



Illinois Urban Manual

A Technical Manual Designed for Urban Ecosystem Protection and Enhancement



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SECTION 1 – PREFACE

This manual is intended for use as a technical reference by developers, planners, engineers, government officials and others involved in land use planning, building site development, and natural resource conservation in rural and urban communities and developing areas.

The standards and associated materials describe best management practices (BMPs) for controlling non-point source pollution impacts that affect ecosystems in existing communities and developing areas. The manual includes an array of BMPs in the following broad categories:

- soil erosion and sediment control;
- stormwater management; and
- special area protection.

Beyond conventional BMP considerations, the manual addresses fish and wildlife habitat improvement, visual and environmental quality and other relevant ecosystem enhancement applications. Where previous BMP manuals have tended to focus on limited aspects of construction site erosion or stormwater runoff control, this manual is designed for more comprehensive, multi-objective ecosystem protection and enhancement.

This manual supersedes the Illinois EPA's 1987 *"Standards and Specifications for Soil Erosion and Sediment Control"* (commonly known as the "Yellowbook") and the original "1995 Illinois Urban Manual." It also replaces Chapter 6, entitled "Procedures and Specifications", of the Association of Illinois Soil and Water Conservation District's 1988 *"Procedures and Standards for Urban Soil Erosion and Sedimentation Control in Illinois"* (commonly known as the "Greenbook").

This manual was prepared for the Illinois Environmental Protection Agency (EPA) by the United States Department of Agriculture's (USDA) - Natural Resources Conservation Service (NRCS) in Illinois. The NRCS was formerly known and recognized as the Soil Conservation Service (SCS). Initially released in 1995, the manual is being revised by a committee made up of federal and state resource agencies, regional planning commissions, local units of government, and the private sector.

Funding in part for the development and maintenance of this manual was provided by Section 319 of the Clean Water Act through Illinois EPA.

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SECTION 1 - INTRODUCTION

This manual is intended to be a dynamic document. Several sections may stay static for long periods of time. Others, such as sections 4, 5, 6, and 7, will likely be expanded on a regular basis to include additional conservation practice standards, construction specifications, material specifications and standard drawings not yet developed.

This manual sets no policy, rules, regulations or restrictions. However, it is anticipated that various units of government and local, state, or federal agencies would use these technical materials to guide development of policy, ordinances, restrictions, or regulations. If adopted by reference in a regulatory program, such as in a Soil Erosion and Sediment Control Ordinance adopted by a local jurisdiction, the contents of the manual have the force of law.

No individual section of this manual will contain all the guidance or material necessary to fully assist users to develop or implement site specific plans. Other references or sections of other manuals or handbooks that supplement this publication should be utilized as appropriate. Other primary reference materials to support this manual are listed in the References section of the practice standards or in Section 9 - References. All references to IDOT in the practice standards and on the standard drawings refer to the *Illinois Department of Transportation Standard Specifications for Road and Bridge Construction*, Adopted January 1, 2002. The standard drawings use an 'RR' designation in place of a gradation number. Assume the 'RR' to be synonymous with 'Gradation'.

Users of the manual are encouraged to contact the following if you have any questions or additional information or assistance is needed:

1. NRCS/SWCD County Office (in the phone book under U.S. Government, Department of Agriculture or the Illinois NRCS website www.il.nrcs.usda.gov under "Directories"), or
2. Illinois EPA, Bureau of Water - Watershed Management Section, 1021 North Grand Avenue East, PO Box 19276, Springfield, IL 62794-9276 (phone 217-782-3362), website: www.epa.state.il.us/water/index.html, or
3. NRCS State Office at 2118 W. Park Court, Champaign, IL 61821 (phone 217-353-6600); or
4. Kent Sims, NRCS Community Assistance Specialist, at 313-J Naperville Rd., Plainfield, IL 60544 (phone 815-577-3597), Email at Kent.Sims@il.usda.gov.

Materials found in this manual can be electronically accessed and are available through the Illinois NRCS website www.il.nrcs.usda.gov under "Technical Resources" or the URL address www.il.nrcs.usda.gov/engineer/urban.

This section was revised in November 2002.

NRCS IL November 2002

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SECTION 2 - NONPOINT SOURCE POLLUTION CONTROL PROCESSES AND PLANNING PRINCIPLES

INTRODUCTION

This section is intended to provide a basic understanding of non-point source (NPS) pollution processes and the principles for minimizing or preventing their effects. These principles must be understood in order to facilitate a comprehensive management strategy, including the design and application of techniques which can effectively control undesired consequences of urban development.

Although this manual is primarily developed to address non-point source impacts, other considerations also need to be addressed. Total natural resource planning will include components that address soil, water, air, plant, and animal resources. In addition, the human aspect of cultural, social, and economic issues needs to be considered.

While this section does not provide a complete discussion of the many issues that should be considered to develop an effective NPS pollution control plan, it does provide a general description of the following key principles and processes:

- A. Overview of Non-point Sources and Impacts;
- B. Planning Principles for Selecting and Implementing Best Management Practices (BMPs);
- C. Soil Erosion and Sediment Control;
- D. Stormwater Management; and
- E. Special Area Protection.

Most NPS pollution control plans will be prepared, and BMPs designed, to meet the requirements of existing ordinances or other governmental or agency regulations or codes. These requirements must be clearly understood so that planning can proceed in a timely and cost effective manner. However, considering the limited scope of many local ordinances, it is strongly recommended that NPS pollution control plans, and site designs, go beyond the required components to address resource concerns in a holistic, multi-objective manner.

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A. OVERVIEW OF NONPOINT POLLUTION SOURCES AND IMPACTS

Recent reports acknowledge that a principal water quality problem in our Nation is non-point source (NPS) pollution. The U.S. Environmental Protection Agency (USEPA) defines NPS pollution as precipitation driven stormwater runoff, generated by land-based activities, such as agriculture, construction, mining, or silviculture. These activities result in diffuse runoff, seepage or percolation of pollutants from the land surface to ground and surface waters.

The Illinois Environmental Protection Agency (EPA) has documented the nature and degree of NPS pollution impacts throughout the State. Numerous watershed assessments have further documented these impacts. To put non-point sources of pollution and the need for their control into perspective, the Illinois EPA first evaluates streams, lakes, and other aquatic ecosystems with respect to their ability to support designated uses, such as aquatic life or swimming. If a use is impaired, causes are identified. Typically, a number of sources, both point and non-point, are identified as contributors. Finally, a list of appropriate BMPs is provided to control the identified non-point sources. While this manual focuses on the selection, design, and implementation of those BMPs, it is important to understand the linkage between BMPs, non-point sources, causes, and use impairments to appreciate the importance of a multi-objective management plan.

A notable distinction between the USEPA definition of non-point source pollution, cited above, and Illinois EPA's definition is the recognition that non-point sources affect not just water quality but also the physical habitat of aquatic ecosystems. The Illinois EPA identifies eight basic categories of NPS pollution which encompass agricultural, urban, and special land development activities (e.g., mining). This manual focuses on NPS pollution in the following categories:

- erosion from construction sites;
- urban runoff; and
- hydrologic/habitat modification.

Development has both direct and indirect impacts on water bodies and other valuable natural features. These impacts occur both during construction and after the development is complete. Some impacts result from the direct modification or destruction of streams, lakes, and wetlands. Other impacts occur primarily offsite due to changes in the quality and quantity of runoff from the development. Some common NPS pollution sources from development are described below.

1. Erosion from Construction Sites

Erosion and sedimentation are natural geologic processes that human activities often accelerate. Erosion occurs through the action of water or wind. In Illinois, water is the primary cause of erosion. Wind erosion in urban areas is a minor concern, but it can be

a nuisance and even a safety hazard in areas near a site under development.

There are three major processes that must be understood to effectively control or limit soil erosion and sedimentation on construction sites. These are detachment, transport, and deposition. Four types of erosion showing detachment and transport of soil on an exposed slope are shown in Figure 2.1. The four erosion types are as follows:

Raindrop erosion is erosion resulting from the direct impact of falling drops of rain on soil particles. This impact dislodges soil particles and splashes them into the air. The dislodged soil particles can then be easily transported by the flow of surface runoff.

Sheet erosion is the removal of a layer of exposed surface soil by the action of raindrop splash and runoff. The water moves in broad sheets over the land and is not confined in small depressions.

Rill and Gully erosion occurs after runoff flows concentrate into rivulets, cutting several inches deep into the soil surface. These grooves are called rills. Gullies may develop from rills if not repaired or in other areas where a concentrated flow of water moves over the soil.

Stream and Channel erosion occurs with an increase in the volume and velocity of runoff. These larger and faster flows detach and then transport soil from the stream bottom and the stream bank toe. If not repaired, large sections of the stream bank may fail or slump into the stream.

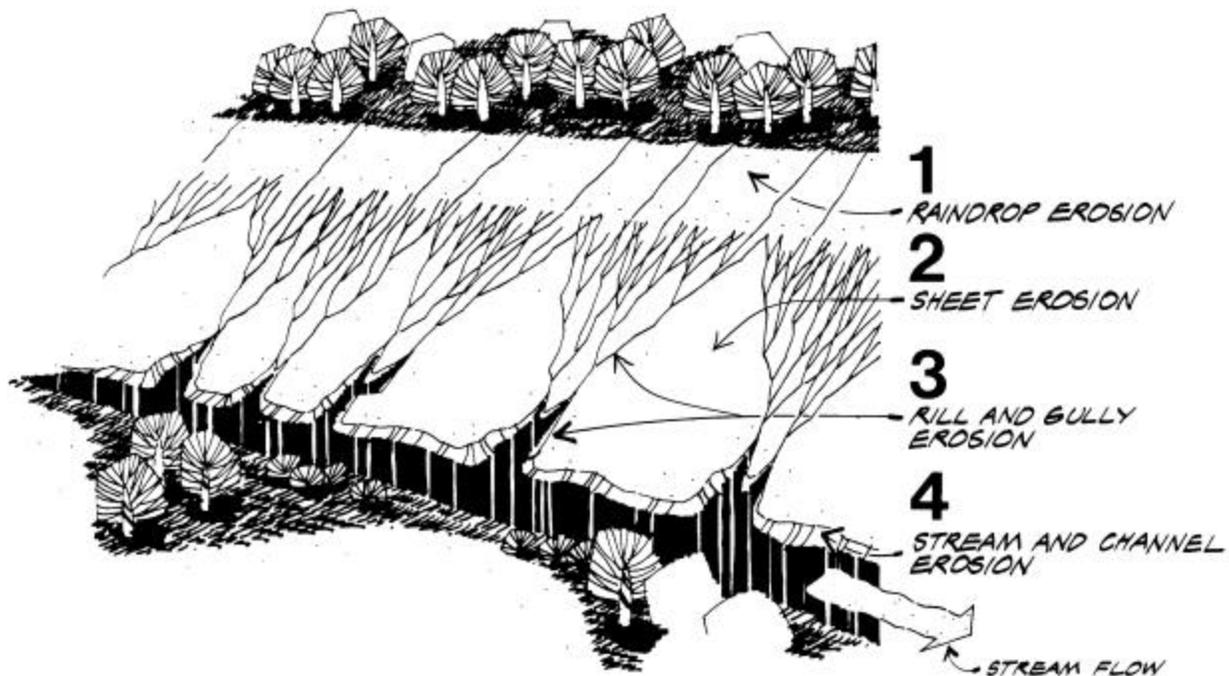
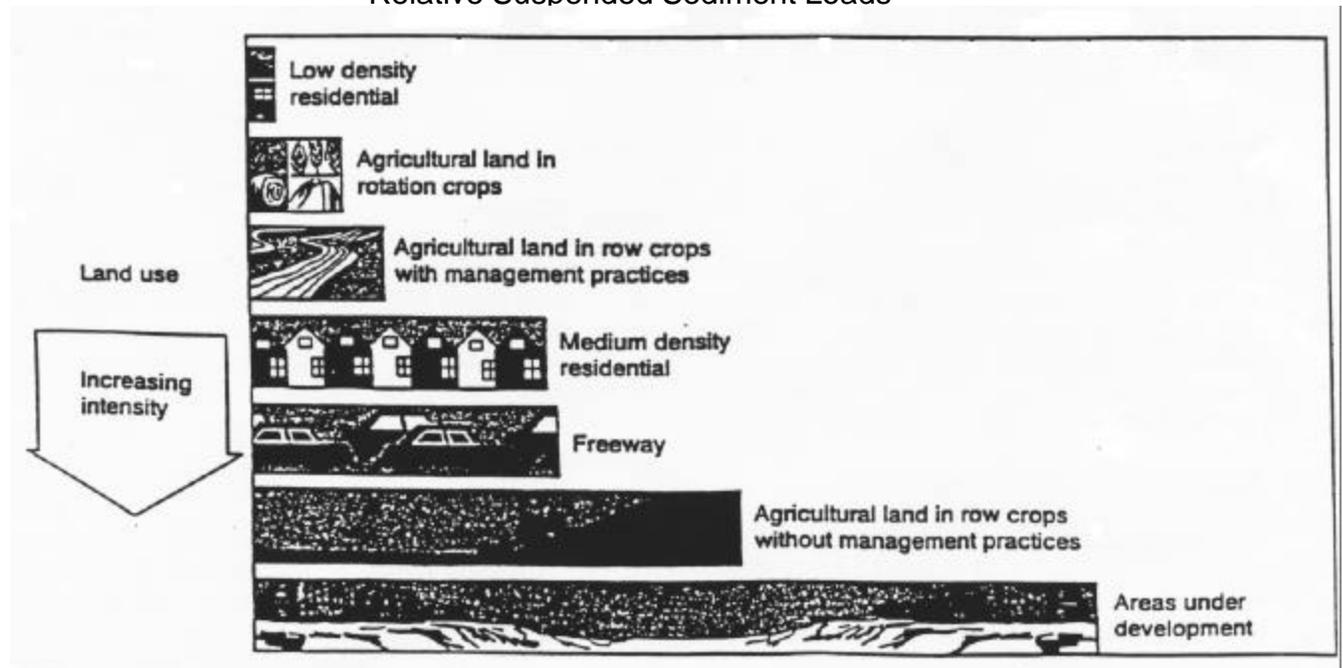


Figure 2-1 The Four Types of Soil Erosion on an Exposed Slope

Many of the BMPs included in Section 4 of this manual will individually address one or more types of erosion. Of these, most will impact the detachment or movement of sediment or provide storage methods.

National estimates indicate that uncontrolled erosion from construction activities can generate enormous quantities of sediment -- 20 to 200 tons per acre per year. In comparison, typical erosion rates from croplands range from 1 to 20 tons per acre per year. Figure 2-2 shows a relative comparison of suspended sediment loading, again indicating the relatively high contribution of sediment from construction sites.

Relative Suspended Sediment Loads



Adapted from Wisconsin Department of Natural Resources
Figure 2-2 Sediment Losses Related to Land Use Practices

Construction site erosion and the movement of sediment as it leaves the site causes several offsite problems. Also, a site that has been degraded from excessive erosion is more expensive to landscape and maintain. The resultant sediment deposits are expensive to remove from culverts, ditches, lakes, or streams. A brief summary of environmental impacts follows.

Water quality impairment: Sediment from construction sites adversely affects water clarity, which reduces sunlight penetration thereby limiting photosynthesis by aquatic plants. In addition, impaired water clarity negatively impacts fish searching for their prey. Sediment-laden runoff also transfers nutrients and other pollutants to downstream lakes and rivers, degrades habitats and spawning areas of aquatic organisms, and increases costs for water treatment.

Loss of flood conveyance and storage: Excess sediment from construction sites fills storm sewers and ditches, detention basins, wetlands, and stream and

river channels. This sediment must be removed to maintain the flow or storage capacity. If not removed, this accumulated sediment worsens drainage and flooding problems and can limit the navigability of river channels. In addition, increased rates of runoff from construction sites can cause local flooding problems.

Degradation of natural areas: Over time, sediment accumulation can lead to the degradation of natural plant communities, such as prairies and wetlands. Sediment accumulation has several negative effects on natural communities. The sediment can bury or suffocate existing plants, smother the native seed bank present, and can act as a medium for the germination of exotic plant seeds that were carried in with the sediment. Many of the exotic species are aggressive (e.g., purple loosestrife, reed canary grass) and can eliminate other more desirable species within a short period of time.

Safety and nuisance problems: Sediment on roadways, conveyed either by direct runoff from construction sites or tracking by construction vehicles, can be a traffic safety hazard. Dust generated from unprotected soil on uncontrolled construction sites is a nuisance for adjacent property owners.

2. Urban Runoff

Urban runoff has been sampled at numerous locations in Illinois and around the country. These data show that urban runoff is contaminated with a number of pollutants, including sediment, heavy metals, petroleum-based hydrocarbons, nutrients, pesticides, chlorides, bacteria, and oxygen-demanding organic matter. It is becoming apparent that pollution in urban runoff is more damaging to many water bodies and ecosystems than pollution from municipal and industrial treatment plants, known as point sources.

Much of the pollutant load is generated from impervious surfaces, particularly roadways and parking lots, and is related to automobile traffic. It is not surprising, therefore, that high density development activities, such as commercial, industrial, and highway projects, generally contribute higher pollutant loads than lower density residential developments. Another important factor controlling the level of pollutant runoff from urban areas is the opportunity for natural vegetative filtering on the site. Unfortunately, most modern developments route runoff from impervious surfaces directly into storm sewers or paved channels which effectively convey the pollutants, without any opportunity for infiltration or filtering, into receiving water bodies.

Water quality impacts of urban runoff have been extensively documented around the country. The following are some common impacts noted in Illinois:

Nutrient enrichment/eutrophication: Pollutant loads of phosphorus and nitrogen in urban runoff are substantially higher than in runoff from undeveloped lands. Most nutrients applied in the urban setting are used on lawns, golf courses and other intensively used and maintained landscapes. Nutrients either

move with the water, like nitrogen, or are attached to eroded soil, like phosphorous. High nutrient levels in lakes and slow moving rivers can result in excessive growth of algae and other aquatic plants which can impair aesthetics, water quality, and recreational potential.

Toxicity to aquatic life: Urban runoff pollutant concentrations often exceed water quality standards. Potential toxicants include pesticides, other organic compounds, and heavy metals. Such toxicants can move with the water, in the air, attached to soil particles, or in plants and animals depending on their solubility in water, origin, mode of application, and other chemical and physical properties. While existing data are not conclusive in showing that these pollutants occur in water bodies in concentrations which are acutely toxic to aquatic biota, there is evidence to indicate that adverse impacts may result from chronic exposure and bioaccumulation of pollutants in the tissue of sensitive organisms. Factors that may worsen toxicity effects include high water temperature (discussed below) and low dissolved oxygen. Dissolved oxygen may be reduced to dangerous levels due to the decomposition of organic matter that is washed off of urban land surfaces by storm events, particularly during the summer time. Low dissolved oxygen also may be a problem during winter ice-cover conditions due to the oxygen demand of contaminated sediments and decaying plant matter. Fish kills are common in urban lakes and detention ponds as a result of such factors.

Sediment contamination: The bottom substrates of water bodies in urban areas are typically coated with a layer of contaminated sediment resulting from urban runoff. This sediment may interfere with the reproduction and feeding mechanisms of aquatic organisms, including fish. It also may be toxic to some sensitive organisms due to elevated concentrations of pesticides, heavy metals, and petroleum-based organic compounds. Urban runoff sediments may also have a relatively high organic content that exerts an oxygen demand as it is "broken down" in receiving water bodies.

Bacterial contamination: The water quality standard for fecal coliform bacteria is frequently violated in urban water bodies following storm events. The violation of this standard generally reflects the presence of significant animal or human waste in the water, and is commonly used as an indicator for the closing of swimming beaches. Additional tests are typically needed to verify whether the contamination is of human origin, such as from faulty septic systems or illicit connections between sanitary sewers and storm sewers.

Salt contamination: The use of salt as a deicing agent can result in extremely high salinity levels in roadside ditches and downstream water bodies. While salinity levels are typically not high enough to be acutely toxic to fish and other aquatic organisms, they may adversely impact sensitive plant communities, particularly wetland species. Further, salt and other soluble urban runoff constituents can degrade aquifers used as a source of water supply.

Impaired aesthetic conditions: Urban runoff carries a number of constituents that may impair the visual appeal and clarity of receiving water bodies. These constituents, including trash and debris, suspended solids, and oil and grease, reduce the recreational potential of many water bodies in urban areas.

Elevated water temperatures: Watershed urbanization has been shown to significantly increase summertime temperatures in receiving streams. This effect is due to a number of factors, including the removal of natural shading and the reduction of base flows, as discussed below. Runoff from impervious surfaces that have been heated by the sun also contributes to this effect. The resultant elevated water temperatures are directly stressful to native aquatic life and increases water quality problems.

Impairment of water supplies: Many of the contaminants listed above adversely affect both surface and groundwater sources of water supply. While surface water impacts can be directly determined from existing data, it is much more difficult to assess the effects to groundwater because of the complexity of multiple sources and routes into underground aquifers.

Beyond their effects on runoff quality, development activities invariably alter runoff patterns by converting pervious land to impervious surfaces and compacting remaining pervious surfaces (e.g., lawns). This conversion results in dramatic increases in the rate and volume of storm runoff and reductions in groundwater recharge. Also, urban drainage features such as storm sewers and lined channels convey runoff water downstream at a much faster rate. This leads to a number of consequences, several of which are explained below.

Increased flooding: Flood flow rates have been shown to increase by 100 to 200 percent or more if a watershed is urbanized without effective stormwater detention. Local drainage problems also are made more severe. As a result, flood damages may be sustained by downstream residences and businesses, and government officials may be forced to implement expensive remedial projects.

Stream channel erosion: Increased rates of runoff and resultant high channel velocities can destabilize downstream channels leading to excessive bank erosion and/or downcutting of the channel, often threatening adjacent structures. This problem is common in Illinois streams, particularly where alterations have been made to the stream or watershed.

Hydrologic destabilization: Development generally results in higher, and more frequent storm flows, and lower and longer duration low flows. The more frequent high flows and the high velocities that accompany them can sometimes "flush out" natural substrates and bottom dwelling organisms. The lower low flows tend to concentrate stream pollutants and reduce stream depths necessary for the survival of fish. Extended low flows also can result in higher summertime water temperatures that further stress fish and other aquatic organisms.

Reduced recharge rates can also result in lower water levels in lakes and wetlands during critical dry periods.

3. Hydrologic/Habitat Modification

Some urban developments directly impact sensitive water bodies and wetlands. To accommodate development plans, streams are sometimes channelized or rerouted. Wetlands may be filled, excavated, or drained. More subtle forms of modification include the removal of native vegetation from stream banks and lakeshores. These activities not only destroy critical aquatic habitats, they also impair other valuable functions. These impacts are summarized below.

Destruction of aquatic and terrestrial habitat: Draining, straightening, vegetation removal, filling, and dredging of natural water bodies and wetlands adversely affects habitat for water dependent fish, wildlife, and waterfowl. In addition to short-term effects caused by construction, significant long-term effects often result due to the elimination of spawning and breeding areas, cover, shading, and a general reduction in habitat diversity. Often, the result of construction in a water body or wetland is the replacement of native vegetation with man-made structures such as riprap or metal retaining walls. Such man-made structures typically do not address the habitat needs of resident aquatic life and wildlife.

Water quality impairment: Construction in and adjacent to water bodies and wetlands create both long-term and short-term effects on water quality. The primary short-term effect is erosion, which was discussed previously. However, the consequences of construction in water bodies and wetlands are often much more severe than construction in upland locations because of the erosive effects of flowing water and wave action. The long-term effects of development in water bodies and wetlands relate primarily to the elimination of vegetation and other natural materials. The typical consequences of these alterations include reduced shading and a resultant increase in water temperature, reduced capacity for pollutant filtering, and an increased propensity for instability and erosion.

Alteration of natural storage and conveyance functions: While state and federal regulations place some constraints on the degree of alteration allowed in floodplains and wetlands, there may still be significant adverse impacts on natural stormwater storage and conveyance functions. Typical consequences include the reduction in stream roughness (or flow retardance) and length due to channel modifications and loss of stormwater storage due to draining or filling of small wetlands. This results in increased flow velocities and volumes, which cause stream channel erosion and increased flooding.

The ultimate concern regarding non-point sources is whether they impair the desired uses of water bodies and aquatic ecosystems -- particularly aquatic life, swimming, and water supply uses. There now is clear evidence from Illinois and around the country that watershed urbanization has serious adverse impacts on the beneficial uses of

downstream water bodies. In northeastern Illinois, an analysis of data from over forty streams and rivers showed that virtually all streams with urban or suburban watersheds had degraded fish communities (i.e., fair to poor conditions based on the Index of Biotic Integrity). In contrast, nearly all streams in rural/agricultural watersheds had good to excellent fish communities. While this correlation may not apply statewide, it does indicate the need to better control urban non-point source impacts to avoid the otherwise inevitable degradation of receiving water bodies.

B. PLANNING PRINCIPLES FOR SELECTING AND IMPLEMENTING BEST MANAGEMENT PRACTICES

Planning principles are the overall guidelines that need to be considered to develop and implement a non-point source control plan that will survive the test of time and provide ecologically and economically sustainable development, while meeting the needs of society. The basic planning principles listed below apply both to new developments as well as existing sites in need of remedial BMPs.

1. Thoroughly collect, review and understand all existing local, state, federal governmental or agency rules, regulations, restrictions, codes, permits, etc.
2. Determine who can help you develop a plan that meets your needs and addresses identified resource concerns.
3. Thoroughly document the pre-development characteristics of the site and immediate surroundings, focusing particularly on topography, drainage patterns, soils, and the presence of important natural features such as streams, water bodies, wetlands, woodlands, and natural area remnants.
4. Plan the development or remedial project to fit the particular topography, soil, drainage patterns and natural vegetation of the site.

Application of these planning principles is particularly important for new developments. Good site planning is often the key to minimizing adverse environmental impacts. Effective site planning and design will result in minimal impacts to water quality, natural hydrologic characteristics, and sensitive landscape features. Site design and the application of sound planning principles are critical factors in achieving effective soil erosion and sediment control, stormwater management, and protection of stream, lake, and wetland resources as described below.

C. PLANNING PRINCIPLES FOR SOIL EROSION AND SEDIMENT CONTROL

This manual describes BMPs to accomplish three basic elements of erosion and sediment control:

- Soil stabilization;
- Runoff control; and

- Sediment control.

The most important, and most often neglected, task is to provide effective soil stabilization throughout the duration of a construction project. Soil stabilization is based on a simple premise: If water cannot detach the soil, it cannot be transported (i.e., erosion does not occur). The easiest, most economical, and environmentally sound way to prevent detachment is by keeping a good vegetative cover in place. It also can be accomplished via other techniques such as mulching or use of erosion blankets.

Runoff control measures are needed to deal with concentrated runoff. Concentrated runoff is a common occurrence on large sites containing existing drainageways and is made more severe by grading activities that removes water absorbent topsoil and compact underlying soils. If concentrated runoff occurs, it will further erode the soil and carry it into streams, lakes, or road ditches. The basic principles behind runoff control measures are to provide stabilized channels for runoff water and to divert concentrated runoff from exposed, erodible soils.

Once the soil is detached, flowing water transports the soil to downslope positions. Sediment control measures are needed to filter, trap, or otherwise remove eroded sediments before they can leave the construction site.

In implementing the erosion and sediment control BMPs described in this manual, it is important to understand them in the context of an overall construction site plan. The following site design, management, and maintenance principles should be implemented on all construction sites.

1. Plan the development to fit the particular topography, soil, drainage patterns and natural vegetation of the site.
2. Preserve and protect areas of natural vegetation on the site.
3. Take special precautions to prevent damages that could result from development activity adjacent to watercourses, lakes, and wetlands.
4. Minimize the extent and duration of the area exposed at one time.
5. Apply temporary erosion control practices as soon as possible to stabilize exposed soils and prevent on-site damage.
6. Install sediment basins or traps, filter barriers, diversions, and perimeter control practices prior to site clearing and grading to protect the disturbed area from off-site and onsite runoff and to prevent sedimentation damage to areas below the development site.
7. Keep runoff velocities low and retain runoff on the site, as much as possible.
8. Provide measures to prevent sediment from being tracked onto public or private roadways.

9. Implement final grading and install permanent vegetation on disturbed areas as soon as possible.
10. Implement a thorough inspection, maintenance, and follow-up program.

D. PLANNING PRINCIPLES FOR STORMWATER MANAGEMENT

This manual describes BMPs to accomplish two basic elements of stormwater management:

- Drainage control; and
- Detention.

In implementing drainage and detention BMPs, however, it is critical that site design decisions reflect the ultimate goal of effective stormwater management--*to minimize the adverse impacts of stormwater runoff both onsite and offsite*. In other words, stormwater management should be looked at as part of the whole watershed, not just the site being developed.

The philosophy endorsed in this manual is to develop stormwater systems that mimic, as closely as possible, the runoff process of the site in its natural state. This philosophy involves the preservation of natural storage, infiltration, and filtering functions.

The primary objectives of the recommended stormwater management approach are to: 1) minimize water quality degradation; 2) minimize downstream channel erosion and habitat loss; 3) maintain natural base flows and groundwater recharge; 4) prevent increases in downstream flooding; 5) provide opportunities for multiple use of drainage and storage facilities; and 6) provide for economical, safe, aesthetic, and socially acceptable drainage within new developments.

Ideally, stormwater management based on this philosophy will not only preserve beneficial uses of downstream water bodies but also will reduce drainage system construction costs. This is accomplished by minimizing the need for expensive capital improvements to the existing drainage system to convey, store, and treat increased runoff volumes and rates.

In order to achieve these objectives, the following site planning and design principles should be implemented on all developments. These principles constitute what is sometimes called a runoff reduction hierarchy.

1. Plan the development to fit the particular topography, soil, drainage patterns and natural vegetation of the site.
2. Minimize impervious surfaces on the property, consistent with the needs of the project, to maximize infiltration opportunities.
3. Reduce flows by use of open vegetated swales, filter strips, and natural

depressions and preserve existing natural drainageways.

4. Infiltrate runoff on-site, as allowed by local soil conditions.
5. Provide stormwater detention designed to emulate natural wetland and pond systems.
6. Construct storm sewers only on an as-needed basis.

E. PLANNING PRINCIPLES FOR SPECIAL AREA PROTECTION

The final category of BMPs included in this manual deal with the protection and restoration of special areas, including:

- Streambanks and shorelines;
- Wetlands and water bodies;
- Trees and native vegetation (including natural areas);
- Steep slopes; and
- Karst areas.

The objectives of special area protection include the preservation of important recreational and habitat amenities and the restoration of degraded resources to a higher functional level. Ultimately, accomplishing these objectives will require site planners to view natural areas from the perspective of long-term sustainability. Planners and developers also should view protection and restoration of natural areas in terms of their positive impacts on site aesthetics, marketing, property values, and reduced long-term maintenance.

The following site planning and design principles will aid decision-makers in identifying and implementing appropriate BMPs.

1. Plan the development to fit the particular topography, soil, drainage patterns and natural vegetation of the site.
2. Consider the unique characteristics of a site, particularly natural areas, as potential amenities which can enhance the aesthetics, land value, and marketing potential of the development.
3. Avoid, wherever possible, the disturbance of existing natural areas including stream corridors, lakes, wetlands, native woodlands and prairies, steep slopes and karst.
4. Protect the integrity and long-term health of natural areas through the utilization of buffers, setbacks, and cluster development techniques.

5. Where feasible, utilize native vegetation and natural materials in the design of BMPs based on local soil, topographic, and pre-settlement vegetation conditions.

BEST MANAGEMENT PRACTICES

Section 4 of this manual contains standards for best management practices (BMPs). These BMPs address site-specific NPS pollution problems and opportunities. These practices have been listed two ways: alphabetically and grouped to address the three principal topics identified above (soil erosion and sediment control, stormwater management, and special area protection). These listings should be useful for selecting individual practices or grouping practices to protect or enhance the planned site, as well as adjacent or downstream areas.

It also should be noted that while a practice may be listed in a particular topical area, the same practice also may be applicable in another area. For example, the most common application of a level spreader is probably a stormwater management BMP to evenly distribute runoff from an impervious surface onto a filter strip. Level spreaders also may be used to minimize erosion by dispersing concentrated runoff on construction sites or to establish and maintain desired hydrologic conditions in wetlands.

To implement effective site planning and BMP selection one must understand the preceding NPS pollution processes and follow sound planning principles. The Practice Selection Guide in Table 2.1 indicates the relative impacts that individual practices have on specified problems. Planning procedures, as described in Section 3 of this manual, will assist with problem identification and selection of practices or groups of practices. Section 8 of this manual contains evaluation criteria and provides information relative to effectiveness for addressing a broad spectrum of resource concerns, whether soil, water, air, plant, or animal.

References:

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TABLE 2.1 PRACTICE SELECTION GUIDE

			PROBLEMS													
NAME	CODE	BRIEF DEFINITION	Sheet & Rill Erosion	Rill & Gully Erosion	Streambank Erosion	Stream Channel Erosion	Toxics & Salt Reduction	Flooding	Increased Peak Flow	Nutrient Pollution	Pesticide Pollution	Sediment Damage	Dust Control	Construction Road Maintenance	Water Table Control	Organic Pollution
Urban Stormwater Wetlands	800	Constructed wetland to improve stormwater quality				3	3	3	3	3	3	3			3	3
Construction Road Stabilization	806	Stabilize temporary roads to reduce erosion		3								2	2	3		
Culvert Inlet Protection	808	Temporary sediment filter at culvert inlets										2				
Diversion	815	Channel and ridge constructed to collect and divert runoff	2	2	1		1	1		1	1	1				
Diversion Dike	820	Perimeter dike to manage and divert runoff	2	2	1		1	1		1	1	1				
Dust Control	825	Controlling dust on construction sites and roads	1				1						3	1		
Erosion Blanket	830	Preformed organic or inorganic erosion mat	2		1	1				1	1	2	1			
Filter Strip	835	Vegetated filter zone to remove pollutants			2		1			1	1	2				
Grass-Lined Channels	840	Natural or constructed channel vegetated to convey water		2		2		1		1	1	1			1	
Impoundment Structure-Full Flow	841	Structure for collecting and storing water, debris, or sediment		3		3		2	2	2	2	2			2	
Impoundment Structure-Routed	842	Structure for collecting and storing water, debris, or sediment		3		3		3	3	3	3	3			3	
Infiltration Trench	847	Pits or trenches designed to hold water to increase infiltration	1	1				1	1	1	1					
Inlet Protection-Block and Gravel	850	Temporary sediment control barrier at storm drain inlet								1	1	1				
Inlet Protection-Excavated Drain	855	Excavated area to trap sediment at storm drain inlet								1	1	1				
Inlet Protection-Fabric Drop	860	Temporary practice to control sediment at storm drain inlet								1	1	1				
Inlet Protection-Gravel & Wire Mesh	861	Temporary sediment control barrier at storm drain inlet								1	1	1				
Inlet Protection-Sod Filter	862	Sediment filter using sod around a storm drain drop inlet								1	1	1				
Inlet Protection-Straw Bale Barrier	863	Temporary practice to control sediment at storm drain inlet								1	1	1				
Land Grading	865	Smoothing surface to planned grade to improve site	2	2				1		1	1	1		2		
Level Spreader	870	Structure to spread water flow uniformly	1	1	1					1	1	1				
Mulching	875	Placing materials to protect soil surface	2	2	1				1	2	2	2	2			
Permanent Vegetation	880	Establishing permanent vegetative cover	3	3	2		2	2	2	3	3	3	3	1		
Permeable Pavement	890	Pavement having interspersed sod, gravel, or sand areas	1	1				1	1	1	1					
Portable Sediment Tank	895	Container for trapping sediment from runoff water								1	1	2				
Right-of-way Diversion	900	Structure to control roadway erosion		1				1				1		2		
Rock Check Dam	905	Structure to control erosion in ditch or grass swale		3								2				
Rock Outlet Protection	910	Rocked area at outlets to reduce flow erosion		2		2						1				
Silt Fence	920	Temporary sediment barrier of filter fabric	2	2						1	1	2				
Sodding	925	Laying blanket of established turf to protect area	3	3	2		1	2	2	3	3	3	3	1		
Stabilized Construction Entrance	930	Rock pad at entrance or exit to control tracking of mud to streets										1		3		
Straw Bale Barrier	935	Bale barrier to trap sediment from runoff	2	2						1	1	2				
Structural Streambank Stabilization	940	Structure to control streambank erosion			3							2				
Subsurface Drain	945	An underground water collection and transport tube	1	1	2		2	1	2	1	1	1		2	3	
Sump Pit	950	Temporary pit to trap and filter water								2	2	2				
Surface Roughening	953	Grooving, stair stepping, or tracking across a slope	1	1					1			1				
Temporary Diversion	955	Temporary diversion for runoff control	2	2	1		1	1		1	1	1				
Temporary Sediment Trap	960	Temporary ponding basin to trap sediment		1					1	1	1	2				
Temporary Seeding	965	Planting vegetation to protect areas from erosion	3	2	2		2	2	2	2	2	2	2			
Temporary Slope Drain	970	Short term water conveyance down a sloping area		2						1	1	1		1		
Temporary Stream Crossing	975	Short term stream crossing for equipment			1	1								2		
Temporary Swale	980	Temporary excavated drainageway to control runoff		1		1		1		1	1	1				
Topsoiling	981	Adding or replacing quality soil to the surface	2	1			2	1	1	1	1	1				
Tree/Forest Ecosystem Preservation	984	Protecting contiguous stands of trees from construction damage	2	2	2			2	1	3	3	1	2		1	
Tree and Shrub Planting	985	Planting trees and shrubs	3	3	3		2	1	2	3	3	3	3		2	
Tree Protection	990	Protecting individual trees from construction damage	1	1	1			1	1	1	1	1	1		1	
Tree Protection-Augering	991	Protecting individual trees from underground construction damage	1	1	1			1	1	1	1	1	1		1	
Vegetative Streambank Stabilization	995	Vegetation to control streambank erosion			3					1	1	1				
Well Decommissioning	996	Permanent sealing of a water well, boring, or monitoring well								3	3					3

1 = Slight Impact 2 = Moderate Impact 3 = Significant Impact

SECTION 3 – PLANNING PROCEDURES

INTRODUCTION

Selection and design of best management practices (BMPs) must involve more than choosing a practice from a list and installing it on a site. It also involves a planning process which considers the problem to be avoided, or remediated, and also factors in the characteristics of the site. Advance planning should occur first in the development of local ordinances in which local governments identify appropriate BMP requirements for new development. Such advance planning will reduce the burden on developers and facilitate the selection of BMPs.

In the context of remedial projects, however, there typically will be no ordinance or "cookbook" to follow. In this setting, planning becomes even more critical in the selection and design of appropriate BMPs.

Planning involves more than simply managing or treating individual problems or resources. It involves a careful, deliberate, and organized approach that is centered on purpose, problem identification, analysis, evaluation, decision-making, and maintenance.

This section of the manual outlines and explains a procedure to identify problems, needs, and objectives; how to inventory, analyze and evaluate BMP alternatives; and finally, how to select and implement practices based on social, environmental, and economic considerations.

Although this manual was developed primarily to address non-point source (NPS) pollution issues, the use and application of the standards are intended to protect, conserve, and enhance natural resources. If planning is approached in this manner, the human impact on the ecosystem will be minimized and related adverse impacts, such as increased flooding, will be minimized.

The Procedures section will cover the following major issues:

- A. Planning process;
- B. Criteria for BMP selection;
- C. Practices and systems; and
- D. Evaluation and monitoring.

This section was revised in January 1999.

NRCS IL January 1999

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SECTION 3 – PLANNING PROCEDURES

All sites being developed will vary in their suitability for different types of development. Knowing the soil type, topography, natural landscape values, drainage area, on and offsite hydrology, flooding potential, and other pertinent data helps identify both beneficial features and potential problems of a site and adjacent areas. Generally, the location of the site has already been determined. What is needed then are the best procedures for identifying and addressing potential or existing problems, or to address established restrictions, ordinances, or regulations to develop a site in a quality manner.

A. Planning Process

The process outlined in this manual is a standard process used by NRCS and others. It is a nine-step process that is fully explained in NRCS's National Planning Procedures Handbook.

The nine steps are outlined below:

1. Identify problems - Identify existing, potential, and perceived natural resource problems, opportunities and concerns, including short-term and long-term issues relating to site resources and offsite impacts. As planning progresses and additional information is gathered, other problems and opportunities may be identified.
2. Determine objectives - Determine how the site will be used, what are the site features, what should be enhanced, and what rules, codes, or restrictions need to be addressed. Develop an understanding of the desired future conditions for the planning area as compared to the existing conditions. This includes the desired resource uses, resource problem reductions, and on-site and off-site ecological protection. Non-point source control processes and planning principles are discussed in Section 2. As resources are inventoried, their interactions analyzed, and alternatives formulated, objectives may need to be reviewed and modified.
3. Inventory resources - Collect appropriate natural resource (soil, water, air, plant, and animal), economic, and social information about the planning area. Also consider impacts offsite, such as water running onto or through the site. Use this information to further define existing and potential problems and opportunities, clarify concerns, and to formulate and evaluate alternatives. Gather information as needed concerning the affected resources, the human considerations, and operation and management.
4. Analyze resource data - Study the resource data and clearly define the natural resource conditions, including limitations to their use and potentials. This step provides the information needed to formulate and evaluate alternatives. The analyses should clearly establish the cause and effect relationships and provide information about existing and future conditions. Qualify and quantify resource use and development impacts. Appendix C "Methods for Estimating Water Quality Impacts of Urban and Suburban Development" contains methods to

estimate the impacts of development.

5. Formulate alternatives - Develop alternatives that will achieve the objectives, solve the identified problems, take advantage of opportunities, and prevent additional problems from occurring. Alternative practices are selected from BMPs in Section 4 and may need to be grouped into systems to address multiple problems. Include measures that mitigate potential adverse impacts on the resources and address regulatory requirements.
6. Evaluate alternatives - Evaluate the alternatives to determine their effectiveness in addressing the problems, opportunities and objectives. Alternatives should pass the tests of feasibility and acceptability -- socially, economically and environmentally - or adjustments should be made.
7. Make decisions - The decision-maker determines which alternative(s) to implement and the necessary documentation is prepared. Public review and comment are obtained, if needed, before a decision is reached. Alternatives chosen are in compliance with all applicable regulations.
8. Implement plan - Implementing the plan includes installing BMPs and obtaining necessary permits, funding, land rights, surveys, final designs, and inspections. It also includes the operation, maintenance, and management needed to assure proper functioning of practices following installation. Practices are implemented per the site plan to achieve short term and long term objectives and goals.
9. Evaluate plan - Evaluate the effectiveness of the implemented plan to ensure that it is functioning as planned and achieving the objectives; to identify reasons for lack of progress in plan implementation, if applicable; and to obtain information on the applied treatment. Where the actual results differ from those anticipated, provide feedback into the planning process. This could include revision of quality criteria; modification of indicators/target values; changes to current practice standards; and revision of other Urban Manual data.

The outlined procedure works best if certain pre-planning activities have occurred. Some of these activities include:

1. Define the site planning area on a map.
2. Order or prepare needed work maps and determine map bases and scales.
3. Determine planning objectives and needs, particularly how they relate to ordinances, regulations, and restrictions relating to site development and use.
4. Assemble existing information and data on soil, water, air, plant, and animal resources on and around the site.
5. Determine who needs to be involved in the planning and review processes.

6. Consider data needs for the site.
7. Prepare a draft work plan that identifies action items, responsible parties, and deadlines.

Good pre-planning will expedite and improve the planning process.

B. Criteria for BMP Selection

Once problems or issues are identified, it becomes paramount to establish goals for BMP selection. Many of the goals are established as part of local, state, or federal laws or as part of existing ordinances and codes. The development of the plan and nature and extent of treatment will be guided by these goals.

Section 2 of this manual identifies non-point source impacts and describes the principles for controlling these impacts with the practices contained in Section 4. Section 8 provides guidance for evaluating the relative impact that individual practices have on identified problems and other soil, water, air, plant and animal resources. This should be used to guide decisions on the best practice or combination of practices that solve the identified or potential problems without creating new problems.

The NRCS, along with others, have established treatment levels that correspond with soil, water, air, plant, and animal resource concerns. These standards are established in the NRCS's Field Office Technical Guide, Section 3.

C. Practices and Systems

The core of this manual is the BMP standards, construction specifications, material specifications, and standard drawings which are contained in Sections 4, 5, 6 and 7, respectively. These sections are meant to be dynamic and expandable. As new information becomes available, and field experience evolves, updates and additions will be prepared as determined by the agencies supporting the manual.

However, updates and additions will also depend on the needs of units of government and other users. As users, you can guide the nature of changes by personal contact with the agencies involved in preparation of the manual. Practices not currently provided in this manual may be obtained from several of the other sources identified in the reference section. Additional practice standards and related materials will be developed as needs indicate.

Users must understand that typically several practices will be needed to meet established criteria for addressing any given problem or resource concern. When a combination of practices is evaluated together, it is termed a system, or *treatment train*. A system is often needed to fully address any problem or concern. If there are multiple issues to plan treatment for, the complexity of the system may require additional practices. The development of the appropriate system involves the analysis of the following items:

1. Nature and extent of problem(s)
2. Onsite versus offsite considerations
3. Short term versus long term solutions
4. Treatment requirement standards
5. Long term maintenance considerations
6. Economic considerations
7. Regulatory requirements

D. Evaluation and Monitoring

The best practices for addressing key problems and concerns are identified in Table 2.1 in Section 2. A broader evaluation of the practices on a more complete range of problems or issues is contained in Section 8. On any given site these general rankings may be different than indicated. They are meant to provide a relative range of effectiveness and should be used as a guide. Qualified and experienced professionals in the natural resource field should be consulted to adequately assess the impacts of any proposed actions.

Monitoring of BMP effects should accompany plan implementation, where appropriate and feasible. The effects of the practice or system should normally be observable and some of the indicators listed in Section 2 might be used to qualify results. Revisions to plans should always be considered if unexpected problems or changes to use and management occur.

SECTION 4 – PRACTICE STANDARDS

INTRODUCTION

This section contains the best management practice (BMP) standards. Each standard includes the following information:

- Definition
- Purpose
- Conditions where practice applies
- Criteria (including minimum or maximum requirements)
- Considerations
- Plans and specifications
- Operation and maintenance
- References

The standards in this section are filed in alphabetical order by the name of the practice. This also corresponds to the numerical order for practice code number. A list of the practices grouped into categories based on their principal applications is also provided for cross-reference. This listing is grouped as follows:

Soil Erosion and Sediment Control (SE/SC)

- Soil stabilization
- Runoff control
- Sediment control
- Miscellaneous SE/SC

Stormwater Management

- Drainage control
- Detention

Special Area Protection

- Streambanks and shorelines
- Wetlands and water bodies
- Trees and native vegetation (including natural areas)

- Steep slopes
- Karst areas

As indicated previously, however, some standards (e.g., level spreader or filter strip) may be used for multiple applications.

Standards are usually used in groups as a system to solve a particular concern or multiple concerns. Standards should be selected by professional engineers, planners, site designers, or other natural resource specialists and based on the principles described in Section 2, since any particular standard will not work in all cases.

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LIST OF URBAN STANDARDS

(Alphabetical)

<u>Name</u>	<u>Code</u>	<u>Date</u>
Urban Stormwater Wetlands*	800	8/94
Construction Road Stabilization	806	1/99
Culvert Inlet Protection	808	1/99
Diversion	815	3/94
Diversion Dike	820	2/94
Dust Control	825	2/94
Erosion Blanket	830	8/94
Filter Strip	835	1/99
Grass - Lined Channel	840	10/01
Impoundment Structure - Full Flow	841	8/94
Impoundment Structure - Routed	842	8/94
Infiltration Trench	847	1/99
Inlet Protection - Block & Gravel	850	8/94
Inlet Protection - Excavated Drain	855	2/94
Inlet Protection - Fabric Drop	860	2/94
Inlet Protection - Gravel & Wire Mesh	861	11/99
Inlet Protection - Sod Filter	862	11/99
Inlet Protection - Straw Bale Barrier	863	11/99
Land Grading	865	2/94
Level Spreader	870	1/99
Mulching	875	12/94
Permanent Vegetation	880	10/01
Permeable Pavement	890	1/99
Portable Sediment Tank	895	3/94
Right-of-Way Diversion	900	2/94
Rock Check Dam	905	1/99
Rock Outlet Protection	910	8/94
Silt Fence	920	10/01
Sodding	925	12/94
Stabilized Construction Entrance	930	8/94
Straw Bale Barrier	935	2/94
Structural Streambank Stabilization	940	8/94
Subsurface Drain	945	8/94
Sump Pit	950	8/94
Surface Roughening	953	11/99
Temporary Diversion	955	8/94
Temporary Sediment Trap	960	10/01
Temporary Seeding	965	12/94
Temporary Slope Drain	970	8/94
Temporary Stream Crossing	975	8/94
Temporary Swale	980	2/94
Topsoiling	981	2/94
Tree and Forest Ecosystem Preservation	984	4/00
Tree and Shrub Planting	985	8/94

LIST OF URBAN STANDARDS cont.
(Alphabetical)

<u>Name</u>	<u>Code</u>	<u>Date</u>
Tree Protection	990	4/00
Tree Protection - Augering	991	4/00
Vegetative Streambank Stabilization	995	8/94
Well Decommissioning	996	11/99

* This practice was originally entitled Artificial Wetland. It is currently being revised and will be renumbered as soon as it has been finalized and approved.

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LIST OF URBAN STANDARDS

(Problem Addressed)

<u>Name (Code)</u>	<u>Date</u>
Soil Erosion and Sediment Control (SE/SC)	
Soil Stabilization	
Construction Road Stabilization (806)	1/99
Erosion Blanket (830)	8/94
Land Grading (865)	2/94
Mulching (875)	12/94
Permanent Vegetation (880)	10/01
Rock Outlet Protection (910)	8/94
Sodding (925)	12/94
Surface Roughening (953)	11/99
Temporary Seeding (965)	12/94
Topsoiling (981)	2/94
Runoff Control	
Diversion (815)	3/94
Diversion Dike (820)	2/94
Right-of-Way Diversion (900)	2/94
Rock Check Dam (905)	1/99
Temporary Diversion (955)	8/94
Temporary Slope Drain (970)	8/94
Temporary Swale (980)	2/94
Sediment Control	
Culvert Inlet Protection (808)	1/99
Inlet Protection - Block & Gravel (850)	8/94
Inlet Protection - Excavated Drain (855)	2/94
Inlet Protection - Fabric Drop (860)	2/94
Inlet Protection - Gravel & Wire Mesh (861)	11/99
Inlet Protection - Sod Filter (862)	11/99
Inlet Protection - Straw Bale Barrier (863)	11/99
Portable Sediment Tank (895)	3/94
Silt Fence (920)	10/01
Stabilized Construction Entrance (930)	8/94
Straw Bale Barrier (935)	2/94
Sump Pit (950)	8/94
Temporary Sediment Trap (960)	10/01
Miscellaneous SE/SC	
Dust Control (825)	2/94
Temporary Stream Crossing (975)	8/94

LIST OF URBAN STANDARDS cont.
(Problem Addressed)

<u>Name (Code)</u>	<u>Date</u>
Stormwater Management	
Drainage Control	
Filter Strip (835)	1/99
Grass-Lined Channel (840)	10/01
Infiltration Trench (847)	1/99
Level Spreader (870)	1/99
Permeable Pavement (890)	1/99
Subsurface Drain (945)	8/94
Detention	
Urban Stormwater Wetlands (800)	8/94
Impoundment Structure - Full Flow (841)	8/94
Impoundment Structure - Routed (842)	8/94
Special Area Protection	
Streambanks and Shorelines	
Structural Streambank Stabilization (940)	8/94
Vegetative Streambank Stabilization (995)	8/94
Wetlands and Waterbodies	
Well Decommissioning (996)	11/99
Trees and Native Vegetation	
Tree and Forest Ecosystem Preservation (984)	4/00
Tree and Shrub Planting (985)	8/94
Tree Protection (990)	4/00
Tree Protection - Augering (991)	4/00
Steep Slopes	
Karst Areas	

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

URBAN STORMWATER WETLANDS

(acre)
CODE 800



(Source: Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois)

DEFINITION

A constructed system of shallow pools that create growing conditions suitable for emergent and riparian wetland plants explicitly designed to lessen the impacts of stormwater quality and quantity in urban areas.

PURPOSE

Stormwater wetlands are designed and installed to maximize pollutant removal and create wetland habitat through the creation of a matrix of water, sediment, plants, and detritus that collectively provides temporary storage of urban stormwater runoff, and removes multiple pollutants from it through a series of complementary physical, chemical, and biological pathways.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to watersheds in urban or urbanizing landscapes where stormwater quality and quantity control is needed to meet the diverse management objectives of developers

and local governing units. Stormwater wetlands typically are not located within delineated natural wetland areas. Natural wetlands provide critical habitat and ecosystem benefits and are protected under local, state and federal statutes. Stormwater wetlands should also not be confused with created or restored wetlands that are used to mitigate for the loss of natural wetlands under permitting provisions of wetland protection requirements.

CRITERIA

For maximum effectiveness, the following basic design criteria should be followed to achieve the major objectives of the stormwater wetland:

1. Capture and effectively treat the stormwater runoff produced by 90 percent of the storms in the urban watershed by designing a stormwater wetland to meet seven basic sizing criteria:
 - a. Minimum treatment volume to capture and treat an amount equal to 0.5 watershed inch.

- b. Surface area requirement - minimum wetland to watershed ratio:

Shallow Marsh Wetland	2%
Pond/wetlands	1%
Extended Detention - (ED)/wetlands	1%
Pocket wetlands	1%

 Wetland types are defined in Reference 1.
 - c. Depth/Area allocation guidelines are shown in Table 2.
 - d. Treatment/Volume allocation guidelines are shown in Table 2.
 - e. Flow path length - dry weather flow path of 2:1 for length to width ratio.
 - f. Dry weather water balance - determine that inflow and ground water inputs are greater than infiltration and evaporation water losses for all designs except pocket wetlands.
 - g. Extended detention volume - consider extended volume, time, release, clogging protection, and water elevation.
2. Pre-treat the stormwater runoff before it reaches the wetland area to reduce water velocity, trap coarse sediments and associated pollutants. Examples of pre-treatment structures are pre-settling basins and forebays.
 3. Create a diversity of depth zones within the wetland to meet the unique growing requirements of emergent wetland plants.
 4. Establish a diverse and dense wetland plant community in the shortest possible time.
 5. Create a functional pondscape within and around the wetland that augments pollutant removal, creates better wildlife habitat, and promotes a more natural appearance.

6. Reduce the future maintenance burden of the stormwater wetland through preventative management to protect its long-term function.
7. Provide habitat elements that promote greater wildlife and waterfowl use within the wetland and buffer, but avoid undesirable habitat outcomes.
8. Serve as an attractive, yet safe, community amenity for adjacent residents.
9. Reduce or avoid any undesirable secondary environmental impacts produced by the construction or operation of the stormwater wetland.

CONSIDERATIONS

Avoid conflict with natural wetlands wherever possible. Employ design techniques to enhance pollutant removal performance of stormwater wetland systems (Table 1). Establish the plant community by transplanting stock native to the region and/or by utilizing mulch/topsoil from a nearby donor wetland scheduled to be developed. Plan habitat diversity to meet the feeding, breeding/nesting, and cover requirements for a wide range of aquatic, avian, and terrestrial species. Check with state and/or federal agencies that issue permits for wetlands about the regulatory status of stormwater wetlands and needed permits prior to construction.

PLANS AND SPECIFICATIONS

Site suitability should be determined on each site by field observation by a qualified interdisciplinary design team with expertise in stormwater engineering, wetlands, landscaping, and pond construction. Construction specifications should be shown in a site-

specific construction plan or drawing. Design criteria for stormwater wetland designs are shown in Table 3.

OPERATION AND MAINTENANCE

Both initial establishment and future development of a stormwater wetland require active management of the hydrology and vegetation, as it grows in biomass, diversity, and spatial coverage.

The design team must plan for the future operation and maintenance of the stormwater wetland in this stage, with a strong emphasis on the first three years. Maintenance activities must be fully vested with a responsible party through an enforceable maintenance covenant. The covenant should specifically include a projected schedule for inspections and forebay sediment cleanouts, and show evidence that dedicated funding will be available to perform this function.

Inspection Criteria -The stormwater wetland should be inspected twice a year in the first three years after construction, with an annual inspection thereafter. Inspections should be conducted with the as-built and pondscaping plans in hand, and should take specific note of species distribution/survival, sediment accumulation, water elevations, and condition of the outlet. Records should be stored so that the progressive development of the wetland system over time can be tracked.

Sediment Cleanout - Accumulated sediment in the forebay should be cleaned out every 3 to 5 years. Cleanouts are conducted after draining the forebay with the help of a skid loader or backhoe. The preferred disposal

method is on-site land application at a pre-designated spoil area.

Mowing - The maintenance access, maintenance bench and embankment should be mowed once a year to prevent woody growth. All remaining areas can be managed as a wet meadow or forest.

REFERENCES

Schueler, Thomas R.;1992. Design of Stormwater Wetland Systems: Guidelines for Creating Diverse and Effective Stormwater Wetlands In the Middle-Atlantic Region. Metropolitan Washington Council of Governments, Washington, DC

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NRCS IL August 1994

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TABLE 1
DESIGN TECHNIQUES TO ENHANCE
POLLUTANT REMOVAL PERFORMANCE OF STORMWATER
WETLAND SYSTEMS

1. Increase the Volume of Runoff Treatment
 - Capture greater percentage of annual runoff volume
 - Provide for longer residence time in wetland for most storm events
2. Increase the Surface Area to Volume Ratio
 - Increase the total area of the wetland, or
 - Increase the internal structural complexity of the wetland, by adding complex microtopography and establishing extensive and dense wetland plant cover
3. Increase the Effective Flow Path Through the Wetland
 - Extend distance between the inlet and outlet berms
 - Maximize sinuosity of dry weather flow path with high marsh wedges
 - Create some areas with extremely shallow flow path (i.e., high marsh)
 - Use multiple cells within the wetland system
4. Provide Runoff Pre-Treatment and Energy Dissipation
 - Use forebay or pond cell near inlet, with broad crested weirs to spread flow between cells
5. Utilize Redundant Pollutant Removal Pathways
 - Provide extended detention to keep removal rates reliable during non-growing season, or
 - Utilize permanent pool to increase algal uptake and sedimentation

From Table 7, Schueler, 1992.

TABLE 2
 GUIDELINES FOR THE ALLOCATION
 OF DEPTH ZONES AND TREATMENT VOLUME IN
 STORMWATER WETLAND SYSTEMS

Stormwater Wetland Systems

TARGET ALLOCATIONS	Design No. 1 <u>SHALLOW MARSH</u>	Design No. 2 <u>POND/WETLAND</u>	Design No. 3 <u>ED WETLAND</u>	Design No. 4 <u>POCKET WETLAND</u>
<u>Percent of Surface Area</u>				
Forebay	5	0	5	0
Micropool	5	5	5	0
Deepwater	5	40	0	5
“Low Marsh”	40	25	40	50
“High Marsh”	40	25	40	40
“Semi-wet”	5	5	10	5
<u>Percent of Treatment Volume</u>				
Forebay	10	0	10	0
Micropool	10	10	10	0
Deepwater	10	60	--	20
“Low Marsh”	45	20	20	55
“High Marsh”	25	10	10	25
“Semi-wet”	0	0	50	0

- Deepwater - One to six feet below normal pool (includes forebays, micropools, pool and channel)
- Low Marsh - Six to 18 inches below normal pool
- High Marsh - Zero to six inches below normal pool
- Semi-wet - Zero to two feet above normal pool (includes ED)

Note: The allocations are only general guidelines and will vary according to design and site constraints.

From Table 11, Schueler, 1992.

TABLE 3 - DESIGN CRITERIA FOR STORMWATER WETLAND DESIGNS

DESIGN CRITERIA	Design No. 1 SHALLOW MARSH	Design No. 2 POND/ WETLAND	Design No. 3 ED WETLAND	Design No. 4 POCKET WETLAND
Wetland/Watershed Ratio	.02	.01	.01	.01 (target)
Minimum Drainage Area	25 acre	25 acre	10 acre	1-10 acre
Length to Width (minimum)	1:1	1:1	1:1	1:1 (target)
Extended Detention	No	No	Yes	No
Allocation of Treatment Volume (pool, marsh, ED)	40/60/0	70/30/0	20/30/50	20/80/0
Allocation of Surface Area (deep, low, high)	20/40/40	45/25/30	20/35/45	10/40/50
Cleanout Frequency	2-5 yrs.	10 yrs.	2-5 yrs.	10 yrs.
Forebay	Required	No	Required	Optional
Micropool	Required	Required	Required	Optional
Outlet Configuration	Reverse-slope pipe or hooded broad crested weir	Same	Same	Hooded broad crested weir
Propagation Technique	Mulch or Transplant	Mulch or Transplant	Mulch or Transplant	Volunteer
Buffer (feet)	20 to 50	25 to 50	25 to 50	0 to 25
Pondscaping Plan Requirements	Emphasize wildlife habitat marsh micro-topography, buffer	Emphasize wildlife habitat and high marsh wedges	Emphasize stabilization of ED zone, project pondscaping zones	Pondscaping plan optional

From Table 16, Schueler, 1992.

CONSTRUCTION ROAD STABILIZATION

(ft.)
CODE 806



(Source: USDA - Natural Resources Conservation Service - Illinois)

DEFINITION

The stabilization of temporary construction access routes, subdivision roads, on-site vehicle transportation routes, and construction parking areas with stone immediately after grading.

PURPOSE

The purpose of this practice is to reduce erosion of temporary roadbeds and parking areas by construction traffic during wet weather.

CONDITIONS WHERE PRACTICE APPLIES

Wherever stone base roads or parking areas are constructed for use by construction traffic.

CRITERIA

Construction roads shall follow the contour of the natural terrain to the extent possible. The maximum grade is 10%.

Locate parking areas on naturally flat areas if they are available to minimize

grading. Keep grades sufficient for drainage but not more than 4 %.

Construction roads shall be at least 14 feet wide for one-way traffic and 20 feet wide for two-way traffic. Two-way traffic widths shall be increased a minimum of 4 feet for trailer traffic. The type of vehicle or equipment, speed, loads, climatic and other conditions under which vehicles and equipment are expected to operate need to be considered and the minimum widths increased accordingly.

All cut and fill slopes shall be 2:1 (horizontal to vertical) or flatter.

Roadside ditches shall be provided as needed and shall be designed and constructed in accordance with practice standard [GRASSED LINED CHANNEL 840](#).

The roadbed or parking surface shall be cleared of all vegetation, roots and other objectionable material.

Where seepage areas or seasonally wet areas must be crossed, install subsurface drains and geotextile filter

fabric. Subsurface drains shall be installed in accordance with practice standard [SUBSURFACE DRAIN 945](#). Geotextile filter fabric, which is used to minimize the migration of stone into the underlying soil by heavy vehicle loads, shall meet the requirements of material specification [592 GEOTEXTILE](#) Table 1 or 2, Class I, II or IV.

At a minimum a 6 inch course of coarse aggregate meeting IDOT CA-1, CA-2, CA-3 or CA-4 gradation shall be applied immediately after grading or the completion of utility installation within the right-of-way.

All roadside ditches, cuts, fills, and disturbed areas adjacent to parking areas shall be stabilized in accordance with practice standards [PERMANENT VEGETATION 880](#) or [TEMPORARY SEEDING 965](#), as applicable.

CONSIDERATIONS

Improperly planned and maintained roads can become a continual erosion problem. Excess runoff from roads cause erosion in adjacent areas, and an unstabilized road may become a dust problem. Construction vehicle traffic routes are especially susceptible to erosion because they become compacted and collect and convey runoff along their surfaces. Rills, gullies and troublesome muddy areas form unless the road is stabilized.

During wet weather, unstabilized dirt roads may become so muddy they are virtually unusable, generating sediment and causing work interruption. Proper grading and stabilization of construction routes often saves money for the contractor by improving the overall

efficiency of the construction operation while reducing the erosion problem.

Low-grade asphalt or asphalt grindings may be used to facilitate maintenance and removal of tracked earth.

Filter fabric may be used under the coarse aggregate to provide a stable foundation and to facilitate removal of the stone.

PLANS AND SPECIFICATIONS

Plans and specifications for installing construction road stabilization shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following:

1. Location where the practice will be installed
2. Dimensions of the practice - length, width and thickness
3. Alignment and grade of the practice
4. Type of materials

All plans shall include installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [CONSTRUCTION ROAD STABILIZATION IL-506](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

Inspect the condition of the surface of construction roads and parking areas. Construction roads quickly accumulate a layer of earth tracked by vehicular traffic that is a source of airborne dust. Periodic blading of the accumulated earth and top-dressing with new stone will be necessary.

Inspect seeded areas adjacent to the roads and parking areas to ensure that a vigorous stand of vegetation is maintained and inspect roadside ditches and other drainage structures to ensure that they do not become clogged with silt or other debris.

REFERENCES

Illinois Department of Transportation, 1997. Standard Specifications for Road and Bridge Construction. IL

Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1992. Virginia Erosion and Sediment Control Handbook, 3rd ed., VA

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CULVERT INLET PROTECTION

(no.)
CODE 808



(Source: USDA Natural Resources Conservation Service - Illinois)

DEFINITION

A temporary sediment filter located at the inlet to storm sewer culverts.

PURPOSE

The purpose of this practice is to prevent sediment from entering, accumulating in and being transferred by a culvert and associated drainage system prior to permanent stabilization of a disturbed project area.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where a culvert and associated drainage system are to be made operational prior to the stabilization of the disturbed drainage area.

CRITERIA

All culvert inlet protection shall be constructed in a manner that will facilitate cleanout and disposal of trapped sediment and minimizes interference with construction activities.

All culvert inlet protection shall be constructed in such a manner that any resultant ponding of stormwater will not cause inconvenience or damage to adjacent areas or structures.

Silt Fence Culvert Inlet Protection

This type of culvert inlet protection has an expected maximum usable life of 3 months.

The maximum area draining to this practice shall be 1 acre.

All criteria included in practice standard [SILT FENCE 920](#) shall apply except the maximum spacing between the posts shall be 3 feet and tops of posts shall be cross-braced.

The placement of the silt fence shall be a minimum of 6 feet from the culvert in the direction of incoming flow, creating a "horseshoe" shape.

If the drainage area exceeds 1 acre, or flow and/or velocity of the flow to the culvert inlet protection is excessive and may breach the structure, use the Stone Culvert Inlet Protection criteria.

Stone Culvert Inlet Protection

Stone culvert inlet protection has a maximum expected useful life of 18 months.

The maximum area draining to this practice shall be 3 acres. For drainage areas larger than 3 acres install a temporary sediment trap meeting the requirements of practice standard [TEMPORARY SEDIMENT TRAP 960](#).

The stone culvert inlet protection is a small stone berm in a horseshoe shape around the culvert inlet. The upstream half of the stone berm shall consist of coarse aggregate meeting IDOT CA-1, CA-2, CA-3 or CA-4 gradation and the downstream half of the stone berm shall consist of riprap meeting IDOT RR-3 or RR-4 gradation. In addition, any riprap that is used for permanent protection on the culvert inlet embankment shall meet IDOT Quality Designation A.

The downstream toe of the stone berm shall be no closer than 24 inches from the culvert opening in order to provide an acceptable emergency outlet for flows from larger storm events.

Maximum height of the stone berm shall be 3 feet.

Side slopes of the stone berm section shall not exceed 2:1 horizontal to vertical.

The stone berm shall be tied into the culvert embankment a minimum of 1 foot above the design elevation of the stone berm.

CONSIDERATIONS

When construction on a project reaches a stage where culverts and other storm

sewer appurtenances are installed and many areas are brought to a desired grade, the erosion control measures used in the early stages normally need to be modified or may need to be removed altogether. At that time, there is a need to provide protection at the points where runoff will leave the area via culverts and drop or curb inlets.

Similar to drop and curb inlets, culverts that are made operational prior to the stabilization of the associated drainage areas can convey large amounts of sediment to drainageways or water bodies. In cases of extreme sediment loading, the pipe or pipe system itself may clog or lose a major portion of its capacity. To avoid these problems it is necessary to prevent sediment from entering the culvert by using one of the culvert inlet protection types identified in this standard.

Filter fabric may be used under the stone to provide a stable foundation and to facilitate removal of the stone.

Other protection strategies should be used if this practice has hydraulic impacts off of the subject property.

PLANS AND SPECIFICATIONS

Plans and specifications for installing culvert inlet protection shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. As a minimum include the following:

1. Location where the practice is to be installed
2. Type of culvert inlet protection to be used
3. Type of materials

4. Dimensions and elevations of the practice

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All plans shall include installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawings [IL-508SF CULVERT INLET PROTECTION - SILT FENCE](#) or [IL-508ST CULVERT INLET PROTECTION - STONE](#) may be used as the plan sheet(s).

OPERATION AND MAINTENANCE

The structure shall be inspected after every runoff producing rain and repairs made as needed.

If aggregate is used, it shall be replaced or cleaned when inspection reveals that clogged voids are causing ponding problems.

Sediment shall be removed and the impoundment restored to its original dimensions when sediment has accumulated to one-half the height of the fence or stone berm.

Removed sediment shall be deposited in a suitable area and in such a manner that it will not erode and cause sedimentation problems.

Temporary structures shall be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

REFERENCES

Illinois Department of Transportation, 1997. Standard Specifications for Road and Bridge Construction. IL

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

DIVERSION

(ft.)

CODE 815



(Source: NC Erosion and Sediment Control Field Manual)

DEFINITION

A channel and supporting ridge constructed across the slope to collect and divert runoff.

PURPOSE

The purpose of this practice is to divert excess surface water from one area for use or safe disposal in other areas.

CONDITIONS WHERE PRACTICE APPLIES

This permanent site development practice applies to areas where runoff can be diverted and used or disposed of safely to prevent flood damage, erosion, or sedimentation damage.

Specific locations and conditions include:

1. Above steep slopes to limit surface runoff onto the slope;
2. Across long slopes to reduce slope length to prevent gully erosion;

3. Below steep grades where flooding, seepage problems, or sediment depositions may occur;
4. Around buildings or areas that are subject to damage from runoff.

CRITERIA

Capacity - Diversions designed to protect areas such as minor buildings and roads, shall have enough capacity to carry the peak runoff expected from a storm frequency consistent with the hazard involved but not less than a 25-year frequency, 24-hour duration storm. Diversions designed to protect major structures, homes, school buildings and high capacity roads shall have enough capacity to carry the peak runoff from a 100-year frequency 24-hour duration storm.

Cross-section - The channel may be parabolic, V-shaped, or trapezoidal, and shall accommodate the equipment to be used for maintaining the diversion. The diversion shall be designed to have stable side slopes. Channel cut slopes shall not be steeper than 3:1. The slope

of a vegetated fill shall be 2:1 or flatter. The ridge height shall include an adequate settlement factor. Settlement allowance shall be 10% of design fill height or 0.2 feet, whichever is greater. The ridge shall have a minimum top width of 4 feet at the design elevation. In the case of diversions with a ridge, the design height of the ridge shall be 0.5 feet above the design water elevation. In the case of an excavated channel diversion, the lowest bank of the channel shall be 0.3 feet above the design water elevation. The minimum cross section shall meet the specified dimensions. The top of the constructed ridge shall not be lower than the design elevation plus the specified overfill for settlement.

Grade and velocity - Channel grades may be uniform or variable. Channel velocity shall not exceed that considered erosive for the soil and planned vegetation or lining. See table 1 for the maximum design velocities. Channel grades shall be sufficient to minimize standing water and wetness problems. If possible velocities 2 fps or higher should be used to avoid sedimentation. Compute velocity for bare earth channels using Manning's formula with "n" value of 0.035.

Location - The location of a diversion and outlet shall be in compliance with state drainage law, traditional case law precedent and local ordinances and regulations. Diversion location shall be dictated by outlet condition, topography, land use, length of slope, and soil type. Diversions shall not outlet on the right-of-way of a public road, highway, or other public utility without the written approval of the appropriate authorities.

Sedimentation - Diversions should not be used below high sediment producing areas unless land treatment practices or structural measures, designed to prevent damaging accumulations of sediment in the channels, are installed with or before the diversions. If movement of sediment into the channel is a significant problem, a vegetated filter strip meeting the requirements of practice standard [FILTER STRIP 835](#) shall be used where soil or climate does not preclude its use. Then, the design shall include extra capacity for sediment and be supported by supplemental structures, cultural or tillage practices, or special maintenance measures.

Outlets - Each diversion must have a safe and stable outlet with adequate capacity. Examples of acceptable outlets include but are not limited to [GRASS LINED CHANNELS 840](#), [IMPOUNDMENT STRUCTURE - FULL FLOW 841](#), [IMPOUNDMENT STRUCTURE - ROUTED 842](#), [INFILTRATION TRENCH 847](#), [LEVEL SPREADER 870](#), and [ROCK OUTLET PROTECTION 910](#). The outlet must convey runoff to a point where outflow will not cause damage. Vegetative outlets shall be installed prior to and have vegetation adequately established in the outlet channel before diversion construction. Underground outlets consist of an inlet and underground conduit. Underground outlets shall meet the requirements of the practice standard [SUBSURFACE DRAIN 945](#). The release rate when combined with storage is to be such that the design storm will not overtop the diversion ridge. On large watersheds, runoff flows are usually too large to outlet entirely through underground outlets.

The design elevation of the water surface in the diversion shall not be lower than the design elevation of the water surface in the outlet at their junction when both are operating at design flow.

Vegetation - Disturbed areas shall be established to vegetation as soon as practicable, generally within 15 days after construction is complete. If the soils or climatic conditions preclude the use of vegetation for erosion protection, non-vegetative linings such as gravel, rock riprap, or cellular block may be used. Seedbed preparation, seeding, fertilizing, and mulching shall comply with the practice standards [PERMANENT VEGETATION 880](#) and [MULCHING 875](#). The vegetation shall be maintained and trees and shrubs controlled by hand, machine, or chemicals.

Sediment-laden water should first be directed through an approved sediment-trapping device before entering receiving surface waters. Examples of acceptable sediment trapping facilities include but are not limited to practice standards [IMPOUNDMENT STRUCTURE - ROUTED 842](#) and [TEMPORARY SEDIMENT TRAP 960](#).

CONSIDERATIONS

Diversions should be planned as a part of initial site development. They are principally runoff control measures that subdivide the site into specific drainage areas. Permanent diversions can be installed as temporary diversions until the site is stabilized, then completed as a permanent measure, or they can be installed in final form during the initial construction operation. The amount of sediment anticipated and the

maintenance required as a result of construction operations will determine which approach should be used. Stabilize permanent diversions with vegetation or materials such as riprap, paving stone, or concrete as soon as possible after installation. Base the location, type of stabilization, and diversion configuration on final site conditions. Evaluate function, need, velocity control, outlet stability, and site aesthetics. When properly located, landforms such as landscape islands, swales or ridges can be used effectively as permanent diversions. Base the capacity of a diversion on the runoff characteristics of the site and the potential damage after development. Consider designing an emergency overflow section or bypass area to limit damage from storms that exceed the design storm. The overflow section may be designed as a weir with riprap protection.

A typical diversion cross-section consists of a channel and a supporting ridge. In the case of an excavated type diversion, the natural ground serves as the diversion ridge. Diversion cross sections must be adapted to the equipment that will be used for their construction and maintenance. The channel may be natural, parabolic or trapezoidal in shape; use of "V" channels is generally discouraged due to erosion problems experienced.

At all points where diversion ridges or channels will be crossed by construction equipment, the diversion should be protected according to requirements of the practice standard [STABILIZED CONSTRUCTION ENTRANCE 930](#). Bridges or culverts of adequate capacity may also be used.

Subsurface drainage should be used along permanent vegetated diversion channels when adequate grade can not be achieved to prevent ponding water, when hillside seeps or soils with poor internal drainage keep the channel wet or when base flow is intercepted by the diversion.

every major rainfall and any needed repairs made promptly.

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PLANS AND SPECIFICATIONS

Plans and specifications for installing diversions shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended function. At a minimum include the following items:

1. Diversion location.
2. Channel grade.
3. Diversion cross-sections.
4. Seeding and fertility rates.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Construction of the diversion shall meet the requirements as listed in the construction specification [27 DIVERSIONS AND WATERWAYS](#). Standard drawing [IL-515 DIVERSION PLAN](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

A maintenance program shall be established to maintain diversion capacity, storage, ridge height, vegetation and outlet. Maintenance needs are to be discussed with the landowner or operator who is responsible for maintaining the practice. Diversion ridges can be hazardous for mowing. Any hazards must be brought to the attention of the responsible party. Diversions should be inspected after

TABLE 1 - MAXIMUM PERMISSIBLE DESIGN VELOCITIES

Soil Texture	Channel Vegetation Retardance and Cover	Permissible Velocity (ft./sec.) ^{1/}
Sand, silt, sandy loam, silt loam, loamy sand (ML, SM, SP, SW)	B - Tall fescue, smooth bromegrass	3.5
	C - Kentucky bluegrass, redtop, red fescue	3.0
	D - Annuals ^{2/} , small grain (rye, oats, wheat, ryegrass)	2.5
	E - Bare channel	1.5
Silty clay loam, sandy clay loam (ML-CL, SC)	B - Tall fescue, smooth bromegrass	4.5
	C - Kentucky bluegrass, redtop, red fescue	4.0
	D - Annuals ^{2/} , small grain (rye, oats, wheat, ryegrass)	3.5
	E - Bare channel	2.0
Clay (CL)	B - Tall fescue, smooth bromegrass	5.5
	C - Kentucky bluegrass, redtop, red fescue	5.0
	D - Annuals ^{2/} , small grain, (rye, oats, wheat, ryegrass)	4.0
	E - Bare channel	2.0

^{1/} To be used only in stabilized protected areas.

^{2/} Annuals – use only as temporary protection until permanent vegetation is established.

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

DIVERSION DIKE

(ft.)
CODE 820



(Source: NC Erosion and Sediment Control Planning and Design Manual)

DEFINITION

A dike or dike and channel constructed along the perimeter of a disturbed construction area.

PURPOSE

The purpose of this practice is to prevent storm runoff from entering the work area or to prevent sediment-laden runoff from entering the construction site without first passing through a sediment trapping facility.

CONDITION WHERE PRACTICE APPLIES

Diversion dikes may be located at the upslope side of a construction site to prevent surface runoff from entering the disturbed area or at the downslope side of the work area to divert sediment-laden runoff to on-site sediment traps or basins. Diversion dikes do not usually encircle the entire area.

CRITERIA

Diversion dikes with 3 acres drainage area or less shall be designed using the practice standard [TEMPORARY DIVERSION 955](#). Diversion dikes with drainage areas greater than 3 acres shall be designed using the practice standard [DIVERSION 815](#).

CONSIDERATIONS

A diversion dike is a special application of a temporary or permanent diversion. It differs from other diversions in that the location and grade are usually fixed, and the cross section and stabilization requirements are based on the existing grade of the work boundary. Hence, the design cross section may vary significantly throughout the length. Give special care to avoid erosive velocities in steep areas. Identify areas where sedimentation will occur since they are often subject to overtopping.

Diversion dikes should be protected from damage from ongoing construction activities. At all points where diversion

ridges or channels will be crossed by construction equipment, the diversion should be protected according to requirements of the practice standard [STABILIZED CONSTRUCTION ENTRANCE 930](#). Bridges or culverts of adequate capacity may also be used.

Immediately vegetate diversion dikes after construction, but make sure channel flow area is stabilized during the initial phase of construction. Exercise caution in diverting flow to be certain that the diverted water is released through a stable outlet and that the flow will not cause flood damage. Sediment laden water should first be directed through an approved sediment-trapping device before entering receiving surface waters. Examples of acceptable sediment trapping devices include but are not limited to practice standards [IMPOUNDMENT STRUCTURE-ROUTED 842](#), or [TEMPORARY SEDIMENT TRAP 960](#).

PLANS AND SPECIFICATIONS

The plans and specifications for installing diversion dikes shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Diversion dike location.
2. Minimum cross-sections.
3. Channel grade.
4. Seeding requirements.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

The diversion dike shall be constructed according to the requirements shown in

construction specification [27 DIVERSIONS AND WATERWAYS](#). Standard drawing [IL-515 DIVERSION PLAN](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

Inspect diversion dikes once a week and after every rainfall. Immediately remove sediment from the flow area and repair the dike. Protect the diversion dike from construction equipment crossing.

A maintenance program shall be established to maintain diversion dike capacity, storage, ridge height, vegetation and outlet. Maintenance needs are to be discussed with the landowner or operator who is responsible for maintaining the practice. Diversion dike ridges can be hazardous for mowing. Any hazards must be brought to the attention of the responsible party.

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

DUST CONTROL

(acre)
CODE 825



(Source: NC Erosion and Sediment Control Planning and Design Manual)

DEFINITION

Control of dust blowing and movement on construction sites and roads.

PURPOSE

The purposes of this practice are to prevent blowing and movement of dust from exposed soil surfaces, to reduce on and off-site damage, to minimize health hazards, and to improve traffic safety.

CONDITIONS WHERE PRACTICE APPLIES

This practice is applicable to areas subject to dust blowing and movement where on and off-site damage is likely without treatment.

CRITERIA

The following are temporary and permanent methods for dust control.

Temporary Methods:

1. Mulches - See practice standard [MULCHING 875](#). Chemical or wood cellulose fiber binders may be used instead of asphalt to bind mulch material.
2. Vegetative Cover - See practice standard [TEMPORARY SEEDING 965](#).
3. Spray-on Adhesives - These may be used on mineral soils. They are not effective on muck soils. Keep traffic off these areas after application.
 - a. Anionic asphalt emulsion: water dilution - 7:1, coarse spray, 1,200 gal/acre.
 - b. Latex emulsion: water dilution - 12.5:1, fine spray, 235 gal/acre.
 - c. Resin-in-water emulsion: water dilution - 4:1, fine spray, 300 gal/acre.
4. Tillage - Roughen the surface and bring clods to the surface. This is an emergency measure that should be used before soil blowing starts. Begin tillage on windward side of site. Chisel plows with shanks spaced about 12"-18" apart and

spring-toothed harrows are examples of equipment that may produce the desired effect.

5. Irrigation - This is commonly used and affords fast protection for haul roads and other heavy traffic roads. The site is sprinkled with water until the surface is moist. Repeat as needed.
6. Barriers - Solid board fences, snow fences, burlap fences, crate walls, bales of hay and similar material can be used to control air currents and blowing soil. Barriers placed at right angles to prevailing wind currents at intervals of about 10 times their height are effective in controlling soil blowing.
7. Calcium Chloride - Apply at a rate that will keep the surface moist. This chemical may be applied by a mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so much as to cause water pollution or plant damage. Application rates should be strictly in accordance with the manufacturer's specified rates. Periodic re-treatment may be needed.
8. Stone - Stone can be used to stabilize roads or other areas during construction using crushed stone or coarse gravel. See practice standard [STABILIZED CONSTRUCTION ENTRANCE 930](#).
9. Street Cleaning - Paved areas that have soil on them from construction sites should be cleaned daily, or as needed, utilizing a street sweeper or bucket-type endloader or scraper.

Permanent Method:

Permanent Vegetation - See the practice standard [PERMANENT VEGETATION 880](#) or [SODDING 925](#).

Existing trees or large shrubs may afford valuable protection if left in place.

CONSIDERATIONS

The easiest way to control dust is to avoid exposed soil surfaces. This is not possible on most construction sites, but the area exposed can usually be reduced by careful planning of controlled traffic patterns and by phasing of clearing and grading operations. Consider use of undisturbed vegetative buffers (min. 50 ft.) between graded areas and protected areas.

PLANS AND SPECIFICATIONS

Plans and specifications for dust control shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum the following items should be included:

1. The area to be treated.
2. The methods that are acceptable to use.

Specifications should indicate when dust control is needed and the method of control to be used. Appropriate industry standards should be used.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

OPERATION AND MAINTENANCE

When temporary dust control measures are used, repetitive treatment should be applied as needed to accomplish control.

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

EROSION BLANKET

(sq. ft.)
CODE 830



(Source: USDA - Natural Resources Conservation Service - Illinois)

DEFINITION

A preformed protective blanket of straw or other plant residue, or plastic fibers formed into a mat, usually with a plastic mesh on one or both sides.

PURPOSE

The purposes of this practice are to protect the soil surface from raindrop impacts and overland flow during the establishment of grass or other vegetation, and to reduce soil moisture loss due to evaporation.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where the protection of newly seeded areas is critical. This is especially important where flowing water may occur before the grass is established. The most common application for erosion control blankets is in the bottom of small channels and on steep embankments.

CRITERIA

Erosion blankets shall be installed after all topsoiling, fertilizing, liming and seeding is complete.

The blanket shall be in firm contact with the soil. It shall be anchored per the manufacturer's recommendation with the proper number and spacing of wire staples. The staples shall be the proper width and length to meet the manufacturer's recommendations.

On slopes and in small drains the blanket shall be unrolled upstream to downstream parallel to the direction of flow. The upstream end of each blanket shall be anchored in a minimum 6-inch deep anchor trench. These blankets, when laid side by side, shall overlap a minimum of 4 inches. When more than one blanket length is needed, the material shall be overlapped 12 inches over the downstream piece. All edges shall be stapled as per manufacturer's recommendation.

CONSIDERATIONS

Erosion blankets will be located as part of the site development plan. They will protect the ground surface from raindrop impacts and flowing water. They will also retain moisture on seeded areas thus increasing the potential for germination and survival of the vegetation. Erosion blankets materials will break down over time. They should be chosen so that they last long enough for the grass or other vegetation to become established.

the blanket then reseeding may be needed. Any erosion blankets that have been displaced will need to be put back and restapled.

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PLANS AND SPECIFICATIONS

Plans and specifications for installing erosion blankets shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Location of the erosion blanket.
2. Type of blanket.
3. Location and cross section of anchor trenches.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [EROSION BLANKET PLAN IL-530](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

Inspect all erosion blankets periodically and after rainstorms to check for damage due to water running under the blanket or if the blankets that have been displaced. Where water has flowed under the blanket, more staples may be needed per given area or more frequent anchoring trenches installed. If significant erosion has occurred under

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

FILTER STRIP

(acre)
CODE 835



(Source: USDA - Natural Resources Conservation Service - Illinois)

DEFINITION

A created or preserved area of vegetation designed to remove sediment and other pollutants and to enhance the infiltration of surface water runoff.

PURPOSE

The principal purpose of this practice is to remove sediment and other pollutants from runoff water by filtration, deposition, infiltration, absorption, and vegetative uptake. Another purpose is to reduce runoff quantities from impervious surfaces by infiltrating it into the ground.

CONDITIONS WHERE PRACTICE APPLIES

This practice may be applied in a variety of urban land uses where surface water runoff is discharged as overland sheet flow. Some typical locations of vegetated filter strips include:

1. Adjacent to roadways, parking lots, and other impervious surfaces to

filter and convey runoff before it is discharged to swales, storm sewers, or surface water bodies

2. Lawns where roof downspouts are discharged to disperse and infiltrate runoff
3. Adjacent to wetlands, streams, ponds or lakes, or conservation practices to provide the runoff mitigation benefits described above and to serve as a wildlife habitat buffer
4. On construction sites and land undergoing development to filter sediment from overland sheet flow

CRITERIA

The maximum drainage area to a filter strip shall be 5 acres.

Vegetative filter strips shall have slopes 15% or less.

The minimum length (dimension parallel to flow path) of the filter strip is determined by the drainage area being treated and the width of the filter strip. The filter strip length shall be at least 1/2 the unit area length. The unit area

length is calculated by dividing the drainage area to the filter strip, in square feet, by the filter strip width (dimension perpendicular to flow path), in feet. The minimum filter strip length shall be 5 feet except on construction sites where the minimum length shall be 25 feet.

The width (dimension perpendicular to flow path) of the filter strip determines the required length of the filter strip. The wider the filter strip, the shorter the required filter strip length. The width shall be as near the same width as the impervious area being treated.

Some applications (e.g., roof downspouts) may require a level spreader to prevent a concentrated flow path through the filter strip. Level spreaders shall be installed according to the requirements in practice standard [LEVEL SPREADER 870](#). For parking lots and roadways, a level spreader will not be needed if the edge of the contributing runoff area is reasonably level and uniform. Level spreaders shall be installed in the filter strip every 50 feet of filter strip length on slopes greater than 5% and every 100 feet of filter strip length on slopes 5% or less.

The maximum flow velocity through the filter strip shall be calculated for the 10-year frequency, 24-hour duration storm event and shall not exceed the maximum permissible velocities as described in practice standard [GRASSED LINED CHANNEL 840](#).

Vegetation shall follow the requirements of practice standard [PERMANENT VEGETATION 880](#) and be protected with an erosion control blanket meeting the requirements of practice standard [EROSION BLANKET 830](#) or mulched meeting the requirements of practice

standard [MULCHING 875](#). In place of permanent seeding, the filter strip may be vegetated with sod following the requirements of practice standard [SODDING 925](#).

The filter strip vegetation should be fully established before the contributing impervious surface is created and its runoff directed onto the filter strip. Where this is not possible, the filter strip shall be vegetated with sod.

CONSIDERATIONS

Nearly 80% of the maximum potential settleable solids removal is achieved with the sizing criteria listed above. The efficiency can be increased to nearly 90% if the filter strip length is increased so that it has a length equaling or exceeding the unit area length.

Ideally, filter strips function best on slopes 5% or less. However, on slopes 1 % or less, vegetation used should be tolerant of saturated soil conditions.

It is critical that appropriate soil stabilization materials be applied immediately after seeding on all vegetative filter strips to minimize rill development during cover establishment. Due to the added runoff volumes coming from the impervious surfaces, an erosion control blanket will be necessary in most installations. Mulch may be adequate on relatively flat slopes where the contributing drainage area is small. In addition to stabilizing soils, these materials should significantly aid seed germination and early plant establishment.

Native prairie vegetation should be used if possible. Native vegetation has distinct advantages over turf grass,

including denser, deeper root structure to enhance infiltration; reduced maintenance needs (particularly less need for herbicides and fertilizer); and enhanced wildlife habitat.

If site constraints prevent the installation of broad filter strips meeting the specified sizing criteria, even narrower strips can provide substantial stormwater mitigation benefits in contrast to conventional curb and gutter storm sewer approaches.

Protect the filter strips from heavy foot and vehicular traffic during construction to prevent compaction and loss of infiltration capacity.

The filter strip area should be cleared of trees, stumps, brush, rocks, and similar materials if they are likely to interfere with installation of the filter strip (e.g., cause short-circuiting or concentrations of flow). Ideally, uniform, well vegetated strips of natural/native vegetation should be preserved as filter strips since their infiltration capacities are likely to be greater if grading is avoided.

On construction sites and other areas with bare soil where the filter strip is being used as a temporary sediment control technique, it is critical that temporary stabilization be applied to exposed soils and that concentrated flow through the filter strip be avoided. If the potential for concentrated flow exists, consideration should be given to construction of other sediment control practices above the filter strip. These practices shall meet the requirements of practice standards found in this manual such as practice standard [TEMPORARY SEDIMENT TRAP 960](#), and [SILT FENCE 920](#).

PLANS AND SPECIFICATIONS

Plans and specifications for installing filter strips shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Location of the practice
2. Length and width of the filter strip
3. Slope of the filter strip
4. Required appurtenant practices such as level spreaders or temporary sediment basins
5. Grading requirements, topsoil stockpiling and utilization requirements
6. Soil preparation, seeding and temporary soil stabilization (i.e., erosion control blanket or mulching) requirements

All plans shall include installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [FILTER STRIP – GRASSED IL-535](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

On active construction sites, the filter strip shall be inspected after every runoff producing rain and repairs made as needed. After construction, filter strips should be inspected during and after major storm events, particularly during the first one or two years. After the first one or two years, the filter strip may be inspected each spring and after major storm events.

Filter strips should be inspected for proper distribution of flows and signs of erosion. The filter strip should be kept

free of litter. Irrigation needs should be minimal except during extended dry periods. Periodic aeration of the soils may be beneficial if the underlying soils have a high clay content, or there is difficulty in maintaining a good vegetative cover due to compaction.

If erosion is discovered, the eroded areas should be filled, reseeded, and mulched. Then the causes for the erosion should be determined and prevented from recurring.

Maintain the vegetation at the most dense stand possible.

Filter strips vegetated with turf grass should be mowed and the residue harvested a minimum of two or three times a year to promote good growth and vegetative density at ground level, nutrient removal from the system, and filtering ability.

Caution should be used when applying herbicides to filter strips or adjacent areas to minimize pollution to the water resources being protected.

Filter strips vegetated with native species should be managed through prescribed burning once every two to three years, after the vegetation is established. Where prescribed burning is not feasible, mowing may be substituted. In contrast to turf grass, native vegetation should be mowed higher and less frequently.

Filter strips that have accumulated so much sediment that they are higher than adjacent areas should be disked or graded as necessary to reestablish shallow sheet flow conditions, and be reseeded.

REFERENCES

Dreher, D.W. and T.H. Price, 1997. Reducing the Impacts of Urban Runoff: The Advantages of Alternative Site Design. Northeastern Illinois Planning Commission, Chicago, IL

Ohio Department of Natural Resources, Division of Soil and Water Conservation, 1996. Rainwater and Land Development. 2nd ed., OH

Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1992. Virginia Erosion and Sediment Control Handbook, 3rd ed., VA

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

GRASS-LINED CHANNEL

(acre)
CODE 840



(Source: USDA - Natural Resources Conservation Service - Illinois)

DEFINITION

A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation for stable conveyance of runoff.

PURPOSE

The purpose of this practice is to convey and dispose of concentrated surface runoff without damage from erosion, deposition, or flooding.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to construction sites and developing areas where:

1. Concentrated runoff will cause damage from erosion or flooding;
2. Sufficient depth of soil materials are present to allow establishment of vegetation that will stabilize the cross section and grade of the channel;
3. Slopes are generally less than 5%;
4. Space is available for a relatively large cross section.

Typical uses include roadside ditches, channels at property boundaries, outlets for diversions, and other channels and drainage of low areas.

CRITERIA

Capacity - As a minimum, grass-lined channels shall carry the peak runoff from the 10-year frequency, 24-hour duration storm. Where flood hazard exists, increase the capacity according to the potential damage. For grass-lined channels with a grade of less than 1 percent, out-of-bank flow may be permitted if such flow will not cause erosion, property or flooding damage. The minimum channel capacity in such cases shall be a 2-year frequency storm. Channel dimensions may be determined by using design tables with appropriate retarding factors or by Manning's formula using an appropriate "n" value. When retarding factors are used, the capacity may be based on "C" retardance and stability on "E" retardance, where the waterway will be regularly mowed and otherwise maintained.

Velocity - The maximum permissible velocities of flow shall not exceed the values shown in Table 1.

Cross section - The channel shape may be parabolic, trapezoidal, or V-shaped, depending on the need and site conditions. The design water surface elevation of a grass-lined channel receiving water from diversions or other tributary channels shall be equal to or less than the design water surface elevation in the diversion or other tributary channels. The parabolic shape is the preferred cross section. The triangular cross-section concentrates flow in the "v" of the channel causing higher and more erosive velocities. When vegetated triangular channels are used, the minimum side slopes should be 6:1 or flatter.

Drainage - Base flow shall be handled by a stone lined center, subsurface drain, or other suitable means since sustained wetness usually prevents adequate vegetative cover. The cross-sectional area of the stone lined center or subsurface drain size to be provided shall accommodate a flow rate of 0.1 cfs/acre or by actual maximum base flow.

Where tile is used along the channel, it should be located as close to 1/3 of the channel (top) width from the center of the waterway as practical. The top of the tile should be at least 2.0 feet (up to 4 feet, where possible) below the bottom of the channel, except where soil or outlet conditions make this depth unpractical. The tile shall meet the requirements shown in the practice standard [SUBSURFACE DRAIN 945](#).

Alignment - Minor changes may be made to improve alignment. Care must

be taken to avoid exposing soil materials (such as sodium soils or high clay content glacial till subsoil) that are not conducive to the establishment and maintenance of adequate vegetative cover.

Outlets - All grass-lined channels shall have a stable outlet with adequate capacity to prevent ponding or flooding damages. Appropriate measures must be taken to dissipate the energy of the flow to prevent scouring of the outlet channel. Examples of acceptable outlets include but are not limited to [GRASS-LINED CHANNELS 840](#), [IMPOUNDMENT STRUCTURE - FULL FLOW 841](#), [IMPOUNDMENT STRUCTURE - ROUTED 842](#), [INFILTRATION TRENCH 847](#), [LEVEL SPREADER 870](#), and [ROCK OUTLET PROTECTION 910](#).

Establishment of vegetation - Grass-lined channels shall be vegetated according to the practice standard [PERMANENT VEGETATION 880](#).

Side slopes - Side slopes shall not be steeper than a ratio of 2 horizontal to 1 vertical. They should be designed to accommodate the equipment used for maintenance. Where planned to be crossed by large equipment, trapezoidal channels shall have side slopes of 8:1 or flatter and be protected according to the practice standard [STABILIZED CONSTRUCTION ENTRANCE 930](#). When triangular (V-shaped) channels are used, the minimum side slopes should be 6:1 or flatter.

Sedimentation protection - Protect permanent grass-lined channels from sediment produced in the watershed, especially during the construction period. This can be accomplished by

the effective use of diversions, sediment traps, protected side inlets and vegetative filter strips along the channel.

Construction - The grass-lined channel will be constructed meeting the requirements of Construction Specification [27 - DIVERSIONS AND WATERWAYS](#).

CONSIDERATIONS

Generally, channels should be located to conform with and use the natural drainage system. Channels may also be needed along development boundaries, roadways, and back lot lines. In all situations channels should be located so that they do not make sharp, unnatural changes in direction or grade of flow. Avoid channels crossing watershed boundaries or ridges.

Major reconfiguration of the drainage system often entails increased maintenance and risk of failure.

Establishment of a dense, erosion resistant vegetation is essential. Construct and vegetate grass-lined channels early in the construction schedule before grading and paving increase the rate of runoff.

All grass-lined channels should be designed to permit easy crossing of equipment during construction and maintenance.

If local ordinances permit, storm sewers may be used to extend existing agricultural tile or base flow across a development. They may also be used as an under drain for the channel if the conduit is open jointed.

Geotextile fabrics or special mulch protection such as fiberglass roving or

straw and netting provide stability until the vegetation is fully established. It may also be necessary to divert water from the channel until vegetation is established or to line the channel with sod. Rock checks or filter fabric checks may also be needed to protect the channel before vegetation is established. Sediment traps may be needed at channel inlets and outlets.

Applicable state drainage laws, traditional case law precedent and local ordinances and regulations must be observed in locating grass-lined channels.

PLANS AND SPECIFICATIONS

Plans and specifications for installing grass-lined channels shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Channel location and alignment.
2. Grade, depth and width.
3. Channel cross section type.
4. Seeding specifications and dates.
5. Subsurface drainage, if needed.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

The grass-lined channel will be constructed meeting the requirements of Construction Specification [27 DIVERSIONS AND WATERWAYS](#). Standard drawings [WATERWAY PLAN IL-540 P, T, or V](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

During the establishment period, inspect grass-lined channels after every rainfall.

After grass is established, check the channel at regular intervals and after every heavy rainfall event. Immediately make repairs. It is particularly important to check the channel outlet and all road crossings for bank stability and evidence of piping or scour holes. Remove all significant sediment accumulations to maintain the designed carrying capacity. Keep the grass in a healthy, vigorous condition at all times, since it is the primary erosion protection for the channel.

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TABLE 1

PERMISSIBLE VELOCITIES FOR CHANNELS LINED WITH VEGETATION

Channel Slope (%)	Lining	Permissible Velocity (ft./sec.) ^{1/}
0 – 5	Tall fescue	5
	Kentucky bluegrass	
	Smooth bromegrass	
	Grass-legume mixture	4
	Red fescue Redtop	3
	Small grains ^{2/}	2.5
5 – 10	Tall fescue	5
	Kentucky bluegrass Smooth bromegrass	4
	Grass-legume mixture	3
Greater than 10	Tall fescue	3
	Kentucky bluegrass	
	Smooth bromegrass	

^{1/} For highly erodible soils, permissible velocities should be decreased 25%. An erodibility factor (K) greater than 0.35 would indicate a highly erodible soil. Erodibility factors (K-factors) for Illinois soils are available in every NRCS office.

^{2/} For temporary seedings.

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

IMPOUNDMENT STRUCTURE - FULL FLOW

(no.)
CODE 841



(Source: Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois)

DEFINITION

A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.

PURPOSE

The purpose of this practice is to reduce sediment and/or debris in runoff waters to prevent damage to downstream facilities; or to provide surface water for consumption, irrigation, wildlife habitat, recreation or fire protection.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where sediment or debris is expected to be contained in runoff waters and may impair the capacity of the watercourse or damage other structures or where a surface water supply is desirable; where storage for at least one inch of water from the contributing watershed is either impractical or undesirable and where any embankment does not exceed the limits for class III, small dams, as defined by the IDNR-OWR in "Rules for

Construction and Maintenance of Dams" and the landowner or other responsible party has secured necessary permits, if required, for design and construction from IDNR-OWR and any local governmental authorities.

CRITERIA

Investigations - sufficient investigations shall be made of the impoundment site and borrow areas to determine the suitability of site and materials for construction, water holding ability and structure stability. A complete analysis of foundation and proposed fill materials shall be made when, in the opinion of the responsible engineer, it is necessary.

Hazard/safety - structures designed under criteria found in this practice shall fall within the class III, small dam category, defined by the IDNR-OWR as follows: "*class III. Dams located where failure has low probability for causing loss of life, where there are no permanent structures for human habitation, or minimum economic loss in*

excess of that which naturally would occur downstream of the dam if the dam had not failed. A dam has a low probability for causing loss of life or minimal economic loss if it is located where its failure may cause damage to agricultural fields, timber areas, township roads, or similar type areas where people seldom are present and where there are few structures. This corresponds to US Army Corps of Engineers Low Hazard Potential and USDA NRCS class a dams."

Small dams have a total impounding capacity of less than 1000 acre-feet and dam height of less than 40 feet, where dam height is defined as "*height of dam, in feet, as measured from the natural bed of the stream or watercourse at the downstream dam slope toe of the barrier to the top of the embankment or barrier.*"

Owners of impoundment structures shall obtain all necessary permits. IDNR-OWR permits may be required for class III, small dams where:

1. The drainage area of the proposed dam is 6400 acres or more in a rural area or 640 acres or more in an urban area, or
2. The dam is 25 feet or more in height, provided that the impounding capacity is greater than 15 acre-feet, or
3. The dam has an impounding capacity of 50 acre-feet or more provided that the dam height is greater than 6 feet.

Pool capacities - structures for the impoundment of debris or sediment shall have a capacity equal to the volume of sediment or debris expected to be trapped at the site during the planned useful life of the structure. That

capacity may be proportionally reduced, if periodic removal of sediment/debris is planned.

Structures that impound water for consumptive use shall have capacity as required by local consumptive use standards.

Structures that impound water for irrigation, wildlife habitat or recreation shall have capacity and depth adequate for the intended use.

Structures that impound water for fire protection shall have a capacity of at least 4000 cubic feet per residence. That capacity shall exist between the inlet to hydrant and an elevation three feet below the permanent pool elevation.

Runoff computation - total runoff amounts and peak discharges may be computed using procedures found in NRCS Engineering Field Handbook, NRCS National Engineering Handbook, SCS TR-55 and TR-20, US Army Corps of Engineers HEC-1 or other procedures designated by the appropriate regulatory authorities.

Principal spillways - non-permit, IDNR-OWR class III dams shall have a principal spillway structure capable of passing the peak discharge from a 24-hour duration storm event of frequency specified in Table 1 with stage at or below emergency spillway crest.

IDNR-OWR class III, permit size dams shall have a principal spillway structure capable of passing the peak discharge from a 24-hour, 25 year storm event with stage at or below the emergency spillway crest.

Principal spillway structures may be conduits, weir-type straight drops, or chutes.

Principal spillway pipe conduits and fittings may be metal, as per NRCS material specifications 551, 552, or 554 or non-metal, as per NRCS material specifications 541, 542, 544, or 547. Conduits of other materials may be used at the discretion of the appropriate regulatory authorities.

Pipe conduits should meet the following requirements:

The pipe should be capable of withstanding external loading without yielding, buckling, or cracking. Pipe strength should not be less than that of the grades indicated in Table 2 for plastic pipe and in Table 3 for corrugated aluminum and galvanized steel pipe. Flexible pipe strength shall not be less than that necessary to support the design load with maximum 5 percent deflection. The inlets and outlets should be structurally sound and made of materials compatible with that of the pipe. All pipe joints should be made watertight by the use of couplings or gaskets or by welding or caulking.

Acceptable pipe materials are cast-iron, steel, corrugated steel, or aluminum, concrete, plastic, vitrified clay with rubber gaskets, and cast-in-place reinforced concrete. Aluminum pipe will not be used in soils with pH values outside the range of 4-9. Concrete and vitrified clay pipe should be laid in a concrete bedding. Plastic pipe that will be exposed to direct sunlight should be made of ultraviolet-resistant materials and protected by coating or shielding, or provisions for replacement should be specified. Connections of plastic pipe to

less flexible pipe or structures must be designed to avoid stress concentrations that could rupture the plastic. Cantilever outlet sections, if used, should be designed to withstand the cantilever load. Pipe supports should be provided when needed. Other suitable outlet protection structure devices may also be used to provide a safe outlet.

Anti-seep collars should be installed around the pipe conduit in the normal saturation zone if any of the following conditions exist:

1. The settled dam height exceeds 15 feet.
2. The conduit is of smooth exterior pipe larger than eight inches in diameter.
3. The conduit is of corrugated exterior pipe larger than 12 inches in diameter.

Anti-seep collars and their connections to the pipe should be watertight. The collar material should be compatible with pipe materials. The maximum spacing should be approximately 14 times the minimum projection of the collar measured perpendicular to the pipe. A minimum of one anti-seep collar should be used on all conduits.

Closed conduit spillways designed for pressure flow must have adequate anti-vortex devices at their inlets.

If needed to prevent clogging of the conduit, an appropriate trash guard should be installed at the inlet or riser.

For safety reasons, all vertical drop inlets should be constructed to prevent accidental injury. This may be accomplished by using a horizontal anti-vortex baffle, trash rack or guardrail.

Procedures for designing, dimensioning, and detailing pipe conduit spillways may be found in the NRCS Engineering Field Handbook, the NRCS National Engineering Handbook and Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control or other references specified by local regulatory authorities.

Weir-type straight drops or box inlets and chutes shall be designed according to procedures in the NRCS Engineering Field Handbook, the NRCS National Engineering Handbook, and the USDA Agricultural Handbook No. 301, or as specified by the local regulatory authorities.

NRCS toe wall drop structures can be used if the vertical drop is 4 feet or less, flows are intermittent, downstream grades are stable, and tailwater depth at design flow is equal to or greater than one-third of the height of the overfall.

The ratio of the capacity of drop boxes to road culverts shall be as required by the responsible road authority. The drop box capacity attached to a new or existing culvert must equal or exceed the culvert capacity at the design flow.

Emergency spillways - An emergency spillway must be provided for each dam, unless the principal spillway is large enough to pass peak discharge from the routed design hydrograph and the trash that comes to it without overtopping the dam. The following are minimum criteria for acceptable use of pipe conduit principal spillway without an emergency spillway: a conduit with a cross-sectional area of 3 square feet or more, an inlet that will not clog, and an elbow designed to facilitate the passage of trash.

The minimum capacity of a natural or constructed emergency spillway shall be that required to pass the peak flow expected from a design storm of the frequency and duration shown in Table 1. IDNR-OWR class III permit dams shall have an emergency spillway capable of passing the peak discharge from a 100-year, 24-hour storm event less principal spillway discharge.

Emergency spillways shall provide for passing the design flow at a safe velocity to a point downstream where the dam will not be endangered.

Constructed emergency spillways are open channels that usually consist of an inlet channel, a control section, and an exit channel. They shall be stable for the material in which the spillway is to be constructed. The emergency spillway shall have a bottom width of not less than 10 feet.

Upstream from the control section, the inlet channel shall be level for the distance needed to protect and maintain the crest elevation of the spillway. The inlet channel may be curved to fit existing topography. The grade of the exit channel of a constructed emergency spillway shall fall within the range established by discharge requirements and permissible velocities. Design procedures and details for vegetated earth emergency spillways may be found in the NRCS Engineering Field Handbook, the NRCS National Engineering Handbook, and NRCS Technical Release 52, or other references specified by the local regulatory authorities.

Foundation cutoff - A cutoff of relatively impervious material shall be provided under the dam if necessary. The cutoff

shall be located at or upstream from the centerline of the dam. It shall extend up the abutments as required and be deep enough to extend into a relatively impervious layer or provide for a stable dam when combined with seepage control. The cutoff trench shall have a bottom width adequate to accommodate the equipment used for excavation, backfill, and compaction operations. Side slopes shall not be steeper than one horizontal to one vertical.

Seepage control - Seepage control is to be included if:

1. Pervious layers are not intercepted by the cutoff,
2. Seepage creates swamping downstream,
3. Such control is needed to insure a stable embankment,
4. Special problems require drainage for a stable dam.

Seepage may be controlled by:

1. Foundation, abutment, or embankment drains,
2. Reservoir blanketing,
3. A combination of these measures.

Earth embankment - The minimum top width for a dam is shown in Table 4. If the embankment top is to be used as a public road, the minimum width shall be 16 feet for one-way traffic and 26 feet for two-way traffic. Guardrails or other safety measures shall be used where necessary and shall meet the requirements of the responsible road authority.

The combined upstream and downstream side slopes of the settled embankments shall not be less than five horizontal to one vertical, and neither

slope shall be steeper than two horizontal to one vertical. All slopes must be designed to be stable, even if flatter side slopes are required.

If needed to protect the slopes of the dam, special measures, such as berms, rock riprap, sand-gravel, soil cement, or special vegetation, shall be provided.

The minimum elevation of the top of the settled embankment shall be 1 foot above the water surface in the reservoir with the emergency spillway flowing at design depth. The minimum difference in elevation between the crest of the emergency spillway and the settled top of the dam shall be 2 feet for all dams having more than 20 acres drainage area or more than 20 feet in effective height.

The design height of the dam shall be increased by the amount needed to insure that after settlement the height of the dam equals or exceeds the design height. This increase shall not be less than 5 percent, except where detailed soil testing and laboratory analysis show that a lesser amount is adequate.

Excavated impoundments:

Runoff - Provisions shall be made for a pipe and emergency spillway if necessary. Runoff flow patterns shall be considered when locating the pit and placing the spoil.

Side slopes - Side slopes of excavated ponds shall be stable and shall not be steeper than one horizontal to one vertical.

Perimeter form - If the structures are to be used for recreation or are highly

visible to the public, the perimeter or edge should be curvilinear.

Inlet protection - If surface water enters the pond in a natural or excavated channel, the side slope of the impoundment shall be protected against erosion.

Excavated material - The material excavated from the pond shall be placed so that its weight will not endanger the stability of the pond side slopes and so that it will not be washed back into the pond by rainfall. It shall be disposed of in one of the following ways:

1. Uniformly spread to a height that does not exceed 3 feet, with the top graded to a continuous slope away from the impoundment.
2. Uniformly placed or shaped reasonably well, with side slopes assuming a natural angle of repose. The excavated material will be placed at a distance equal to the depth of the impoundment but not less than 12 feet from the edge of the impoundment.
3. Shaped to a designed form that blends visually with the landscape
4. Used for low embankment and leveling.
5. Hauled away.

Vegetation - Disturbed areas that are not to be cultivated shall be established as soon as practicable after construction. Seedbed preparation, seeding, fertilizing and mulching shall comply with practice standards [PERMANENT VEGETATION 880](#) or [TEMPORARY SEEDING 965](#).

CONSIDERATIONS

Site safety - Impoundments are potential attractive nuisances and safety aspects must be considered in their design and layout. If the area is used or may be used for recreation, it is recommended that warning signs be erected, that lifesaving equipment be available on site and that emergency instructions be posted in a conspicuous location.

Visual resource design - The visual design of impoundments shall be carefully considered in areas of high public visibility and those associated with recreation. The underlying criterion for all visual design is appropriateness. The shape and form of ponds, excavated material, and plantings are to relate visually to their surroundings and to their function.

The embankment may be shaped to blend with the natural topography. The edge of the impoundment may be shaped so that it is generally curvilinear rather than rectangular. Excavated material can be shaped so that the final form is smooth, flowing, and fitting to the adjacent landscape rather than angular geometric mounds. If feasible, islands may be added for visual interest and to attract wildlife.

Impoundments for water supply should have adequate drainage area to fill at least yearly. As a minimum, drainage area, in acres, where water supply is a primary purpose, shall equal permanent storage in acre-feet.

PLANS AND SPECIFICATIONS

Plans and specifications for installing full flow impoundment structures shall be in keeping with this standard and shall

describe the requirements for installing the practice to achieve its intended purpose. Items that specifications should address, if applicable, and appropriate construction/material specifications, standard drawings and other standards are as follows:

Site and foundation preparation - All site and foundation areas shall be prepared and maintained in such a manner that earthfill placement or other specified treatments allow the practice to achieve its intended purpose. Applicable construction specifications may include: [1 CLEARING](#), [2 CLEARING AND GRUBBING](#), [8 MOBILIZATION](#), [10 WATER FOR CONSTRUCTION](#), and [11 REMOVAL OF WATER](#).

Applicable material specifications may include: [521 AGGREGATES FOR DRAINFILL FILTERS](#), and [592 GEOTEXTILES](#).

Applicable standard drawings may include drawing number [IL-515 DIVERSION PLAN](#), [IL-585 EARTH DAM STRUCTURE PLAN](#), [IL-630 STABILIZED CONSTRUCTION ENTRANCE](#), [IL-650 SUMP PIT PLAN](#), and [IL-670 TEMPORARY SLOPE DRAIN PLAN](#).

Other applicable standards may include: [DIVERSION 815](#), [SUMP PIT 950](#), [TEMPORARY SLOPE DRAIN 970](#), and [TEMPORARY STREAM CROSSING 975](#).

Excavations and earthfill - All specified excavation shall be preformed and earthfills shall be placed in such a manner that allows the practice to achieve its intended purpose. Applicable construction specifications may include: [10 WATER FOR](#)

[CONSTRUCTION](#), [21 EXCAVATION](#), [23 EARTHFILL](#), [24 DRAINFILL](#), [25 ROCKFILL](#), [26 SALVAGING AND SPREADING TOPSOIL](#), [61 LOOSE ROCK RIPRAP](#), [62 GROUTED ROCK RIPRAP](#), and [95 GEOTEXTILE](#).

Applicable material specifications may include: [521 AGGREGATES FOR DRAINFILL AND FILTERS](#), [523 ROCK FOR RIPRAP](#), and [592 GEOTEXTILE](#).

Applicable standard drawings may include: [IL-585 EARTH DAM STRUCTURE PLAN](#).

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CANOPY INLET, IL-593 FLEXIBLE ANTISEEP COLLAR, IL-594 CMP WATER CONTROL STRUCTURE, and IL-610 PIPE OUTLET TO FLAT AREA.

Site physical protection plan - Adequate measure shall be specified to control, on site, additional runoff and/or contaminants expected as a result of construction activities; to provide for the safety of the general public; and to provide a maintainable system of erosion protection for the constructed practice. Applicable construction specifications may include: 6 SEEDING, SPRIGGING, & MULCHING FOR PROTECTIVE COVER, 26 SALVAGING & SPREADING TOPSOIL, 27 DIVERSIONS AND WATERWAYS, 46 TILE DRAINS, 61 LOOSE ROCK RIPRAP, 62 GROUTED ROCK RIPRAP, 64 WIRE MESH GABIONS, 91 CHAIN LINK FENCE, and 95 GEOTEXTILES.

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Other applicable standards may include: DIVERSION 815, DIVERSION DIKE 820, DUST CONTROL 825, EROSION BLANKET 830, FILTER STRIP 835,

LAND GRADING 865, MULCHING 875,
PERMANENT VEGETATION 880,
PORTABLE SEDIMENT TANK 895,
ROCK OUTLET PROTECTION 910,
SILT FENCE 920, SODDING 925,
STRAW BALE BARRIER 935,
SUBSURFACE DRAIN 945,
TEMPORARY DIVERSION 955,
TEMPORARY SEDIMENT TRAP 960,
TEMPORARY SEEDING 965,
TEMPORARY SWALE 980, and
TOPSOILING 981.

If required by the IDNR-OWR, an
emergency action plan shall be filed for
permit structures.

NRCS IL August 1994

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OPERATION AND MAINTENANCE

An operation and maintenance plan should be developed and concurred in by the owners/operators of the impoundment structure. The operation plan shall establish a schedule for testing all operable facilities to ensure that they function as intended, or that necessary repairs are made. The maintenance plan shall specify responsible parties for maintaining or replacing, as necessary: all vegetative components of the structure, riprap for wave protection or outlet protection, inlet and outlet works, safety features including fences and signs, and on-site erosion/water control facilities.

Procedures and responsible parties for removing and disposing of accumulated debris and/or sediment as necessary to ensure the function of the structure shall be specified. Procedures and responsible parties for repairing damage to embankment, spillway structures and other appurtenances shall be specified. The structure shall be inspected at least yearly and after every storm event causing flows through vegetated spillways or over top of embankment.

TABLE 1

SPILLWAY REQUIREMENTS FOR NON-PERMIT DAMS

Drainage Area (Acres)	Principal Spillway Minimum Design Storm Frequency (Years)	Emergency Spillway Minimum Design Storm Frequency (Years)
0 – 100	5	25
100 – 250	10	50
> 250	25	100

TABLE 2

PRINCIPAL SPILLWAY
PVC PIPE FOR USE IN EARTH DAMS

Nominal Pipe Size	Schedule or Standard Dimension Ratio (SDR)	Maximum Depth of Fill (ft.)
4" or smaller	Schedule 40	15
	Schedule 80	20
	SDR 26	10
6", 8", 10", 12"	Schedule 40	10
	Schedule 80	15
	SDR 26	10

TABLE 3
 PRINCIPAL SPILLWAY
 MINIMUM GAUGES FOR CORRUGATED METAL PIPE

	Pipe Diameter (in.)						Pipe Diameter (in.)			
	12 & less	24	30	36	42	48	12 & less	24	30	36
Fill Over Pipe (ft.)	Steel Minimum Gauge						Aluminum ¹ Minimum Thickness (in.)			
1 – 15	16	16	16	14	12	10	.06	.06	.075	.075
15 – 20	16	16	16	14	12	10	.06	.06	.105	.105

¹Riveted or helical fabrication.

TABLE 4
 MINIMUM TOP WIDTH FOR DAMS

Total Height of Embankment (ft.)	Top Width (ft.)
10 or less	6
10 – 15	8
15 – 20	10
20 – 25	12
25 – 35	14
35 or more	15

IMPOUNDMENT STRUCTURE - ROUTED

(no.)
CODE 842



(Source: Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois)

DEFINITION

A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.

PURPOSE

The purposes of this practice are to reduce sediment and/or debris in runoff waters or retard flooding, to prevent damage to downstream facilities; or to provide surface water for consumption, irrigation, wildlife habitat, recreation or fire protection.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where sediment or debris is expected to be contained in runoff waters and may impair the capacity of the watercourse or damage other structures or where a surface water supply is desirable; where storage for at least one inch of water from the contributing watershed is available and where any embankment does not exceed the limits for class III, small dams, as defined by the IDNR-OWR in

"Rules for Construction and Maintenance of Dams" and the landowner or other responsible party has secured necessary permits, if required, for design and construction from IDNR-OWR and any local governmental authorities.

CRITERIA

Investigations - sufficient investigations shall be made of the impoundment site and borrow areas to determine the suitability of site and materials for construction, water holding ability and structure stability. A complete analysis of foundation and proposed fill materials shall be made when, in the opinion of the responsible engineer, it is necessary.

Hazard/safety - structures designed under criteria found in this practice shall fall within the class III, small dam category, defined by the IDNR-OWR as follows: "*class III. Dams located where failure has low probability for causing loss of life, where there are no permanent structures for human habitation, or minimum economic loss in*

excess of that which naturally would occur downstream of the dam if the dam had not failed. A dam has a low probability for causing loss of life or minimal economic loss if it is located where its failure may cause damage to agricultural fields, timber areas, township roads, or similar type areas where people seldom are present and where there are few structures. This corresponds to US Army Corps of Engineers Low Hazard Potential and USDA NRCS class a dams."

Small dams have a total impounding capacity of less than 1000 acre-feet and dam height of less than 40 feet, where dam height is defined as "*height of dam, in feet, as measured from the natural bed of the stream or watercourse at the downstream dam slope toe of the barrier to the top of the embankment or barrier.*"

Owners of impoundment structures shall obtain all necessary permits. IDNR-OWR permits may be required for class III, small dams where:

1. The drainage area of the proposed dam is 6400 acres or more in a rural area or 640 acres or more in an urban area, or
2. The dam is 25 feet or more in height, provided that the impounding capacity is greater than 15 acre-feet, or
3. The dam has an impounding capacity of 50 acre-feet or more provided that the dam height is greater than 6 feet.

Pool capacities - structures for the impoundment of debris or sediment shall have a capacity equal to the volume of sediment or debris expected to be trapped at the site during the planned useful life of the structure. That

capacity may be proportionally reduced, if periodic removal of sediment/debris is planned.

Structures that impound water for consumptive use shall have capacity as required by local consumptive use standards.

Structures that impound water for irrigation, wildlife habitat or recreation shall have capacity and depth adequate for the intended use.

Structures that impound water for fire protection shall have a capacity of at least 4000 cubic feet per residence. That capacity shall exist between the inlet to hydrant and an elevation three feet below the permanent pool elevation.

Runoff computation - total runoff amounts and peak discharges may be computed using procedures found in NRCS Engineering Field Handbook, NRCS Engineering Handbook, SCS TR-55 and TR-20, US Army Corps of Engineers HEC-1 or other procedures designated by the appropriate regulatory authorities.

Principal spillways - non-permit, IDNR-OWR class III dams shall have a principal spillway structure capable of passing the peak discharge from the routed hydrograph from a 24-hour duration storm event of frequency specified in Table 1 with stage at or below emergency spillway crest.

IDNR-OWR class III, permit size dams shall have a principal spillway structure capable of passing the peak discharge from the routed hydrograph from a 24-hour, 25 year storm event with stage at or below the emergency spillway crest.

Acceptable procedures for flood routing include those in Chapter 11, NRCS Engineering Field Handbook, SCS TR-20, SCS TR-48, US Army Corps of Engineers HEC-1 or other procedures designated by the appropriate regulatory authorities.

For structures with flood retarding as a purpose capacity of the principal spillway shall be adequate to discharge, in 10 days or less, the floodwater storage needed to provide the desired level of protection to the downstream benefited area. Storage provided primarily for the purpose of reducing the frequency of use of the emergency spillway need not be included in this 10-day drawdown limitation. The determination of capacity must be based on consideration of the benefits that accrue to the reduction in the discharge rate, damages that may result from prolonged storage in the retarding pool, damages that may result from prolonged outflow, and limitations in water rights or other legal requirements. Longer release times may be used if warranted by downstream conditions. The discharge through gated outlets shall not be considered in determining the emptying time of the retarding pool.

The elevation of the crest of the lowest stage of the principal spillway shall be set at the elevation of the sediment pool. For dry dams, the riser shall be designed to permit design discharge at the sediment pool elevation with provisions for discharging water at lower elevations to satisfy the functional requirements of the structure.

All parts of the principal spillway, except attached gates and trash racks, shall have an expected service life equal to or greater than the design life of the

structure or provisions made for replacement.

The minimum diameter of the conduit used as a principal spillway shall be 10 inches.

The storage volume shall not be less than the expected sediment accumulation during a period equal to the design life.

The retarding storage requirements shall be contain the runoff expected to occur at a frequency consistent with the level of protection to be provided to the downstream benefited area, with proper allowance for discharge through the principal spillway. The retarding storage capacity shall be sufficient to limit the use of the emergency spillway to a permissible frequency and duration based upon consideration of the erosion resistance of the spillway material and vegetative protection to be provided.

Principal spillway structures may be conduits, weir-type straight drops, or chutes.

Principal spillway pipe conduits and fittings may be metal, as per NRCS material specifications 551 through 554 or non-metal, as per NRCS material specifications 541, 542, 544, or 547. Conduits of other materials may be used at the discretion of the appropriate regulatory authorities.

Pipe conduits should meet the following requirements:

The pipe should be capable of withstanding external loading without yielding, buckling, or cracking. Pipe strength should not be less than that of the types indicated in Table 2 for plastic

pipe and in Table 3 for corrugated aluminum and galvanized steel pipe. Flexible pipe strength shall not be less than that necessary to support the design load with maximum 5 percent deflection. The inlets and outlets should be structurally sound and made of materials compatible with that of the pipe. All pipe joints should be made watertight by the use of couplings or gaskets or by welding or caulking.

Acceptable pipe materials are cast-iron, steel, corrugated steel, or aluminum, concrete, plastic, vitrified clay with rubber gaskets, and cast-in-place reinforced concrete. Aluminum pipe will not be used in soils with pH values outside the range of 4-9. Concrete and vitrified clay pipe should be laid in a concrete bedding. Plastic pipe that will be exposed to direct sunlight should be made of ultraviolet-resistant materials and protected by coating or shielding, or provisions for replacement should be specified. Connections of plastic pipe to less flexible pipe or structures must be designed to avoid stress concentrations that could rupture the plastic. Cantilever outlet sections, if used, should be designed to withstand the cantilever load. Pipe supports should be provided when needed. Other suitable outlet protection structure devices may also be used to provide a safe outlet.

Anti-seep collars should be installed around the pipe conduit in the normal saturation zone if any of the following conditions exist:

1. The settled dam height exceeds 15 feet.
2. The conduit is of smooth exterior pipe larger than eight inches in diameter.

3. The conduit is of corrugated exterior pipe larger than 12 inches in diameter.

Anti-seep collars and their connections to the pipe should be watertight. The collar material should be compatible with pipe materials. The maximum spacing should be approximately 14 times the minimum projection of the collar measured perpendicular to the pipe. A minimum of one anti-seep collar should be used on all conduits.

Closed conduit spillways designed for pressure flow must have adequate anti-vortex devices at their inlets.

If needed to prevent clogging of the conduit, an appropriate trash guard should be installed at the inlet or riser.

For safety reasons, all vertical drop inlets should be constructed to prevent accidental injury. This may be accomplished by using a horizontal anti-vortex baffle, trash rack or guardrail.

Procedures for designing, dimensioning, and detailing pipe conduit spillways may be found in the Engineering Field handbook, the NRCS National Engineering Handbook and the Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control or other references specified by local regulatory authorities.

Weir-type straight drops or box inlets and chutes shall be designed according to procedures in the NRCS Engineering Field Handbook, the NRCS National Engineering Handbook, and the USDA Agricultural handbook No. 301, or as specified by the local regulatory authorities.

NRCS toe wall drop structures can be used if the vertical drop is 4 feet or less, flows are intermittent, downstream grades are stable, and tailwater depth at design flow is equal to or greater than one-third of the height of the overfall.

The ratio of the capacity of drop boxes to road culverts shall be as required by the responsible road authority. The drop box capacity attached to a new or existing culvert must equal or exceed the culvert capacity at the design flow.

Emergency spillways - An emergency spillway must be provided for each dam, unless the principal spillway is large enough to pass peak discharge from the routed design hydrograph and the trash that comes to it without overtopping the dam. The following are minimum criteria for acceptable use of pipe conduit principal spillway without an emergency spillway: a conduit with a cross-sectional area of 3 feet or more, an inlet that will not clog, and an elbow designed to facilitate the passage of trash.

The minimum capacity of a natural or constructed emergency spillway shall be that required to pass the peak flow expected from the routed hydrograph from a design storm of the frequency and duration shown in Table 1. IDNR-OWR class III permit dams shall have an emergency spillway capable of passing the peak discharge from the routed hydrograph from a 100-year, 24-hour storm event less principal spillway discharge.

Emergency spillways shall provide for passing the design flow at a safe velocity to a point downstream where the dam will not be endangered.

Constructed emergency spillways are open channels that usually consist of an inlet channel, a control section, and an exit channel. They shall be stable for the material in which the spillway is to be constructed. The emergency spillway shall have a bottom width of not less than 10 feet.

Upstream from the control section, the inlet channel shall be level for the distance needed to protect and maintain the crest elevation of the spillway. The inlet channel may be curved to fit existing topography. The grade of the exit channel of a constructed emergency spillway shall fall within the range established by discharge requirements and permissible velocities. Design procedures and details for vegetated earth emergency spillways may be found in the NRCS Engineering Field Handbook, the NRCS National Engineering Handbook, and SCS Technical Release 52, or other references specified by the local regulatory authorities.

Foundation cutoff - A cutoff of relatively impervious material shall be provided under the dam if necessary. The cutoff shall be located at or upstream from the centerline of the dam. It shall extend up the abutments as required and be deep enough to extend into a relatively impervious layer or provide for a stable dam when combined with seepage control. The cutoff trench shall have a bottom width adequate to accommodate the equipment used for excavation, backfill, and compaction operations. Side slopes shall not be steeper than one horizontal to one vertical.

Seepage control - Seepage control is to be included if:

1. Pervious layers are not intercepted by the cutoff,
2. Seepage creates swamping downstream,
3. Such control is needed to insure a stable embankment,
4. Special problems require drainage for a stable dam.

Seepage may be controlled by:

1. Foundation, abutment, or embankment drains,
2. Reservoir blanketing,
3. A combination of these measures.

Earth embankment - The minimum top width for a dam is shown in Table 4. If the embankment top is to be used as a public road, the minimum width shall be 16 feet for one-way traffic and 26 feet for two-way traffic. Guardrails or other safety measures shall be used where necessary and shall meet the requirements of the responsible road authority.

The combined upstream and downstream side slopes of the settled embankments shall not be less than five horizontal to one vertical, and neither slope shall be steeper than two horizontal to one vertical. All slopes must be designed to be stable, even if flatter side slopes are required.

If needed to protect the slopes of the dam, special measures, such as berms, rock riprap, sand-gravel, soil cement, or special vegetation, shall be provided.

The minimum elevation of the top of the settled embankment shall be 1 foot above the water surface in the reservoir with the emergency spillway flowing at design depth. The minimum difference in elevation between the crest of the

emergency spillway and the settled top of the dam shall be 2 feet for all dams having more than 20 acres drainage area or more than 20 feet in effective height.

The design height of the dam shall be increased by the amount needed to insure that after settlement the height of the dam equals or exceeds the design height. This increase shall not be less than 5 percent, except where detailed soil testing and laboratory analysis show that a lesser amount is adequate.

Excavated impoundments:

Runoff - Provisions shall be made for a pipe and emergency spillway if necessary. Runoff flow patterns shall be considered when locating the pit and placing the spoil.

Side slopes - Side slopes of excavated ponds shall be stable and shall not be steeper than one horizontal to one vertical.

Perimeter form - If the structures are to be used for recreation or are highly visible to the public, the perimeter or edge should be curvilinear.

Inlet protection - If surface water enters the pond in a natural or excavated channel, the side slope of the impoundment shall be protected against erosion.

Excavated material - The material excavated from the pond shall be placed so that its weight will not endanger the stability of the pond side slopes and so that it will not be washed back into the pond by rainfall. It shall be disposed of in one of the following ways:

1. Uniformly spread to a height that does not exceed 3 feet, with the top graded to a continuous slope away from the impoundment.
2. Uniformly placed or shaped reasonably well, with side slopes assuming a natural angle of repose. The excavated material will be placed at a distance equal to the depth of the impoundment but not less than 12 feet from the edge of the impoundment.
3. Shaped to a designed form that blends visually with the landscape
4. Used for low embankment and leveling.
5. Hauled away.

Vegetation - Disturbed areas that are not to be cultivated shall be established as soon as practicable after construction. Seedbed preparation, seeding, fertilizing and mulching shall comply with practice standards [PERMANENT VEGETATION 880](#) or [TEMPORARY SEEDING 965](#).

CONSIDERATIONS

Site safety - Impoundments are potential attractive nuisances and safety aspects must be considered in their design and layout. If the area is used or may be used for recreation, it is recommended that warning signs be erected, that lifesaving equipment be available on site and that emergency instructions be posted in a conspicuous location.

Visual resource design - The visual design of impoundments shall be carefully considered in areas of high public visibility and those associated with recreation. The underlying criterion for all visual design is appropriateness. The shape and form of ponds, excavated material, and plantings are to

relate visually to their surroundings and to their function.

The embankment may be shaped to blend with the natural topography. The edge of the impoundment may be shaped so that it is generally curvilinear rather than rectangular. Excavated material can be shaped so that the final form is smooth, flowing, and fitting to the adjacent landscape rather than angular geometric mounds. If feasible, islands may be added for visual interest and to attract wildlife.

Impoundments for water supply should have adequate drainage area to fill at least yearly. As a minimum, drainage area, in acres, where water supply is a primary purpose, shall equal permanent storage in acre-feet.

PLANS AND SPECIFICATIONS

Plans and specifications for installing full flow impoundment structures shall be in keeping with this standard and shall describe the requirements for installing the practice to achieve its intended purpose. Items that specifications should address, if applicable, and appropriate construction/material specifications, standard drawings and other standards are as follows:

Site and foundation preparation - All site and foundation areas shall be prepared and maintained in such a manner that earthfill placement or other specified treatments allow the practice to achieve its intended purpose. Applicable construction specifications may include: [1 CLEARING](#), [2 CLEARING AND GRUBBING](#), [8 MOBILIZATION](#), [10 WATER FOR CONSTRUCTION](#), and [11 REMOVAL OF WATER](#).

Applicable material specifications may include: [521 AGGREGATES FOR DRAINFILL](#) and [FILTERS](#), and [592 GEOTEXTILES](#).

Applicable standard drawings may include drawing number [IL-515 DIVERSION PLAN](#), [IL-585 EARTH DAM STRUCTURE PLAN](#), [IL-630 STABILIZED CONSTRUCTION ENTRANCE](#), [IL-650 SUMP PIT PLAN](#), and [IL-670 TEMPORARY SLOPE DRAIN PLAN](#).

Other applicable standards may include: [DIVERSION 815](#), [SUMP PIT 950](#), [TEMPORARY SLOPE DRAIN 970](#), and [TEMPORARY STREAM CROSSING 975](#).

Excavations and earthfill - All specified excavation shall be preformed and earthfills shall be placed in such a manner that allows the practice to achieve its intended purpose. Applicable construction specifications may include: [10 WATER FOR CONSTRUCTION](#), [21 EXCAVATION](#), [23 EARTHFILL](#), [24 DRAINFILL](#), [25 ROCKFILL](#), [26 SALVAGING AND SPREADING TOPSOIL](#), [61 LOOSE ROCK RIPRAP](#), [62 GROUTED ROCK RIPRAP](#), and [95 GEOTEXTILE](#).

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OPERATION AND MAINTENANCE

An operation and maintenance plan should be developed and concurred in by the owners/operators of the impoundment structure. The operation plan shall establish a schedule for

testing all operable facilities to ensure that they function as intended, or that necessary repairs are made. The maintenance plan shall specify responsible parties for maintaining or replacing, as necessary: all vegetative components of the structure, riprap for wave protection or outlet protection, inlet and outlet works, safety features including fences and signs, and on-site erosion/water control facilities.

Procedures and responsible parties for removing and disposing of accumulated debris and/or sediment as necessary to ensure the function of the structure shall be specified. Procedures and responsible parties for repairing damage to embankment, spillway structures and other appurtenances shall be specified. The structure shall be inspected at least yearly and after every storm event causing flows through vegetated spillways or over top of embankment.

If required by the IDNR-OWR, an emergency action plan shall be filed for permit structures.

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TABLE 1

SPILLWAY REQUIREMENTS FOR NON-PERMIT DAMS

Drainage Area (Acres)	Principal Spillway Minimum Design Storm Frequency (Years)	Emergency Spillway Minimum Design Storm Frequency (Years)
0 – 100	5	25
100 – 250	10	50
> 250	25	100

TABLE 2

PRINCIPAL SPILLWAY
PVC PIPE FOR USE IN EARTH DAMS

Nominal Pipe Size	Schedule or Standard Dimension Ratio (SDR)	Maximum Depth of Fill (ft.)
4" or smaller	Schedule 40	15
	Schedule 80	20
	SDR 26	10
6", 8", 10", 12"	Schedule 40	10
	Schedule 80	15
	SDR 26	10

TABLE 3
 PRINCIPAL SPILLWAY
 MINIMUM GAUGES FOR CORRUGATED METAL PIPE

	Pipe Diameter (in.)						Pipe Diameter (in.)			
	12 & less	24	30	36	42	48	12 & less	24	30	36
Fill Over Pipe (ft.)	Steel Minimum Gauge						Aluminum ¹ Minimum Thickness (in.)			
1 – 15	16	16	16	14	12	10	.06	.06	.075	.075
15 – 20	16	16	16	14	12	10	.06	.06	.105	.105

¹ Riveted or helical fabrication.

TABLE 4
 MINIMUM TOP WIDTH FOR DAMS

Total Height of Embankment (ft.)	Top Width (ft.)
10 or less	6
10 – 15	8
15 – 20	10
20 – 25	12
25 – 35	14
35 or more	15

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

INFILTRATION TRENCH

(ft.)
CODE 847



(Source: Center for Watershed Protection)

DEFINITION

An excavated trench filled with coarse granular material in which stormwater runoff is collected for temporary storage and infiltration.

PURPOSE

The purposes of this practice are to reduce runoff volume and peak discharges from a site, increase groundwater recharge and baseflow, and to filter soluble contaminants out of runoff before it reaches receiving waters. Infiltration trenches are not intended to remove coarse sediments.

CONDITIONS WHERE PRACTICE APPLIES

This permanent site development practice applies to small drainage areas not exceeding 5 acres.

The soils surrounding the trench shall have permeability rates of 0.5 to 2.41 in/hr, a minimum available water capacity of 0.15 in/in, and clay content

less than 35%. These values can be found in published soil surveys.

Because infiltration trenches are not designed to filter coarse particulate matter, appropriate sediment control devices must be included in the site design and must be installed prior to the construction of the trench.

CRITERIA

Design capacity shall be a minimum volume of 0.5 inches of runoff per acre of drainage area.

The capacity of the trench shall be based on the porosity (% voids) of the coarse aggregate used in the system. If test data is not available, use 40% porosity for the coarse aggregate.

The trench shall be filled with coarse aggregate which meets IDOT CA-1, or CA-3 gradation. The bottom 6 inch layer in the trench shall be sand which meets IDOT CA-14, CA-15 or CA-16 gradation. The coarse aggregate shall be separated from the soil surrounding the trench by a filter fabric. The fabric

shall meet the requirements in material specification [592 GEOTEXTILE](#) Table 1 or 2, Class 1 with an apparent opening size of at least 30 for non-woven and 50 for woven. The fabric shall extend through the coarse aggregate one foot below the trench surface to prevent plugging. The filter fabric may be extended across the trench bottom in place of the sand layer.

Infiltration trenches shall be designed to dewater within 72 hours. Table 1 lists the maximum trench depths allowed for various soil types for 48 and 72 hour dewatering time periods. The permeability rate shall be field verified to a depth 3 feet below the trench bottom.

The width of the infiltration trench is determined using the design volume and final trench depth values.

All infiltration trenches must have an overflow component since they are not designed to handle large runoff volumes.

The location of the infiltration trench shall meet the following requirements. The bottom of the trench shall be a minimum of 3 feet above the seasonal high water table, bedrock, an impermeable soil layer or dissimilar soil layer. The trench shall be a minimum of 20 feet downslope or 100 feet upslope from any building foundation. The trench shall be a minimum of 100 feet from drinking water wells, septic tanks, drainfields etc. The trench shall not be installed on landslopes greater than 15% and shall be at least 50 feet from where landslopes are greater than 15%. The trench shall not be installed in fill soils.

Observation wells shall be included with the infiltration trench to enable inspection of their performance.

Observation wells shall be constructed of 6-8 inch diameter perforated pipe embedded vertically through the aggregate and extended above the ground surface. The surface protrusion shall be capped and protected against vandalism. A well anchor shall be secured to the pipe to prevent the well from being pulled out of the trench. The well anchor may consist of a metal plate or bar secured at or near the bottom of the observation well.

CONSIDERATIONS

It is absolutely critical that settleable particles and floatable organic materials be removed from runoff water before it enters the infiltration trench. The trench will clog and become nonfunctional if excessive particulate matter is allowed to enter the trench. Runoff filtering practices such as practice standard [FILTER STRIP 835](#), and [GRASSED LINED CHANNEL 840](#) must be installed upstream of the trench. If there are uncontrolled sources of grease or oil, grease traps also need to be installed upstream of the trench.

For the same reasons, control of construction site sediment is critical during trench installation. Appropriate sediment control practices such as practice standards [TEMPORARY SEDIMENT TRAP 960](#) and [SILT FENCE 920](#) must be installed and maintained during construction. A more reliable alternative is to wait to install the trench until construction is complete and the upstream drainage area is stabilized.

Infiltration trenches should not be installed if there is not a reliable long term commitment to upstream sediment control.

Care must be taken to prevent groundwater contamination by not installing infiltration trenches in highly permeable sand or gravel seams that are directly connected to underlying aquifers.

For removal of soluble contaminants, a 12 inch soil layer with a cation exchange capacity (CEC) of 0.5 millieq/100g or greater needs to be present. In Illinois, most soils that meet the permeability, available water capacity and clay content criteria will have a CEC of 0.5 millieq/100g or greater.

PLANS AND SPECIFICATIONS

Plans and specifications for installing infiltration trenches shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. System location
2. Depth, width and length
3. Aggregate gradation
4. Filter fabric requirements
5. Observation well details
6. Identification of upstream sediment control BMPs

All plans shall include installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [INFILTRATION TRENCH IL-547](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

During the first year after construction, the observation well should be inspected after each significant rainfall event to ensure that the trench is draining properly. Thereafter, the well should be inspected seasonally.

If the trench clogs, it may be necessary to remove and replace all or part of the filter fabric and possibly the coarse aggregate. The frequency of such repairs will depend on the adequacy of pre-treatment as discussed previously.

Most of the maintenance should be concentrated on the pretreatment practices, such as filter strips and swales, upstream of the trench to ensure that sediment does not reach the infiltration trench.

Maintenance needs are to be discussed with the landowner or operator who is responsible for maintaining the practice.

REFERENCES

Illinois Department of Transportation, 1997. Standard Specifications for Road and Bridge Construction. IL

Ohio Department of Natural Resources, Division of Soil and Water Conservation, 1996. Rainwater and Land Development. 2nd ed., OH

NRCS IL January 1999

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TABLE 1
 MAXIMUM DEPTH FOR TRENCHES AND BASINS LIMITED
 BY SOIL PERMEABILITY RATE

Soil Texture	Minimum Permeability (fc) in/hr	Maximum Depth of Trench (d) in.	
		48 hours (T)	72 hours (T)
Sand	13	NA	NA
Loamy Sand	6	NA	NA
Sandy Loam	2	240	360
Loam	1	120	180
Silt Loam	1	120	180
Sandy Clay Loam	1	120	180
Clay Loam <35% Clay	0.8	96	144
Clay Loam >35% Clay	0.4	NA	NA
Silty Clay Loam <35% Clay	0.8	96	144
Silty Clay Loam >35% Clay	0.4	NA	NA
Sandy Clay <40% Clay	0.4	NA	NA
Sandy Clay >40% Clay	<0.06	NA	NA
Silty Clay	<0.06	NA	NA
Clay	<0.06	NA	NA

NA – not applicable

Values based on a Soil Porosity of 40 %.

Maximum allowable depth computed by:

$$d = \frac{(fc)(T)100}{P}$$

where

d = depth	inch
fc = permeability rate	inch/hour
T = time to dewater	hour
P = porosity (% voids)	%

Design Volume of Trench = Required Runoff Volume / Porosity

Porosity = Volume of Voids / Total Volume

Required Runoff Volume = Volume of Voids in Trench

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

INLET PROTECTION - BLOCK & GRAVEL

(no.)
CODE 850



(Source: NC Erosion and Sediment Control Planning and Design Manual)

DEFINITION

A temporary sediment control barrier formed around a storm drain inlet by the use of standard concrete blocks and gravel.

PURPOSE

The purpose of this practice is to help prevent sediment from entering storm drains before stabilizing the contributing watershed. This practice allows early use of the storm drain system.

CONDITIONS WHERE PRACTICE APPLIES

A block and gravel type of inlet protection may be used where storm drain inlets are to be made operational before permanent stabilization of the disturbed drainage area. This method of inlet protection applies to both drop inlets and curb inlets where heavy flows are expected and an overflow capacity is necessary to prevent excessive ponding around the structure. Shallow temporary flooding after rainfall should be expected.

This practice may be used near the edge of fill material and must not divert water away from the storm drain.

This practice can be used in combination with other temporary inlet protection devices such as practice standards [INLET PROTECTION - EXCAVATED DRAIN 855](#) or [INLET PROTECTION - FABRIC DROP 860](#).

CRITERIA

The drainage area should be smaller than 1 acre unless site conditions and assurances that timely inspection and maintenance allows for frequent removal and adequate disposal of accumulated sediment.

The height of the barrier shall be at least 12 inches but no greater than 24 inches. Do not use mortar. Limit the height to prevent excess ponding and bypass flow.

Recess the first course of blocks at least 2 inches below the crest opening of the storm drain for lateral support. Support subsequent courses laterally if needed.

by placing a 2 x 4-inch wood stud through the block openings that are perpendicular to the block course needing support. Lay one block on its side on each side of the bottom row for dewatering the pool.

Place hardware cloth or comparable wire mesh with 1/2 inch openings over all block openings to hold gravel in place. Place gravel just below the top of the blocks on slopes of 2:1 or flatter. The gravel shall meet the requirements for coarse aggregate with IDOT gradations of CA-1, CA-2, or CA-3.

CONSIDERATIONS

In developing areas, installation of streets and storm sewer networks usually occur before the construction of homes, businesses or other developments. During this and subsequent phases of construction, unprotected soil is susceptible to erosion. Storm sewers that are operational before their drainage areas are stabilized often carry large amounts of sediment to lakes, detention ponds, streams, or other natural or constructed drainageways. As a result, the water quality of the receiving body of water is detrimentally affected. In cases of extreme sediment loading, the storm sewer may clog completely or lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.

Storm drain inlet protection consists of several types of inlet filters and traps. Each type differs in application dependant upon site conditions and type of inlet. Not all designs are appropriate in all cases. The user must carefully select a design suitable for the needs and site conditions. Field experience has shown that inlet protection that

causes excessive ponding in an area of high construction activity may become so inconvenient that it is removed or bypassed, thus transmitting sediment-laden flows unchecked. In such situations, a structure with an adequate overflow mechanism must be utilized.

Stone is utilized as the chief ponding/filtering agent in many types of inlet protection. The various types of "coarse aggregates" which are shown are able to filter out sediment mainly through slowing down flows directed to the inlet by creating an increased flow path for the stormwater (through void space in the respective stone). The stone filtering medium by no means slows stormwater flow rate as does filter cloth and therefore cannot provide the same degree of filter efficiency when smaller silt and clay particles are introduced into stormwater flows. However, as mentioned earlier, excessive ponding in busy areas adjacent to stormwater inlets is in many cases unacceptable.

In most instances, inlet protection utilizing stone should not be the sole control measure. At the time that storm sewer inlet and associated appurtenances become operational, areas adjacent to the structures are most likely at final grade or will not be altered for extended periods. This is the time when practice standard [TEMPORARY SEEDING 965](#) and other appropriate controls should be implemented to enhance sediment-loss reductions. In addition, by varying stone sizes used in the construction of inlet protection, a greater degree of sediment removal can be obtained. As an option, filter cloth can be used with the stone in these devices to further enhance sediment removal. Notably, the potential inconvenience of excessive

ponding must be examined with these choices, especially the latter. In all designs that utilize stone with a wire-mesh support as a filtering mechanism, the stone can be completely wrapped with the wire mesh to improve stability and provide easier cleaning.

Filter fabric may be added to any of the devices that utilize coarse aggregate stone to enhance sediment removal. The fabric shall meet the requirements as shown in material specification [592 GEOTEXTILE](#) Table 1 or 2, Class 1 with an AOS of at least 30 for non-woven and 50 for woven. As a result of the significant increase in filter efficiency provided by the fabric, a larger range of stone sizes (IDOT CA-1, CA-2 or CA-3) may be utilized with such a configuration. The larger stone will help keep larger sediment masses from clogging the cloth.

Inlet protection devices are for drainage areas of one acre or less. Runoff from areas larger than one acre should be routed through a properly designed practice such as [IMPOUNDMENT STRUCTURE-ROUTED 842](#), [TEMPORARY SEDIMENT TRAP 960](#).

The best way to prevent sediment from entering the storm sewer system is to stabilize disturbed areas of the site as quickly as possible, preventing erosion and stopping sediment at its source.

PLANS AND SPECIFICATIONS

Plans and specifications for installing block and gravel inlet protection shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Inlet location

2. Stone gradation
3. Wire screen hole size

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [IL-550 INLET PROTECTION - BLOCK AND GRAVEL PLAN](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

Inspect the barrier after each runoff producing rain and make repairs as needed.

Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to one-half the design depth of the trap. Removed sediment shall be deposited in a suitable area in such a manner that it will not erode.

When the contributing drainage area has been adequately stabilized, remove all materials and any unstable soil, and either salvage or dispose of it properly. Bring the disturbed area to proper grade, then smooth and compact it. Appropriately stabilize all bare areas around the inlet.

NRCS IL August 1994

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

INLET PROTECTION - EXCAVATED DRAIN

(no.)
CODE 855



(Source: NC Erosion and Sediment Control Planning and Design Manual)

DEFINITION

An excavated area in the approach to a storm drain drop inlet or curb inlet.

PURPOSE

The purpose of this practice is to help prevent sediment from entering storm drains before stabilizing the contributing watershed. This practice allows early use of the storm drain system.

CONDITIONS WHERE PRACTICE APPLIES

An excavated drain type of inlet protection may be used where storm drain drop inlets are to be made operational before permanent stabilization of the disturbed drainage area. This method of inlet protection is applicable where relatively heavy flows are expected and overflow capability and ease of maintenance are desired. Frequent maintenance is required and temporary flooding in the excavated area will occur. This practice can be used in combination with other temporary inlet protection devices such

as practices, [INLET PROTECTION-BLOCK AND GRAVEL 850](#), and [INLET PROTECTION-FABRIC DROP 860](#).

CRITERIA

Limit the drainage area to 1 acre. The minimum depth shall be 1 foot and the maximum depth shall be 2 feet as measured from the crest of the inlet structure.

Maintain side slopes around the excavated area no steeper than 2:1.

The minimum volume of excavated area around the drop inlet shall be approximately 135 yd³/acre of drainage area.

Shape the basin to fit site conditions, with the longest dimension oriented toward the longest inflow area to provide maximum trap efficiency. Where an inlet is located so as to receive concentrated flows such as in a highway median, the basin shall have a rectangular shape in a 2:1 length to

width ratio, with the length being oriented in the direction of flow.

Install provisions, such as weep holes, for draining the temporary pool to improve trapping efficiency for small storms and to avoid problems from standing water after heavy rains.

Gravel meeting the requirements for coarse aggregate with gradations of CA-1, CA-2 or CA-3, may be placed next to the storm drain inlet structure to improve filtering efficiency.

When gravel is used, the weep hole should be covered with screen wire or hardware cloth to prevent the gravel from entering the storm drain.

CONSIDERATIONS

In developing areas, installation of streets and storm sewer networks usually occurs before homes, businesses or other developments are constructed. During this and subsequent phases of construction, unprotected soil is susceptible to erosion. Storm sewers that are operational before their drainage areas are stabilized often carry large amounts of sediment to lakes, detention ponds, streams, or other natural or constructed drainageways. As a result, the water quality of the receiving body of water is detrimentally affected. In cases of extreme sediment loading, the storm sewer may clog completely or lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.

Field experience has shown that inlet protection which cause excessive ponding in areas of high construction

activity may become so inconvenient that it is removed or bypassed, thus transmitting sediment laden flows unchecked. In such situations, a structure with an adequate overflow mechanism should be utilized.

Storm drain inlet protection consists of several types of inlet filters and traps. Each type differs in application dependant upon site conditions and type of inlet. Not all designs are appropriate in all cases. The user must carefully select a design suitable for the needs and site conditions.

Stone is utilized as the chief ponding/filtering agent in many types of inlet protection. The various types of "coarse aggregates" which are depicted are able to filter out sediment mainly through slowing down flows directed to the inlet by creating an increased flow path for the stormwater (through void space in the respective stone). The stone filtering medium by no means slows stormwater flow rate as does filter cloth and therefore cannot provide the same degree of filter efficiency when smaller silt and clay particles are introduced into stormwater flows. However, as mentioned earlier, excessive ponding in busy areas adjacent to stormwater inlets is in many cases unacceptable. That is why stone must be utilized with many installations.

Fortunately, in most instances, inlet protection utilizing stone should not be the sole control measure. At the time that storm sewer inlet and associated appurtenances become operational, areas adjacent to the structures are most likely at final grade or will not be altered for extended periods. This is the time when practice standard

[TEMPORARY SEEDING 965](#) and other

appropriate controls should be implemented to enhance sediment-loss mitigation. In addition, by varying stone sizes used in the construction of inlet protection, a greater degree of sediment removal can be obtained. As an option, filter cloth can be used with the stone in these devices to further enhance sediment removal. Notably, the potential inconvenience of excessive ponding must be examined with these choices. In all designs that utilize stone with a wire-mesh support as a filtering mechanism, the stone can be completely wrapped with the wire mesh to improve stability and provide easier cleaning.

Filter fabric may be added to any of the devices that utilize coarse aggregate stone to enhance sediment removal. The fabric shall meet the requirements as shown in material specification [592 GEOTEXTILE](#) Table 1 or 2, Class 1 with an AOS of at least 30 for non-woven and 50 for woven. As a result of the significant increase in filter efficiency provided by the fabric, a larger range of stone sizes (IDOT CA-1, CA-2 or CA-3) may be utilized with such a configuration. The larger stone will help keep larger sediment masses from clogging the cloth. Notably, significant ponding may occur at the inlet if filter cloth is utilized in this manner.

Inlet protection devices are for drainage areas of one acre or less. Runoff from areas larger than one acre should be routed through a properly designed practice such as [IMPOUNDMENT STRUCTURE-ROUTED 842](#) or [TEMPORARY SEDIMENT TRAP 960](#).

A temporary berm may need to be constructed downstream of the inlet

protection device to prevent bypass flows.

The best way to prevent sediment from entering the storm sewer system is to stabilize the disturbed area of the site as quickly as possible, preventing erosion and stopping sediment at its source.

PLANS AND SPECIFICATIONS

Plans and specifications for installing excavated drain inlet protection shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Inlet location.
2. Basin length, width and depth.
3. Detail around inlet structure.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [IL-555 INLET PROTECTION -EXCAVATED DRAIN PLAN](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

Inspect, clean, and properly maintain the excavated basin after every storm until the contributing area has been permanently stabilized. To provide satisfactory basin efficiency, remove sediment when the volume of the basin has been reduced by one-half. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize it appropriately.

After the contributing drainage area has been stabilized, remove the gravel and accumulated sediment, plug the weep

holes, backfill to final grade and
establish vegetation.

NRCS IL February 1994

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

INLET PROTECTION - FABRIC DROP

(no.)
CODE 860



(Source: USDA - Natural Resources Conservation Service - Illinois)

DEFINITION

A temporary fabric barrier placed around a drop inlet.

PURPOSE

The purpose of this practice is to help prevent sediment from entering storm drains during construction operations. This practice allows early use of the storm drainage system.

CONDITIONS WHERE PRACTICE APPLIES

A fabric drop type of inlet protection may be used where storm drain inlets are to be made operational before permanent stabilization of the disturbed drainage area. This method of inlet protection is effective where the inlet drains a small, nearly level area with slopes generally less than 5% and where shallow sheet flows not exceeding 1 cfs are expected. The immediate land area around the inlet should be relatively flat (less than 1% slope) and located so that accumulated sediment can be easily removed. This method should not be

used in areas receiving concentrated flows, such as in street or highway medians.

CRITERIA

The maximum drainage area shall not exceed 1 acre per inlet.

The maximum height of fabric above the crest of the drop inlet shall be 1.5 feet. This height allows a shallow temporary de-silting pool to form behind the fabric but limits the pressure against the fabric if overtopping occurs. The selected height of the top of the barrier should allow overflow to the drop inlet and not let overflow bypass the inlet to unprotected lower areas. It may be necessary to build a temporary dike on the downslope side of the structure to prevent bypass flows.

For fabric barriers, use stakes of 2 x 4-inch wood (preferred) or equivalent metal with a minimum length of 3 feet. Space the stakes a maximum of 3 feet apart, and securely drive them into the

ground to a depth of approximately 18 inches.

Drive the stakes close to the drop inlet so that overflow will fall directly into the structure and not on unprotected soil.

To provide needed stability to the installation, make a frame around the stakes a maximum of 1.5 ft above the top of the drop inlet. This will serve as a stable crest for overflow during rainfall. Place the bottom 12 inches of the fabric in a trench and backfill the trench with 12 inches of compacted soil or six inches of crushed gravel.

Fasten fabric securely by staples or wire to the stakes and frames. Joints must be overlapped to the next stake.

Improved performance and sediment storage volume can be obtained by excavating the area. See practice standard, [INLET PROTECTION - EXCAVATED DRAIN 855](#). The fabric shall meet the requirements as shown in Material Specification [592 GEOTEXTILE](#) Table 1 or 2, Class 1 with an AOS of at least 30 for non-woven and 50 for woven.

CONSIDERATIONS

In developing areas, installation of streets and storm sewer networks usually occur before the construction of homes, businesses or other developments. During this and subsequent phases of construction, unprotected soil is susceptible to erosion. Storm sewers that are operational before their drainage areas are stabilized often carry large amounts of sediment to lakes, detention ponds, streams, or other natural or constructed drainageways. As a result, the water

quality of the receiving body of water is detrimentally affected. In cases of extreme sediment loading, the storm sewer may clog completely or lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.

Storm drain inlet protection consists of several types of inlet filters and traps. Each type differs in application dependant upon site conditions and type of inlet. Not all designs are appropriate in all cases. The user must carefully select a design suitable for the needs and site conditions.

Inlet protection devices are for drainage areas of one acre or less. Runoff from areas larger than one acre should be routed through a properly designed practice such as [IMPOUNDMENT STRUCTURE-ROUTED 842](#) or [TEMPORARY SEDIMENT TRAP 960](#).

In some instances, a wire mesh may be needed to reinforce the fabric and supporting posts. This should be used in areas where concentrated flows may occur or where timely maintenance may be a concern. If used, the wire mesh shall have a maximum opening of 6 inches.

A temporary berm may need to be constructed downstream of the inlet protection device to prevent bypass.

The best way to prevent sediment from entering the storm sewer system is to stabilize the disturbed area of the site as quickly as possible, preventing erosion and stopping sediment at its source.

PLANS AND SPECIFICATIONS

NRCS IL February 1994

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The plans and specifications for installing fabric drop inlet protection shall be in keeping with this standard and shall describe requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Inlet location.
2. Type and size support posts.
3. Fabric material requirements.
4. Detail around inlet structure.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [IL-560 INLET PROTECTION - FABRIC DROP PLAN](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

Inspect the fabric barrier after each rain and make repairs as needed.

Sediment deposits should be removed after each rainfall to provide adequate storage volume for the next rain. The sediment must be removed when the level of deposition reaches approximately one-half the height of the barrier. Be careful not to damage or undercut the fabric during sediment removal.

When the contributing drainage area has been adequately stabilized, remove all materials and any unstable sediment and dispose of them properly. Bring the disturbed area to the grade of the drop inlet and smooth and compact it. Appropriately stabilize all bare areas around the inlet.

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

INLET PROTECTION - GRAVEL & WIRE MESH

(no.)
CODE 861



(Source: MN Protecting Water Quality in Urban Areas)

DEFINITION

A temporary sediment control barrier formed around a storm drain inlet by the use of gravel and wire mesh.

PURPOSE

The purpose of this practice is to help prevent sediment from entering storm drains until the contributing watershed is stabilized.

CONDITIONS WHERE PRACTICE APPLIES

A gravel and wire mesh type of inlet protection applies where new or existing storm sewers receive sediment-laden runoff.

This method of inlet protection applies to both drop inlets and curb inlets where heavy flows are expected and ponding in front of the structure is not likely to cause inconvenience or damage to adjacent structures and unprotected areas.

This practice can be used in combination with other temporary inlet protection devices such as practice standards [INLET PROTECTION – BLOCK & GRAVEL 850](#), [INLET PROTECTION - EXCAVATED DRAIN 855](#), [INLET PROTECTION - FABRIC DROP 860](#) or [INLET PROTECTION – STRAW BALE BARRIER 863](#).

CRITERIA

The drainage area to each gravel and wire inlet protection shall be one acre or less.

Hardware cloth or comparable wire mesh with 1/2 inch openings shall be placed over the inlet structure extending a minimum of 12 inches beyond each side of the inlet opening. If more than one strip of mesh is necessary, the strips shall be overlapped a minimum of 6 inches.

Gravel shall be placed over the wire mesh to a minimum depth of 12 inches. The gravel shall extend beyond the inlet opening a minimum of 18 inches on all

sides. The gravel shall meet the requirements for coarse aggregate with IDOT gradation of CA-1 or CA-3.

Filter fabric may be added under the coarse aggregate to enhance sediment removal. The fabric shall meet the requirements as shown in material specification [592 GEOTEXTILE](#) Table 1 or 2, Class 1 with an AOS of at least 30 for non-woven and 50 for woven. As a result of the significant increase in filter efficiency provided by the fabric, a larger range of stone sizes (IDOT CA-1, CA-2 or CA-3) may be utilized with such a configuration. The choice to use filter fabric must also consider the larger ponding area that will result.

CONSIDERATIONS

In developing areas, installation of streets and storm sewer networks usually occur before the construction of homes, businesses or other developments. During this, and subsequent phases of construction, unprotected soil is susceptible to erosion. Storm sewers that are operational before their drainage areas are stabilized often carry large amounts of sediment to lakes, detention ponds, streams, or other natural or constructed drainageways. As a result, the water quality of the receiving body of water is detrimentally affected. In cases of extreme sediment loading, the storm sewer may clog completely or lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.

Storm drain inlet protection consists of several types of inlet filters and traps. Each type differs in application dependant upon site conditions and type

of inlet. Not all designs are appropriate in all cases. The user must carefully select a design suitable for the needs and site conditions. Field experience has shown that inlet protection that causes excessive ponding in an area of high construction activity may become so inconvenient that it is removed or bypassed, thus transmitting sediment-laden flows unchecked. In such situations, a structure with an adequate overflow mechanism must be utilized.

Stone is utilized as the chief ponding/filtering agent in many types of inlet protection. The various types of "coarse aggregates" are able to filter out sediment mainly through slowing down flows directed to the inlet by creating an increased flow path for the stormwater (through void space in the respective stone). The stone filtering medium does not slow stormwater flow rate as well as filter cloth and therefore cannot provide the same degree of filter efficiency when smaller silt and clay particles are introduced into stormwater flows. In all designs that utilize stone with a wire-mesh support as a filtering mechanism, the stone can be completely wrapped with the wire mesh to improve stability and provide easier cleaning.

In most instances, inlet protection utilizing stone should not be the sole control measure. At the time that storm sewer inlet and associated appurtenances become operational, areas adjacent to the structures are most likely at final grade or will not be altered for extended periods. This is the time when practice standard [TEMPORARY SEEDING 965](#) and other appropriate controls should be implemented to reduce soil erosion.

The best way to prevent sediment from entering the storm sewer system is to stabilize disturbed areas of the site as quickly as possible, preventing erosion and stopping sediment at its source.

Runoff from areas larger than one acre should be routed through a properly designed practice such as [IMPOUNDMENT STRUCTURE - ROUTED 842](#), or [TEMPORARY SEDIMENT TRAP 960](#).

PLANS AND SPECIFICATIONS

Plans and specifications for installing gravel and wire mesh inlet protection shall be in keeping with this standard and shall describe the requirements for applying the practice. At a minimum include the following items:

1. Inlet location
2. Stone gradation
3. Wire screen hole size
4. Filter fabric specifications if used

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [GRAVEL & WIRE MESH INLET PROTECTION PLAN IL - 561](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

The structure shall be inspected after every runoff producing rain and repairs made as needed. When a geotextile filter fabric is used, inspection must be made more frequently as the fabric tends to "plug" quickly.

If the gravel filter becomes clogged with sediment so that it no longer adequately performs its function, the gravel must be

pulled away from the inlet, cleaned and replaced.

Sediment shall be removed and the barrier restored to its original dimensions when the sediment has accumulated to one-half the barrier height. Removed sediment shall be deposited in a suitable area in such a manner that it will not erode.

When the contributing drainage area has been adequately stabilized, remove all materials and any unstable soil, and either salvage or dispose of it properly. Bring the disturbed area to proper grade, then smooth and compact it. Appropriately stabilize all bare areas around the inlet.

REFERENCES

Illinois Department of Transportation, 1997. Standard Specifications for Road and Bridge Construction. IL

Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1992. Virginia Erosion and Sediment Control Handbook, 3rd ed., VA

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

INLET PROTECTION – SOD FILTER

(no.)
CODE 862



(Source: USDA - Natural Resources Conservation Service - Illinois)

DEFINITION

A sediment filter formed around a storm drain drop inlet by the use of sod.

PURPOSE

The purpose of this practice is to help prevent sediment and mulch materials from entering storm drains before permanent seeding has become established in the contributing watershed.

CONDITIONS WHERE PRACTICE APPLIES

This method of inlet protection is applicable only for drop inlets at the time when permanent seeding of the contributing drainage area is completed.

CRITERIA

The drainage area shall be limited to 1 acre.

Sod shall be placed to form a turf mat that covers the soil for a minimum of 4 feet from each side of the inlet structure.

Final grading, soil preparation and installation of sod shall follow criteria in practice standard [SODDING 925](#).

For sites where permanent seeding has not been completed, practice standards [INLET PROTECTION - BLOCK & GRAVEL 850](#), [INLET PROTECTION – EXCAVATED DRAIN 855](#), [INLET PROTECTION – FABRIC DROP 860](#), [INLET PROTECTION – GRAVEL & WIRE MESH 861](#), or [INLET PROTECTION – STRAW BALE BARRIER 863](#) shall be utilized, as appropriate.

Filter fabric may be used under the storm sewer grate to enhance sediment removal. The fabric shall meet the requirements as shown in material specification [592 GEOTEXTILE](#), Table 1 or 2 Class 1 with an AOS of at least 30 for non-woven and 50 for woven. Use of the fabric may increase the frequency of maintenance.

CONSIDERATIONS

Storm drain inlet protection consists of several types of inlet filters and traps.

Each type differs in application dependant upon site conditions and type of inlet. Not all designs are appropriate in all cases. The user must carefully select a design suitable for the needs and site conditions.

The best way to prevent sediment from entering the storm sewer system is to stabilize disturbed areas of the site as quickly as possible, preventing erosion and stopping sediment at its source.

For this practice to have its maximum effect, the sod must be flush with the surrounding ground surface.

Runoff from areas larger than one acre should be routed through a properly designed practice such as [IMPOUNDMENT STRUCTURE - ROUTED 842](#), or [TEMPORARY SEDIMENT TRAP 960](#).

PLANS AND SPECIFICATIONS

Plans and specifications for installing sod filter inlet protection shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Inlet location
2. Filter fabric specifications if used
3. Site preparation
4. Fertilization
5. Installation techniques
6. Sod type, quality and quantity
7. Watering

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [SOD FILTER INLET PROTECTION PLAN IL-562](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

The structure shall be inspected after every runoff producing rain and repairs made as needed.

If the grate or filter fabric becomes clogged with sediment or mulch materials so that it no longer adequately performs its function, they must be pulled away from the inlet, and the grate and filter fabric cleaned and replaced.

Removed materials shall be deposited in a suitable area in such a manner that it will not cause problems.

REFERENCES

North Carolina Sedimentation Control Commission, 1988. Erosion and Sediment Control Planning and Design Manual. NC

Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1992. Virginia Erosion and Sediment Control Handbook. 3rd ed., VA

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INLET PROTECTION – STRAW BALE BARRIER

(no.)
CODE 863



(Source: Lake County Soil and Water Conservation District)

DEFINITION

A temporary sediment control barrier formed around a storm drain drop inlet consisting of a row of entrenched and anchored straw bales.

PURPOSE

The purpose of this practice is to help prevent sediment from entering storm drains until the contributing watershed is stabilized.

CONDITIONS WHERE PRACTICE APPLIES

A straw bale barrier type of inlet protection applies where new or existing storm sewers receive sediment-laden runoff. This method is applicable for drop inlets only.

This method is applicable where the inlet drains a small, nearly level area with slopes generally less than 5% and shallow sheet flows not exceeding 0.5 cfs are expected.

The immediate land area around the inlet should be relatively flat (less than 1% slope) and located so that accumulated sediment can be easily removed.

This method does not apply to inlets receiving concentrated flows, such as in street or highway medians.

This method applies where effectiveness is required for 3 months or less.

This practice can be used in combination with other temporary inlet protection devices such as practice standards [INLET PROTECTION – BLOCK & GRAVEL 850](#), [INLET PROTECTION – EXCAVATED DRAIN 855](#), [INLET PROTECTION – FABRIC DROP 860](#) or [INLET PROTECTION – GRAVEL & WIRE MESH 861](#).

CRITERIA

The drainage area to each straw bale barrier inlet protection shall be one acre or less.

The inside edge of the bales shall be a maximum of 2 feet from the edge of the inlet.

Straw bale barrier inlet protection shall be installed prior to the storm sewer system becoming functional.

Filter fabric may be added to the upstream side of the straw bales to enhance sediment removal. The fabric shall meet the requirements as shown in material specification [592 GEOTEXTILE](#), Table 1 or 2, Class 1 with an AOS of at least 30 for non-woven and 50 for woven. The choice to use filter fabric must also consider the larger ponding area that will result.

CONSIDERATIONS

In developing areas, installation of streets and storm sewer networks usually occur before the construction of homes, businesses or other developments. During this, and subsequent phases of construction, unprotected soil is susceptible to erosion. Storm sewers that are operational before their drainage areas are stabilized often carry large amounts of sediment to lakes, detention ponds, streams, or other natural or constructed drainageways. As a result, the water quality of the receiving body of water is detrimentally affected. In cases of extreme sediment loading, the storm sewer may clog completely or lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.

Storm drain inlet protection consists of several types of inlet filters and traps. Each type differs in application dependant upon site conditions and type

of inlet. Not all designs are appropriate in all cases. The user must carefully select a design suitable for the needs and site conditions.

Straw bale inlet protection should be considered for trapping sediment where sheet and rill erosion is occurring in small, relatively flat drainage areas. Straw bale inlet protection should not be used in areas of concentrated flow.

At the time storm sewer inlet and associated appurtenances become operational, areas adjacent to the structures are most likely at final grade or will not be altered for extended periods. This is the time when practice standard [TEMPORARY SEEDING 965](#) and other appropriate controls should be implemented to reduce soil erosion.

Based on field observations in Illinois and other states, straw barriers have not been as effective as a sediment control measure as they could be. There are four major reasons for this. First, improper use of straw bales has been a major problem. Straw bale barriers have been used in drainageways where high water velocities and/or volumes have destroyed them or significantly impaired their effectiveness. Second, improper placement and installation of the barriers, such as staking the bales directly to the ground with no soil seal or entrenchment, has allowed undercutting and flow around the ends. This has resulted in additions of, rather than removal of, sediment from runoff waters. Third, inadequate inspection and maintenance lowers the effectiveness of these barriers. Fourth, because straw bales decompose in the presence of moisture, they have a very limited life span.

Runoff from areas larger than one acre should be routed through a properly designed practice such as [IMPOUNDMENT STRUCTURE - ROUTED 842](#), or [TEMPORARY SEDIMENT TRAP 960](#).

PLANS AND SPECIFICATIONS

Plans and specifications for installing straw bale barrier inlet protection shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Inlet location.
2. The depth of trench required to bed the bales
3. The method(s) required to anchor the bales.
4. Filter fabric specifications if used.

All plans shall include the installation, inspection and maintenance schedules with the responsible party clearly identified.

Standard drawing [INLET PROTECTION - STRAW BALE BARRIER PLAN IL-563](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

Straw bale barrier inlet protection shall be inspected after every runoff producing rain and repairs made as needed.

Close attention shall be paid to the repair of damaged bales, end runs and undercutting beneath bales.

Necessary repairs to the barrier or replacement of bales shall be accomplished promptly.

Sediment shall be removed and the barrier restored to its original dimensions when the sediment has accumulated to one-half the barrier height. Removed sediment shall be deposited in a suitable area in such a manner that it will not erode.

When the contributing drainage area has been adequately stabilized, remove all materials and any unstable soil, and either salvage or dispose of it properly. Bring the disturbed area to proper grade, then smooth and compact it. Appropriately stabilize all bare areas around the inlet.

REFERENCES

North Carolina Sedimentation Control Commission, 1988. Erosion and Sediment Control Planning and Design Manual. NC

Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1992. Virginia Erosion and Sediment Control Handbook, 3rd ed., VA

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

LAND GRADING

(acre)
CODE 865



(Source: NC Erosion and Sediment Control Planning and Design Manual)

DEFINITION

Reshaping the ground surface to planned grades as determined by engineering survey evaluation and layout.

PURPOSE

The purposes of this practice are to provide suitable topography for buildings, facilities, and other land uses, to control surface runoff, and to minimize soil erosion and sedimentation both during and after construction.

CONDITIONS WHERE PRACTICE APPLIES

This practice is applicable where grading to a planned elevation is necessary and practical for the proposed development of a site and for proper operation of sedimentation control practices.

CRITERIA

The grading plan and installation shall be based upon adequate surveys and

investigations. The plan is to show the location, slope, cut, fill, and finish elevations of surfaces to be graded. It will also show the auxiliary practices for safe conveyance of runoff water, slope stabilization, soil erosion and sediment control, and stormwater management. These practices may include but are not limited to retaining walls, grass-lined swales, grade stabilization structures, lined ditches, sediment basins, detention ponds, diversions and surface and subsurface drains. The practices may be temporary or permanent, depending upon the need after construction is completed.

The development and establishment of the plan shall incorporate the following, as appropriate:

1. The cut face of the excavation, which is to be vegetated, shall be two horizontal to one vertical (2:1) or flatter. Cut slopes of materials not to be vegetated shall be at or below the safe angle of repose for the materials encountered. For maintenance reasons 4:1 or flatter

- slopes are preferable. Slopes steeper than 2:1 shall require special design and stabilization considerations that shall be adequately shown on the plans.
2. The permanent exposed faces of fills shall be two horizontal to one vertical (2:1) or flatter. For slope maintenance, 4:1 or flatter is recommended. Slopes exceeding 2:1 shall require special design and stabilization considerations that shall be adequately shown on the plans.
 3. Provisions shall be made to safely conduct surface water to storm drains or to suitable natural water courses and to prevent surface runoff from damaging the cut faces and fill slopes.
 4. Subsurface drainage shall be provided in areas having a high water table to intercept seepage that would affect building foundations, slope stability, or create undesirable wetness.
 5. Excavations shall not be made so close to property lines as to endanger the adjoining property without supporting and protecting such property from erosion, sliding, settling, or cracking.
 6. No fill shall be placed where it will slide or wash upon the premises of another, or so placed adjacent to the bank of a channel as to create bank failure or decrease the natural carrying capacity of the stream. At a minimum, a setback of 25 feet should be provided as a buffer to sensitive areas.
 7. Fills shall consist of material from cut areas, borrow pits, or other approved sources. Fill material shall be free of brush, rubbish, rocks, logs, stumps, building debris, and other objectionable material. It should be free of stones over two inches in diameter where compacted by hand or mechanical tampers or over eight inches in diameter where compacted by rollers or other equipment. Frozen material shall not be placed in the fill nor shall the fill material be placed on a frozen foundation.
 8. Diversions shall be provided whenever the vertical interval of any slope exceeds 20 feet. Diversions shall be located to divide the slope face as equally as possible and shall convey the water to a stable outlet. Soils, seeps, rock outcrops, etc., shall also be taken into consideration when designing diversions.
 - a. Diversions shall be a minimum bottom width of six feet to provide for maintenance.
 - b. Diversions shall be designed with cut slope of 6:1 or flatter to the toe of the upper slope and with a minimum of one foot in depth. The gradient to the outlet shall be between 2% and 3%, unless accompanied by appropriate design and computations.
 - c. The flow length within a diversion shall not exceed 800 feet unless accompanied by an appropriate design and computations. See practice standards [DIVERSION 815](#), [DIVERSION DIKE 820](#) or [TEMPORARY DIVERSION 955](#).
 9. Surface water shall be diverted from the face of all cut and fill slopes by the use of diversions, ditches and waterways or conveyed downslope by the use of a designed structure, except where:
 - a. The face of the slope is or shall be stabilized and the face of all graded slopes shall be protected from surface runoff until they are stabilized.

- b. The face of the slope shall not be subject to any concentrated flows of surface water such as from natural drainageways, graded waterways, downspouts, etc.
 - c. The face of the slope shall be protected by special erosion control materials, sod, gravel, riprap, or other stabilization method.
10. Cut slopes occurring in ripable rock shall be serrated. These serrations shall be made with conventional equipment as the excavation is made. Each step or serration shall be constructed on the contour and will have steps cut at nominal two-foot intervals with nominal three-foot horizontal shelves. These steps will vary depending on the slope ratio or the cut slope. These steps will weather and act to hold moisture, lime, fertilizer and seed thus producing a much quicker and longer lived vegetative cover and better slope stabilization. Overland flow shall be diverted from the top of all serrated cut slopes and carried to a suitable outlet.
 11. Stockpiles, borrow areas, and spoil areas shall be shown on the plans and shall be subject to the provision of this standard.
 12. All disturbed areas shall be stabilized in accordance with the practice standards [MULCHING 875](#), [PERMANENT VEGETATION 880](#) or [TEMPORARY SEEDING 965](#), as appropriate.
 13. Use slope breaks, such as diversions or benches, as appropriate, to reduce the length of cut-and-fill slope to limit sheet and rill erosion and prevent gullyng. A spacing guide follows.

		Horizontal Distance (ft.)
Steep Slopes	2:1	20
	3:1	35
	4:1	45
Long Slopes	15-25%	50
	10-15%	80
	6-10%	125
	3-6%	200
	<3%	300

CONSIDERATIONS

Fitting a proposed development to the natural configurations of an existing landscape reduces the need for some erosion and sediment control measures. It may also result in a more desirable and less costly development.

Before grading begins, decisions must be made on the steepness of cut-and-fill slopes, how they will be protected from runoff, how they will be stabilized, and how they will be maintained. The grading plan establishes drainage areas, directs drainage patterns, and affects runoff velocities.

The grading plan forms the basis of the erosion and sediment control plan. Key considerations that affect erosion and sedimentation include deciding which slopes are to be graded, when the work will start and stop, the percent and length of finished slopes, where and how excess material will be disposed of, and where fill is needed.

Leaving undisturbed temporary and permanent buffer zones in the grading operation may provide an effective and low-cost erosion control measure that will help reduce runoff velocity and volume and off-site sedimentation. In developing the grading plan, always

consider how to take advantage of undisturbed water disposal outlets before storm drains or other constructed outlets are installed.

PLANS AND SPECIFICATIONS

Plans and specifications for land grading shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. The finished land slope grade and direction of land slope.
2. Location of other related structures, e.g., drains, curbs, etc.
3. Topsoil stockpile location.
4. Borrow areas if needed.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

OPERATION AND MAINTENANCE

Periodically check all graded areas and the supporting erosion and sediment control practices, especially after heavy rainfalls. Promptly remove all sediment from diversions, sediment trapping practices and other water-disposal practices. If washouts or breaks occur, repair them immediately. Prompt maintenance of small, eroded areas before they become significant gullies is an essential part of an effective erosion and sediment control plan.

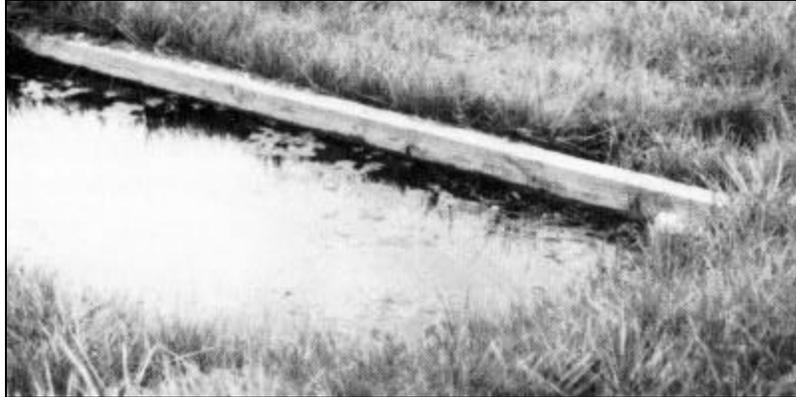
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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

LEVEL SPREADER

(no.)
CODE 870



(Source: VA Erosion and Sediment Control Handbook)

DEFINITION

A device used to disperse concentrated runoff uniformly over the ground surface as sheet flow.

PURPOSE

The purpose of this practice is to convert concentrated, potentially erosive flow to sheet flow and release it uniformly over a stabilized area or filter strip. The resultant sheet flow enhances pollutant filtering and runoff infiltration and reduces the potential for erosion.

CONDITIONS WHERE PRACTICE APPLIES

The principal application of a level spreader is to convey runoff from impervious surfaces, such as parking lots or roadways, uniformly onto vegetated filter strips. Level spreaders can also be applied as outlets for diversion structures. Level spreaders are appropriate and/or necessary under the following conditions:

1. Where runoff from an impervious

surface is uneven and/or runoff is released as concentrated flow, such as through curb cuts or roof downspouts

2. At the ends of diversions
3. Where the runoff water will not re-concentrate after release from the level spreader until it reaches an outlet designed for concentrated flow
4. Where sediment-free storm runoff can be released in sheet flow down a stabilized slope without causing erosion
5. Where the lip of the level spreader can be constructed in undisturbed soil
6. Where there will be no traffic over the spreader

CRITERIA

Criteria for level spreader design can vary greatly depending on the application. For this reason, two sets of criteria are specified for several of the factors that follow.

For impervious surface runoff applications:

The capacity for the level spreader is determined in the design of the filter strip to which it discharges (see practice standard [FILTER STRIP 835](#)).

The spreader shall run linearly along the entire width of the filter strip to which it discharges. In most cases, the spreader will be the same width as the contributing impervious surface. The ends of the spreader shall be tied into higher ground to prevent flow around the spreader.

The minimum depth shall be 6 inches and the minimum width shall be 6 feet for the lower side slope. Side slopes shall be 2:1 (horizontal to vertical) or flatter.

The grade of the spreader shall be 0%.

The discharge area shall meet the requirements of practice standard [FILTER STRIP 835](#).

For diversion outlet applications:

The capacity of the spreader shall be determined using the peak flow from the 10-year frequency, 24-hour duration storm. The drainage area shall be restricted so that maximum flows into the spreader will not exceed 30 cfs.

Spreader dimensions: Select the length and depth of the spreader from the table below. The length dimension is parallel to the diversion.

Design Flow (cfs)	Minimum Depth (ft)	Minimum Length (ft)
0-10	0.5	10
10-20	0.6	20
20-30	0.7	30

The minimum width of the spreader shall be 6 feet for the lower side slope. Side slopes shall be 2:1 (horizontal to vertical) or flatter.

Construct a 20 foot transition section in the diversion channel so the width of the channel will smoothly meet the width of the spreader to ensure uniform outflow.

The last 20 feet of the diversion channel shall provide a smooth transition from the channel grade to the level spreader and where possible, shall be less than or equal to 1%. The grade of the level spreader shall be 0%.

The outlet discharge area must be generally smooth and well vegetated with a maximum slope of 10%.

For all applications:

The spreader lip shall be constructed to a uniform height and zero grade over the length of the spreader. For design flows of 4 cfs or greater, a rigid lip of non-erodible material, such as pressure-treated timbers or concrete curbing, shall be used. For flows less than 4 cfs, a vegetated lip may be used. The spreader lip shall be constructed on undisturbed soil.

When using a vegetated lip it shall be protected with an erosion control blanket to prevent erosion and allow the vegetation to become established. The erosion control blanket for a vegetated lip shall meet the requirements of

practice standard [EROSION BLANKET 830](#). The blanket shall be a minimum of 4 feet wide extending a minimum of 1 foot downstream over the level lip. The blanket shall be secured with heavy duty staples and the downstream and upstream edges shall be buried at least 6 inches deep in a vertical trench.

When using a rigid lip it shall be entrenched at least 4 inches below existing ground and securely anchored to prevent displacement. An apron of coarse aggregate meeting IDOT CA-1 or CA-3 gradation shall be placed to the top of the rigid lip and extend downslope at least 3 feet. A filter fabric shall be placed under the coarse aggregate. The filter fabric shall meet the requirements of material specification [592 GEOTEXTILE](#) Table 1 or 2, Class I, II, or IV.

Immediately after level spreader construction, seed and mulch the entire disturbed area of the spreader. Seeding shall meet the requirements of practice standard [PERMANENT VEGETATION 880](#) and mulching shall meet the requirements of practice standard [MULCHING 875](#).

CONSIDERATIONS

The level spreader is a relatively low-cost structure to:

1. Disperse impervious surface runoff uniformly to a filter strip or
2. Release small volumes of concentrated flow from diversions when conditions are suitable

To accomplish these purposes, particular care must be taken to construct the spreader lip completely level. Any depressions in the lip will

concentrate the flow, resulting in a loss of pollutant filtering effectiveness and/or erosion. Evaluate the outlet system to be sure that flow does not concentrate below the outlet.

For filter strip applications, the determination of whether a level spreader is needed should be based on how the runoff is entering the filter strip. If the runoff is concentrated by curb cuts, and particularly if a large area of impervious surface drains to one point, a level spreader is essential to achieve effective pollutant removal in the filter strip. A level spreader also is important if the filter strip is relatively steep in order to avoid erosion from concentrated runoff discharge. If the runoff is evenly distributed over the width of the impervious surface (e.g., a curbless, even-sloped road or parking lot), a level spreader may not be necessary.

When the level spreader is used as an outlet for temporary or permanent diversions and diversion dikes, runoff containing high sediment loads must be treated in a sediment trapping device such as practice standard [TEMPORARY SEDIMENT TRAP 960](#) or [IMPOUNDMENT STRUCTURE - ROUTED 842](#) before release into a level spreader.

PLANS AND SPECIFICATIONS

Plans and specifications for installing a level spreader shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. The spreader location
2. The length and width

3. For filter strip applications, plans for both the adjacent impervious surface and the filter strip, for diversion outlets, plans detailing the diversion structure and the adjacent outlet area
4. Lip details: vegetated or rigid
5. Stone gradation
6. Filter fabric specifications if used
7. Rigid lip material specifications if used
8. Erosion control blanket specifications if used
9. Seeding and mulching requirements

Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1992. Virginia Erosion and Sediment Control Handbook, 3rd ed., VA

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All plans shall include installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [LEVEL SPREADER IL-570](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

Inspect level spreaders after every rainfall until vegetation is established, and promptly make needed repairs. After the area has been stabilized, make periodic inspections and maintain vegetation in a healthy, vigorous condition.

Verify that the level spreader is distributing flow evenly. If problems are noted, make appropriate modifications to ensure even flow distribution.

REFERENCES

Illinois Department of Transportation, 1997. Standard Specifications for Road and Bridge Construction. IL

North Carolina Sedimentation Control Commission, 1988. Erosion and Sediment Control Planning and Design Manual. NC

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

MULCHING

(acre or sq.ft.)
CODE 875



(Source: Kane-DuPage Soil and Water Conservation District)

DEFINITION

The application of plant residues and other suitable materials to the soil surface.

PURPOSE

The purposes of this practice are as follows:

1. To prevent erosion and prevent surface compaction or crusting by protecting the soil surface from raindrop impact and reducing the velocity of overland flow.
2. To foster the growth of vegetation by conserving available moisture and providing insulation against extreme heat and cold.
3. To improve the aesthetics of the site.
4. To control weeds.

CONDITIONS WHERE PRACTICE APPLIES

Temporary Mulches:

1. Areas that have been seeded to provide a temporary or permanent

seeding.

2. Areas that cannot be seeded because of the season of the year and need for soil surface protection.
3. For mud and dust control.
4. Provide protection during periods when construction or seeding cannot be done.

Permanent Mulches:

1. Used together with planting trees, shrubs, and other ground covers that do not provide adequate soil stabilization.
2. Used in lieu of vegetative planting for ornamental reasons or because the site is not suitable for vegetation.

CRITERIA

1. The choice of materials will be based on the type of soil to be protected, season and economics.
2. Prior to Application
 - a. Shape and grade, as required, the waterway, channel, slope, or other area to be protected.

- b. Remove all rocks, clods, or debris larger than 2 inches in diameter that will prevent contact between the mulch and the soil surface.
 - c. When open-weave nets are used, lime, fertilizer, and seed may be applied either before or after laying the net. When excelsior matting is used, these materials must be applied before the mat is laid.
3. Time of Application
- a. Immediately after seeding or planting by conventional method or hydroseeding. Can be applied with seeding as hydromulching.
 - b. Immediately after seedbed preparation when dormant seedings are to be made by seeding over the mulch.
 - c. When temporary erosion control is to be attained, mulch may be applied any time soil and site conditions are suitable for spreading and anchoring.
4. Application - Mulch materials shall be spread uniformly, by hand or machine. When spreading straw mulch by hand, divide the area to be mulched into approximately 1,000 sq. ft. sections and place approximately 90 lbs. of straw in each section to facilitate uniform distribution.
5. Mulch Anchoring - Straw mulch shall be anchored immediately after spreading to prevent wind blow. One of the following methods of anchoring straw shall be used:
- a. Mulch anchoring tool - This is a tractor-drawn implement (mulch crimper, serrated straight disk, or dull farm disk) designed to punch mulch approximately 2 inches into the soil surface. This method

- provides maximum erosion control with straw. It is limited to use on slopes no steeper than 3:1, where equipment can operate safely. Machinery shall be operated on the contour.
- b. Liquid mulch binders - Application of liquid mulch binders and tackifiers should be heaviest at edges of areas and at crests of ridges and banks, to prevent wind blow. The remainder of the area should have binder applied uniformly. Binders may be applied after mulch is spread; however, it is recommended sprayed into the mulch as it is being blown onto the soil. Applying straw and binder together is the most effective method.

The following types of binders may be used:

- i. Asphalt - Any type of asphalt thin enough to be blown from spray equipment is satisfactory. Recommended for use are rapid curing (RC-70, RC-250, RC-800), medium curing (MC-250, MC-800) and emulsified asphalt (SS-1, MS-2, RS-1, and RS-2).
- ii. Synthetic Binders - Chemical binders may be used as recommended by the manufacturer to anchor mulch. These are expensive, and therefore, usually used in small areas or in residential areas where asphalt may be a problem.
- iii. Wood Fiber - Wood fiber hydroseeder slurries may be used to tack straw mulch.

This combination treatment is well suited to steep slopes, critical areas, and severe climate conditions.

- c. Mulch nettings - Lightweight, degradable, plastic, polyester, or paper nets may be stapled over the mulch according to manufacturer's recommendations.
- d. Peg and twine - Because it is labor-intensive, this method is feasible only in small areas where other methods cannot be used. Drive 8 to 10-inch wooden pegs to within 3 inches of the soil surface, every 4 feet in all directions. Stakes may be driven before or after straw is spread. Secure mulch by stretching twine between pegs in a criss-cross-within-a-square pattern. Turn twine 2 or more times around each peg.

Chemical Mulches - Chemical mulches may be used alone only in the following situations:

1. Where no other mulching material is available.
2. In conjunction with temporary seeding during the times when mulch is not required for that practice.

Note: Chemical mulches may be used to bind other mulches or with wood fiber in a hydroseeded slurry at any time. Manufacturer's recommendations for application of chemical mulches shall be followed.

Nets and Mats - Nets may be used alone on level areas, on slopes no steeper than 3:1, and in waterways.

When mulching is done in late fall or during June, July, and August, or where soil is highly erodible, nets should only be used in conjunction with an organic mulch such as straw.

When nets and organic mulch are used together, the net should be installed over the mulch except when the mulch is wood fiber. Wood fiber may be sprayed on top of the installed net.

Excelsior blankets are considered protective mulches and may be used alone on erodible soils and during all times of year.

Other products designed to control erosion shall conform to manufacturer's specification and should be applied in accordance with manufacturer's instructions provided those instructions are at least as stringent as this specification.

Laying the Net:

1. Start laying net from top of channel or top of slope and unroll downgrade. Always lay netting in the direction of water flow.
2. Allow to lie loosely on soil - do not stretch.
3. To secure net: Upslope ends of net should be buried in a slot or trench no less than 6 inches deep. Tamp earth firmly over net. Staple the net every 12 inches across the top end. Edges of net shall be stapled every 3 feet. Where 2 strips of net are laid side by side, the adjacent edges shall be overlapped 3 inches and stapled together.

Staples will be made of plain iron wire, No. 8 gauge or heavier, and will be 6 inches or more in length. Staples shall

be placed down the center of net strips at 3-foot intervals. DO NOT STRETCH net when applying staples.

Joining strips - Insert new roll of net in trench, as with upslope ends of net. Overlap the end of the previous roll 18 inches, turn under 6 inches, and staple across end of roll just below anchor slot and at the end of the turned-under net every 12 inches.

At bottom of slopes - Extend net out onto a level area before anchoring. Turn ends under 6 inches, and staple across end every 12 inches.

Check slots - On highly erodible soils and on slopes steeper than 4:1, erosion check slots should be made every 15 feet. Insert a fold of net into a 6-inch trench and tamp firmly. Staple at 12-inch intervals across the downstream portion of the net.

Rolling - After installation, stapling, and seeding, the net should be rolled to ensure firm contact between net and soil.

CONSIDERATIONS

1. A surface mulch is one of the most effective means of controlling runoff and erosion on disturbed lands.
2. The choice of materials for mulching shall be based on the type of soil to be protected, site conditions, season, and economics.
3. Organic mulch materials such as straw, wood chips, bark, and wood fiber have been found to be the most effective.
4. Chemical soil stabilizers or soil binders are not effective mulches when used alone. These materials

are useful to bind organic mulches together.

5. A variety of mulch nets, mats, or blankets are available to use as mulching or to hold the mulch in place. Netting and mats are especially helpful on critical areas such as waterways.

Organic Mulches:

Straw - The mulch most commonly used in conjunction with seeding. The recommended straw should come from oats, wheat, rye or barley, and may be spread by hand or machine. Straw can be windblown and should be anchored to stay in place.

Wood Chips - Suitable for areas that will not be closely mowed, and around ornamental plantings. Chips decompose slowly and do not require tacking. They should be treated with 12 pounds nitrogen per ton to prevent nutrient deficiency in plants. They also can be very inexpensive mulch if obtained from trees cleared on the site.

Bark Chips, Shredded Bark - By-products of timber processing. They are often used in landscaped plantings. Bark is also suitable mulch for areas planted to grasses and not closely mowed; and may be applied by hand or mechanically. Bark is not usually toxic to grasses or legumes, and additional nitrogen fertilizer is not required.

There are other organic materials that make excellent mulches but are only available locally or seasonally. Creative use of these materials can reduce costs.

Chemical Mulches and Soil Binders:

A wide range of synthetic, spray-on materials are marketed to stabilize and protect the soil surface. These are emulsions or dispersions of vinyl compounds, asphalt, rubber, or other substances which are mixed with water and applied to the soil. They may be used alone or may be used to tack wood fiber hydromulches or straw.

When used alone, chemical mulches do not have the capability to insulate the soil or retain soil moisture that organic mulches have. This soil protection is also damaged by traffic. Application of these mulches is usually more expensive than organic mulching, and the mulches decompose in 60-90 days.

Nets and Mats:

When used alone, netting does not retain soil moisture or modify soil temperature. It stabilizes the soil surface while grasses are being established, and is useful in grassed waterways and on slopes. Light netting may also be used to hold other mulches in place.

The most critical aspect of installing nets and mats is obtaining firm, continuous contact between the material and the soil. Without such contact, the material is useless and erosion occurs. It is important to use an adequate number of staples and to roll the material after laying it to ensure that the soil is protected.

Aggregate Cover - Gravel and crushed stone provide a long-term protection against erosion, particularly on short slopes. Before the gravel or crushed stone is applied it should be washed. If

vegetation is not desired, black polyethylene sheeting should be placed on the ground first to prevent seed germination and growth through the aggregate cover.

PLANS AND SPECIFICATIONS

Plans and specifications for applying mulch shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Materials to be used.
2. How mulch will be anchored.
3. Location of different materials if more than one material is used on the site.

All plans shall include installation, inspection, and maintenance schedules with the responsible party identified.

OPERATION AND MAINTENANCE

All mulches should be inspected periodically, in particular after rainstorms, to check for rill erosion. Where erosion is observed, additional mulch should be applied. Nets should be inspected after rainstorms for dislocation or failure. If washouts or breakage occur, re-install netting as necessary after repairing damage to the slope. Inspections should occur until grasses are firmly established. Where mulch is used with ornamental plantings, inspect periodically throughout the year to determine if mulch is maintaining coverage of the soil surface; repair as needed.

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

PERMANENT VEGETATION

(acre or sq.ft.)
CODE 880



(Source: USDA - Natural Resources Conservation Service - Illinois)

DEFINITION

Establishing permanent vegetative cover to stabilize disturbed or exposed areas.

PURPOSE

The purposes of this practice are to:

1. Permanently stabilize disturbed or exposed areas in a manner that adapts to site conditions and allows selection of the most appropriate plant materials.
2. Reduce erosion and sedimentation from such areas.
3. Create a landscape that enhances soil permeability and the filtering of runoff pollutants, while improving wildlife habitat.

CONDITIONS WHERE PRACTICE APPLIES

1. Disturbed areas where long-lived vegetative cover is needed to stabilize the soil.

2. Rough graded areas that will not be brought to final grade for a year or more.
3. Other areas where permanent cover is desired.

CRITERIA

Selection of plant materials

Selection of plant materials shall be based on climate, topography, soils, moisture conditions, land use, available light (shade tolerance), aesthetics, planned use of the area, and the degree of maintenance desired. All seed shall be of high quality and comply with Illinois Seed and Weed Laws.

See Tables A, B and C for selection of grasses, forbs, ground covers, and vines under different moisture and light conditions. These tables provide information for selected species that are generally commercially available and suitable for use in urban and agricultural settings. The native species presented represent those that are more tolerant of disturbed urban situations where this

practice would be applied. See the references given with the tables for information on additional species. The tables in this standard are not meant to be all-inclusive and the information in this standard can be applied to other species that may be desired or suitable for a given application. For trees and shrubs see practice standard [TREE AND SHRUB PLANTING 985](#). For manicured turf grass sod, see practice standard [SODDING 925](#).

Site Preparation

The site shall not be worked when frozen or saturated. Install necessary erosion and sediment control practices before seeding, and complete grading according to the approved plan. The grading plan shall utilize techniques and equipment that minimize soil compaction. If the final graded site consists of subsoil that may have been compacted by heavy equipment during grading activities, the subgrade shall be scarified to a depth of at least four inches by chisel plowing, disking or harrowing. This practice will create at least limited pore space for water and root penetration and bonding of the topsoil and the subsoil.

After the grading operation, spread topsoil where needed following practice standard [TOPSOILING 981](#). Topsoil shall meet criteria in material specification [804 MATERIAL FOR TOPSOILING](#).

Seedbed preparation

If needed based upon soil conditions and desired vegetation type, incorporate the lime and fertilizer into the soil with a disk harrow, springtooth harrow, or similar tools to a depth of at least 3

inches. On sloping areas the final operation shall be on the contour.

Prior to seeding or planting, the seedbed shall be relatively free of all weeds ($\geq 80\%$ weed free), stones, roots, sticks, rivulets, gullies, crusting and caking, or other debris which may interfere with seeding or planting operations or plant establishment.

The seedbed shall not be worked when frozen or saturated. Prior to seeding or planting the surface shall be disked or raked to a depth of 2-3 inches either by hand or mechanical means to create a smooth uniform seedbed. This operation should result in a seedbed comprised of soil aggregates ranging from fine to coarse, with none larger than two inches in diameter.

In areas that have not been regraded, which have grown up in weeds, or to be no-till seeded, a herbicide application may be necessary to reduce competition with the desired vegetation. An approved herbicide may be used to treat such areas to kill all existing vegetation. Herbicide application shall be done at least 15 days prior to seeding or planting.

Fertilization

Fertilizer or lime is generally not recommended for native vegetation establishment unless soil tests indicate $\text{pH} < 5.5$, $\text{P} < 15 \text{ lb./ac.}$, or $\text{K} < 150 \text{ lb./ac.}$ If levels are below this, apply lime and fertilizer according to a soil test and the needs of the vegetation selected.

Seed

All legumes shall be inoculated with the

proper inoculant prior to seeding. Seeding rates given in Tables A and B are based upon Pure Live Seed (PLS).

Seed mixtures shall be selected according to site conditions and desired use and appearance. Other considerations include soil moisture condition, shade tolerance, mowing tolerance, winter hardiness, flooding tolerance, mature height, emergence time, and salt tolerance.

All seeds shall have the proper stratification and/or scarification to break seed dormancy for spring or early summer plantings. No treatments are needed for late summer, early fall, or dormant seeding.

Seeding

Seeding may be done by any of the following methods:

1. Conventional Drill

- a. Apply seed uniformly at a depth of 1/4 to 1/2 inch with a drill (band seed) or cultipacker seeder. On sloping land, seeding operations should be on the contour wherever possible.
- b. Apply mulch or erosion blanket following seeding as required.

2. Broadcast Seeding

- a. Cultipack or roll seedbed, then apply seed uniformly and cover to 1/4 to 1/2 inch depth with a cultipacker, or similar tool. Spinning disc type broadcasters equipped with an agitator are effective with native seed mixes. Often broadcasters require the use of a carrying agent such as oats or vermiculite. Attention

should be given to seed mixes with seeds of varying size and weight so that the seed remains effectively mixed during seeding operations.

- b. On sloping land, dragging, harrowing or cultipacking should be done on the contour to ensure seed-soil contact and reduce erosion.
- c. Apply mulch or erosion blanket following seeding as required.

3. Hydroseeding

- a. For areas to be hydroseeded, final seedbed preparation shall leave the soil surface in a slightly roughened condition.
- b. Lime and fertilizer shall be incorporated prior to seeding unless they are to be applied at the same time as the seed (applying lime with a hydroseeder may be abrasive to the equipment). Do not use hydrated lime in a slurry mix.
- c. A minimum of 1000 gallons of water per acre shall be used. The hydraulic seeding equipment shall include a pump rated and operated at no less than 100 gallons per minute and at no less than 100 pounds per square inch pressure. The tank shall have a mechanical agitator powerful enough to keep all materials in a uniform suspension in the water. Calibration of the hydraulic equipment shall be accurate.
- d. When seeding legumes, increase the recommended rate for inoculant four times for hydroseeding. If legume inoculant is added to a fertilizer and/or lime, seeding should be applied within 30 minutes.

- e. If seed and fertilizer are mixed together they should be seeded within 2 hours of mixing.

4. Dormant Seeding

Dormant seeding may be done between November 15 and March 15 by using conventional drill or broadcast methods.

If soil conditions are suitable during the dormant seeding period, prepare the seedbed and seed as indicated in this specification. Apply mulch or erosion blanket following seeding.

5. No-till

In some instances it may be desirable to sow seed into existing sod, a temporary cover crop, or natural vegetation. Drilling may be done after herbicide application to non-native sod or undesirable weeds such as Canada thistle. A rangeland type grass drill with a no-till attachment shall be used. Seeds should be drilled to the depth appropriate for the species, according to the supplier's recommendations.

The seeds of some plants require light to stimulate germination and growth. In situations with some of these species, particularly some native forbs, a combination of broadcasting and no-till drilling may be used. Grasses should be drilled first, followed by broadcasting of the desired forbs.

Plugs and Rootstock

Some plants cannot be grown readily from seed and must be planted vegetatively (see Table A). Plugs are young plants that are grown in a nursery or greenhouse for transplant. Rootstock may consist of fragments of horizontal

stems or roots that include at least one node (joint).

1. Plugs

Plugs shall be planted in designated areas according to site plans and the recommendations of the supplier for that species. Attention should be given to soil moisture, anticipated flooding, shade, and other factors.

- a. Plugs shall be planted in a hole dug with a trowel, spade, planting bar, or suitable instrument such that the hole is of a minimum diameter and depth to accommodate the plug, with its roots, without damage.
- b. The soil excavated from the planting hole should be used to backfill around the plant and lightly packed to secure the roots in the soil.
- c. Plugs shall be watered upon completion of planting enough to keep soil moist but not saturated.
- d. If planting is delayed more than six hours after delivery, store plugs in the shade, protect from the weather and mechanical damage, and keep them moist and cool. All plugs should be planted within 24 hours of delivery.
- e. Plugs shall be obtained from a reputable nursery or grown from seed. Plugs shall not be collected from wild populations of plants.

2. Rootstock

Plant tubers and other rootstock into a properly prepared area according to the following and in accordance with the

suppliers recommendations for that species.

- a. Tubers and rootstock should be freshly dug before planting. If planting is delayed, protect material from weather and mechanical damage, and keep moist and cool. Do not use materials that have been in cold storage more than 45 days.
- b. Holes for planting rootstock shall be dug in locations shown on plans or as adjusted in the field.
- c. Holes shall be dug with a trowel, spade, planting bar or other suitable instrument, such that holes are of a minimum depth and diameter to accommodate the tuber or rootstock without damage.
- d. Rootstock shall be obtained from a reputable nursery or grown from seed. Rootstock shall not be collected from wild populations of plants.

Ground Covers

Most shrub and vine type ground covers are available as bare root stock, balled and burlapped, or in containers or pots. Many ground covers and vines perform best when planted in the spring. Container-grown plants can be planted throughout the growing season if adequate water is provided.

Ground covers and vines are plants that naturally grow very close together and close to the ground or climbing over other plants. This can cause severe competition for space, nutrients and water. Soil for ground covers should be well-prepared. A well-drained soil high in organic matter is best. If the area to be planted is so large or difficult to

prepare due to steepness or rockiness that adding amendments to the soil as a whole would be impractical, organic matter and fertilizer may be added to each planting hole.

Lime and fertilize according to soil test, if needed. If no soil test is available and the soil is believed to be deficient, add 30 lbs. of 10-10-10 fertilizer and 100 lbs. of ground agricultural limestone per 1000 square feet. Incorporate into the top 4 to 6 inches of the soil.

When planting individual plants, prepare a hole slightly larger than the container or ball and deep enough that the roots can extend to the bottom. Most ground covers should be planted $\frac{1}{2}$ " to 1" deeper than they have grown in the pot or container.

Mulching/Erosion Blanket

All permanent seedings shall be mulched upon completion of seed application or planting. Refer to practice standard [MULCHING 875](#). Erosion blanket should be substituted for mulch on steep slopes (10% slope or greater) or wherever highly erosive conditions exist (e.g. in drainage swales or waterbody shorelines). Refer to practice standard [EROSION BLANKET 830](#). When planting plugs and tubers, particularly in wetland plantings, mulch or erosion blanket should NOT be used except in specific areas with erosive conditions. When planting ground covers it may be advantageous to apply mulch or erosion blanket prior to planting. Plants should then be tucked into the soil through slits or holes. In all cases, planting should be done in a staggered pattern to minimize erosion.

CONSIDERATIONS

Where feasible, deep-rooted native species are preferred because of their abilities to enhance soil permeability and pollutant filtering and their reduced needs for fertilizer, herbicides, irrigation, and mowing. Care also should be taken to avoid non-native aggressive species that could spread beyond the site boundaries.

The best time for seeding depends upon the species; there is no single best time to seed. There are certain groups of species which do best fall planted and are compromised by spring seeding. There are other groups of species that do best spring planted and are compromised by fall seeding. Some species are not tolerant of nurse or temporary cover crops while others benefit by them. Some species are difficult to establish in the field from seed and are far more practical to install as plugs.

Some species require light for germination and are thus less successful if drilled into the soil, while others require burial to have successful germination. Broadcasting is generally favored for native species for this reason, and so the plants do not become established in unnatural looking rows. A temporary cover crop may be necessary to hold soil until permanent vegetation becomes established. See practice standard [TEMPORARY SEEDING 965](#).

Using an intact native soil is the most desirable situation, but in most cases stabilization is needed because of earthwork activities. In many instances, the topsoil may have been removed

and/or stockpiled during earthwork activities.

Evaluate the capabilities and limitations of the soil to be seeded or planted and the desired use and appearance of the area. Special attention needs to be given to soil pH, texture, internal water movement, moisture regime, steepness, and stability in order to plan the appropriate treatment.

PLANS AND SPECIFICATIONS

The plans and specifications for seeding or planting and mulching shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Seed mixtures and rates or plant species and density.
2. Site preparation methods.
3. Fertilization rates and methods of application.
4. Seeding or planting methods.
5. Seeding or planting periods.
6. Mulching or erosion blanket materials and application rates.

All plans shall include the installation, inspection and maintenance schedules with the responsible party identified.

OPERATION AND MAINTENANCE

High-maintenance areas are mowed frequently, fertilized and pesticide treated regularly, and either (1) receive intensive use (e.g., athletic fields or golf courses) or (2) require maintenance to a particular aesthetic standard (e.g., home lawns). Grasses or ground covers used for these situations are long-lived perennials that form a tight sod and are

fine-leaved in appearance. They must be well adapted to the geographic area where they are planted and able to endure the stress of frequent mowing. Sites where high-maintenance vegetative cover is commonly utilized include homes, industrial parks, schools, churches, and active recreational areas.

High-maintenance seedings should be fertilized one year after planting to strengthen the plants and insure proper stand density. The following recommendations may be used:

1. For grass only stands, apply 200 lbs./acre (5 lbs/1000 sq. ft.) of 27-3-3, or equivalent.
2. For grass-legume or pure legume stands, apply 500 lbs/ac. (12 lbs./1000 sq. ft.) of 10-20-20, or equivalent.
3. The best time to apply fertilizer is between March 1 and May 30 or August 1 and September 30.

Do not mow high-maintenance turf seedings until the stand is at least 6 inches tall. Do not mow closer than 3 inches during the year of establishment.

In areas adjacent to waterbodies and wetlands, fertilizer should be used sparingly to minimize runoff of nutrients causing undesired growth of aquatic plants (eutrophication).

Low-maintenance areas are mowed infrequently or not at all, and do not receive lime, pesticide or fertilizer on a regular basis. Plants must persist with little maintenance over long periods of time. Native grass, forb, and legume mixtures are favored for these sites because they are deep-rooted and can add nutrients to the soil. Legumes in particular are a source of soil nitrogen.

Mixed stands are more resistant to adverse conditions. Sites suitable for low-maintenance vegetation include steep slopes, stream or channel banks, lake shorelines, stormwater drainage and detention facilities, office campuses, low-density residential properties, some commercial properties and areas adjacent to roadways.

Native plants typically do not require fertilization to become established. Experience in prairie restoration suggests that fertilizing adds to weed problems and promotes undesirable species. For this reason, conventional fertilizing is not recommended for native plantings.

Low-maintenance stands should be mowed only as needed to control weeds. Native plantings should be mowed to control weeds prior to August 15 during the establishment period (2-3 years). Mowing should be done before undesirable weeds set seed. Keep mowing height above the height of the seeded plants (6-12 inches).

Prescribed burning is the preferred maintenance technique for native prairie vegetation. Burns should be performed after the establishment period (2-3 years) on a 2-3 year rotational basis to control invasive weeds and to encourage a balance between grass and forb species. Less-frequent burning may be appropriate once the prairie is well established.

Goose or other nuisance wildlife control may be needed on some plantings. For example, plantings (plants, rootstock or seed) of native wetland plants must be protected from depredation by Canada geese. Goose exclosures constructed of fence posts and "chicken wire" netting

is usually recommended during the first year of establishment.

Vine and shrub type ground covers may need hand weeding until the area is well covered.

For ground covers and vines, prune old growth in the spring as needed to improve appearance and promote growth. If pruning is desired, it should be done every year rather than when the plants have developed into an overgrown state.

High and low maintenance areas

Vegetation cannot be expected to provide erosion control cover and prevent soil slippage on a soil that is not stable due to its structure, water movement, or excessive slope.

The operation of equipment is restricted and may be unsafe on slopes steeper than 3:1. Where steepness prohibits the use of farm machinery, seedbed preparation, fertilization, and seeding or planting may need to be done by hand.

Moisture is essential for seed germination and seedling establishment. Supplemental irrigation can be very helpful in assuring adequate stands in dry seasons or to speed development of full cover.

Protect the planted area from human, animal and vehicular traffic until the stand is adequately established.

Inspect all planted areas for failures and make necessary repairs, replacements, reseedings, and mulching within the planting season, if possible. If a stand has less than 70% ground cover, re-evaluate the choice of plant materials, quantities of lime and fertilizer, seeding

or planting methods, time of seeding or planting and available light and moisture. Re-establish the stand with modifications based on the evaluation.

After initial planting and/or seeding, irrigate to keep the seedbed moist (not wet) for at least 7 to 10 days after seeding depending on conditions. This may require watering daily the first week, especially during hot weather, and less frequently thereafter. Water application rates and delivery must be carefully controlled to prevent runoff and erosion. Inadequate or excessive amounts of water can be more harmful than no supplemental water. Irrigation is seldom needed for low-maintenance seedings made at the appropriate time of the year.

Herbicides may also be used for weed control. Apply all herbicides according to rates specified on the label.

REFERENCES

U.S Department of Agriculture - Natural Resources Conservation Service, U.S. Environmental Protection Agency - Region 5, U.S. Fish and Wildlife Service, and U.S. Army Corps of Engineers - Chicago District, 1997. Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois. IL

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Table A. Grass, forb, and sedge species for low maintenance areas.

Species ¹	Common name	Native	Moisture	Sunlight	Seeding rate ²	Aggressive	Salt tolerance	Seeds/oz. ³	Recommended planting method
GRASSES									
Agrostis alba	red top	N	mesic-wet	full-partial	.5-1.0	N	High	312000	seed
Andropogon gerardi	big blue stem	Y	mesic	full	2.0-5.0	N	No consensus	8200-10000	seed
Avena sativa	oats	N	mesic-dry	full	30-50	N	Moderate		seed
Bouteloua curtipendula	side oats grama	Y	mesic-dry	full	5	N	Low	6000-8000	seed
Bromus inermis	smooth brome	N	mesic-dry	full	24	Y	High	8500	seed
Bromus pubescens	woodland brome	Y	mesic	shade-partial	0.031	N	Low to Moderate	70875	seed
Calamagrostis canadensis	blue joint grass	Y	wet	full	.03-.25	N	Low	95000-280000	transplants (plugs)
Cinna arundinacea	common wood reed	Y	mesic	shade-partial	0.1-1.0	N	Low to Moderate	56700	seed
Dactylus glomerata	orchard grass	N	mesic-wet	full-partial	4-8	N	High	41000	seed
Echinochloa crusgalli	barn yard grass	Y	mesic-wet	full-partial	.375-4.0	Y	High	31500	seed
Elymus canadensis	nodding wild rye	Y	mesic-wet	full-partial	.02-3.0	N	Low-Moderate	4200-5200	seed
Elymus virginicus	Virginia wild rye	Y	mesic-wet	full-partial	.06-1.0	N	No consensus	4200-4500	seed
Festuca elatior	tall fescue (many varieties)	N	mesic-dry	full-partial	10-30	N	Moderate to High	14000	seed
Festuca rubra	red fescue (many varieties)	N	mesic	full-partial	10-20	N	Moderate to High	38000	seed
Glyceria striata	fowl manna grass	Y	mesic-wet	full-partial	.05-1.0	N	Low to Moderate	113000-160000	seed
Hystrix patula	bottlebrush grass	Y	mesic	shade-partial	0.062	N	Low to Moderate	4700-7600	seed
Leersia oryzoides	rice cut grass	Y	wet	full-partial	.1-1.0	N	No consensus	34000-94000	seed, rhizomes
Lolium multiflorum	annual ryegrass	N	mesic-dry	full-partial	10-30	N	Moderate to High	14000	seed
Lolium perenne	perennial ryegrass	N	mesic-dry	full-partial	10-30	N	Moderate to High	14000	seed
Panicum virgatum	switch grass	Y	mesic-wet	full-partial	.125-1.0	N	Moderate to High	14000-18000	seed
Phleum pratense	timothy	N	mesic	full-partial	.375-2.0	N	High	77000	seed
Schizachyrium scoparium	little blue stem	Y	dry	full	1.0-6.0	N	No consensus	8800-15000	seed
Sorghastrum nutans	Indian grass	Y	mesic	full	2.5-6.0	N	Moderate to High	8300	seed
Spartina pectinata	prairie cord grass	Y	wet	full-partial	.125-2.0	N	High	157500	rhizomes, transplants
Sporobolus heterolepis	prairie drop seed	Y	dry	full	.5	N	Low	14000-16000	seed
Zizania aquatica	wild rice	Y	wet	full	3	N	No consensus		seed
FORBS & GRAMINOIDS (grass-like)									
Acorus calamus	sweet flag	Y	6-20in. water	full-partial	.006-.25	N	No consensus	750-3300	rhizomes
Asclepias incarnata	swamp milkweed	Y	wet	full	.31	N	Moderate to High	4650	seed
Alisma subcordatum	water plantain	Y	0-6in. water	full	.06-.5	N	Moderate to High	60000-70000	seed
Aster leavis	smooth blue aster	Y	mesic-dry	full-partial	.02-.125	N	Low	48000-55000	seed
Aster lanceolatus	panicked aster	Y	mesic-wet	full-partial	.03-.06	N	Low to Moderate		seed
Aster novae-angliae	New England aster	Y	mesic-wet	full-partial	.03-.375	N	Low to Moderate	66000-70000	seed
Bidens cernua	nodding beggarsticks	Y	wet	full-partial	.25-.5	N	Moderate to High	14000-21000	seed
Bidens frondosa	common beggarsticks	Y	wet	full-partial	.125	Y	Moderate to High	28000	seed
Carex comosa	bristly sedge	Y	0-12in. water	full-partial	.125-.375	N	Low to Moderate	29000	transplants (plugs)
Carex cristatella	crested oval sedge	Y	wet	full-partial	.125	N	Low to Moderate	141750	fresh seed
Carex granularis	pale sedge	Y	wet	full-partial	.031	N	Low		fresh seed
Carex hystricina	porcupine sedge	Y	wet	full-partial	0.125	N	Low	29840	seed
Carex lanuginosa	wooly sedge	Y	wet	full	.125	N	Moderate to High	23625	seed
Carex scoparia	lance-fruited oval sedge	Y	wet	full-partial	0.125	N	Low	84000	seed
Carex stipata	awl-fruited sedge	Y	wet	full-partial	.125	N	Low to Moderate	35000	seed
Carex vulpinoidea	fox sedge	Y	wet	full-partial	.06-.5	N	Moderate	100000-141000	seed
Coreopsis tripteris	tall coreopsis	Y	mesic	full-partial	.25-.5	N	Low to Moderate	11500-14000	seed
Coreopsis palmata	prairie coreopsis	Y	mesic	full	.015-.5	N	Low	8800	seed
Echinacea pallida	pale purple cone flower	Y	mesic	full	.25-.5	N	Low	5100	seed
Eleocharis obtusa	blunt spike rush	Y	wet	full	.02-.4	N	Moderate		seed

Species ¹	Common name	Native	Moisture	Sunlight	Seeding rate ²	Aggressive	Salt tolerance	Seeds/oz. ³	Recommended planting method
Eleocharis smallii	creeping spike rush	Y	wet	full	.02-.4	N	Moderate		seed
Eupatorium maculatum	spotted joe pye weed	Y	wet	full	.06-2.0	N	Low to Moderate	85000-95000	seed
Eupatorium perfoliatum	common boneset	Y	wet	full	.06-.125	N	Low to Moderate	160000-200000	seed
Gentiana andrewsii	bottle gentian	Y	mesic-wet	full-partial	.015-.125		Low to Moderate	800000	seed
Geranium maculatum	wild geranium	Y	mesic	shade-partial	0.54	N	Low	350	seed
Helenium autumnale	sneezeweed	Y	wet	full-partial	.12-.5	N	Low to Moderate	130000	seed
Helianthus grosseserratus	sawtooth sunflower	Y	wet	full	.15-.31	Y	Moderate to High	15000	seed
Iris virginica	blue flag iris	Y	wet	full-partial	.06-.625	N	Low to Moderate	850-1000	rhizomes, transplants
Juncus effusus	common rush	Y	wet	full-partial	.37	N	Moderate to High		rhizomes
Juncus torreyi	Torrey's rush	Y	wet	full-partial	.006-.375	N	Moderate to High	70875	rhizomes
Liatris pycnostachya	prairie blazing star	Y	mesic-wet	full	.125	N	Low	11500	seed
Liatris spicata	marsh blazing star	Y	wet	full	.125	N	Low	11500	seed
Lotus corniculatus*	bird's foot trefoil	N	mesic	full	8	Y	High	25000	seed
Medicago sativa*	alfalfa	N	mesic	full	8	Y	Moderate to High	12500	seed
Lobelia cardinalis	cardinal flower	Y	wet	full-partial	.06	N	No consensus	300000-400000	seed
Monarda fistulosa	wild bergamot	Y	mesic	full-partial	.125-1.0	N	Moderate	75000-78000	seed
Petalostemum purpureum*	purple prairie clover	Y	mesic	full	.25	N	Low to Moderate	19000	seed
Phlox divaricata	woodland phlox	Y	mesic	shade-partial	0.13	N	Low	12500	seed
Polygonum amphibium	water smartweed	Y	0-20in. water	full	.5-1.5	N	No consensus		seed
Pycnanthemum virginianum	common mountain mint	Y	mesic-wet	full	.02-.06	N	No consensus	220000-284000	seed
Ratibida pinnata	yellow cone flower	Y	mesic	full	.125-.25	N	No consensus	27000-30000	seed
Rudbeckia hirta	black-eyed susan	Y	mesic	full-partial	.125-.5	N	Moderate	92000-100000	seed
Sagittaria latifolia	broadleaf arrowhead	Y	6-20in. water	full-partial	.06-.25	N	Moderate	56700	rhizomes, transplants
Scirpus acutus	hardstem bulrush	Y	0-36in. water	full	.06-.25	N	High	18000-30000	rhizomes
Scirpus americanus (pungens)	chairmaker's rush	Y	0-16.5in. water	full	.06-.125	N	Moderate to High		rhizomes
Scirpus fluviatilis	river bulrush	Y	0-30in. water	full-partial	.06-.125	N	Moderate to High	3375	rhizomes
Scirpus tabernaemontani (validus)	soft-stem bulrush	Y	12-20in. water	full	.06-.25	N	Moderate to High	31000-38000	rhizomes
Silphium laciniatum	compass plant	Y	mesic	full	.03-.19	N	Low to Moderate	655	seed
Silphium terebinthinaceum	prairie dock	Y	mesic-wet	full	.03-.19	N	Moderate	1050	seed
Smilacina racemosa	false solomon's seal	Y	mesic	shade-partial		N	Low to Moderate	900-1000	seed, transplants
Solidago gigantea	late goldenrod	Y	mesic-wet	full	.06-.3	N	Moderate to High	378000	seed
Sparganium eurycarpum	common burreed	Y	0-12in. water	full-partial	.2-.375	N	Low to Moderate	550	rhizomes
Tradescantia ohiensis	spiderwort	Y	mesic-dry	full-partial	.06-1.0	N	Low to Moderate	8000	seed
Trifolium hybridum*	alsike clover	N	mesic	full-partial	4-8	N	High	44000	seed
Trifolium pratense*	red clover	N	mesic	full-partial	4-8	N	Moderate to High	17000	seed
Verbena hastata	blue vervain	Y	wet	full	.015-.125	N	Moderate to High	93000-100000	seed
Vernonia fasciculata	common iron weed	Y	wet	full	.01-.19	N	No consensus	20000-24000	seed, transplants

¹ The nomenclature (plant names) used follow Kartesz (1994) which has been largely adopted as a national standard. Some commonly used synonyms are given in parentheses.

² All seeding rate information is pounds per acre and based upon Pure Live Seed (PLS). Seeding rates are given as ranges, since the actual seeding rate desired depends upon whether it is used as part of a mix or for a pure stand.

³ The seeds per ounce data is taken from supplier catalogues where available. Where no data was available or where large conflicts between sources existed this entry is blank.

* Legumes requiring proper inoculant.

Table B. High Maintenance (Turf Grass) Seed Mixtures.

Seed Mixture	Moisture Regime	Sun Light	Salt Tolerance	Seeding Rates (PLS)	
				lbs/ac.	lbs/1000sq ft
Kentucky blue grass use at least 3 varieties	dry-well drained	full-partial	moderate	88-130	2-3
Kentucky blue grass Red fescue	dry-well drained	full	moderate	110 44	2.5 1.0
Tall fescue (turf type)	dry-wet	full-shade	moderate	220-260	5-6
Red fescue Kentucky blue grass	dry-well-drained	full-partial	moderate to high	110 44	2.5 1.0
Kentucky blue grass Perennial ryegrass	dry-well-drained	full-partial	moderate	86 43	2.0 1.0
Red fescue Alkali grass Squirreltail grass	wet - moist	full-partial	high to very high	35 35 15	0.8 0.8 0.35

Seeding Dates

Spring	Northern Illinois	Early spring to June 1
	Central Illinois	Early spring to May 15
	Southern Illinois	Early spring to May 15
Fall	Northern Illinois	August 1 to September 1
	Central Illinois	August 1 to September 10
	Southern Illinois	August 1 to September 20
Dormant	Northern Illinois	November 1 to March 15
	Central Illinois	November 15 to March 1
	Southern Illinois	November 15 to March 1

Table C. Ground Covers and Vines.

Species	Common Name	Native	Mature			Spacing	Invasive	Flowers
			Height	Moisture	Sunlight			
Ajuga reptans	bugleweed	No	6-12"	mesic-dry	full sun-shade	12"	Yes	blue
Asarum canadense	wild ginger	Yes	6"	mesic	partial-shade	18"	No	red
Celastrus scandens	American bittersweet	Yes	vine	mesic-dry	full-partial	12"	Yes	green
Ceanothus americanus	New Jersey tea	Yes	18-30"	mesic-dry	full	18"	No	white
Clematis terniflora	sweet autumn clematis	No	vine	mesic-dry	partial-shade	12"	No	white
Clematis virginiana	Virginia's bower	Yes	vine	wet	partial	12"	No	white
Convallaria majalis	lily of the valley	No	6-12"	mesic-dry	partial-shade	12"	slightly	white
Cotoneaster adpressa	creeping cotoneaster	No	6-12"	mesic-dry	full	18"	No	pink
Dioscorea villosa	wild yam	Yes	vine	wet-mesic	partial-shade	12"	slightly	green
Duchesnia indica	false strawberry	No	6-12"	wet-dry	full-shade	18"	Yes	yellow
Euonymus fortunei	wintercreeper	No	12-18"	mesic-dry	full-shade	12"	Yes	purple
Galium odoratum	sweet woodruff	No	<6"	mesic-dry	partial-shade	12"	No	white
Gysophyla repens	creeping baby's breath	No	6-12"	mesic-dry	full	12"	No	white
Hedera helix	English ivy	No	<6"	mesic-dry	full-shade	12"	No	
Hemerocallis fulva	day lily	No	12-18"	wet-dry	full-shade	18"	Yes	various
Hosta lancifolia	hosta (plaintain lily)	No	12-18"	wet-mesic	partial-shade	18"	No	various
Hydrangea petiolaris	climbing hydrangea	No	vine	wet-mesic	partial	36"	No	white
Ilex verticillata	winterberry holly	Yes	18-36"	wet	partial	12"	No	white
Juniperus horizontalis	creeping juniper	Yes	6-18"	mesic-dry	full	30"	No	
Lonicera prolifera	yellow honeysuckle	Yes	vine	mesic	partial-shade	12"	No	yellow
Pachysandra terminalis	Japanese spurge	No	6-12"	mesic	partial-shade	12"	No	green
Parthenocissus quinquefolia	Virginia creeper	Yes	vine	mesic	partial-shade	18"	No	green
Phlox stolonifera	creeping phlox	No	6-12"	mesic	partial	12"	No	various
Phlox subulata	moss phlox	No	12-18"	mesic	full	12"	No	various
Polygonum Reynoutria	dwarf fleece flower	No	<6"	mesic	full-partial	12"	Yes	white
Potentilla fruticosa	shrubby cinquefoil	Yes	18-36"	mesic-dry	full	36"	No	yellow
Ranunculus repens	creeping buttercup	No	6-12"	wet-mesic	full-partial	36"	slightly	yellow
Ribes alpinum pumilum	dwarf alpine current	No	18-36"	mesic	full-partial	36"	No	
Ribes americanum	wild black currant	Yes	to 48"	wet	full-partial	36"	No	yellow
Ribes missouriensis	wild gooseberry	Yes	to 48"	mesic	partial-shade	36"	No	yellow
Rosa arkansana	sunshine rose	Yes	12-36"	mesic-dry	full	18"	No	white-pink
Rosa blanda	early wild rose	Yes	12-36"	wet-dry	full	18"	No	white-pink
Rosa carolina	pasture rose	Yes	12-36"	dry	full	18"	No	white-pink
Sedum acre sexangulare	large-leaf stonecrop	No	<6"	mesic	full	12"	No	yellow
Thymus serpyllum	creeping thyme	No	<6"	mesic	full-partial	6"	No	various
Vinca minor	common periwinkle	No	6-12"	wet-mesic	partial-shade	12"	slightly	violet

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

PERMEABLE PAVEMENT

(sq.ft.)
CODE 890



(Source: Conservation Design Forum)

DEFINITION

A pavement consisting of structural materials (e.g., concrete slabs, paving blocks or grids, or turf blocks) having regularly interspersed void areas. The voids are filled with pervious materials, such as vegetated soil, gravel or sand.

PURPOSE

The purpose of this practice is to reduce runoff and associated pollutants from low-volume traffic areas by providing a load bearing surface having adequate strength to accommodate vehicles while allowing infiltration of surface water and filtration of pollutants. This is accomplished by trapping a portion of rainfall in the pavement's voids and infiltrating it into the underlying soil.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where pavement is desirable or required for low-volume traffic areas.

This practice should be used with caution in areas underlain with highly permeable soils (i.e., surface sand or gravel) where infiltrated pollutants may reach groundwater without opportunity for attenuation.

The effects of subgrade compaction, freeze-thaw cycles and deicing and snow removal must be considered in determining the applicability of this practice.

Possible areas for use of these paving materials include:

1. Parking lots, especially fringe or overflow parking areas
2. Parking aprons, taxiways, blast pads, and runway shoulders at airports (heavier loads may demand use of reinforced grid systems)
3. Emergency stopping and parking lanes and vehicle cross-overs on divided highways
4. Off-street parking aprons in residential neighborhoods
5. Recreational vehicle camping area parking pads

6. Private roads, easement service roads, and fire lanes
7. Industrial storage yards and loading zones (heavier loads may demand use of reinforced grid systems)
8. Driveways for residential and light commercial use
9. Bike paths, walkways, patios, and swimming pool aprons
10. As an alternative to conventional paving in areas where tree protection and preservation is a concern

CRITERIA

Permeable pavement can infiltrate up to the first half inch of precipitation. Provisions must be made to handle the runoff from larger storms.

Permeable pavement system categories include:

1. Cast-in-place concrete slabs: Reinforced concrete slabs covering large areas are formed in place on the ground to be covered. The slab is suitable for heavy loads and has maximum resistance to movement caused by frost heave or settling.
2. Pre-cast concrete grids: Concrete paving units incorporating void areas, usually pre-cast in a concrete products plant and trucked to a job site for placement. These units have a higher percentage of permeable (i.e., grass) surface.
3. Modular unit pavers: Smaller pavers which may be clay bricks, granite sets or pre-cast concrete of various shapes. These pavers are monolithic units which do not have void areas incorporated in the blocks. They are installed on the base layer with pervious material placed in the gaps between units.

4. Geoweb: Although geoweb is primarily designed for soil reinforcement, they may be applicable as a permeable pavement.

The manufacturer's specifications shall be used to determine if the material to be used is suited for the intended purpose and for the gradation of the base course. The base course of granular material shall be at least 6 inches thick. Filter fabric shall be required between the compacted ground surface and the base course. The filter fabric shall meet the requirements of material specification [592 GEOTEXTILE](#) Table 1 or 2, Class I, II, or IV with AOS of 30 for woven and 50 for nonwoven.

CONSIDERATIONS

For stormwater quality as well as aesthetic purposes, it is recommended that the void areas in permeable pavement be filled with soil and planted with grass. Vegetation can improve infiltration and the physical filtering of runoff as well as reduce water volumes through long-term transpiration.

For parking lot applications, since permeable pavement with turf does not hold up well under frequent traffic, it is suggested to use permeable pavement only in the parking spaces and pave the traffic lanes in the normal fashion.

The runoff reduction effectiveness of permeable pavement is largely a function of the relative size of the openings in the pavement. Blocks with large openings, sometimes called turf blocks, are recommended. Conventional modular pavers that are grouted in place generally will not be very effective.

In areas where tree protection and preservation applies the protection of trees shall meet the requirements of practice standard [TREE PROTECTION 990](#).

is needed in plowing paving blocks or grids.

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PLANS AND SPECIFICATIONS

Plans and specifications for installing permeable pavement shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following:

1. Pavement location.
2. Paver thickness and type.
3. Base course thickness and gradation.
4. Filter fabric requirements.
5. Void material and dimensions.
6. Seeding requirements.

All plans shall include installation, inspection, and maintenance schedules with the responsible party identified.

OPERATION AND MAINTENANCE

Where turf is incorporated into these installations as the permeable surface medium, some turf maintenance will be necessary. However, fertilizers and deicing chemicals have adverse effects on concrete products in general, and the use of such chemicals should be restricted as much as possible. Deicing chemicals also adversely affect turf. Mowing is seldom required in areas of frequent traffic.

Cast-in-place installations, because they are monolithic and maintain a smooth surface, can be snow plowed provided the blade is set high enough to prevent damage to grass cover. Additional care

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

PORTABLE SEDIMENT TANK

(no.)
CODE 895



(Source: Kane-Dupage Soil and Water Conservation District)

DEFINITION

A compartmented container through which sediment-laden water is pumped to trap and retain the sediment.

PURPOSE

The purpose of this practice is to trap and retain sediment prior to pumping the water to drainageways, adjoining properties, and rights-of-way below the sediment tank site.

CONDITIONS WHERE PRACTICE APPLIES

A sediment tank is to be used on sites where excavations are deep and space is limited, such as urban construction, where direct discharge of sediment-laden water to stream and storm drainage systems is to be avoided. Also it is used where an excavation extends below the seasonal high water table causing a sump pump to be used.

CRITERIA

The portable sediment tank will be constructed with at least three equal baffled compartments. The inlet and outlet pipe will be a minimum diameter of 3 inches. The minimum storage volume of the tank shall be in cubic feet, calculated by multiplying 32 times the pump discharge in gallons per minute (GPM).

CONSIDERATIONS

The sediment tank should be located for ease of clean out and disposal of the trapped sediment, and to minimize the interference with construction activities and pedestrian traffic.

Portable sediment tanks should only be used when other sediment trapping practices cannot be installed due to lack of space or other reasons. This is due to their lack of efficiency and high labor requirements to remove the sediment.

PLANS AND SPECIFICATIONS

Plans and specifications for installing portable sediment tanks shall be in keeping with this standard and shall describe the requirements for applying the practice. The specifications will show the required storage volume of the tank.

All plans shall include installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [IL-595 PORTABLE SEDIMENT TANK PLAN](#) may be used as the plan sheet. Other container designs can be used if the storage volume is adequate and approval is obtained from the local approving agency.

OPERATION AND MAINTENANCE

The tank shall be cleaned out when one-third of the storage volume is filled with sediment. All sediment collected in the tank shall be disposed of in an approved sediment trapping device such as practice standard [TEMPORARY SEDIMENT TRAP 960](#) or [IMPOUNDMENT STRUCTURE - ROUTED 842](#) or on the construction site or as approved by the engineer/inspector.

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RIGHT-OF-WAY DIVERSION

(no.)
CODE 900



(Source: MN Protecting Water Quality in Urban Areas)

DEFINITION

A ridge or ridge and channel constructed diagonally across a sloping road or utility right-of-way that is subject to erosion.

PURPOSE

The purpose of this practice is to limit the accumulation of erosive volumes of water by diverting surface runoff at predesigned intervals.

CONDITIONS WHERE PRACTICE APPLIES

Where runoff protection is needed to prevent erosion on sloping access right-of-ways or other long, narrow sloping areas generally less than 100 feet in width.

CRITERIA

The diversion ridge shall be constructed of compacted soil or coarse aggregate or a combination of both.

Coarse aggregate, if used, shall meet one of the following IDOT gradations: CA-1, CA-2, CA-3 or CA-4.

Height - The height shall be a minimum of 18 inches measured from the channel bottom to the ridge top for gravel diversions and 18 inches from ground surface to the ridge top for earth diversions.

Side slope - 2:1 or flatter, 3:1 or flatter where vehicles cross.

Base width of ridge - 6 feet minimum.

Length - The diversion should be constructed completely across the disturbed portion of the right-of-way.

The required spacing of diversions is shown below:

Average Land Slope (%)	Maximum Spacing (ft)
<5	125
5 to 10	100
10 to 20	75
20 to 35	50
>35	25

Grade and angle - The grade should be positive not to exceed 2%. A crossing angle of approximately 60 degrees is preferred.

Outlet - Diversions shall have stable outlets that are not subject to erosion. Site spacing may need to be adjusted for field conditions to utilize the most suitable outlet. Examples of stable outlets include practice standards [ROCK OUTLET PROTECTION 910](#), [LEVEL SPREADER 870](#), or [TEMPORARY SEDIMENT TRAP 960](#).

Concentrated flows should spread over the widest possible area after release. Flows with high sediment concentrations should pass through appropriate sediment trapping practices such as [IMPOUNDMENT STRUCTURE - ROUTED 842](#) or [TEMPORARY SEDIMENT TRAP 960](#).

CONSIDERATIONS

Construction of access roads, power lines, pipelines, and other similar installations often requires clearing long narrow rights-of-way over sloping terrain. Disturbance and compaction promotes gully formation in these cleared strips by increasing the volume and velocity of runoff. Gully formation may be especially severe in tire tracks and ruts. To prevent gulying, runoff can often be diverted across the width of the right-of-way to undisturbed areas by using small pre-designed diversions. Give special consideration to each individual outlet area, as well as to the cumulative effect of added diversions.

Generally earthen diversions are applicable where there will be little or no construction traffic within the right-of-way. Gravel structures are more applicable to road and other rights-of-ways where vehicular traffic is anticipated.

When earthen ridges are used, at all points where the ridge or channel will be crossed by heavy equipment the diversion should be protected according to requirements of the practice standard [STABILIZED CONSTRUCTION ENTRANCE 930](#).

PLANS AND SPECIFICATIONS

Plans and specifications for installing right-of-way diversions shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include:

1. Approximate location.
2. Minimum cross section and maximum grade.
3. Coarse aggregate gradation, if used.

All plans shall include installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [IL-600 RIGHT-OF-WAY DIVERSION PLAN](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

Periodically inspect the right-of-way diversions for wear and after heavy rainfall for erosion damage. Remove sediment from the flow area and repair the dike. Check outlet areas and make timely repairs as needed. When permanent road drainage is established and the area above the temporary right-of-way diversions is permanently stabilized, remove the ridge and fill the channel to blend with the natural ground, and appropriately stabilize the disturbed area.

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ROCK CHECK DAM

(no.)
CODE 905



(Source: USDA Natural Resources Conservation Service - Illinois)

DEFINITION

A small rock dam constructed across a grassed swale or road ditch.

PURPOSE

The purposes of this practice are to reduce the velocity of concentrated stormwater flows, thereby reducing erosion of the swale or ditch, trap sediment generated from adjacent areas or the ditch itself and to increase infiltration when suitable soils are present.

CONDITIONS WHERE PRACTICE APPLIES

This practice, utilizing a combination of rock sizes, is limited to use in small grassed swales or open channels that drain 10 acres or less. It shall not be used in a perennial stream where protection of the flowing stream is the objective.

Some specific applications include:

1. Temporary ditches or swales that, because of their short time of

service, cannot receive a non-erodible lining but still need protection to reduce erosion

2. Permanent ditches or swales that cannot receive a permanent non-erodible lining for an extended period of time
3. Either temporary or permanent ditches or swales that need protection during the establishment of grass linings
4. An aid in the sediment trapping strategy for an active construction site. This practice is not a substitute for major perimeter trapping measures such as practice standard [TEMPORARY SEDIMENT TRAP 960](#).

CRITERIA

The drainage area of a ditch or swale being protected shall not exceed 2 acres when rock meeting IDOT CA-1, CA-2, CA-3 or CA-4 gradation is used alone and shall not exceed 10 acres when rock meeting IDOT RR-3 or RR-4 gradation and Quality Designation A is added on the downstream side of the dam.

The maximum height of the rock check dam shall be 3.0 feet. The top of the rock check dam shall be a minimum of 1.0 feet below the top of the ditch or swale.

The maximum spacing between the dams should be such that the toe of the upstream dam is at the same elevation as the top of the rock at the center of the downstream dam.

The rock check dams shall be placed such that the resultant ponding will not cause inconvenience or damage to adjacent areas or structures.

The center of the rock check dam shall be at least 6 inches lower than the sides. Hand or mechanical placement will be necessary to achieve complete coverage of the ditch or swale and to assure that the center of the dam is lower than the sides. Rock shall be placed according to construction specification [25 ROCKFILL](#) using Method 1 placement and Class III compaction.

CONSIDERATIONS

For added stability, the base of the rock check dam should be keyed into the soil to a depth of 6 inches.

Filter fabric may be used under the rock to provide a stable foundation and to facilitate removal of the rock. The filter fabric shall meet or exceed the requirements of material specification [592 GEOTEXTILE](#) Table 1 or 2, Class I, II or IV.

Rock check dams are effective in reducing flow velocity and thereby the potential for channel erosion. It is usually better to establish a protective

vegetative lining before flow is confined or to install a structural channel lining than to install rock check dams. Field experience has shown rock check dams to perform much more effectively than silt fences or straw bales in the effort to stabilize "wet-weather" ditches.

Rock check dams installed in grass-lined channels may kill the vegetative lining if submergence after rains is too long and/or siltation is excessive.

If temporary rock check dams are used in grass-lined channels that will be mowed, care should be taken to remove all the rock when the rock check dam is removed. This should include any rocks that have washed downstream.

Field experience has shown that many rock check dams are not constructed with the center lower than the sides forming a weir. Stormwater flows are then forced to the rock-soil interface, thereby promoting scour at that point and subsequent failure of the structure to perform its intended function.

PLANS AND SPECIFICATIONS

Plans and specifications for installing rock check dams shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following:

1. Location where the practice will be installed
2. Dimensions, elevations, and spacing between the dams
3. Rock gradation and quality
4. Fabric specification if used

All plans shall include installation, inspection, and maintenance schedules with the responsible person identified.

Standard drawing [ROCK CHECK DAM IL-605CA](#) or [IL-605R](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

On active construction sites, the rock check dams shall be inspected at least once every 7 days and within 24 hours of a rainfall of 0.5 inches or more. If any erosion has taken place around or below the rock check dam or if rocks have been dislodged, repairs shall be made to prevent further damage. Sediment shall be removed once it has accumulated to one-half the height of the rock check dam. The center of the rock check dam shall also be inspected periodically to insure that the center of the dam is lower than the sides.

Unless they will be incorporated into a permanent stormwater management control, rock check dams must be removed when their useful life has been completed. In temporary ditches and swales, rock check dams should be removed and the ditch filled in when they are no longer needed. In permanent structures, rock check dams should be removed when a permanent lining can be installed. In the case of grass-lined ditches, rock check dams should be removed when the grass has matured sufficiently to protect the ditch or swale. The area beneath the rock check dams should be seeded and mulched immediately after they are removed.

For rock check dams that are made a part of a permanent stormwater management control, regular

inspections should be made to see if any erosion has occurred around or below the dam and if any rock has been dislodged. Immediately make all needed repairs to prevent further damage. If sediment trapping is to be a continuing function of the rock check dam, the sediment shall be removed when it has accumulated to one-half the depth of the rock check dam.

REFERENCES

Illinois Department of Transportation, 1997. Standard Specifications for Road and Bridge Construction. IL

Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1992. Virginia Erosion and Sediment Control Handbook, 3rd ed., VA

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

ROCK OUTLET PROTECTION

(no.)
CODE 910



(Source: USDA - Natural Resources Conservation Service - Illinois)

DEFINITION

A section of rock protection placed at the outlet end of culverts, conduits, or channels.

PURPOSE

The purposes of this practice are to prevent scour erosion at stormwater outlets, to protect the outlet structure, and to minimize the potential for downstream erosion by reducing the velocity and energy of concentrated stormwater flows. The practice also reduces the effects of turbidity and sedimentation downstream.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the receiving channel or area. This applies to:

1. Culvert outlets of all types.

2. Pipe conduits from all sediment basins, dry and wet basin detention storm water ponds.
3. New channels constructed as outlets for culverts and conduits.
4. Where outflows from conduits or channels do not exceed 10 fps.

The design of structurally lined aprons at the outlet of pipes and paved channel sections applies to the immediate area or reach below the pipe or channel and does not apply to continuous rock linings of channels or streams.

The design of rock outlet protection depends entirely on the location. Pipe outlets at the top of cuts or on slopes steeper than 10 percent cannot be protected by rock aprons or riprap sections due to reconcentration of flows and high velocities encountered after the flow leaves the apron.

CRITERIA

Tailwater depth - Depth of tailwater immediately below the pipe outlet must be determined for the design capacity of

the pipe. Manning's Equation may be used to determine tailwater depth. If the tailwater depth is less than half the diameter of the outlet pipe and the receiving stream is wide enough to accept divergence of the flow, it shall be classified as a Minimum Tailwater Condition. If the tailwater depth is greater than half the pipe diameter and the receiving stream will continue to confine the flow, it shall be classified as a Maximum Tailwater Condition. Pipes which outlet onto a flat area with no defined channel will be assumed to have a Minimum Tailwater Condition.

Apron length - Apron length (L_a) shall be determined from Table 2 according to the appropriate tailwater condition and velocity out of the conduits.

Apron width - When the pipe discharges directly into a well-defined channel, the apron shall extend across the channel bottom and up the channel banks to an elevation one foot above the maximum tailwater depth or to the top of the bank, whichever is less.

If the pipe discharges onto a flat area with no defined channels, the following criteria will be followed. Apron width will be 3 times the pipe diameter at the upstream location. The downstream width will be the pipe diameter plus the apron length for pipes with minimum tailwater conditions and the pipe diameter plus 0.4 times the apron length for pipes flowing under maximum tailwater conditions.

Bottom grade - The outlet protection apron shall be constructed with no slope (0.0% grade) along its length. There shall be no overfall at the end of the apron. The elevation of the downstream end of the apron shall be equal to the

elevation of the receiving channel or adjacent ground.

Alignment - Outlet protection apron shall be located so that there are no bends in the horizontal alignment.

Materials - Outlet protection may be done using rock riprap, concrete block or gabions.

Thickness - The maximum thickness of the riprap layer shall be 1.5 times the maximum stone diameter for d50 of 15 inches or less; and 1.2 times the maximum stone size for d50 greater than 15 inches. Table 1 lists some examples.

Stone quality - Stone for riprap shall consist of field stone or rough unhewn quarry stone. The stone shall be hard and angular and a quality that will not disintegrate on exposure to water or weathering. The specific gravity of the individual stones shall be at least 2.5.

The median size stone for riprap shall be determined from Tables 1 and 2 for the material specified for the tailwater condition present. The placement of the riprap shall conform to construction specification [61 LOOSE ROCK RIPRAP](#).

Recycled concrete equivalent may be used provided it has a density of at least 150 pounds per cubic foot, and does not have any exposed steel or reinforcing bars.

Filter Fabric - In all cases, filter fabric shall be placed between the riprap and the underlying soil to protect soil movement into and through the riprap. The material must meet or exceed requirements specified in material

specification [592 GEOTEXTILE](#), Table 1 or 2, Class I, II, or III.

Gabions - shall be made of hexagonal triple twist mesh with heavily galvanized steel wire. Gabions shall be fabricated in such a manner that the sides, ends, and lid can be assembled at the construction site into mats of the specified sizes. The mats shall be a minimum of 9 inches thick.

The area on which the gabion is to be installed shall be graded as shown on the drawings. Foundation conditions shall be the same as for placing rock riprap. Where required, a cut off may be needed to prevent undermining of the main gabion structure. Gabions shall meet the requirements for installation as shown in construction specification [64 WIRE MESH GABIONS](#).

CONSIDERATIONS

The outlets of channels, conduits and other structures are points of high erosion potential, because they frequently carry flows at velocities that exceed the allowable limit for the area downstream. To prevent scour and undermining, an outlet stabilization structure is needed to absorb the impact of the flow and reduce the velocity to non-erosive levels. A riprap-lined apron is the most commonly used practice for this purpose because of its relatively low cost and ease of installation. The riprap apron should be extended downstream until stable conditions are reached even though this may exceed the length calculated for design velocity control.

Riprap - stilling basins or plunge pools reduce flow velocity rapidly. They should be considered in lieu of aprons where overfalls exit at the ends of pipes

or where high flows would require excessive apron length. Consider other energy dissipaters such as concrete impact basins or paved outlet structures when conduits are flowing more than 10 fps. These will require a special design and Table 2 cannot be used.

PLANS AND SPECIFICATIONS

Plans and specification for installing rock outlet protection shall be in keeping with this standard and will describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following:

1. Location where the practice will be installed.
2. Dimensions of the practice.
3. Plan view, profile and cross section of each channel reach between the storm drain outlet under consideration and the existing publicly maintained system or the natural stream channel receiving the discharge flow.
4. Rock size and thickness.
5. Fabric specifications.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party clearly identified.

Standard drawing [IL-610 PIPE OUTLET TO FLAT AREA](#) or [IL-611 PIPE OUTLET TO CHANNEL](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

Inspect riprap outlet structures after heavy rains to see if any erosion around or below the riprap has taken place or if stones have been dislodged.

Immediately make all needed repairs to prevent further damage.

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TABLE 1
ROCK RIPRAP SIZES AND THICKNESS

IDOT Gradation Number	d50 (in.)	dmax (in.)	Minimum Blanket Thickness (in.)
RR-3 1/	5	10	15
RR-4	9	14	20
RR-5	12	19	28
RR-6	15	22	32
RR-7	18	27	32

1/ Concrete block may be used to replace RR-3.

TABLE 2
MINIMUM IDOT ROCK SIZES AND APRON LENGTH
FOR MAXIMUM AND MINIMUM TAILWATER CONDITIONS

Culvert Dia. (in.)	Minimum Tailwater				Maximum Tailwater			
	5 fps 1/		10 fps 1/		5 fps 1/		10 fps 1/	
	Rock Gradation	La (ft.)	Rock Gradation	La (ft.)	Rock Gradation	La (ft.)	Rock Gradation	La (ft.)
12	No. 3	10	No. 3	12	No. 3	12	No. 3	15
18	No. 3	14	No. 4	16	No. 3	12	No. 3	16
24	No. 3	16	No. 4	20	No. 3	14	No. 4	17
30	No. 3	18	No. 4	22	No. 3	16	No. 4	20
36	No. 4	20	No. 5	24	No. 3	16	No. 4	22
48	No. 4	24	No. 6	28	No. 4	20	No. 4	24
60	No. 5	32	No. 6	36	No. 4	22	No. 5	26
72	No. 6	40	No. 6	44	No. 5	24	No. 5	29
96	No. 7	50	No. 7	54	No. 5	26	No. 5	32

1/ Maximum conduit velocity fps.

Rock Gradation source: Illinois Department of Transportation, 1997.

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
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SILT FENCE

(ft.)
CODE 920



(Source: USDA Natural Resources Conservation Service - Illinois)

DEFINITION

A temporary barrier of entrenched geotextile fabric (filter fabric) stretched across and attached to supporting posts used to intercept sediment-laden runoff from small drainage areas of disturbed soil.

PURPOSE

The purpose of this practice is to cause deposition of transported sediment load from sheet flows leaving disturbed areas

CONDITIONS WHERE PRACTICE APPLIES

A silt fence may be used subject to the following conditions:

1. The maximum allowable slope lengths contributing runoff to a silt fence are listed in the following table:

Slope (%)	Maximum Spacing (ft.)
25	50
20	75
15	125
10	175
Flatter than 10	200

2. The maximum drainage area for overland flow to a silt fence shall not exceed 1/2 acre per 100 feet of fence; and
3. Erosion would occur in the form of sheet erosion; and
4. There is no concentration of water flowing to the barrier; and
5. Where effectiveness is required for more than one construction season or 6 months, whichever is less.
6. As protection for a storm drain inlet refer to practice standard [INLET PROTECTION - FABRIC DROP 860](#).
7. As protection for a culvert inlet refer to practice standard [CULVERT INLET PROTECTION 808](#).

CRITERIA

All silt fences shall be placed as close to the contour as possible, with the ends extending upslope. The area below the fence must be undisturbed or stabilized.

Silt fence fabric shall meet the requirements in material specification [592 GEOTEXTILE](#) Table 1 or 2, Class I with an minimum apparent opening size (AOS) of 30 for non-woven and 50 for woven.

Fence posts shall be a minimum of 48 inches long. Wood posts shall be of sound quality wood with a minimum cross sectional area of 3.0 square inches. Steel posts shall be standard T and U sections weighing not less than 1.33 pound per linear foot or other steel posts having equivalent strength and bending resistance. The maximum spacing shall be 5 feet. When wire or other form of approved backing is used, the maximum spacing may be increased to 8 feet. The posts shall be driven a minimum of 18 inches into the ground or as approved by the engineer. Spacing may need to be adjusted so that posts are located in low areas where water may pond.

Wire fence shall be a minimum 12-gauge wire with a maximum 6-inch mesh opening. All other forms of support, such as polymeric mesh, shall be approved by the engineer/inspector.

The filter fabric shall be furnished in a continuous roll cut to the length of the silt fence needed to avoid splices. When splices are necessary, the fabric shall be spliced at a support post with a minimum 6-inch overlap, folded over and securely fastened so that silt-laden water cannot escape through the fence.

The height of a silt fence shall be a minimum of 24 inches above the original ground surface and shall not exceed a height of 30 inches above the ground surface. Wire or another form of approved support mesh backing shall be used on silt fences exceeding 24 inches in height.

The silt fence shall be entrenched to a minimum depth of 6 inches, with an additional 6 inches extending along the bottom of the trench in the upslope direction. When wire or another form of support mesh backing is used, the wire or other approved support mesh shall extend into the trench a minimum of 3 inches. The trench shall be backfilled and the soil compacted over the fabric.

The filter fabric and wire support, if used, must be securely fastened to the upslope side of the posts using heavy duty wire staples at least one inch long or tie wires (10 gage minimum), or in accordance with manufacturer's recommendations. The fabric shall not be stapled or wired to the wire support or to existing trees.

If the silt fence must cross contours, with the exception of the ends of the fence, gravel check dams placed perpendicular to the back of the fence shall be used to minimize concentrated flow and erosion along the back of the fence. The gravel check dams shall be approximately 1 foot deep at the back of the fence and be continued perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface behind the fence. The gravel check dams shall consist of appropriately sized and specified rock for the fence line grade and contributing drainage area. The gravel check dams shall be located

every 10 feet along the fence where the fence must cross contours. The fence line grade and slope length in combination shall be stable after the installation of the check dams.

Silt fences shall be used prior to the establishment of erosion controls and installed prior to the clearing of existing vegetation.

CONSIDERATIONS

Silt fences should be considered for trapping sediment where sheet and rill erosion may be expected to occur in small drainage areas. Silt fences should not be placed in areas of concentrated flows.

Research has shown that silt fences can trap a much higher percentage of suspended sediments than can straw bale barriers and in most cases is the preferred option. As with straw bale barriers, improper placement as well as improper installation and maintenance of silt fences have, in many instances, significantly decreased the effectiveness of this practice.

While both woven and non-woven fabrics are commercially available, the woven fabric generally displays higher strength than the non-woven fabrics do. When tested under acid and alkaline water conditions, most of the woven fabrics increase in strength. There are a variety of reactions among non-woven fabrics. The same is true of testing under extensive ultra violet radiation. Permeability rates demonstrate very high filtering efficiencies for sandy sediments, there is considerable variation among both woven and non-woven fabrics when filtering the finer silt and clay particles.

PLANS AND SPECIFICATIONS

Plans and specifications for installing silt fences shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following:

1. Location where the silt fence is to be installed.
2. The type, size, and spacing of fence posts.
3. The type and size of wire or other approved support mesh backing, if used.
4. The type of filter fabric used.
5. The method of anchoring the filter fabric.
6. The method of fastening the filter fabric to the fencing support.
7. The rock size and location of gravel check dams, if used.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Standard Drawing [IL-620 SILT FENCE PLAN](#) or [IL-620W SILT FENCE WITH WIRE SUPPORT PLAN](#) can be used as the plan sheets.

OPERATION AND MAINTENANCE

Silt fences shall be removed when they have served their usefulness, but not before the upslope areas have been permanently stabilized.

Silt fences shall be inspected immediately after each rainfall and at least daily during prolonged rainfall.

Should the fabric decompose or become ineffective prior to the end of the expected usable life and the fence still is

necessary, the fabric or the entire system shall be replaced promptly.

Sediment deposits should be removed after each rainfall. They must be removed when the level of deposition reaches approximately one-half the height of the silt fence.

Any sediment deposits remaining in place after the silt fence is no longer required shall be dressed to conform to the existing grade, a seedbed prepared and the site vegetated.

REFERENCES

North Carolina Sedimentation Control Commission, 1988. Erosion and Sediment Control Planning and Design Manual. NC

Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1992. Virginia Erosion and Sediment Control Handbook. 3rd ed., VA

Washington State Department of Ecology, 2000. Stormwater Management Manual for Western Washington. WA

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

SODDING

(sq. ft.)
CODE 925



(Source: NC Erosion and Sediment Control Planning and Design Manual)

DEFINITION

Stabilization of fine-graded disturbed areas by laying a continuous cover of grass sod.

PURPOSE

The purposes of this practice are to prevent erosion and damage from sediment by stabilizing the soil surface and to improve the visual quality and utility of the area quickly.

CONDITIONS WHERE PRACTICE APPLIES

Disturbed areas, which require immediate cover for erosion protection or sediment control.

Where sodding is preferred to other means of grass establishment.

Residential or commercial areas where quick use or aesthetics are factors.

At places where surface water concentrates such as waterways carrying intermittent flows.

Areas around drop inlets or in swales.

Any area where conditions make seeding impractical or impossible.

CRITERIA

Final grade - Prior to soil preparation, areas to be sodded shall be brought to final grade in accordance with the approved plan. Any irregularities in soil surface shall be filled or shaped to prevent the formation of depressions or water pockets.

Soil Preparation - Soil tests should be made to determine the exact requirements for lime and fertilizer. Apply soil amendments uniformly and incorporate into the top 3 to 6 inches of the soil by disking or other acceptable means. Level with a harrow or similar tool. Roll lightly to firm surface after leveling. Prior to laying sod, the soil surface shall be clear of trash, debris, large roots, branches, stones, and clods in excess of 1 inch in length or diameter. Sod shall not be applied to gravel or other non-soil surface.

Sod - High quality sod free of disease, insects or weeds and consisting of about a 3/4 inch mat of vigorous turf will be selected. It shall not be cut or laid in excessively wet or dry weather. Sod shall be harvested, delivered, and installed within a period of 48 hours. The type of sod used must be composed of plants adapted to the site and suited for the use.

Sod Installation - Sod should not be laid if temperatures are too hot or too cold. The soil should be slightly moist but firm enough not to leave depressions if walked on. The first row shall be laid in a straight line perpendicular to the slopes with subsequent rows placed parallel to and butted tightly against each other. Lateral joints shall be staggered to promote more uniform growth and strength. Care shall be taken to prevent voids or over exposure of the roots which would cause drying. As sodding of defined areas is completed, sod shall be rolled or tamped to provide firm contact between roots and soil. Fill any gaps between edges or ends of sod mats with good soil and roll.

Watering - After rolling is complete, sod shall be irrigated to a depth sufficient that the underside of the sod mat and 4 inches of soil below sod is thoroughly wet. Irrigate at a rate that does not result in runoff. Until a good root system develops, supplement rainfall as often as necessary to maintain moist soil to a depth of at least 4 inches.

Mowing - Do not mow for 2-3 weeks or until at least 3 inches of new growth occurs. During the first 4 months do not remove more than 1/3 of the grass leaf at any one cutting.

CONSIDERATIONS

It is initially more costly to install sod than to seed. However, this cost is easily justified in places where sod can perform better than seed or where instant cover for erosion control or aesthetics is wanted.

Sod can be laid during times of the year when seeded grass may fail, so long as there is adequate water available for irrigation in the early weeks if establishment. Sod should not be laid during periods when the ground is frozen or during hot, dry periods.

Select high quality sod that is densely matted, healthy, weed-free and uniformly cut. Sod selected should always be freshly cut and laid within 48 hours. If sodding is delayed keep it cool and moist. High activity or critical runoff areas should be considered for sodding. Areas such as building entrance zones or where concentrated water flows occur should be sodded. Sod provides instant soil stabilization and acts as a natural filter of runoff.

On slopes greater than four (4) percent or where concentrated flows are likely the sod should be staked to prevent movement.

Select a sod that will meet the needs of the site. It will look good and will protect the site for years if properly selected and maintained.

PLANS AND SPECIFICATIONS

The plans for sodding shall specify the following:

1. Site preparation.
2. Fertilization.
3. Installation techniques.

4. Sod type, quality and quantity.
5. Watering.
6. Use and maintenance.

OPERATION AND MAINTENANCE

One of the main features of sod is that it permits almost immediate use of the area. Try to limit foot traffic to low use for the first 2 to 3 weeks. After that normal to high traffic levels can occur if normal growing conditions prevail.

Water the sod regularly, every week to 2 weeks, until a good root system develops. Moisten the soil uniformly to a depth of about 4 inches.

If the site was properly limed and fertilized prior to sodding only maintenance levels of nitrogen (N) phosphorus (P₂O₅) and potassium (K₂O) need to be applied.

Apply maintenance fertilizer beginning one year after sodding to maintain sod health, appearance and vigor. Amount and formulation of the fertilizer depends on the grass mixture and level of turf management. Turf management professionals should be consulted for specific recommendations. If no information is available, a total annual rate of 130 pounds of N per acre (3 pounds per 1,000 sq. ft.) and 40 pounds each of P₂O₅ and K₂O per acre (1 pound per 1,000 sq. ft.) should be applied. Apply as split applications, once in the spring after grass begins to grow (April-May) and once in the fall about 6 weeks before dormancy (August-September).

Mowing should occur as needed to maintain about 2 1/2 - 3 1/2 inches of grass. Generally, no more than 1/3 of

the total foliage should be removed during mowing.

Proper mowing height, fertilization and watering help maintain a disease and weed free sod. If weeds or diseases become a problem consult a turf specialist for treatment recommendations and adhere to label rates.

Special treatment, such as thatching aerating or rolling may be needed on an irregular basis. Consult a turf specialist for these issues.

Do not use sodium chloride salts on walks, or drives where runoff might damage the sod. Areas requiring resodding should be prepared in the same manner as the original installation.

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

STABILIZED CONSTRUCTION ENTRANCE

(no.)
CODE 930



(Source: USDA – Natural Resources Conservation Service – Illinois)

DEFINITION

A stabilized pad of aggregate underlain with filter fabric located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk, or parking area.

PURPOSE

The purpose of this standard is to reduce or eliminate the tracking of sediment onto public right-of-ways or streets.

CONDITIONS WHERE PRACTICE APPLIES

A stabilized construction entrance shall be used at all points of construction ingress and egress.

CRITERIA

Stabilized construction entrance shall meet the following requirements:

Aggregate size - IDOT coarse aggregate gradations: CA-1, CA-2, CA-3, or CA-4.

Thickness - 6 inches or more.

Stone placement - The stone entrance for the entrance shall be placed according to construction specification [25 ROCKFILL](#). Placement will be by Method 1 and compaction will be class III.

Width - 14 feet minimum but not less than the full width of ingress or egress points.

Length - As required, but not less than 70 feet, except on a single residence lot where a 30 feet minimum shall apply.

Filter fabric shall be used under the aggregate to minimize the migration of stone into the underlying soil by heavy vehicle loads. The filter fabric shall meet the requirements of materials specification [592 GEOTEXTILE](#) Table 1 or 2, Class I, II, or IV.

All surface water flowing or diverted toward construction entrances shall be piped across the entrance. If piping is impractical, a mountable berm with 5:1 slopes will be permitted.

Washing - If conditions on the site are such that the vehicles traveling over the gravel do not remove the majority of the mud, then the tires of the vehicles must be washed before entering a public road. Wash water must be carried away from the entrance to a sediment trapping facility such as practice standards [IMPOUNDMENT STRUCTURE-ROUTED 842](#) or [TEMPORARY SEDIMENT TRAP 960](#). All sediment shall be prevented from entering storm drains, ditches, watercourses, or surface waters including wetlands. A wash rack may be used to make washing more convenient and effective.

Location - the washing station should be located to provide for maximum utility by all construction vehicles.

Timing - the graveled access shall be installed as soon as practical after the start of site disturbance.

Removal - the entrance shall remain in place and be maintained until the disturbed area is stabilized by permanent best management practices.

CONSIDERATIONS

Improperly planned and maintained construction entrances can become a continual erosion problem.

The tracking of mud from active building sites onto paved roads by construction vehicles can be greatly reduced, and in some cases eliminated, by the use of a

stabilized construction entrance. These entrances provide an area where mud can be removed from construction vehicle tires before they enter a public road.

If the action of the vehicle tires traveling over the stone is not sufficient to remove the majority of the mud, then the tires must be washed before the vehicle enters a public road. When washing is required it shall be done on an area stabilized with aggregate, or using a wash rack underlain with gravel. Provisions shall be made to intercept the wash water and trap the sediment before it is carried off-site. Construction entrances should be used in conjunction with the stabilization of construction roads, and other exposed areas, to reduce the amount of mud picked up by construction vehicles.

PLANS AND SPECIFICATIONS

Plans and specifications for installing stabilized construction entrances shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Location.
2. Length.
3. Width.
4. Thickness.
5. Type of materials.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [STABILIZED CONSTRUCTION ENTRANCE PLAN IL-630](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

The entrance shall be maintained in a condition that will prevent tracking of sediment onto public right-of-ways or streets. This may require periodic top dressing with additional aggregate. All sediment spilled, dropped, or washed onto public right-of-ways must be removed immediately. Periodic inspection and needed maintenance shall be provided after each rain.

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

STRAW BALE BARRIER

(ft.)
CODE 935



(Source: USDA - Natural Resources Conservation Service - Illinois)

DEFINITION

A temporary barrier consisting of a row of entrenched and anchored straw bales or similar material used to intercept sediment-laden runoff from small drainage areas of disturbed soil.

PURPOSE

The purpose of this practice is to cause deposition of transported sediment load from sheet flow leaving disturbed areas.

CONDITIONS WHERE PRACTICE APPLIES

A straw bale barrier may be used subject to the following conditions:

1. The maximum allowable slope lengths contributing runoff to a straw bale barrier are listed in the following table:

Slope (%)	Maximum Spacing (ft.)
25	25
20	50
15	75
10	100
Flatter than 10	125

2. The maximum drainage area for overland flow to a straw bale barrier shall not exceed 1/4 acre per 100 feet of barrier; and
3. Erosion would occur in the form of sheet and rill erosion; and
4. There is no concentration of water flowing to the barrier; and
5. Where effectiveness is required for less than 3 months.

CRITERIA

Straw bale barriers do not require any formal design but the following requirements must be met:

Bales shall be placed in a single row, lengthwise on the contour, with the ends of adjacent bales tightly abutting one another. The end bales should extend

upslope so that the trapped sediment laden water cannot flow around the ends of the barrier.

All bales shall be either wire-bound or string tied. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales in order to prevent deterioration of the bindings. Hay or other baled material may be used in lieu of straw.

The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After bales are staked and chinked, the excavated soil shall be backfilled and compacted against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier.

Each bale shall be securely anchored by at least two stakes (minimum cross sectional area of 3.0 square inches or standard "T" or "U" steel posts (minimum weight of 1.0 pound per linear foot) or rebars driven through the bale. The first stake in each bale shall be driven toward the previously laid bale to force the bales together. Stakes or steel pickets shall be driven a minimum 18-inch deep into the ground to securely anchor the bales.

The holes between bales shall be chinked (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a straw bale barrier tends to increase efficiency.

Straw bale barriers shall be installed prior to the clearing of existing vegetation or any site grading.

CONSIDERATIONS

Straw bale barriers should be considered for trapping sediment where sheet and rill erosion is occurring in small drainage areas. Straw bale barriers should not be placed in areas of concentrated flow. The practice standard [SILT FENCE 920](#) does the same job and is usually faster and cheaper to install.

Based on field observations in Illinois and other states, straw barriers have not been as effective as a sediment control measure as they could be. There are four major reasons for this. First, improper use of straw bales has been a major problem. Straw bale barriers have been used in streams and drainageways where high water velocities and/or volumes have destroyed them or significantly impaired their effectiveness. Second, improper placement and installation of the barriers, such as staking the bales directly to the ground with no soil seal or entrenchment has allowed undercutting and flow around the end. This has resulted in additions of, rather than removal of, sediment from runoff waters. Third, inadequate inspection and maintenance lowers the effectiveness of these barriers. Fourth, because straw bales decompose in the presence of moisture, they have a very limited life span.

PLANS AND SPECIFICATIONS

Plans and specifications for installing straw bale barriers shall be in keeping with this standard and shall describe the

requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

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1. The depth of trench required to bed the bales.
2. The method(s) required to anchor the bales.
3. The installation, inspection and maintenance schedules with the responsible party clearly identified.
4. The replacement schedule for bales.

Standard drawing [IL-635 STRAW BALE BARRIER PLAN](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

Straw bale barriers shall be inspected immediately after each runoff event and at least daily during prolonged rainfall. Close attention shall be paid to the repair of damaged bales, end runs and undercutting beneath bales. Necessary repairs to the barrier or replacement of bales shall be accomplished promptly.

Sediment deposits should be removed after each rainfall. They must be removed when the level of deposition reaches approximately one-half the height of the barrier.

Any sediment deposits remaining in place after the straw bale barrier is no longer required shall be dressed to conform to the existing grade, prepared and seeded.

Straw bale barriers shall be removed when they have served their usefulness, but not before the upslope areas have been permanently stabilized.

STRUCTURAL STREAMBANK STABILIZATION

(ft.)
CODE 940



(Source: McHenry County Soil and Water Conservation District)

DEFINITION

Stabilization of eroding streambanks by use of designed structural measures.

PURPOSE

The purpose of this practice is to protect streambanks from the erosive forces of flowing water.

CONDITIONS WHERE PRACTICE APPLIES

Sections of streambanks that are subject to erosion due to excessive runoff from construction activities. Generally applicable where flow velocities exceed 5 ft/sec or where vegetative streambank protection is inappropriate.

CRITERIA

Since each reach of channel requiring protection is unique, measures for structural streambank protection should be installed according to a plan based on specific site conditions.

Develop designs according to the following principles:

1. Make protective measures compatible with other channel modifications planned or being carried out in other channel reaches.
2. Use the minimum design velocity of the peak discharge of the 10-year storm. Structural measures must be effective for this design flow and must be capable of withstanding greater flows without serious damage.
3. Ensure that the channel bottom is stable or stabilized by structural means before installing any permanent bank protection.
4. Ensure that streambank protection extends between stabilized or controlled points along the stream.
5. Do not change channel alignment without a complete evaluation of the anticipated effect on the rest of the stream channel, especially downstream.
6. Give special attention to maintaining and improving habitat for fish and wildlife.
7. Ensure that all requirements of state law and all permit requirements of

local, state, and federal agencies are met.

Riprap - Riprap is the most commonly used structural material for stabilizing streambanks. When possible, slope banks to 2:1 or flatter, and place a gravel filter or filter fabric on the smoothed slopes before installing riprap. Place the toe of the riprap at least 1 foot below the stream channel bottom or below the anticipated depth of channel degradation. Where necessary, riprap the entire length between well-stabilized points of the stream channel.

Riprap shall be installed according to the requirements in construction specification [61 LOOSE ROCK RIPRAP](#).

Gabions - These rectangular, rock-filled wire baskets are pervious, semi-flexible building blocks that can be used to armor the bed and/or banks of channels or act as deflectors to divert flow away from eroding channel sections. Gabions shall be installed according to the requirements in construction specification [64 WIRE MESH GABIONS](#).

Reinforced concrete - May be used to armor eroding sections of the streambank by constructing retaining walls or bulkheads. Provide positive drainage behind these structures. Reinforced concrete may also be used as a channel lining for stream stabilization.

Grid pavers - Modular concrete units with interspersed void areas that can be used to armor the streambank while maintaining porosity and allowing the establishment of vegetation. These structures may be obtained in precast

blocks or mats that come in a variety of shapes, or they may be formed and poured in place. Keep design and installation in accordance with manufacturer's instructions.

Revetment - Structural support or armoring to protect an embankment from erosion. Riprap or gabions are commonly used. Gabions may be either stacked or placed as a mattress. Install revetment to a depth below the anticipated channel degradation and into the channel bed as necessary to provide stability. Stabilize all areas disturbed by construction as soon as the structural measures are complete.

CONSIDERATIONS

Stream channel erosion problems vary widely in type and scale, and there is no one measure that works in all cases. Stabilization structures should be planned and designed by an engineer with experience in this field. Many of the practices discussed here involve the use of manufactured products and should be installed in accordance with the manufacturer's specifications. Where long reaches of stream channels require stabilization, make detailed stream studies.

Before selecting a structural stabilization technique, the designer should carefully evaluate the possibility of using vegetative stabilization in conjunction with structural measures to achieve the desired protection. Vegetative techniques are generally less costly and more compatible with natural stream characteristics.

PLANS AND SPECIFICATIONS

A detail of the streambank stabilization shall be shown on the plan, and contain the following minimum requirements.

1. Location and extent of streambank to be stabilized.
2. A detail of the protective layer.
3. Thickness and gradation of riprap, if used.
4. Specifications for the materials used including the filter or filter fabric.

Standard drawing [IL-640 STRUCTURAL STREAMBANK STABILIZATION PLAN](#) may be used as the plan sheet for riprap and standard drawings [IL-641](#), [IL-642](#), [IL-643](#), [IL-644](#), OR [IL-645 STRUCTURAL STREAMBANK STABILIZATION - GABIONS](#) may be used as the plan sheet for gabions.

OPERATION AND MAINTENANCE

Check stabilized streambank sections after every high water event, and make any needed repairs immediately to prevent further damage.

NRCS IL August 1994

urbst940.doc

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

SUBSURFACE DRAIN

(ft.)
CODE 945



(Source: USDA Natural Resources Conservation Service - Illinois)

DEFINITION

A conduit, such as corrugated plastic tubing, tile, or pipe, installed beneath the ground surface to collect and/or convey drainage water.

PURPOSE

The purposes of this practice are to:

1. Improve the soil environment for vegetative growth, reduce erosion, and improve water quality by:
 - a. Regulating the water table and ground water flows,
 - b. Intercepting and preventing water movement into a wet area,
 - c. Relieving artesian pressures,
 - d. Removing surface runoff,
 - e. Leaching of saline and sodic soils,
 - f. Serving as an outlet for other subsurface drains, and
 - g. Regulating subirrigated areas or waste disposal areas.
2. Collect ground water for beneficial uses.
3. Remove water from heavy use areas, such as around buildings,

roads, and play areas; and accomplish other physical improvements related to water removal.

4. Regulate water to control health hazards caused by pests such as liver fluke, flies, or mosquitoes.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to areas having a high water table where the benefits of lowering the water table or controlling ground water or surface runoff justify installing such a system.

This standard applies to areas suitable for the intended use after installation of required drainage and other conservation practices. The soil shall have enough depth and permeability to permit installation of an effective and economically feasible system. The ability to drain and treat saline and sodic soils shall be considered where this is a problem.

In areas where an outlet is available, either by gravity flow or by pumping, the

outlet shall be adequate for the quantity and quality of effluent to be discharged.

CRITERIA

The design and installation shall be based on adequate surveys and investigations.

Capacity - The required capacity shall be determined by one or more of the following:

1. Application of a locally tried and proven drainage coefficient to the acreage drained, including added capacity required to dispose of surface water entering through inlets.
2. Yield of ground water based on the expected deep percolation of irrigation water from the overlying fields, including the leaching requirement.
3. Comparison of the site with other similar sites where subsurface drain yields have been measured.
4. Measurement of the rate of subsurface flow at the site during a period of adverse weather and ground water conditions.
5. Application of Darcy's law to lateral or artesian subsurface flow.
6. Estimates of lateral or artesian subsurface flow.

The minimum required drainage coefficient shall be determined from the Illinois Drainage Guide, for the kinds of crop grown and degree of existing drainage.

Size - The size of subsurface drains shall be computed by applying Manning's formula. The size shall be based on the required capacity and

computed by using one of the following assumptions:

1. The hydraulic gradeline is parallel to the bottom grade of the subsurface drain with the conduit flowing full at design flow.
2. The conduit flowing partly full where a steep grade or other conditions require excess capacity.
3. Conduit flowing under pressure with hydraulic gradeline set by site conditions on a grade that differs from that of the subsurface drain. This procedure shall be used only if surface water inlets or nearness of the conduit to outlets with fixed water evaluations permit satisfactory estimates of hydraulic pressure and flows under design conditions.

All subsurface drains shall have nominal diameter that equals or exceeds 3 inches.

Depth, spacing, and location - The depth, spacing, and location of the subsurface drain shall be based on site conditions, including soils, topography, ground water conditions, crops, land use, outlets, and saline or sodic conditions.

The minimum depth of cover over subsurface drains in mineral soils shall be 2 ft. This minimum depth shall apply to normal field levels and may exclude sections of line near the outlet or sections laid through minor depressions where the conduit is not subject to damage by frost action or equipment travel.

The minimum depth of cover in organic soils shall be 2.5 ft. for normal field levels, as defined above, after initial subsidence. Structural measures shall

be installed if it is feasible to control the water table level in organic soils within the optimum range of depths.

The maximum depth of cover for standard duty corrugated plastic tubing shall be 10 ft for trench widths of 2 ft or less. Heavy-duty tubing shall be specified for depths greater than 10 ft, trench widths more than 2 ft, or in rocky soils. For computation of maximum allowable loads on subsurface drains, use the trench and bedding conditions specified and the crushing strength of the kind and class of drain. The design load on the conduit shall be based on a combination of equipment loads and trench loads. Equipment loads are based on the maximum expected wheel loads for equipment to be used, the minimum height of cover over the conduit, and the trench width. Equipment loads on the conduit may be negated when the depth of cover exceeds 6 ft. Trench loads are based on the type of backfill over the conduit, the width of the trench, and the unit weight of the backfill material. A safety factor of not less than 1.5 shall be use in computing the maximum allowable depth of cover for a particular type of conduit.

Minimum velocity and grade - In areas where sedimentation is not a hazard, the minimum grades shall be based on site conditions and a velocity not less than 0.5 ft/sec. If a sedimentation hazard exists, a velocity of not less than 1.4 ft/sec shall be used to establish the minimum grades. Otherwise, provisions shall be made for preventing sedimentation by use of filters or by collecting and periodically removing sediment from installed traps, or by periodically cleaning the lines with high-

pressure jetting systems or cleaning solutions.

Maximum velocity without protection. Excessive flow velocity in the drain may induce piping of soil material into the drain line.

TABLE 1
Maximum Velocities by Soil Texture

Soil Texture	Velocity (ft./sec.)
Sand & sandy loam	3.5
Silt & silt loam	5.0
Silty clay loam	6.0
Clay & clay loam	7.0
Coarse sand or gravel	9.0

Maximum grade and protection - On sites where topographic conditions require that drain lines be placed on steep grades and design velocities will be greater than indicated under "Maximum velocity without protection," special measures shall be used to protect the conduit or surrounding soil. These measures shall be specified for each job according to the particular conditions of the site.

The protective measures shall include one or more of the following:

1. Enclose continuous perforated pipe or tubing with fabric-type filter material or properly graded sand and gravel.
2. Use nonperforated continuous tubing, a watertight pipe, or seal joints.
3. Place the conduit in a sand and gravel envelope or blinding with the least erodible soil available.
4. Select rigid butt end pipe or tile with straight smooth sections and square ends to obtain tight fitting joints.

5. Wrap open joints of the pipe or tile with tar-impregnated paper, burlap, or special fabric-type filter material.
6. Install open-air risers for air release or entry.

Iron ochre considerations - If drains are to be installed in sites where iron ochre problems are likely to occur, provisions should be made to provide access for cleaning the lines. Each drain line should outlet directly into an open ditch and/or should have entry ports as needed to provide access for cleaning equipment. Drain cleaning provisions should be installed in such a way that the drains can be cleaned in an upstream or rising grade direction. If possible, drains in ochre-prone areas should be installed during the dry season when the water table is low and the iron is in its insoluble form.

Where possible, in areas where the potential for ochre problems is high, protection against ochre development can be provided by designing an outlet facility to ensure permanent submergence of the drain line.

Protection against root clogging -

Problems may occur where it is necessary to place drains in close proximity to perennial vegetation. Roots of water-loving trees, such as willow, cottonwood, elm, and soft maple, or some shrubs and grasses growing near subsurface drains may enter and obstruct the flow.

The first consideration is to use nonperforated tubing or closed joints through the root zone area. Where this is not possible, water-loving trees should be removed from a distance of at least 100-ft on each side of the drain. A distance of 50 ft should be maintained from other species of trees except for

fruit trees. Orchards can often be drained by drains located close to the fruit trees.

Where crops and grasses may cause trouble to drain lines, facilities may be installed to provide a means for submerging the line to terminate the root growth as desired or to maintain a water table above the drainlines to prevent growth into the system.

Materials - Subsurface drains include conduits of plastic, clay, concrete, bituminized fiber, metal, or other materials of acceptable quality. The conduit shall meet strength and durability requirements of the site.

Foundation - If soft or yielding foundations are encountered, the lines shall be stabilized and protected from settlement by adding gravel or other suitable materials to the trench, by placing the conduit on a treated plank that will not readily decompose or on other rigid supports, or by using long sections of non-perforated watertight pipe having adequate strength to insure satisfactory subsurface drain performance. The use of a flat treated plank is not recommended for corrugated plastic tubing.

Filters and Filter Material - Filters will be used around conduits, as needed, to prevent movement of the surrounding soil material into the conduit. The need for a filter will be determined by the characteristic of the surrounding soil material, site conditions, and velocity of flow in the conduit. A suitable filter should be specified if:

1. Local experience indicates a need,
2. Soil materials surrounding the conduit are dispersed clays, low

plasticity silts, or fine sands (ML or SM with P.I less than 7),

3. Where deep soil cracking is expected, or
4. Where the method of installation may result in voids between the conduit and backfill material.

If a sand-gravel filter is specified, the filter gradation will be based on the gradation of the base material surrounding the conduit within the following limits:

D15 size smaller than 7 times d85 size but not smaller than 0.6 mm.

D15 size larger than 4 times d15 size, less than 5% passing No. 200 sieve, maximum size smaller than 1.5 inches.

D represents the filter material and d represents the surrounding base material. The number following each letter is the percent of the sample, by weight that is finer than that size. For example, D15 size means that 15 percent of the filter material is finer than that size.

Specified filter material must completely encase the conduit so that all openings are covered with at least 3 inches of filter material except that the top of the conduit and side filter material may be covered by a sheet of plastic or similar impervious material to reduce the quantity of filter material required. Artificial fabric or mat-type filter materials may be used, provided that the effective opening size, strength, durability, and permeability are adequate to prevent soil movement into the drain throughout the expected life of the system.

Envelopes and envelope material - Envelopes shall be used around

subsurface drains if they are needed for proper bedding of the conduit or to improve the characteristics of flow of ground water into the conduit.

Materials used for envelopes do not need to meet the gradation requirements of filters, but they must not contain materials that will cause an accumulation of sediment in the conduit or that will render the envelope unsuitable for bedding of the conduit.

Envelope materials shall consist of sand-gravel, organic, or similar material. Sand-gravel envelope materials shall all pass a 1.5 inch sieve; not more than 30 percent shall pass a No. 60 sieve; and not more than 5 percent shall pass the No. 200 sieve. ASTM-C-33 fine aggregate for concrete has been satisfactorily used and is readily available.

Where organic or other compressible materials are used, they shall be used only around a rigid wall conduit and above the centerline or flexible tubing. All organic or other compressible material shall be of a type that will not readily decompose.

Placement and bedding - The conduit should not be placed on exposed rock or stones more than 1.5 inches in diameter. Where such conditions are present the trench must be overexcavated a minimum of 6 inches and refilled to grade with a suitable bedding material.

The conduit must be placed on a firm foundation to insure proper alignment. If installation will be below a water table or where unstable soils are present, special equipment, installation procedures, or bedding materials may

be needed. These special requirements may also be necessary to prevent soil movement into the drain or plugging of the envelope if installation will be made in such materials as quicksand or a silt slurry. For trench installations of corrugated plastic tubing 8 inches or less in diameter, one of the following bedding methods will be specified:

1. A shaped groove or 90 degree V-notch in the bottom of the trench for tubing support and alignment.
2. As sand-gravel envelope, at least 3 inches thick, to provide support.
3. Compacted soil bedding material beside and to 3 inches above the tubing.

For trench installations of corrugated plastic tubing larger than 8 inches, the same bedding requirements will be met except that a semi-circular or trapezoidal groove shaped to fit the conduit will be used rather than a V-shaped groove.

For rigid conduits installed in a trench, the same requirements will be met except that a groove or notch is not required.

All trench installations should be made when the soil profile is in its driest possible condition in order to minimize problems of trench stability, conduit alignment, and soil movement into the drain.

For trench installations where a sand-gravel or compacted bedding is not specified, the conduit should be blinded with selected material containing no hard objects larger than 1.5 inches in diameter. Blinder should be carried to a minimum of 3 inches above the conduit.

Auxiliary structures and protection -

Structures installed in drain lines must not unduly impede the flow of water in the system. Their capacity must be no less than that of the line or lines feeding into or through them. The use of internal couplers for corrugated plastic tubing will be allowed.

If the drain system is to carry surface water flow, the capacity of the surface water inlet shall not be greater than the maximum design flow in the drain line or lines. Covers, orifice plates, and/or trash racks should be used to ensure that no foreign materials are allowed in the drain lines.

The capacity of a relief well system will be based on the flow from the aquifer, the well spacing, and other site conditions and will be adequate to lower the artesian waterhead to the desired level.

The size of relief wells is generally based on the available material rather than on hydraulic consideration. Such wells will not be less than 4 inches in diameter.

Junction boxes, manholes, catch basins, and sand traps must be accessible for maintenance. A clear opening of not less than 2 feet will be provided in either circular or rectangular structures. The drain system must be protected against velocities exceeding those proved under "Maximum velocity without protection" and against turbulence created near outlets, surface inlets, or similar structures. Continuous or closed joint pipe must be used in drain lines adjoining the structure where excessive velocities will occur.

Junction boxes shall be installed where three or more lines join or if two lines join at different elevations. In some locations it may be desirable to bury junction boxes. A solid cover should be used, and the junction box should have a minimum of 1 1/2 foot of soil cover.

If not connected to a structure, the open end of each subsurface drain line will be capped with a tight-fitting cap of the same material as the conduit or other durable materials.

The outlet must be protected against erosion and undermining of the conduit, entry of tree roots, damaging periods of submergence, and entry of rodents or other animals into the subsurface drain. A continuous section of rigid pipe without open joints or perforations will be used at the outlet end of the line and must discharge above the normal elevation of low flow in the outlet ditch. Corrugated plastic tubing is not suitable for the outlet section. Minimize the visual impact of projecting outlets.

Continuously submerged outlets will be permitted for water table control systems.

The outlet pipe and its installation will conform to the following requirements:

1. If burning vegetation on the outlet ditch bank is likely to create a fire hazard; the material from which the outlet pipe is fabricated must be fire resistant. If the likelihood is great, the outlet pipe must be fireproof.
2. Two-thirds of the pipe will be buried in the ditch bank, and the cantilever section must extend to the toe of the ditch side slope or the side protected from erosion. The minimum length of the pipe will normally be 8 feet.

Under certain conditions shorter sections are appropriate, e.g., steep-sided main and laterals (1:1 or less) with a narrow bottom width of 3 feet, commonly referred to as "minimum ditches," for outletting individual subsurface drain laterals. For conduits 10 inches in diameter and greater, longer outlet sections should be considered, such as:

10 inches and 12 inches in diameter, use 12 feet.

15 inches and 18 inches in diameter, use 16 feet.

Use 20-foot outlet pipe for all diameters larger than 18 inches.

3. If ice or floating debris may damage the outlet pipe, the outlet shall be recessed to the extent that the cantilevered part of the pipe will be protected from the current in the ditch.
4. Headwalls used for subsurface drain outlets must be adequate in strength and design to avoid washouts and other failures.

Watertight conduits strong enough to withstand the expected loads will be used if subsurface drains cross under irrigation canals, ditches, or other structures. Conduits under roadways must be designed to withstand the expected loads. Shallow subsurface drains through depressed or low areas and near outlets must be protected from damage caused by farm machinery and other equipment and from freezing and thawing.

CONSIDERATIONS

Consideration shall be given to possible damages above or below the point of discharge that might involve legal

actions under state or local laws. Consideration shall be given to maintaining or enhancing environmental values.

Septic tanks and other waste disposal systems shall not be connected to subsurface drain systems.

Where wetlands will be affected, the cooperators will be advised and USDA-NRCS wetland policy shall apply.

PLANS AND SPECIFICATIONS

Plans and specification for installing subsurface drains shall be in keeping with this standard and include the following:

1. Drain location and alignment.
2. Drain depth and grade.
3. Filter and envelope requirements (if used).
4. Material requirements.
5. Backfilling requirements.

OPERATION AND MAINTENANCE

A properly designed and installed subsurface drain requires little maintenance. However, check drains periodically and especially after heavy rains to see that they are operating properly. Keep the outlet free of sediment and other debris, and keep the animal guard in place and functional. Investigate any wet areas along the line for possible cave-in due to vehicle traffic, blockage by roots, or other problems. Make all needed repairs promptly.

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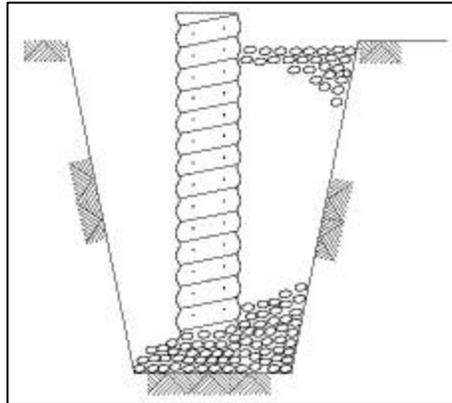
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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

SUMP PIT

(no.)

CODE 950



(Source: USDA – Natural Resources Conservation Service – Illinois)

DEFINITION

A temporary pit which is constructed to trap and filter water for pumping into a suitable discharge area.

PURPOSE

The purpose of this practice is to remove excessive water from excavations in a manner that improves the quality of the water being pumped.

CONDITIONS WHERE PRACTICE APPLIES

Sump pits are constructed when water collects during the excavation phase of construction. This practice is particularly useful in urban areas during excavation for building foundations.

CRITERIA

A perforated vertical standpipe is placed in the center of the pit to collect filtered water. The standpipe will be a perforated 12 to 24-inch diameter corrugated metal or PVC pipe. Water is then pumped from the center of the pipe

to a suitable discharge area. The pit will be filled with coarse aggregate meeting the requirements of IDOT standards for gradations of CA-2, CA-3 or CA-4.

CONSIDERATIONS

Discharge of water pumped from the standpipe should be to a suitable practice such as practice standard [IMPOUNDMENT STRUCTURE-ROUTED 842](#), [PORTABLE SEDIMENT TANK 895](#), [TEMPORARY SEDIMENT TRAP 960](#), or a stabilized area. If water from the sump pit will be pumped directly to a storm drainage system, filter fabric will be wrapped around the standpipe to ensure clean water discharge. The fabric, if used, shall meet the requirements as shown in material specification [592 GEOTEXTILE](#) Table 1 or 2, Class 1 with an equivalent opening size of at least 30 for non-woven or 50 for woven. It is recommended that 1/4 to 1/2 inch hardware cloth wire be wrapped around and secured to the standpipe prior to attaching the filter fabric. This will increase the rate of water seepage into the standpipe.

PLANS AND SPECIFICATIONS

Plans and specifications for installing and utilizing sump pits shall be in keeping with standard and shall describe the requirements for applying the practice to achieve its intended purpose.

The contractor or responsible reviewing authority will determine the number of sump pits and their locations.

Standard drawing [IL-650 SUMP PIT PLAN](#) may be used as a plan sheet.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

OPERATION AND MAINTENANCE

The sump pit may have to be replaced if the pit and filter fabric plugs with sediment.

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

SURFACE ROUGHENING

(acre or sq. ft.)
CODE 953



(Source:VA Erosion and Sediment Control Handbook)

DEFINITION

A rough soil surface with horizontal grooves running across the slope on the contour, stair stepping, or tracking with construction equipment.

PURPOSE

The purposes of this practice are to aid in the establishment of vegetative cover from seed, reduce runoff velocity, increase infiltration, reduce erosion, and provide for sediment trapping.

CONDITIONS WHERE PRACTICE APPLIES

Areas that have been graded and are to be stabilized with vegetation established by seed without use of an erosion control mat.

Areas that have been graded and will not be permanently stabilized immediately.

Slopes with a stable rock face do not require roughening or stabilization.

CRITERIA

All slopes steeper than 3:1 (horizontal to vertical) shall be surface roughened by either stair-step grading, grooving, or tracking.

Areas with slopes flatter than 3:1 shall have the soil surface lightly roughened and loosened to a depth of 2 to 4 inches prior to seeding.

Stair-step grading shall consist of cutting a slope into stair steps. Each step shall have a vertical cut depth to horizontal step length of less than 1:1. The horizontal portion of the step shall slope toward the vertical wall. Individual vertical cuts shall not be more than 30 inches on soft materials and not more than 40 inches in rocky materials.

Grooving shall consist of using machinery to create a series of ridges and depressions that run perpendicular to the slope (on the contour). Grooves shall not be less than 3 inches deep nor further than 15 inches apart except for areas that will be mowed where the

grooves shall not be less than 1 inch deep nor further than 10 inches apart.

Tracking shall consist of surface roughening with tracked machinery. Tracking shall only be used on coarse texture or relatively dry, finer-texture soils to avoid compaction of the soil. The tracked machinery shall be operated up and down the slope to leave horizontal depressions in the soil. Back-blading shall not be permitted during the final grading operation. The number of machinery passes shall be limited to minimize soil compaction.

All surface roughened areas shall be seeded and mulched as soon as possible to obtain optimum seed germination and seedling growth. Seeding and mulching shall be completed in accordance with practice standards [MULCHING 875](#), [PERMANENT VEGETATION 880](#), or [TEMPORARY SEEDING 965](#), as appropriate.

Fill slopes that are surface roughened by allowing the surface to remain rough as the fill is placed and compacted shall have a loose uncompacted surface depth of 4 to 6 inches.

CONSIDERATIONS

Rough slope surfaces are preferred because they aid in the establishment of vegetation, improve water filtration, and decrease runoff velocity. Graded areas with smooth, hard surfaces may be initially attractive, but such surfaces increase the potential for erosion. A rough, loose soil surface gives a mulching effect that protects lime, fertilizer and seed. Nicks in the surface are cooler and provide more favorable

moisture conditions than hard, smooth surfaces; this aids seed germination.

There are different methods for achieving a roughened soil surface on a slope, and the selection of an appropriate method depends upon the type of slope. Factors to be considered in choosing a method are slope steepness, mowing requirements, and whether the slope is formed by cutting or filling.

Stair-step grading may be carried out on any material soft enough to be ripped with a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading.

Grooves may be made with any appropriate implement that can be safely operated on the slope and which will not cause significant compaction. Suggested implements include offset discs, tillers, spring harrows, chisel rippers, and the teeth on a front-end loader bucket.

For areas that will be mowed, surface roughening should consist of shallow grooves created by normal tilling, disking, harrowing, or use of a cultipacker-seeder. The final pass of any such implement shall be on the contour.

Tracking is generally not as effective as the other roughening methods described since the soil surface is more likely to be compacted which results in less infiltration of runoff.

PLANS AND SPECIFICATIONS

Plans and specifications for surface roughening shall be in keeping with this standard and shall describe the

requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Location
2. Method and equipment needed

All plans shall include installation, inspection, and maintenance schedules with the responsible party identified.

OPERATION AND MAINTENANCE

The slope shall be inspected after every runoff producing rain and repairs made as needed. Fill any eroded areas to slightly above the original grade, re-roughen the surface, then re-seed and mulch as soon as possible.

REFERENCES

North Carolina Sedimentation Control Commission, 1988. Erosion and Sediment Control Planning and Design Manual. NC

Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1992. Virginia Erosion and Sediment Control Handbook, 3rd ed., VA

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TEMPORARY DIVERSION

(ft.)
CODE 955



(Source: NC Erosion and Sediment Control Planning and Design Manual)

DEFINITION

A temporary ridge or excavated channel or combination ridge and channel constructed across sloping land on a predetermined grade.

PURPOSE

The purpose of this practice is to protect work areas from upslope runoff and to divert sediment-laden water to an appropriate sediment trapping facility or stabilized outlet.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to construction areas where runoff can be diverted and disposed of properly to control erosion, sedimentation, or flood damage. Specific locations and conditions include:

1. Above disturbed existing slopes, and above cut or fill slopes to prevent runoff over the slope;
2. Across unprotected slopes, as slope breaks, to reduce slope length;

3. Below slopes to divert excess runoff to stabilized outlets;
4. Where needed to divert sediment-laden water to sediment traps such as practice standard [IMPOUNDMENT STRUCTURE-ROUTED 842](#);
5. At or near the perimeter of the construction area to keep sediment from leaving the site;
6. Above disturbed areas before stabilization to prevent erosion and maintain acceptable working conditions.
7. Temporary diversions may also serve as sediment traps when the site has been overexcavated on a flat grade. They may also be used in conjunction with a silt fence, practice standard [SILT FENCE 920](#).
8. Where active construction activities make the use of a permanent practice standard [DIVERSION 815](#) unfeasible.

CRITERIA

Temporary diversions must be planned to be stable throughout their useful life and to meet the criteria given below.

Those not meeting the criteria stated below will be designed as permanent diversions. See practice standard DIVERSION 815.

1. Drainage area will not exceed three acres.
2. The minimum cross section will be as follows:

Top Width (ft.)	Height (ft.)	Side Slopes
0	1.5	4:1
4	1.5	2:1

3. The grade may be variable depending upon the topography and must have a positive grade to the outlet. The maximum channel grade will be limited to 1.0 percent.
4. The maximum spacing of diversions on side slopes or graded rights-of-way will be no greater than the following:

Land Slope (%)	Maximum Spacing (ft.)
1 or less	300
2 – 3	200
3 – 5	150
5 or greater	100

5. Diverted runoff will outlet onto a stabilized area, into a properly designed waterway, grade stabilization structure or sediment trapping facility.
6. Diversions that are to serve longer than 30 working days shall be seeded and mulched meeting the requirements in practice standards [TEMPORARY SEEDING 965](#) and [MULCHING 875](#) as soon as they are constructed to preserve dike height and reduce maintenance.

7. The channel cross section may be parabolic, v-shaped or trapezoidal.

CONSIDERATIONS

It is important that diversions are properly designed, constructed and maintained since they concentrate water flow and increase erosion potential. Particular care must be taken in planning diversion grades. Too much slope can result in erosion in the diversion channel or at the outlet. A change of slope from steeper grade to flatter may cause deposition to occur. The deposition reduces carrying capacity and may cause overtopping and failure.

Frequent inspection and timely maintenance are essential to the proper functioning of diversions. Sufficient area must be available to construct and properly maintain diversions.

It is usually less costly to excavate a channel and form a ridge or dike on the downhill side with the spoil than to build diversions by other methods. Where space is limited, it may be necessary to build the ridge by hauling in diking material or using a silt fence to divert the flow. Use gravel to armor the diversion dike where vehicles must cross frequently.

Temporary diversions may serve as in-place sediment traps if overexcavated 1 to 2 feet and placed on a nearly flat grade. The dike serves to divert water as the stage increases. A combination silt fence and channel in which fill from the channel is used to stabilize the fence can trap sediment and divert runoff simultaneously.

Wherever feasible, build and stabilize diversions and outlets before initiating other land-disturbing activities. Construction of diversions will be in compliance with Illinois drainage laws.

PLANS AND SPECIFICATIONS

Plans and specifications for installing temporary diversions shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Diversion location.
2. Channel grade.
3. Diversion cross-sections.
4. Seeding and fertility rates.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Construction of the diversion shall meet the requirements as listed in the construction specification [27 DIVERSIONS AND WATERWAYS](#); standard drawing [IL-655 TEMPORARY DIVERSION PLAN](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

Inspect temporary diversions once a week and after every rainfall. Immediately remove sediment from the flow area and repair the diversion ridge. Carefully check outlets and make timely repairs as needed. When the area protected is permanently stabilized, remove the ridge and the channel to blend with the natural ground level and appropriately stabilize it.

NRCS IL August 1994

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TEMPORARY SEDIMENT TRAP

(no.)
CODE 960



(Source: NC Erosion and Sediment Control Planning and Design Manual)

DEFINITION

A small, temporary ponding basin formed by construction of an embankment or excavated basin.

PURPOSE

The purpose of this practice is to detain sediment-laden runoff from small-disturbed areas for a sufficient period of time to allow the majority of sediment and other water-based debris to settle out.

CONDITIONS WHERE PRACTICE APPLIES

1. At the outlets of diversions, channels, slope drains, or other runoff conveyances that discharge sediment-laden water.
2. Below areas that are 5 acres or less.
3. Where access can be maintained for sediment removal and proper disposal.
4. In the approach to a storm water inlet located below a disturbed area as part of an inlet protection system.

5. Structure life should be limited to 18 months.
6. Where failure of the structure will not result in loss of life, damage to homes, commercial or industrial buildings, main highways or railroads; or in the use or service of public utilities.

CRITERIA

Storage capacity - Designs shall provide for both sediment storage and detention storage.

The sediment storage shall be sized to store the estimated sediment load generated from the site over the duration of the construction period with a minimum storage equivalent to the volume of sediment generated in one year. For construction periods exceeding one year, the one-year sediment load and a sediment removal schedule may be substituted.

The detention storage shall be composed of equal volumes of "wet" and "dry" detention storage. Each shall be sized for the runoff from either a 2-

year, 24-hour storm from the area draining into the basin under maximum runoff conditions during construction, or 134 cubic yards/acre based on the area draining into the basin, whichever is greater. Half of the detention storage shall be below the permeable fill.

Embankment - Ensure that embankments for temporary sediment traps do not exceed 5 feet in height measured at the centerline from the original ground surface to the top of the embankment. Additional freeboard may be added to the embankment height to allow flow through a designed bypass location. Construct embankments with a minimum top width of 5 feet and side slopes of 2:1 or flatter. Machine compact embankments according to the requirements in construction specification [23 EARTHFILL](#).

The design height of the embankment shall be increased by the amount needed to insure that after settlement the height of the dam equals or exceeds the design height. The height of the embankment shall be increased by 5% where the fill material is placed in lifts of 8" or less and compacted by heavy equipment traversing the fill. The height shall be increased by 10% when fill material is pushed up and compacted by a bulldozer.

The original ground under the embankment shall be scarified to a depth of 6" or more prior to placement of the fill material. Fill material shall not be placed over frozen ground. The earthen embankment shall be seeded with temporary or permanent vegetation in accordance with methods outlined in the practice standards [PERMANENT VEGETATION 880](#) or [TEMPORARY SEEDING 965](#).

Excavation - Where sediment pools are formed or enlarged by excavation, keep side slopes at 2:1 or flatter for safety.

Outlet section - Construct the sediment trap outlet using a stone section of embankment located at the low point in the basin. The stone section serves two purposes: 1) the top section serves as a nonerosive spillway outlet for flood flow, and 2) the bottom section provides a means of dewatering the basin between runoff events.

Stone size - A combination of coarse aggregate and riprap shall be used to provide for filtering/detention as well as outlet stability. Construct the outlet using well-graded stones with a d50 size of 9 inches and a maximum stone size of 14 inches (IDOT RR-4). A 1-foot thick layer of 1/2-inch rock (IDOT CA-2) should be placed on the inside face to reduce drainage flow rate.

Side slopes stone layer thickness - Keep the side slopes of the spillway at least 21 inches thick.

Depth - Keep the crest of the spillway outlet a minimum of 1.5 feet below the settled top of the embankment.

Protection from piping - Place filter cloth, according to the requirements in material specification [592 GEOTEXTILE](#) Table 1 or 2, Class I, II or IV with an AOS of 30 for nonwoven and 50 for woven, between the soil and the riprap to prevent piping. An alternative would be to excavate a keyway trench across the riprap foundation and up the sides to the height of the dam.

Weir length and depth - Keep the spillway weir at least 4 feet long and sized to pass the peak discharge of the 10 year frequency, 24-hour duration

storm without failure, overtopping of the basin or significant erosion. A maximum flow depth of 1 foot, a minimum freeboard of 0.5 feet, and maximum side slopes of 2:1 are required. Weir length may be selected from the table below:

Drainage Area (acres)	Weir Length (ft.)
1	4.0
2	6.0
3	8.0
4	10.0
5	12.0

Dimensions shown are minimum.

The release rate of the basin shall be that rate required to achieve minimum detention times of at least 10 hours. The elevation of the permeable fill outlet shall be placed such that it only drains the dry detention storage.

Direct spillway bypass to natural, stable areas. Locate bypass outlets so that flow will not damage the embankment.

Discharges from both the principal and emergency spillways of a sediment trap must be conveyed to a natural waterway in a channel of adequate capacity and stability. Where this channel intersects with the natural waterway, the discharge shall be less than 1 1/2 feet per second or otherwise below the velocity which will initiate erosion or scour within the receiving waterway. Outlets to stormwater facilities must have adequate capacity to receive the discharge from the sediment trap.

Where an emergency spillway is utilized, the spillway crest elevation should be at least 1.5 feet below the settled top of the embankment with the emergency spillway crest being 0.5 feet below the top of the embankment.

Rock placement - The rock will be placed according to construction specification [25 ROCKFILL](#). Placement will be by Method 1 and compaction of rockfill will be Class III.

CONSIDERATIONS

Select locations for sediment traps during site evaluation. Note natural drainage divides and select trap sites so that runoff from potential sediment-producing areas can easily be diverted into the traps.

Make traps readily accessible for periodic sediment removal and other necessary maintenance. Plan locations for sediment disposal as part of trap site selection. Clearly designate all disposal areas on the plans.

In preparing plans for sediment traps, it is important to consider provisions to protect the embankment from failure from storm runoff that exceeds the design capacity. Consider nonerosive emergency spillway bypass areas, particularly if there could be severe consequences from failure. If a bypass is not possible and failure would have severe consequences, consider alternative sites.

Sediment trapping is achieved primarily by settling within a permanent pool formed by excavation, or by a combination of excavation and embankment. Sediment-trapping efficiency is a function of surface area and inflow rate. Installations that provide pools with large length to width ratios reduce short-circuiting and allow more of the pool surface area for settling. This optimizes efficiency.

The minimum length of flow through the trap should be 10 feet and the minimum

length to width ratio should be 2:1. If site conditions permit a greater travel distance through the basin and greater length to width ratio the water quality benefit provided by the sediment trap will be enhanced. The average trap permanent pool depth should be a minimum of 3 feet to prevent resuspension of sediments.

Another method of improving the trapping efficiency is to place geotextile fabric between the riprap and coarse aggregate. If this is done, timely maintenance is needed to assure that the outlet does not clog with sediment.

Because well-planned sediment traps are key measures to preventing off-site sedimentation, they should be installed in the first stages of project development.

PLANS AND SPECIFICATIONS

Plans and specifications for temporary sediment traps shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Location of the sediment traps.
2. Size of basin including width, length and depth.
3. Minimum cross section of embankment.
4. Minimum profile through spillway.
5. Location of emergency spillway, if used.
6. Gradation and quality of rock.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

The standard drawing [IL-660 TEMPORARY SEDIMENT TRAP](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

Inspect temporary sediment traps after each period of significant rainfall. Remove sediment and restore the trap to its original dimensions when the sediment has accumulated to one-half the design depth of the permanent pool. Place the sediment that is removed in the designated disposal area and replace the contaminated part of the gravel facing.

Check the structure for damage from erosion or piping. Periodically check the depth of the spillway to ensure it is a minimum of 1.5 feet below the low point of the embankment to slightly above design grade. Any riprap displaced from the spillway must be replaced immediately.

After all sediment-producing areas have been permanently stabilized, remove the structure and all unstable sediment. Smooth the area to blend with the adjoining areas and stabilize properly.

REFERENCES

Illinois Department of Transportation, 1997. Standard Specifications for Road and Bridge Construction. IL

North Carolina Sedimentation Control Commission, 1988. Erosion and Sediment Control Planning and Design Manual. NC

Northeastern Illinois Planning Commission, 1991. Model Soil Erosion and Sediment Control Ordinance. IL

Northeastern Illinois Planning
Commission, 1993. Urban Stormwater
Best Management Practices for
Northeastern Illinois. IL

Virginia Department of Conservation
and Recreation, Division of Soil and
Water Conservation, 1992. Virginia
Erosion and Sediment Control
Handbook. 3rd ed., VA

NRCS IL October 2001

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TEMPORARY SEEDING

(acre or sq. ft.)

CODE 965



(Source: USDA Natural Resources Conservation Service - Illinois)

DEFINITION

Planting rapid-growing annual grasses or small grains, to provide initial, temporary cover for erosion control on disturbed areas.

PURPOSE

The purpose of this practice is to temporarily stabilize denuded areas that will not be brought to final grade or on which construction will be stopped for a period of more than 14 working days.

Temporary seeding helps reduce runoff and erosion until permanent vegetation or other erosion control measures can be established. In addition, it provides residue for soil protection during seedbed preparation and reduces problems of mud and dust production from bare soil surfaces during construction.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cleared, unvegetated, or sparsely vegetated soil

surfaces where vegetative cover is needed for less than 1 year.

Applications of this practice include diversions, dams, temporary sediment basins, temporary road banks, topsoil stockpiles and any other exposed areas of a construction site.

CRITERIA

Plant selection - Select plants appropriate to the season and site conditions from Table 1.

Site preparation - Prior to seeding, install necessary erosion control and sediment control practices if possible.

Remove large rocks or other debris that may interfere with seedbed preparation or seeding operations.

Seedbed preparation:

1. Liming: Where the pH of the soil is below 5.5, apply one and one half to two tons per acre of finely ground agricultural limestone. If the seeding period is less than 30 days liming will not be required.

2. Fertilizer: Apply 500 pounds per acre of 10-10-10 fertilizer or equivalent. Incorporate lime and fertilizer into the top 2 - 4 inches of soil. If the seeding period is less than 30 days fertilizer will not be required.
3. Prepare a seedbed of loose soil to a depth of 3 to 4 inches. If recent tillage or grading operations have resulted in a loose surface, additional tillage or roughening may not be required except to break up large clods. If rainfall caused the surface to become sealed or crusted, loosen it just prior to seeding by disking, raking, harrowing, or other suitable methods. Groove or furrow slopes steeper than 3:1 on the contour before seeding.

Seeding - Seed shall be evenly applied with a cyclone seeder, drill, cultipacker seeder or hydroseeder. Small grains shall be planted no more than one inch deep. Grasses shall be planted no more than one half inch deep.

Cover broadcast seedings by cultipacking, dragging a harrow, or raking.

Mulching - Seedings made during optimum spring and summer seeding dates, with favorable soil and site conditions, will not require mulch.

When temporary protection is needed see practice standard MULCHING 875.

CONSIDERATIONS

Temporary seedings should be used to protect earthen structures such as dikes, diversions, dams and other structures used for sediment control during construction. Temporary seedings can also reduce the amount of

maintenance these structures may need. For example, the frequency of sediment basin clean-outs will be reduced if watershed areas, outside the active construction zone, are stabilized.

Proper seedbed preparation, selection of appropriate species, and use of quality seed are as important in this practice as in practice standard [PERMANENT VEGETATION 880](#).

Failure to follow established guidelines and recommendations carefully might result in an inadequate or short-lived stand of vegetation that will not control erosion.

Temporary seeding provides protection for no more than 1 year, during which time permanent stabilization should be initiated.

PLANS AND SPECIFICATIONS

Plans and specifications for temporary seeding shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Plant species to be used
2. Dates of seeding
3. Seedbed preparation
4. Fertilization and seeding rates and methods.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

OPERATION AND MAINTENANCE

Reseed areas where seedling emergence is poor, or where erosion occurs, as soon as possible. Protect from vehicular and foot traffic. Control weeds by mowing.

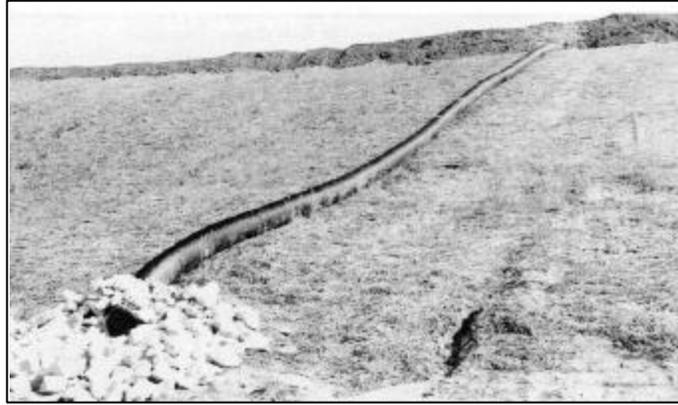
TABLE 1

TEMPORARY SEEDING SPECIES, RATES AND DATES

Species	Lbs./Acre	Lbs./1000 ft. ²	Seeding Dates
Oats	90	2	Early spring – July 1
Cereal Rye	90	2	Early spring – Sept. 30
Wheat	90	2	Early spring – Sept. 30
Perennial Ryegrass	25	0.6	Early spring – Sept. 30

TEMPORARY SLOPE DRAIN

(no.)
CODE 970



(Source: IN Handbook for Erosion Control on Developing Areas)

DEFINITION

A flexible tubing or rigid conduit extending temporarily from the top to the bottom of a cut or fill slope.

PURPOSE

The purpose of this practice is to convey concentrated runoff down the face of a cut or fill slope without causing erosion on or below the slope.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to construction areas where stormwater runoff above a cut or fill slope will cause erosion if allowed to flow over the slope. Temporary slope drains are generally used in conjunction with temporary diversions or diversion dikes to convey runoff down a slope until permanent water disposal measures can be installed. The maximum allowable drainage area is 5 acres per slope drain.

CRITERIA

Capacity - Peak runoff from the 10-year frequency, 24-hour duration storm.

Dike design - An earthen dike, meeting the requirements of practice standards [TEMPORARY DIVERSION 955](#) or [DIVERSION DIKE 820](#), shall be used to direct stormwater runoff into the temporary slope drain.

Pipe size - Unless individually designed, size drains according to the following table:

Pipe/Tubing Diameter (D)	Maximum Drainage Area
12 inches	0.5 acres
18 inches	1.5 acres
21 inches	2.5 acres
24 inches	3.5 acres
30 inches	5.0 acres

Inlet - The height of the earth dike at the entrance to the pipe slope drain shall be equal to or greater than the diameter of the pipe, $D + 18$ inches and at least 6 inches higher than the adjoining ridge on either side. The lowest point of the

ridge should be a minimum of 1 foot above the top of the drain so that design flow can freely enter the pipe. The minimum top width of the dike at the inlet shall be 4 feet. The inlet may be a standard IDOT flared end section with a minimum 6-inch toe plate. A standard T-section fitting may also be used. All connections shall be watertight. Appropriate inlet protection shall be used if a sediment trapping facility is impractical downstream. If ponding will cause a problem at the inlet and make such protection impractical, appropriate sediment removing measures shall be taken at the outlet of the pipe.

Outlet - The pipe slope drain shall outlet into a sediment-trapping device when the drainage area is disturbed. A riprap apron meeting the requirements of practice standard [ROCK OUTLET PROTECTION 910](#) shall be installed below the pipe outlet where water is being discharged into a stabilized area.

Conduit - The conduit shall have a slope of 3 percent or steeper and be installed with watertight connecting bands. The conduit material may be smooth iron; corrugated metal or heavy duty non-perforated corrugated plastic pipe or specially designed flexible tubing.

Install reinforced, hold-down grommets or stakes to anchor the conduit at intervals not to exceed 10 ft with the outlet end securely fastened in place. The conduit must extend beyond the toe of the slope. Terminate the drain in a 4-foot level section where practical.

CONSIDERATIONS

There is often a significant lag between the time a cut or fill is graded and the time it is permanently stabilized. During

this period, the slope is very vulnerable to erosion, and temporary slope drains together with temporary diversions can provide valuable protection.

Temporary slope drains must be sized, installed, and maintained properly, because failure will usually result in severe erosion of the slope. The entrance section to the drain should be well entrenched and stable so that surface water can enter freely. The drain should extend downslope beyond the toe of the slope to a stable area or outlet.

Other points of concern are failure from overtopping from inadequate pipe inlet capacity or blockage and lack of maintenance of diversion channel capacity and ridge height.

PLANS AND SPECIFICATIONS

Plans and specifications for installing temporary slope drains shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Drain location.
2. Inlet type.
3. Conduit size and material.
4. Conduit hold down device.
5. Ridge height over conduit.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [IL-670 TEMPORARY SLOPE DRAIN PLAN](#) may be used as a plan sheet.

OPERATION AND MAINTENANCE

Inspect the slope drain and supporting diversion once a week and after every rainfall and promptly make necessary repairs. The contractor should avoid the placement of any material on and prevent construction traffic across the slope drain. When the protected area has been permanently stabilized, temporary measures may be removed, materials disposed of properly, and all disturbed areas stabilized appropriately.

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

TEMPORARY STREAM CROSSING

(no.)
CODE 975



(Source: Kane-DuPage Soil and Water Conservation District)

DEFINITION

A bridge, ford, or temporary structure installed across a stream or watercourse for short-term use by construction vehicles or heavy equipment.

PURPOSE

The purpose of this practice is to provide a means for construction vehicles to cross streams or watercourses without moving sediment into streams, damaging the streambed or channel, or causing flooding.

CONDITIONS WHERE PRACTICE APPLIES

Where heavy equipment must be moved from one side of a stream channel to another, or where light-duty construction vehicles must cross the stream channel frequently for a short period of time. Generally, a temporary stream crossing is applicable to flowing streams with drainage areas less than 1 square mile. More exacting engineering methods should be used on larger drainage areas.

CRITERIA

In addition to erosion and sediment control, structural stability, utility, and safety must also be taken into consideration when designing temporary stream crossings. Bridge designs in particular, should be completed by a qualified engineer.

The anticipated life of a temporary stream crossing structure is usually considered to be 1 year or less. Remove the structure immediately after it is no longer needed.

As a minimum, design the structure to pass bank full flow or peak flow, whichever is less, from a 2-year frequency, 24-hour duration storm without over topping. Ensure that no erosion will result from the 10-year peak storm.

Ensure that design flow velocity at the outlet of the crossing structure is non-erosive for the receiving stream channel.

Consider overflow for storms larger than the design storm and provide a protected overflow area.

A water diverting structure such as a swale shall be constructed (across the roadway on both roadway approaches) 50 feet maximum on either side of the waterway crossing. This will prevent roadway surface runoff from directly entering the waterway. The 50 feet is measured from the top of the waterway bank. If the roadway approach is constructed with a reverse grade away from the waterway, a separate diverting structure is not required.

The aggregate for the roadway shall be a minimum of 6 inches thick stone or recycled concrete meeting one of the following IDOT coarse aggregate gradations: CA-1, CA-2, CA-3 or CA-4.

The aggregate will be placed on geotextile fabric meeting the requirements in material specification [592 GEOTEXTILE](#) Table 1 or 2, class I, II, or IV.

CONSIDERATIONS

Careful planning can minimize the need for stream crossings. Try to avoid crossing streams, whenever possible, complete the development separately on each side and leave a natural buffer zone along the stream. Temporary stream crossings are a direct source of water pollution; they may create flooding and safety hazards; they can be expensive to construct; and they cause costly construction delays if washed out.

Select locations for stream crossings where erosion potential is low. Evaluate stream channel conditions, overflow areas, and surface runoff control at the

site before choosing the type of crossing. When practical, locate and design temporary stream crossings to serve as permanent crossings to keep stream disturbance to a minimum.

Plan stream crossings in advance of need, and when possible, construct them during dry periods to minimize stream disturbance and reduce cost. Ensure that all necessary materials and equipment are on-site before any work is begun. Complete construction in an expedient manner and stabilize the area immediately.

When construction requires dewatering of the site, construct a bypass channel before undertaking other work. If stream velocity exceeds that allowed for the in-place soil material, stabilize the bypass channel with riprap or other suitable material. After the bypass is completed and stable, the stream may be diverted.

Unlike permanent stream crossings, temporary stream crossings may be allowed to overtop during peak storm periods. However, the structure and approaches should remain stable. Keep any fill needed in floodplains to a minimum to prevent upstream flooding and reduce erosion potential. Use riprap to protect locations subject to erosion from overflow.

Where appropriate, install in-stream sediment traps immediately below stream crossings to reduce downstream sedimentation. When used, excavate the basin a minimum of 2 feet below the stream bottom and approximately two times the cross-sectional flow area of the existing channel. Ensure that the flow velocity through the basin does not exceed the allowable flow velocity for

the in-place soil material; otherwise it should not be excavated. In locations where trees or other vegetation must be removed, the sediment trap may be more damaging to the stream than if it was not installed.

Stream crossings are of three general types: bridges, culverts and fords. Consider which method best suits the specific site conditions.

Bridges - Where available materials and designs are adequate to bear the expected loading, bridges are preferred for temporary stream crossing.

Bridges usually cause the least disturbance to the streambed, banks, and surrounding area. They provide the least obstruction to flow and fish migration. They generally require little or no maintenance, can be designed to fit most site conditions, and can be easily removed and materials salvaged. However, bridges are generally the most expensive to design and construct. Further, they may offer the greatest safety hazard if not adequately designed, installed, and maintained, and if washed out, they cause a longer construction delay and are more costly to repair.

In steep watersheds it is recommended to tie a cable or chain to one corner of the bridge frame with the other end secured to a large tree or other substantial object. This will prevent flood flows from carrying the bridge downstream where it may cause damage to property.

Culvert crossings - Culverts are the most common stream crossings. In many cases, they are the least costly to install, can safely support heavy loads,

and are adaptable to most site conditions. Construction materials are readily available and can be salvaged. However, the installation and removal of culverts causes considerable disturbance to the stream and surrounding area. Culverts also offer the greatest obstruction to flood flows and are subject, therefore, to blockage and washout.

Fords - Fords made of stabilizing material such as rock are often used in steep areas subject to flash flooding, where normal flow is shallow (less than 3 inches deep) or intermittent. Fords should only be used where crossings are infrequent. Fords are especially adapted for crossing wide, shallow watercourses.

When properly installed, fords offer little or no obstruction to flow, can safely handle heavy loading, are relatively easy to install and maintain, and, in most cases, may be left in place at the end of the construction.

Problems associated with fords include the following: 1) approach sections are subject to erosion. Generally do not use fords where bank height exceeds 5 feet, 2) excavation for the installation of the riprap-gravel bottom and filter material causes major stream disturbance. In some cases, fords may be adequately constructed by shallow filling without excavation, 3) the stabilizing material is subject to washing out during storm flows and may require replacement, 4) mud and other contaminants are brought directly into the stream on vehicles unless crossings are limited to no flow conditions.

PLANS AND SPECIFICATIONS

Plans and specifications for temporary stream crossing shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. The location of the crossing.
2. Required material specifications.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [IL-675 TEMPORARY STREAM CROSSING PLAN](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

Inspect temporary stream crossings after runoff-producing rains to check for blockage in channel, erosion of abutments, channel scour, riprap displacement, or piping. Make all repairs immediately to prevent further damage to the installation.

Remove temporary stream crossings immediately when they are no longer needed. Restore the stream channel to its original cross-section, and smooth and appropriately stabilize all disturbed areas.

Leave in-stream sediment traps in place to continue capturing sediment.

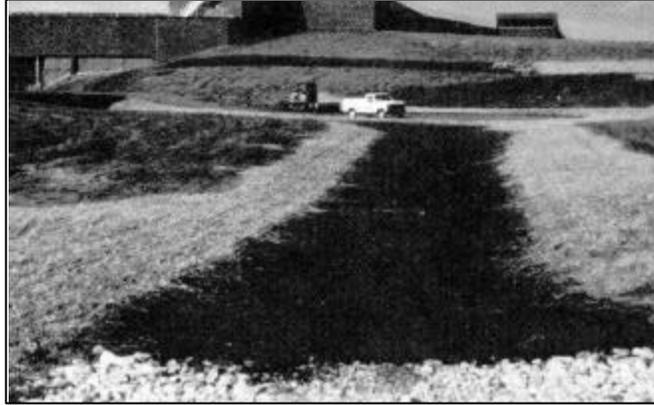
NRCS IL August 1994

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

TEMPORARY SWALE

(ft.)
CODE 980



(Source: MN Protecting Water Quality in Urban Areas)

DEFINITION

A temporary excavated drainageway.

PURPOSE

The purposes of this practice are to prevent runoff from entering disturbed areas by intercepting and diverting it to a stabilized outlet and to intercept sediment-laden water in disturbed areas and divert it to a sediment-trapping device.

CONDITIONS WHERE PRACTICE APPLIES

Temporary swales are constructed:

1. To divert flows from entering a disturbed area.
2. Intermediately across disturbed areas to shorten overland flow distances.
3. To direct sediment-laden water along the base of slopes to a sediment trapping device.
4. To transport off-site flows across disturbed areas such as rights-of-way.

This standard applies to swales draining 10 acres or less. For drainage areas larger than 10 acres, refer to the practice standard [GRASS-LINED CHANNEL 840](#).

CRITERIA

The channel cross section shall be designed using the criteria in Table 1.

Stabilization of the swale shall be completed within 10 days of installation in accordance with the practice standards [TEMPORARY SEEDING 965](#), [PERMANENT VEGETATION 880](#), [MULCHING 875](#), [EROSION BLANKET 830](#).

The flow channel shall be stabilized using the criteria in Table 2.

All stone or concrete linings will be placed on geotextile fabric meeting the requirements in material specification [592 GEOTEXTILE](#) Table 1 or 2, class I, II, or IV. In highly erodible soils refer to the next higher slope grade for type of stabilization. Recycled Concrete Equivalent shall be concrete broken to

the required size, and shall contain no steel reinforcement.

In areas where the drainage area is undisturbed, the swale shall have an outlet that functions without erosion, and dissipates runoff velocity prior to discharge off the site. Examples of stable outlets include [LEVEL SPREADER 870](#) and [ROCK OUTLET PROTECTION 910](#).

In areas where the drainage area is disturbed, runoff shall be conveyed to a sediment trapping facility until the drainage area above the swale is adequately stabilized. Examples of appropriate sediment trapping facilities include practice standards [IMPOUNDMENT STRUCTURE - ROUTED 842](#) or [TEMPORARY SEDIMENT TRAP 960](#).

CONSIDERATIONS

The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet condition.

If the temporary swale is used to divert flows from entering a disturbed area, a sediment-trapping device may not be needed.

PLANS AND SPECIFICATIONS

Plans and specifications for installing temporary swales shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Location where the practice is to be installed.
2. Cross-section and grade of channel.

3. Type of stabilization treatment and materials to be used.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawings [IL-680R TEMPORARY ROCK SWALE PLAN](#) or [IL-680V TEMPORARY VEGETATED SWALE PLAN](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

Vegetated swale channels should be inspected regularly to check for points of scour, bank failure or inadequate vegetative cover; rubbish or channel obstruction; rodent holes or excessive wear from pedestrian or construction traffic.

Swales collecting runoff from disturbed areas shall remain in place until the disturbed areas are permanently stabilized.

Lined swale channels should be checked regularly for deterioration from freezing, salt or chemicals; scour or undermining at the inlet and outlet; or points of sediment deposition.

Any needed repairs shall be made promptly.

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TABLE 1
CHANNEL CROSS SECTION REQUIREMENTS

	A	B
Drainage area	< 5 acres	5 – 10 acres
Bottom width flow channel	4 feet	6 feet
Depth of flow channel	1 foot	1 foot
Side slopes	2:1 or flatter	2:1 or flatter
Grade	0.5% minimum	0.5% minimum

TABLE 2
CHANNEL STABILIZATION REQUIREMENTS

Type of Treatment	Channel Grade (%)	A < 5 acres	B 5 – 10 acres
1	0.5 – 3.0	Seed & straw mulch	Seed & straw mulch
2	3.1 – 5.0	Seed & straw mulch	Seed & cover w/ jute or excelsior; sod; or line with IDOT CA-2 or CA-3 coarse aggregate
3	5.1 – 8.0	Seed & cover w/ jute or excelsior; sod; or line with IDOT CA-2 or CA-3 coarse aggregate	Line with IDOT RR-3 rock
4	8.1 – 20.0	Line with IDOT RR-3 rock	Engineering design

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

TOPSOILING

(acre or sq. ft.)
CODE 981



(Source: VA Erosion and Sediment Control Handbook)

DEFINITION

Methods of preserving and using topsoil to enhance final site stabilization with vegetation.

PURPOSE

The purpose of this practice is to provide a suitable growth medium for final site stabilization with vegetation.

CONDITIONS WHERE PRACTICE APPLIES

1. Where the preservation or importation of topsoil is determined to be the most effective method of providing a suitable growth medium.
2. Where the subsoil or existing soil present any or all of the following problems:
 - a. The texture, bulk density, pH, or nutrient balance of the available soil cannot be modified by a reasonable means to provide an adequate growth medium for the desired vegetation.
 - b. The soil is too shallow to provide adequate rooting depth or will not

supply necessary moisture and nutrients for growth of desired vegetation.

- c. The soil contains substances toxic or potentially toxic to the desired vegetation.
3. Where high-quality turf or ornamental plants are desired.

CRITERIA

Determine if sufficient quantities of suitable topsoil as described in material specification [804 MATERIAL FOR TOPSOILING](#) is available at the site or nearby. Topsoil shall be spread at a lightly compacted depth of 2 to 4 inches. Depths of 4 inches or greater are recommended where fine-textured (clayey) subsoil or other root limiting factors are present.

If topsoil is to be stockpiled at the site, select a location so that it will not erode, block drainage, or interfere with work on the site.

During construction of the project, soil stockpiles shall be stabilized or protected with sediment trapping

measures such as practice standards [SILT FENCE 920](#) or [TEMPORARY SEEDING 965](#). Perimeter controls shall be placed around the stockpile immediately; seeding of stockpiles shall be completed within 7 days of formation of the stockpile if it is to remain dormant for longer than 30 days.

Bonding - If the topsoil and existing soil surface are not properly bonded water will not infiltrate evenly, and it will be difficult to establish vegetation.

Care must be taken not to apply topsoil to an existing soil surface if the two have contrasting textures. Clayey topsoil over sandy subsoil is a particularly poor combination, as water creeps along the junction between the two soil layers and may cause the topsoil to slough.

Do not apply topsoil to slopes greater than 2:1 to avoid slippage. Topsoiling of steep slopes should be discouraged unless good bonding of the soils can be achieved.

Depending on subsoil conditions, additional measures may be required for ornamental shrub and tree plantings. See practice standard [TREE AND SHRUB PLANTING 985](#).

CONSIDERATIONS

Topsoil is the surface layer of the soil profile, generally characterized as darker than the subsoil due to the enrichment with organic matter. It is the major zone of root development and biological activity. Microorganisms that enhance plant growth thrive in this layer. Topsoil can usually be differentiated from subsoil by texture as well as color. Clay content usually increases in the subsoil. Where subsoils are high in

clay, the topsoil layer may be significantly coarser in texture. The depth of natural topsoil may be quite variable. On severely eroded sites it may be gone entirely.

Advantages of topsoil include its higher organic matter content, friable consistence (soil aggregates can be easily crushed with only moderate pressure), its available water holding capacity, and its nutrient content. Most often it is superior to subsoil in these characteristics. The texture and friability of topsoil are usually much more conducive to seedling germination, emergence, and root growth.

In addition to being a better growth medium, topsoil is often less erodible than subsoil, and the coarser texture of topsoil increases infiltration capacity and reduces runoff.

Although topsoil may provide an improved growth medium, there may be disadvantages, too. Stripping, stockpiling, hauling, and spreading topsoil or importing topsoil may not be cost-effective. Handling may be difficult if large amounts of branches or rocks are present or if the terrain is too rough. Most topsoil contains weed seeds, which compete with desirable species.

In site planning, compare the options of topsoiling with preparing a seedbed in the available subsoil. The clay content of many subsoils retains moisture. When properly limed and fertilized, subsoil may provide a satisfactory growth medium, which is generally free of weed seeds.

Topsoiling is normally recommended where ornamental plants or high-maintenance turf will be grown. It may

also be required to establish vegetation on shallow soils; soils containing potentially toxic materials, stony soils, and soils of critically low pH (highly acid).

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PLANS AND SPECIFICATIONS

The plans and specifications for installing topsoiling shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. At a minimum include the following items:

1. Topsoil source.
2. Stockpile location and method of stabilization prior to its use.
3. Topsoil/subsoil bonding procedures.
4. Site preparation plans and method of application, distribution and compaction.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

The application of topsoil shall meet the requirements as listed in the construction specification [752 STRIPPING, STOCKPILING SITE PREPARATION AND SPREADING TOPSOIL](#).

OPERATION AND MAINTENANCE

After topsoil application, follow procedures for seedbed preparation. Take care to avoid excessive mixing of topsoil into the subsoil. Permanently stabilize the site following appropriate practice standards as quickly as practicable. Periodically inspect the site until permanent stabilization is achieved. Make necessary repairs to eroded areas or areas of light vegetative cover.

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

TREE AND FOREST ECOSYSTEM PRESERVATION

(acre or sq. ft.)
CODE 984



(Source: USDA - Natural Resources Conservation Service - Illinois)

DEFINITION

The preservation of contiguous stands of trees from damage during construction operations.

PURPOSE

The purpose of this practice is to preserve contiguous forested areas and stands of trees that have present and future value for erosion protection, wildlife habitat, landscape aesthetics, and other economic and environmental benefits.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on development sites containing stands of trees.

CRITERIA

The Critical Forest Edge Zone (CFEZ) is one foot outside the perimeter of the leaf canopy of the stand of trees to be protected. The area within the CFEZ

shall be protected from damage during construction operations.

All required protection measures shall be installed prior to the commencement of any site development activity and shall remain in place and in working, functional order until all site development activities have ceased or the surrounding area has been stabilized.

No construction activities shall be permitted within the CFEZ. In addition, all roadways, parking areas, and storage areas shall be located outside the CFEZ.

Construction fencing (florescent polyethylene laminar safety netting), wooden snow fence, or approved equivalent with a minimum height of 40 inches shall be installed around the CFEZ of all forested areas to be preserved, prior to pruning. The fencing shall be secured to ground-mounted metal or wood posts spaced a maximum of 6 feet apart and maintained to

prevent clearing, grading and development activities from encroaching within the CFEZ.

If a higher degree or more permanent protection is desired, a chain link fence following criteria in Construction Specification [91 CHAIN LINK FENCE](#), a wire fence following criteria in Construction Specification [92 FIELD FENCE](#), or a comparable wooden structure may be used.

Signs shall be posted which identify the enclosed areas as the CFEZ.

Appropriate soil erosion and sediment control measures shall be installed outside of the CFEZ to prevent sediment from reaching the CFEZ.

When utilities or other development features necessitate underground movement of the soil within the critical root zone, follow criteria in practice standard [TREE PROTECTION - AUGERING 991](#). There shall be no trenching within the critical root zone of any tree within the protected area of the CFEZ. The critical root zone is defined as being one foot outside the perimeter of the dripline or leaf canopy of an individual tree.

Measures must be installed according to a site-specific plan and in accordance with all applicable local, state, and federal laws and regulations.

CONSIDERATIONS

Preserving and protecting trees and other natural plant groups often result in more stable soil and aesthetically pleasing development.

When working within the boundary of a municipality, local authorities such as

the Urban Forester, City Arborist, Municipal Forester or Horticulturist, or Public Works officials should be contacted to determine locally enforced tree protection/preservation standards.

Tree surveys should be required for all parcels that contain mature woodlands, groves, young woodlands or significant trees. Tree surveys should identify the location, size (caliper), species, and condition health rating of all trees having a diameter at breast height (DBH) of 12 inches or more. Property line and hedgerow trees should be included in the tree survey. Required tree surveys and inventories should be conducted by a certified arborist or a professional forester.

It is recommended that a professional forester review the pre-construction plan; supervise/inspect the on-site tree protection operation; and review the site for compliance during the post-construction phase.

It is recommended that a professional forester, licensed landscape architect, or an agency designee with biological, natural resource or environmental credentials select the trees to be preserved before siting roads, buildings or other structures.

If trees are to be removed, it is recommended that a professional forester should be present to supervise the tree removals to make recommendations to ensure the dropped trees minimize damage to protected trees. All trees to be removed will be recorded by stem diameter so that responsible party can conduct natural area mitigation by planting enough trees to replace the trees on at least one for one replacement schedule.

Complete removal of all the trees on site followed by total site compaction well beyond the project perimeter is not recommended.

For sites greater than 15 acres in size that are unique examples of biodiversity as identified by authorized agencies/commissions, or where the area will be greatly impacted by the project and no other viable option exists, a natural resources team consisting of a forester, soil scientist, and botanist should be formed to determine the alternative that least damages the resource.

The following features should be considered when developing sites in and around wooded areas:

1. Rare and endangered species
2. Historical or archeological significance
3. Quantity and quality of forested area in the county or local governmental area
4. Frailty of resources without existing trees
5. Potential for soil erosion with the absence of the forest cover
6. The loss of aesthetic quality of the site; existence of critical areas (such as flood plains, steep slopes, and wet lands)
7. Unique flora and fauna
8. Health and condition of the individual trees and the forest ecosystem
9. Loss of habitat and flora and fauna species diversity
10. Groups of trees to be saved on the erosion control plan

A mitigation plan for damaged trees should be prepared in consultation with a professional forester or certified arborist and included with construction plans and contract documents.

PLANS AND SPECIFICATIONS

Plans and specifications for tree and forest ecosystem preservation shall be in keeping with this standard and will describe the requirements for applying the practice. At a minimum include the following items:

1. Forested areas to be preserved.
2. Location and type of fencing to be used to protect the trees.
3. Locations of construction areas, traffic patterns and roadways, storage areas and parking pads, and the construction project in relationship to the CFEZ to be preserved.
4. Types and locations of signs.

All plans shall include the installation, inspection and maintenance schedules with the responsible person clearly identified.

Standard drawing [IL-690 TREE PROTECTION - FENCING](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

On active construction sites protected areas should be inspected at least every 7 days for compliance and any repairs made as needed.

The protective signs and fences shall be removed only after all construction work has been finished, including final grading and shaping of the site, and the site has been inspected by a professional forester for damages to the trees.

Inspections shall include a listing of trees with damage to trunks, mounding of soil around the trunk, evidence of root

damage, and evidence of improper pruning.

and John Hartman. University of Kentucky Agricultural Communications.

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NRCS IL April 2000

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Avoidance of Construction Damage to Trees on Wooded Lots. Mark Timmons

TREE AND SHRUB PLANTING

(acre or sq. ft.)

CODE 985



(Source: National Arbor Day Foundation)

DEFINITION

Planting of selected trees and shrubs.

PURPOSE

The purpose of this standard is to establish trees and/or shrubs to conserve soil, beautify, screen unsightly views, provide shade and attract wildlife.

CONDITIONS WHERE PRACTICE APPLIES

In urban environments where woody tree and shrub species are needed to protect the soil from erosion, where ornamental plants are desirable for landscaping and beautification and where woody plants are needed to screen unsightly views, reduce noise levels or provide wildlife food and habitat.

CRITERIA

Select tree and shrub species suited to the soil and site conditions and adapted to the plant hardiness zone in which the planting site is located.

Keep the roots of bare root stock moist at all times prior to planting. The ball of balled and burlapped (B&B) stock and the soil of container grown stock shall be kept moist but not saturated prior to planting.

Plant trees and shrubs at a spacing that will provide enough space for full crown development. Ornamental and shade trees shall have a minimum spacing of 20 feet by 20 feet and ornamental shrubs at 5 feet by 5 feet. Trees and shrubs planted as noise barriers, screen plantings and windbreaks shall have a minimum spacing of 8 feet by 8 feet for trees and 4 feet by 8 feet for shrubs.

All bare root, container grown and balled and burlapped (B&B) planting stock shall meet the minimum root system spread criteria as established in construction specification [707-DIGGING, TRANSPORTING, PLANTING AND ESTABLISHMENT OF TREES, SHRUBS AND VINES](#).

All plant materials will be dormant at the time they are planted. Planting dates and procedures shall conform to those

established by construction specification [707 DIGGING, TRANSPORTING, PLANTING AND ESTABLISHMENT OF TREES, SHRUBS AND VINES](#) for the applicable Planting Suitability Zone of Illinois.

All plantings shall be mulched unless specified otherwise in a landscaping or planting plan following criteria in practice standard [MULCHING 875](#). The mulching material shall be uniformly graded and have the ability to completely block sunlight from reaching the surface of the soil. Mulching materials shall meet the minimum requirements as listed in material specifications [592 GEOTEXTILE](#), [800 PAPER AND PLASTIC NETTING](#), [801 JUTE NETTING](#), [802 EXCELSIOR BLANKETS](#), and [803 STRAW BLANKETS](#).

CONSIDERATIONS

Tree planting in urban areas should be completed as specified in a landscaping or tree and shrub planting plan developed for each site.

Care should be exercised to avoid locating trees and shrubs where they will, at maturity, interfere with electrical lines, utility maintenance zones, drain tiles, septic fields or create a traffic hazard due to blocked visibility.

Existing quality trees and shrubs should be evaluated and, where appropriate, incorporated into the landscaping or tree and shrub planting plan.

Trees and shrubs to plant should be selected based on:

1. Desired function such as shade, privacy or noise reduction screening,

2. Plant characteristics such as hardiness, growth rate, mature height and spread, resistance to insect, disease and pollution, seed production habits and soil or site requirements.

PLANS AND SPECIFICATIONS

Plans and specifications are to be developed for specific planting sites in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Installation for this practice shall meet the requirements as listed in construction specification [707-DIGGING, TRANSPORTING, PLANTING AND ESTABLISHMENT OF TREES, SHRUBS AND VINES](#).

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [IL-686 TREE AND SHRUB PLANTING SITE PLAN](#) may be used as the planting plan for a specific site.

OPERATION AND MAINTENANCE

A maintenance program shall be established to provide sufficient water, fertility, mulch, corrective pruning and protection from damage by insects, diseases and machinery. Dead or severely damaged plants will be replaced as needed.

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

TREE PROTECTION

(no.)
CODE 990



(Source: USDA - Natural Resources Conservation Service - Illinois)

DEFINITION

The protection of individual trees from damage during construction operations.

PURPOSE

The purpose of this practice is to reduce damage to and loss of individual trees during construction by implementing pre- to post-construction tree protection procedures.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on development sites containing individual trees. Refer to practice standard [TREE AND FOREST ECOSYSTEM PRESERVATION 989](#) for information on preserving stands of trees.

CRITERIA

The Critical Root Zone (CRZ) is one foot outside the perimeter of the leaf canopy of the tree to be protected. This area shall be protected from damage during construction operations. Trees not

identified to be protected shall be removed.

All required protection measures shall be installed prior to the commencement of any site development activity and shall remain in place and in working, functional order until all site development activities have ceased or the surrounding area has been stabilized.

No construction activities, including the placement of topsoil, shall be permitted within the CRZ. In addition, all roadways, parking areas, and storage areas shall be located outside any CRZ.

Construction fencing (fluorescent polyethylene laminar safety netting), wooden snow fence, or approved equivalent with a minimum height of 40 inches shall be installed around the CRZ of all trees to be protected, prior to pruning. The fencing shall be secured to ground-mounted metal or wood posts spaced a maximum of 6 feet apart and maintained to prevent clearing, grading

and development activities from encroaching within the CRZ.

If a higher degree or more permanent protection is desired a chain link fence following criteria in Construction Specification [91 CHAIN LINK FENCE](#), a wire fence following criteria in Construction Specification [92 FIELD FENCE](#), or a comparable wooden structure may be used.

Signs shall be posted that identify the fenced areas as CRZ.

Appropriate soil erosion and sediment control measures shall be installed outside the CRZ to prevent sediment from reaching the CRZ.

Locate roadways, storage areas, parking pads, etc. at least 25 feet from the CRZ of an individual tree.

Follow natural contours, where feasible to maintain the natural drainage patterns of the site so as not to cause the tree to get reduced moisture.

Do not trench within the CRZ of the protected tree. For roots impacted outside the CRZ, the roots shall be properly pruned according to the Society of American Foresters, National Arborist Association and International Society of Arboriculture standard of using the appropriate pruning tool to make a clean cut. The use of heavy equipment such as a backhoe for tree root pruning shall be prohibited.

In situations where it is not feasible to avoid impact in the critical root zone, follow criteria in practice standard [TREE PROTECTION - AUGERING 991](#).

CONSIDERATIONS

When working within the boundary of a municipality, local authorities such as the Urban Forester, City Arborist, Municipal Forester or Horticulturist, or Public Works officials should be contacted to determine locally enforced tree protection/preservation standards.

A professional forester or certified arborist should be consulted for any clearing of trees and any actions that deviate from criteria within this standard. On-site supervision is recommended.

Trees to be saved should be evaluated using the following criteria in priority order:

1. Species and condition (maintain slower growing trees in good condition),
2. Long-term suitability of the tree for its present location,
3. Length of time to mitigate losses,
4. Cost of mitigating tree losses,
5. Expected long-term maintenance costs for the tree compared to other trees of the same age/size,
6. Soil erosion prevention and reduction of storm water runoff,
7. The number of other trees growing under the same conditions and the precedent that would be set by removing the tree in question,
8. Impact on property value and aesthetics,
9. Ability to screen noise and visual improprieties or ability to enhance privacy, and
10. Ability to moderate temperature changes, provide shade and reduce wind forces.

Trees to be removed should be evaluated using the following criteria in priority order:

1. In the opinion of the professional forester or certified arborist, there is a clear and reasonable risk of failure that could cause injury or property damage including existing utility service and corrective measures are not feasible and/or the tree is a safety hazard.
2. Tree is dead.
3. The tree is in poor condition with several dead branches or major crack(s).
4. Contiguous and fatal disease is present as diagnosed by a trained entomologist, plant pathologist or professional forester.
5. Current tree damage is beyond repair or the tree is in extremely poor shape due to storm damage or previous mechanical injury.
6. There is a potential of the tree to damage existing or future hardscape features such as driveways or sidewalks.
7. There is no feasible way to avoid disturbing the soil around, grading over, or placing a hardened surface within the critical root zone and the tree is an oak, hickory, red bud, horse chestnut, Kentucky coffee tree, larch, honey locust, or conifer. Consultation with a professional forester is required prior to using this criteria for tree removal.
8. Tree has a greater than 45 degree lean toward traffic or another target or it creates an unsafe vision clearance for pedestrians or vehicular traffic.
9. Tree is a fast growing or a weak wooded tree that is invasive such as box elder, silver maple, tree of heaven, Russian olive or black

cherry. Exceptions may be made for large healthy specimens of these species.

10. Tree is within five feet of a structure or that when mature will have a canopy spread that will overlap the structure. Consult with an arborist or forester.
11. The tree could be successfully transplanted with a tree spade onto another site.
12. Trees that are non-native species or invasive.

A mitigation plan for damaged trees should be prepared in consultation with a professional forester or certified arborist and included with construction plans and contract documents.

When site soil resources have been greatly altered, it is recommended a soil restoration strategy be implemented. The strategy may include:

1. Scarifying compacted areas
2. Adding top soil in areas of extreme erosion
3. Adding about 12 inches of well-rotted leaf compost
4. Adding ground cover using herbaceous vegetation, shrubs, and trees. Use of native species is encouraged.

PLANS AND SPECIFICATIONS

Plans and specifications for tree protection shall be in keeping with this standard and will describe the requirements for applying the practice. At a minimum include the following items:

1. All existing trees by species, location, and diameter at 4 ½ feet above the ground and clearly

indicate the trees and/or branches to be removed.

2. Locations of roadways, storage areas, truck clean-out areas, and parking pads, in relationship to the trees to be protected.
3. Location and type of fencing to be used to protect trees, including the distance for placing the fencing around the CRZ.
4. Types and locations of signs.

All plans shall include the installation, inspection, and maintenance schedules with the responsible party identified.

Standard drawing [IL-690 TREE PROTECTION - FENCING](#) may be used as the plan sheet.

OPERATION AND MAINTENANCE

The protective signs and fences will be removed only after all construction work has been finished, including final grading and shaping of the site, and the site has been inspected by a professional forester for damages to the trees.

On active construction sites, it is recommended that trees be inspected every 7 days for compliance.

Inspections shall include a listing of trees with:

1. Damage to trunks
2. Mounding of soil around the trunk
3. Evidence of root damage
4. Evidence of improper pruning

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

TREE PROTECTION - AUGERING

(no.)
CODE 991



(Source: Tree City USA Bulletin No. 35)

DEFINITION

Underground construction such as utility work by augering (tunneling) through an individual tree's Critical Root Zone (CRZ).

PURPOSE

The purpose of this practice is to reduce damage to and loss of individual trees where underground construction involves a tree's CRZ.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on development sites containing trees, infrastructure including utilities, and a construction project that has limited space and where these elements are in direct conflict.

CRITERIA

The CRZ is one foot outside the perimeter of the leaf canopy of the tree to be protected. This area shall be protected from damage during construction operations.

All required protection measures shall be installed prior to the commencement of any site development activity and shall remain in working, functional order until all site development activities have ceased or the surrounding area has been stabilized. Protection measures, including fencing and signage, shall follow criteria in practice standard [TREE PROTECTION 990](#).

Open trenching in the root zone of a tree is prohibited except when the trenching falls outside the CRZ.

All trees located where there is insufficient space to bypass the CRZ must be augered. Augering activity shall not occur on more than one side of the tree and shall follow distance and depth requirements in Table 1.

TABLE 1
AUGERING REQUIREMENTS

Tree Diameter (in.)	Distance of Augering from Tree Trunk - each side (ft.)	Depth of Augering (ft.)
1-4	3	2 ½
5-9	6	3
15-19	10	3 ½
20 inches or more	15	4

The following shall be avoided:

1. Making deep cuts that sever a large portion of the root system, depriving the tree of water and increasing the tree's chance of wind throw.
2. Compacting the soil within the area not designated for augering.
3. Any other actions, such as depositing concrete wash, which hardens the surface area within 25 feet of the CRZ.

CONSIDERATIONS

When working within the boundary of a municipality, local authorities such as the Urban Forester, City Arborist, Municipal Forester or Horticulturist, or Public Works officials should be contacted to determine locally enforced tree tunneling or augering requirements.

It is recommended that a professionally qualified individual check the area work plan and site for environmental soundness and evaluate the techniques for protecting the trees.

A mitigation plan for damaged trees should be prepared in consultation with

a professional forester or certified arborist and included with the construction plans and contract documents.

When site soil resources have been greatly altered, it is recommended that a soil restoration strategy be implemented. The strategy may include:

1. Scarifying compacted areas
2. Adding top soil in areas of extreme erosion
3. Adding about 12 inches of well-rotted leaf compost
4. Adding ground cover using herbaceous vegetation, shrubs, & trees. Use of native species is encouraged.

PLANS AND SPECIFICATIONS

Plans and specifications for augering operations shall be in keeping with this standard and will describe the requirements for applying the practice. At a minimum include the following items:

1. The individual trees to be protected and the location of the proposed auger tunnel.
2. The location and type of fencing to be used to protect trees indicating the distance for placing the fencing around the CRZ.
3. Locations of roadways, storage areas, truck clean-out areas, and parking pads, in relationship to the trees to be protected.
4. Types and locations of signs

All plans shall include the installation, inspection and maintenance schedules with the responsible person clearly identified.

OPERATION AND MAINTENANCE

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The protective signs and fences will be removed only after all construction work has been finished, including final grading and shaping of the site, and the site has been inspected by a professional forester for damages to the trees.

It is recommended that on-site inspections be conducted to determine compliance with augering specifications.

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NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

VEGETATIVE STREAMBANK STABILIZATION

(ft.)
CODE 995



(Source: USDA – Natural Resources Conservation Service – Illinois)

DEFINITION

The stabilization and protection of eroding streambanks with selected vegetation.

PURPOSE

The purpose of this standard is to protect streambanks from the erosive forces of flowing water and provide a natural, pleasing appearance.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to natural or excavated channels where the streambanks are susceptible to erosion from the action of water, ice or debris and the problem can be solved using vegetative measures.

Vegetative stabilization is generally applicable where bankfull flow velocity does not exceed 5 ft/sec. and soils are erosion resistant. Above 5 ft/sec., structural measures are generally required.

CRITERIA

The U.S. Army Corps of Engineers, Illinois Department of Natural Resources-Office of Water Resources, Illinois Environmental Protection Agency, and any appropriate local unit of government shall be consulted for determining permits that may be required.

Vegetative protective measures to be applied shall be compatible with improvements planned or being carried out by others.

Protective measures shall be started at a stabilized or controlled point on the stream and extended to a stabilized or controlled point downstream. The grade of the channel must be controlled, either by natural or artificial means, before any vegetative protective measures can be considered feasible unless the live dormant posts or stakes can be installed below the anticipated depth of bottom scour.

Cuttings, stakes and posts to be used as live dormant woody materials shall be obtained from moisture-loving species that will either root naturally or respond to treatment with rooting hormones as listed in Table 3. All woody plant materials will be dormant at the time of installation. Establishment dates and procedures shall conform to those listed in construction specification 750 and standard drawing No. 695-VEGETATIVE STREAMBANK STABILIZATION SITE PLAN.

Establishment dates and procedures for vegetative streambank stabilization using selected grasses or grass mixtures shall conform to those listed in Table 1 and Table 2.

Bank reshaping and disturbance will be kept to a minimum except where necessary to adequately install the practice and meet any appropriate requirements. If deemed needed, banks will be shaped to result in a bank slope of 1:1 or flatter.

A temporary seeding shall be used on all sites using a mixture and seeding rates as listed in Table 1 to provide temporary protection while the permanent cover is becoming established. Planting dates shall be as shown in Table 2.

The use of an EROSION BLANKET meeting requirements in practice standard 830 will provide additional protection during the establishment period.

Where necessary, structural measures shall be planned along with the vegetative measures to stabilize the streambanks using practice standard STRUCTURAL STREAMBANK

STABILIZATION 940 and any applicable construction and material specifications and standard drawings.

CONSIDERATIONS

Special attention should be given to improving wildlife habitat as a secondary benefit by using woody plants and grasses that provide food and/or cover for native wildlife species.

The retention of a 30 feet riparian zone along stream channels that is established to trees, shrubs, and/or grasses may provide wildlife, landscaping and water quality benefits.

Streambanks to be protected using grasses may need to be shaped on a 2:1 or 3:1 slope to provide for adequate seedbed preparation. The use of sod, instead of seeding, should be evaluated where economically justified and technically feasible.

The type of vegetative cover to be used should be based on the soil type, stream velocities, adjacent landuse and anticipated level of maintenance to be performed.

Steep channel reaches, high erosive banks and sharp bends may require structural stabilization measures, such as riprap, while the remainder of the streambank may require vegetative measures, only.

PLANS AND SPECIFICATIONS

Plans and specifications are to be developed for specific planting sites in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Installation of this practice shall meet the requirements as listed in construction specification 750 - USE OF DORMANT WOODY PLANTS FOR STREAMBANK STABILIZATION, construction specification 751 - USE OF GRASSES FOR STREAMBANK STABILIZATION, and standard drawing No. 695 - VEGETATIVE STREAMBANK STABILIZATION SITE PLAN which may be used as the planting plan for a specific site.

OPERATION AND MAINTENANCE

A maintenance program shall be established to provide sufficient moisture, fertility, replacement of dead or damaged plants and protection from damage by insects, diseases, machinery and human activities.

Streambanks stabilized using grasses will be evaluated as to whether an occasional or periodic mowing and fertilization are to be performed to maintain a healthy protective ground cover.

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TABLE 1
SEEDING RATES

Seeding Mixture	Rate (lb.) PLS/Acre	Rate (lb.) PLS/1000 ft. ²	Suitable pH	Site Suitability		
				Droughty	Well Drained	Wet
<u>Permanent Seeding</u>						
1. Smooth Bromegrass	24	.55	6.0 – 7.5	X	X	
Alfalfa	8	.20				
2. Tall Fescue or Redtop	12	.30			X	X
	2.5	.06				
3. Redtop	2.5	.06		X	X	X
Ladino Clover	2.5	.06				
4. Creeping Red Fescue	15	.34		X	X	X
5. Switchgrass ^{1/}	8	.20	5.5 – 7.0	X	X	X
<u>Temporary Seedings ^{2/}</u>						
1. Cereal Rye or Wheat	90	2.5		X	X	X
2. Oats	90	2.5				
3. Perennial Ryegrass	24	.55	5.5 – 7.5	X	X	X
<u>Companion Crops ^{2/}</u>						
1. Spring Oats	32			X	X	X
2. Cereal Rye or Wheat	90					

^{1/} Do not seed in the fall.

^{2/} Temporary seeding and companion crops can be planted anytime during the growing season.

TABLE 2
SEEDING DATES

SPRING

Northern Illinois	Early Spring to June 1
Central Illinois	Early Spring to May 15
Southern Illinois	Early Spring to May 15

FALL

Northern Illinois	August 1 to September 1
Central Illinois	August 1 to September 10
Southern Illinois	August 1 to September 20

DORMANT

Northern Illinois	November 1 to March 15
Central Illinois	November 15 to March 1
Southern Illinois	November 15 to March 1

TABLE 3

WOODY PLANT MATERIALS

<u>Plant Zone</u>	<u>Common Name</u>	<u>Genus Species</u>	<u>Growth Form</u>
1	Black Willow	Salix nigra	Tree
1	Bankers Willow	Salix cottettii	Shrub
1	Purple-osier Willow	Salix purpurea	Shrub
1	Sandbar Willow	Salix interior	Tree
1	Carolina Willow	Salix caroliniana	Tree
1	Peach-leaved Willow	Salix amygdaloides	Tree
1	Buttonbush	Cephalanthis occidentalis	Shrub
1,2,3	Red-osier Dogwood	Cornus stolonifera	Shrub
2,3	Silky Dogwood	Cornus amomum	Shrub
2,3	Flowering Dogwood	Cornus florida	Tree
2,3	Green Ash	Fraxinus pennsylvanica	Tree
2,3	Sycamore	Platanus occidentalis	Tree
1,2,3	Baldcypress	Taxodium distichum	Tree
1,2	River Birch	Betula nigra	Tree
1,2,3	Eastern Cottonwood	Populus deltoides	Tree
1,2,3	Swamp Cottonwood	Populus heterophylla	Tree

Species selection shall consider the position of the plant in the bank profile (see figure 2 of standard drawing).

Zone 1 = Below normal waterline to upper limit of saturation area kept moist by capillary water movement. This zone includes the greatest potential for periodic inundations and the least moisture stress.

Zone 2 = Area from upper limit of Zone 1 to 2-3 feet from the top of the bank. This area may be subject to rapid drying and greater moisture stress.

Zone 3 = Area 2-3 feet below the top of the bank to a minimum of 30 feet into the floodplain (riparian area).

NATURAL RESOURCES CONSERVATION SERVICE
ILLINOIS URBAN MANUAL
PRACTICE STANDARD

WELL DECOMMISSIONING

(no.)
CODE 996



(Source: IL Department of Natural Resources)

DEFINITION

The sealing and permanent closure of a water well, boring, or monitoring well.

PURPOSE

The purposes of this practice are to:

1. Prevent entry of contaminated surface water into the well and migration of contaminants into the unsaturated (vadose) zone or saturated zone.
2. Prevent entry of vermin, debris, or other foreign substances into the well or well bore hole.
3. Eliminate the physical hazard of an open hole to people, animals and vehicles.
4. Prevent the commingling of chemically or physically different ground waters between separate water bearing zones.

CONDITIONS WHERE PRACTICE APPLIES

This standard applies to sealing and permanent closure of a water well, boring, or monitoring well that is no longer in use, or is in such a state of disrepair that it has the potential for transmitting contaminants into an aquifer or otherwise threatens the public health or safety.

This practice does not apply to wells that were used for waste disposal, or if evidence of contamination in the well exists. This practice does not apply to wells that contain contaminant levels that exceed state or federal water quality standards. Treatment of contamination source(s) is required before a well is decommissioned.

CRITERIA

All planned work shall comply with regulations as set forth in the Illinois Water Well Construction Code (Section 920.120 - Abandoned Wells and Section

920.130 - Permit Requirements) and any applicable local law.

CONSIDERATIONS

The decommissioning of water wells, borings, and monitoring wells are regulated by the Illinois Water Well Construction Code and local health department ordinances. If there is any disagreement between this standard and the current state/local codes, the state/local codes have primacy.

This practice may be part of a ground water protection system that includes water and chemical management practices.

To the extent practicable, an abandoned well should be decommissioned in a manner that restores the original hydrogeological conditions of the well site and does not preclude the use of the site from future land management practices.

Decommissioning requires special consideration of specific geological, biological, physical, and climatic conditions, the chemical composition of the surrounding soil, rock, and ground water at the well site, and the well's construction. The proximity of the abandoned well to other planned or existing wells and the hydrologic conditions of the area should be considered when decommissioning abandoned wells.

PLANS AND SPECIFICATIONS

Plans and specifications for decommissioning abandoned water wells shall be consistent with this standard and shall describe the

requirements for applying the practice to achieve its intended purposes.

Minimum documentation of a well decommissioning shall consist of an approved (by Illinois State Department of Health or local health department) plan or permit and a well sealing form (IL 482-0631, or local health department provided form).

OPERATION AND MAINTENANCE

The decommissioned well site shall be maintained in such a manner as to be consistent with adjacent land use(s). If general subsidence of the area overlaying the sealed well occurs, sufficient soil material shall be added to maintain a positive slope away from the abandoned well.

REFERENCE

Illinois Department of Public Health, 1998. Illinois Water Well Construction Code, Section 920.120-Abandoned Wells and Section 920-130-Permit Requirements. Springfield, IL

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SECTION 5 - CONSTRUCTION SPECIFICATIONS

INTRODUCTION

This section contains construction specifications and instructions for their use. The construction specifications along with material specifications (see Section 6) make up the contract specifications and can be used as the requirements in construction contracts. To make the construction specifications complete the last section must be written to identify the specific methods that apply, identify and describe bid items, and list any specific instructions that pertain to the job under construction. This last section is normally shown with the heading ITEMS OF WORK AND CONSTRUCTION DETAILS.

The construction specifications and instructions for use are from NRCS's National Engineering Handbook Series (NEH) Part 642 (formerly referred to as NEH Section 20) as well as several state interim specifications. The interim specifications are numbered starting at 200 and do not usually have a corresponding instruction for use.

A general discussion is included that describes how a bid schedule is set up, how construction specifications are compiled, and how construction details and bid items are set up in the specifications. Some examples are included in the discussion. The discussion is an abridged version from NEH Part 642.

Current updates of construction specifications from NRCS's National Engineering Handbook Series Part 642 can be found at <http://www.ftw.nrcs.usda.gov/nehcs.html>. The notice for the May 2001 release of the construction specifications in Part 642 identified revisions to Construction Specification 51 - Corrugated Metal Pipe and Construction Specification 94 - Contractor Quality Control. These changes are reflected in this release of Chapter 5 of the Illinois Urban Manual. The dates on the other construction specifications have not been updated; however, the technical content of all other construction specifications has not likely changed.

This section was updated in November 2002.

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SECTION 5 - CONSTRUCTION SPECIFICATIONS

GENERAL DISCUSSION

CONSTRUCTION CONTRACT

The body of a construction contract consists of general provisions, a bid schedule, specifications, drawings, inspection requirements, performance time, contract administration data and, when applicable, special provisions and wage rate decisions. Typically the general provisions are administrative and technical requirements that apply to all items of construction and to all contracts. The bid schedule tabulates the items of work for which direct payment will be made, shows the estimated quantities of work and the units of measurement, and provides space for the entry of contract prices. The specifications and drawings include the technical details and requirements of the contract. The office responsible for the design of the work develops the drawings and specifications and, in cooperation with the responsible administrative office, the bid schedule. The special provisions are administrative instructions and requirements that apply to the specific contract and are prepared by the responsible administrative office.

TERMS AND DEFINITIONS

The following terms and definitions are used relative to specifications for construction contracts:

National Standard Construction Specifications state the technical and workmanship requirements for the various operations required in the construction of the works, the methods of measurement, and the basis of payment.

National Standard Material Specifications state the quality of materials to be incorporated in the permanent works. The material specifications make up Section 6 of this manual.

Interim Specifications are specifications prepared for use in contracts that include construction items or materials not covered by National Standard Specifications.

Standard Specifications are National Standard and Interim specifications.

Construction Details are prepared by the design office and state the special requirements peculiar to a specific work of construction. They may take the form of written addenda to the standard construction specifications or notes on the drawings.

Contract Specifications are the complete specifications prepared for a specific contract and consist of construction and material specifications supplemented by lists and descriptions of items of work and construction details.

NATIONAL STANDARD CONSTRUCTION SPECIFICATIONS

National standard construction specifications are to be used verbatim. Some national standard specifications have sections that contain alternative methods of achieving work. The specification writer may delete the methods not used in the contract;

however, the method selected must be used verbatim. Only methods identified in the specification may be deleted from the national standard construction specification. Each of the national standard construction specifications is supplemented by instructions for its use. These instructions state the applicability of the specification and discuss the items of information that must be included in the contract specifications and drawings in order to completely define the specified item. They also discuss the conditions under which it may be appropriate to use any of the various methods listed. These instructions are included for use by design personnel and are not to be included in contract specifications.

NATIONAL STANDARD MATERIAL SPECIFICATIONS

National standard material specifications have been prepared for those materials whose quality must be uniform in all areas of applicability. National standard material specifications are to be used verbatim. They are not supplemented by instructions for use. Items of information that must be included in the contract specifications in order to completely describe the materials required for a specific contract are listed in the instructions for use of the construction specifications to which the material specifications are complementary.

Reference to material specifications may be in national standard construction specifications or may be placed in the construction details (either written in the specifications or noted on the contract drawings).

INTERIM SPECIFICATIONS

Interim specifications are for items that are not covered by national standard construction and material specifications. Interim specifications follow the same format as the national standard specifications. They are typically unique to a specific locality and therefore are not national in scope.

SELECTING APPROPRIATE STANDARD SPECIFICATIONS

The type of work to be done or the type of structural detail required will often dictate the construction method or sequence. The specification requirements must be compatible with the methods that must be used. The specification writer must also make sure that the methods selected in one specification are compatible with those selected in another. For example, the method of designating pay limits for excavation and earthfill.

BID SCHEDULE

The bid schedule forms the basis for payments to the Contractor and must list all items of work for which direct payment will be made. Since the efficiency of contract administration is directly affected by the manner in which the schedule is organized, the preparation of the bid schedule requires the close cooperation of the responsible design engineer and the contracting officer. Operating procedures must include provision for administrative review of the bid schedule in the early stages of its development as well as upon completion.

Designating the Items of Work

Considerable judgment based on design, construction, and contracting experience is required to divide the work into items for inclusion in the bid schedule. The schedule must be sufficiently comprehensive to allow the Contractor to make reasonably accurate estimates of the cost of doing the work and to enable the Contracting Officer to keep orderly records of work progress and to accurately compute progress and final payments due; on the other hand, the number of scheduled items should be held to the minimum needed to accomplish these purposes. The practicable extent to which the work should be divided into scheduled items must be judged in light of the quantities of work involved and local construction practices and procedures. The bid schedule should include those items necessary to result in fair and equitable treatment of the owner(s) and the Contractor.

Division of the Work into Items

For maximum efficiency of contract administration, the work should be divided into items on the basis of the following principles:

1. The work should be divided into items in a manner that will insure reasonable refinement of unit prices. The cost of any given type of work will vary according to its complexity and the complicating effects of the conditions under which it must be done. Generally, the scope of a bid item should be limited to a given type of work of a particular order of complexity and cost.

Exceptions to this rule may be justified on small jobs involving relatively small quantities of work.

2. The work should be divided into items in a manner that will prevent confusion of supplemental job requirements. Similar types of work may involve different sizes of components or different qualities of materials. To prevent confusion, each variation of a given type of work should be established as a separate item of work. Also, the grouping of non-related items or similar components of separate works of improvement should be avoided.
3. The work should be divided into items in a manner consistent with the cost sharing arrangements established in the work plan and the project agreement. For many projects, certain works of improvement may be paid for entirely or partially by different sponsoring organizations. To facilitate accounting of project costs, the work for such improvements should be established as separate items of work in the bid schedule.

Numbering and Titling

Bid items must be numbered consecutively beginning with the number one (1). Sub-item numbers shall not be used. Each bid item shall be given a descriptive title that distinctly identifies the work to be done. All items that involve significant quantities of

work (or significant procurement cost in the case of prefabricated units) should be designated as separate bid items.

Pay Items

Measurable items whose quantities may be subject to variation should be designated for payment on a unit price basis, and the estimated quantity of work and units of measurement must be shown in the schedule. Items that involve significant quantities of work, but are not conveniently measurable or whose quantities are not subject to variation, may be designated for payment on a lump-sum basis. An item involving a relatively insignificant quantity of work that is subject to only very minor variation may be designated as a subsidiary item, compensation for which is included in the payment for another item which has a logical relationship to the subsidiary item. Subsidiary items will not be numbered nor listed in the bid schedule, but must be designated and described in the "Items of Work and Construction Details" of the item and also referenced in the "Items of Work and Construction Details" Section of the specification for the pay item to which it is subsidiary.

Units of measurement must be compatible with the measurement and payment clauses of the specifications.

Example 1

A typical bid schedule format is demonstrated by the following:

<u>BID SCHEDULE</u>						
<u>Item</u>	<u>Work</u>	<u>Spec No.</u>	<u>Estimated Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
1	Clearing, Class A	1	12.5	ac.	_____	_____
2	Mobilization and Demobilization	8	1	Job	<u>xxxx</u>	_____
3	Excavation, Common	21	300	cu. yd.	_____	_____
4	Loose Rock Riprap	61	500	ton	_____	_____

CONTRACT SPECIFICATIONS

Contract specifications shall consist of an assembly of the appropriate standard construction and material specifications. Each construction specification will be supplemented by a Section entitled: "Items of Work and Construction Details". The supplemental Section of each construction specification shall: (1) be prepared especially for each invitation; (2) designate by number and title all of the bid items (exactly as numbered and titled in the bid schedule) to be performed in conformance with the requirements of the specification; (3) designate all subsidiary items to be

performed in conformance with the requirements of the specification; (4) for each designated item of work, state such supplemental requirements and items of information as are needed to relate the construction specification to the job at hand; (5) bear the number that is next in sequence after the number of the last Section of the standard specification; and (6) be inserted into the contract specification as the last page(s) of the construction specification.

Compilation

A contract specification must conform verbatim to the standard construction or material specification except, in a Section for which the standard specification offers methods, not all of the methods need to be included in that Section of the contract specification or be a one-time-use specification. The methods selected must be compatible with one another and with the conditions, materials and methods prevalent in the area of applicability and the requirements of the specified structural element.

More than one method may be included in any Section of a construction specification, in which case, the methods shall be numbered sequentially (i.e., Method 1, Method 2, etc.). The method applicable to each respective item of work, material, measurement and payment shall be identified in the construction detail Section. The instruction for each construction specification identifies the optional methods and provides guidance on their use.

Identifying

The title of each contract specification shall be the same as that of the standard construction or material specification.

When a construction specification is modified for a specific job by deleting specific methods from the standard specification, the state abbreviation and project name shall be added below "NRCS-IL-URB" in the lower left corner to indicate to the user and reviewers that the standard specification has been modified. The date at the bottom of the pages of the national standard specification shall not be changed. The pages should be renumbered consecutively.

When a construction specification is not modified by deleting specific methods from the standard specification, the numbering and footer information on the standard specification shall not be changed.

The Items of Work and Construction Details pages shall have the state abbreviation and the project name below "NRCS-IL-URB" in the lower left corner, the same page numbering format as the standard specification centered at the bottom of the page, and the date of compilation in the lower right corner.

Measurement and Payment

Each construction specification contains a Section that describes the method measurement to be used for the work performed or the material furnished and the

manner of payment to be made in full compensation of the work described. The basis for designating separate work items was described earlier under the "Bid Schedule" Section. Within the conditions described therein, each of the construction specifications may be modified to include a lump sum payment method. The format and working of the method will generally be as follows:

For items of work for which specific lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for this item will be made at the contract lump sum price for the item and will constitute full compensation for completion of the work.

Preparing Construction Details

The construction details for each item of work should be concise and will normally contain (see individual instruction for use of each construction specification):

1. Such definitions and descriptions as are needed to define the scope of work;
2. The information required to define the types and qualities of materials to be used in the work;
3. Special requirements such as foundation preparation, grading tolerances, provisions for coordinating with other work, obtaining "As Built" geology data, etc.; and
4. Other items of instruction necessary to define the construction requirements peculiar to the item of work.

The construction details should contain only such information and instructions as are needed to relate the construction specification to the job at hand. It is neither necessary nor desirable to emphasize or attempt to interpret provisions of the specification by repetition of the provisions in the construction details in the same or similar words.

In preparing construction details, it must be recognized that notes on the drawings have the effect of specifications in defining the type and quality of materials to be furnished and in defining the scope of the work. Supplemental information or requirements that are directly related to details shown on the drawings may be stated in notes on the drawings rather than in the specifications if that arrangement will more conveniently and effectively convey the information to the appropriate individuals that will benefit from this data. The engineer responsible for the design must use good judgment in deciding where various supplemental data should be located for maximum effectiveness. Usually, information shown by notes on the drawings need not be repeated in the specifications, however, if there is a compelling reason for doing so, great care must be taken to prevent conflicts between the notes and the specifications.

Construction details should not conflict with or interpret the general terms and conditions of the contract. They may modify a clause in the standard specifications if the standard specification contains the phrase "unless otherwise specified...".

Example 2

The following example demonstrates a typical construction detail for excavation that would be prepared for a specific contract and inserted at the end of Construction Specification 21, Excavation:

11. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and construction details are:

a. Bid Item 7, Excavation, Foundation, Common

- (1) This item shall consist of the excavation of unsuitable materials from the foundation of the main dam in areas that are located within the base area of the dam but outside the limits of cutoff trench.
- (2) The depth of excavation required is estimated at five (5) feet at the central half of the base area of the dam and tapering to about two (2) feet at the edges. The actual depths and extent of foundation excavation will be determined by the engineer after examination of the material encountered.
- (3) The sides of all foundation excavations shall not be steeper than 1 -1/2 horizontal to 1 vertical.
- (4) In Section 5, Use of Excavated Materials, Method 1 will apply.
- (5) In Section 6, Disposal of Waste Materials, Method 2 will apply.
- (6) In Section 11, Measurement and Payment, Method 1 will apply.

b. Bid Item 8, Excavation, Cutoff Trench, Common

- (1) This items consists of all common excavation required within the limits of the cutoff trench as shown on the drawings.
- (2) The depth of excavation required is estimated to extend generally down to near elevation 1105. The actual depths of excavation will be determined by the engineer after examination of the materials encountered.
- (3) In Section 5, Use of Excavated Materials, Method 1 will apply.
- (4) In Section 6, Disposal of Waste Materials, Method 2 will apply.
- (5) In Section 11, Measurement and Payment, Method 1 will apply.

c. Bid Item 9, Excavation, Cutoff Trench, Rock

- (1) This item consists of all rock excavation required within the limits of the cutoff trench as shown on the drawings.
- (2) In Section 4, Blasting, a blasting plan shall be furnished to the Contracting Officer for review and approval prior to the start of any blasting operations.
- (3) In Section 5, Use of Excavated Materials, Method 1 will apply.
- (4) In Section 6, Disposal of Waste Materials, Method 2 will apply.
- (5) In Section 11, Measurement and Payment, Method 1 will apply.

d. Bid Item 10, Excavation, Principal Spillway, Common

- (1) This item consists of all common excavation required within the limits shown on the drawings for the installation of the pipe conduit, riser footing, and outlet structure, except for that portion of the excavation located within the limits of the cutoff trench or above the lower limit of foundation excavation.
- (2) In Section 5, Use of Excavated Materials, Method 1 will apply.
- (3) In Section 6, Disposal of Waste Materials, Method 2 will apply.
- (4) In Section 11, Measurement and Payment, Method 1 will apply.

e. Bid Item 11, Excavation, Principal Spillway, Rock

- (1) This item consists of all rock excavation required within the limits shown on the drawings for the installation of the pipe conduit, riser footing, and outlet structure except for that portion of the excavation located within the limits of the cutoff trench.
- (2) In Section 4, Blasting, a blasting plan shall be provided to the Contracting Officer for review and approval prior to the start of any blasting operations.
- (3) In Section 5, Use of Excavated Materials, Method 1 will apply.
- (4) In Section 6, Disposal of Waste Materials, Method 2 will apply.
- (5) In Section 11, Measurement and Payment, Method 2 will apply.

f. Bid Item 12, Excavation, Emergency Spillway, Common

- (1) This item consists of all common excavation required within the limits shown on the drawings for the construction of the emergency spillway.
- (2) The grading tolerances for emergency excavation control section (Emergency Spillway Stations 11+30 to 12+10) shall be plus or minus 0.1 foot from grade shown. The grading tolerances for other emergency spillway excavations shall be plus or minus 0.2 feet from the grades shown
- (3) In Section 5, Use of Excavation Materials, Method 1 will apply.
- (4) In Section 6, Disposal of Waste Materials, Method 2 will apply.
- (5) In Section 11, Measurement and Payment, Method 1 will apply.

g. Subsidiary Item, Excavation, Borrow, Common

- (1) This item consists of all common excavation required to obtain suitable earthfill materials required to construct the permanent works.
- (2) In Section 9, Borrow Excavation, all borrow areas shall be graded to prevent the ponding of water. Finished slopes shall not be steeper than four (4) horizontal to one (1) vertical.
- (3) In Section 11, Measurement and Payment, no separate payment will be made for borrow excavation. Compensation for borrow excavation will be included in the payment for Bid Item 13, Earthfill Zone 1.

Example 3

The following example demonstrates a typical construction detail to cross-reference a subsidiary item, for earthfill that would be written for a specific contract and inserted into Construction Specification 23, EARTHFILL. Refer to item g, Example 2 previously provided:

10. ITEMS OF WORK AND CONSTRUCTION DETAILS

Items of work to be performed in conformance with this specification and construction details are:

a. Bid Item 13, Earthfill, Zone I

- (1) This item consists of placing and compacting all suitable materials required to construct Zone I of the embankment and the desilting pond, it also includes backfilling the cutoff trench and constructing a two (2) foot thick blanket on the left abutment as shown on the drawings.
- (2) In Section 2, Materials, the following shall apply:
 - (a) The material for Zone I shall be the natural deposits of gravel, sands, silts, and clays obtained from borrow area 1 and suitable materials from the required excavations.
 - (b) Material selected to construction Zone I, Earthfill, shall contain not less than thirty-five (35) percent fines (material passing the No. 200 sieve) when determined on a dry weight basis of the portion of the mass smaller than three (3) inches in nominal diameter, when tested in accordance with ASTM D 1140.
 - (c) Unsuitable or oversize materials shall be removed from fill materials before placement on the embankment and shall be wasted in the designated disposal locations shown on the drawings. Acceptable rock materials larger than six (6) inches in diameter shall be removed from Zone I and placed in Zone II or placed as rock riprap as applicable.
- (3) In Section 4, Placement, the fill shall be placed in layers not exceeding nine (9) inches in thickness prior to compaction. The maximum size of rock incorporated in the fill matrix shall be six (6) inches.
- (4) In Section 5, Control of Moisture, the moisture content of the fill matrix at the time of compaction shall be maintained with the range of two (2) percentage points below to two (2) percentage points above optimum moisture content.
- (5) In Section 6, Compaction, compaction shall be Class A. The fill matrix shall be compacted to at least ninety-five (95) percent of the maximum density determined by compaction tests of the fill materials by the appropriate method outlined in ASTM D 698.
- (6) In Section 9, Measurement and Payment, Method 2 and 6 will apply. Such payment will constitute full compensation for related subsidiary Item, Excavation, Borrow, Common.

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LIST OF CONSTRUCTION SPECIFICATIONS and INSTRUCTIONS FOR USE
(Alphabetical)

<u>Construction Specification Name</u>	<u>Number</u>
Chain Link Fence	91
Channel Clearing and Shaping	4
Clay Pipe	43
Clearing	1
Clearing and Grubbing	2
Concrete for Major Structures	31
Concrete Pipe Conduits and Drains	42
Concrete Repair	35
Construction Surveys	7
Contractor Quality Control	94
Corrugated Metal Pipe	51
Corrugated Polyethylene Tubing	44
Digging, Transporting, Planting and Establishment of Trees, Shrubs and Vines	707
Diversions and Waterways	27
Drainfill	24
Ductile-Iron Pipe	53
Earthfill	23
Excavation	21
Field Fence	92
Field Office	96
Geosynthetic Clay Liner	98
Geotextile	95
Grouted Rock Riprap	62
HDPE and LLDPE Liner	97
Identification Markers or Plaques	93
Lime-Treated Earthfill	28
Metal Fabrication and Installation	81
Mobilization and Demobilization	8
Painting Metalwork	82
Painting Wood	84
Piling	13
Plastic Pipe	45
Pollution Control	5
Pressure Grouting	14
Reinforced Concrete Pressure Pipe Conduits	41
Relief Wells	12
Removal of Water	11
Rockfill	25
Rock Riprap	61
Seeding, Sprigging and Mulching	6
Shotcrete	33
Sodding	204
Soil-Cement	29

LIST OF CONSTRUCTION SPECIFICATIONS AND INSTRUCTIONS FOR USE cont.
(Alphabetical)

<u>Construction Specification Name</u>	<u>Number</u>
Steel Pipe	52
Steel Reinforcement	34
Stripping, Stockpiling, Site Preparation and Spreading Topsoil	752
Structure Concrete	32
Structure Removal	3
Tile Drains	46
Timber Fabrication and Installation	83
Topsoiling	26
Traffic Control	9
Treatment of Rock Surfaces	63
Use of Grasses for Streambank Stabilization	751
Use of Woody Plantings for Streambank Stabilization	750
Water Control Gates	71
Water for Conservation	10
Wire Mesh Gabions and Mattresses Twisted (Woven) or Welded Mesh	64

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LIST OF CONSTRUCTION SPECIFICATIONS and INSTRUCTIONS FOR USE
(Numerical and Topical)

		Date	
		Instruction	Specification
<u>Site Preparation</u>			
1.	Clearing	1/97	1/97
2.	Clearing and Grubbing	1/97	1/97
3.	Structure Removal	1/97	1/97
4.	Channel Clearing and Shaping	1/97	1/97
5.	Pollution Control	10/98	10/98
6.	Seeding, Sprigging and Mulching	11/97	11/97
7.	Construction Surveys	11/97	11/97
8.	Mobilization and Demobilization	10/98	10/98
9.	Traffic Control	11/97	11/97
10.	Water for Construction	10/98	10/98
<u>Foundation Work</u>			
11.	Removal of Water	10/98	10/98
12.	Relief Wells	10/98	10/98
13.	Piling	10/98	10/98
14.	Pressure Grouting	10/98	10/98
<u>Earthwork</u>			
21.	Excavation	10/98	10/98
23.	Earthfill	10/98	10/98
24.	Drainfill	10/98	10/98
25.	Rockfill	10/98	10/98
26.	Topsoiling	10/98	10/98
27.	Diversions and Waterways	11/97	11/97
28.	Lime-Treated Earthfill	11/97	11/97
29.	Soil-Cement	11/97	11/97
<u>Concrete and Reinforcement</u>			
31.	Concrete for Major Structures	1/97	1/97
32.	Structure Concrete	1/97	11/97
33.	Shotcrete	10/98	10/98
34.	Steel Reinforcement	11/97	11/97
35.	Concrete Repair	11/97	11/97
<u>Non-Metal Pipe Conduits and Drains</u>			
41.	Reinforced Concrete Pressure Pipe Conduits	11/97	11/97
42.	Concrete Pipe Conduits and Drains	11/97	11/97
43.	Clay Pipe	10/98	10/98
44.	Corrugated Polyethylene Tubing	10/98	10/98
45.	Plastic Pipe	10/98	10/98
46.	Tile Drains	10/98	10/98

LIST OF CONSTRUCTION SPECIFICATIONS and INSTRUCTIONS FOR USE cont.
(Numerical and Topical)

	Instruction	Date	Specification
<u>Metal Pipe Conduits</u>			
51.	Corrugated Metal Pipe	5/01	5/01
52.	Steel Pipe	10/98	10/98
53.	Ductile-Iron Pipe	10/98	10/98
<u>Riprap and Slope Protection</u>			
61.	Rock Riprap	11/97	11/97
62.	Grouted Rock Riprap	10/98	10/98
63.	Treatment of Rock Surfaces	10/98	10/98
64.	Wire Mesh Gabions and Mattresses Twisted (Woven) or Welded Mesh	11/97	11/97
<u>Water Control Gates and Valves</u>			
71.	Water Control Gates	10/98	10/98
<u>Miscellaneous Structural Work</u>			
81.	Metal Fabrication and Installation	10/98	10/98
82.	Painting Metalwork	10/98	10/98
83.	Timber Fabrication and Installation	10/98	10/98
84.	Painting Wood	10/98	10/98
<u>Miscellaneous Construction</u>			
91.	Chain Link Fence	11/97	11/97
92.	Field Fence	11/97	11/97
93.	Identification Markers or Plaques	11/97	11/97
94.	Contractor Quality Control	5/01	5/01
95.	Geotextile	10/98	10/98
96.	Field Office	11/97	11/97
97.	HDPE and LLDPE Liner	5/02	5/02
98.	Geosynthetic Clay Liner	5/02	5/02
<u>Vegetation</u>			
204.	Sodding		4/00
707.	Digging, Transporting, Planting, and Establishment of Trees, Shrubs and Vines		8/94
750.	Use of Woody Plantings for Streambank Stabilization		4/00
751.	Use of Grasses for Streambank Stabilization		4/00
752.	Stripping, Stockpiling, Site Preparation and Spreading Topsoil		8/94

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INSTRUCTIONS FOR USE OF CONSTRUCTION SPECIFICATION 1

CLEARING

1. APPLICABILITY

Construction Specification 1 is applicable to the clearing of vegetation at construction sites where grubbing is not required.

2. MATERIAL SPECIFICATIONS

There are no material specifications complementary to Construction Specification 1.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. When the area(s) to be cleared is definable on the project layout map or other construction plan view drawing, the limits of each Class (A, B, or C as defined in Section 2. CLASSIFICATION) of clearing must be shown and clearly defined.
- b. When the area(s) to be cleared are not definable on the drawings (which may occur for many channel improvement projects) the extent of each Class of clearing required must be described by notes and designation of right-of-way boundaries and station limits. The full extent of work to be performed must be clearly defined.
- c. When replacement plants are required because of damage caused by the Contractor, the specific size, number, and species needs to be specified in Section 8. Example: "Any tree removed that was designated to remain or is irreparably damaged shall be replaced with two 15 gallon size Valley Oak (*Quercus lobata*) as directed by the Contracting officer."
- d. When measurement and payment is identified to be in accordance with Method 2, Section 7, the survey line(s) along which the length of cleared area(s) is to be measured must be designated. The lateral extent and station reaches of the area(s) to be cleared must be clearly defined.
- e. Areas in which disposal of refuse/waste material will not be allowed or areas where disposal will be restricted or limited must be clearly defined or shown on the drawings.
- f. Required minimum depth of earth cover over buried materials, if applicable.
- g. Required surface grading over buried materials, if applicable. Existing natural flow patterns onto or from the construction site onto other properties must be a consideration in the final grading.
- h. Restrictions on the use of explosives, if any.
- i. Restrictions on the burning of combustible materials as a disposal procedure, if any.

- j. Special requirements to control erosion, water pollution, and air pollution, if applicable. Requirements of this specification must be compatible with any and all requirements outlined in Construction Specification 5, [Pollution Control](#), when included as part of the contract.
- k. Method(s) of measurement and payment, if the standard specification includes more than one method.

4. DISCUSSION OF METHODS

a. Section 7, Measurement and Payment

- (1) Methods 1 and 3 are intended for use when the area(s) to be cleared is/are extensive and can be defined in area units on the ground and clearly shown on the drawing(s). Section 8 should specify horizontal or surface measurements to be used to determine area cleared. A reservoir project is a good example of this type of site.
- (2) Method 2 is intended for use when the area(s) to be cleared is/are long and narrow, and cannot be clearly defined on the drawings. Section 8 should specify horizontal or surface measurements to be used to determine area cleared. A channel right-of way is a typical example of this type of site.
- (3) Method 4 is intended for use when the area(s) to be cleared cannot be measured practically and when it is reasonable to expect that variations in the quantity of clearing to be performed will be minor. For Method 4, the procedures that will be used to determine the amount of work satisfactorily completed for progress payment needs to be identified in Section 8.

Options may include:

- an on site agreed-to estimate of the percent of work satisfactorily completed at time of progress payment cut off; or
- require the contractor to provide measurements of all areas and those that have been satisfactorily cleared, and use a percentage of the total item; or other suitable and fair methods, one of which could be related to the construction schedule.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

1. CLEARING

1. SCOPE

The work shall consist of the clearing and disposal of trees, snags, logs, brush, shrubs, stumps, and rubbish from the designated areas.

2. CLASSIFICATION

Unless otherwise specified in Section 8, clearing will be classified according to the following definitions:

Class A clearing requires that trees and other woody vegetation be removed so that the remaining stumps extend no higher than four (4) inches above the ground surface.

Class B clearing requires that trees and other woody vegetation be removed so that the remaining stumps extend no higher than twelve (12) inches above the ground surface.

Class C clearing requires that trees and other woody vegetation be removed as near the ground surface as conventional tools or field conditions will permit, or as specified in Section 8.

3. PROTECTION OF EXISTING VEGETATION

Trees and other woody vegetation designated to remain undisturbed shall be protected from damage throughout the entire construction period. Any damage resulting from the Contractor's operations or neglect shall be repaired by the Contractor.

Earthfill, stockpiling of materials, vehicular parking, and excessive foot or vehicular traffic shall not be allowed within the drip line of vegetation designated to remain in place. Vegetation damaged by any of these or similar actions shall be replaced with viable vegetation of the same species or as specified in Section 8 and approved by the Contracting Officer.

Any cuts, skins, scrapes or bruises to the bark of the vegetation shall be carefully trimmed and local nursery accepted procedures utilized to seal damaged bark.

Any limbs or branches one-half (1/2) inch or greater in diameter which are broken, severed or otherwise seriously damaged during construction shall be cutoff at the base of the damaged limb or branch flush with the adjacent limb or tree trunk.

All roots one (1) inch or greater in diameter which are cut, broken or otherwise severed during construction operations shall have the end smoothly cut perpendicular to the root. Roots exposed during excavation or other operations shall be covered with moist earth and/or backfilled as soon as possible to prevent the roots from drying.

4. MARKING

The limits of the areas to be cleared will be marked by means of stakes, flags, tree markings or other suitable methods. Trees to be left standing and uninjured will be designated by special markings placed on the trunks at a height of about six (6) feet above the ground surface.

5. CLEARING

All trees not marked for preservation and all snags, logs, brush, shrubs, stumps, rubbish and similar materials shall be cleared from within the limits of the marked areas.

6. DISPOSAL

All materials cleared from the designated areas shall be disposed of at locations shown on the drawings or in a manner specified in Section 8. The Contractor is responsible for complying with all local rules and regulations and the payment of any and all fees that may result from the disposal at locations away from the construction location.

7. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the cleared area will be measured to the nearest 0.1 acre. Payment for clearing will be made for the total area within the designated limits at the contract unit price for the specified class of clearing. Such payment will constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to the completion of the work.

Method 2 For items of work for which specific unit prices are established in the contract, the length of the cleared area will be measured to the nearest full station (100 feet) along the line designated on the drawings or in the specifications. Payment for clearing will be made for the total length within the designated limits at the contract unit price for the specified class of clearing. Such payment will constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to the completion of the work.

Method 3 For items of work for which specific unit prices are established in the contract, the cleared areas will be measured within the specified limits to the nearest 0.1 acre. The cleared areas will be determined by measuring the width cleared, within the specified limits, at representative sections and multiplying the average width between sections by the linear distance between sections. Payment for clearing will be made at the contract unit price for the item and shall constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to the completion of the work.

Method 4 For items of work for which specific lump sum prices are established in the contract, payment for clearing will be made at the contract lump sum prices. Such payment shall constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to the completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 8.

INSTRUCTIONS FOR USE OF CONSTRUCTION SPECIFICATION 2

CLEARING AND GRUBBING

1. APPLICABILITY

Construction Specification 2 is applicable to the clearing and grubbing of woody vegetation and the removal of trash and rubbish at construction sites.

2. MATERIAL SPECIFICATIONS

There are no material specifications complementary to Construction Specification 2.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. When the area(s) to be cleared and grubbed, including area(s) of rubbish removal, is definable on the project layout map or other construction plan view, the limits must be shown and clearly defined.
- b. When the area(s) to be cleared and grubbed is not definable on the drawings (which may occur for many channel improvement projects) the extent of clearing and grubbing required must be described by notes and designation of right-of-way boundaries and station limits.
- c. When replacement plants are required because of damage caused by the Contractor, the specific size, number, and species needs to be specified in Section 7. Example; "Any tree removed that was designated to remain or is irreparably damaged shall be replaced with two 15 gallon size Valley Oak (*Quercus lobata*) as directed by the Contracting Officer."
- d. When measurement and payment is identified to be in accordance with Method 2, Section 6, the survey line(s) along which the cleared and grubbed area(s) length is to be measured must be designated. The lateral extent and station reaches of the area(s) to be cleared and grubbed must be clearly defined.
- e. Areas in which disposal of refuse/waste material will not be allowed or areas where disposal will be restricted must be clearly defined and/or shown on the drawings.
- f. Special requirements for grubbing depth, if required.
- g. Required depth of earth cover over buried materials, if applicable.
- h. Required surface grading over buried materials, if applicable. Existing natural flow patterns onto or from the construction site onto other properties must be a consideration in the final grading.
- i. Restrictions on the use of explosives, if any.
- j. Restrictions on the burning of combustible materials as a disposal procedure, if any.

- k. Special requirements for control of erosion, water pollution, and air pollution, if applicable. Requirements of this specification must be compatible with any and all requirements outlined in Construction Specification 5, [Pollution Control](#), when included as part of the contract.
- l. Method(s) of measurement and payment, if the standard specification includes more than one method.

4. DISCUSSION OF METHODS

a. Section 6, Measurement and Payment

- (1) Method 1 is intended for use when the area (s) to be cleared and grubbed is extensive and can be defined in units of area on the ground and on the drawings. Section 6 should specify horizontal or surface measurements to be used to determine area cleared and grubbed. A reservoir area is a typical example of this type of site.
- (2) Method 2 is intended for use when the area (s) to be cleared and grubbed is long and narrow. Section 6 should specify horizontal or surface measurements to be used to determine length of clearing and grubbing. A channel right-of-way is a typical example of this type of site.
- (3) Method 3 is intended for use when the area(s) to be cleared and grubbed is extensive, but the vegetation consists mainly of scattered trees, stumps, snags, etc., that can be measured individually.
- (4) Method 4 is intended for use when the area(s) to be cleared and grubbed cannot be measured practically and when it is reasonable to expect that variations in the estimated quantity of work to be performed will not occur after the contract is awarded. For Method 4, the procedures that will be used to determine the amount of work satisfactorily completed for progress payment needs to be identified in Section 7.

Options may include:

- an on site agreed-to estimate of the percent of work satisfactorily completed at time of cutoff; or
- require the contractor to provide measurements of all areas and identify those that have be satisfactorily cleared and grubbed, and use a percentage of the total bid item; or
- other suitable and fair methods, one of which could be related to construction schedule.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

2. CLEARING AND GRUBBING

1. SCOPE

The work shall consist of clearing and grubbing and disposal of trees, snags, logs, brush, stumps, shrubs and rubbish from the designated areas.

2. PROTECTION OF EXISTING VEGETATION

Trees and other vegetation designated to remain undisturbed shall be protected from damage throughout the duration of the construction period. Any damages resulting from the Contractor's operations or neglect shall be repaired by the Contractor.

Earthfill, stockpiling of materials, vehicular parking, and excessive foot or vehicular traffic shall not be allowed within the drip line of vegetation designated to remain in place. Vegetation damaged by any of these or similar actions shall be replaced with viable vegetation of the same species, similar condition, and like size unless otherwise approved by the Contracting Officer.

Any cuts, skins, scrapes or bruises to the bark of the vegetation shall be carefully trimmed and local nursery accepted procedures utilized to seal damaged bark.

Any limbs or branches one-half (1/2) inch or greater in diameter which are broken, severed or otherwise seriously damaged during construction shall be cut off at the base of the damaged limb or branch flush with the adjacent limb or tree trunk.

All roots one (1) inch or greater in diameter which are cut, broken or otherwise severed during construction operations shall have the end smoothly cut perpendicular to the root. Roots exposed during excavation or other operations shall be covered with moist earth and/or backfilled as soon as possible to prevent the roots from drying out.

3. MARKING

The limits of the area(s) to be cleared and grubbed will be marked by means of stakes, flags, tree markings or other suitable methods. Trees to be left standing and uninjured will be designated by special markings placed on the trunk about six (6) feet above the ground surface.

4. CLEARING AND GRUBBING

All trees not marked for preservation and all snags, logs, brush, stumps, shrubs, rubbish and similar materials shall be cleared from within the limits of the designated areas. Unless otherwise specified, all stumps, roots and root clusters having a diameter of one (1) inch or larger shall be grubbed out to a depth of at least two (2) feet below subgrade for concrete structures and one (1) foot below the ground surface at embankment sites and other designated areas.

5. DISPOSAL

All materials cleared and grubbed from the designated areas shall be disposed of at locations shown on the drawings or in a manner specified in Section 7. The Contractor is responsible for complying with all local rules and regulations and the payment of any and all fees that may result from disposal at locations away from the project site.

6. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific units prices are established in the contract, the cleared and grubbed area will be measured to the nearest 0.1 acre. Payment for clearing and grubbing will be made for the total area within the designated limits at the contract unit price. Such payment will constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to the completion of the work.

Method 2 For items of work for which specific unit prices are established in the contract, the length of the cleared and grubbed area will be measured to the nearest full station (100 feet) along the line designated on the drawing or identified in the specifications. Payment for clearing and grubbing will be made for the total length within the designated limits at the contract unit price. Such payment will constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to the completion of the work.

Method 3 For items of work for which specific unit prices are established in the contract, each tree, stump and snag having a diameter of four (4) inches or greater and each log having a diameter of four (4) inches or greater and a length of ten (10) feet will be measured prior to removal. The size of each tree and snag will be determined by measuring its trunk at breast height above the natural ground surface. The size of each log will be determined by measuring the butt and by measuring its length from butt to tip. The size of each stump will be measured at the top. Diameter shall be determined by dividing the measured circumference by 3.14.

Payment for clearing and grubbing of each tree, stump and snag having a diameter of four (4) inches or greater and each log having a diameter of four (4) inches or greater and a length of ten (10) feet or greater will be made at the contract unit price for its size designation as determined by the following schedule:

Measured Diameter (in.)	Size Designation (in.)
4 to 8	6
8 to 12	10
12 to 24	18
24 to 36	30
36 to 60	48
Over 60	60

The sum of such payments shall constitute full compensation for clearing and grubbing; including the clearing and grubbing of smaller trees, stumps, snags, logs, brush, shrubs, roots, applicable permits and associated fees, and rubbish removal. Such payment shall constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to the completion of the work.

Method 4 For items of work for which specific lump sum prices are established in the contract, payment for clearing and grubbing will be made at the contract lump sum price. Such payment shall constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to the completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7.

STRUCTURE REMOVAL

1. APPLICABILITY

Construction Specification 3 is applicable to the removal of all types of structures, including fencing, from construction sites.

2. MATERIAL SPECIFICATIONS

There are no material specifications complementary to Construction Specification 3.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. The location and description of each structure or fence to be removed or the area from which structures are to be removed must be shown on the drawings. If structure removal is designated by area limits, the location and description of all buried structures to be removed must be shown together with area boundaries. All known information regarding the structure must be shown.
- b. The location and types of structures or fences to be preserved in place or to be salvaged must be shown on the drawings.
- c. The required extent and depth of removal.
- d. The locations of storage areas for salvaged structural materials must be shown on the drawings or indicated by appropriate notations. Note: A separate bid item may be required, due to cost sharing arrangements, when structure salvage is included in the contract.
- e. Areas where disposal of refuse material will not be permitted or areas where disposal will be limited, if known. If refuse materials must be disposed of outside the right-of-way or work limits, make appropriate notation.
- f. Structures, including fences, to be removed by others.
- g. Required minimum depth of earth cover, soil density requirements, and surface grading over buried materials, if applicable.
- h. Restrictions on the use of explosives, if any.
- i. Special requirements for control of erosion, water pollution, and air pollution, if applicable. Requirements of this specification must be compatible with any and all requirements outlined in Construction Specification 5, [Pollution Control](#), when included as part of the contract.
- j. Method(s) of measurement and payment, if the standard specification includes more than one method.

4. DISCUSSION OF METHODS

a. Section 2, Marking

- (1) Method 1 is intended for use when the structures to be removed are of significant size or when structures at several easy to identify locations must be removed. Whenever possible, this method is preferred over Method 2.
- (2) Method 2 may be used when several small structures located within the work limits are to be removed.

b. Section 3, Removal

- (1) Method 1 is compatible with Method 1, Marking, and must be used accordingly.
- (2) Method 2 is compatible with Method 2, Marking, and must be used accordingly.

c. Section 6, Measurement and Payment

- (1) Method 1 is for measurement and payment on a unit basis.
- (2) Method 2 is for payment on a lump sum basis. For this method, Section 7 should include the procedures that will be used to determine extent of satisfactory completed work for progress payment purposes.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

3. STRUCTURE REMOVAL

1. SCOPE

The work shall consist of the removal, salvage, and disposal of structures (including fences) from the designated areas.

2. MARKING

Method 1 Each structure or structure part to be removed will be marked with stakes, flags, paint or other suitable method.

Method 2 The area boundaries from which structures must be removed will be marked by means of stakes, flags, paint or other suitable method. Structures to remain undisturbed or to be salvaged will be designated by special markings.

3. REMOVAL

Method 1 All structures designated for removal in the contract shall be removed to the specified extent and depth.

Method 2 Within the areas so marked, all visible and buried structures identified shall be removed to the specified extent and depth.

4. SALVAGE

Structures or structure parts that are designated to be salvaged shall be carefully removed and neatly placed in the specified or approved storage location. Salvaged structures that are capable of being disassembled shall be dismantled into individual members or sections. Such structures shall be neatly and systematically marked with paint prior to disassembly. All connectors and other parts shall be marked to indicate their proper location within the structure and shall be fastened to the appropriate structural member or packed in suitable containers.

Material from fences designated to be salvaged shall be placed outside the work area on the property on which the fence was originally located. Fence wire shall be rolled into uniform rolls of suitable size and neatly piled with other salvaged materials. Posts and rails shall be neatly stacked.

5. DISPOSAL OF REFUSE MATERIALS

Refuse materials resulting from structure removal shall be disposed of in a manner and at locations specified in Section 7 of this specification or in an acceptable manner and at locations approved by the Contracting Officer. Disposal by burning shall be in accordance with local rules and regulations.

6. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established by the contract, payment for the removal of each structure unit, except fences, will be made at the contract unit price. Fences removed or removed and salvaged will be measured to the nearest linear foot. Payment for fence removal or removal and salvage will be made at the contract unit prices for each type and size of fence.

Such payment will constitute full compensation for all labor, equipment, tools, applicable permits and associated fees for burning and disposal of refuse, and all other items necessary and incidental to the completion of the work.

Method 2 For items of work for which specific lump sum prices are established by the contract, payment for structure removal will be made at the contract lump sum price.

Such payment will constitute full compensation for all labor, equipment, tools, applicable permits and associated fees for burning and disposal of refuse, and all other items necessary and incidental to the completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed as a contract line item number in the bid schedule, will be included in the payment for the item of work to which it is made subsidiary. Such items and items to which they are made subsidiary are identified in Section 7 of this specification.

CHANNEL CLEARING AND SHAPING

1. APPLICABILITY

Construction Specification 4 is applicable to the clearing, removal, and disposal of woody and other vegetation; removal and disposal of trash and rubbish; and the earth shaping of the bottom and sides of the channel. This specification is applicable for natural floodways, constructed channels, and other drainage systems.

2. MATERIAL SPECIFICATIONS

There are no material specifications complementary to Construction Specification 4.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. The special markings indicating trees to be left standing, undisturbed, and uninjured must be described.
- b. For Section 2, Protection of Existing Vegetation, when the specific size of replacement plant is known or is desired, specify the number, size and species of the replacement in Section 8. Example: "Any tree designated to remain or is irreparably damaged shall be replaced with two 15 gallon size Valley Oak (*Quercus lobata*) as directed by the Contracting Officer."
- c. Areas in which disposal of refuse material or other waste materials resulting from channel clearing and shaping activities will not be allowed or areas where disposal will be limited or restricted, if known.
- d. Restrictions on the burning of combustible materials as a disposal procedure, if any.
- e. The reaches of the stream or channel where shaping is to be performed.
- f. An illustration and/or description that provides the shaping requirements.
- g. Method(s) of measurement and payment, if the standard specification includes more than one method.

4. DISCUSSION OF METHODS

a. Section 7, Measurement and Payment

- (1) Method 1 is intended for irregular-shaped reaches that need to be physically measured in the field. Section 8 should specify horizontal or surface measurements to be used to determine area cleared and shaped.
- (2) Methods 2 and 3 are intended for long channel reaches with uniform widths and minor variations in width, respectively. Section 8 should specify

horizontal or surface measurements to be used to determine area cleared and shaped.

(3) Method 4 is intended for use where the amount of work required is relatively consistent throughout the described work area. For this method, procedures that will be used to determine the amount of work satisfactorily completed for progress payment needs to be identified in Section 8. Options may include:

- an on site agreed-to estimate of the percent of work satisfactorily completed at time of cutoff;
or
- require the contractor to provide supporting calculations to determine extent of work satisfactorily completed;
or
- other suitable and fair methods, one of which could be related to the construction schedule.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

4. CHANNEL CLEARING AND SHAPING

1. SCOPE

The work shall consist of clearing designated areas by the removal and disposal of trees, logs, stumps, shrubs, brush, and rubbish, and the shaping of the channel.

2. PROTECTION OF EXISTING VEGETATION

Trees and other vegetation designated to remain undisturbed shall be protected from damage throughout the duration of the construction period. Any damages resulting from the Contractor's operations or neglect shall be repaired by the Contractor.

Earthfill, stockpiling of materials, vehicle or equipment parking, and excessive foot or vehicle traffic shall not be allowed within the drip line of vegetation designated to remain in place. Vegetation damaged by any of these or similar actions shall be replaced with viable vegetation of the same species, similar condition, and like size unless otherwise approved by the Contracting Officer.

Any cuts, skins, scrapes or bruises to the bark of the vegetation shall be carefully trimmed and local nursery accepted procedures utilized to seal damaged bark.

Any limbs or branches one-half (1/2) inch or greater in diameter which are broken, severed or otherwise seriously damaged during construction shall be cutoff at the base of the damaged limb or branch, flush with the adjacent limb or tree trunk.

All roots one (1) inch or greater in diameter which are cut, broken or otherwise severed during channel shaping shall have the end smoothly cut perpendicular to the root. Roots exposed during channel shaping operations shall be covered with moist soil as soon as possible to prevent roots from drying out.

3. MARKING

The limits of the area(s) to be cleared and shaped will be marked by means of stakes, flags, paint, tree markings or other suitable methods, or as specified in Section 8 of this specification, or will be shown on the drawings. Trees to remain standing, undisturbed, and uninjured will be designated by special markings.

4. CLEARING

Trees and other vegetation marked for clearing shall be cut off as near the ground surface as conventional tools and equipment will normally permit. All trees not marked for preservation and all snags, logs, brush, shrubs, stumps, and rubbish shall be cleared from within the area limits identified.

5. DISPOSAL

All woody material, vegetation, and rubbish resulting from clearing from designated areas shall be disposed of at the locations and in a manner shown on the drawings, or as specified in Section 8 of this specification.

6. SHAPING

The channel bottom and side slopes shall be shaped as shown on the drawings. The resulting shaped channel surface shall be reasonably smooth. Material excavated during the channel shaping operation shall be removed from the channel and disposed of as specified in Section 8 of this specification.

7. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established by the contract, the designated cleared and shaped area will be measured and the area determined to the nearest 0.1 acre. Payment for clearing and shaping will be at the contract unit price for the item and shall constitute full compensation for all labor, equipment, tools, applicable permits and associated fees for burning and disposal of refuse, and all other items necessary and incidental to the satisfactory completion of the work.

Method 2 For items of work for which specific unit prices are established by the contract, the length of the cleared and shaped channel designated will be measured to the nearest 100 feet. Payment for clearing and shaping will be made at the contract unit price for the item and shall constitute full compensation for all labor, equipment, tools, applicable permits and associated fees for burning and disposal of refuse, and all other items necessary and incidental to the satisfactory performance of the work.

Method 3 For items of work for which specific unit prices are established by the contract, the cleared and shaped area(s) will be measured and the area determined to the nearest 0.1 acre. The designated cleared and shaped area(s) will be determined from the measured width at representative sections and the distance between the sections. Payment for clearing and shaping will be made at the contract unit price for the item and shall constitute full compensation for all labor, equipment, tools, applicable permits and associated fees for burning and disposal of refuse, and all other items necessary and incidental to the satisfactory completion of the work.

Method 4 For items of work for which specific lump sum prices are established by the contract, the extent of clearing and shaping will not be measured or determined for payment. Payment for clearing and shaping will be made at the contract lump sum price for the item and shall constitute full compensation for all labor, equipment, tools, applicable permits and associated fees for burning and disposal of refuse, and all other items necessary and incidental to the satisfactory completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule, will be included in the payment for the item of work to which it is made subsidiary. Such items and items to which they have been made subsidiary are identified in Section 8 of this specification.

POLLUTION CONTROL

1. APPLICABILITY

This specification is applicable to the control or reduction of pollution from all construction activities.

2. MATERIAL SPECIFICATIONS

There are no material specifications complementary to this specification. Any material specifications required shall be specified in Section 8 of this specification.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. The area to be controlled should be defined and the limits to be treated shall be shown on the drawings and/or described in the construction specifications.
- b. If areas to be treated are not easily definable on the site map, such as some channel projects, the extent of treatment shall be fully described by notes or designated by stations or right-of-way limits.
- c. Restrictions or special requirements limiting the selection of best management practices for control or treatment should be specified.
- d. Special requirements designating the sequence of construction operations. These requirements might require temporary or prolonged shutdown periods of some or all construction operations.
- e. Alternate methods of control, if applicable.
- f. Any restrictions on amount of area disturbed before treatment is started.
- g. Any restriction on timing of installation, operation, or remove any of the controls or treatments. Stabilization and structural practices such as; diversions, stream crossings, sediment basins, sediment filters, and waterways are typically specified as temporary and to be removed. If any of these practices are to remain in place, specify in Section 8, along with any maintenance or changes required before final acceptance.
- h. Special pollution control requirements, such as sectional excavation or placement of materials, burying operations, waste area reclamation, blasting, clearing, dredging, or other unique construction procedure or operation.
- i. Water and chemicals for dust control is covered in Section 5. Payment for water for dust control may be included as an item of work under this specification or Construction Specification [10, Water for Construction](#). The intent is to be covered in Section 8 of this specification.

- j. Any other special requirements pertaining to this specification, including reference to applicable state and local laws and regulations.
- k. Storm Water Pollution Prevention Plan (SWPPP) requirements. Environmental Protection Agency or State requirements shall be followed as applicable.
- l. Method of measurement and payment.

4. CONSTRUCTION METHODS TO BE APPLIED IN CONTRACTS TO CONTROL POLLUTION

The following list does not include all possible erosion and pollution control methods. All personnel concerned with planning, design, and construction should study the site carefully and specify needed practices required to control erosion, sediment, and air pollution. Pollution control specifications are to be coordinated with the SWPPP requirements developed to meet the National Pollution Discharge Elimination System (NPDES) program.

a. Structures

- (1) Limit clearing and grubbing prior to actual need. Protect vegetation where possible.
- (2) Install terraces, diversions, or level spreaders, including stable outlets.
 - (a) Above and below borrow areas.
 - (b) Above earth emergency spillways.
 - (c) Above storage areas.
- (3) Control access and haul roads.
 - (a) Contour roads and grade surfaces away from slopes and toward controlled outlets.
 - (b) Dust control with water and/or chemicals.
 - (c) Erosion control by installing turnouts, culverts, and stabilize road ditches.
 - (d) Vegetate disturbed areas.
 - (e) Surface roughening or pitting.
- (4) Shape and control borrow areas. Reduce area and duration of exposed areas.
- (5) Install debris basins, brush dams, straw bale barriers and geotextile fences.
- (6) Locate, shape, size and protect by-pass channel.
 - (a) Use coffer dams.
 - (b) Pump extra water across construction area.

- (7) Sectional construction.
- (8) Timely installation of all structural and stabilization practices.
- (9) Control work sequence.
- (10) Complete as you go.
- (11) Winter or seasonal shut downs to minimize pollution control problems.
- (12) Good housekeeping practices, to prevent water or air pollution, in use at the work site at all times.
- (13) Seeding for temporary and/or permanent protection. Provide topsoil as appropriate.
- (14) Prevent wild fires. Burn only per regulations.
- (15) Prevent pollution by chemicals and lubricants.
- (16) Mulch unprotected areas.

b. Channels

- (1) Preserve natural vegetation where possible. Remove blocks if possible.
- (2) Leave old channel to function as long as possible. Perform new channel excavation as an initial construction activity.
- (3) Where possible, do not open new channel to flows until vegetation is established. Sequence work.
- (4) Seed or sod slopes immediately after construction. Provide topsoil as necessary.
- (5) Mulch or mat slopes immediately after disturbance.
- (6) Spray mulch, seed, fertilizer, and asphalt or polyvinyl resin, etc.
- (7) Begin excavation downstream and work upstream.
- (8) Use temporary grade control structures.
- (9) Limit clearing, clearing and grubbing, and snagging.
- (10) Limit disturbance of channel banks to one side. Delay and complete other side after the initial side is vegetated.

- (11) Channel construction should be performed in segments, completing each segment prior to starting the next segment.
- (12) Control storm water inlets into channel.
- (13) Install pipe inlets, grade control structures, etc., at the time of construction.
- (14) Install sediment traps in channel and provide for their clean out and maintenance.

5. DISCUSSION OF METHODS

a. Section 7, Measurement and Payment

- (1) Method 1 This method provides measurement and payment by the unit of work performed. The use of water and chemical suppressants inappropriately and excessive to need may be clarified in Section 8.
- (2) Method 2 This method provides for payment on the lump sum basis with progress payments determined from invoices provided by the Contractor.
- (3) Method 3 This method provides for payment on the lump sum basis with measurement on a prorated and equal basis for each monthly payment period.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

5. POLLUTION CONTROL

1. SCOPE

The work shall consist of installing measures or performing work to control erosion and minimize the production of sediment and other pollutants to water and air from construction activities.

2. MATERIALS

All materials furnished shall meet the requirements of the Material Specifications listed in Section 8 of this specification.

3. EROSION AND SEDIMENT CONTROL MEASURES AND WORKS

The measures and works shall include, but are not limited to, the following:

Staging of Earthwork Activities The excavation and moving of soil materials shall be scheduled to minimize the size of areas disturbed and unprotected from erosion for the shortest reasonable time.

Seeding Seeding to protect disturbed areas shall occur as soon as reasonably possible following completion of that earthwork activity.

Mulching Mulching to provide temporary protection of soil surfaces from erosion.

Diversions Diversions to divert water from work areas and to collect water from work areas for treatment and safe disposition. These works are temporary and shall be removed and the area restored to its near original condition when they are no longer required or when permanent measures are installed.

Stream Crossings Culverts or bridges where equipment must cross streams. These works are temporary and shall be removed and the restored to its near original condition when they are no longer required or when permanent measures are installed.

Sediment Basins Sediment basins to collect, settle and eliminate sediment from eroding areas from impacting properties and streams below the construction site(s). These works are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures are installed.

Sediment Filters Straw bale filters or geotextile sediment fences to trap sediment from areas of limited runoff. Sediment filters shall be properly anchored to prevent erosion under or around them. These works are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures are installed.

Waterways Waterways for the safe disposal of runoff from fields, diversions and other structures or measures. These works are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures are installed.

Other Additional protection measures as specified in Section 8 of this specification or required by Federal, State, or Local Government.

4. CHEMICAL POLLUTION

The Contractor shall provide water-tight tanks or barrels, or construct a sump sealed with plastic sheets to be used to dispose of chemical pollutants, such as drained lubricating or transmission fluids, grease, soaps, concrete mixer wash water, asphalt, etc., produced as a by-product of the construction activities. At the completion of the construction work, sumps shall be removed and the area restored to its original condition as specified in Section 8 of this specification. Sump removal shall be conducted without causing pollution.

Sanitary facilities such as chemical toilets, or septic tanks shall not be located adjacent to live streams, wells, or springs. They shall be located at a distance sufficient to prevent contamination of any water source. At the completion of construction activities, facilities shall be disposed of without causing pollution as specified in Section 8 of this specification.

5. AIR POLLUTION

The burning of brush and/or slash, and disposal of other materials shall adhere to state and local regulations.

Fire prevention measures shall be taken to prevent the start or spreading of wild fires which may result from project activities. Firebreaks or guards shall be constructed and maintained at locations shown on the drawings.

All public access or haul roads used by the contractor during construction of the project shall be sprinkled or otherwise treated to fully suppress dust. All dust control methods shall insure safe construction operations at all times. If chemical dust suppressants are applied, the material shall be a commercially available product specifically designed for dust suppression and the application shall follow manufacturer's requirements and recommendations. A copy of the product data sheet and manufacturer's recommended application procedures shall be provided to the Engineer five (5) working days prior to the first application.

6. MAINTENANCE, REMOVAL, AND RESTORATION

All pollution control measures and temporary works shall be adequately maintained in a functional condition for the duration of the construction period. All temporary measures shall be removed and the site restored to near original condition.

7. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, each item will be measured to the nearest unit applicable. Payment for each item will be made at the contract unit price for that item. For water or chemical suppressant items used for dust control for which items of work are established in Section 8 of this specification, measurement for payment will not include water or chemical suppressants that are used inappropriately or excessive to need. Such payment will constitute full compensation for the completion of the work.

Method 2 For items of work for which lump sum prices are established in the contract, payment will be made as the work proceeds and supported by invoices presented by the Contractor that reflect actual costs. If the total of all progress payments is less than the lump sum contract price for this item, the balance remaining for this item will be included in the final contract payment. Payment of the lump sum contract price will constitute full compensation for completion of the work.

Method 3 For items of work for which lump sum prices are established in the contract, payment will be prorated and provided in equal amounts on each monthly progress payment estimate. The number of months used for prorating shall be the number estimated to complete the work as outlined in the Contractor's approved construction schedule. The final month's prorate amount will be provided with the final contract payment. Payment as described above will constitute full compensation for completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items, and the items to which they are made subsidiary, are identified in Section 8 of this specification.

INSTRUCTIONS FOR USE OF CONSTRUCTION SPECIFICATION 6

SEEDING, SPRIGGING AND MULCHING

1. APPLICABILITY

Construction Specification 6 is applicable to vegetating and/or mulching all designated areas requiring protective cover following completion of construction operations.

2. MATERIAL SPECIFICATIONS

Material requirements are included in this specification.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Complete plans of the designated areas to be treated, including locations of disposal sites for oversize rocks and other debris.
- b. Name of plant or mixture to include scientific name, common name, and acceptable cultivars.
- c. Purity, germination, hard seed, and weed seed requirements for seed or mixture. Certified (e.g. Blue Tag) seed may be specified.
- d. Fertilizer, lime and other soil amendment requirements, if applicable.
- e. Inoculant requirements, if needed.
- f. Types of mulch, straw, hay, native hay, etc., and mulching methods, when required.
- g. Dates for seeding, sprigging, fertilizing, and mulching operations.
- h. Rates for seeding, sprigging, fertilizing, and mulching operations, expressed in pounds pure live seed (PLS) per acre.
- i. Method of application of seed, sprigs, fertilizer, and mulch.
- j. Method of anchoring mesh or netting.
- k. Supplemental irrigation to support vegetation establishment; frequency, volume per application, duration, etc. It is critical with some soils that over irrigation and soil saturation be avoided.

4. DISCUSSION OF METHODS

a. Section 6, Measurement and Payment

(1) Method 1 Measurements used to determine the size of the area treated should specify horizontal or surface measured values in Section 7.

Constructed fill and/or cut slopes steeper than three (3) feet horizontal to one

- (1) foot vertical should consider surface measurements to calculate areas for payment purposes.
- (2) Methods 2 and 3 The procedures that will be used to determine the amount of work satisfactorily completed for progress payment should be identified in Section 7.

Options may include:

- an on-site agreed-to estimate of the percent of work satisfactorily complete at time of progress payment preparation; or
- require the contractor to provide invoices (Method 3) to support his incurred costs to satisfactory complete work at time of progress payment; or
- other suitable and fair methods, one of which could be related to the construction schedule.

When specifications are prepared electronically and all but one method are deleted for use in a contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

6. SEEDING, SPRIGGING AND MULCHING

1. SCOPE

The work shall consist of preparing the area for treatment, furnishing and placing seed, sprigs, mulch, fertilizer, inoculant, lime and other soil amendments, and anchoring mulch in designated areas as specified.

2. MATERIALS

Seed - All seed shall conform to the current rules and regulations of the state where it is being used and shall be from the latest crop available. It shall meet or exceed the standard for purity and germination listed in Section 7.

Seed shall be labeled in accordance with the state laws and the U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of invitations for bids. Bag tag figures will be evidence of purity and germination. No seed will be accepted with a test date of more than nine (9) months prior to the delivery date to the site.

Seed that has become wet, moldy, or otherwise damaged in transit or storage will not be accepted. The percent of noxious weed seed allowable shall be as defined in the current state laws relating to agricultural seeds. Each type of seed shall be delivered in separate sealed containers and fully tagged unless exception is granted in writing by the Engineer.

Fertilizer - Unless otherwise specified, the fertilizer shall be a commercial grade fertilizer. The fertilizer shall meet the standard for grade and quality specified by state law. Where fertilizer is furnished from bulk storage, the Contractor shall furnish a supplier's certification of analysis and weight. When required by the contract, a representative sample of the fertilizer shall be furnished to the Engineer for chemical analysis.

Inoculants - The inoculant for treating legume seeds shall be a pure culture of nitrogen-fixing bacteria prepared specifically for the species and shall not be used later than the date indicated on the container or as otherwise specified. A mixing medium, as recommended by the manufacturer, shall be used to bond the inoculant to the seed. Two times the amount of the inoculant recommended by the manufacturer shall be used, except four times the amount shall be used when seed is applied by use of a hydraulic seeder. Seed shall be sown within twenty-four (24) hours of treatment and shall not remain in the hydraulic seeder longer than four (4) hours.

Lime and other Soil Amendments - Lime shall consist of Standard Ground Agriculture Limestone, or approved equivalent. Standard Ground Agriculture Limestone is defined as ground limestone meeting current requirements of the State Department of Agriculture. Other soil amendments shall meet quality criteria and application requirements specified in Section 7.

Mulch Tackifiers - Asphalt emulsion tackifiers shall conform to the requirements of ASTM D 977, Specification for Emulsified Asphalt. The emulsified asphalt may be rapid setting, medium setting, or slow setting. Non-asphaltic tackifiers required because of environmental considerations shall be as specified in Section 7.

Straw Mulch Materials - Straw mulch shall consist of wheat, barley, oat or rye straw, hay, grass cut from native grasses or other plants as specified in Section 7. The mulch material shall be air dry, reasonably light in color, and shall not be musty, moldy, caked, or otherwise of low quality. The use of mulch that contains noxious weeds will not be permitted. The Contractor shall provide a method satisfactory to the Engineer for determining weight of mulch furnished.

Other Mulch Materials - Mulching materials, such as wood cellulose fiber mulch, mulch tackifiers, synthetic fiber mulch, netting, and mesh are other mulching materials that may be required for specialized locations and conditions. These materials, when specified, must be accompanied by the manufacturer's recommendations for methods of application.

3. SEEDING MIXTURES, SOD, SPRIGS AND DATES OF PLANTING

The application rate per acre for seed mixtures, sprigs, or sod and date of seeding or planting shall be as shown on the plans or as specified in Section 7.

4. SEEDBED PREPARATION AND TREATMENT

Areas to be treated shall be dressed to a smooth, firm surface. On sites where equipment can operate on slopes safely, the seedbed shall be adequately loosened (4 to 6 inches deep) and smoothed. Depending on soil and moisture conditions, disking or cultipacking or both may be necessary to properly prepare a seedbed. On sites where equipment cannot operate safely, the seedbed shall be prepared by hand methods by scarifying to provide a roughened soil surface so that broadcast seed will remain in place.

If seeding is to be accomplished immediately following construction operations, seedbed preparation may not be required except on compacted, polished, or on freshly cut soil surfaces.

Rocks larger than six (6) inches in diameter, trash, weeds, and other debris that will interfere with seeding or maintenance operations shall be removed or disposed of as specified in Section 7.

Seedbed preparation shall be discontinued when soil moisture conditions are not suitable for the preparation of a satisfactory seedbed as determined by the Engineer.

5. SEEDING, SPRIGGING, FERTILIZING, MULCHING, AND STABILIZING

All seeding or sprigging operations shall be performed in such a manner that the seed and/or sprigs are applied in the specified quantities uniformly on the

designated areas. The method and rate of seed application shall be as specified in Section 7. Unless otherwise specified, seeding or sprigging shall be accomplished within two (2) days after final grading is completed and approved.

Fertilizer, lime, and other soil amendments shall be applied as specified in Section 7. When specified, the fertilizer and soil amendments shall be thoroughly incorporated into the soil immediately following surface application.

The rate, amount, and kind of mulching or mesh shall be as specified in Section 7. Mulches shall be applied uniformly to the designated areas, and shall be applied to areas seeded not later than two (2) working days after seeding has been performed. Straw mulch material shall be stabilized within twenty-four (24) hours of application by the use of a mulch crimper or equivalent anchoring tool or by a suitable tackifier. When the mulch crimper or equivalent anchoring tool is used, it shall have straight blades and be the type manufactured expressly for, and capable of firmly punching the mulch into the soil. On sites where the equipment can be safely operated, it shall be operated on the contour. On sites where equipment cannot safely operate to perform the work required, hand methods shall be used.

The tackifier shall be applied uniformly over the mulch material at the specified rate, or by injecting it into the mulch material as it is being applied. The mesh or netting stabilizing materials shall be applied smoothly but loosely on the designated areas, and the edges shall be buried or securely anchored by means of spikes or staples as specified in Section 7.

The Contractor shall maintain the mesh or netting areas until all work under the contract has been completed and accepted. Maintenance shall consist of the repair of areas damaged by water erosion, wind, fire, or other causes. Such areas shall be repaired to re-establish the intended condition and to the design lines and grades required by the contract. The areas shall be re-fertilized, re-seeded, and re-mulched prior to the new application of the mesh or netting.

6. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, each area treated will be measured as specified in Section 7 and the area calculated to the nearest 0.1 acre. Payment for treatment will be made at the contract unit price for the designated treatment which will constitute full compensation for completion of the work.

When specified as an item of work, mesh or netting will be measured to the nearest square yard of surface area covered and accepted. Payment will be made at the contract unit price and will constitute full compensation for completion of the work.

Method 2 For items of work for which specific lump sum prices are established in the contract, the quantity of work will not be measured for payment. Payment for this item will be made at the contract lump sum price for the item and will constitute full compensation for the completion of the work.

Method 3 For items of work for which lump sum prices are established in the contract, payment will be made as the work proceeds. Progress payments will be determined as specified in Section 7. Payment of the lump sum contract price will constitute full compensation for completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the item(s) to which they are made subsidiary are identified in Section 7.

CONSTRUCTION SURVEYS

1. **APPLICABILITY**

Construction Specification 7 is applicable to construction contracts containing clauses requiring the Contractor to provide construction surveys, layout and measurement from government established baselines and bench marks; to provide quantity surveys, measurements and computations for progress payment estimates; and when Method 3, Section 5, is authorized, provide original and final surveys for final quantity determinations.

2. **MATERIAL SPECIFICATIONS**

There are no material specifications complementary to this specification. Any material requirements are to be specified in Section 9.

3. **ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS**

- a. Baselines, benchmarks, and all other basic survey control information to be provided by the government are to be indicated on the drawings.
- b. Number of copies, format and timing of the submittal of survey data, notes, computations, etc., to be provided to the Engineer by the Contractor.
- c. Special requirements for advance notification of surveys to be performed by the Contractor.
- d. Quality of any material, as applicable. Example may be the providing of permanent reference stakes.
- e. Qualifications of construction survey personnel such as qualified construction personnel, certified or licensed land surveyors, or registered engineers. Provide a list outlining the minimum requirements expected.
- f. Special requirements for staking, such as offset reference stakes and hubs for excavations and fills.
- g. Requirements other than the standards of the industry such as being consistent with NRCS procedures or higher levels of accuracy than those specified. Precision and accuracy is discussed in EFH Chapter 1.
- h. Any special surveys, etc., to be performed by either the Contractor or the government, that are not listed in Section 5.

4. DISCUSSION OF METHODS

a. Section 5, Construction Surveys

- (1) Method 1 is for use where the government provides basic staking that includes alignment, grade and slope stakes. Other staking shall be performed by the Contractor and is considered quality control construction staking and surveys for the determination of work accomplished for progress payment purposes.
- (2) Method 2 is for use where the Contractor performs all surveys required for the layout and control of construction work and all surveys necessary for progress payment quantities. This does not include original (initial) and final surveys for determining final quantities for payment purposes.
- (3) Method 3 is the same as Method 2 except the Contractor is required to perform the original (initial) and final surveys for use in determining final payment quantities. Note: The use of Method 3 requires approval to use FAR Clause 52.236-16, Quantity Surveys, Alternate I. NRCS policy for Field Surveys is located in NEM Section 540.04, Contractor Surveys; Section 540.05, Checking; and, Section 540.06, Responsibility. The project's Quality Assurance Plan should outline the checking requirements. The State Conservation Engineer has the authority to approve construction documents (drawings and specifications) that outline the survey responsibilities. Administrative authority to use Method 3 rests with the Contract Specialist on the Regional Office Staff.

b. Section 8, Payment

- (1) Method 1 is for use when a related construction survey activity is significant and not expected to be uniform throughout the contract.
- (2) Method 2 is for use when the extent of required construction survey is minor and could be expected to be fairly uniform throughout the duration of the contract.

When specifications are prepared using electronic procedures and all but one method are deleted for use in a contract specification, delete "All Methods The following provisions apply to all methods of payment." and left justify the remaining text.

Note: The implementation of methods within this construction specification needs to be compatible with the Quality Assurance Plan prepared and approved for the project.

CONSTRUCTION SPECIFICATION

7. CONSTRUCTION SURVEYS

1. SCOPE

The work shall consist of performing all surveys, measurements and computations required by this specification.

2. EQUIPMENT AND MATERIAL

Equipment for construction surveys shall be of a quality and condition to provide the required accuracy. The equipment shall be maintained in good working order and in proper adjustment at all times. Records of repairs, calibration tests, accuracy checks and adjustments shall be maintained and be available for inspection by the Engineer. Equipment shall be checked, tested, and adjusted as necessary in conformance with manufacturer's recommendations.

Material includes all the necessary field notebooks, stakes, templates, platforms, equipment, spikes, steel pins, tools, and all other items necessary to perform the work specified.

3. QUALITY OF WORK

All work shall follow recognized professional practice and the standards of the industry unless otherwise specified in Section 9 of this specification. The work shall be performed to the accuracy and detail appropriate for the type of job. Notes, sketches, and other data shall be complete, recorded neatly, legible, reproducible and organized in a manner that facilitates ease in review and will allow reproduction of copies for job documentation. Survey equipment that requires little or no manual recording of field data shall have survey information documented as outlined in Section 9 of this specification.

All computations shall be mathematically correct and shall include information to identify the bid item, date, and who performed, checked and approved the computations. Computations shall be legible, complete and clearly document the source of all information used including assumptions and measurements collected.

If a computer program is used to perform the computations, the Contractor shall provide the Engineer with the software identification, vendor's name, version number, and other pertinent data, prior to beginning survey activities. Computer generated computations shall show all input data including values assigned and assumptions made.

The elevations of permanent and temporary benchmarks shall be determined and recorded to the nearest 0.01 foot. Differential leveling and transit traverses shall be of such precision that the error of vertical closure in feet shall not exceed plus or minus 0.1 times the square root of the traverse distance in miles. Linear measurements shall be accurate to within 1.0 foot in 5000 feet, unless otherwise specified in Section 9 of this specification. The angular error of closure for transit

traverses shall not exceed 1.0 minute times the square root of the number of angles turned.

The minimum requirements for placing slope stakes shall be at 100 foot stations for tangents, as little as 25-feet for sharp curves, breaks in the original ground surface and at any other intermediate stations necessary to insure accurate location for construction layout and measurement. Slope stakes and cross sections shall be perpendicular to the centerline. Significant breaks in grade shall be determined for cross sections. Distances shall be measured horizontally and recorded to the nearest 0.1 foot. Side shots for interim construction stakes may be taken with a hand level.

Unless otherwise specified in Section 9 of this specification, measurements for stationing and establishing the location of structures shall be made to the nearest 0.1 foot.

Elevations for concrete work, pipes and mechanical equipment shall be determined and recorded to the nearest 0.01 foot. Elevations for earthwork shall be determined and recorded to the nearest 0.1 foot.

4. PRIMARY CONTROL

The baselines and bench marks for primary control, necessary to establish lines and grades needed for construction, are shown on the drawings and have been located on the job site.

These baselines and benchmarks shall be used as the origin of all surveys, layouts and measurements to establish construction lines and grades. The Contractor shall take all necessary precautions to prevent the loss or damage of primary control points. Any stakes and/or control points lost or damaged by construction activity will be re-established by the Contractor or at Contractor expense.

5. CONSTRUCTION SURVEYS

Prior to commencement of work requiring contractor performed surveys, the Contractor shall submit in writing for Engineer's review: the name, qualifications and experience of the individual's to be assigned to the survey tasks.

Method 1 Contractor performed surveys shall include: (1) checking and any supplemental or interim staking, (2) performing quantity surveys, measurements and computations for progress payment, (3) other surveys as described in Section 9 of this specification.

Method 2 Contractor performed surveys shall consist of all work necessary for: (1) establishing line and grade for all work, (2) setting slope stakes for all work, (3) checking and any supplemental or interim staking, (4) establishing final grade stakes, (5) performing quantity surveys, measurements and computations for

progress payment and (6) other surveys as described in Section 9 of this specification.

Method 3 Contractor performed surveys shall consist of all work necessary for: (1) establishing line and grade for all work, (2) setting slope stakes for all work, (3) checking and any supplemental or interim staking, (4) establishing final grade stakes, (5) performing quantity surveys, measurements and computations for progress payments, (6) performing original (initial) and final surveys for determinations of final quantities, and (7) other surveys as described in Section 9 of this specification.

6. STAKING

Prior to the commencement of work on any item, the construction staking required for the item shall be completed. Construction staking shall be completed as follows, or as otherwise specified in Section 9 of this specification:

- a. Clearing and grubbing - The boundary of the area(s) to be cleared and grubbed shall be staked or flagged at a maximum interval of 200 feet, closer if needed, to clearly mark the limits of work. When Contractor staking is the basis for determining the area for final payment, all boundary stakes will be reviewed by the Engineer prior to start of this work item.
- b. Excavation and fill - Slope stakes shall be placed at the intersection of the specified slopes and ground line. Slope stakes and the reference stakes for slopes shall be marked with the stationing, required cut or fill, slope ratio and horizontal distance from the centerline or other control line. The minimum requirements for placing slope stakes is outlined in Section 3, Quality of Work.
- c. Structures - Centerline and offset reference line stakes for location, alignment and elevation shall be placed for all structures.

7. RECORDS

All survey data shall be recorded in fully identified standard hardbound engineering survey field notebooks with consecutively numbered pages. All field notes and printed data shall include the purpose or description of the work, the date the work was performed, weather data, sketches and the personnel who performed and checked the work. Electronically generated survey data and computations shall be bound, page numbered and cross-referenced in a bound field notebook containing the index for all survey activities. All work shall follow recognized professional practice.

The construction survey records shall be available at all times during the progress of the work for examination and use by the Engineer and when requested, copies shall be made available. The original field notebooks and other records shall be provided to and become the property of the owner prior to final payment and acceptance of all work.

Complete documentation of computations and supporting data for progress payments shall be submitted to the Engineer with each invoice for payment as specified in Section 9 of the specification. When the Contractor is required to conduct initial and final surveys as outlined in Section 5, CONSTRUCTION SURVEYS, notes shall be provided as soon as possible after completion to the Engineer for the purpose of determining final payment quantities.

8. PAYMENT

Method 1 For items of work for which lump sum prices are established in the contract, payment will be made as the work proceeds, after presentation of correct and accurate invoices by the Contractor showing related costs and evidence of the charges of suppliers, subcontractors, and others for supplies furnished and work performed. Invoices for the total amount of the contract price will not be accepted until all surveys are complete and required documentation has been determined complete. If the total of such payments is less than the lump sum contract price for this item, the unpaid balance will be included in the final contract payment. Payment of the lump sum contract price will constitute full compensation for completion of all work under the bid item.

Method 2 For items of work for which lump sum prices are established in the contract, payment will be made as the work proceeds with progress payment amounts determined as a percentage of the total work planned as projected from the Contractor's approved construction schedule. Payment of the lump sum contract price will constitute full compensation for completion of all work under this bid item.

Payment will not be provided under this item for the purchase price of materials and/or equipment having a residual value.

All Methods The following provisions apply to all methods of payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the item to which they are made subsidiary are identified in Section 9 of this specification.

MOBILIZATION AND DEMOBILIZATION

1. APPLICABILITY

Construction Specification 8 is applicable to any construction contract that includes a bid item for general mobilization and demobilization of the Contractor's personnel and equipment. It is not intended to cover mobilization and demobilization of special equipment for specific items of work, such as grouting equipment, pile driving equipment, rock drilling equipment, etc., for which payment for mobilization and demobilization is included and provided by specific bid items elsewhere in the contract.

2. MATERIAL SPECIFICATION

There are no material specifications complementary to Construction Specification 8.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Special requirements pertaining to mobilization and demobilization, if any.
- b. Any particular work for which payment will or will not be made under the mobilization and demobilization item if not adequately described by the specification.
- c. When more than one site(s) (work limits not continuous) are included in the contract, include in Section 4 of this specification if mobilization of contractor's equipment and personnel between sites are included or not included in Section 3, Payment.

4. DISCUSSION OF METHODS

No Methods are outlined in the Specification.

CONSTRUCTION SPECIFICATION

8. MOBILIZATION AND DEMOBILIZATION

1. SCOPE

The work shall consist of the mobilization and demobilization of the Contractor's forces and equipment necessary for performing the work required under the contract.

This work shall not include mobilization and demobilization for specific items of work for which payment is provided elsewhere in the contract.

Mobilization will not be considered as work in fulfilling the contract requirements for commencement of work.

2. EQUIPMENT AND MATERIALS

Mobilization shall include all activities and associated costs for transportation of Contractor's personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other necessary general facilities for the Contractor's operations at the site; premiums paid for performance and payment bonds, including coinsurance and reinsurance agreements as applicable; and other items specified in Section 4 of this specification.

Demobilization shall include all activities and costs for transportation of personnel, equipment, and supplies not required or included in the contract from the site; including the disassembly, removal and site clean up, of offices, buildings and other facilities assembled on the site specifically for this contract.

This work includes mobilization and demobilization required by the contract at the time of award. If additional mobilization and demobilization activities and costs are required during the performance of the contract as a result of changed, deleted, or added items of work for which the Contractor is entitled to an adjustment in contract price, compensation for such costs will be included in the price adjustment for the item or items of work changed or added.

3. PAYMENT

Payment will be made as the work proceeds, after presentation of paid invoices and/or documentation of direct costs by the Contractor showing specific mobilization and demobilization costs and supporting evidence of the charges of suppliers, subcontractors, and others. When the total of such payments is less than the lump sum contract price, the balance remaining will be included in the final contract payment. Payment of the lump sum contract price for mobilization and demobilization will constitute full compensation for completion of the work.

Payment will not be made under this item for the purchase costs of materials having a residual value, the purchase costs of materials to be incorporated in the project, or the purchase costs of operating supplies.

INSTRUCTIONS FOR USE OF CONSTRUCTION SPECIFICATION 9

TRAFFIC CONTROL

1. APPLICABILITY

This specification is applicable to providing facilities for control of traffic and providing public safety during construction.

2. MATERIAL SPECIFICATIONS

There are no material specifications complementary to Construction Specification 9.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Any local constraints in traffic control, utilities, and access of local residents to their homes shall be stated.
- b. Provide information on any required permits and/or approvals.
 - (1) List any traffic control permits required and the issuing agency.
 - (2) List any fees and/or inspection costs that may be required as a result of obtaining a permit.
- c. Any special local activities that would generate above average vehicle use by the public. Outline the dates that this activity could occur so construction schedules would be considerate of this potential conflict. Examples: State and County Fairs, rodeos, sporting events, special local holiday or seasonal activities, etc.
- d. Name(s) and contact information for local authorities responsible for traffic control, maintenance, and public safety in the project area.
- e. The appropriate state or other acceptable technical reference(s) shall be identified. Also, provide for issuing agency's name, contact person, address, telephone number, and ordering information, as appropriate.

Example:

Manual of Traffic Controls for Construction and Maintenance of Work Zones

(Reference)

State of California; Business, Transportation and Housing Agency, Department of Transportation

(Issued by)

(Contact Person's Name and Title)

(805) 792-4729 CDOT-39-2870
(Telephone No.) (Order No.)

- f. For Measurement and Payment, outline the procedures that will be used to determine the percent of work completed for progress payments if it differs from that outlined in Section 6.

4. DISCUSSION OF METHODS

No Methods are outlined in the Specification.

CONSTRUCTION SPECIFICATION

9. TRAFFIC CONTROL

1. SCOPE

The work shall consist of establishing traffic control and maintaining safe, convenient use of public roads and rights-of-way.

2. TRAFFIC AND ACCESS

The Contractor's operations shall cause no unnecessary inconvenience to the public. The public rights-of-way shall be maintained at all times unless interruption is authorized by proper local authority. Contractor's authorized closing and/or detour plans shall be provided the Engineer for approval.

Safe and adequate access shall be provided and maintained to all public protection devices and to all critical utility control locations. Facility access shall be continuous and unobstructed unless otherwise approved.

3. STORAGE OF EQUIPMENT AND MATERIALS IN PUBLIC STREETS

Construction materials and equipment shall not be stored or parked on public streets, roads, or highways. During any material or equipment loading and/or unloading activities that may temporarily interfere with traffic, acceptable detour(s) shall be provided for the duration of the activity. Any associated expense for this activity will be the responsibility of the Contractor.

Excavated material, including suitable material that is intended for adjacent trench backfills or other earth backfill as specified in Section 5 of this specification, shall not be stored in public streets, roads, or highways that remain in service for the public. Any waiver of this requirement must be obtained from the proper local authority and approved by the Engineer. All excess and unsuitable material shall be removed from the site as soon as possible. Any spillage shall be removed from roadways prior to use by the public.

4. STREET CLOSURES, DETOURS, AND BARRICADES

The Contractor shall comply with the requirements of all applicable responsible units of government for closure of any street, road, or highway. The Contractor shall provide the required barriers, guards, lights, signs, temporary bridges, and flaggers together with informing the public of any detours and construction hazards by the most suitable means available such as local newspapers, local radio stations, etc. The Contractor shall also be responsible for compliance with additional public safety requirements that may arise during construction. The Contractor shall furnish and install, and upon completion of the work, promptly remove all signs, warning devices, and other materials used in the performance of this work.

Unless otherwise specified, not less than seven (7) days prior to closing, or partially closing, or reopening any street, road, or highway, the Contractor shall notify, in

writing, the Fire Chief, Police Chief, County Sheriff, State Patrol, schools that operate school buses, or any other government official as may be appropriate.

Unless otherwise specified, the Contractor shall furnish to the Engineer a written plan showing the proposed method of signing, barricading for traffic control, and safety for street detours and closures.

All temporary detours will be maintained to ensure use of public rights-of-way is provided in a safe manner. This may include dust control, grading, graveling, etc. as required in Section 7 of this specification.

5. GENERAL AND SPECIFIC REFERENCES

All signs, signals, barricades, use of flaggers, and other traffic control and public safety devices shall conform to the general requirements set forth in the "Manual of Uniform Traffic Control Devices" (MUTCD) and the latest edition of "Standard Highway Signs and Standard Alphabets for Highway Signs" and/or OSHA Construction Industry Standards (29 CFR Part 1926), Subpart G, Signs, Signals, and Barricades unless otherwise specified in Section 7 of this specification.

6. MEASUREMENT AND PAYMENT

For items of work for which specific lump sum prices are established in the contract, payment for the work will be made at the contract lump sum price. Progress payments will be made based upon the percentage of estimated total time that traffic control will be required unless otherwise specified in Section 7 of this specification. Payment will constitute full compensation for all flaggers, labor, materials, equipment and all other items necessary and incidental to completion of the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and items to which they are made subsidiary are identified in Section 7 of this specification.

WATER FOR CONSTRUCTION

1. APPLICABILITY

Construction Specification 10 is applicable to all water required at the construction site except for water used for mixing and/or curing grout and concrete covered by Construction Specifications 14, 31, 32, 33, 35, 62, and 63. Construction Specification 10 is to be made a part of the contract when a pay item for water is provided. More than one pay item and method of payment may be used if the source of water is expected to be different, the volume of water required is uncertain, and the cost is expected to vary.

2. MATERIAL SPECIFICATIONS

There are no Material Specifications complementary to Construction Specification 10.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Pay item for water in units of 1,000 gallons with an estimated quantity provided.
- b. Designated source of water with details of ownership and water rights, if applicable.
- c. Cost to the Contractor of water at the designated source, if applicable. Note: It may be advantageous for NRCS or Sponsor to contract separately with the owner of the water and furnish it to the Contractor free at the source. This should be considered only if the net cost to the NRCS or Sponsors would be less than if included in the bid by the Contractor.
- d. Special requirements pertaining to furnishing and using water, including water quality requirements if quality may be a problem for the purpose intended.
- e. Details on metering, accuracy, gauge certification, location of meter for payment purposes, or other requirements imposed by state and/or local agencies for measuring water use. Specify in Section 8 of this specification where meters are located if there is a concern for water losses between the measured source and the point of delivery or application. A statement such as "Meters shall be installed at the point of delivery into the water hauling equipment or application systems; such as, sprinkler systems, flooding systems, etc." may be used.
- f. Details of the costs and expenses that will be included in the pay items if exceptions are to be made in the measurement and payment option selected from Section 7.

4. DISCUSSION OF METHODS

a. Section 7, Measurement and Payment

- (1) Method 1 must be used when the cost of water is paid but the remaining costs of transporting water, distributing it for construction purposes, and application are subsidiary to the items of work they are associated. Only costs of water at the meter will be paid for under this method.
- (2) Method 2 must be used when the cost of water and all other associated transportation, distribution and application costs are included in the unit cost of water.
- (3) Method 3 must be used when the water is provided to the Contractor without cost and the remaining costs of transportation, distribution and application are to be paid at the unit price for each 1,000 gallons applied.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

10. WATER FOR CONSTRUCTION

1. SCOPE

The work shall consist of furnishing, transporting, measuring, and applying water as specified.

2. FACILITIES AND EQUIPMENT

The Contractor shall install and maintain access and haul roads and furnish, operate, and maintain all pumps, meters, piping, tanks, storage and other facilities required to load, transport, store, distribute, and use construction water as specified.

These facilities shall be equipped with accurate, work dedicated meters, tanks of known volume, or other devices that will provide a correct measurement of water supplied. Meters shall be installed at the point of delivery into water hauling equipment or application system; such as, sprinkler systems, flooding systems, etc., as specified.

3. DUST ABATEMENT AND HAUL ROAD MAINTENANCE

Water for dust abatement and haul road maintenance shall be applied to haul roads and other dust producing areas as needed to prevent air pollution or excessive dust, which causes impaired vision on trafficked roads and in work areas, and to maintain the roads in good condition for safe and efficient operation during periods of use. Roads that may be jointly used with the public and by the Contractor's equipment, shall have dust abatement provisions acceptable to the public entity that has road maintenance responsibility. Compensation for water used for dust abatement and haul road maintenance shall be as specified in Section 8 of this specification.

4. EARTHFILL, DRAINFILL, AND ROCKFILL

Water required for proper installation of earthfill, drainfill, and/or rockfill shall be utilized in the fill materials as specified in the applicable construction specifications. Compensation for construction water used for earthfill, drainfill and/or rockfill shall be as specified in Section 8 of this specification.

5. CONCRETE, MORTAR, AND GROUT

Water required in the mixing or curing of concrete, shotcrete, roller compacted concrete, or other portland cement mortar or grout shall meet the requirements of the applicable construction specifications and shall be used in conformance with those specifications. Payment for construction water used in these items is covered by the applicable concrete, mortar, and/or grout specifications.

6. OTHER CONSTRUCTION REQUIRING WATER

Water required and used for other construction activities under this contract but not specifically covered by this specification shall be considered subsidiary to the item(s) of work which requires its use.

7. MEASUREMENT AND PAYMENT

Method 1 For water items for which specific unit prices are established in the contract, the volume of water furnished and utilized in accordance with the specifications will be measured to the nearest 1,000 gallons.

Payment for water will be made at the contract unit price. Such payment will constitute full compensation for the direct costs of water. All other costs necessary for applying water are subsidiary to the items of work they are associated.

Method 2 For water items for which specific unit prices are established in the contract, the volume of water furnished and utilized in accordance with the specifications will be measured to the nearest 1,000 gallons.

Payment for water and the cost associated with transportation, distribution and application will be made at the contract unit price. Such payment will constitute full compensation for completion of the work.

Method 3 For water items for which specific unit prices are established in the contract, the volume of water utilized in accordance with the specifications will be measured to the nearest 1,000 gallons.

Payment for water will be made at the contract unit price. Such payment, excluding water cost, will constitute full compensation for completion of the work.

All Methods The following provisions apply to all methods of measurement and payment:

- a. The measurement for payment will include all water utilized, except as noted in Sections 5, 6, and 8 of this specification. Measurement for payment will not include water that is utilized inappropriately or excessive to need.
- b. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 8 of this specification.

REMOVAL OF WATER

1. **APPLICABILITY**

Construction Specification 11 is applicable to the temporary diversion of surface water and dewatering of the borrow and construction areas during the construction period.

2. **MATERIAL SPECIFICATIONS**

There are no material specifications complementary to Construction Specification 11.

3. **ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS**

- a. Special requirements or restrictions for the diversion system and/or method of diverting surface water.
- b. Special requirements for dewatering the construction site that may affect quality of work and/or construction safety (such as lowering water table prior to performing excavations and maintaining a maximum water level during construction operations).
- c. Special requirements for dewatering borrow areas such as removal of surface water and subsurface drainage to contribute to proper soil moisture conditions during borrow excavation operations. A contract bid item should be included if water problems may be expected in the borrow area and additional work, such as installation and operation of a pumping system, could be expected.
- d. Information on alternate borrow sources that may not require dewatering.
- e. Special requirements for the control of erosion and water pollution. Requirements included in this specification should be directly associated with dewatering and be compatible with Construction Specification 5, [Pollution Control](#), if also used as a contract bid item.
- f. Waiver of the requirement that the Contractor furnish a site-specific plan outlining procedures to divert surface water and dewatering the construction site, if a plan in writing is not necessary.
- g. Depending on the magnitude and complexity expected, diverting surface water and dewatering may require separate bid items.
- h. For Section 6, Removal of Temporary Works, if pollution of the ground water is a concern when clean gravel is used as backfill, specify other backfill procedures in Section 8.
- i. Provisions for payment, if payment is to be made on a unit price basis, for pumping to dewater borrow areas and construction sites as follows:

- (1) Contract bid item for pumping to dewater borrow areas or construction sites.
- (2) At least one lump sum contract bid item that will include compensation for the work and cost of preparation for pumping.

4. DISCUSSION OF METHODS

a. Section 7, Measurement and Payment

- (1) Method 1 is intended when removal of water is to be covered by one or more lump sum contract bid items. The procedures that will be used to determine progress payments should be outlined in Section 8.
- (2) Method 2 is intended for use when pumping to dewater borrow areas is to be measured and paid for as a unit price bid item of work.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

11. REMOVAL OF WATER

1. SCOPE

The work shall consist of the removal of surface water and ground water as necessary to perform the construction required by the contract in accordance with the specifications. It shall include: (1) constructing, installing, building, and maintaining all necessary temporary water containment facilities, channels, and diversions, (2) furnishing, installing, and operating all necessary pumps, piping, and other facilities and equipment, and (3) removing all such temporary works and equipment after their intended function is no longer required.

2. DIVERTING SURFACE WATER

The Contractor shall install, maintain and operate all cofferdams, channels, flumes, sumps, and all other temporary diversion and protective works needed to divert stream flow and other surface water through or around the construction site. Control of surface water shall be continuous during the period that damage to construction work could occur. Unless otherwise specified and/or approved, the diversion outlet shall be into the same drainage way that the water would have reached before being diverted.

The Contractor shall furnish the Engineer in writing, a proposed plan for diverting surface water before beginning any construction activities for which a diversion is required, unless waived in Section 8 of this specification. Acceptance of this plan, or the waiving of the plan requirement, will not relieve the Contractor of the responsibilities related to this activity during the process of completing the work as specified.

3. DEWATERING THE CONSTRUCTION SITE

Foundations, cutoff trenches, and all other parts of the construction site shall be dewatered and kept free of standing water and muddy conditions as necessary for the proper execution of the work. The Contractor shall furnish, install, operate, and maintain all drains, sumps, pumps, casings, well points, and all other equipment required to properly dewater the site as specified. Dewatering systems that cause a loss of soil fines from the foundation areas will not be permitted.

4. DEWATERING BORROW AREAS

The Contractor shall maintain all borrow areas free of surface water and otherwise provide for timely and effective removal of surface and subsurface water that accumulates within the borrow area, unless waived in Section 8 of this specification. Borrow material shall be processed as necessary to achieve proper and uniform moisture content at the time of placement.

If pumping to dewater borrow areas is included as a bid item of work in the bid schedule, each pump discharge pipe shall be equipped with a water meter. Meters shall be such that the measured quantity of water is accurate within three (3) percent

of the true quantity. The Contractor shall provide necessary support to perform accuracy tests of the water meters when requested by the Engineer.

5. EROSION AND POLLUTION CONTROL

Removal of water from the construction site, including the borrow areas, shall be accomplished in a manner that erosion and the transporting of sediment and other pollutants are minimized. Dewatering activities shall be accomplished in a manner that the water table water quality is not altered. Pollution control activities shall not conflict with the requirements of Construction Specification 5, [Pollution Control](#), if it is a part of this contract.

6. REMOVAL OF TEMPORARY WORKS

When temporary works are no longer needed, the Contractor shall remove and return the area to a similar condition that existed prior to construction. Areas where temporary works were located shall be graded for slightly appearance with no obstruction to natural surface water flows or the proper functioning and access to the works of improvement installed. The Contractor shall exercise extreme care during the removal stages to minimize the loss of soil sediments and debris that was trapped during construction.

Pipes, casings, and any other material used to dewater the site shall be removed from temporary wells. The wells shall be filled to ground level with clean gravel or other suitable material approved by the Engineer unless specified otherwise in Section 8 of this specification. The Contractor shall exercise extreme care to prevent pollution of the ground water by these actions.

7. MEASUREMENT AND PAYMENT

Method 1 Items of work listed in the bid schedule for removal of water, diverting surface water, and dewatering construction sites and borrow areas will be paid for at the contract lump sum prices. Such payment will constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to the completion of the work.

Method 2 Items of work listed in the bid schedule for removal of water, diverting surface water, dewatering construction sites, and dewatering borrow areas will be paid for at the contract lump sum prices. Such payment will constitute full compensation for furnishing, installing, operating, and maintaining the necessary trenches, drains, sumps, pumps, and piping, and for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work, except that additional payment for pumping to dewater borrow areas and the removal of water will be made as described in the following paragraph.

If pumping to dewater borrow areas is a contract bid item, payment will be made at the contract unit price which shall be the price per 1,000 gallons shown in the bid schedule. Such payment will constitute full compensation for pumping only.

Compensation for equipment and preparation and for other costs associated with pumping will be included in the lump sum payment for removal of water or the lump sum payment for dewatering the borrow areas. Payment will be made only for pumping that is necessary to dewater borrow areas that cannot be effectively drained by gravity or that must have the water table lowered to be usable as a suitable borrow source. Pumping for other purposes will not be included for payment under this item.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule, will be included in the payment for the contract line item to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 8 of this specification.

RELIEF WELLS

1. APPLICABILITY

Construction Specification 12 is applicable to the construction of pressure relief wells in foundations of structures.

2. MATERIAL SPECIFICATION

Material Specification [521, Aggregates for Drainfill and Filters](#), and [554, Steel Pipe](#), are complementary to Construction Specification 12.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Plan location of each well.
- b. Profile along the line of wells showing the spacing and estimated depths of the wells.
- c. Sectional elevation of typical wells showing:
 - (1) The location of the well screens, if required;
 - (2) The diameter and vertical extent of the filter;
 - (3) Details of the outlet at the upper end of the filter;
 - (4) Details of couplings and special fittings and appurtenances such as tees, check valves, caps and appurtenant housings.
- d. Special limits on time of installation. For example, it may be required that the relief wells be installed before any structural load is placed on the foundation or prior to a specific phase of construction.
- e. The type and size of pipe.
- f. The type and size of well screens including the size and pattern of screen openings or slots.
- g. The grading requirements of the filter material.
- h. Section 7, note in Section 13 when well development is required.
- i. Acceptable methods of plugging abandoned wells in Section 13. Requirements placed on the Contractor must be in conformance with state and local regulations for this activity.

4. DISCUSSION OF METHODS

Two methods are included in Section 11, Measurement, and three methods in Section 12, Payment. These methods are self-explanatory, but it must be noted that Methods 1 and 2 of Section 11 are, respectively, complementary to Methods 1 and 2 of Section 12.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

12. RELIEF WELLS

1. SCOPE

The work shall consist of installing and developing pressure relief wells in foundations of earth structures.

2. MATERIALS

The well screen shall be of the specified type and size, and the size and pattern of the screen openings shall conform to the details shown on the drawings. Each screen shall be equipped with a bottom plug of the same material as the screen.

The riser pipe and fittings shall conform to the requirements of Material Specification [547](#), [551](#), and [554](#) for the type of pipe specified in Section 13 of this specification. Filter materials shall conform to the requirements of Material Specification [521](#) and shall be graded as specified in Section 13 of this specification.

3. LOCATION AND DEPTH OF WELLS

The plan location and depth of each well shown on the drawings are based on design estimates. The final depth and location of the components of each well will be determined by the Engineer on the basis of the examination of the well log and samples recovered during drilling. The location of a well will be changed by the Engineer where obstructions encountered during drilling require abandonment of the proposed well location.

4. DRILLING

Unless otherwise specified, the wells shall be drilled vertically by a rotary drilling procedure. The diameter of each well shall be adequate to permit the placement of the specified thickness of filter material. As determined by the Engineer, drilling methods that may reduce the yield of the well will not be permitted.

The well shall be cased with a temporary casing of a type that:

- a. Shall have sufficient thickness to retain its shape and maintain the true section throughout its total depth; and
- b. Shall be removable in a manner that will not disturb the filter, well screen or riser pipe.

5. INSTALLING RISER PIPE AND SCREEN

The riser, consisting of the riser pipe, well screens, couplings and fittings, shall be measured and inspected as it is assembled and placed in the well. Spiders, or other centering devices, shall be attached to the assembled riser in sufficient numbers to center it within the well and to accurately maintain its position during the placement of the filter material.

Before the riser is placed, filter materials shall be placed at the bottom of the well to the elevation specified by the Engineer for the bottom of the well screen. The riser shall be placed in the well in such a manner as to avoid shock and to prevent damage to any of its components. The relief outlet or top of the riser shall be securely maintained at the designated elevation during the placement of the filter material.

6. PLACING FILTER/DRAINFILL

The filter material shall be placed by tremie, or other method approved by the Engineer, to an elevation not less than one (1) foot above the top of the highest well screen. At the initial placement operations, the tremie shall rest on the bottom of the well and be filled with filter material. The tremie and the temporary casing shall be raised in increments of not more than two (2) feet allowing the filter material to flow from the bottom of the tremie. The top surface of the filter material in the tremie shall be maintained above the water surface at all times. The top surface of the filter material in the well shall be maintained a minimum of two (2) feet above the bottom of the casing as the casing is raised.

7. DEVELOPING

Following filter material placement and when specified in Section 13 of this specification, the well shall be developed by an approved method. Prior to development, the Contractor shall submit a plan for accomplishing the work to the Engineer for review.

All materials pulled into the screen during development shall be removed. Filter material shall be added to the annular space around the screen as needed to maintain the top of the filter at the specified elevation.

Any well that continues to produce appreciable amounts of fines after development for a period of four hours will be abandoned and relocated unless otherwise continued by the Engineer.

8. BACKFILLING

After the well has been developed, the annular space around the riser pipe above the filter material shall be filled with selected moist impervious earthfill or portland cement concrete. Backfill shall be placed in layers not to exceed twelve (12) inches in thickness and each layer shall be tamped firmly into place. The temporary casing shall be withdrawn in increments as the backfill is placed.

9. ABANDONED WELLS

All abandoned wells shall be plugged as specified in Section 13 of this specification. When a well is abandoned after development, the well screen and riser pipe shall be salvaged, whenever possible.

10. LOGGING AND SAMPLING

The Contractor shall conduct drilling operations in such a manner that the Engineer may take representative disturbed soil samples of all materials encountered.

11. MEASUREMENT

Method 1 The amount of well drilling will be measured to the nearest foot of well drilled and cased. Wells abandoned for causes other than the fault of the Contractor will be included in the measurement for payment.

The volume of filter material and backfill material will be computed to the nearest 0.1 cubic yard from measurements of the vertical well space occupied by each and the outside diameters of the casing and riser. Filter material and backfill material for wells abandoned for causes not attributed to actions of the Contractor will be included in the measurement for payment.

The amounts of pipe and well screen installed in the riser and outlet assembly will be measured to the nearest linear foot at the time the riser is assembled. Pipe and well screen that cannot be salvaged from wells abandoned for causes not attributed to actions of the Contractor will be included in the measurement for payment.

The number of couplings and special fittings and appurtenances will be counted at the time the riser is assembled. Couplings and special fittings and appurtenances that cannot be salvaged from wells abandoned for causes not attributed to actions of the Contractor will be included in the measurement for payment.

The time required to develop each well will be measured to the nearest one-half hour. Time required to develop wells abandoned for causes not attributed to actions of the Contractor will be included in the measurement for payment.

Method 2 The amount of well drilling will be measured to the nearest foot of well drilled and cased. Wells abandoned for causes not attributed to actions of the Contractor will be included in the measurement for payment.

The volume of each grading of filter material placed will be computed to the nearest 0.1 cubic yard from measurements of the vertical well space occupied by each and the diameters of the casing and riser. Filter in wells abandoned for causes not attributed to actions of the Contractor will be included in the measurement for payment.

The amounts of pipe, couplings, fittings, appurtenances and well screen installed in the riser and outlet assembly will be measured to the nearest linear foot at the time the riser is assembled.

Pipe, couplings, fittings, appurtenances and well screen that cannot be salvaged from wells abandoned for causes not attributed to actions of the Contractor will be included in the measurement for payment.

The time required to develop each well will be measured to the nearest one-half hour. Time required to develop wells abandoned for causes not attributed to actions of the Contractor will be included in the measurement for payment.

Backfill will not be measured.

12. PAYMENT

Method 1 Payment for each item of work will constitute full compensation for all labor, equipment, materials and all other items necessary and incidental to the completion of the work included in the item.

Payment for drilling and casing each size of well will be made at the contract unit price for that size of well and will include compensation for drilling, casing, and pulling casing.

Payment for furnishing and placing filter material will be made at the contract unit price for that grading of filter material.

Payment for furnishing, placing and compacting backfill will be made at the contract unit price.

Payment for furnishing and installing each type and size of pipe will be made at the contract unit price for that type and size of pipe.

Payment for furnishing and installing each type and size of well screen will be made at the contract unit price for that type and size of well screen.

Payment for furnishing and installing each coupling will be made at the contract unit price for that type and size of coupling.

Payment for each special fitting or appurtenance will be made at the contract unit price for that type and size of fitting or appurtenance.

Payment for developing each well will be made at the contract unit price for developing that size of well.

Method 2 Payment for each item of work will constitute full compensation for all labor, equipment, materials and all other items necessary and incidental to the completion of the work included in the item.

Payment for drilling, casing and backfilling each size of well will be made at the contract unit price for that size of well and will include compensation for drilling, casing, pulling casing, and backfilling.

Payment for furnishing and placing filter material will be made at the contract unit price for that grading of filter material.

Payment for furnishing and installing each type and size of pipe complete with all couplings, fitting and appurtenances (except well screens) will be made at the contract unit price for that type and size of pipe.

Payment for furnishing and installing each type and size of well screen will be made at the contract unit price for that type and size of well screen.

Payment for developing each well will be made at the contract unit price for developing that size of well.

Method 3 Measurement will not be made. Items of work listed in the bid schedule for installing, operating, and removal of relief wells will be paid for at the contract lump sum prices. Such payment will constitute full compensation for all labor, equipment, tools and all other items necessary and incidental to the completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 13 of this specification.

PILING

1. APPLICABILITY

Construction Specification 13 is applicable to the furnishing and installation of timber piles, steel piles, steel sheet piles, pre-cast concrete piles, and shells for cast-in-place piles. It is not applicable to the installation of drilled, cast-in-place piles.

2. MATERIAL SPECIFICATIONS

Material Specifications [511 \(Steel Piles\)](#), [512 \(Wood Piles\)](#), [513 \(Precast Concrete Piles\)](#), and [514 \(Cast-in-Place Concrete Piles\)](#) are complementary to Construction Specification 13. Include Construction Specification [31, Concrete for Major Structures](#), or [32, Structure Concrete](#), as appropriate, when not included in the contract for other concrete installation.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Plan showing the location of all piles, including test piles, if any.
- b. Foundation profiles and sections showing:
 - (1) Log of borings, including penetration test results;
 - (2) Required or estimated pile penetration;
 - (3) Cutoff elevations.
- c. Required bearing capacities. (Note: Specify (1) required bearing capacity or (2) required penetration or (3) required bearing capacity and minimum penetration, as appropriate.)
- d. For timber piles state the type, class, species and length of piles required. For Type I piles, state where the piles will be inspected. For Type II piles, state the type of treatment and minimum retention of preservative per cubic foot of pile.
- e. Details of pre-cast or cast-in-place concrete piles including dimensions, reinforcement details, class of concrete, size of aggregate, type of cement and slump required.
- f. Nominal size and weight of Section for H-bearing piles.
- g. Authorization to use gravity drop hammers, if appropriate.
- h. Details of load tests that will be required, if appropriate.
- i. Methods of measurement and payment if the standard specification includes more than one method.

4. DISCUSSION OF METHODS

a. Section 12, Measurement and Payment

- (1) Methods 1 and 2 are intended for use when a considerable number of piles of about the same length are required. Method 1 provides for a single pay item for furnishing and driving piles. Method 2 provides for separate pay items for furnishing piles and driving piles.
- (2) Method 3 may be used when the lengths of piles required may be quite variable. It is particularly suitable where the cutoff portions of the piles may be salvaged and used on the job, such as when steel bearing piles are specified.
- (3) Method 4 may be used for sheet pile walls when the required depth of penetration is known.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

13. PILING

1. SCOPE

The work shall consist of furnishing and installing the specified kinds and types of piles at the locations shown on the drawings.

2. MATERIALS

Piles shall conform to the requirements of Material Specifications 511, 512, 513, or 514 as appropriate to the kinds of piles specified. For piles of material other than that list above, the material requirements outlined in Section 14 of this specification shall apply.

3. SITE PREPARATION

All excavation within the area to be occupied by bearing piles shall be completed before the piles are driven.

4. PROTECTION OF PILE HEADS

The heads of all piles shall be protected during driving by suitable caps, rings, heads, blocks, mandrels and other devices.

The heads of timber piles shall be fitted into a steel head block or fitted with heavy steel or wrought iron rings or wire wrapping.

The heads of steel piles shall be cut square and fitted with a steel driving cap.

The heads of pre-cast concrete piles and casings shall be fitted into cushion type drive caps having a rope or other suitable cushion next to the pile head and fitting into a casting which in turn supports a timber shock block.

Driving heads, mandrels and other devices shall be provided by the Contractor as needed for special types of piles and shall conform to the recommendations of the pile manufacturer.

5. PILES, GENERAL

The Contractor shall notify the Engineer before pile driving operation commences. Such notice shall be far enough in advance, a minimum of 24 hours, to provide the Engineer adequate time to be present for the driving operations. Piles shall be driven only in the presence of the Engineer or authorized representative.

The determination of piling order lengths shall be the Contractor's responsibility, unless otherwise specified.

Unless otherwise approved, piles shall be driven with steam, air, diesel powered hammers or a combination of hammers, vibration or water jets. Water jets may be

used only when specifically authorized by the Engineer. Where jetting is authorized, the jets shall be withdrawn before the specified depth or bearing capacity is obtained and the piles shall be driven with the hammer to the final penetration.

When drop hammers are permitted, the height of drop shall not be more than eight (8) feet for concrete piles or twelve (12) feet for steel and timber piles, unless otherwise specified.

The driving of piling with followers shall be allowed only when expressly approved by the Engineer.

Piles shall not be driven within 20 feet of concrete less than seven (7) days after placement, including concrete placed in cast-in-place piles with or without pre-driven shells or casings.

The Contractor shall not attempt to drive piles beyond the point of refusal, as indicated by excessive bouncing of the hammer or kicking of the pile.

6. BEARING PILES

Bearing piles shall be driven to the position, line, and batter specified on the drawings. Each pile shall be driven continuously and without interruption to the specified depth or until the specified bearing capacity is obtained. Deviation from this procedure will be permitted only when interruption of driving is caused by conditions that could not reasonably be anticipated.

When a diesel hammer is used, it shall be operated at full throttle when blows are counted for determination of bearing capacity except that throttle adjustments shall be made as necessary to prevent the non-striking parts of the hammer from rising from the pile on the ram upstroke.

7. SHEET PILES

The piling shall be driven in such a manner as to insure perfect interlocking throughout the entire length of each pile. The piles shall be held in proper alignment during driving by means of assembling frames or other suitable temporary guide structures. Temporary guide structures shall be removed when they have served their purpose.

At any time that the forward edge of the sheet pile wall is found to be out of correct alignment:

- a. The piling already assembled and partly driven shall be driven to the required depth.
- b. Taper piles shall then be driven to bring the forward edge into correct alignment before additional regular piling is assembled and driven. The maximum permissible taper in a single pile shall be one-fourth inch per foot of length.

8. ESTIMATING BEARING CAPACITY

When load tests are not required, the bearing capacity of each pile shall be estimated by use of one of the following formulas, as appropriate:

a. For gravity hammers, $R = \frac{2WH}{S+1}$

- b. For single-acting steam or air hammers and for diesel hammers having unrestricted rebound of the ram,

$$R = \frac{2WH}{S+0.1}$$

- c. For double-acting steam or air hammers and diesel hammers having enclosed rams,

$$R = \frac{2H(W+AP)}{S+0.1} ; \quad \text{or, } R = \frac{2E}{S+0.1}$$

where:

- R = safe bearing capacity in pounds,
W = weight, in pounds, of striking parts of hammer,
H = height of fall in feet,
A = area of piston in square inches,
P = pressure, in pounds per square inch, of steam, air or other gas exerted on the hammer piston or ram,
E = the manufacturer's rating for foot-pounds of energy developed by double-acting steam or air hammers, or 90 percent of the average equivalent energy, in foot-pounds, developed by diesel hammers having enclosed rams as evaluated by gauge and chart readings,
S = average penetration, inches per blow, for the last five (5) to ten (10) blows of a gravity hammer or the last ten (10) to twenty (20) blows for steam, air or diesel powered hammers.

The above formulas are applicable when:

- The hammer has a free fall
- The head of the pile is not crushed
- The penetration is reasonably quick and uniform
- There is no sensible bounce after the blow
- A follower is not used.

Twice the height of the bounce shall be deducted from "H" to determine its value in the formula.

In case water jets are used in conjunction with the driving, the bearing power shall be determined by the above formulas from the results of driving after the jets have been removed.

9. LOAD TESTS

When load tests are specified, the test loads shall be applied gradually, without impact, and in a manner that no lateral forces are applied to the pile. Load testing shall not be started until twenty-four (24) hours after driving of the test pile is completed unless otherwise specified in Section 14 of this specification. Except as otherwise specified, load tests shall be performed according to the following procedures:

The total test load shall be twice the specified working load and shall be applied to the pile in increments equal to 25-percent of the working load. Settlement of the top of the pile shall be measured to an accuracy of 0.01-inch before and after the application of each load increment and at 2, 4, 8, 15, 30, and 60 minutes after, and then every two (2) hours until the next load increment is applied. Additional load shall not be applied until the rate of settlement is less than 0.01-inch in one (1) hour.

The total test load shall remain on the pile for a minimum period of twenty-four (24) hours. Settlement shall be measured at six (6) hour intervals during this period and at the end of the period, at least twice during removal of the load, and immediately after all of the test load is removed. The net settlement shall be measured approximately twenty-four (24) hours after the total load has been removed.

If settlement continues in excess of 0.01-inch per hour under less than the total test load, no additional load shall be applied, but the load that has been applied shall remain on the pile a minimum of twenty-four (24) hours, and settlement measurements while the load is on the pile, and during and after removal of the load shall be made as if it were the total test load.

10. CUTTING OFF PILES

The Contractor shall cut the piles at the specified elevations. The length of pile cut off shall be sufficient to permit the removal of all damaged material. Steel shells or concrete casings for cast-in-place concrete piles shall be cut off at the specified elevation before being filled with concrete.

Steel bearing piles shall be cut off in clean, straight lines as shown on the drawings. Any irregularities shall be leveled off with deposits of weld metal or by grinding before placement of bearing caps.

Pre-cast concrete piles and concrete casings shall be cut off in a manner such as to prevent damage to the remaining portion of the pile or casing or to the projecting reinforcement required for connecting the piles to the structure.

Timber piles that are to be capped shall be accurately cut off so that true bearing is obtained on every pile without the use of shims.

11. DEFECTIVE PILES

Any pile damaged in driving, driven out of proper location, driven below the specified cut off elevation or inaccurately cut off shall be corrected by one of the following methods, whichever is approved by the Engineer:

- a. The defective pile shall be pulled and replaced or re-driven;
- b. A new pile shall be driven adjacent to the defective pile; or
- c. The defective pile shall be spliced or built up or a sufficient portion of the footing shall be extended to properly embed the pile.

Pile shells abandoned in place after driving shall be filled with concrete or sand-cement grout as appropriate to the conditions that are present.

All piles pushed up by the driving of adjacent piles or by any other cause shall be re-driven to final grade.

Any sheet pile ruptured in the interlock or otherwise damaged during driving shall be pulled and replaced.

12. CORRECTING SURFACE HEAVE

Any excess material resulting from displacement of earth by pile driving shall be removed. Materials disturbed by pile driving shall be conditioned and compacted to a minimum density equal to adjacent undisturbed material.

13. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the number of each type, kind, and length of pile driven in place will be counted. Payment for furnishing and driving each type, kind, and length of pile will be made at the contract unit price. Such payment will constitute full compensation for all labor, equipment, materials, and all other items necessary and incidental to the completion of the work.

Method 2 For items of work for which specific unit prices are established in the contract, the number of each type, kind, and length of pile furnished, accepted, and stockpiled in good condition at the site of the work will be counted. Payment for furnishing each type, kind, and length of pile will be made at the contract unit price. Payment for driving each type and kind of pile will be made at the contract unit price. Such payment will constitute full compensation for all labor, equipment, materials, and all other items necessary and incidental to the completion of the work.

Method 3 For items of work for which specific unit prices are established in the contract, the length of each type and kind of pile driven will be computed to the nearest foot as the difference between the measured length of pile before driving and measured length of pile cut off after driving. Payment for furnishing and driving each type and kind of pile will be made at the contract unit price. Such payment will constitute full payment for all labor, equipment, materials, and other items necessary and incidental to the completion of the work.

Method 4 For items of work for which specific unit prices are established in the contract, the area of sheet pile walls, acceptably placed in accordance and within the neat lines shown on the drawings, will be computed to the nearest square foot. Payment will be made at the contract unit price for each type, kind, and weight of piling. Such payment will constitute full payment for all labor, equipment, materials, and other items necessary and incidental to the completion of the work.

All Methods The following provisions apply to all methods of measurement and payment:

The measurement of the number of linear feet of piles (or number of piles) furnished and the number of piles driven shall include test and tension piles specified in the contract. Piles furnished and driven at the option of the Contractor will not be included. No payment will be made for furnishing or driving pile, including test piles, to replace piles lost or damaged prior to the completion of the contract while in stockpile or during handling and driving.

When load tests are specified, payment for each test will be made at the contract unit price per test. Such payment will constitute full compensation for all labor, equipment, materials, and all other items necessary and incidental to perform the test, except furnishing and driving piling.

When splices are specified, payment for each splice will be made at the contract unit price. Such payment shall constitute full compensation for labor, equipment, materials, and all other items necessary and incidental to the completion of the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 14 of this specification.

PRESSURE GROUTING

1. APPLICABILITY

Construction Specification 14 is applicable to the drilling and pressure grouting of structure foundations with suspension grouts.

2. MATERIAL SPECIFICATIONS

Material Specification [522](#) and [531](#) are complementary to Construction Specification 14.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Plan and profile of the grouting layout. Include region to be grouted, location and spacing of lines and holes. Show the depth of holes, location, and logs of drill holes used in the geologic investigation.
- b. Mode of drilling (rotary, percussion, or rotary-percussion) and diameter of grout holes.
- c. Inclination of holes (angle to vertical) if inclined holes are required.
- d. Designate the location and distance for transport of core boxes into storage.
- e. Number and depth of check holes to be drilled and mode of drilling.
- f. Details of testing and sampling in over burden, if required. Include method of measurement and payment.
- g. Location and placement details of capping concrete or concrete slabs, if required.
- h. Method of grouting (packer or stage). As a rule, packer grouting is the preferred method unless rock conditions prohibit the seating of packers in the hole. If analysis shows stage grouting must be used, the reasoning for the decision should be documented.
- i. Area boundaries and depth of stages for stage grouting. Depth intervals (lifts) for packer grouting.
- j. Criteria for split spacing (cubic feet of dry solids per linear foot of hole, usually 0.5 cubic foot per foot of hole).
- k. Sequence in which grout hole rows are to be grouted, usually upstream row first.
- l. Design pressures at the collar for various grout mixes and various depth intervals, see chart in Section 13 of the specification.
- m. Limitations and requirements on the sequence of drilling and grouting, usually 50 feet.

- n. Minimum distance to be maintained between grouting and drilling operations, and minimum age of grout at which drilling in grouted holes or adjacent to grouted holes will be permitted, normally 12 hours.
- o. Specify the minimum distance between grouted area and blasting site and maximum allowable blasting intensity. Criteria: Particle velocity maximum of 1 inch per second at the location of the grouted rock.
- p. Minimum distance between grout and water injections, concrete structures, and drains.
- q. Specify type of cement to be used in grout mix and specify starting ratios if different from Section 14.
- r. Specify to which gradation sand is to conform as per gradation limits in Section 2.
- s. Type and quality of admixtures. If calcium chloride is to be used, specify that it shall conform to ASTM D 98. Specify: "high sodium, Wyoming grade bentonite", if bentonite is specified in Section 18.
- t. Type and quality of bulk fillers. (Specify Section 2 gradation limits or other numerical gradation. Note approval of fly ash source, if applicable.)
- u. Pollution Control Measures (PCM) When Construction Specification 5, Pollution Control, does not provide guidance for the grouting operations, include requirements in this specification. PCM are to be installed and maintained by the Contractor to prevent waste grout materials, chemical wastes, and soil from entering the stream. A plan for pollution control is to be submitted by the Contractor to the Engineer for review prior to installation of any measures. After grouting has been completed, pollution control measures are to be removed. A minimum of one sediment basin will usually be required. Cross reference these requirements with Construction Specification 5.
- v. The quantity variation clause applies to pressure grouting. Quantity estimates should not include token amounts but should reflect the best estimate of expected grout take based on site exploration data and engineering geology.
- w. Bid items for mobilization for pressure grouting, if applicable. A separate bid item should be considered if mobilization for grouting equipment will involve a significant amount of work, and grouting is not the principal item of construction work under the contract. If grouting is the main job, a general mobilization item using Construction Specification 8 should be used for all mobilization.
- x. If Construction Specification 94, Contractor Quality Control, is not a part of the contract and this specification is being used in a federal contract, and the Contractor is required to keep detailed records for quality control, modify Section 15, RECORDS by inserting in Section 18, Items of Work and Construction Details, the altered roles of the Engineer and Contractor.

- y. Alternate to (x) above, use Construction Specification 94 and detail the Contractor's Quality Control activities that are required.

4. DISCUSSION OF METHODS

No Methods are outlined in the Specification.

Section 18 shall provide a clear statement of the items listed under Section 17, Measurement and Payment, that will apply to work requirements for measurement and payment purposes.

CONSTRUCTION SPECIFICATION

14. PRESSURE GROUTING

1. SCOPE

The work shall consist of drilling grout holes, exploratory holes and check holes, pressure testing, pressure washing, and injecting suspension grout under pressure, and shall include furnishing of all materials, labor, and equipment as described and specified.

2. MATERIALS

Portland Cement. Portland cement shall conform to the requirements of Material Specification 531 for the specified type. If the cement contains lumps or foreign material which would clog the grouting equipment or interfere with grout injection, it shall be screened through a 100-mesh screen. Cement shall be furnished in bags (94 lb.) unless special equipment is provided for storing, handling, and weighing bulk cement as specified in Section 3 of this specification.

Water. Water used shall be clean and free from injurious amounts of oil, acid, organic matter, or other deleterious substances.

Sand. Sand for grout shall conform to Material Specification 522 and unless otherwise specified, the gradation shall be within the numerical limits in the following table:

<u>Sieve Designation (U.S. Std. Square Mesh)</u>	<u>Percent Passing by Weight</u>
16	100
50	20 – 50
100	10 – 30
200	0 – 5

Sand included in the mix shall be measured in cubic-foot boxes or other volumetric method approved by the Engineer, or by dry unit weight with correction for moisture content.

Bulk Fillers. Bulk fillers other than sand shall be of the type and quality specified in Section 18 of this specification. Bulk fillers included in the mix shall be measured in cubic-foot boxes, or by dry unit weight with correction for moisture content, if applicable.

Admixtures. Admixtures shall be the type and quality specified in Section 18 of this specification.

Storage and Supply. A sufficient quantity of all materials shall be on hand to insure that grouting operations will not be interrupted or delayed. Materials shall be stored and protected at all times and at all locations in such a manner that the quality of the materials is maintained.

3. EQUIPMENT

All drilling and grouting equipment shall be of a type and capacity, and in condition, to perform the work described.

Drilling Equipment. Drilling equipment shall be capable of drilling angle holes up to 45° from vertical, unless otherwise specified in Section 18 of this specification.

For exploratory holes, all drilling equipment used in rock shall be of the rotary type and shall be equipped with hydraulic feed.

Cores shall be drilled with standard ball bearing, swivel type, "N" size, double or triple tube split inner core barrels or equivalent size wire-line coring equipment.

Equipment for drilling grout and check holes shall be of the rotary, percussion, or rotary-percussion type as specified in Section 18 of this specification. No core recovery will be required, and the type of bit used shall be optional. Equipment using air alone for flushing cuttings shall not be used. When percussion drilling equipment using water for flushing cuttings is used, the lifting rate of the flushing water shall be not less than 18 inches per second.

Grouting Equipment. The equipment shall be capable of mixing and pumping grout having a mix ratio, by volume, of one (1) part water, one (1) part cement, and two (2) parts bulk filler, such as sand or fly ash.

Mixers. Unless otherwise specified, mixers shall be of the high speed colloidal type and capable of thoroughly mixing water, cement, and bulk fillers to produce a grout of uniform texture and consistency. Mixers shall match the capacity of the pumping plant.

Holdover Tank. A holdover tank shall be furnished if a single compartment mixer is used. It shall be equipped with mechanical agitators to prevent segregation of the grout, and shall have sufficient capacity to temporarily store the grout and thus provide a continuous supply. The outflow shall pass through a No. 16 wire mesh screen if the grout contains particles or foreign matter that would interfere with its proper flow into the voids it is intended to fill.

Pumps. Grout pumps shall be of the long stroke, multiple piston or the helical screw type. The capacity shall be not less than 3 cubic feet per minute at 200 psi for the maximum grout mix of 1:1:2 (w:c:bf) by volume.

Cement and Fly Ash-Handling Equipment. If bulk cement or fly ash is used, it shall be stored in weather tight bins or silos equipped and arranged to discharge directly into a weighing hopper, and hence, directly into the grout mixer without spillage and without intermediate handling.

Air Supply. The air supply shall meet the requirement of the pumps and shall not be less than 200 cubic feet per minute per plant.

Water Meter. One water meter, of the reset type, graduated in tenths of gallons or hundredths of cubic feet shall be used with each mixer.

Pressure Gauges. One pressure gauge shall be installed at the pump and one at the collar of the hole. Gauges shall be of the non-clogging type or shall be prevented from clogging by using gauge savers or grease. Spare gauges shall be available at the plant at all times.

Hoses, Valves, and Fittings. Hoses, valves, and fittings shall be compatible with the maximum pressures specified. Hose from pump to grout header and return shall not be smaller than 1 1/2-inch (ID), and the pipe between header and packer shall not be smaller than 3/4-inch (ID). Double or single packers may be required for grouting and pressure testing. Packers shall fit tightly in the holes at all testing and grouting pressures.

4. ARRANGEMENT OF GROUTING EQUIPMENT

The arrangement of grouting equipment shall provide a return line from the header back to the mixer or holdover tank, permitting continuous circulation of the grout. The grout pressure shall be controlled at the header or at the end of the return line.

The hose between the take-off at the grout supply line to the header at the hole shall not be longer than 15 feet.

Grouting several holes simultaneously from the same grout pump (multiple header arrangement) will not be permitted.

Each hole shall be equipped with a shutoff valve below the hand coupling union, permitting shutoff at refusal pressure and removal of the header to another hole while still maintaining pressure in the completed hole.

The header arrangement shall include a blow off valve and a control valve, to be used to check hole back pressure prior to header removal, and a return line valve. The header shall be connected to the supply line by means of a U-shaped pipe arrangement or other fashion which prevents fallout of solids into the hole from the bypassing grout during low rates of grout acceptance.

5. COMMUNICATIONS

A suitable voice communications system between individuals at the pump units and the holes shall be maintained by the Contractor.

6. GROUT MIXTURES

Composition. Grout shall consist of a mixture of portland cement, water, sand, bulk filler, and additives, as specified.

Grout mixes and sequences of changes in mix ratio or composition shall be as specified in Section 13 of this specification or as approved by the Engineer.

Mix Ratios. Grout mix ratios will be expressed in cubic feet of water to a bag of cement. Bulk fillers will be expressed in cubic feet to a bag of cement. Other additives will be expressed in percent to a bag of cement and measured in pounds, gallons, or pints.

7. GROUT CAPS AND CONCRETE SLABS

Concrete for grout caps and slabs, if required, shall be placed as shown on the drawings. The concrete shall be a workable mixture of portland cement, fine and coarse aggregates, and water, containing not less than 6 bags of cement per cubic yard of concrete, and not more than 6 gallons of water per bag of cement, including the free moisture of the aggregates.

Portland cement shall conform to the requirements of Material Specification 531 for the type specified. Aggregates shall consist of sound and durable particles and shall conform to the limitations for deleterious substances and the grading requirements of ASTM Specification C 33. Coarse aggregates shall be size 7, 67, 57 or 467 as defined in ASTM Specification C 33.

Batching, mixing, and placing shall be conducted in a manner that will produce a uniform, well-graded, and dense concrete.

When ready-mixed concrete is furnished, the Contractor shall furnish the Engineer a delivery ticket showing the time of loading and the quantities of materials used for each load of concrete. Concrete shall be placed within 1-1/2 hours after introduction of the cement to the aggregates or within 3/4 hours when the temperature of the concrete is 85° F or greater.

Surfaces against which concrete is to be placed shall be cleaned of all soil, loose rock, and other loose material and shall be moist when the concrete is placed.

Concrete shall be placed only when the Engineer is present.

The concrete shall be prevented from drying for a curing period of at least 5 days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period, or shall be coated with an acceptable curing compound as soon as free water has disappeared.

8. DRILLING OVERBURDEN

Unless otherwise specified, holes drilled through overburden shall be cased with steel. Casings shall be removed after completion of the grouting operations unless otherwise approved by the Engineer. Holes in overburden shall be backfilled with grout or a sand-cement mixture or by tamping soil into the holes to approximately

the bulk density of the surrounding overburden, unless otherwise specified in Section 18 of this specification.

9. DRILLING ROCK

The location, inclination, and depth of holes shall be as shown on the drawings or as directed by the Engineer.

The use of rod dope, grease, and other solid or liquid lubricants shall not be permitted.

The Contractor shall perform such exploratory drilling as may be required to determine the condition of the rock prior to grouting and the effectiveness of the grouting operation as the work progresses. All exploratory holes shall be cored and shall be pressure tested when directed by the Engineer. Exploratory holes shall be drilled with an "N" size core barrel as specified in Section 3 of this specification. Rock core samples shall be carefully placed in correct sequence in labeled core boxes furnished by the Contractor. The Contractor shall transport the core boxes to the location designated in Section 18 of this specification.

Unless otherwise specified, grout holes shall have a diameter not less than 2-15/16 inches (NX).

10. WASHING GROUT HOLES

When authorized by the Engineer and prior to grout injection, grout holes shall be washed with water and air to remove mud, drill cuttings, and other materials which will interfere with the grout take of the hole. Grout holes to be washed and the sequence of washing shall be approved by the Engineer. Washing under pressure using packers or pressure testing shall be performed when specified. Washing time for each hole shall be approved by the Engineer.

If mud is moved into a hole by grouting nearby holes after the hole has been washed, the mud will be removed by re-washing the hole.

The air and water pressure will be adjusted to provide the maximum cleaning condition for the holes as determined by the Engineer. Water and air shall be introduced simultaneously under pressure and at the same elevation in the hole. The water pump shall be capable of producing 200 gpm of water at a minimum of 100 psi. The air supply shall be capable of furnishing a minimum of 200 cubic feet per minute at 100 psi.

Unless approved by the Engineer, no holes shall be washed that are within 100 feet of a previously grouted hole unless the grout has been placed for at least 48 hours.

11. PRESSURE TESTING

In holes to be pressure tested, the packer or packers shall be set at intervals as directed by the Engineer. Each interval shall be tested at water pressures up to the specified design grouting pressure for that interval, unless otherwise directed by the Engineer. Pressures exceeding the specified design pressures shall not be applied unless specifically authorized by the Engineer.

The flow shall be read at 1 minute intervals. The test is completed when the rate of take is steady for at least 3 consecutive minutes at the maximum pressure for the section being tested. The flow readings shall be recorded on a form supplied by or approved by the NRCS.

Pressure test equipment shall be calibrated at the site to determine the pressure loss in the equipment at various flow rates and test depths.

Pressure tests and calibration of pressure test equipment shall be performed in the presence of the Engineer.

12. PACKER AND STAGE GROUTING

For packer grouting, the holes shall be drilled to the total depths and shall be grouted in lifts starting at the bottom. If the drill water is lost completely, the hole shall be grouted at that depth and drilling continued not less than 24 hours after grouting. The packer lifts and related pressures shall be as specified except as otherwise directed by the Engineer.

If stage grouting becomes necessary, it shall be performed in successive depth intervals (stages) in each hole beginning at the rock surface and progressing to the deeper stages. All of the holes in a specified area shall be drilled and grouted in each stage before grouting of the succeeding stage is begun. The stages and the grouting pressures for each stage shall be as specified unless otherwise directed by the Engineer.

Each stage of a hole shall be washed with water and air simultaneously and immediately before grouting. Washing under pressure or pressure testing shall be performed as specified in Section 10 of this specification.

13. GROUT INJECTION

The pumping rate shall not exceed 3 cubic feet per minute, unless otherwise approved by the Engineer. Grout pressures shall be as specified in Section 18 of this specification, but shall not exceed the refusal pressures shown in the following table:

GROUT REFUSAL PRESSURES FOR MIX RATIOS

Rock Cover (feet)	Gauge Pressure at Collar in PSI For the Mix Ratios (by volume)							
	1:1:2	1:1:1	1:1:3/5	1:1 W:C	2:1	3:1	5:1	Water
5	1	1	1	1	1	1	2	3
10	1	1	2	2	3	3	4	5
20	1	2	3	5	7	8	9	10
40	8	12	14	17	21	23	26	30
60	22	26	28	34	40	43	46	52
80	36	41	44	52	60	64	68	75
100	50	56	60	70	80	84	90	99

- NOTES: (1) 1:1:3/5 = 5 water : 5 cement : 3 sand
 (2) overburden counts as 50% rock cover,
 (10 feet of overburden = 5 feet of rock cover)
 (3) For depths and mix ratios other than those shown, linear interpolation shall be made to determine maximum pressure.

Grouting, particularly in zones near the surface, shall be accomplished with extreme caution to prevent uplift of the rock or excessive leakage at the surface.

The Contractor shall caulk surface cracks which allow excessive loss of grout. Cracks may be caulked by mechanical means or with fast-setting mortar. If necessary, grouting shall be temporarily suspended or the pressure shall be reduced to permit the caulking of leaks. Accelerators may be added to the grout for the same purpose if approved by the Engineer.

If grout injected into one hole appears in adjacent holes, the interconnected holes shall be plugged temporarily with packers set just above the level at which the grout is entering. Holes grouted by interconnection shall be split spaced.

The quantity of grout prepared in advance shall be kept to a minimum. Grout, which has remained in the mixer or holdover tank with or without agitation for greater than one (1) hour, shall be discarded.

Grout temperatures shall be not lower than 50° F. The grouted soil, rock, or concrete shall be not colder than 40° F when grout is injected and for at least 48 hours thereafter. Insulation or heat shall be applied to the surface for 24 hours prior and 48 hours after grouting if required to keep the soil, rock, or concrete above the minimum required temperature.

When the hole shows signs of refusal, a thinner mix shall be used to prevent or remove clogging.

A hole shall be considered grouted when the grout take at the design pressure is less than one cubic foot of grout in 10 minutes.

If a hole continues to accept grout after a specified amount of the thickest workable grout mixture has been injected, the Engineer may specify a reduced pump speed and/or the use of accelerators, or may direct that the pumping be halted temporarily to permit the grout to set. In which case, the hole shall be flushed with about 5 to 8 cubic feet of water and rested for at least 4 hours.

Grouting shall be discontinued in holes which do not respond to the above procedure and the holes shall be re-drilled and re-grouted later, or the area of high grout absorption shall be grouted from adjacent holes until the design objective has been achieved.

14. GROUTING PROCEDURE

The procedures and grout mixes described below are general guidelines and may be altered in the field by the Engineer to suit the conditions encountered and to meet the design objectives.

Unless on-the-site experience indicates otherwise and in lieu of pressure testing, each stage or lift of a hole to be grouted shall be started with about 15 cubic feet (three batches) of water:cement mix to be no thinner than 5:1 (w:c) by volume, unless otherwise specified in Section 18 of this specification.

If the hole continues to take grout at a pumping rate not to exceed 3 cubic feet per minute and at a pressure equal to or less than specified as refusal pressure, the mix ratio shall be changed to 3:1 (w:c). If the majority of the holes accept the 3:1 without signs of slowdown in the rate of take, holes in that stage or location may be started with a 3:1 instead of the 5:1 mix. A change to a different location or stage may require a return to the 5:1 starter mix.

Grout mixes shall be thickened from 5:1 to 3:1 to 2:1 to 1:1 after which sand and/or fly ash shall be added to the mix in a graduated manner (5:5:1S, 5:5:2S, etc.). The water-cement ratio shall not be less than one.

15. RECORDS

Unless otherwise specified, the Contractor shall keep drilling logs and complete records of all grouting operations. These records include time logs of grout mixes and admixtures used in each stage or lift for each hole, related pressures and pumping rates, backpressures, and observations on excessive leakage and other non-routine conditions. The drilling log shall include date, hole location, depth of rock, and depths to various rock features. Rock features shall be described as hard, soft, weathered, cracks, cavities, etc. The Contractor quality control activities are outlined in Construction Specification 94, when applicable.

Unless otherwise specified, the Contractor shall cooperate in providing all information related to drilling and grouting activities required by the contract.

Unless otherwise specified, one copy of the records shall be provided the Engineer at the completion of each shift.

16. CLEANUP

After grouting is completed, the Contractor shall remove the grouting plant and all related parts, equipment, and supplies from the site, including unused materials and waste.

17. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices or lump sum prices are established in the contract, measurement and payment for pressure grouting will be made as described below. Such payment will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to the completion of the work.

Mobilization. Payment for mobilization will be made at the contract lump sum price. Such payment will include compensation for moving grouting equipment and supplies to the site of the work, assembling the plant at the site, moving on the site as work progresses, and removal from the site upon completion of the work. Sixty percent of the lump sum price will be paid when the plant is assembled at the site and grouting work is begun. The remaining 40 percent will be paid after the work is completed, the plant is removed from the site, and cleanup is complete.

Drilling overburden. Drilling overburden will be measured by determining to the nearest foot the total linear feet of accepted hole drilled in the overburden. Payment for drilling overburden will be made at the contract unit price which will include compensation for placing and removing casings.

Drilling Rock. Drilling rock will be measured by determining to the nearest foot the total linear feet of accepted hole of each size drilled in rock without coring. Payment for drilling rock will be made at the contract unit price for each size of hole.

Coring Rock. Coring rock will be measured by determining to the nearest foot the total linear feet of accepted hole of each size cored in rock. Payment for coring rock will be made at the contract unit price for each core size which will include compensation for furnishing and handling the core boxes, storing cores, and recording observations as specified.

Pressure Tests. Pressure testing will be measured by determining the total time to the nearest one-quarter hour that pressure is applied to the holes in making the required tests. One-quarter hour will be added for setting up equipment for each testing period. No extra payment will be made for calibrating pressure test equipment. Payment for pressure tests will be made at the contract unit price.

Washing Grout Holes. Measurement for payment will be determined by the total time, to the nearest one-tenth hour, that water is actually applied to the hole. No

extra payment will be made for setting up equipment. Payment for washing grout holes will be made at the contract unit price.

Connections to Grout Holes. Connections to grout holes will be measured by determining the number of connections made of the grout supply hose to the holes to be grouted. The number of connections for payment will not exceed one per hole for packer grouting or one for each stage for stage grouting, except that if grouting is interrupted to permit the grout to set, one additional connection will be measured for payment each time grouting at the same elevation in the same hole is resumed. Payment for connections to grout holes will be made at the contract unit price.

Placing Grout. Grout placed will be measured to the nearest cubic foot by counting the number of batches of each grout mixture injected in the holes as specified and multiplying by the number of cubic feet per batch. The number of cubic feet per batch for each grout mixture will be determined as the average of the measured volumes of at least three batches of the mixture, or shall be calculated as the sum of the absolute volumes of water, cement, sand and bulk fillers used in the mixture. Absolute volume is defined as:

$$\frac{\text{weight (lb.) of material}}{\text{bulk specific gravity of material X 62.4}}$$

Admixtures shall not be considered in determining batch volume. The weight and specific gravity for sand shall be based on saturated surface dry conditions.

Payment for placing grout will be made at the contract unit price which will include compensation for handling all materials for the purpose of mixing and placing grout, sealing surface leaks, and maintaining grout records. Payment will not be made for grout lost by failure of the Contractor to caulk surface leaks or for grout otherwise wasted due to the actions of the Contractor.

Cement. Cement for grout will be measured on the basis of the number of bags of cement (94 lb.) or equivalent weight of bulk cement used in the grout. Cement used in concrete for capping or other purposes will not be included. Payment for cement will be made at the contract unit price. Payment will not be made for cement in grout wasted because of mechanical failure or due to the actions of the Contractor.

Sand and Bulk Fillers. Sand and bulk fillers will be measured by volume or equivalent weight, adjusted for moisture content where applicable, to the nearest cubic foot of each used in the grouting operation. Payment will be made at the contract unit price for sand and each type of bulk filler specified. Payment will not be made for sand or bulk filler wasted because of mechanical failure or due to the actions of the Contractor.

Admixtures. Liquid admixtures will be measured by volume to the nearest gallon. Dry admixtures will be measured by weight to the nearest pound. Payment for admixtures will be made at the contract unit price for each type of admixture

specified. Payment will not be made for admixtures wasted because of mechanical failure or due to the actions of the Contractor.

Grout Caps and Concrete Slabs. Capping and slab concrete will be measured to the nearest 0.1 cubic yard by determining the combined weights of cement, aggregates, and water used in concrete mixed and placed as specified, and dividing by a unit weight of 4000 lb. per cubic yard. Payment for capping concrete will be made at the contract unit price which will include compensation for furnishing and handling all materials, including cement, and for mixing, transporting, placing, and curing the concrete.

Subsidiary Items. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 18 of this specification.

EXCAVATION

1. APPLICABILITY

Construction Specification 21 is applicable to all types of excavation. The specification defines classes of excavation and includes special requirements for certain types of excavation but does not establish and define all types of excavation. It is intended that the types of excavation be established on a job or project basis, as needed.

The "class" of excavation defines the kind of material to be excavated. The "type" of excavation defines the functional purpose of the excavation. Established types of excavation may include (but are not restricted to):

- a. Foundation Excavation with or without Stripping;
- b. Cutoff, Keyway, or Core Trench Excavation;
- c. Channel Excavation;
- d. Structure Excavation;
- e. Auxiliary Spillway Excavation;
- f. Abutment Shaping Excavation;
- g. Borrow Area Excavation.

Any of the established types may include excavation of materials in either class or may be unclassified. However, the excavation of a given class of material may be more difficult in one type of excavation than in another. These factors must be carefully considered as a basis for establishing types of excavation to be designated on the drawings and listed in the bid schedule.

For projects involving considerable quantities of excavation of different classes of material under conditions that vary in different part of the works, bids must be asked, and payments made, on the basis of both type and class of excavation. For such projects it is necessary that the bid schedule be set up in terms of both type and class of excavation (for example: Channel Excavation, Common; and Channel Excavation, Rock).

For projects involving only one type of excavation and for projects involving small quantities of excavation, it may be sufficient to include only the classes of excavation in the bid schedule.

2. MATERIAL SPECIFICATIONS

There are no material specifications complementary to Construction Specification 21, Excavation.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. The horizontal and vertical extent of each type of excavation. Indicate the vertical extent as approximate where the exact depth required is not known.

- b. Designation and definition of types of excavation.
- c. Excavation pay limits when Method 1, Section 10, is used.
- d. Surface finish requirements, such as grading tolerances. This may be especially important at the crest of an auxiliary spillway.
- e. The location and limits of all borrow areas. Outline all surface grading requirements following completion of borrow material utilization.
- f. The location and limits of all waste areas. When borrow areas serve also as waste areas, coordination of construction activities may be important.
- g. Boring logs and test pit logs pertinent to all areas to be excavated. In addition to descriptions of materials, logs must also include, when it exists, water table elevations and dates of observation. For purposes of the construction drawings, no indications of correlation of materials between logs shall be shown. Interpretation of materials is to be avoided and left to the contractor for determination.
- h. Existing access and haul roads.
- i. Special requirements for dewatering and keeping the excavation dry, with cross reference to Construction Specification 11, [Removal of Water](#), where applicable.
- j. Special requirements for control of blasting, including written plans and approvals, if applicable.
- k. Special requirements for control of erosion, water pollution and air pollution, with cross-reference to Construction Specification 5, [Pollution Control](#), as applicable.
- l. Requirements for control of the size gradation of excavated rock where necessary in order to obtain material of a particular gradation for rock fill or riprap.
- m. Methods of measurement and payment, if the standard specification includes more than one method.
- n. Requirements for concrete to fill voids from over-excavation (refer to Construction Specification 31, [Concrete for Major Structures](#), or 32, [Structure Concrete](#)) if requirements in Section 9 are not adequate.

4. DISCUSSION OF METHODS

a. Section 5, Use of Excavated Materials

- (1) Method 1 is intended for use when the quality, condition and relative location of significant quantities of the materials to be excavated are known to be

suited to the economic construction of the required earthfills and earth backfills, and particularly where alternate sources of material are less desirable or do not exist.

- (2) Method 2 is intended for use when the known data indicate that the use of alternate sources of earthfill materials may result in more economical construction of the required earthfills and earth backfills.

b. Section 6, Disposal of Waste Materials

- (1) Method 1 is intended for use when areas for wasting unsuitable and/or excess materials are available at the site, when the waste fill will beneficially supplement the function of the permanent works or when there is no known market for such waste materials as may be produced.
- (2) Method 2 is intended for use when areas for wasting unsuitable and excess material are not readily available at the site or when there is a known market for such waste materials as may be produced.

c. Section 10, Measurement and Payment

Note in Section 11 when volume calculations other than the average cross-sectional end area method will be used and describe the applicable method. Example - "In lieu of computing excavation volumes by the method of average cross-sectional end areas, the volume may be computed by the prismatic formula method with the assistance of computer aided design program."

- (1) Method 1 is intended for excavations where the pay limits can best be defined on the drawings.
- (2) Method 2 is intended for excavations bounded by simple plane surfaces and constant or gradually varying cross section throughout.
- (3) Method 3 is intended for excavations whose lower limits are determinable only by examination of the materials encountered and where the lower limits have been designated on the drawings as approximate or "to be determined by the Engineer during construction".
- (4) Method 4 is intended for structure excavation bounded by fairly simple plane surfaces where pay limits are not shown on the drawings.

When specifications are prepared using electronic procedures and all but one method are deleted for use in a contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

21. EXCAVATION

1. SCOPE

The work shall consist of the excavation required by the drawings and specifications and disposal of the excavated materials.

2. CLASSIFICATION

Excavation will be classified as common excavation or rock excavation in accordance with the following definitions or will be designated as unclassified.

Common excavation shall be defined as the excavation of all materials that can be excavated, transported, and unloaded by the use of heavy ripping equipment and wheel tractor-scrappers with pusher tractors or that can be excavated and dumped into place or loaded onto hauling equipment by means of excavators having a rated capacity of one cubic yard or larger and equipped with attachments (such as shovel, bucket, backhoe, dragline or clam shell) appropriate to the material type, character, and nature of the materials.

Rock excavation shall be defined as the excavation of all hard, compacted or cemented materials that requires blasting or the use of ripping and excavating equipment larger than defined for common excavation. The excavation and removal of isolated boulders or rock fragments larger than one (1) cubic yard encountered in materials otherwise conforming to the definition of common excavation shall be classified as rock excavation. The presence of isolated boulders or rock fragments larger than one (1) cubic yard will not in itself be sufficient cause to change the classification of the surrounding material.

For the purpose of these classifications, the following definitions shall apply:

Heavy ripping equipment shall be defined as a rear-mounted, heavy duty, single-tooth, ripping attachment mounted on a track type tractor having a power rating of at least 250 flywheel horsepower unless otherwise specified in Section 11.

Wheel tractor-scraper shall be defined as a self-loading (not elevating) and unloading scraper having a struck bowl capacity of at least twelve (12) cubic yards.

Pusher tractor shall be defined as a track type tractor having a power rating of at least 250 flywheel horsepower equipped with appropriate attachments.

3. UNCLASSIFIED EXCAVATION

Excavation designated as "Unclassified Excavation" shall include all materials encountered regardless of their nature or the manner in which they are removed. When excavation is unclassified, none of the definitions or classifications stated in Section 2, CLASSIFICATION, shall apply.

4. BLASTING

The transportation, handling, storage, and use of dynamite and other explosives shall be directed and supervised by person(s) of proven experience and ability who are authorized and qualified to conduct blasting operations.

Blasting shall be done in such a manner as to prevent damage to the work or unnecessary fracturing of the foundation and shall conform to any special requirements in Section 11 of this specification. When specified in Section 11, the Contractor shall furnish the Engineer in writing, a blasting plan prior to blasting operations.

5. USE OF EXCAVATED MATERIALS

Method 1 To the extent they are needed, all suitable materials from the specified excavations shall be used in the construction of required permanent earthfill or rockfill. The suitability of materials for specific purposes will be determined by the Engineer. The Contractor shall not waste or otherwise dispose of suitable excavated materials.

Method 2 Suitable materials from the specified excavations may be used in the construction of required earthfill or rockfill. The suitability of materials for specific purposes will be determined by the Engineer.

6. DISPOSAL OF WASTE MATERIALS

Method 1 All surplus or unsuitable excavated materials will be designated as waste and shall be disposed of at the locations shown on the drawings.

Method 2 All surplus or unsuitable excavated materials will be designated as waste and shall be disposed of by the Contractor at sites of his own choosing away from the site of the work in an environmental acceptable manner and that does not violate local rules and regulations.

7. EXCAVATION LIMITS

Excavations shall comply with OSHA Construction Industry Standards (29CFR Part 1926) Subpart P, Excavations, Trenching, and Shoring. All excavations shall be completed and maintained in a safe and stable condition throughout the total construction phase. Structure and trench excavations shall be completed to the specified elevations and to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work. Excavations outside of the lines and limits shown on the drawings or specified herein required to meet safety requirements shall be the responsibility of the Contractor in constructing and maintaining a safe and stable excavation.

8. BORROW EXCAVATION

When the quantities of suitable materials obtained from specified excavations are insufficient to construct the specified earthfills and earth backfills, additional materials shall be obtained from the designated borrow areas. The extent and depth of borrow pits within the limits of the designated borrow areas shall be as specified in Section 11 or as approved by the Engineer.

Borrow pits shall be excavated and finally dressed to blend with the existing topography and sloped to prevent ponding and to provide drainage.

9. OVER-EXCAVATION

Excavation in rock beyond the specified lines and grades shall be corrected by filling the resulting voids with portland cement concrete made of materials and mix proportions approved by the Engineer. Concrete that will be exposed to the atmosphere when construction is completed shall meet the requirements of concrete selected for use under Construction Specification 31, [Concrete for Major Structures](#), or 32, [Structure Concrete](#), as appropriate.

Concrete that will be permanently covered shall contain not less than five (5) bags of cement per cubic yard. The concrete shall be placed and cured as specified by the Engineer.

Excavation in earth beyond the specified lines and grades shall be corrected by filling the resulting voids with approved compacted earthfill, except that, if the earth is to become the subgrade for riprap, rockfill, sand or gravel bedding, or drainfill, the voids may be filled with material conforming to the specifications for the riprap, rockfill, bedding or drainfill. Prior to correcting an over-excavation condition, the Contractor shall review the planned corrective action with the Engineer and obtain approval of the corrective measures.

10. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the volume of each type and class of excavation within the specified pay limits will be measured and computed to the nearest cubic yard by the method of average cross-sectional end areas or by methods outlined in Section 11 of this specification. Regardless of quantities excavated, the measurement for payment will be made to the specified pay limits, except that excavation outside the specified lines and grades directed by the Engineer to remove unsuitable material will be included. Excavation required because unsuitable conditions result from the Contractor's improper construction operations, as determined by the Engineer, will not be included for measurement and payment.

Method 1 The pay limits shall be as designated on the drawings.

Method 2 The pay limits shall be defined as follows:

- a. The upper limit shall be the original ground surface as it existed prior to the start of construction operations except that where excavation is performed within areas designated for previous excavation or earthfill the upper limit shall be the modified ground surface resulting from the specified previous excavation or earthfill.
- b. The lower and lateral limits shall be the neat lines and grades shown on the drawings.

Method 3 The pay limits shall be defined as follows:

- a. The upper limit shall be the original ground surface as it existed prior to the start of construction operations except that where excavation is performed within areas designated for previous excavation or earthfill the upper limit shall be the modified ground surface resulting from the specified previous excavation or earthfill.
- b. The lower and lateral limits shall be the true surface of the completed excavation as directed by the Engineer.

Method 4 The pay limits shall be defined as follows:

- a. The upper limit shall be the original ground surface as it existed prior to the start of construction operations except that where excavation is performed within areas designated for previous excavation or earthfill the upper limit shall be the modified ground surface resulting from the specified previous excavation or earthfill.
- b. The lower limit shall be at the bottom surface of the proposed structure.
- c. The lateral limits shall be 18-inches outside of the outside surfaces of the proposed structure or shall be vertical planes 18-inches outside of and parallel to the footings, whichever gives the larger pay quantity, except as provided in d, below.
- d. For trapezoidal channel linings or similar structures that are to be supported upon the sides of the excavation without intervening forms, the lateral limits shall be at the under side of the proposed lining or structure.
- e. For the purposes of the definitions in b, c, and d, above, any specified bedding or drainfill directly beneath or beside the structure will be considered to be a part of the structure.

All Methods The following provisions apply to all methods of measurement and payment.

Payment for each type and class of excavation will be made at the contract unit price for that type and class of excavation. Such payment will constitute full compensation

for all labor, materials, equipment, and all other items necessary and incidental to the performance of the work, except that extra payment for backfilling over-excavation will be made in accordance with the following provisions:

Payment for backfilling over-excavation, as specified in Section 9 of this specification, will be made only if the excavation outside specified lines and grades is directed by the Engineer to remove unsuitable material and if the unsuitable condition is not a result of the Contractor's improper construction operations as determined by the Engineer.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 11 of this specification.

EARTHFILL

1. **APPLICABILITY**

Construction Specification 23 is applicable to all types of earthfill, including fill sections constructed of rocky soils and embankments constructed of soft or friable rock which is expected to break down during compaction.

2. **MATERIAL SPECIFICATIONS**

There are no material specifications complementary to Construction Specification 23.

3. **ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS**

- a. Complete plans and cross sections of the required earthfills and earth backfills.
- b. Pay limits, where applicable.
- c. Borrow areas or other sources of material(s).
- d. Designation and description of the types of materials required in the various parts of the work.
- e. Maximum allowable size of rock particles.
- f. Special requirements for foundation preparation.
- g. Maximum layer thickness before compaction for earthfill. (Table A-23 of these Instructions may be used as a guide. Table A-23 gives upper limits for the general classes of material listed. The specified maximum layer thickness may have to be substantially less than the tabulated value to obtain adequate compaction.)
- h. Maximum layer thickness before compaction for earth backfill by manually directed power tampers. (The maximum thickness that can be adequately compacted depends upon the tampers and upon the soil being placed, varying from about four (4) inches for plastic clays to about eight (8) inches for coarse grained material of low plasticity.)
- i. Special instructions for sectional or phased construction where applicable.
- j. Allowable range of moisture content for each item. For example:
 - (1) "The moisture content of the fill matrix at the time of compaction shall be neither less than two (2) percent below optimum moisture content nor more than two (2) percent above optimum moisture content."

(2) "The moisture content of the fill material shall be maintained within the limits required to: (a) prevent bulking or dilatance of the material under the action of the hauling or compacting equipment; (b) prevent the adherence of the earthfill material to the treads and tracks of the equipment; and, (c) ensure the crushing and blending of the soil clods and aggregations into a reasonably homogeneous mass."

- k. Compaction class for each item. (Table A-23 may be used as a guide.)
- l. For Class A compaction: Compaction test method and required percent of maximum density. Typical compaction test results, if applicable.
- m. For Class B compaction: Minimum mass density.
- n. For Class C compaction: Type of roller; minimum weight or contact pressure of roller; minimum vibrating force and frequency for vibrating roller; minimum number of passes.
- o. Special rapid methods for moisture control, (quick dry, speedy, alcohol, nuclear gauge), if used. These methods are only to be used on soils where they prove to be a reliable approximation to ASTM D 2216. When rapid methods are used, a reference to the procedure to be followed should be included.
- p. When the "family of curves" and the one-point Proctor is the intended method for soil density standard determination and verification, it should be referenced and so specified in Section 10.
- q. Special requirements, where applicable, for placing earth backfill adjacent to structures; such as, reduced compactive effort for high, thin walled structures. This may include monitoring stresses and wall movements and/or specifying minimum in-place concrete strength requirements before the forms or other supports are removed or earth backfilling commences. Minimum in-place concrete strength requirements shall be determined by the designer and clearly stated.
- r. Required minimum strength of concrete, determined according to Section 6, for starting compaction of backfill adjacent to structures, if applicable. Use of minimum strength is encouraged over minimum times listed in Section 6.
- s. Methods of measurement and payment.
- t. Embedded structures or other elements whose volume will be excluded from the earthfill volume for payment. Major items may be listed for exclusion. The cost of measuring, computing, checking, record keeping, etc. must clearly justify the exclusion.

- u. Special requirements pertaining to furnishing and applying water, including designated source and details of ownership and water rights, if applicable, and including water quality requirements if quality may be a concern.
- v. Special requirements for control of erosion, water pollution, and air pollution, with appropriate cross-reference to Construction Specification [5, Pollution Control](#).
- w. Surface finish requirements, such as completed surface grade tolerances.

4. DISCUSSION OF METHODS

a. Section 9, Measurement and Payment

Note in Section 10 when volume calculations other than by the average cross-sectional end area method will be used and describe the applicable method. Example - "In lieu of computing volumes by the method of average cross-sectional end areas, the volume may be computed by the prismatic formula method with the assistance of computer aided design program."

- (1) Method 1 is intended for structure earth backfill and other cases where pay limits can best be shown on the drawings.
- (2) The selected methods for pay limits must be compatible with those selected for use in Construction Specification [21, Excavation](#).
- (3) Method 6 or 7 must be used with any or all Methods 1 through 5.
 - (a) Method 6 is intended for use when no separate payment is to be made for water.
 - (b) Method 7 is intended for use with Construction Specification [10, Water for Construction](#), when the Contractor is to be paid under a separate item for the water needed to bring the earthfill and earth backfill materials to the specified moisture content.

When specifications are prepared using electronic procedures and all but one method are deleted for use in a contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

TABLE A – 23

Grading Characteristics of Soil Fill Material		Approximate Compaction Classes	Maximum Layer Thickness (Before Compaction)			
% > No. 4	% Fines (Passing #200)		Tamping Roller	Pneumatic Roller	Vibrating Roller	40000 lb. Track Trctr.
0 – 35	Over 5	A	9"	9"	---	---
	Under 5	A B, C	9" ---	12" 18"	24" 30"	--- 12"
35 – 65	25 – 50	A B, C	9" 9"	12" 18"	24" 24"	--- ---
	5 – 25	A B, C	--- ---	12" 18"	24" 24"	--- ---
	Under 5	B, C	---	24"	24"	18"
Over 65	Over 5	B, C	---	18"	24"	---
	Under 5	B, C	---	24"	24"	18"

Note: Tabulated values are upper limits. Actual maximum layer thickness for uniform compaction of a given soil material may be substantially lower. Maximum size of rock or rock fragments should not exceed 2/3 of the layer thickness prior to compaction. Soil plasticity should be a consideration.

For Weathered or weakly indurated rock materials:

For materials such as shales, schists, disintegrated granite, soft sandstone, and siltstone, the appropriate compaction classes depend upon the degree of breakdown under the action of the excavating and compacting equipment. The maximum layer thickness before compaction must be determined on the basis of special laboratory tests or field compaction tests or both. Field test fills should be considered to determine the least effort required to meet minimum density requirements.

CONSTRUCTION SPECIFICATION

23. EARTHFILL

1. SCOPE

The work shall consist of the construction of earth embankments, other earthfills, and earth backfills required by the drawings and specifications.

Earthfill is composed of natural earth materials that can be placed and compacted by construction equipment operated in a conventional manner.

Earth backfill is composed of natural earth materials placed and compacted in confined spaces or adjacent to structures (including pipes) by means of hand tamping, manually directed power tampers or vibrating plates, or equivalent.

2. MATERIALS

All fill materials shall be obtained from required excavations and designated or approved borrow areas. The selection, blending, routing and disposition of materials in the various fills shall be subject to approval by the Engineer.

Fill materials shall contain no frozen soil, sod, brush, roots or other perishable materials. Rock particles larger than the maximum size specified for each type of fill shall be removed prior to compaction of the fill.

The types of materials used in the various fills shall be as listed and described in the specifications and drawings.

3. FOUNDATION PREPARATION

Foundations for earthfill shall be stripped to remove vegetation and other unsuitable materials or shall be excavated as specified.

Except as otherwise specified, earth foundation surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the fill or otherwise acceptably scored and loosened to a minimum depth of two (2) inches. The moisture content of the loosened material shall be controlled as specified for the earthfill, and the surface materials of the foundation shall be compacted and bonded with the first layer of earthfill as specified for subsequent layers of earthfill.

Earth abutment surfaces shall be free of loose, uncompacted earth in excess of two inches in depth normal to the slope and shall be at such a moisture content that the earthfill can be compacted against them to produce a good bond between the fill and the abutments.

Rock foundation and abutment surfaces shall be cleared of all loose materials by hand or other effective means and shall be free of standing water when fill is placed upon them. Occasional rock outcrops in earth foundations for earthfill, except in dams and other structures designed to restrain the movement of water, shall not

require special treatment if they do not interfere with compaction of the foundation and initial layers of the fill or the bond between the foundation and the fill.

Foundation and abutment surfaces shall be not steeper than one (1) horizontal to one (1) vertical unless otherwise specified. Test pits or other cavities shall be filled with compacted earthfill conforming to the specifications for the earthfill to be placed upon the foundation.

4. PLACEMENT

Earthfill shall not be placed until the required excavation and foundation preparation have been completed and the foundation has been inspected and approved by the Engineer. Earthfill shall not be placed upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the earthfill matrix.

Earthfill shall be placed in approximately horizontal layers. The thickness of each layer before compaction shall not exceed the maximum thickness specified in Section 10 or shown on the drawings. Materials placed by dumping in piles or windrows shall be spread uniformly to not more than the specified thickness before being compacted.

Hand compacted earth backfill shall be placed in layers whose thickness before compaction does not exceed the maximum thickness specified for layers of earth backfill compacted by manually directed power tampers.

Earth backfill shall be placed in a manner which will prevent damage to the structures and will allow the structures to assume the loads from the earth backfill fill gradually and uniformly. The height of the earth backfill adjacent to a structure shall be increased at approximately the same rate on all sides of the structure.

Earthfill and earth backfill in dams, levees and other structures designed to restrain the movement of water shall be placed so as to meet the following additional requirements:

- a. The distribution of materials throughout each zone shall be essentially uniform, and the earthfill shall be free from lenses, pockets, streaks or layers of material differing substantially in texture, moisture content, or gradation from the surrounding material. Zone earthfills shall be constructed concurrently unless otherwise specified.
- b. If the surface of any layer becomes too hard and smooth for proper bond with the succeeding layer, it shall be scarified parallel to the axis of the fill to a depth of not less than two (2) inches before the next layer is placed.
- c. The top surfaces of embankments shall be maintained approximately level during construction, except that a crown or cross-slope of approximately two (2) percent shall be maintained to ensure effective drainage, and except as otherwise specified for drainfill or sectional zones.

- d. Dam embankments shall be constructed in continuous layers from abutment to abutment except where openings to facilitate construction or to allow the passage of stream flow during construction are specifically authorized in the contract.
- e. Embankments built at different levels as described under (c) or (d) above shall be constructed so that the slope of the bonding surfaces between embankment in place and embankment to be placed is not steeper than three (3) feet horizontal to one (1) foot vertical. The bonding surface of the embankment in place shall be stripped of all material not meeting the requirements of this specification, and shall be scarified, moistened and re-compacted when the new earthfill is placed against it. This is to insure a good bond with the new earthfill and to obtain the specified moisture content and density at the contact of the in place and new earthfills.

5. CONTROL OF MOISTURE CONTENT

During placement and compaction of earthfill and earth backfill, the moisture content of the materials being placed shall be maintained within the specified range.

The application of water to the earthfill materials shall be accomplished at the borrow areas insofar as practicable. Water may be applied by sprinkling the materials after placement on the earthfill, if necessary. Uniform moisture distribution shall be obtained by disking.

Material that is too wet when deposited on the earthfill shall either be removed or be dried to the specified moisture content prior to compaction.

If the top surface of the preceding layer of compacted earthfill or a foundation or abutment surface in the zone of contact with the earthfill becomes too dry to permit suitable bond it shall either be removed or scarified and moistened by sprinkling to an acceptable moisture content prior to placement of the next layer of earthfill.

6. COMPACTION

Earthfill. Earthfill shall be compacted according to the following requirements for the class of compaction specified:

Class A Compaction. Each layer of earthfill shall be compacted as necessary to provide the density of the earthfill matrix not less than the minimum density specified in Section 10 or identified on the drawings. The earthfill matrix is defined as the portion of the earthfill material finer than the maximum particle size used in the compaction test method specified.

Class B Compaction. Each layer of earthfill shall be compacted to a mass density not less than the minimum density specified.

Class C Compaction. Each layer of earthfill shall be compacted by the specified number of passes of the type and weight of roller or other equipment specified, or by an approved equivalent method. Each pass shall consist of at least one passage of the roller wheel or drum over the entire surface of the layer.

Earth backfill. Earth backfill adjacent to structures shall be compacted to a density equivalent to that of the surrounding in-place earth materials or adjacent required earthfill or earth backfill. Compaction shall be accomplished by means of hand tamping or manually directed power tampers, plate vibrators, walk-behind, miniature, or self-propelled rollers. Unless otherwise specified, heavy equipment including backhoe mounted powertampers, or vibrating compactors and manually directed vibrating rollers, shall not be operated within two (2) feet of any structure. Towed or self-propelled vibrating rollers shall not be operated within five (5) feet of any structure. Compaction by means of drop weights operating from a crane or hoist will not be permitted.

The passage of heavy equipment will not be allowed: (1) over cast-in-place conduits prior to 14-days after placement of the concrete; (2) over cradled or bedded pre-cast conduits prior to seven (7) days after placement of the concrete cradle or bedding; or (3) over any type of conduit until the backfill has been placed above the top surface of the structure to a height equal to one-half the clear span width of the structure or pipe or two (2) feet, whichever is greater, except as may be specified in Section 10.

Compacting of earth backfill adjacent to structures shall not be started until the concrete has attained the strength specified in Section 10 for this purpose. The strength will be determined by compression testing of test cylinders cast by the Contractor's quality control personnel for this purpose and cured at the work site in the manner specified in ASTM C 31 for determining when a structure may be put into service.

When the required strength of the concrete is not specified as described above, compaction of earth backfill adjacent to structures shall not be started until the following time intervals have elapsed after placement of the concrete.

<u>Structure</u>	<u>Time Interval</u>
Vertical or near-vertical walls with earth loading on one side only	14 days
Walls backfilled on both sides simultaneously	7 days
Conduits and spillway risers, cast in-place (with inside forms in place)	7 days
Conduits and spillway risers, cast-in place (inside forms removed)	14 days

<u>Structure</u>	<u>Time Interval</u>
Conduits, pre-cast, cradled	2 days
Conduits, pre-cast, bedded	1 day
Cantilever outlet bents (backfilled both sides simultaneously)	3 days

7. REWORKING OR REMOVAL AND REPLACEMENT OF DEFECTIVE EARTHFILL

Earthfill placed at densities lower than the specified minimum density or at moisture contents outside the specified acceptable range of moisture content or otherwise not conforming to the requirements of the specifications shall be reworked to meet the requirements or removed and replaced by acceptable earthfill. The replacement earthfill and the foundation, abutment and earthfill surfaces upon which it is placed shall conform to all requirements of this specification for foundation preparation, approval, placement, moisture control and compaction.

8. TESTING

During the course of the work, the Engineer will perform such quality assurance tests as are required to identify materials; determine compaction characteristics; determine moisture content; and determine density of earthfill in-place. Tests performed by the Engineer will be used to verify that the earthfills conform to contract requirements of the specifications and not as a replacement for the Contractor's quality control program.

Densities of earthfill requiring Class A compaction will be determined in accordance with ASTM D 1556, D 2167, D 2922 or D 2937 except that the volume and moist weight of included rock particles larger than those used in the compaction test method specified for the type of fill will be determined and deducted from the volume and moist weight of the total sample prior to computation of density or if using the nuclear gauge, added to the specified density to bring it to the measure of equivalent composition for comparison. The density so computed will be used to determine the percent compaction of the earthfill matrix. Unless otherwise specified, moisture content will be determined by one of the following methods: ASTM D 2216, D 3017, D 4643, D 4944, or D 4959.

9. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the volume of each type and compaction class of earthfill and earth backfill within the specified zone boundaries and pay limits will be measured and computed to the nearest cubic yard by the method of average cross-sectional end areas or by methods outlined in Section 10 of this specification. Unless otherwise specified in Section 10, no deduction in volume will be made for embedded items such as, but

not limited to: conduits, inlet structures, outlet structures, embankment drains, sand diaphragm and outlet, and their appurtenances.

The pay limits shall be as defined below, with the further provision that earthfill required to fill voids resulting from over-excavation of the foundation, outside the specified lines and grades, will be included in the measurement for payment only where such over-excavation is directed by the Engineer to remove unsuitable material and where the unsuitable condition is not a result of the Contractor's improper construction operations as determined by the Engineer. Earthfill beyond the specified lines and grades to backfill excavation required for compliance with OSHA requirements will be considered subsidiary to the earthfill bid item(s).

Method 1 The pay limits shall be as designated on the drawings

Method 2 The pay limits shall be the measured surface of the foundation when approved for placement of the earthfill and the specified neat lines of the earthfill surface.

Method 3 The pay limits shall be the measured surface of the foundation when approved for placement of the earthfill and the measured surface of the completed earthfill.

Method 4 The pay limits shall be the specified pay limits for excavation and the specified neat lines of the earthfill surface.

Method 5 The pay limits shall be the specified pay limits for excavation and the measured surface of the completed earthfill.

Method 6 Payment for each type and compaction class of earthfill and earth backfill will be made at the contract unit price for that type and compaction class of earthfill. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the performance of the work.

Method 7 Payment for each type and compaction class of earthfill and earth backfill will be made at the contract unit price for that type and compaction class of earthfill. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the performance of the work, except furnishing, transporting, and applying water to the foundation and earthfill materials. Water applied to the foundation and earthfill materials will be measured and payment will be made as specified in Construction Specification 10.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 10 of this specification.

INSTRUCTIONS FOR USE OF CONSTRUCTION SPECIFICATION 24

DRAINFILL

1. APPLICABILITY

Construction Specification 24 is applicable to the placing of drainfill in all types of structure drainage systems such as:

- a. Drainage systems installed beneath concrete structures, lining or pavements;
- b. Wall drains for concrete structures;
- c. Embankment drainage systems;
- d. Interceptor drains installed adjacent to structures;
- e. Foundation drains.

2. MATERIAL SPECIFICATIONS

Material Specification [521](#) is complementary to Construction Specification 24.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. The location, extent, and dimensions of each drain.
- b. The grading limits of each type of drainfill.
- c. The allowable percentage of material (non-plastic) passing No. 200 Sieve.
- d. The source of drainfill materials, when applicable.
- e. Specifications for control of moisture if required. If water is to be added and is to be included in a separate pay item for water, add the statement in Section 9: "Water applied to the drainfill material will be measured and payment will be made as specified in Construction Specification [10, Water for Construction](#)".
- f. Class of compaction. Also specify the weight and number of passes of the compacting equipment required, if more than the minimum amounts specified in Section 6. (Class A provides for control of compaction by minimum density requirements determined by ASTM D698 for fine grain material. Classes I, II and III specify the method of compaction. Relative density tests during construction usually should be made in connection with the method specifications to evaluate the compaction being accomplished and be compared to test data outlined in ASTM D4254. Class I is intended for use where highest densities are required, Class II is intermediate, and Class III may be used for wall drains in uncompacted backfill or for other applications where strength is not important.

Specify in Section 9 the ASTM D698 procedure to be modified to consist of one point value for maximum dry density determined on an oven-dried representative

sample of the drainfill material. The procedure shall be repeated three times to obtain an average value for the one point.

When specifying Class II compaction, note in Section 9 the method (a, b, or c) that applies. Note also if one or more of the methods are to be excluded.

- g. Special requirements for placing drainfill adjacent to new concrete as set forth in Section 4.

4. DISCUSSION OF METHODS

a. Section 2, Materials

- (1) Method 1 is intended for use in specifications for drainage systems in areas where commercial aggregate is available in sufficient quantity to meet project needs.
- (2) Method 2 is intended to be used in specifications for drainage systems in areas where the Contractor will need to process the material from designated sources.

b. Section 8, Measurement and Payment.

- (1) Method 1 is intended for use when for use when quantities are determined from volume measurements and payment is made to the nearest cubic yard.
- (2) Method 2 is intended for use when quantities are determined by weight and payment is by the ton.

When specifications are prepared using electronic procedures and all but one method are deleted for use in a contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

24. DRAINFILL

1. SCOPE

The work shall consist of furnishing, placing and compacting drainfill required in the construction of structure drainage systems.

2. MATERIALS

Method 1 Drainfill materials shall conform to the requirements of Material Specification 521. A minimum of thirty (30) days prior to delivery of materials to the site, the Contractor shall inform the Engineer in writing of the source(s) from which drainfill material will be obtained. The Contractor shall provide the Engineer free access to the source(s) for the purpose of obtaining samples for testing.

Method 2 Drainfill materials shall be sand, gravel, or crushed stone or mixtures thereof obtained from the specified sources. They shall be selected as necessary to avoid the inclusion of organic matter, clay balls, excessive fine particles or other substances that would interfere with their free-draining properties.

3. BASE PREPARATION

Foundation surfaces and trenches shall be clean and free of organic matter, loose soil, foreign substance, and standing water when the drainfill is placed. Earth surfaces upon or against which drainfill will be placed shall not be scarified.

4. PLACEMENT

Drainfill shall not be placed until the subgrade has been inspected and approved by the Engineer. Drainfill shall not be placed over or around pipe or drain tile until the installation of the pipe or tile has been inspected and approved.

Drainfill shall be placed uniformly in layers not to exceed twelve (12) inches thick prior to compaction. When compaction is accomplished by manually controlled equipment, the layers shall not exceed eight (8) inches thick. The material shall be placed in a manner to avoid segregation of particle sizes and to insure the continuity and integrity of all zones. No foreign materials shall be allowed to become intermixed with or otherwise contaminate the drainfill.

Traffic shall not be permitted to cross over drains at random. Equipment crossovers shall be maintained, and the number and location of such crossovers shall be established and approved prior to the beginning of drainfill placement. Each crossover shall be cleaned of all contaminating materials and shall be inspected and approved by the Engineer prior to the placement of additional drainfill material.

Any damage to the foundation surface or the trench sides or bottom occurring during placement of drainfill shall be repaired before drainfill placement is continued.

The upper surface of drainfill constructed concurrently with adjacent zones of earthfill shall be maintained at a minimum elevation of one (1) foot above the upper surface of adjacent earthfill.

Drainfill over and/or around pipe or drain tile shall be placed in a manner to avoid any displacement in line or grade of the pipe or tile.

Drainfill shall not be placed adjacent to structures until the concrete has attained the strength specified in Section 9 of this specification. The strength shall be determined by compression testing of concrete test cylinders cast and field cured at the project site in accordance with ASTM Method C 31 for determining when a structure may be placed into service.

When the required strength of the concrete is not specified as described above, placement of drainfill adjacent to concrete structures shall not be commenced until the following item intervals have elapsed following placement of the concrete:

<u>Structure Type</u>	<u>Time Interval</u>
Vertical or near-vertical wall with earth loading on one side only (Retaining walls and counterforts)	14 days
Walls backfilled on both sides simultaneously	7 days
Conduits and galleries, cast-in-place (with inside forms in place) (inside forms removed)	7 days 14 days
Conduits, precast, cradled	2 days
Conduits, precast, bedded	1 day
Cantilever outlet bents backfilled on both sides simultaneously	3 days

5. CONTROL OF MOISTURE

The moisture content of drainfill materials shall be controlled as specified in Section 9 of this specification. When the addition of water is required, it shall be applied in a manner to avoid excessive wetting to adjacent earthfill. Except as specified in Section 9 of this specification, control of moisture content will not be required.

6. COMPACTION

Drainfill shall be compacted according to the following requirements for the class of compaction specified:

Class A Compaction. For drainfill materials with more than 70% passing the 3/4 inch sieve, each layer of drainfill shall be compacted to a minimum dry density of not less than the density specified in Section 9 of this specification as determined by ASTM D698.

For drainfill materials with 70% or less passing the 3/4 inch sieve, each layer of drainfill shall be compacted to a relative density of not less than 70% as determined by ASTM D4254.

Class I Compaction. Each layer of drainfill shall be compacted by a minimum of two (2) passes, over the entire surface, with a steel-drum vibrating roller weighing a minimum of five (5) tons and exerting a vertical vibrating force of not less than 20,000 pounds at a minimum frequency of 1200 times per minute, or by an approved equivalent method.

Class II Compaction. Each layer of drainfill shall be compacted by one of the following methods or by an approved equivalent method (A pass is defined as at least one complete coverage of the roller wheel, tire or drum over the entire surface for each layer):

- a. A minimum of two (2) passes over the entire surface with a pneumatic-tired roller exerting a minimum pressure of 75 pounds per square inch (psi).
- b. A minimum of four (4) passes over the entire surface with the track of a crawler-type tractor weighing a minimum of 20 tons.
- c. Controlled movement of the hauling equipment so that the entire surface is traversed by not less than one tread track of the loaded hauling equipment.

Class III Compaction. No compaction will be required beyond that resulting from the placing and spreading operations.

When compaction other than Class III compaction is specified, materials placed in trenches or other locations inaccessible to heavy equipment shall be compacted by means of manually controlled pneumatic or vibrating tampers as specified in Section 9 of this specification.

Heavy equipment shall not be operated with 2 feet of any structure. Vibrating rollers shall not be operated within 5 feet of any structure. Compaction by means of drop weights operating from cranes, hoists, or similar equipment will not be permitted.

7. TESTING

The Contractor shall conduct such tests as necessary to verify that the drainfill materials and the in place drainfill meets the specification requirements.

The Engineer shall be granted access to perform such tests as are required to verify that the drainfill materials and the drainfill in place meets the requirements of the

specifications. These tests are not intended to provide the Contractor with information needed to assure that the materials and workmanship meet the specification requirements. These verification tests will not relieve the Contractor of the responsibility of performing required tests for that purpose.

8. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the volume of drainfill within the neat lines shown on the drawings will be measured and computed to the nearest cubic yard. Where the Engineer directs placement of drainfill outside the neat lines to replace unsuitable foundation material, the volume of such drainfill will be included. The volume included will only be to the extent that the unsuitable condition is not a result of the Contractor's improper construction operation in the determination of the Engineer.

Payment for drainfill will be made at the contract unit price for each type of drainfill, complete in place. Except as otherwise specified in Section 9 of this specification, such payment will constitute full compensation for all labor, equipment, materials, and all other items necessary and incidental to the performance of the work.

Method 2 For items of work for which specific unit prices are established in the contract, the quantity of drainfill placed within the specified limits will be computed to the nearest 0.1 ton by actual weight. Where the Engineer directs placement of drainfill outside the neat lines to replace unsuitable foundation material, the weight of such drainfill will be included. The weight included will only be to the extent that the unsuitable condition is not a result of the Contractor's improper construction operation in the determination of the Engineer.

Payment for drainfill will be made at the contract unit price for each type of drainfill, complete in place. Except as otherwise specified in Section 9 of this specification, such payment will constitute full compensation for all labor, equipment, materials, and all other items necessary and incidental to the performance of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not included in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 9 of this specification.

ROCKFILL

1. APPLICABILITY

Construction Specification 25 is applicable to rockfill constructed of hard, durable rock with sufficiently open grading to drain freely. It does not apply to riprap slope protection nor to earthfill constructed of rocky soils or of soft rock which is expected to breakdown during compaction activities.

2. MATERIAL SPECIFICATIONS

There are no material specifications complementary to Construction Specification 25.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Complete plans and cross-sections of the required fills. Include any required construction tolerances measured from the lines and grades shown on the drawings.
- b. Zoning plans, including gradation requirements for materials in each zone.
- c. Specifications for bedding.
- d. Pay limits where applicable.
- e. The source of each type of fill.
- f. Screening or other processing requirements.
- g. Specifications for wetting during placement and compaction, if required. If water is to be added and is to be included in the separate pay item for water, add the statement: Water applied to the fill material will be measured and payment will be made as specified in Construction Specification 10, [Water for Construction](#).
- h. Class of compaction for rockfill. Specify more passes or heavier equipment if test fills or other sources of information indicate the need for it. (Class I is intended for use where the highest degree of compaction is required, Class II is intermediate, and Class III is for use where no special compaction is needed.)

When specifying Class II compaction, note in Section 10 the method (a, b, or c) that applies. Note also if one or more of the methods are to be excluded.
- i. Class of compaction for bedding. Also specify more passes or heavier equipment if more than minimum amounts specified in Section 8 may be needed.

4. DISCUSSION OF METHODS

- a. Section 5, Placement.

- (1) Method 1 is intended for use whenever the grading of materials within the fill is not a critical element of the design.
- (2) Method 2 is intended for use when the piping or cracking potential of the core zone is a critical element of the design or when the percentage of large rock is relatively low and special slope protection is desired.

CONSTRUCTION SPECIFICATION

25. ROCKFILL

1. SCOPE

The work shall consist of the construction of rockfill zones of embankments and other rockfills required by the drawings and specifications, including bedding where specified.

2. MATERIALS

Materials for rockfill and bedding shall be obtained from the specified sources, unless otherwise specified in Section 10 of this specification. The materials shall be excavated, selected, processed, and handled as necessary to conform to the specified gradation requirements.

3. FOUNDATION PREPARATION

Foundations for rockfill shall be stripped to remove vegetation and other unsuitable materials or shall be excavated as specified.

Except as otherwise specified, earth foundation surfaces shall be graded to remove surface irregularities, and test pits or other cavities shall be filled with compacted earthfill of approximately the same kind and density as the adjacent foundation material.

Rock foundation surfaces shall be cleared of all loose materials not conforming to the specifications for the rockfill.

Abutments for rockfill zones of embankments shall be prepared as specified above for foundations.

Rockfill and/or bedding shall not be placed until the foundation preparation is completed and the foundation and excavations have been inspected and approved.

4. BEDDING

When a bedding layer beneath rockfill is specified, the bedding material shall be spread uniformly on the prepared subgrade surfaces to the depth indicated. Compaction of the bedding material shall be as specified in Section 10 of this specification.

5. PLACEMENT

Method 1 The rock shall be dumped and spread into position in approximately horizontal layers not to exceed three (3) feet in thickness. It shall be placed in a manner to produce a reasonably homogeneous stable fill that contains no segregated pockets of large or small fragments or large unfilled spaces caused by bridging of the larger rock fragments.

Method 2 The rock shall be dumped and spread into position in approximately horizontal layers not to exceed three (3) feet in thickness. The rock shall be placed so that the completed fill shall be graded with the smaller rock fragments placed in the inner portion of the embankment and the larger rock fragments placed on the outer slopes. Rock shall be placed in a manner that will produce a stable fill that contains no large unfilled spaces caused by bridging of the larger fraction.

6. CONTROL OF MOISTURE

The moisture content of rockfill material shall be controlled as specified in Section 10 of this specification. When the addition of water is required, it shall be applied in a manner to avoid excessive wetting of adjacent earthfill. Except as specified in Section 10 of this specification, control of the moisture content will not be required.

The moisture content of the bedding material shall be controlled to ensure that bulking of the sand materials does not occur during compaction operations.

7. COMPACTION OF ROCKFILL

Rockfill shall be compacted as described below for the class of compaction specified or by an approved equivalent method.

Class I Compaction. Each layer of fill shall be compacted by a minimum of four (4) passes, over the entire surface, with a steel-drum vibrating roller having a minimum weight of five (5) tons and exerting a vertical vibrating force of not less than 20,000 pounds at a frequency not less than 1200 times per minute.

Class II Compaction. Each layer of fill shall be compacted by a minimum of four (4) passes over the entire surface by a track of a crawler-type tractor weighing a minimum of twenty (20) tons.

Class III Compaction. No compaction will be required beyond that resulting from the placing and spreading operations.

Heavy equipment shall not be operated within two (2) feet of any structure. Vibrating rollers shall not be operated within five (5) feet of any structure. Compaction by means of drop weights operating from a crane, hoist or similar equipment will not be permitted.

When compaction other than Class III compaction is specified, rockfill placed in trenches or other locations inaccessible to heavy equipment shall be compacted by means of manually controlled pneumatic or vibrating tampers or by equivalent methods approved by the Engineer.

8. COMPACTION OF BEDDING

Bedding shall be compacted according to the following requirements for the Class of compaction specified:

Class A Compaction. Each layer of bedding shall be compacted to a relative density of not less than 70 percent as determined by ASTM Method D 4254.

Class I Compaction. Each layer of bedding shall be compacted by a minimum of two (2) passes, over the entire surface, with a steel-drum vibrating roller weighing a minimum of five (5) tons and exerting a vertical vibrating force not less than 20,000 pounds at a frequency not less than 1200 times per minute, or an approved equivalent method.

Class II Compaction. Each layer of bedding shall be compacted by one of the following methods or by an equivalent method approved by the Engineer:

- a. A minimum of two (2) passes, over the entire surface, with pneumatic rubber-tired roller exerting a minimum pressure of 75 pounds per square inch (psi). A pass is defined as at least one passage of the roller wheel, track, tire or drum over the entire surface of the bedding layer.
- b. A minimum of four (4) passes, over the entire surface, with the track of a crawler-type tractor weighing a minimum of 20 tons.
- c. Controlled movement of the hauling equipment so that the entire surface is traversed by a minimum of one (1) tread track of the loaded equipment.

Class III Compaction. No compaction will be required beyond that resulting from the placing and spreading operations.

Heavy equipment shall not be operated within two (2) feet of any structure. Vibrating rollers shall not be operated within five (5) feet of any structure. Compaction by means of drop weights operating from a crane, hoist or similar equipment will not be permitted.

When compaction other than Class III is specified, bedding placed in trenches or other locations inaccessible to heavy equipment shall be compacted by means of manually controlled pneumatic or vibrating tampers or by equivalent methods approved by the Engineer.

9. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the volume of each type of rockfill, including bedding, with the zone boundaries and limits specified on the drawings or established by the Engineer will be measured and computed to the nearest cubic yard by the method of average cross-sectional end areas.

Payment for each type of rockfill will be made at the contract unit price for that type of fill. Except as otherwise specified in Section 10 of this specification, such payment will constitute full compensation for all labor, equipment, materials, and all

other items necessary and incidental to the performance of the work, including furnishing, placing and compacting the bedding material.

Compensation for any type of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 10 of this specification.

INSTRUCTIONS FOR USE OF CONSTRUCTION SPECIFICATION 26

TOPSOILING

1. APPLICABILITY

Construction Specification 26 is applicable to the furnishing and spreading of topsoil to selected areas of the construction site for the purpose of establishing vegetative cover to minimize soil erosion and provide aesthetic improvement.

2. MATERIAL SPECIFICATIONS

No material specifications are complementary to Construction Specification 26.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Limits of source areas for obtaining topsoil.
- b. Limits of areas on which topsoil is to be spread.
- c. Depth of topsoil layer following the spreading operation.
- d. Limits and locations for stockpile areas, if critical.
- e. Limitation of rock sizes to be included in the topsoil to be spread.
- f. Restriction of woody vegetation that may be included in the topsoil to be spread.
- g. Note in the Measurement and Payment section if the measurements will be slope measured or horizontal measurements for use in computing the area covered.
- h. Extent of compaction required for the topsoil.

4. DISCUSSION OF METHODS

The methods in Section 5, Spreading, and Section 6, Measurement and Payment, are self-explanatory.

When progress payments are anticipated, outline in Section 7 the procedures that will be implemented to determine progress amounts.

When specifications are prepared using electronic procedures and all but one method are deleted for use in a contract specification, delete from the next to last paragraph "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text. Also, delete from the last paragraph "All Payment Methods" and left justify the remaining text.

CONSTRUCTION SPECIFICATION

26. TOPSOILING

1. SCOPE

The work shall consist of furnishing and spreading topsoil to specified depths at locations shown on the drawings.

2. QUALITY OF TOPSOIL

Topsoil shall consist of friable surface soil reasonably free of grass, roots, weeds, sticks, rocks or other unsuitable materials. Additional quality requirements, if any, are contained in Section 7 of this specification.

3. FURNISHING

Method 1 Topsoil shall be salvaged from designated earth surfaces that will be disturbed by construction activities. After designated sites have been cleared and grubbed, the topsoil shall be removed from the designated areas and shall be stockpiled at locations shown on the drawings or acceptable to the Engineer. Unsuitable materials encountered during removal of topsoil shall be disposed of at locations shown on the drawings or approved by the Engineer, or otherwise hauled and disposed of at locations removed from the construction site. The Contractor is responsible for complying with all local rules and regulations and the payment of any and all fees that may result from the disposal at locations outside the construction work limits.

Method 2 Topsoil shall be furnished from an off-site source designated by the Contractor. The Engineer shall be granted access to the source for inspection and acceptance prior to delivery to the site. Test results and samples shall be provided when specified in Section 7 of this specification.

4. STOCKPILING

Stockpiles of topsoil shall not conflict with the requirements of Construction Specification 5, [Pollution Control](#), when made a part of this contract.

5. SPREADING

Method 1 Spreading shall not be conducted when the ground or topsoil is frozen, excessively wet or otherwise in a condition detrimental to uniform spreading operations. Surfaces designated to receive a topsoil application shall be lightly scarified just prior to the spreading operation.

Following the spreading operation, the topsoil surface shall be left reasonably smooth and without ruts or surface irregularities that could contribute to concentrated water flow down slope.

Method 2 Spreading shall not be performed when the ground or topsoil is frozen, excessively wet or otherwise in a condition detrimental to uniform spreading

operations. Surfaces designated to receive a topsoil application shall be lightly scarified just prior to the spreading operation. Where compacted earthfills are designated to be topsoiled, the topsoil shall be placed concurrently with the earthfill and shall be bonded to the compacted fill with the compacting equipment.

Following the spreading operation, the topsoil surface shall be left reasonably smooth and without ruts or surface irregularities that could contribute to concentrated water flow down slope.

6. MEASUREMENT AND PAYMENT

Method 1 The total surface(s) covered by topsoil will be measured and the area(s) computed to the nearest square yard. Payment for furnishing and placing topsoil will be made at the contract unit price.

Method 2 The total surface(s) covered by topsoil, except the surface area(s) of embankments, levees, dikes and other earthfills will not be included for payment, will be measured and the area(s) computed to the nearest square yard.

Payment for topsoil spread on the surfaces of embankments, levees, dikes and other earthfills will be included in the measurement and payment for that item of earthfill where topsoil application occurred.

Method 3 For items of work for which specific unit prices are established in the contract, the volume of topsoil furnished and spread will be computed to the nearest cubic yard by the method of average cross-sectional end areas from surveys of the excavated topsoil stockpile or, if not stockpiled, cross-sectional surveys of the borrow area(s). Payment for furnishing and spreading topsoil will be made at the contract unit price.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 6 of this specification.

All Payment Methods Payment will constitute full compensation for all labor, equipment, materials and all other items necessary and incidental to the completion of the work, including excavating, stockpiling, hauling, and spreading, including the wasting of unsuitable excavated material.

INSTRUCTIONS FOR USE OF CONSTRUCTION SPECIFICATION 27

DIVERSIONS AND WATERWAYS

1. APPLICABILITY

Construction Specification 27 is applicable to diversion and waterway construction where the extent of earth excavation and embankment installations is considered minor.

2. MATERIAL SPECIFICATIONS

There are no material specifications complementary to Construction Specification 27.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Location of diversions) and/or waterways) in plan view.
- b. Typical cross section(s) for diversion and/or waterway.
- c. Locations of special borrow area(s) and waste or disposal area(s), if required.
- d. Profile when structure (diversion or waterway) location is known.
- e. Clear and concise information needs to be provided in the specifications to ensure bid item integrity. This is especially true when other earthwork construction specifications are being used in the adjacent areas.

4. DISCUSSION OF METHODS

a. Section 6, Measurement and Payment

When specifications are prepared using electronic procedures and all but one method are deleted for use in a contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

27. DIVERSIONS AND WATERWAYS

1. SCOPE

The work shall consist of all excavations, shaping, grading, and earthfills required to construct the diversions and waterways as shown on the drawings or as staked in the field.

2. MATERIAL

The earth materials used in constructing the earthfill portions of the diversions and/or waterways shall be suitable materials obtained from required excavations or earth materials obtained from designated borrow areas. Material for earthfills shall be free from frozen material, brush, roots, sod, stones over six (6) inches in diameter or other objectionable material(s).

3. FOUNDATION PREPARATION

Foundations for earthfill shall be stripped to remove vegetation and other unsuitable materials or shall be excavated as specified.

Except as otherwise specified, earth foundation surfaces shall be graded to remove surface irregularities and shall be scarified parallel to the axis of the earthfill or otherwise acceptably scored and loosened to a minimum depth of two (2) inches. The moisture content of the loosened material shall be controlled as specified for the earthfill, and the surface materials of the foundation shall be compacted and bonded with the first layer of earthfill as specified for subsequent layers of earthfill.

Earth abutment surfaces shall be free of loose, uncompacted earth in excess of two inches in depth normal to the slope and shall be at such a moisture content that the earthfill can be compacted against them to produce a good bond between the earthfill and the abutments.

4. PLACEMENT

Earthfill material shall not be placed until the required foundation preparation is complete, inspected, and approved for placement. Earthfill shall not be placed upon frozen surfaces. Earthfill shall be placed in horizontal layers not exceeding nine (9) inches in thickness. The moisture content of the earthfill materials shall be sufficient to obtain firm and suitable compaction. Compaction shall be obtained by routing the hauling and spreading equipment over the earthfill material in such a manner that the entire surface of each layer will be traversed by not less than one track tread of the loaded equipment, or equivalent methods approved by the Engineer.

5. EXCAVATION

Excavation shall be to the lines and grades shown on the drawings and/or as staked in the field. All surplus and/or unsuitable material will be designated as waste and

shall be disposed of at locations shown on the drawings or at a location approved by the Engineer.

6. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the length of waterway and/or diversion will be determined to the nearest linear foot by measurement along the centerline of the waterway and/or diversion. Such payment will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to the performance of the work.

Method 2 For items of work for which specific lump sum prices are established in the contract, the quantity of waterway and/or diversion will not be measured for payment. Payment for waterways and/or diversions will be made at the contract lump sum price and shall constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to the performance of the work.

Method 3 The pay limits for excavation and earthfill shall be as designated on the drawings. Payment for excavation and earthfill to construct the waterways and/or diversions will be separately measured and computed to the nearest cubic yard by the method of average cross-sectional end areas. Payment for excavation and/or earthfill will be made at the unit price bid and shall constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to the performance of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

INSTRUCTIONS FOR USE OF CONSTRUCTION SPECIFICATION 28

LIME-TREATED EARTHFILL

1. APPLICABILITY

Construction Specification 28 is applicable to the treatment of clayey soils for the construction or repair of earthfills for dams, dikes, and similar engineering works using hydrated lime.

2. MATERIAL SPECIFICATIONS

Material Specification [593](#) is complementary to Construction Specification 28.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Work limits of area to be treated and processing area.
- b. Treatment procedures or sequence of operations if different or in addition to those in this basic specification.
- c. Type of lime to be used.
- d. Rate of application of lime. This is expressed as a percentage of dry weight of the soil.
- e. Source of soil to be treated.
- f. Location and thickness of zone to be treated.
- g. Maximum layer thickness before compaction. (Refer to Instruction for use of Construction Specification [23](#).)
- h. Maximum layer thickness before compaction for earth backfill compacted by manually directed power tampers. (Same Reference as (g.) above.)
- i. Compaction Class.
- j. Construction Specification [5](#), [Pollution Control](#), shall address the following: weather for spreading, location of work area, storage of materials, disposal of waste materials and containers.
- k. Special equipment needed.
- l. Construction Specification [23](#), [Earthfill](#), needs to be included.
- m. Measurement and payment for lime by the ton as a separate bid item.

4. DISCUSSION OF METHODS

a. Section 6, Lime Application

- (1) Method 1 is intended for dry application of lime.
- (2) Method 2 is intended for the application of lime as a water slurry mix.

b. Section 11, Measurement and Payment

- (1) Method 1 is intended for cases where pay limits can best be shown on the drawings.
- (2) Method 2 through Method 5 are self-explanatory.
- (3) Method 6 or 7 must be used with any or all Methods 1 through 5.
 - (a) Method 6 is intended for use when no separate payment is to be made for water.
 - (b) Method 7 is intended for use with Construction Specification [10, Water for Construction](#), when the Contractor is to be paid under a separate item for the water.

When specifications are prepared using electronic procedures and all but one method are deleted from use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

28. LIME-TREATED EARTHFILL

1. SCOPE

The work shall consist of furnishing lime, mixing lime with soil, curing and placing the lime treated soil.

2. MATERIALS

Soil material shall be obtained from the designated area(s). The selection of the material shall be as outlined in Section 12 of this specification. Soil material shall contain no frozen soil, sod, brush, roots, or other perishable materials. Rock particles larger than the maximum size specified for each type of earthfill shall be removed prior to treatment operations.

Water shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

Hydrated lime shall meet the requirements of Material Specification [593](#).

3. EQUIPMENT

All equipment necessary for the proper construction of the work shall be on the work site prior to the start of lime treatment operations. Unless otherwise specified, mixing equipment shall include the combined use of heavy disk plows and high speed rotary mixers. Disks shall be at least 24-inches in diameter and rotary mixers shall be capable of mixing lifts at least nine (9) inches thick traveling at a minimum speed of four (4) m.p.h. and covering a minimum width of six (6) feet.

All equipment used to convey or transport lime to or on the work-site shall be covered or enclosed so as to avoid lime dust problems.

4. SITE PREPARATION

The Contractor shall prepare, mix, and cure the lime treated earth material in the area(s) shown on the drawings.

Prior to start of lime treatment operations, the processing area used for mixing and curing shall be stripped of topsoil and graded to a relatively smooth and uniform surface.

After the area is no longer required for mixing and curing, it shall be re-graded as required, disked to a depth of four (4) inches, and covered uniformly with the removed topsoil.

5. LIME PROPORTIONING

The amount of lime shall be as specified in Section 12 of this specification. Adjustment in the amount of lime may be required as the work progresses and shall be adjusted as requested and approved by the Engineer.

6. LIME APPLICATION

Lime shall not be applied when the temperature is below 40° F or is expected to drop below 40° F within 24-hours. Lime will not be applied during high wind conditions that hinder effective application or causes pollution by drift off site.

Method 1 Hydrated lime shall be uniformly applied in dry form on the soil surface at a rate that will attain the specified proportioning and lightly sprinkled with water to minimize dusting and blowing.

Method 2 Hydrated lime shall be mixed with water to form a slurry prior to application to the soil surface. The slurry shall consist of a mixture of one ton of lime to a minimum volume of 500 gallons of water. Agitation shall be accomplished through integral paddles, re-circulating pumps or a combination of these devices. The lime and water shall be maintained as a uniform mixture until application to the soil surface.

The slurry shall be uniformly applied to the soil surface at a rate that will attain the specified proportioning. The slurry shall be applied under pressure through spray bars.

7. MIXING

The soil, lime, and water shall be mixed by disking and use of rotary mixers until a uniform mixture is obtained. During initial mixing with dry lime, a minimum of two cycles of water application followed by mixing with disks and high speed rotary mixers shall be accomplished.

The depth of the lift for treatment shall be no greater than that depth that can be effectively mixed by the equipment. The cycle of watering and mixing shall continue until the soil, lime and water mixture has been thoroughly processed to a uniform mixture without lumps of soil and/or lime. When mixing is complete, the water content of the mix shall not be less than standard optimum water for the soil-lime mixture, when tested in accordance with ASTM D 698, Procedure A.

After mixing, the lime treated layer shall be sealed to minimize evaporation loss, lime carbonation, and excessive wetting from rainfall or other sources. Sealing shall be accomplished by lightly compacting the surface of the treated layer with a pneumatic tire or smooth wheel roller or by other methods approved by the Engineer.

The mixing of lime, soil and water shall be completed within the same workday it is started.

8. PLACEMENT

Lime-treated earthfill shall not be placed until the required excavation and foundation preparation have been completed and the foundation has been inspected and approved by the Engineer. Earthfill shall not be placed upon a frozen surface, nor shall snow, ice, or frozen material be incorporated in the earthfill.

Immediately before placement of lime-soil mixture, the subgrade shall be scarified and moistened to create a water content that shall allow suitable bonding of lime-soil mixture. Surface free water shall not be present during placement operations.

Lime-treated earthfill shall be placed in approximately horizontal layers. The thickness of each layer before compaction shall not exceed the maximum thickness specified in Section 12 or shown on the drawings. Materials placed by dumping in piles or windrows shall be spread uniformly to not more than the specified thickness before being compacted.

During placement and compaction of the lime-soil mixture, the moisture content of the materials being placed shall be maintained within the specified range.

The water content of the mixture at the time of placement and compaction shall not be less than standard optimum moisture when tested in accordance with ASTM D 698, Procedure A.

9. COMPACTION

Lime-treated earthfill shall be compacted in accordance with Section 6 of Construction Specification [23, Earthfill](#), for the specified class.

10. CURING

The lime and soil mixture shall be cured a minimum of 72-hours unless otherwise specified in Section 12. The water content of the mixture shall be maintained at or above standard optimum water content during the curing period by sprinkling with water, re-mixing, and resealing.

After the required curing time has occurred and prior to use as earthfill, the treated material shall be thoroughly re-mixed. Final mixing shall be accomplished in a manner that all non-slaked lime particles retained on the No. 4 sieve are removed, the remaining material shall have all clods reduced in size to meet the following gradation:

Minimum passing 2-inch sieve = 100 percent

Minimum passing No. 4 sieve = 60 percent

11. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract bid schedule:

- (1) The quantity of lime used for lime treatment will be measured to the nearest ton by actual weight, and
- (2) The volume of lime stabilized earthfill within the specified zone boundaries and pay limits shown on the drawings will be measured and computed to the nearest cubic yard by the method of average cross-sectional end areas. Unless otherwise specified, no deduction in volume will be made for embedded conduits and appurtenances.

The pay limits for lime-treated earthfill shall be as defined below, with the further provision that lime stabilized earthfill required to fill voids resulting from over-excavation of the foundation and/or placed outside the specified lines and grades will be included in the measurement for payment only where such placement is approved by the Engineer. Such approval will only be granted for the purpose of filling over-excavation that results from the removal of unsuitable material and where placement outside the lines and grades were not a result of Contractor's improper construction operations as determined by the Engineer.

Method 1 The pay limits shall be as designated on the drawings.

Method 2 The pay limits shall be the measured surface of the foundation when approved for placement of lime treated earthfill and the specified neat lines of the earthfill surface.

Method 3 The pay limits shall be the measured surface of the foundation when approved for placement of lime treated earthfill and measured surface of the completed earthfill.

Method 4 The pay limits shall be the specified pay limits for excavation and specified neat lines of the earthfill surface.

Method 5 The pay limits shall be the specified pay limits for excavation and measured surface of the completed earthfill.

Method 6 Payment for the lime treated earthfill will be made at the contract unit price for that type of earthfill. Such payment will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to the performance of the work, including stripping topsoil, grading, and spreading topsoil over the processing area following completion of lime treated earthfill activities. No separate payment will be made for water applied to the foundation and used for preparing hydrated lime.

Method 7 Payment for lime treated earthfill will be made at the contract unit price for that type of earthfill. Such payment will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to the performance of the work, including stripping topsoil, grading, and spreading topsoil over the processing area following completion of lime treated earthfill activities. It does not include furnishing, transporting, and applying water to the foundation and earthfill materials. Water applied to the foundation and earthfill materials will be measured and payment made as specified in Construction Specification 10, Water for Construction.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 12 of this specification.

SOIL-CEMENT

1. APPLICABILITY

Construction Specification 29 is applicable to all soil-cement fills.

2. MATERIAL SPECIFICATIONS

The following specifications are complementary to Construction Specification 29:

- a. [Portland Cement](#). Material Specification [531](#)
- b. [Curing Compound \(For Concrete\)](#). Material Specification [534](#)

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Complete plans and cross-sections of the required soil-cement fills.
- b. Borrow areas or other sources of materials. Any grading and shaping requirements of borrow areas.
- c. Soil-cement soil gradation and Atterberg limits.
- d. Cement content of the soil-cement mixture.
- e. The cement type and types of admixtures.
- f. The required pozzolan content.
- g. Allowable range of moisture content of the soil-cement mixture at the time of compaction.
- h. Compaction requirement for subgrade and soil-cement.
- i. The maximum compacted layer thickness.
- j. Pay limits where applicable.
- k. The method of curing process required. If a concrete curing compound is designated, specify "type" of curing compound required.
- l. Minimum capacity of the mixing plant, if applicable.
- m. Any special instructions about the use of soil materials that do not have similar gradation and Atterberg limits to those tested.
- n. All surfaces that are to be bonding surfaces need to be identified: i.e., soil-cement surfaces that are to receive an overlying layer of soil-cement or concrete that requires bonding of the two materials.

- o. The minimum strength of soil-cement determined by the design investigation using available borrow materials and the cement content specified.
- p. If required, specify in Section 15 the durability requirements as outlined in ASTM D 559 and D 560 to evaluate alternative design mixes as provided in Section 2(b).

4. DISCUSSION OF METHODS

- a. Methods in Section 5, Design of Soil-Cement Mixture, and Section 6, Mixing, are self-explanatory.
- b. Section 12, Protecting and Curing
 - (1) Method 1 is an environmentally sound, economical curing process that will provide either a clear, or an opaque white, moisture barrier.
 - (2) Method 2 will provide the best environment for curing, but is likely to be the most expensive. It is suggested for small areas or to reduce shrinkage cracking to the least extent.
 - (3) Method 3 is adaptable for smaller areas and offers the economy to reuse sheeting. Windy conditions may disrupt this curing method.
- c. Section 14, Measurement and Payment
 - (1) Method 1 is for use when cement is included in the unit price for soil-cement.
 - (2) Method 2 is for use when the cement is paid for as a separate unit priced item apart from the soil-cement.
- d. Sections 5, 6, 12, and 14

When specifications are prepared using electronic procedures and all but one method are deleted for use in a contract specification, delete the following and left justify the remaining text:

Section 5 and Section 12, "All Methods"

Section 6, "All Methods The following provisions apply to all methods of mixing."

Section 14, "All Methods The following provisions apply to all methods of measurement and payment."

CONSTRUCTION SPECIFICATION

29. SOIL CEMENT

1. SCOPE

The work shall consist of the furnishing, placing, compacting, and curing a mixture of soil material, portland cement, and water. The mixture shall be uniformly mixed, blended, compacted, finished, and cured as specified. It shall conform to the lines, grades, thicknesses, and cross section(s) shown on the drawings.

2. MATERIALS

Soil materials shall be obtained from the required excavations or designated borrow locations and shall meet the requirements outlined in this Section.

Deleterious materials such as sod, brush, or roots shall be separated from soil materials during the selection, blending, and routing operations. Rock particles larger than two (2) inches in any dimension shall be removed prior to mixing.

Soil materials, cement content, and moisture content other than those specified in Section 15 may be used as approved by the Engineer. Proposed alternatives must meet one of the following requirements to be considered:

- (a) If the soil material to be used has gradation and Atterberg limits similar to the soils specified, the same cement content and water content shall be used. The Contractor shall provide gradation and Atterberg limit test data from a qualified soil testing laboratory verifying gradation and Atterberg limits.
- (b) If the soil materials do not have gradation and Atterberg limits similar to the soils specified, the Contractor shall provide soil-cement durability tests, moisture-density relations data, Atterberg limits, and gradation tests from a qualified soil testing laboratory. The soil-cement mix ratio and water content shall also be provided by the laboratory. As a minimum, the following durability tests shall be provided: ASTM D 559 and ASTM D 560. The moisture-density relations are to be in accordance with ASTM D 558. The tests must indicate a soil-cement of a quality equal to or exceeding the quality specified.

Portland cement shall conform to the requirements of Material Specification 531 for the specified type. Mixing of different brands or types of cement will not be permitted.

Portland cement shall be furnished in bags, barrels, or bulk. Bagged cement that is stored at the job site shall be used in the same order as the deliveries arrived on the site. Each shipment of bagged cement shall be handled and stored so that it may be readily distinguished from other shipments. Emptied cement bags shall be disposed of by the Contractor at off-site locations selected by the Contractor. Burning of emptied cement bags is permitted if identified on the burning permit as an allowable activity.

Water used in mixing or curing soil-cement shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances, and shall meet the requirements for water as specified in ASTM C 94.

Pozzolanic Materials, when used, shall comply with the requirements of ASTM C 618 Class C or F, Specifications for Fly Ash, and Raw or Calcined Natural Pozzolan, except the loss on ignition shall not exceed 3.0 percent.

Curing compounds, when used, shall conform to the requirements of Material Specification 534 for the type of curing compound specified. Application of the curing compound shall be in accordance with Section 12 of this specification and the manufacturer's recommendations.

3. OPERATIONS OF PITS OR STOCKPILES OF SOIL MATERIALS

All work required in the opening and operation of borrow areas or stockpiles shall be performed by the Contractor. The borrow areas or stockpiles shall be opened in such a manner as to expose a near vertical face of the soil material for a suitable working depth. Exposed cut faces shall not exceed five feet in height without benching back if it poses a threat to construction personnel and/or others. The Contractor shall conform to OSHA Construction Industry Standards (29 CFR Part 1926) Subpart P, Excavations, Trenching, and Shoring during all excavation operations.

Material shall be excavated in successive vertical cuts extending across the pit or stockpile. When approved by the Engineer, successive horizontal cuts on a horizontal oriented working face may be permitted in homogeneous soils. All pockets or strata of unsuitable materials not meeting the quality requirements specified in Section 2, Material, shall be wasted. The method of operating the pit or stockpile and the blending of materials shall be adjusted as necessary to obtain material conforming to the specifications. Upon completion of the work, the pits shall be graded and dressed to minimize erosion and to provide free drainage.

4. FOUNDATION PREPARATION

Before soil-cement processing commences, the subgrade placement area shall be graded, shaped, and compacted in conformance with the lines and grades shown on the drawings. The subgrade shall firmly support the construction equipment. Immediately prior to the placement of the soil-cement, the compacted subgrade surface shall be moistened to approximately the same moisture content as specified for the soil-cement, and shall be kept moist until the soil-cement is placed.

5. DESIGN OF SOIL-CEMENT MIXTURE

General. The materials and proportions of the soil-cement mixture shall constitute the "job-mix". After a job-mix has been approved, the source, character, or grading of the soil and the type, brand, or quantity of cement or pozzolanic material shall not be changed without prior approval of the Engineer. A change in materials or

proportions requires the establishment of a new job-mix supported by evidence, as required for the initial job-mix, that the proposed new materials and mix proportions will produce soil-cement of the strength specified.

The use of calcium chloride or other accelerants or antifreeze compounds will not be permitted unless approved by the Engineer.

Method 1. The Contractor shall determine the mix proportions and submit the job-mix design, along with the supporting test results to the Engineer for approval prior to incorporating any of the material into the work. The brand of cement and the location of the soil material source shall be included with the job-mix design data. The mix design shall be such that the soil-cement meets or exceeds the minimum compressive strength specified. A new mix design shall be submitted for approval any time the Contractor requests a change in materials or a proportioning of materials from that given in the approved mix design. In no case will the Engineer's review and approval of a mix design relieve the Contractor of responsibility to provide soil-cement meeting the contract specifications.

A maximum of fifteen (15) percent of the total weight of cement may be replaced with fly ash at a rate of 1.2 pounds of fly ash per pound of cement replaced.

Method 2. The Contractor shall furnish the soil, fly ash, cement, and moisture content as specified in Section 15 of this specification. During the course of the work, the Engineer may adjust the job-mix proportions as needed to achieve the specified compressive strength.

All Methods. The percent of cement to be used in the mix will be determined by dividing the weight of cement by the oven dry weight of the soil material.

6. MIXING

The mixing plant shall produce a mixture of soil, cement, and water that is uniform in color and at the required moisture and cement content throughout. The plant shall be equipped with measurement devices that will proportion the mix in the specified quantities. Prior to use, all measurement devices shall be calibrated and certified by a qualified technician approved by the Engineer. The actual quantities of the mix shall not vary more than two (2) percent from the approved job-mix quantities, unless otherwise approved. The moisture content shall be the percentage of moisture in the mixture at the time of compaction.

The Engineer shall have full and free access to the mixing plant at all times for inspection of the plant's operation and for sampling the soil-cement mixture and its components.

Method 1. Mixing of the soil, cement (including fly ash), and water shall be accomplished in a stationary mixing plant. The plant may be either a batch type or a continuous flow type design. The plant may use either weight or volume proportioning. The scale or metering devices shall be sensitive to one (1) percent of

the maximum load that may be required or imposed. The mixer shall be a pugmill, revolving-blade, or rotary-drum system.

Facilities for efficiently storing, handling, and proportioning unmixed materials shall be provided at the plant.

Method 2. Mixing of the soil, cement (including fly ash), and water shall be accomplished in a truck mixer. The mixer shall meet the requirements for truck mixers contained in ASTM C 94.

Method 3. Mixing of the soil-cement shall be accomplished in place. Mixing of the soil, cement (including fly ash), and water shall be accomplished by a single or multiple transverse shaft mixer, a traveling pugmill, or similar equipment approved by the Engineer. A motor grader or similar equipment will not be acceptable in lieu of the mixing equipment specified.

Soil material to be mixed in place shall be formed into windrows or divided into known grid areas. If windrows are used, they shall be prepared to a known size with a sizing device. The tops of the windrows shall be flattened or slightly trenched to receive the cement.

The cement quantity necessary to meet the specified cement to soil ratio shall be distributed uniformly on the windrowed soil or over the prepared grid areas. After spreading, cement that has been displaced, or is found to be less than that specified, shall be properly adjusted or replaced prior to starting mixing operations.

The mixing operation shall be accomplished in such a manner that there are no unmixed seams of soil between layers. Excessive streaking of the soil cement below the layer being mixed will not be allowed.

All Methods. The following provisions apply to all methods of mixing. The mixing time shall be controlled so that all ingredients shall be mixed as long as necessary to ensure a thorough, uniform, and homogeneous mixture of soil, cement, pozzolanic material (if used), and water. Mixing time shall be adjusted based on tests and field determinations. The mixing time shall be considered as the interval between the time the cement contacts the soil and water and the time the mixture leaves the mixing unit or when the mixer speed is reduced to the agitating speed. The soil and cement shall be mixed sufficiently to prevent cement balls from forming before the water is added. The water may be applied through the mixing machine or separately by approved pressure distributing equipment.

Soils containing plastic silt or clay lumps larger than one (1) inch shall be pulverized or screened out of the raw soil prior to mixing.

7. TRANSPORTING

The soil-cement mixture shall be transported from the mixing plant to the site of placement in vehicles having tight, clean, and smooth beds or mixer trucks. Haul time shall not exceed thirty (30) minutes.

The Contractor shall protect the soil-cement mixture if transported during unfavorable weather. Any material excessively wet by precipitation will be subject to rejection.

Equipment shall not be operated on a finished and compacted layer of soil-cement, except where specifically permitted. Any damage resulting to the finished surfaces of the soil-cement from such an operation shall be repaired by the Contractor at no cost to the owner.

Earth ramps crossing over completed soil-cement must have a minimum compacted thickness of two (2) feet. Where ramps are constructed over soil-cement that is not to finished grade, all foreign materials and the uppermost one (1) inch of the top layer of soil-cement must be removed prior to the continuation of the soil-cement installation.

8. PLACEMENT

Soil-cement shall not be placed until the required excavations and preparation of the foundation are completed and the foundation has been inspected and approved by the Engineer.

Equipment for spreading the soil-cement mixture shall be suitable for the purpose and shall be operated in such a manner as to produce a reasonably smooth, uniform surface. The equipment shall be controllable so as to produce uniform layers not more than the specified maximum thickness. The layer of soil-cement, or each successive lift when layering is required, shall be spread and compacted as soon as possible after the preceding layer is completed and approved. Soil-cement shall be placed in horizontal layers or layers conforming to the plane of the subgrade.

When the time between completion of compaction on a layer and start of placement of the next layer is greater than two (2) hours, the Contractor shall scarify the surface to a depth of one (1) inch at a maximum spacing of twelve (12) inches unless specified otherwise in Section 15 or approved by the Engineer. The Contractor shall clean off the scarified surface thoroughly by power brooming or other approved methods prior to proceeding. The broomed surface shall then be thoroughly moistened over its entire surface before the next layer of soil-cement is placed.

Soil-cement placement operations may commence when the air temperature is not less 40° F and a rising temperature is expected for the work period. Soil-cement shall not be placed on a frozen foundation, or if the soil to be processed is frozen, or if weather conditions are such that the material being processed cannot be

completely compacted and protected before the onset of damaging weather (such as overnight lows below 40° F, cold fronts, rainstorms, etc.). The use of accelerators or antifreeze compounds will not be allowed, unless otherwise specified. The temperature of fresh soil-cement shall not be allowed to drop below 32° F for a period of seven (7) days after placement. If temperatures are expected to be below 45° F, the Contractor's method for protection shall be approved by the Engineer prior to placement of any soil-cement.

When the mean air temperature does not exceed 90° F, the moisture content at the time of compaction shall be within the range specified. When the mean air temperature exceeds 90° F. or conditions promoting rapid drying of the soil-cement mixture exist, the moisture content of the mixture may be increased up to two (2) percentage points above optimum, unless otherwise specified. Any increase in moisture content shall be less than the quantity which will cause the soil-cement to become unstable during the compaction and finishing operations.

9. COMPACTION

- a. Equipment - Compaction equipment used shall be capable of uniformly compacting the soil-cement mixture to the specified density. Compaction equipment shall not have tamping feet or projections that penetrate to previously compacted layers. Compaction with only the wheels of the hauling equipment shall not be an acceptable method of compaction.
- b. Compaction Requirements - Soil-cement shall be uniformly compacted to a density not less than the minimum density specified. Optimum moisture and maximum density shall be determined by ASTM D 558. Natural Resources Conservation Service Test No. S-6 (USBR Test E-25), Rapid Compaction Control Method as referenced in NEH-19, may be used as equivalent to ASTM D 558.

Compaction shall start as soon as possible after spreading. Elapsed time between the addition of water to the soil-cement mixture and the start of compaction shall not exceed sixty (60) minutes. The elapsed time between addition of water to the soil-cement mixture and completion of compaction shall not exceed ninety (90) minutes.

- c. Other Requirements - If the surface of a layer of soil-cement has been rutted or compacted unduly by hauling or other equipment, the Contractor shall scarify and re-compact such surfaces within two (2) hours of the addition of water to the cement. When required to maintain uniformity of the layer surface, blading in connection with compaction operations shall be employed. If blading is required, raw unmixed soil shall not be bladed onto the mixed soil-cement. When greater than two (2) hours has occurred from the time water was added to the cement, the damaged soil-cement shall be removed in a manner and to the extent approved by the Engineer.

10. CONSTRUCTION JOINTS

At the end of each workday, or when the adjacent placing operation is terminated for a period longer than two (2) hours, a vertical construction joint shall be made along all unfinished edges of the thoroughly compacted soil-cement. Just before placing operations are resumed, the construction joint shall be shaved to remove all dry soil-cement and all curing compound from the joint face.

11. REMOVAL AND REPLACEMENT

The soil-cement installation shall be considered defective and shall be removed and replaced in accordance with these specifications, when any one of the following conditions occur:

- a. Compaction operations are interrupted for any reason prior to the completion of compaction and the soil-cement mixture is left undisturbed for more than thirty (30) minutes.
- b. The soil-cement mixture becomes excessively wet prior to completion of compaction, so that the moisture content exceeds the specified limits.
- c. The compacted soil-cement does not meet the density and moisture requirements; except that when the moisture is lower than required, the soil-cement mixture may be reworked, thoroughly mixed, and compacted within the time limits stated in Section 9 (b), previously.
- d. The finished surface is rough or below grade such that a thin "scab" section would be required to smooth the surface or bring the surface to grade.

12. PROTECTING AND CURING

- a. Moistening Bonding Surfaces - Compacted surfaces of soil-cement that are to receive an overlay of soil-cement or concrete shall be kept moist until placement of the overlay or adjacent layer of soil-cement or concrete. The Contractor will not be required to keep such surfaces moistened for longer than seven (7) days, unless the overlay of soil-cement or concrete is not accomplished within seven (7) days as a result of the Contractor's operations.
- b. Curing Finished Exposed Surfaces

Method 1. Concrete curing compound conforming to ASTM C 309 of the type specified shall be applied at a rate of not less than one (1) gallon per 150 square feet of surface using constantly agitating, pressure spray equipment. It shall form a uniform, continuous, adherent film that shall not check, crack, or peel.

The surfaces of each section of soil-cement to be treated with curing compound shall be moistened with a light spray of water immediately after the section has been compacted. As soon as the surface film of moisture disappears, but while

the surface still has a damp appearance, the curing compound shall be applied. Special care shall be implemented to insure ample coverage with the compound at edges, corners, and around rough spots. After application of the curing compound has been completed and the coating is dry to the touch, any required repair of the soil-cement surfaces shall be performed. All curing compound or other foreign substances shall be removed from the area prior to receiving additional soil-cement to ensure a clean bonding surface. Each repair, after being finished, shall be moistened and coated with curing compound in accordance with the foregoing requirements.

Method 2. Curing moisture shall be maintained by sprinkling, flooding, fog spraying, or covering with continuously moistened canvas, cloth mats, straw, sand, or other approved material. Water and/or covering shall be applied in such a manner that the soil-cement surface is not eroded or otherwise damaged.

Method 3. Waterproof paper or plastic sheeting shall be used to completely cover the soil-cement and prevent moisture loss. Adjoining sheeting shall be overlapped at least one (1) foot and weighted or taped to prevent moisture loss at joints. Sheeting shall be anchored sufficiently to prevent displacement due to wind.

All Methods. The curing process shall be maintained for seven (7) days. Any curing compound that is removed from the surface or damaged within seven (7) days after application shall be repaired immediately. The Contractor shall have all equipment and materials required for curing at the site ready for use before starting soil-cement placement activities.

13. INSPECTION AND TESTING

During the course of the work, the Engineer will perform such quality assurance tests as are required to identify materials; determine compaction characteristics; determine moisture content; and determine density of soil-cement in-place. Tests performed by the Engineer will be used to verify that the soil-cement placed conforms to contract requirements of the specifications and not as a replacement for the Contractor's quality control program.

The Contractor shall conduct all required quality control tests in accordance with the approved Contractor Quality Control Plan to assure that work performed meet contract requirements.

14. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the quantity of soil-cement will be measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas. The quantity of soil-cement required to fill voids resulting from over-excavation outside the neat lines or pay limits will be included in the measurement for payment where such over-excavation is directed by the Engineer to remove unsuitable foundation

material(s), but only to the extent that the unsuitable condition is not a result of the Contractor's improper construction operations, as determined by the Engineer.

Method 1. Payment for soil-cement will be made at the contract unit price per cubic yard. The payment will constitute full compensation for all labor, materials, equipment, transportation, tools, and all other items necessary and incidental to completion of the work, but not including other items listed for payment elsewhere in the contract.

Method 2. Payment for soil-cement will be made at the contract unit price per cubic yard. The payment will constitute full compensation for all labor, materials, equipment, transportation, tools, and all other items necessary and incidental to completion of the work, but not including furnishing and handling cement or other items listed for payment elsewhere in the contract.

Measurement for payment of cement will be made to the nearest 100 pounds by actual weight. For each load of cement delivered, the Contractor shall furnish to the Engineer a statement-of-delivery ticket showing the weight of the cement in the load. Payment for cement will be made at the contract unit price for furnishing and handling the cement and such payment will constitute full compensation for all materials, labor, equipment, storage, transportation, and all other items necessary and incidental to furnishing and handling the cement. No payment will be made for cement used in wasted soil-cement, cement used in replacement of damaged or defective soil-cement, cement used in extra soil-cement required as a result of over-excavation, and excavations intentionally performed to facilitate operations.

All Methods. The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule, will be included in the payment for items of work to which it is made subsidiary. Such payment, and the items to which they are made subsidiary, are identified in Section 15 of this specification.

CONCRETE FOR MAJOR STRUCTURES

1. APPLICABILITY

Construction Specification 31 is applicable to the types of concrete construction entailed in NRCS operations where high material quality is not negotiable. Supplementary specifications will be required for works of a special nature, such as:

- a. Placing concrete under water.
- b. Concrete exposed to seawater.
- c. Concrete exposed to alkali soils or alkaline water.
- d. High strength concrete using microsilica.
- e. Special finishes; such as, sack rubbed, stone rubbed, treatment with cement-based coatings, etc.

Examples of such specifications and guides are contained in Standard Specifications for Highway Bridges, AASHTO and the ACI Manual of Concrete Practice.

2. MATERIAL SPECIFICATIONS

The following material specifications are complementary to Construction Specification 31:

- a. [Aggregates Specification 522](#)
- b. [Cement Specification 531](#)
- c. [Fly Ash Specification 532](#)
- d. [Blast -Furnace Slag Specification 532](#)
- e. [Air-Entraining Admixtures Specification 533](#)
- f. [Water-Reducing and/or Retarding Admixtures Specification 533](#)
- g. [Plasticizing Admixtures Specification 533](#)
- h. [Accelerating and Water-Reducing and Accelerating Admixtures Specification 533](#)
- i. [Curing Compounds Specification 534.](#)
- j. [Preformed Joint Filler Specification 535](#)
- k. [Sealing Compound for Joints Specification 536](#)

l. [Non-Metallic Waterstops Specification 537](#)

m. [Metal Waterstops Specification 538](#)

n. [Dowels Specification 539](#)

o. [Metal Specification 581](#).

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

a. Complete engineering and structural detail drawings of the structure. (See Section 6, National Engineering Handbook.)

b. Type, size and quality of joint filler, waterstops, and metal plates.

c. Deviations, if any, from the specified concrete temperature ranges in Section 21, CONCRETING IN COLD WEATHER.

d. Specify dowel size, spacing, length, and treatment of moveable dowel ends (plastic sleeve, grease, etc.). Also specify deviations, if any, from dowels specified.

e. Deviations, if any, from specifications requiring:

(1) Placement of slab concrete in a single layer.

(2) Consolidation of concrete with vibrators.

f. Section 3, Concrete Mix Design, Method 1. Specify and/or consider the following items:

(1) Class of concrete.

(2) Type of cement.

(3) If water-cement ratios greater than 0.50 will be allowed, they must be specified in Section 25.

(4) Any deviation from the air content and slump specified in Section 3, Method 1, must be specified in Section 25. (The air content specified in Section 3 may not be reduced for structures where the average annual minimum air temperature is below 20° F.)

(5) Aggregate Data. Specify only the nominal maximum size of coarse aggregate and not the ASTM size designation for coarse aggregates.

If Material Specification 522 does not apply, specify the applicable specification and/or the salient properties for aggregate.

(6) Types of admixtures, if any.

(7) Fly Ash and Slag Considerations. Specify in Section 25 if fly ash or ground blast-furnace slag is required or is not allowed in the design mix as a partial substitute for cement. Specify in Section 25 if the fly ash class is restricted to either Class F or C (ASTM C 618). If there is no mention of fly ash or slag in Section 25, the Contractor has the option to use either fly ash (Class F or C) or slag (any grade) in the design mix under Method 1, Section 3.

- g. Section 3, Concrete Mix Design, Method 2. Specify the material proportions and batch weights for the initial job mix which includes: water-cement ratio; cement type and content/cy; coarse aggregate nominal maximum size and content/cy; fine aggregate content/cy; percent air content required; slump requirements; fly ash class and content/cy, if any; slag grade, and content/cy, if any; and any other admixtures that will be used.
- h. Section 9, Conveying. The hot weather limitations for non-plasticized concrete may be waived by the Engineer if the concrete continues to remain within the allowable slump range and the temperature of the concrete does not exceed 90° F. This is consistent with industry practices but the waiver must be based on the performance of the concrete onsite and the Engineer should exercise caution and judgment when waiving the limitations.
- i. Section 10, Placing. Specify a placement plan when required. Placement plans should be considered only when complex placement and/or control is required or expected or when a high volume of concrete is involved.
- j. Section 16, Removal of Forms, Supports, and Protective Coverings.

Strength Test option. Specify a minimum concrete compressive strength for the form removal of structure member in Section 25. The designer and the government assume the risk of form removal at that designated strength.

Cumulative Time option. Form removal time for this option is based upon the structural live load (the final in service load the member must support) being substantially greater than the structural dead load (load of the member only) and no significant horizontal loads on the member when the forms are removed. If the structural dead load is near to or larger than the structural live load, identify in Section 25 the members that will require longer form removal times (See Footnote 2/ for the Accumulative Form Removal Time table.). For walls and columns where forms may be removed quickly and may be exposed to significant horizontal loads; such as, wind loads, different removal times should be specified or the Strength Test option required (See Footnote 3/ for the Accumulative Form Removal Time table.). ACI 347R, Guide to Formwork for Concrete, Paragraph 3.7.2.3 may be used as a reference for removal times.

- k. Specify the finish in Section 25 if a finish other than that required in Section 17 and 18 is needed; such as, an architectural surface, a special finish, or other

necessary restrictions. USBR Concrete Manual, Chapter VI, Sections 119 and 121 may be used as a reference for different finishes.

- l. Section 22, Concreting in Hot Weather. Extreme conditions for formed concrete is a manner of professional judgment on the part of the Engineer. Extreme conditions for flatwork and slab construction is defined as when the evaporation rate exceeding 0.2 lb/ft²/hr. Another method that may be specified in Section 25 or approved is Figure 11-8, page 135, "Design and Control of Concrete", Thirteenth Edition, Portland Cement Association, 5420 Old Orchard Road, Skokie, IL 60077-1083.
- m. Section 23, Acceptance of Concrete Work.

Concrete Strength. The basic premise for acceptance is the approved job mix is delivered to the structure. Strength test failing to meet the required criteria will occasionally occur even though concrete strength and uniformity are satisfactory. The probabilities of a low strength test result from a job mix meeting the criteria in Section 3 are: A 9 percent chance (1 in 11) that an individual strength test will fall below f'_c , a 1 percent chance (1 in 100) that an individual strength test will fall more than 500 psi below f'_c , and a 1 percent chance that the average of three consecutive strength tests will fall below f'_c .

Allowances should be made for such statistically expected variations in deciding whether the strength level being produced is adequate. The criterion of an individual strength test falling more than 500 psi below f'_c adapts well to small numbers of tests (small concrete volumes) and is the strongest indicator that something is wrong with the concrete mix. Although there is a 1% chance that concrete strength will not meet this criteria, verification of the in-place strength should be required if it does not meet the criteria and the contractor required to take actions to improve the strength test averages. The criterion of the average of three consecutive strength tests being equal to or greater than the f'_c is a good trend indicator and not as critical as the other criterion. An occasional average below f'_c can be tolerated; however, if it occurs two or more consecutive times, consideration should be given to verifying the in-place concrete strength and requiring the contractor to take actions to improve the strength test averages.

Structure Dimensions. Specify acceptable tolerances for the structure if the tolerances shown under Structure Dimensions affect the function, strength, or appearance of the structure.

4. DISCUSSION OF METHODS

- a. Section 3, Concrete Mix Design

- (1) Method 1 is intended for use when strength is to be used as one of the criteria for acceptance of the concrete and the Contractor is to be responsible for the mix.

(2) Method 2 is intended for use when the Engineer is to be responsible for and prescribe the concrete mix and strength will not govern acceptance from the Contractor.

b. Section 13, Construction Joints

(1) Method 1 is intended for use in circumstances where maximum bond between old and new concrete is desired. When such joint treatment is specified, it is permissible to design horizontal construction joints as flat plane surfaces without keyways or metal plates. Method 1 is preferred for all structures that are continuously or intermittently exposed to water.

(2) Method 2 is intended for use in circumstances where bond between old and new concrete is not a critical element.

c. Section 24, Measurement and Payment

(1) Method 1 is intended for use with Method 1 in Section 3, when the design and control of the concrete mix is the responsibility of the Contractor (that is, when the compressive strength of the concrete is one of the criteria determining acceptability).

(2) Method 2 is intended for use with Method 2 in Section 3, when the job mix is designed and controlled by the Engineer. A bid item for cement should be included in the specification and the bid schedule.

When specifications are prepared using electronic procedures and all but one method are deleted for use in a contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

31. CONCRETE FOR MAJOR STRUCTURES

1. SCOPE

The work shall consist of furnishing, forming, placing, finishing and curing portland cement concrete as required to build the structures designated in Section 25 of this specification.

2. MATERIALS

Aggregates shall conform to the requirements of Section 25 and Material Specification 522 unless otherwise specified.

Portland cement shall conform to the requirements of Material Specification 531 for the specified type. One brand only of any type of cement shall be used in any single structure as defined in Section 25.

Fly ash shall conform to the requirements of Material Specification 532.

Blast-furnace slag used as a partial substitution of portland cement in concrete shall conform to the requirements of Material Specification 532.

Air-entraining admixtures shall conform to the requirements of Material Specification 533. If air-entraining cement is used, any additional air-entraining admixture shall be of the same type as that in the cement.

Plasticizing admixtures shall conform to the requirements of Material Specification 533.

Water-reducing and/or retarding admixtures shall conform to the requirements of Material Specification 533.

Accelerating and water-reducing and accelerating admixtures, if specified in Section 25, shall conform to the requirements of Material Specification 533.

Curing compound shall conform to the requirements of Material Specification 534.

Preformed expansion joint filler shall conform to the requirements of Material Specification 535.

Sealing compound for joints shall conform to the requirements of Material Specification 536.

Waterstops shall conform to the requirements of Material Specifications 537 and 538 for the specified kinds.

Dowels shall be a plain round steel bar conforming to the requirements of Material Specification 539.

Metal plates shall conform to the requirements of Material Specification 581 for structural quality or commercial or merchant quality steel. Structural quality shall be used only if specifically designated in the drawings or specifications.

Water used in mixing and curing concrete shall be clean and free from injurious amounts of oil, salt, acid, alkali, organic matter or other deleterious substances.

3. CONCRETE MIX DESIGN

Method 1

Responsibilities. The Contractor shall be responsible for the design and proportioning of the concrete. Job mixes shall be prepared to meet the quality, consistency and strength of concrete specified.

Submittals. At least 15 calendar days prior to the placement of any concrete the Contractor shall provide the Engineer with full documentation to support each job mix and any admixtures to be used in the work. The Contractor shall furnish test results to the Engineer for each admixture showing that it meets the requirements of Material Specification 533. Job mixes will be reviewed and accepted or rejected by the Engineer within 8 calendar days following the date of submittal. After a job mix has been accepted, neither the source, character, gradation of the aggregates nor the type or brand of cement or admixtures shall be changed without prior notice to the Engineer. Revisions or changes in a job mix, which are determined to be significant by the Engineer, shall follow the same submittal and acceptance process as for initial job mix.

Design Criteria.

The class of concrete shall be as specified in Section 25 and in accordance with the following specified compressive strength.

<u>Class of Concrete</u>	<u>Specified Compressive Strength (f'_c) at 28 days, (psi)</u>
5000	5000
4000	4000
3000	3000
2500	2500

Maximum water-cement ratio shall be 0.50, unless otherwise specified.

Unless otherwise specified the air content (by volume) of the concrete at the time of placement shall be:

<u>Maximum Size Aggregate</u>	<u>Air Content (%)</u>
3/8 inch to 1 inch	5 to 7
Over 1 inch	4 to 6

The consistency of all concrete shall allow it to be placed without segregation or excessive laitance. Unless otherwise specified, the slump shall be:

<u>Type of Structural Section</u>	<u>Slump (inches)</u>
Massive sections, pavements, footings	2 ± 1
Heavy beams, thick slabs, thick walls (over 12 in.)	3 ± 1
Columns, light beams, thin slabs, thin walls (12 in. or less)	4 ± 1

Superplasticized concrete shall be a concrete mix containing either a water-reducing, high range admixture (ASTM C 494, Type F or G) at a dosage rate that reduces the quantity of water required to produce a concrete mix within the above slump range by 12% or more, or a plasticizing admixture (ASTM C 1017) at a dosage rate required to produce an increase in the slump of at least 2 inches more than that specified above.

Water-reducing admixtures (ASTM C 494) shall not be used to increase the slump of the concrete mix to a slump greater than the slump requirements specified above.

A plasticizing admixture (ASTM C 1017) may be added to an approved job mix without resubmittal and reapproval of the job mix if the following requirements are met:

- a. The plasticizing admixture shall be introduced into the concrete mix as specified by the manufacturer and be compatible with other admixtures in the job mix.
- b. The water content shall be equal to or less than that required in the job mix without the admixture.
- c. The cement content shall be the same as that required in the job mix without the admixture.
- d. The air content shall be within the specified range.
- e. The slump shall not exceed 7-1/2 inches unless the Contractor can demonstrate prior to placement that the job mix can be placed without segregation or excessive laitance at a slump between 7-1/2 inches and 9 inches. The concrete shall retain the increased slump for not less than 30 minutes.

- f. If a plasticizing admixture is added at the job site, the slump of the concrete prior to the addition of the admixture shall not exceed the slump specified above for concrete that does not contain a plasticizing admixture.

Calcium chloride or other corrosive accelerators shall not be used, unless otherwise specified.

Fly ash may be used as a partial substitution for portland cement in an amount not greater than 25 percent (by weight) of cement in the concrete mix, unless otherwise specified.

Ground granulated blast-furnace slag may be used as a partial substitution for portland cement in amounts between 25 to 70 percent (by weight) of cement in the concrete mix, unless otherwise specified.

Job Mix Criteria .

Proportioning of concrete for job mixes shall be based on either the standard deviation computed from compressive strength tests of previous batch records, or established by laboratory trial mixes. A compressive strength test is the average of the compressive strengths of two standard cured cylinders prepared and tested in accordance with Section 4, unless otherwise specified.

- a. For a job mix based upon the standard deviation computed from compressive strength tests of previous batch records, the previous batches shall represent similar materials and conditions to those expected for the job mix and have a strength within 1000 psi of the specified compressive strength (f'_c) at 28 days for the class of concrete specified. The Contractor shall provide to the Engineer copies of the facility's previous batching records that show the compressive strength results and the batch mix design used.
- b. For a job mix based upon a laboratory trial mix, the trial mix shall contain the actual materials to be used in the final job mix, have a slump within 0.75 inches of the maximum allowable slump, and have an air content within 0.5% of the maximum allowable air content. The Contractor shall provide the Engineer with copies of the actual compressive strength test records for the trial mix from the testing facility performing the test.
- c. The trial job mix or previous batch records shall include the water-reducing admixture when a water-reducing admixture is used in a concrete mix specifically to improve the physical properties of the hardened concrete or change portions of the mix components.
- d. In meeting strength requirements, the selected job mix proportions must produce an average strength, f_{cr} , exceeding the specified compressive strength, f'_c , by the amount specified below.

n	s₃₀	f_{cr}
>30	1.00 s	The larger of these two equations: f_c + 1.34 s₃₀ f_c + 2.33 s₃₀ - 500
25	1.03 s	
20	1.08 s	
15	1.16 s	
<15		f_c + 1000 for f_c < 3000 f_c + 1200 for f_c ≤ 5000 f_c + 1400 for f_c > 5000

where **n** = number of consecutive compressive strength tests,
s₃₀ = standard deviation adjusted to 30 tests, psi,
f_{cr} = required average compressive strength, psi,
f_c = specified compressive strength of concrete, psi,
s = standard deviation, psi, computed as,
s = { [sum (**X_i**-**X_a**)² / [**n**-1] }^{1/2}
where **X_i** = individual strength test result, psi, and
X_a = average of n strength test results, psi.

Method 2

Responsibilities. The Engineer will be responsible for the design and proportioning of the job mix. The initial job mix will be as specified in Section 25. The Engineer may adjust the initial job mix proportions to establish the designated job mix. The Engineer will provide the Contractor with a copy of each job mix as soon as the materials and proportions have been determined. After the job mix has been designated, neither the source, character or gradation of the aggregates nor the type or brand of cement or admixtures shall be changed without prior approval of the Engineer. During the course of the work, the Engineer may adjust the job mix proportions and batch weights whenever necessary to meet special job conditions.

The Contractor, for each class of concrete, shall be responsible for:

- a. Taking the following actions and furnish the Engineer with the below information at least 35 calendar days prior to any placement of concrete, unless otherwise designated:
 - (1) Select the source of aggregates and sample and test the gradations of aggregates available;
 - (2) Select the brand and type of cement;
 - (3) Select the brand of admixtures and obtain manufacturer's test data and recommendation of use;

- (4) Identify the concrete production facility, the type of mixer, and the mixing methods that will be used; and
 - (5) Provide from the concrete production facility consecutive compressive strength test records and batching records for concrete mixes that have materials, proportions, and compressive strengths within 1000 psi of the proposed design mix.
- b. Batching at least 3 cubic yards of the initial job mix, in the presence of the Engineer, for testing and evaluation not less than 30 calendar days prior to any placement of concrete.

4. INSPECTING AND TESTING

During the course of the work, the Engineer will perform quality assurance testing as required to assure the concrete meets the contract requirements. The Engineer shall have free entry to the plant and equipment furnishing concrete under the contract. Proper facilities shall be provided for the Engineer to inspect materials, equipment and processes, and to obtain samples of the concrete. All tests and inspections will be conducted so as not to interfere unnecessarily with the manufacture, delivery, and placement of the concrete.

Any portion of a batch may be tested by the Engineer for any of the purposes below. Samples taken for testing shall be representative of that portion of the batch.

- a. Determining uniformity of the batch.
- b. Checking compliance with requirements for slump and air content when the batch is discharged over an extended period of time.
- c. Checking compliance of the concrete with the specifications when the whole amount being placed in a small structure, or a distinct portion of a larger structure, is less than full batch.

If concrete is conveyed to the placement location by pumping or conveyor belts, the samples shall be collected at the discharge end.

When a plasticizing admixture is added to the concrete mix at the job site, slump tests will be made both prior to the addition of the admixture to the concrete mix and after the admixture has been incorporated into the concrete mix.

The tests on concrete will be performed by the following methods indicated, unless otherwise specified:

Type of Test	Test Method (ASTM Designation)
Sampling	C 172
Slump Test	C 143
Air Content	C 231 or C 173
Compression Test Specimens	C 31 or C 42
Compressive Strength Testing	C 39
Unit Weight	C 138
Temperature	C 1064

A strength test for concrete shall be the average of two standard cured concrete cylinders prepared in accordance with ASTM C 31 from the same sample of concrete and tested in accordance with ASTM C 39 at 28 days, unless otherwise specified. If one cylinder shows manifest evidence of improper sampling, molding, curing or testing, it shall be discarded and the strength of the remaining cylinder shall then be considered the compressive strength of the concrete. Should both cylinders show such defects, the entire test shall be discarded.

If both cylinders are discarded or in-place concrete which was not sampled is in question, the in-place concrete may be sampled by coring in accordance with ASTM C 42. For core tests, the below requirements shall be followed:

- a. At least three representative cores shall be taken from each area of concrete in question. If one or more of the cores shows signs of being damaged prior to testing, it shall be replaced by a new one.
- b. Test cores shall be prepared for testing in accordance with moisture conditioning in ASTM C 42, unless the Engineer determines that the concrete in the structure will be dry under service conditions. If the concrete is determined to be dry under service conditions, the cores shall be air dried (temperature 60° to 80° F and relative humidity less than 60%) for 7 days before testing and shall be tested dry.

5. HANDLING AND MEASUREMENT OF MATERIALS

Aggregates shall be stored or stockpiled in such a manner that separation of coarse and fine particles of each size will be avoided and that various sizes will not become intermixed before proportioning. Methods of handling and transporting aggregates shall be such as to avoid contamination, excessive breakage, segregation, degradation, or intermingling of various sizes.

Unless otherwise specified, scales shall be beam type or springless dial type. They shall be accurate when static load tested to $\pm 0.4\%$ of the total capacity of the scales. All exposed fulcrums, clevises and similar working parts of scales shall be kept clean.

Measuring tanks for mixing water shall be of adequate capacity to furnish the maximum amount of mixing water required per batch. Tanks shall be equipped with

outside taps and valves to verify their calibration unless other means are provided for readily and accurately determining the amount of water in the tank.

The quantities of each component of the concrete mix shall be measured by the following methods and to the accuracy indicated below:

Cement, Fly Ash, Slag. Cement, except as otherwise specifically permitted, shall be measured by weight or in bags which have the weight plainly marked on the bag. When cement, fly ash, and slag are supplied in bulk and are measured by weight, they shall be weighed on a scale separate from that used for other materials, and in a hopper entirely free and independent of the hopper used for weighing the aggregate. When fly ash or slag is used in the job mix, the cement and the fly ash or slag may be weighed separately, or cumulatively by weighing the cement first and then adding the fly ash or slag to arrive at the composite weight. The weight of the cement and the combined weight of the cement and fly ash or slag shall be $\pm 1\%$ of the required weight of the cementitious materials. When cement is measured in bags, no fraction of a bag shall be used unless weighed.

Aggregates shall be measured by weight, unless otherwise specifically permitted. Mix proportions shall be based on saturated, surface-dry weights. The batch weight of each aggregate shall be the required saturated, surface-dry weight corrected by the weight of surface moisture it contains. The weight of each of the specified aggregates shall be $\pm 2\%$ of the required weight.

Mixing water shall consist of water added to the batch, ice added to the batch, water occurring as surface moisture on the aggregates, and water introduced in the form of admixtures. The added water shall be measured by weight or volume to an accuracy of 1% of the required total mixing water. Added ice shall be measured by weight. Wash water shall not be used as a portion of the mixing water for succeeding batches.

Admixtures. Dry admixtures shall be measured by weight. Paste or liquid admixtures shall be measured by weight or volume. The admixtures shall be $\pm 3\%$ of the required weight or volume for each specific admixture.

6. MIXERS AND MIXING

Mixers are either stationary parts of a central mixing plant or portable equipment; such as, revolving drum truck mixers and volumetric batching/continuous mixing truck mixers. Mixers shall be capable of thoroughly mixing the concrete ingredients into a uniform mass within the specified mixing time and of discharging the mix without segregation. Each mixer or agitator shall bear a manufacturer's rating plate indicating the gross volume of the drum, the capacity of the drum or container in terms of the volume of mixed concrete, and the minimum and maximum mixing speeds of rotation of the drum, blades, or paddles. When the truck mixer is used for truck mixed concrete as described in Section 6,a,(2) or for shrink mixed concrete as

described in Section 6,a,(3), the capacity of the drum or container in terms of the volume of mixed concrete shall not exceed 63% of the gross volume of the drum. When the truck mixer is used to transport central-mixed concrete as described in Section 6,a,(1), the capacity of the drum or container in terms of the volume of mixed concrete shall not exceed 80% of the gross volume of the drum. The mixer shall be operated in accordance with these recommendations.

Concrete shall be uniform and thoroughly mixed when delivered to the forms in a freshly mixed and unhardened state. Variations in slump of more than one (1) inch within a batch will be considered evidence of inadequate mixing and shall be corrected by changing batching procedures, increasing mixing time, changing mixers or other means. Mixing time shall be within the limits specified below unless the Contractor demonstrates by mixer performance tests that adequate uniformity is obtained by different times of mixing.

No mixing water in excess of the amount called for by the job mix shall be added to the concrete during mixing or hauling or after arrival at the delivery point. Water to compensate for up to a one (1) inch loss in slump may be added, not to exceed the design maximum water cement ratio. Withholding some of the mixing water until the concrete arrives on the job, then adding the remaining water and turning the mixer 30 revolutions at mixing speed will be allowed to overcome transporting conditions. When loss of slump or workability cannot be offset by these measures, complete mixing shall be performed by on-site batching and mixing, or by using a combination of centrally batching and transporting materials to the site and adding remainder of materials onsite.

Concrete may be furnished by (a) ready-mix methods, (b) by volumetric batching and continuous mixing at the site, or (c) by batch mixing at the site.

- a. Ready-Mixed Concrete. Ready-mixed concrete shall be mixed, transported, and placed in a freshly mixed and unhardened state.

The Contractor shall furnish the Engineer a batch ticket showing amount of concrete in cubic yards; the time of loading; the time the load was discharged; the revolution counter reading at the time of loading and discharge; and the type and actual quantity of each material, including all admixtures, used in each batch of concrete.

Truck mixers and truck agitators shall be equipped with revolution counters by which the number of revolutions of the drum or blades may be readily verified.

Ready-mixed concrete shall be mixed and delivered by one of the following methods:

- (1) **Central-Mixed Concrete**. Central-mixed concrete is mixed completely in a stationary mixer and transported to the point of delivery either in a truck agitator, a truck mixer operating at agitating speed, or nonagitating equipment.

When a truck agitator or a truck mixer is used as an agitator and transports concrete that has been completely mixed in a stationary mixer, mixing during transportation shall be at the speed designated by the manufacturer of the equipment as agitating speed. When concrete is transported in a truck mixer or truck agitator, the volume of the mixed concrete shall not exceed 80% of the gross volume of the drum. The total number of revolutions of the truck mixer or truck agitator shall not exceed 200 before discharge of the concrete, unless otherwise specified.

The use of nonagitating equipment to transport concrete to the site of the work will be permitted only if the consistency and uniformity of the concrete as discharged at the point of delivery meet the requirements of this specification. Bodies of nonagitating hauling equipment shall be so constructed that leakage of the concrete mix, or any part thereof will not occur. Concrete hauled in open-top vehicles shall be protected from rain, and from more than 20 minutes exposure to the sun and wind when the air temperature is above 75° F.

(2) **Truck-Mixed Concrete.** Truck-mixed concrete is completely mixed in a truck mixer. The total volume of all ingredients to be mixed in a revolving drum truck mixer shall not exceed 63% of the gross volume of the drum. The concrete ingredients shall be mixed between 70 and 100 revolutions of the drum or blades at the speed designated by the manufacturer as mixing speed. Mixing in excess of 100 revolutions shall be at the speed designated by the manufacturer of the equipment as agitating speed. The total number of revolutions shall not exceed 300 before discharge of the concrete, unless otherwise specified.

(3) **Shrink-Mixed Concrete.** Shrink-mixed concrete is partially mixed at a central plant and the mixing is completed in a truck mixer, the mixing time in the central plant mixer shall be the minimum required to intermingle the ingredients. The volume of the mixed concrete in a truck mixer shall not exceed 63% of the gross volume of the truck drum. The mixing shall be completed in a truck mixer. The number of revolutions of the truck mixer drum or blades shall be between 50 and 100 revolutions at the speed designated by the manufacturer as mixing speed. Mixing in excess of 100 revolutions shall be at the speed designated by the manufacturer of the equipment as agitating speed. The total number of revolutions shall not exceed 300 before discharge of the concrete, unless otherwise specified.

b. Volumetric batching and continuous mixing at the site (Commonly referred to as mobile concrete mixers). Unless otherwise specified, volumetric batching and continuous mixing at the construction site will be permitted. The batching and mixing equipment shall conform to the requirements of ASTM C 685 and shall be demonstrated prior to placement of concrete, by tests with the job mix, to produce concrete meeting the specified proportioning and uniformity

requirements. Concrete made by this method shall be produced, inspected, and documented in conformance with Sections 6, 7, 8, 13, and 14 of ASTM C 685.

- c. Batch mixing at the site. This method of batching and mixing concrete shall be either (a) by batching and mixing all materials onsite by the use of paving mixers or stationary construction mixers, or (b) by using a combination of centrally batching a portion of the mix, transporting it to the site, and adding the remainder of materials and mixing onsite.

Paving mixers or stationary construction mixers and associated transport vehicles shall be in accordance with recommended practices for central-mixed concrete above. The time for mixing a batch of concrete in the mixer drum shall be according to manufacturer's recommendations but not less than 1 minute plus 1/4 minute for each cubic yard of concrete being mixed (8 cy batch = 3 minutes).

When a combination of centrally batching and transporting materials to the site and adding remainder of materials onsite is used, the Contractor shall prepare a written plan detailing how the batching and mixing of the concrete materials will be accomplished and controlled. This written batching and mixing plan shall be submitted to the Engineer for review and approval not less than 10 working days prior to the placement of concrete. The volume of the mixed concrete in a truck mixer shall not exceed 63% of the gross volume of the drum.

The Contractor shall furnish the Engineer for each batch of fresh concrete a batching ticket showing: the type, brand and amount of cement; the type, name, and amount of each admixture; total water added to the batch which includes free water on the aggregate; maximum size of aggregate; the type and dry weight of fine aggregate; the type and dry weight of coarse aggregate; the time of loading (the time that water was introduced to the cement); and the time the load was discharged.

7. FORMS

Forms shall be of good quality wood, plywood, steel or other approved material and shall be mortar tight. The forms and associated falsework shall be substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions and contours. Form surfaces shall be smooth and free from holes, dents, sags or other irregularities and maintained in this condition throughout the work. Forms shall be coated with a nonstaining form release agent before being set into place. Acceptable tolerances for formed structure members are specified in Section 23.

When a superplasticized concrete mix is used, forms shall be coated, according to the manufacturer's recommendations, with a form release agent that is specifically formulated for plasticized concrete. Forms shall be designed to withstand the increased pressures of the superplasticized concrete and the increase impact forces resulting from larger drop heights used in placing the superplasticized concrete.

Metal ties or anchorages which will be embedded in the concrete shall be equipped with cones, she-bolts or other devices that permit their removal to a depth of at least one inch without injury to the concrete. Ties designed to break off below the surface of the concrete shall not be used without cones. If approved fiberglass or plastic form ties are used, the tie ends shall be cut flush with the finished concrete and ground smooth.

All edges that will be exposed shall be chamfered, unless finished with molding tools as specified in Section 18.

8. PREPARATION OF FORMS AND SUBGRADE

Prior to placement of concrete, the forms, embedments, and subgrade shall be free of chips, sawdust, debris, water, ice, snow, extraneous oil, mortar, or other harmful substances or coatings. Any form release agent on the reinforcing steel or other surfaces required to be bonded to the concrete shall be removed.

Rock surfaces shall be cleaned by high pressure air-water cutting, sandblasting or wire brush scrubbing, as necessary, and shall be wetted immediately prior to placement of concrete. Earth surfaces shall be firm and damp. Placement of concrete on mud, dried earth, noncompacted fill or frozen subgrade will not be permitted. All ice, snow and frost shall be removed and the temperature of all surfaces, including the reinforcing steel and other steel inclusions, to be in contact with the new concrete shall be no colder than 40° F.

Items to be embedded in the concrete shall be positioned accurately and anchored firmly.

Weepholes in walls or slabs shall be formed with nonferrous materials.

9. CONVEYING

Concrete shall be delivered to the site and discharged completely into the forms within 1-1/2 hours or before the drum of truck has revolved a total of 300 revolutions, whichever comes first, after the introduction of the mixing water to the cement and aggregates or the introduction of the cement to the aggregates. In hot weather or under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85° F or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes.

Superplasticized concrete can be conveyed and placed when the temperature of the concrete is below 95° F and the slump of the concrete remains within the allowable slump range.

The Engineer will allow an appropriate extension of time when the setting time of the concrete is increased a corresponding amount by the addition of an approved admixture. In any case, concrete shall be conveyed from the mixer to the forms as

rapidly as practicable, by methods that will prevent segregation of the aggregates or loss of mortar.

10. PLACING

Concrete shall not be placed until the subgrade, forms, steel reinforcement, and other embedments have been inspected and approved by the Engineer. For walls and columns, subsequent higher placements of concrete shall not be placed until the concrete below the new placement has gained sufficient strength to support the concrete dead load and any superimposed loads without distress. Placement sequences and timing shall consider form removal timing covered in Section 16.

If a placement plan is required in Section 25, concrete shall not be placed until the placement plan has been reviewed and approved by the Engineer.

The Contractor shall have all equipment and materials required for curing available at the site ready for use before placement of concrete begins.

Concrete shall be placed only in the presence of the Engineer. The Contractor shall give reasonable notice to the Engineer prior to each placement. Such notice shall be far enough in advance to give the Engineer adequate time to assure that the subgrade, forms, steel reinforcement and other preparations comply with specifications. Other preparations include, but are not limited to, the concrete batching plant, mixing and delivery equipment and system, placing and finishing equipment and system, schedule of work, work force and heating or cooling facilities as applicable. All deficiencies are to be corrected before concrete is delivered for placing.

Concrete shall be placed and consolidated in a manner that will prevent segregation of the mix components. The concrete shall be deposited as closely as possible to its final position in the forms and shall be worked into the corners and angles of the forms and around all reinforcement and embedded items in a manner to prevent segregation of aggregates or excessive laitance. The depositing of concrete shall be regulated so that the concrete can be consolidated with a minimum of lateral movement. Concrete placed against sloping surfaces shall start at the lowest elevation and work upwards to the highest elevation.

Concrete other than architectural concrete shall not be dropped more than 5 feet vertically unless suitable equipment is used to prevent segregation. Architectural concrete shall not be dropped more than 3 feet vertically unless suitable equipment is used to prevent segregation. When a superplasticized concrete mix is used, concrete other than architectural concrete shall not be dropped more than 12 feet vertically and architectural concrete shall not be dropped more than 10 feet vertically unless suitable equipment is used to prevent segregation.

11. LAYERS

Slab concrete shall be placed to design thickness in one continuous layer, unless otherwise specified.

Formed concrete shall be placed in horizontal layers not more than 20 inches deep. When a superplasticized concrete mix is used, formed concrete may be placed in horizontal layers not more than 5 feet deep.

Successive layers of fresh concrete between construction joints shall be placed at a rate fast enough that the preceding layer is still plastic and can be easily mixed with the fresh concrete such that seams ("cold joints") or plane of weakness will not occur. If the surface of a previously placed layer of concrete has taken a set to the degree that it will not flow and mix with the succeeding layer when vibrated, the Contractor shall discontinue placing concrete and shall make a construction joint according to the procedure specified in Section 13. If placing is discontinued when a layer is incomplete, the ends of the incomplete layer shall be formed by a vertical bulkhead.

12. CONSOLIDATING

All concrete shall be consolidated with internal type mechanical vibrators capable of transmitting vibration to the concrete at frequencies not less than 8000 impulses per minute, unless otherwise specified or approved prior to placement. Vibration shall be supplemented by spading, rodding, and hand tamping, as necessary to insure smooth and dense concrete along form surfaces, in corners, and around embedded items. The Contractor shall provide a sufficient number of vibrators to properly consolidate the concrete immediately after it is placed. A sufficient number of standby vibrators shall be kept onsite during the placement of concrete.

Vibration shall compact the concrete and bring it into intimate contact with the forms, reinforcing steel, and other embedded items while removing voids and pockets of entrapped air. The location, insertion, duration, and removal of the vibrators shall be such that maximum consolidation of the concrete is achieved without causing segregation of the mortar and coarse aggregate or causing water or cement paste to flush to the surface. Vibration shall be applied to the freshly deposited concrete by rapidly inserting the vibrator and slowly in an up and down motion removing the vibrator at points uniformly spaced at not more than 1-1/2 times the radius of the area visibly effected by vibration. Generally, rapidly inserting the vibrator and removing the vibrator with an up and down motion at 5 to 10 seconds per foot on 14 inch spacings or less. The area visibly effected by the vibrator shall overlap the adjacent, just vibrated area. The vibrator shall extend vertically into the previously placed layer of fresh concrete by at least 6 inches, at all points, to insure effective bond between layers. In thin slabs, the vibrator(s) should be sloped toward the horizontal to allow operations in a fully embedded position.

Vibration shall not be applied directly to the reinforcement steel, the forms, or other embedded items, unless otherwise specified. Vibration shall not be applied to concrete that has hardened to the degree that it does not become plastic when

vibrated. If surface vibrators are used, surface vibrators may contact forms when consolidating thin slabs.

The use of vibrators to transport concrete in the forms or conveying equipment will not be permitted.

Surface vibrators may be used to consolidate thin slabs 8 inches and less in thickness. For slabs greater than 8 inches in thickness, the slab shall be consolidated with internal vibration and may be augmented through use of surface vibrators; such as, vibrating screeds, plate or grid vibratory tampers, or vibratory roller screeds. If concrete is to be consolidated using surface vibration methods, the Contractor shall detail in writing how this work is to be performed, including equipment selection and specifications, to the Engineer for review and approval not less than 30 calendar days prior to placing concrete by this method.

13. CONSTRUCTION JOINTS

Construction joints shall be made at the locations shown on the drawings, unless otherwise specified or approved by the Engineer. If construction joints are needed which are not shown on the drawings, they shall be placed in locations approved by the Engineer.

Where a feather edge would be produced at a construction joint, as in the top surface of a sloping wall, an insert form shall be used so that the resulting edge thickness on either side of the joint is not less than twice the maximum aggregate diameter used in the concrete mix.

Nonvertical construction joints in structural elements; such as, walls and columns, shall be consolidated and screeded to grade, unless otherwise specified. Construction joints shall be covered and wet cured for 7 days or until concrete placement resumes, unless otherwise specified.

Steel tying and form construction adjacent to concrete in-place shall not be started until the concrete has cured at least 12 hours. Before new concrete is deposited on or against concrete that has hardened, the forms shall be retightened. New concrete shall not be placed until the hardened concrete has cured at least 12 hours.

Method 1 Surfaces of construction joints shall be cleaned of all unsatisfactory concrete, laitance, coatings, stains or debris by either sandblasting after the concrete has gained sufficient strength to resist excessive cutting, or high pressure air-water cutting as soon as the concrete has hardened sufficiently to prevent the jet from displacing the coarse aggregates, or both. The surface of the concrete in-place shall be cut to expose clean, sound aggregate but not so deep as to undercut the edges of larger particles of the aggregate. After cutting, the surface shall be thoroughly washed to remove all loose material. If the surface is congested by reinforcing steel, is relatively inaccessible, has cured beyond the ability to cut with air-water blasting, or it is considered undesirable to disturb the concrete before it is

hardened, cleaning of the joint by air or water jets will not be permitted and the sandblasting method will be required after the concrete has hardened.

Immediately before new concrete is placed, all construction joints shall be wetted and standing water removed.

Method 2 Surfaces of construction joints shall be cleaned of all unsatisfactory concrete, laitance, coatings, stains, or debris by washing and scrubbing with a wire brush or wire broom, or by other means approved by the Engineer. Immediately before new concrete is placed, all construction joints shall be wetted and standing water removed.

14. EXPANSION AND CONTRACTION JOINTS

Expansion and contraction joints shall be made only at locations shown on the drawings.

Exposed concrete edges at expansion and contraction joints shall be carefully tooled or chamfered, and the joints shall be free of mortar and concrete. Joint filler shall be fully exposed for its entire length with clean and true edges.

When open joints or weakened plane "dummy" joints are specified, joints formed in fresh concrete shall be constructed by the insertion and subsequent removal of a wood strip, metal plate or other suitable template in such a manner that the corners of the concrete will not be chipped or broken. The edges of the fresh concrete at the joints shall be finished with an edging tool prior to removal of the joint strips. Open joints or weakened plane "dummy" joints may also be saw-cut joints conforming to the depth and extent specified.

Preformed expansion joint filler shall be held firmly in the correct position as the concrete is placed.

15. WATERSTOPS

Waterstops shall be held firmly in the correct position as the concrete is placed. Joints in metal waterstops shall be brazed or welded. Joints in rubber or plastic waterstops shall be cemented, welded or vulcanized as recommended by the manufacturer. Joints shall be watertight and of a strength equivalent to that specified in Material Specification [537](#). Intersecting waterstop joints shall be prefabricated and supplied by the same manufacturer providing the waterstop.

16. REMOVAL OF FORMS, SUPPORTS, AND PROTECTIVE COVERINGS

Forms, supports, and protective coverings shall be removed as soon as practical after the concrete has gained sufficient strength to support its own weight and superimposed loads. Removal shall be done in a manner that will not damage the concrete surface nor induce sudden or excessive stresses.

The minimum period from completion of the concrete placement to the removal of the forms shall be based on either Strength Tests or Cumulative Times.

Strength Tests. The strength of the in-place concrete will be determined by testing concrete cylinders specifically cast for this purpose and cured adjacent to the member in accordance with the ASTM C 31 method for determining removal time. Unless otherwise specified, forms supporting the weight of the concrete member may be removed after the concrete strength is 70% of that specified for the Class of concrete. Forms not supporting the weight of the concrete member or other superimposed loads may be removed after the concrete strength has reached the strength specified in Section 25.

Cumulative Time. The total accumulated time, not necessarily continuous, that the air adjacent to the concrete is above 50° F and the specified concrete curing has occurred concurrently will be determined. Forms may be removed after the total accumulated time in the following table:

ACCUMULATED FORM REMOVAL TIMES		
Sides of Slabs or Beams		^{1/} 12 hours
Undersides of Slabs or Beams	Clear Span	^{1/ 2/}
	< 10 ft	4 days
	10 - 20 ft	7 days
	> 20 ft	14 days
Sides of Walls or Columns	Height Above Form	^{1/ 3/ 4/}
	≤ 10 ft	12 hours
	≤ 20 ft	24 hours
	> 20 ft	72 hours

- ^{1/} Table values apply to normal concrete. Values for concrete which contains cements or admixtures that significantly retard or accelerate strength gain will be determined by the Engineer and based on actual design mix data.
- ^{2/} Values apply to members designed to support significant superimposed loads. Values for members designed for only self weight when placed in service shall be 50% greater.
- ^{3/} Values apply to members not subject to significant horizontal loads. Additional time or rebracing will be needed for members subject to significant wind or other horizontal loads.
- ^{4/} Subsequent higher lifts may be placed after 12 hours.

17. FINISHING FORMED SURFACES

All formed concrete surfaces shall be true and even, and shall be free from over-tolerance depressions, holes, projections, bulges, or other defects in the specified surface finish or alignment, unless otherwise specified in Section 25. Depressions are measured as the distance from the bottom of a 5 foot long template or straight edge.

Surfaces to be backfilled or otherwise concealed when construction is completed shall have the following surface treatment, unless otherwise specified: Repair defective concrete, fill all form tie holes, correct surface depressions deeper than 1 inch, and remove or smooth fins and abrupt projections that exceed 3/4 inch.

Surfaces to be permanently exposed, where other finishes are not specified, shall have the following treatment: Repair defective concrete, fill all form tie holes, remove or smooth all abrupt irregularities greater than 1/4 inch in depth or projection, and treat all depressions and irregularities such that they do not exceed 1/2 inch in depth.

Repair and filling of form bolt and tie holes, and other holes of similar size and depth shall be performed as specified in Section 20.

18. FINISHING UNFORMED SURFACES

All exposed surfaces of the concrete shall be accurately screeded to grade and then float finished, unless otherwise specified. The float finish shall result in a surface that has no irregularities that exceeds 1/4 inch when checked with a template or straight edge that is 10 feet long.

All exposed surfaces of concrete shall be accurately struck off to grade after placement and consolidation are completed. Following strike-off, the surfaces shall be immediately smoothed by darbying or bull floating before any free water has bled to the surface. The concrete shall then be allowed to rest until the bleed water and water sheen has left the surface and the concrete has stiffened to where it will sustain foot pressure with only about 1/4 inch indentation. At this time all joints and edges that will be exposed to view that are not chamfered shall be finished with edging tools. After edging and hand-jointing is complete, all exposed surfaces shall be floated with wood or magnesium floats. The floating should work the concrete no more than necessary to remove screed, edger and jointer marks and produce a compact surface, uniform in texture.

Water shall not be sprinkled or added to the surface of the concrete during the darbying, bull floating, floating, or other finishing operations to facilitate finishing.

19. CURING

Freshly placed concrete shall be cured a minimum of 7 days in accordance with the recommended practices set forth below. A curing process shall be started as soon as the concrete has hardened sufficiently to prevent surface damage. Curing concrete, including exposed surfaces of formed concrete and concrete in forms,

shall be maintained at a satisfactory moisture content for at least 7 days following placement. If forms are removed prior to the end of the 7 day curing period, the interrupted curing process shall be re-established and maintained until a full 7 day curing period is achieved.

A satisfactory moisture condition is: (a) Continuous or frequent application of water or use of a saturated cover material; such as, canvas, cloth, burlap, earth, sand, etc., or (b) Prevention of excessive water loss from the concrete by use of an impermeable coating (curing compound) or covering (plastic, paper, etc.). The application of water or covering shall not erode, mar, or otherwise damage the concrete. Plastic film or paper shall meet the requirements of ASTM C 171. Black covering shall not be used when concreting in hot weather.

Except as otherwise specified in Section 25, curing compound may be used for exposed surfaces or formed surfaces after patching and repair have been completed. Unless otherwise specified, the curing compound shall be white pigmented and conform to ASTM C 309, Type 2, Class A or B. Clear curing compound (Type 1) or clear with fugitive dye (Type 1-D) may be used only when specified in Section 25. Curing compounds shall not be used on surfaces that are to receive additional concrete, paint, tile, or other coatings unless the Contractor demonstrates that the membrane can be satisfactorily removed or can serve as a base for the later application.

Curing compound shall be thoroughly mixed before applying and agitated during application. Except as otherwise specified in Section 25, the compound shall be applied at a pressure of 75 to 100 psi using a continuously agitating pressure sprayer at a uniform rate of not less than one gallon per 175 square feet of surface. Manual hand pump sprayers shall not be used unless otherwise specified. For individual concrete placements or repairs having a surface areas of 400 square feet or less, curing compound may be applied with a soft-bristled brush, paint roller, or hand sprayer. The compound shall form a uniform continuous, adherent film that shall not check, crack or peel and shall be free from pinholes or other imperfections.

All surfaces covered with curing compound shall be continuously protected from damage to the protective film during the required curing period.

Surfaces subjected to heavy rainfall or running water within 3 hours after the compound has been applied, or surfaces damaged by subsequent construction operations during the curing period shall be resprayed in the same manner as for the original application.

Water for curing shall be clean and free from any substances that will cause discoloration of the concrete.

20. CONCRETE PATCHING, REPAIR OR REPLACEMENT

Patching. All form bolts, metal ties, and similar forming restraints shall be removed to a depth of one inch below the surface of the concrete and their cavities repaired

unless otherwise specifically permitted or specified. Small cavities, large air holes, minor honeycombed areas, and other superficial imperfections that require patching to meet the specified finish requirements shall be thoroughly cleaned and filled. Holes left by bolts or straps that pass through the concrete section shall be filled solid with a dense, well-bonded, nonshrink patching material. Dry-pack mortar and replacement concrete shall follow the appropriate procedure detailed in the Repair and Maintenance chapter of the Concrete Manual, Bureau of Reclamation, U.S. Department of the Interior. Proprietary patching materials shall be appropriate for the type of repair, used within the manufacturer's recommended limits, and applied according to the manufacturer's recommendations.

Repair or Replacement. The Contractor shall repair and/or replace concrete that does not meet the requirements of this specification. Prior to starting any repair or replacement work, the Contractor shall prepare a written plan for the repair or replacement. The primary reference for materials and repair methods for the plan shall be the appropriate sections of the Repair and Maintenance chapter of the Concrete Manual, Bureau of Reclamation, U.S. Department of the Interior. The repair plan shall be submitted to the Engineer for review at least ten days prior to any repair or replacement work. Approval of the plan will be authorized in writing by the Contracting Officer.

When proprietary patching materials are proposed in the plan, the manufacturer's data sheets and written recommendations shall be included in the plan.

Repair materials or replacement concrete shall have properties, color, and texture similar to and compatible with the concrete being repaired or replaced. Repair or replacement concrete work shall be performed only when the Engineer is present.

Curing of repaired or replaced concrete shall be started immediately after finish work is completed and as specified in Section 19 or as specified by the manufacturer of proprietary compounds.

21. CONCRETING IN COLD WEATHER

Methods for concreting in cold weather shall be performed when, for more than 3 consecutive days, the following conditions exist: (a) the average daily air temperature at the job site is less than 40° F and (b) the air temperature at the job site is not greater than 50° F for more than one-half of any 24-hour period. The average daily air temperature is the average of the highest and lowest temperatures occurring during the period from midnight to midnight.

Concrete shall be protected against freezing during the first 24 hours after placement whether or not the average weather conditions specified above for cold weather concreting exist.

The following provisions also shall apply, unless otherwise specified:

- a. When the cement is added to the mix, the temperature of the mixing water shall not exceed 140° F nor shall the temperature of the aggregate exceed 150° F.
- b. The temperature of the concrete at the time of placing shall be within the placement temperature range shown below, unless otherwise specified.

<u>Least dimension of Section, inches</u>	<u>Placement Temperature, F</u>
Less than 12	55 - 75
12 to 36	50 - 70
36 to 72	45 - 65
Greater than 72	40 - 60

- c. The minimum temperature of the concrete for the first 72 hours after placement shall not be less than the minimum temperature shown above. Concrete structures shall be immediately protected after concrete placement by methods of covering, housing, insulating, or heating concrete structures that will be sufficient to maintain the minimum temperature adjacent to the concrete surface. If the minimum temperature requirements are not met and the concrete did not freeze, the protection time will be extended a period equal to twice the number of hours the temperature was below the minimum temperature.
- d. Exhaust flue gases from combustion heaters shall be vented to the outside of the enclosure. The heat from heaters and ducts shall be directed in such a manner as to not overheat or dry the concrete in localized areas or to dry exposed concrete surfaces.
- e. At the end of the protection period, the concrete shall be allowed to cool gradually. The maximum decrease at the concrete surface in a 24-hour period shall not exceed 40° F.

22. CONCRETING IN HOT WEATHER

Methods for concreting in hot weather shall be in accordance with the requirements set forth below.

For the purpose of this specification, hot weather is defined as any combination of the following conditions that impair the quality of freshly mixed or hardened concrete by accelerating the rate of moisture loss and rate of cement hydration, or otherwise resulting in detrimental results:

- *** High ambient temperature
- *** High concrete temperature
- *** Low relative humidity
- *** Wind velocity
- *** Solar radiation.

Whenever the above conditions exist or when climatic conditions are such that the temperature of the concrete may reasonably be expected to exceed 90° F at the time of delivery to the work site or during the placement operations, the following provisions shall apply:

- a. The Contractor shall maintain the temperature of the concrete below 90° F during mixing, conveying, and placing.
- b. Exposed concrete surfaces which tend to dry or set too rapidly shall be continuously moistened by means of fog sprays or other means to maintain adequate moisture during the time between placement and finishing. Water shall not be sprinkled or added directly to the surface of the concrete prior to finishing.
- c. Finishing of slabs and other exposed surfaces shall be started as soon as the condition of the concrete allows and shall be completed without delay. Water shall not be sprinkled or added to the surface of the concrete during the darbying, bull floating, floating, or other finishing operations to facilitate finishing.
- d. Formed surfaces shall be kept completely and continuously wet from the time the concrete takes initial set to when the forms are removed. After the forms are removed, the concrete surfaces shall be kept completely and continuously wet for the duration of the curing period or until curing compound is applied in accordance to Section 21.
- e. Exposed and unformed concrete surfaces, especially flat work placed with large areas of surface, shall be kept completely and continuously wet for the duration of the curing period or until curing compound is applied in accordance to Section 19. The concrete shall be protected against thermal shock from rapid cooling (5° F per hour or more than 40° F per 24-hour period) of the concrete by application of curing water or temperature changes during the first 24 hours of the curing period.
- f. When any single or combination of conditions may result in very rapid setting or drying of the concrete, extreme conditions exist. For flat work and slab construction, extreme conditions exist when the evaporation rate exceeding 0.2 lb/ft²/hr.

The Engineer may (1) restrict placement to the most favorable time of the day, (2) restrict the depth of layers to assure coverage of the previous layer while it will still respond readily to vibration, (3) suspend placement until conditions improve, and (4) restrict the removal of forms, repair, and patching to small areas which can be protected with curing compound immediately.

The evaporation rate for flat work and slab construction may be determined by calculating the evaporation rate from a shallow cake pan having a surface area of at least 1 square foot or by other methods approved by the Engineer or designated in Section 25.

23. ACCEPTANCE OF THE CONCRETE WORK

Acceptance of the concrete work will be a cumulative acceptance process based upon progressively meeting the requirements of the specifications and drawings for:

- *** Fresh concrete,
- *** Concrete strength and durability,
- *** Structure dimensions, and
- *** Structure appearance.

Fresh Concrete

Fresh concrete conforming to the mix proportions and quality requirements of the approved job mix and the handling and placement requirements of previous sections will be satisfactory.

Concrete Strength

A strength test is the average of the compressive strengths of two standard cured cylinders prepared and tested in accordance with Section 4, unless otherwise specified. The strength of the hardened concrete will be satisfactory if the following requirements are met:

- a. If Method 1 from Section 3 is specified and the concrete work is less than 75 total cubic yards for the class of concrete specified, the compressive strength of the concrete will be satisfactory if no individual strength test falls more than 500 psi below the specified compressive strength (f'_c) for the respective class of concrete.
- b. If Method 1 from Section 3 is specified and the concrete work is 75 total cubic yards or more for the class of concrete specified, the compressive strength of the concrete will be satisfactory if both of the following requirements are met:
 - (1) No individual strength test falls more than 500 psi below the specified compressive strength (f'_c) for the class of concrete specified.
 - (2) The average of any three consecutive strength tests is not less than the specified compressive strength (f'_c) two or more consecutive times for the class of concrete specified.

The Contractor shall take steps to increase the average of subsequent strength tests when the average of any three consecutive strength tests falls below the specified concrete strength (f'_c).

- c. The Engineer will determine the structural adequacy and evaluate the durability of the in-place concrete when the concrete strength based on the standard cured

concrete cylinders is unsatisfactory. The Engineer will determine the need for additional quality assurance testing.

- d. The Contractor may core the concrete, have the cores tested by a certified testing laboratory at the Contractor's expense, and submit test results to the Engineer for consideration and evaluation of concrete strength adequacy when the concrete strength based on the standard cured concrete cylinders is unsatisfactory.
- e. Sampling and testing concrete by coring shall conform to Section 4. The strength of the concrete based upon concrete cores will be satisfactory if both of the following requirements are met:
 - (1) The average compressive strength of the three cores equal or exceed 85 percent of the specified compressive strength (f'_c).
 - (2) The compressive strength of any individual core does not fall below 75 percent of the specified compressive strength (f'_c).
- f. If Method 2 from Section 3 is specified, the Engineer is responsible for the concrete job mix design and the quality concrete that results from the job mix.

The hardened concrete will be satisfactory if the required batch tickets or other documentation acceptable to the Engineer clearly show that the batch ingredients and weights of each ingredient including all admixtures conforms to the job mix provided by the Engineer. Random periodic inspection of the batching operations may be made by the Engineer to verify that ingredients and ingredient proportions conform to the batching documentation.

If the concrete ingredients, proportions, or admixtures varies from the job mix provided by the Engineer, the concrete may be rejected if, in the judgment of the Engineer, the variance will significantly affect the strength or durability of the concrete or will adversely affect the life expectancy or other components of the structure.

Structure Dimensions and Appearance

The appearance of the concrete shall meet the requirements of Sections 17 and 18.

The dimensions of formed members, unless otherwise specified, will be satisfactory if they conform to the requirements of the specifications, the locations shown on the drawings, and are within acceptable tolerances below:

- a. Variation from plumb for walls and column shall be not more than 0.2% of the wall or column height.
- b. Variation from specified elevations for slabs, floors, or other horizontal members shall be not more than 0.2% of the length of the member in the direction of grade.

- c. Variations in the cross-sectional dimensions of columns and beams and in the thickness of walls and above-grade slabs shall not be more than minus 1/4 inch or plus 1/2 inch from the shown dimensions.

24. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, concrete will be measured to the neat lines or pay limits shown on the drawings, and the volume of concrete will be computed to the nearest 0.1 cubic yard. No deduction in volume will be made for chamfers, rounded or beveled edges, or for any void or embedded item that is less than five cubic feet in volume. Where concrete is placed against the sides or bottom of an excavation without intervening forms, drainfill, or bedding, the volume of concrete required to fill voids resulting from overexcavation outside the neat lines or pay limits will be included in the measurement for payment where such overexcavation is directed by the Engineer to remove unsuitable foundation material; but only to the extent that the unsuitable condition is not a result of the Contractor's improper construction operations, as determined by the Engineer.

Method 1 Payment for each item of concrete will be made at the contract unit price for that item. The payment for concrete will constitute full compensation for completion of the concrete work, including joint fillers, waterstops, dowels or dowel assemblies and metal plates, but not including reinforcing steel or other items listed for payment elsewhere in the contract.

Method 2 Payment for each item of concrete will be made at the contract unit price for that item. The payment for concrete will constitute full compensation for completion of the concrete work, including joint fillers, waterstops, metal plates, dowels, and other assemblies, but not including furnishing and placing reinforcing steel or furnishing and handling cement or other items listed for payment elsewhere in the contract.

Cement will be measured by dividing the volume of concrete accepted for payment by the yield of the applicable job mix. The yield will be determined by the procedure specified in ASTM C 138. If the amount of cement actually used per batch exceeds the amount in the job mix specified by the Engineer, the measurement will be based on the amount of cement specified by the Engineer for the job mix. Unless otherwise stated in Section 25, a bag of cement will be considered 94 pounds. Payment for each type of cement will be made at the contract unit price for furnishing and handling that type of cement and such payment will constitute full compensation for furnishing and handling the cement.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 25 of this specification.

INSTRUCTIONS FOR THE USE OF CONSTRUCTION SPECIFICATION 32

STRUCTURE CONCRETE

1. APPLICABILITY

Construction Specification 32 is applicable for the installation of low and moderate hazard structures, where the quantity of concrete is generally 75 cubic yards or less per structure, and where the location of the structure will allow economical maintenance or replacement.

2. MATERIAL SPECIFICATIONS

Material Specifications [522](#), [531](#), [532](#), [533](#), [534](#), [535](#), [537](#), and [538](#) are complementary to Construction Specification 32. When local aggregates do not conform to the requirements of Material Specification [522](#) but are known to produce concrete of adequate quality, reference to Interim Standard Material Specification is permissible, or requirements may be stated in the construction details in Section 24.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Class of concrete.
- b. Type, size and quantity of joint filler, waterstop, and any other items to be embedded.
- c. Type of cement.
- d. Specify in Section 24 if fly ash or ground blast furnace slag is required or is not allowed in the design mix as a partial substitute for cement.
- e. Nominal size of coarse aggregate; or specifications for aggregate if Material Specification [522](#) does not apply-
- f. Type of admixtures, if any.
- g. Special slump and air content requirements, if applicable.
- h. If volumetric batching and continuous mixing will not be permitted, include a statement to that effect.
- i. Special type of finish or coating of finished surfaces.
- j. Note in Section 24 any other deviations from the basic specifications.

4. DISCUSSION OF METHODS

a. Section 23, Measurement and Payment

Describe method of measurement and payment if it differs from the methods listed.

CONSTRUCTION SPECIFICATION

32. STRUCTURE CONCRETE

1. SCOPE

The work shall consist of furnishing, forming, placing, finishing, and curing portland cement concrete as required to build the structures described in Section 24 of this specification.

2. MATERIALS

Aggregates shall conform to the requirements of Material Specification 522 unless otherwise specified. The grading of coarse aggregates shall be as specified in Section 24.

Portland cement shall conform to the requirements of Material Specification 531 for the specified type.

Fly ash shall conform to the requirements of Material Specification 532.

Air-entraining admixtures shall conform to the requirements of Material Specification 533. If air-entraining cement is used, any additional air-entraining admixture shall be of the same type as that in the cement.

Water reducing and/or retarding admixtures shall conform to the requirements of Material Specification 533.

Curing compound shall conform to the requirements of Material Specification 534.

Preformed expansion joint filler shall conform to the requirements of Material Specification 535.

Waterstops shall conform to the requirements of Material Specifications 537 and 538 for the specified kinds.

Water used in mixing and curing concrete shall be clean and free from injurious amounts of oil, salt, acid, alkali, organic matter or other deleterious substances.

3. CLASS OF CONCRETE

Concrete for structure concrete shall be classified as follows:

<u>Class of Concrete</u>	<u>Maximum Net Water Content (gallons/bag)</u>	<u>Minimum Cement Content (bags/cu. yd.)</u>
3000M	6	5-1/2
4000M	6	6

4. AIR CONTENT AND CONSISTENCY

Unless otherwise specified, the slump shall be 3 to 5 inches. If air entrainment is specified, the air content by volume shall be 4 to 7 percent of the volume of the concrete. When specified, directed or approved by the Engineer, a water-reducing, set-retarding or other admixture shall be used. High Range Water Reducing Agents (Superplasticizers) may be used to increase workability, reduce water content and control concrete temperature in hot weather. The maximum slump after adding high range water reducing agents shall be 7-1/2 inches.

5. DESIGN OF THE CONCRETE MIX

The proportions of the aggregates shall be such as to produce a concrete mixture that will work readily into the corners and angles of the forms and around reinforcement when consolidated, but will not segregate or exude free water during consolidation.

Fly ash may be used as a partial substitution for portland cement in an amount not greater than 25 percent (by weight) of the cement in the concrete mix, unless otherwise specified.

Prior to placement of concrete, the Contractor shall furnish the Engineer, for approval, a statement of the materials and mix proportions (including admixtures, if any) he intends to use. The statement shall include evidence satisfactory to the Engineer that the materials and proportions will produce concrete conforming to this specification. The materials and proportions so stated shall constitute the "job mix". After a job mix has been approved, neither the source, character or grading of the aggregates nor the type or brand of cement or admixture shall be changed without prior notice to the Engineer. If such changes are necessary, no concrete containing such new or altered materials shall be placed until the Engineer has approved a revised job mix.

6. INSPECTION AND TESTING

The Engineer shall have free entry to the plant and equipment furnishing concrete under the contract. Proper facilities shall be provided for the Engineer to inspect materials, equipment and processes and to obtain samples of the concrete. All tests and inspections will be conducted so as not to interfere unnecessarily with manufacture and delivery of the concrete.

7. HANDLING AND MEASUREMENT OF MATERIALS

Materials shall be stockpiled and batched by methods that will prevent segregation or contamination of aggregates and insure accurate proportioning of the ingredients of the mix.

Except as otherwise provided in Section 8, cement and aggregates shall be measured as follows:

Cement shall be measured by weight or in bags of 94 pounds each. When cement is measured in bags, no fraction of a bag shall be used unless weighed.

Aggregates shall be measured by weight. Mix proportions shall be based on saturated, surface-dry weights. The batch weight of each aggregate shall be the required saturated, surface-dry weight plus the weight of surface moisture it contains.

Water shall be measured, by volume or by weight, to an accuracy within one percent of the total quantity of water required for the batch.

Admixtures shall be measured within a limit of accuracy of three percent.

8. MIXERS AND MIXING

Concrete shall be uniform and thoroughly mixed when delivered to the work site. Variations in slump of more than one (1) inch within a batch will be considered evidence of inadequate mixing and shall be corrected by increasing mixing time or other acceptable alternative.

For stationary mixers, the mixing time after all cement and aggregates are in the mixer drum shall be not less than 1-1/2 minutes. When concrete is mixed in a truck mixer, the number of revolutions of the drum or blades at mixing speed shall be not less than 70 nor more than 100.

Unless otherwise specified, volumetric batching and continuous mixing at the construction site will be permitted. The batching and mixing equipment shall conform to the requirements of ASTM Specification C 685 and shall be demonstrated prior to placement of concrete, by tests with the job mix, to produce concrete meeting the specified proportioning and uniformity requirements. Concrete made by this method shall be produced, inspected, and certified in conformance with Sections 6, 7, 8, 13, and 14 of ASTM Specification C 685.

No mixing water in excess of the amount called for by the job mix shall be added to the concrete during mixing or hauling or after arrival at the delivery point.

9. FORMS

Forms shall be of wood, plywood, steel or other approved material and shall be mortar tight. The forms and associated falsework shall be substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions and contours. Form surfaces shall be smooth and free from holes, dents, sags or other irregularities. Forms shall be coated with a non-staining form release agent before being set into place.

Metal ties or anchorages within the forms shall be equipped with cones, she-bolts or other devices that permit their removal to a depth of at least one inch without injury

to the concrete. Ties designed to break off below the surface of the concrete shall not be used without cones.

All edges that will be exposed to view when the structure is completed shall be chamfered, unless finished with molding tools as specified in Section 18.

10. PREPARATION OF FORMS AND SUBGRADE

Prior to placement of concrete, the forms and subgrade shall be free of chips, sawdust, debris, water, ice, snow, extraneous oil, mortar, or other harmful substances or coatings and the temperature of all surfaces to be in contact with the new concrete shall be not be less than 40° F. Any oil on the reinforcing steel or other surfaces required to be bonded to the concrete shall be removed. Rock surfaces shall be cleaned by air-water cutting, wet sandblasting or wire brush scrubbing, as necessary, and shall be wetted immediately prior to placement of concrete. Earth surfaces shall be firm and damp. Placement of concrete on mud, dried earth or uncompacted fill or frozen subgrade will not be permitted.

Items to be embedded in the concrete shall be positioned accurately and anchored firmly.

Weepholes in walls or slabs shall be formed with nonferrous materials.

11. CONVEYING

Concrete shall be delivered to the site and discharged into the forms within 1-1/2 hours after the introduction of the cement to the aggregates. In hot weather or under conditions contributing to quick stiffening of the concrete, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes.

The Engineer may allow a longer time, provided the setting time of the concrete is increased a corresponding amount by the addition of an approved set-retarding admixture. In any case, concrete shall be conveyed from the mixer to the forms as rapidly as practicable by methods that will prevent segregation of the aggregates and no loss of mortar occurs.

12. PLACING

Concrete shall not be placed until the subgrade, forms, steel reinforcement, and embedded items have been inspected and approved. No concrete shall be placed except in the presence of the Engineer. The Contractor shall give reasonable notice to the Engineer each time he intends to place concrete. Such notice shall provide sufficient time for the Engineer to inspect the subgrade, forms, steel reinforcement and other preparations for compliance with the specifications. "Other preparations" include but are not limited to the concrete mixing plant, delivery equipment system, placing, finishing, and curing equipment and system, schedule of work, workforce,

heating or cooling facilities if applicable. Deficiencies are to be corrected before concrete is delivered for placing.

The concrete shall be deposited as closely as possible to its final position in the forms and shall be worked into the corners and angles of the forms and around all reinforcement and embedded items in a manner to prevent segregation of aggregates or excessive laitance. Formed concrete shall be placed in horizontal layers not more than 20 inches thick. Concrete shall not be dropped more than five feet vertically unless suitable equipment is used to prevent segregation. When high range water reducing agents are used, the concrete shall not be allowed to drop more than 10 feet. Hoppers and chutes, pipes or "elephant trunks" shall be used as necessary to prevent segregation and the splashing of mortar on the forms and reinforcing steel above the layer being placed.

Immediately after the concrete is placed in the forms, it shall be consolidated by spading, hand tamping or vibration as necessary to insure smooth surfaces and dense concrete. Each layer shall be consolidated to insure monolithic bond with the preceding layer. If the surface of a layer of concrete in-place sets to the degree that it will not flow and merge with the succeeding layer when spaded or vibrated, the Contractor shall discontinue placing concrete and shall make a construction joint according to the procedure specified in Section 13.

If placing is discontinued when an incomplete horizontal layer is in place, the unfinished end of the layer shall be formed by a vertical bulkhead.

13. CONSTRUCTION JOINTS

Construction joints shall be made at the locations shown on the drawings. If construction joints are needed which are not shown on the drawings, they shall be placed in locations approved by the Engineer.

Where a feather edge would be produced at a construction joint, as in the top surface of a sloping wall, an insert form shall be used so that the resulting edge thickness on either side of the joint is not less than 6 inches.

In walls and columns, as each lift is completed, the top surfaces shall be immediately and carefully protected from any condition that might adversely affect the hardening of the concrete.

Steel tying and form construction adjacent to concrete in-place shall not be started until the concrete has cured at least 12 hours. Before new concrete is deposited on or against concrete that has hardened, the forms shall be re-tightened. New concrete shall not be placed until the hardened concrete has cured at least 12 hours.

Surfaces of construction joints shall be cleaned of all unsatisfactory concrete, laitance, coatings or debris by washing and scrubbing with a wire brush or wire broom or by other means approved by the Engineer. The surfaces shall be kept moist for at least one hour prior to placement of the new concrete.

14. EXPANSION AND CONTRACTION JOINTS

Expansion and contraction joints shall be made only at locations shown on the drawings.

Exposed concrete edges at expansion and contraction joints shall be carefully tooled or chamfered, and the joints shall be free of mortar and concrete. Joint filler shall be left exposed for its full length with clean and true edges.

Preformed expansion joint filler shall be held firmly in the correct position as the concrete is placed.

When open joints are specified, they shall be constructed by the insertion and subsequent removal of a wooden strip, metal plate or other suitable template in such a manner that the corners of the concrete will not be chipped or broken. The edges of open joints shall be finished with an edging tool prior to removal of the joint strips.

15. WATERSTOPS

Waterstops shall be held firmly in the correct position as the concrete is placed. Joints in metal waterstops shall be soldered, brazed or welded. Joints in rubber or plastic waterstops shall be cemented, welded or vulcanized as recommended by the manufacturer.

16. REMOVAL OF FORMS

Forms shall not be removed without the approval of the Engineer. Forms shall be removed in such a way as to prevent damage to the concrete. Supports shall be removed in a manner that will permit the concrete to take the stresses due to its own weight uniformly and gradually.

17. FINISHING FORMED SURFACES

Immediately after the removal of the forms:

- a. All fins and irregular projections shall be removed from exposed surfaces.
- b. The holes produced on all surfaces by the removal of form ties, cone-bolts, and she-bolts shall be cleaned, wetted and filled with a drypack mortar consisting of one part portland cement, three parts sand that will pass a No. 16 sieve, and just sufficient water to produce a consistency such that the filling is at the point of becoming rubbery when the material is solidly packed.

18. FINISHING UNFORMED SURFACES

All exposed surfaces of the concrete shall be accurately screeded to grade and then float finished, unless specified otherwise.

Excessive floating or troweling of surfaces while the concrete is soft will not be permitted.

The addition of dry cement or water to the surface of the screeded concrete to expedite finishing will not be allowed.

Joints and edges on unformed surfaces that will be exposed to view shall be chamfered or finished with molding tools.

19. CURING

Concrete shall be prevented from drying for a curing period of at least 7 days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period, or until curing compound is applied as specified below. Moisture shall be maintained by sprinkling, flooding or fog spraying or by covering with continuously moistened canvas, cloth mats, straw, sand or other approved material. Wood forms left in-place during the curing period shall be kept continuously wet. Formed surfaces shall be thoroughly wetted immediately after forms are removed and shall be kept wet until patching and repairs are completed. Water or covering shall be applied in such a way that the concrete surface is not eroded or otherwise damaged.

Concrete, except at construction joints, may be coated with the approved curing compound in lieu of continued application of moisture, except as otherwise specified in Section 24. The compound shall be sprayed on the moist concrete surfaces as soon as free water has disappeared, but shall not be applied to any surface until patching, repairs and finishing of that surface are completed. The compound shall be applied at a uniform rate of not less than one gallon per 175 square feet of surface and shall form a continuous adherent membrane over the entire surface. Curing compound shall be thoroughly mixed before applying and continuously agitated during application. Curing compound shall not be applied to surfaces requiring bond to subsequently placed concrete, such as construction joints, shear plates, reinforcing steel and other embedded items. If the membrane is damaged during the curing period, the damaged area shall be re-sprayed at the rate of application specified above. Surfaces covered by the membrane shall not be trafficked unless protected from wear.

20. REMOVAL AND REPLACEMENT OR REPAIR

When concrete is honeycombed, damaged or otherwise defective, the Contractor shall remove and replace the structure or structural member containing the defective concrete or, where feasible, correct or repair the defective parts. The Engineer will determine the required extent of removal, replacement or repair. Prior to starting repair work the Contractor shall obtain the Engineer's approval of his plan for effecting the repair. The Contractor shall perform all repair work in the presence of the Engineer.

21. CONCRETING IN COLD WEATHER

Concrete shall not be mixed nor placed when the daily minimum atmospheric temperature is less than 40° F unless facilities are provided to prevent the concrete from freezing. The use of accelerators or antifreeze compounds will not be allowed.

22. CONCRETING IN HOT WEATHER

The Contractor shall apply effective means to maintain the temperature of the concrete below 90° F during mixing, conveying and placing.

23. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, concrete will be measured to the neat lines shown on the drawings and the volume of concrete will be computed to the nearest 0.1 cubic yard. Measurement of concrete placed against the sides of an excavation without the use of intervening forms will be made only to the neat lines or pay limits shown on the drawings. No deduction in volume will be made for chamfers, rounded or beveled edges or for any void or embedded item that is less than five (5) cubic feet in volume.

Payment for each item of structure concrete will be made at the contract unit price or the contract lump sum, whichever is applicable, for that item. Such payment will constitute full compensation for all labor, materials, equipment, transportation, tools, forms, falsework, bracing and all other items necessary and incidental to the completion of the work, except items listed for payment elsewhere in the contract.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 24 of this specification.

SHOTCRETE

1. APPLICABILITY

Construction Specification 33 is applicable to the placement of dry mix and wet mix shotcrete.

2. MATERIAL SPECIFICATIONS

The following specifications are complementary to Construction Specification 33:

- a. [Portland Cement Specification 531](#)
- b. [Aggregates Specification 522](#)
- c. [Curing Compounds Specification 534](#)

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Complete engineering drawings and structural detail drawings as specified in Section 6, National Engineering Handbook, including as a minimum:
 - (1) Plans and cross sections showing the surface dimensions and thickness of all shotcrete slabs, walls, or layers and neat pay lines.
 - (2) Reinforcement details including bar placement diagrams.
 - (3) Finish lines and grades.
 - (4) Joint and edge details.
- b. The condition or orientation of subgrade materials or surfaces. Identify wet areas that will require special treatment. Detail the special treatment that will be required (special shotcrete mixtures that may include silica fume and/or accelerators for flash sets, drainage blankets, special subsurface treatment, etc.).
- c. Notes as necessary to indicate special placement or finishing requirements.
- d. Type of cement.
- e. Special admixtures. i.e., silica fume, fibers, high range water reducers, air entraining, and accelerators. Calcium chloride shall not be used in shotcrete containing steel embedments.
- f. Required compressive strength.
- g. Nozzleman qualifications as stated in Section 6 are considered appropriate for most complex jobs with significant amount of concrete. Qualification requirements may be reduced for small, simple jobs as determined by the designer.

- h. Volumetric batching is permitted in Section 7 for projects with difficult access, small volumes of shotcrete, or low placement rates. Volume batching where permitted shall be specified in Section 19 by aggregate and cement batching by the bag or pre-blended dry cement and aggregate.

4. DISCUSSION OF METHODS

a. Section 18, Measurement and Payment

- (1) Method 1 is intended for use where shotcrete in place is to be reasonably uniform in shape and thickness so that measurement of the surface area will be feasible and will be representative of the amount of shotcrete placed.
- (2) Method 2 is intended for use where measurement of shotcrete in place will not be feasible or when payment by materials in place will not be feasible or when payment by materials used rather than shotcrete in place is desirable for other reasons.

When specifications are prepared using electronic procedures and all but one measurement and payment method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

33. SHOTCRETE

1. SCOPE

The work shall consist of furnishing, mixing, applying and curing shotcrete. Except as otherwise specified, either a dry mix or wet mix process may be used.

2. MATERIALS

[Portland cement](#) shall conform to the requirements of Material Specification [531](#) for the specified type.

[Aggregates](#) shall conform to the requirements of Material Specification [522](#) unless otherwise specified. Gradation shall be one of the three options specified by ACI 506R, Table 2.1 unless otherwise specified.

[Admixtures](#), if specified, shall meet the requirements indicated. Non-chloride chemical admixtures shall conform to ASTM C 494. Air-entraining admixtures shall conform to ASTM C 260. Fly ash or pozzolanic materials shall conform to ASTM C 618. Calcium chloride shall conform to ASTM D 98 and shall be in flake or pellet form.

Water used in mixing or curing shotcrete shall be clean and free from injurious amounts of oil, salt, acid, alkali, organic matter or other deleterious substances.

[Curing compound](#) shall conform to the requirement of Material Specification [534](#).

3. STRENGTH AND QUALITY

The compressive strength of shotcrete at the age of 28 days shall be not less than specified in Section 19 of this specification.

Shotcrete shall be uniform and dense, free from "drummy" areas that indicate laminations, voids, sand pockets, or disbanded material.

4. CONSISTENCY

The proportion of water added to the mixture shall be accurately controlled to produce thorough and uniform hydration of the shotcrete. The consistency of the shotcrete shall be such that the surface of the shotcrete in place shall have a rich, glossy appearance and that the shotcrete shall adhere to the supporting surface without flowing, slumping or sloughing. For application to vertical or overhanging surfaces the mix proportions shall be adjusted so that the placed shotcrete will adhere to a minimum thickness of 3/4-inch without sagging or sloughing. For adjustment of consistency the addition of fly ash or pozzolanic material to the mixture in amounts not greater than 20-percent (by weight) of cement in the mixture will be permitted.

5. INSPECTION AND TESTING

Procedures for preparing shotcrete test panels and the testing specimens sawed or cored from panels will be performed in accordance with ASTM Method C 1140. The compression test specimens will be cores taken from the test panels or from the structure.

Similar panels not less than 18 inches square and not less than six (6) inches thick shall be made periodically as directed by the Engineer during the progress of the work.

Cores, taken from the test panels, shall receive standard curing in lime-saturated water at $73.4^{\circ} \pm 3.0^{\circ}$ F within 24 hours after removal. Cores shall continue to receive the prescribed initial cure treatment until standard curing is commenced.

For each strength test, three (3) cores will be tested in compression. The test result will be the average of the strengths of the three (3) specimens, except that if one specimen shows manifest evidence of improper sampling, coring, or testing, it will be discarded and the strengths of the remaining two (2) specimens will be averaged. If more than one (1) specimen representing a test shows such defects, the entire test will be discarded.

The Contractor shall furnish the forms and make the required test panels and shall provide such facilities, materials and assistance as may be necessary for curing, handling, and protecting the panels. Test panels shall be cast only when the Engineer is present.

6. NOZZLE OPERATOR QUALIFICATIONS

The nozzle operator shall be able to document a minimum of 3000 hours of experience as a nozzle operator and shall have completed at least one (1) similar application as a nozzle operator, unless otherwise specified.

The nozzle operator and application crew members shall be required to meet pre-construction testing requirements administered by the Engineer on a test panel or an area as follows:

The Engineer will carefully observe shooting of the test panel or area and note if the nozzle operator examinee:

- a. Cleans the shooting surface with air and water prior to shooting.
- b. Applies a bonding coat on the shooting surface ahead of the heavier shotcrete applications.
- c. Directs shotcrete application around reinforcement in a manner which prevents buildup on the face of the reinforcement and allows the shotcrete to flow and compact tightly around the back of the reinforcement.

- d. If applicable, directs the finisher or nozzle helper to cutout any sags, sand or rebound pockets.
- e. If applicable, and where necessary, directs the finisher or nozzle helper to broom the shotcrete surface prior to application of additional layers.

7. MEASURING MATERIALS

The proportions of the shotcrete mix shall be controlled on the basis of the weight of each component material, unless otherwise specified in Section 19 of this specification, except that water may be measured by volume. Materials shall have the following batch tolerances of their mix proportion weights: Cement, plus or minus two (2) percent; Aggregate, plus or minus four

(4) percent; Admixtures, plus or minus six (6) percent. Weighing equipment used shall be accurate to within 0.4 percent of scale capacity.

8. EQUIPMENT

The Contractor shall furnish all equipment necessary for batching, mixing and placing the shotcrete. The equipment shall meet the following requirements.

The placing equipment for dry mix shotcrete shall be designed and equipped to receive the dry mix, introduce the mix into a stream of compressed oil free dry air, convey the mix pneumatically through a delivery hose to a nozzle at the point of discharge, inject water under pressure into the suspended stream of dry sand and cement within the nozzle, and spray the resulting shotcrete mix onto the surface of the work at a uniform rate and at a controlled velocity. The placing equipment shall be equipped with accurate gauges to indicate the air pressure and water pressure and with devices capable of accurately controlling the air pressure at any level between 50-psi and 80-psi, the water pressure at any level between 50-psi and 100-psi, and the rate of application of water at the nozzle.

The placing equipment for wet mix shotcrete shall be designed and equipped to receive the shotcrete from the mixer, convey it through a delivery hose to a nozzle at the point of discharge, accelerate it in the nozzle by means of compressed oil free dry air, and spray it onto the surface of the work. It shall be capable of delivering shotcrete to the nozzle uniformly and continuously and discharging it from the nozzle at a uniform rate and at a controlled velocity sufficient for all parts of the work.

Batch and continuous mixing equipment shall include: a power-driven mixer capable of thoroughly mixing the materials at a rate adequate to insure uniform feeding of the mixture to the placing equipment; and a feeding apparatus capable of supplying the mixture to the placing equipment at an adequate and uniform rate.

9. MIXING

Dry Mix Shotcrete The cement and admixtures and other additives (except accelerator) shall be mixed into a predampened homogeneous mass that thoroughly coats the aggregate before being fed through a vibratory screen into the placing equipment. Proper pre-dampening shall be indicated by the "ball-in-hand" test as follows: When a small amount of mix is tightly squeezed the resulting ball will hold together or crack slightly but essentially remain whole. The mix has too little pre-dampening moisture if the ball crumbles into discrete particles when the hand is opened and/or color is light gray. If moisture comes off on the hand, too much pre-dampening moisture is in the mix. The properly pre-dampened dry mix shall be used within 45 minutes after mixing (15 minutes in hot weather conditions with temperatures over 85° F) and any material that becomes dried out or caked after mixing shall be wasted. Rebound material shall not be remixed or reused.

Wet Mix Shotcrete Air-entrainment and chemical admixtures may only be used in wet mix concrete. The cement, sand, admixtures (except accelerator) and water shall be thoroughly mixed in the mixer drum sufficiently to produce shotcrete of the required consistency that is uniform within each batch and uniform from batch to batch when discharged into the placing equipment.

Accelerators, if specified, shall be mixed at the nozzle. Ready-mix concrete shall conform to the requirements of ASTM C 94 unless otherwise specified.

The entire contents of the mixer shall be discharged from the drum before materials for a succeeding batch are placed therein. A mix that becomes difficult to pump shall be discarded; otherwise, a batch shall be gunned within 1 1/2 hours of batching in normal weather and within 45 minutes during hot weather conditions (temperatures over 85° F). Rebound material shall not be remixed or reused.

10. FORMS

Forms shall be structurally adequate and of such design that rebound or accumulated loose sand can freely escape or be readily removed. Shooting strips shall be used at corners, edges, and on surfaces where necessary to obtain true lines and proper thickness. Where practicable, ground wires shall be installed as guides to accurately establish the specified contour of the finished surface of shotcrete. Ground wires shall be set and used as guides for templates in forming curved and molded surfaces. When shotcrete is to be placed on horizontal or sloping surfaces, headers and ground wires shall be provided to the extent necessary to insure control of slab thickness. Ground wires shall be tightened and kept taut, secure, and true to line and plane during placement of shotcrete and shall be removed when placement is completed.

Header boards will be required where the drawings indicate a square edge and at required joints. Form surfaces shall be thoroughly cleaned and a form release agent applied before shotcrete is placed.

11. PREPARATION OF SURFACES TO RECEIVE SHOTCRETE

All surfaces to receive or support shotcrete shall be carefully prepared and conditioned. All such prepared surfaces shall be inspected and approved by the Engineer prior to the application of shotcrete.

Earth surfaces to which shotcrete is to be applied shall be firmly compacted and neatly trimmed to line and grade.

Asphaltic concrete surfaces shall be thoroughly cleaned of any growths, earth, or any other material that would affect bond, or be detrimental to the shotcrete.

Concrete, mortar, or rock surfaces shall be thoroughly cleaned by water blasting or sand blasting to remove all dirt, laitance, weak or unbonded mortar, loose material, grease or other deleterious substances.

Surfaces on which the shotcrete is to be placed shall be sufficiently rough to insure the adherence of the shotcrete. Offsets which would cause an abrupt and substantial change in thickness of the shotcrete shall be removed or tapered.

All surfaces shall be maintained in a moistened condition for three (3) hours before application of shotcrete. Shotcrete shall not be applied to mud, dried earth, uncompacted fill, rebound material, or surfaces on which free water exists unless otherwise specified in Section 19. All ice, snow and frost shall be removed and the temperature of all surfaces, to be in contact with the new shotcrete shall be no colder than 40° F.

12. PLACING

The Contractor shall have all equipment and materials required for curing available at the site and ready for use before placement of shotcrete begins. No shotcrete shall be placed except in the presence of the Engineer or authorized representative. The Contractor shall give reasonable notice to the Engineer each time shotcrete placement is scheduled. Such notice shall be far enough in advance to give the Engineer adequate time to inspect the surfaces to which the shotcrete is to be applied, the forms, steel reinforcement, and other preparations for compliance with the specifications prior to the start of placement operations.

During placement of shotcrete the air pressure shall be adjusted as required to control rebound and density of shotcrete. For a given application, once the optimum operating pressures have been established they shall be maintained constant throughout the application. For dry mix shotcrete, the air pressure at the material outlet or air-inlet on the gun shall be not less than 40 psi plus 5 psi for each 50 feet of length of the discharge hose greater than 100 feet and 5 psi for each 25 feet the nozzle is above the gun (shotcrete delivery equipment). The water pressure at the nozzle shall be not less than 15 psi greater than the air pressure at the material outlet or air-inlet on the gun.

For most applications the placing nozzle shall be held between two (2) and six (6) feet from and approximately normal to the surface of the work. At longer distances it may be necessary to increase the nozzle velocity so that the impact velocity will suit the requirements of the application. Corners shall be filled first.

Shotcrete shall be applied in a single thickness or to a layer thickness no greater than that which will cause sagging, sloughing, or dropout. Sags and sloughs shall be cut out and regunned. Replacement shall be accomplished before the previously placed shotcrete has completely set. When shotcrete is placed on a vertical surface, application shall be started at the bottom and be completed at the top.

In any case when the placing of shotcrete is interrupted for more than one (1) hour, the edge of the layer shall be sloped off at an angle of approximately 45 degrees to the surface being shot, and the sloped portion shall be covered with a double layer of six (6) ounce burlap and kept continuously moist until the application of shotcrete is resumed. Before applying new material, the sloped portion shall be thoroughly cleaned and wetted by means of an air and water blast or an equally effective method approved by the Engineer.

Material that rebounds and accumulates on forms, subgrade surfaces or reinforcing steel ahead of the shotcrete being placed shall be removed and discarded.

13. FINISHING

Rebound material shall be carefully swept off the finished shotcrete surface and discarded before it becomes too hard for removal. After the shotcrete has been placed to the depth required, the surface shall be checked with a straightedge or template and any low spots shall be brought up to grade by placing additional shotcrete. The finished surface of the shotcrete shall be left as a natural gun finish unless screeding and or further finishing are specified in Section 19 of this specification.

When specified screeding shall be accomplished as follows: Place shotcrete a fraction beyond the guide strips, ground wires or forms. Allow the surface of the shotcrete to stiffen to the point it will not pull or crack under screeding or troweling. Trim, slice, or scrape excess material to true line and grade and remove the placing guides.

A natural rod finish shall consist of the removal, by floating, of the impressions left after the guide strips or ground wires have been removed.

A natural broom finish shall be that finish resulting from brooming the natural rod finish.

A float finish shall be that finish resulting from floating the natural rod finish with a wood or rubber float.

14. CURING

Shotcrete shall be prevented from drying for a curing period of at least seven (7) days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period or until curing compound is applied as specified below. Moisture shall be maintained by sprinkling, flooding or fog spraying, or by covering with continuously moistened canvas, cloth mats, straw, sand or other approved material. Wood forms left in place during the curing period shall be kept wet. Formed surfaces shall be thoroughly wetted immediately after forms are removed and shall be kept wet until patching and repairs are completed. Water, or covering, shall be applied in such a way that the shotcrete surface is not eroded or otherwise damaged.

Water for curing shall be clean and free from any substances that will cause discoloration of the shotcrete where finished surfaces will be exposed to view.

Except as otherwise specified in Section 17 d. of this specification, and except for surfaces to which additional shotcrete is to be applied, shotcrete may be coated with curing compound as an alternative to the continued application of moisture.

The compound shall be sprayed on the moist shotcrete surfaces as soon as rebound has been removed and any required repairs are completed, or as soon as water curing is discontinued.

The curing compound shall be thoroughly mixed immediately before applied and continuously agitated during application. It shall be applied at a uniform rate of not less than one (1) gallon per 100 square feet of surface for natural gun finishes. Curing compound shall be applied in two (2) applications, one (1) in each direction. If a natural rod, broom, or float finish is specified, the curing compound application rate shall be at least one (1) gallon per 150 square feet. Curing compound shall not check, crack or peel, and shall be free from pinholes or other imperfections.

Curing compound shall not be applied to subgrade surfaces or other surfaces requiring bond with subsequently placed shotcrete, such as construction joints, reinforcing steel and other embedded items.

Surfaces subjected to heavy rainfall or running water within three (3) hours after the compound has been applied, or surfaces damaged by subsequent construction operations during the curing period shall be resprayed in the same manner as for the original applications.

Surfaces covered by the membrane shall not be trafficked unless protected from damage and/or wear.

15. REPLACEMENT OR REPAIR

When shotcrete lacks uniformity, exhibits segregation, honeycombing, or laminations, or contains dry patches, slugs, voids or sand pockets the Contractor

shall remove and replace the defective shotcrete. The Engineer's concurrence in the extent of removal and replacement is required.

Prior to starting significant removal and replacement work the Contractor shall obtain the Engineer's approval of their plan for making the repair. Such approval shall not be considered a waiver of the Contracting Officer's or owner's right to require complete removal of defective work if the completed repair does not produce shotcrete of the required quality and appearance.

Repair work shall be performed only when the Engineer is present.

Repair shall be made with shotcrete conforming to this specification. When removal of defective shotcrete is required, reinforcement damaged or destroyed shall be replaced prior to replacement of the shotcrete. At the edges of removed sections the sound shotcrete shall be carefully trimmed to the extent required to expose sufficient reinforcement for effecting competent splices. The sound shotcrete at the edges of removed sections shall be trimmed to a slope of approximately 45 degrees with the surface of the work and shall be thoroughly moistened prior to placement of the new shotcrete.

Any portions of the work having thickness less than those specified may be repaired by the placement of additional layers of shotcrete, provided that such repair is expressly approved by the Engineer.

Surfaces of the work to which additional shotcrete is to be applied shall be prepared as required by Section 11 of this specification.

Curing as specified in Section 14 of this specification shall be applied to repaired areas immediately after the repairs are completed.

16. PLACING IN COLD WEATHER

When the atmospheric temperature may be expected to drop below 40° F at the time shotcrete is placed, or at any time during the curing period, the following provisions shall also apply:

- a. Shotcrete placement shall be permitted when the air temperature is at least 40° F and rising. Placement shall be discontinued if the temperature falls to 40° F and is expected to continue to fall.
- b. The temperature of the shotcrete at time of placing shall not be less than 50° F nor more than 90° F. The temperature of neither aggregates nor mixing water shall be more than 100° F just prior to mixing with the cement.
- c. When the daily minimum temperature is less than 40° F, shotcrete shall be insulated or housed and heated after placement. The temperature of the shotcrete and air adjacent to the shotcrete shall be maintained at not less than 50° F nor more than 90° F for the duration of the curing period.

- d. Methods of insulating, housing and heating the structure shall be in accordance with "Standard Specification for Cold Weather Concreting," ACI Standard 306.1.
- e. The use of accelerators or antifreeze compounds will not be allowed unless otherwise specified.
- f. When dry heat is used to protect shotcrete, means of maintaining an ambient humidity of at least 40 percent shall be provided unless the shotcrete has been coated with curing compound as specified in Section 14 of this specification or is covered tightly with an approved impervious material.

17. PLACING IN HOT WEATHER

When climatic factors such as high air temperature, reduced relative humidity and increased wind velocities are present, or conditions are such that the temperature of placed shotcrete exceeds 90° F at, or during the first 24 hours after placement, the following provisions shall also apply:

- a. The Contractor shall maintain the temperature of the shotcrete below 90° F during mixing, conveying, and placing using the methods given in items b, c, and d below.
- b. Exposed shotcrete surfaces which tend to dry or set too rapidly shall be continuously moistened by means of fog sprays or otherwise protected from drying immediately after placement.
- c. Shotcrete surfaces exposed to the air shall be covered as soon as the shotcrete has hardened sufficiently and shall be kept continuously wet for at least the first 24 hours of the curing period, and for the entire curing period unless curing compound is applied as specified in Subsection d., below.
- d. If moist curing is discontinued before the end of the curing period, white pigmented curing compound shall be applied immediately, following the procedures specified in Section 14 of this specification.

18. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the dimensions of the exposed surface of the shotcrete will be measured to the neat lines shown on the drawings and the surface area will be computed to the nearest square foot. Payment will be made at the contract unit price for shotcrete. Such payment will constitute full compensation for completion of the work, including making and handling test panels but not including reinforcing steel or other items listed for payment elsewhere in the contract.

Measurement and payment for furnishing and placing reinforcing steel will be made as specified in Construction Specification 34.

Method 2 For items of work for which specific unit prices are established in the contract, cement and aggregates used in shotcrete and in authorized test panels will be measured by the batch weights of the materials charged into the mixer. No deduction will be made for normal rebound; however, payment will not be made for material wasted because the in-place shotcrete does not conform to the specifications. Payment will be made at the contract unit prices for cement and aggregates for shotcrete. Such payment will constitute full compensation for completion of the work, including making and handling test panels but not including reinforcing steel or other items listed for payment elsewhere in the contract.

Measurement and payment for furnishing and placing reinforcing steel will be made as specified in Construction Specification 34.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 19 of this specification.

STEEL REINFORCEMENT

1. APPLICABILITY

Construction Specification 34 is applicable to the placement of steel bar reinforcement and steel welded wire fabric reinforcement for reinforced concrete or pneumatically applied mortar.

2. MATERIAL SPECIFICATIONS

Steel Reinforcement. Material Specification 539 is complementary to Construction Specification 34.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Complete placing drawings prepared by the designer or instructions for the Contractor to prepare placement drawings with steel schedules from the engineering drawings.
- b. Steel schedule and bar list with bending diagram if needed to facilitate the placement drawings. These are usually needed for all except simple structures.
- c. Type and grade of steel if it is necessary to restrict the Contractor's choice from the list in Material Specification 539.
- d. Bar splice requirements are normally covered by the ACI Codes and should be referenced. Unique limitations or exceptions need be included to provide clarity.
- e. Standard Methods would include the following to be used to specify bar splice lengths. There is an option to use one of two methods in specifying lap lengths at bar splices. The required information will vary depending upon the method used.
 - (1) Method 1 show splice locations along with lengths of bars in a schedule that is adequate to meet the design requirements and criteria.
 - (2) Method 2 include the following:
 - (a) Locations where splices are permitted or not.
 - (b) Type of splices at locations permitted contact, non-contact or butt.
 - (c) Splice layout at locations permitted staggered or coincident and alternating or repeated in Section 10.
 - (d) Splice class for each respective location and mat.
 - (e) Concrete design compressive strength, $f'c$.
 - (f) Bar stress condition - tension or compression.

- (g) Designation of "top bars" and "others".
- (h) Steel reinforcement design yield strength.
- f. Method(s) of measurement and payment, if the standard specification includes more than one method.

4. DISCUSSION OF METHODS

a. Section 5, Splicing Bar Reinforcement.

- (1) Method 1 is intended for use when construction drawings for reinforced concrete structures show bar placement details and steel schedules listing bar dimensions and bar shape. Splice locations and bar laps have been determined during design and fully detailed on the drawings. This method will apply when National Standard detail drawings are used.
- (2) Method 2 is intended for use when construction drawings do not contain complete bar placement diagrams and bar schedules. This method should be considered when quality control and other responsibilities are placed on the Contractor. Complete bar placement - drawings and schedules should normally be included in all construction drawings. However, in such cases when engineering drawings are prepared by a project sponsor or an A-E firm and complete bar placement drawings and schedules are not provided, they may be prepared by the steel fabricator based on engineering drawings as shown in ACI 315.

b. Section 9, Measurement and Payment.

- (1) Method 1 is intended for use when all reinforcement is measured by weight.
- (2) Method 2 is intended for use when bar reinforcement is measured by weight and welded wire fabric reinforcement is measured by area.

When specifications are prepared using electronic procedures and all but one measurement and payment method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

34. STEEL REINFORCEMENT

1. SCOPE

The work shall consist of furnishing and placing steel reinforcement for reinforced concrete or pneumatically applied mortar.

2. MATERIALS

Steel reinforcement shall conform to the requirements of Material Specification 539. Before reinforcement is placed, the surfaces of the bars and fabric and any metal supports shall be cleaned to remove any loose, flaky rust, mill scale, oil, grease or other undesirable coatings or foreign substances. Epoxy-coated steel reinforcement shall be free of surface damage. After placement, the reinforcement shall be maintained in a clean and serviceable condition until it is completely embedded within the concrete.

3. BAR SCHEDULE, LISTS AND DIAGRAMS

Any supplemental bar schedules, bar lists or bar-bending diagrams required in Section 10 of this specification to accomplish the fabrication and placement of steel reinforcement shall be provided by the Contractor. Prior to placement of reinforcement, the Contractor shall furnish four copies of any such lists or diagrams to the Engineer for approval. Acceptance of the reinforcement will not be based on approval of these lists or diagrams, but will be based on inspection of the steel reinforcement after it has been placed, tied, supported and ready to receive concrete.

4. BENDING

Reinforcement shall be cut and bent in compliance with the requirements of the American Concrete Institute Standard 315. Bars shall not be bent or straightened in a manner that will injure or weaken the material. Bars with kinks, cracks or improper bends will be rejected.

5. SPLICING BAR REINFORCEMENT

Method 1 Splices of reinforcement shall be made only at locations shown on the drawings and provided by the steel schedule. Placement of bars at the lap splice locations shown, when not in contact, shall not be farther apart than one-fifth (1/5) the shown lap length and in any case no greater than six (6) inches.

Method 2 Splices of reinforcement shall be limited to those locations shown on the drawings. Splice lengths shall be determined prior to fabrication and meet the requirements of ACI Standard 318 "Building Code Requirements for Reinforced Concrete" based upon design information contained in Section 10 of this specification. Bar placement drawings and schedules shall be provided for approval prior to fabrication. The drawings shall show all splice locations, layouts, and lap dimensions.

6. SPLICING WELDED WIRE FABRIC

Unless otherwise specified, welded wire fabric shall be spliced in the following manner:

- a. Adjacent sections shall be spliced end to end (longitudinal lap) by overlapping a minimum of one full mesh plus two (2) inches plus the length of the two end overhangs. The splice length is measured from the end of the longitudinal wires in one piece of fabric to the end of the longitudinal wire in the lapped piece of fabric.
- b. Adjacent sections shall be spliced side to side (transverse lap) a minimum of one full mesh plus two (2) inches. The splice length shall be measured from the centerline of the first longitudinal wire in one piece of fabric to the centerline of the first longitudinal wire in the lapped piece of fabric.

7. PLACING

Reinforcement shall be accurately placed and secured in position in a manner that will prevent its displacement during the placement of concrete. Tack welding of bars will not be permitted. Metal chairs, metal hangers, metal spacers and concrete chairs may be used to support the reinforcement. Metal hangers, spacers and ties shall be placed in such a manner that they will not be exposed in the finished concrete surface. The legs of metal chairs or side form spacers that may be exposed on any face of slabs, walls, beams or other concrete surfaces shall have a protective coating or finish by means of hot dip galvanizing, epoxy coating, plastic coating, or be stainless steel. Metal chairs and spacers not fully covered by a protective coating or finish shall have a minimum cover of 3/4 inch of concrete over the unprotected metal portion except for those with plastic coatings may have a minimum cover of 1/2 inch of concrete over the unprotected metal portion. Pre-cast concrete chairs shall be manufactured of the same class of concrete as specified for the structure and shall have the tie wires securely anchored in the chair or a V-shaped groove at least 3/4 inch in depth molded into the upper surface to receive the steel bar at the point of support. Pre-cast concrete chairs shall be clean and moist at the time concrete is placed.

High density or structural plastic rebar accessories, designed to insure maximum concrete bond, may be substituted for metal or concrete accessories in spacer applications as approved by the Contracting Officer. Exposure of plastic rebar accessories at the finished concrete surface shall be kept to a minimum. Plastic rebar accessories, when used, shall be staggered along adjacent parallel bars and shall be placed at intervals no closer than twelve (12) inches. Plastic rebar accessories shall not be used in concrete section six (6) inches or less in thickness.

Reinforcement shall not be placed until the prepared site has been inspected and approved. After placement of the reinforcement, concrete shall not be placed until the reinforcement has been inspected and approved by the Engineer.

8. STORAGE

Steel reinforcement stored at the work site shall be placed on platforms, skids or other supports and in a manner that contact with the ground is avoided and be protected from mechanical damage and/or corrosion.

9. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the weight of steel reinforcement placed in the concrete in accordance with the drawings will be determined to the nearest pound by computation from the placing drawings. Measurement of hooks and bends will be based on the requirements of ACI Standard 315. Computation of weights of reinforcement will be based on the unit weights established in Tables 34-1 and 34-2 of this specification. Computation of weights for welded wire fabric not shown in Table 34-2 shall be based on ACI Standard 315. The area of welded wire fabric reinforcement placed in the concrete in accordance with the drawings will be determined to the nearest square foot by computation from the placing drawings with no allowance for required laps. The weight of steel reinforcing in extra splices or extra-length splices approved for the convenience of the Contractor or the weight of supports and ties will not be included in the measurement for payment.

Payment for furnishing and placing reinforcing steel will be made at the contract unit price. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work including preparing and furnishing bar schedules, lists or diagrams; furnishing and attaching ties and supports; and furnishing, transporting, storing, cutting, bending, cleaning and securing all reinforcements.

Method 2 For items of work for which specific unit prices are established in the contract, the weight of bar reinforcement placed in the concrete in accordance with the drawings will be determined to the nearest pound by computation from the placing drawings. Measurement of hooks and bends will be based on the requirements of ACI Standard 315. Computation of weights of bar reinforcement will be based on the unit weights established in Table 34-1 of this specification. The weight of steel reinforcing in extra splices or extra length splices approved for the convenience of the Contractor or the weight of supports and ties will not be included in the measurement for payment.

The area of welded wire fabric reinforcement placed in the concrete in accordance with the drawings will be determined to the nearest square foot by computation from the placing drawings with no allowance for required laps.

Payment for furnishing and placing bar reinforcing steel will be made at the contract unit price for bar reinforcement. Payment for furnishing and placing welded wire fabric reinforcing steel will be made at the contract unit price for welded wire fabric reinforcement. Such payment will constitute full compensation for all labor,

materials, equipment and all other items necessary and incidental to the completion of the work including preparing and furnishing bar schedules, lists or diagrams; furnishing and attaching ties and supports; and furnishing, transporting, cutting, bending, cleaning, and securing all reinforcement.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule, will be included in the payment for the item of work to which it is made subsidiary. Such items to which they are made subsidiary are identified in Section 10 of this specification.

TABLE 34 – 1. STANDARD REINFORCING BARS

<u>Bar Size No.</u>	<u>Weight (lb./ft.)</u>
3	0.376
4	0.668
5	1.043
6	1.502
7	2.044
8	2.670
9	3.400
10	4.303
11	5.313
14	7.650
18	13.600

TABLE 34 – 2. RECTANGULAR WELDED WIRE FABRIC

<u>Style Designation</u>		<u>Weight</u>
<u>By Steel Wire Gauge</u>	<u>By W-Number</u>	<u>(lb./100 Sq. Ft.)</u>
6 x 6 – 10 x 10	6 x 6 – W 1.4 x W 1.4	21
6 x 6 – 8 x 8	6 x 6 – W 2.1 x W 2.1	30
6 x 6 – 6 x 6	6 x 6 – W 2.9 x W 2.9	42
6 x 6 – 4 x 4	6 x 6 – W 4.0 x W 4.0	58
4 x 4 – 10 x 10	4 x 4 – W 1.4 x W 1.4	31
4 x 4 – 8 x 8	4 x 4 – W 2.1 x W 2.1	44
4 x 4 – 6 x 6	4 x 4 – W 2.9 x W 2.9	62
4 x 4 – 4 x 4	4 x 4 – W 4.0 x W 4.0	85
4 x 12 – 8 x 12	4 x 12 – W 2.1 x W 0.9*	25
4 x 12 – 7 x 11	4 x 12 – W 2.5 x W 1.1*	31

NOTE: Style Designation is defined in ACI Standard 315 of the American Concrete Institute.

*Welded smooth wire fabric with wires smaller than Size W1.4 is manufactured from galvanized wire.

CONCRETE REPAIR

1. APPLICABILITY

Construction Specification 35 is applicable to the usual types of concrete repair entailed in NRCS operations. Supplementary specifications will be required for works of a special nature, such as:

- a. Placing concrete repair under water.
- b. Concrete repair exposed to sea or salt water.
- c. Concrete repair exposed to alkali soils or alkaline water.
- d. Special surface finishes.

2. MATERIAL SPECIFICATIONS

The following specifications are complementary to Construction Specification 35:

- a. [Aggregates. Specification 522](#)
- b. [Portland Cement. Specification 531](#)
- c. [Fly Ash. Specification 532](#)
- d. [Water-Reducing, Set-Retarding Admixtures. Specification 533](#)
- e. [Air-Entraining Admixtures. Specification 532](#)
- f. [Curing compounds. Specification 534](#)

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Complete engineering and structural detail drawings of the repair.
- b. Notation of the type and quality of concrete, including:
 - (1) Strength of concrete repair material if other than 4000 psi.
 - (2) Type of cement.
 - (3) Types of admixtures, if any.
 - (4) Nominal size of coarse aggregate; or specification for aggregate if Material Specification [522](#) does not apply.
 - (5) Authorization for a design mix that includes pozzolan as a partial substitute for cement.

- (6) Deviations from the air content, if any.
- (7) If replacement concrete is permitted, specify slump of the non-plasticized concrete mixture.
- c. Notation of which strength test procedure is to be used when ASTM C 684 is used.
- d. If volumetric batching and continuous mixing is not permitted, include statement to that effect.
- e. Deviations, if any, from specifications requiring:
 - (1) Placement of concrete repair in a single continuous pour.
 - (2) Consolidation of concrete repair material with vibrators.
- f. Finish requirements for unformed surfaces if other than float finish is designated.

4. DISCUSSION OF METHODS

a. Section 17, Measurement and Payment

- (1) Method 1 is intended for use when the actual approved volume of the repair will be calculated to determine payment.
- (2) Method 2 is intended for use when proprietary repair methods are used and the major components come in pre-measured and pre-packaged units. The size of a unit should be discussed in Section 18.
- (3) Method 3 is intended for use when the actual approved surface area of the repair will be calculated to determine payment.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

35. CONCRETE REPAIR

1. SCOPE

The work shall consist of removal of unsuitable concrete; surface and face preparation; forming; and furnishing, placing, finishing, and curing concrete repair material as required to repair structures designated in Section 18 of this specification.

2. MATERIALS

Aggregates shall conform to the requirements of Material Specification 522 unless otherwise specified. The grading of coarse aggregates shall be as specified in Section 18, shown on the drawings, or as specified by the manufacturer of a proprietary repair material.

Portland cement shall conform to the requirements of Material Specification 531 for the specified type. Only one brand of any type of cement shall be used in any single repair as defined in Section 18.

Water used in mixing and curing of the concrete repair shall be clean and free from injurious amounts of oil, salt, acid, alkali, organic matter or other deleterious substances.

Fly Ash shall conform to the requirements of Material Specification 532.

Air-entraining admixtures shall conform to the requirements of Material Specification 533. If air-entraining cement is used, any additional air-entraining admixture shall be the same type as that in the cement.

Chemical admixtures for water-reducing, retarding, or water-reducing and retarding shall conform to the requirements of Material Specification 533.

Curing compound shall conform to the requirements of Material Specification 534.

Construction Specification 33, Shotcrete.

Proprietary concrete repair materials shall be subject to review and approval of the Engineer prior to use. The material shall meet all specified salient features for repair materials and not react detrimentally with the existing concrete or associated member of the structure being repaired.

Replacement concrete repair materials shall be a material that consists essentially of a binding medium of portland cement and water that will meet all the specified salient features for repair materials and not react detrimentally with the existing concrete or associated members of the structure being repaired. This may be, but is not limited to, a conventional concrete mix with or without admixtures, shotcrete, pre-placed aggregate concrete, or grout.

3. PREPARATION OF AREAS TO BE REPAIRED

All loose, cracked or otherwise unsuitable or defective concrete shall be removed from the existing structure as shown on the drawings or specified in Section 18. The final extent of removal shall be determined by the Engineer after inspection of prepared surfaces.

Feathered edges at the surface will not be permitted. The surface edge of the repaired area shall be cut with a saw, drilled, or chipped to leave a sharp edge with a minimum of a 3/4-inch depth face perpendicular to the face of the wall.

The top-side of the repair hole shall be shaped to a uniform fairly straight face which is sloped upward on a one (1) inch rise for each three (3) inches of depth of cut toward the face from which the repair material will be placed. The repair hole shall be conical in shape with the large end at the surface from which repair material will be placed.

The bottom and vertical or near vertical sides of the hole shall be cut sharply and approximately perpendicular to the face of the wall. All interior corners shall be rounded to a minimum radius of one (1) inch.

Where reinforcement is encountered, the concrete directly in contact with the sides of the reinforcement shall be removed to provide at least 1-inch clear distance between the reinforcement and the in-place concrete.

Prior to placement of concrete repair material, all oil and/or grease shall be steam or solvent cleaned from all reinforcement and surfaces to which the repair materials are required to bond. If solvent cleaning is used, solvents and solvent residues shall not impair the repair material or its bonding strengths.

After removal of all oil and grease, the reinforcement shall be cleaned to remove any loose, flaky rust, mill scale, and other coatings or foreign substances that would impair bonding of the repair material to the reinforcement. The prepared faces of the repair hole shall be cleaned by high pressure water jets or compressed air jetting with water to remove all loose particles and dust. The repair hole shall be free of chips, sawdust, debris, free water, ice, snow, or other harmful substances or coatings.

4. DISPOSAL

Unless otherwise specified, all concrete and other debris resulting from the repair works shall be removed from the site and disposed of at location(s) of the Contractor's selection. The Contractor is responsible for complying with all local, state, and federal regulations pertaining to the disposal of such waste.

5. SELECTION OF CONCRETE REPAIR MATERIAL

Only one brand of proprietary concrete repair material shall be used in any single repair operation unless compatibility between brands can be proven with actual test or performance data.

A conventional concrete mix to be used as a replacement concrete repair material shall be ready-mix concrete that will meet all the specified salient features for repair materials and conform to ASTM C 94. Option A from Section 5 of ASTM C 94 shall apply.

The Contractor will be responsible for the selection and correct application of the concrete repair material. At least 14-days prior to installation, the Contractor shall provide the Engineer for approval all technical data for the repair material. The technical data shall include the design mix and test results to verify satisfactory conformance to the salient feature requirements. If a proprietary material is used, the manufacturer's recommended preparation, use, and installation specifications shall also be submitted 14-days prior to installation. Concrete repair materials shall not be placed prior to approval.

Concrete repair material shall have the following salient features:

- a. Be a cementitious material that after hardening will remain stable in wet and moist environments and will not dissolve in water.
- b. A 28-day compressive strength of 4000 psi or greater when tested according to ASTM C 39, unless otherwise specified.
- c. Bond strength of the repair material shall be tested in accordance with ASTM C 882 procedures for Type V material and shall have the minimum strength of 1100 psi at 28-days unless otherwise specified.
- d. Shall be suitable for application at the minimum temperature of 55 degrees Fahrenheit.
- e. Shall not contain chlorides, added gypsum, added lime, or high alumina cements. Shall be non-combustible, both before and after cure.
- f. Color shall be concrete gray unless otherwise specified.
- g. Shall not produce a vapor barrier material and shall be thermally compatible with concrete.
- h. Shall have a freeze-thaw resistance equal to or greater than 4000 psi, air-entrained concrete designed for severe exposure conditions according to ACI Standard Practice 211.1, unless otherwise specified.

- i. Shall exhibit no shrinkage at 28-days and not greater than 0.4% expansion at 3, 14, or 28-days after placement when tested according to the procedures in Corps of Engineers Specification for Non-shrink Grout, CRD-C 621.

Additional site specific requirements for materials are defined in Section 18.

6. HANDLING AND MEASUREMENT OF MATERIAL

For all types of repair materials, the cementitious components shall be kept dry and protected from contamination until incorporated in the mix. Broken containers or bags of pre-measured and pre-mixed components will not be accepted.

Handling and measurement of conventional concrete mix repair material shall conform to ASTM C 94.

Handling and measurement of pre-packaged proprietary materials shall follow the manufacturer's recommendations and requirements. Handling and measurement of components which are not pre-packaged or pre-measured shall be in accordance with the requirements listed below and the manufacturer's requirements. A copy of the manufacturer's written requirements will be provided to the Engineer 14-days prior to installation.

Handling and measurement of proprietary components which are not pre-measured shall be handled and measured in the following manner:

Aggregates shall be stored or stockpiled in such a manner that separation of coarse and fine particles of each size will be avoided and that various sizes will not become intermixed before proportioning. Methods of handling and transporting aggregates shall be such as to avoid contamination, excessive breakage, segregation or degradation, or intermingling of various sizes.

Scales for weighing aggregates and repair material components shall be beam type, electronic or springless dial type. They shall be accurate within 0.4-percent under operating conditions. All exposed fulcrums, clevises and similar working parts of scales shall be kept clean and properly maintained.

The quantities by weight of repair material components and aggregates in each batch of material, as indicated by the scales, shall be within the following percentage of the required batch weights:

Aggregates	plus or minus two (2) percent
Other components	plus or minus one (1) percent

Measuring tanks for mixing water or liquid shall be of adequate capacity to furnish the maximum amount of mixing water or liquid required per approved batch. Measuring tanks shall provide the means for readily and accurately measuring the amount of water or liquid required. Accuracy of water measurement shall be plus or minus one (1) percent.

7. FORMS

Forming material shall be wood, plywood, steel or other approved material and shall be mortar tight. The forms and associated false-work shall be substantial and unyielding and shall be constructed so that the finished repair will conform to the specified dimensions and contours. Form surfaces shall be smooth and free from holes, dents, sags or other irregularities.

To prevent bonding of the repair materials to the forms, prior to setting the forms into place, the surface of the form shall be lined with plastic sheeting or coated with a non-staining form release agent compatible with the repair material being used. If the forms are lined with plastic, the plastic shall be stretched taut removing all wrinkles and folds and maintain a smooth condition during the placement and curing of the repair material.

Metal ties or anchorage within the forms shall be equipped with cones, she-Bolts or other devices that permit their removal to a minimum depth of one (1) inch without injury to the concrete or repair material. Ties designed to break-off below the surface of the concrete shall not be used without cones.

All visible edges and corners included in the repair location shall be shaped the same as adjacent or similar edges or corners of the structure being repaired.

Forms shall be constructed to facilitate consolidation and complete filling of the repair void, and when all surfaces are formed, to facilitate applying pressure to the repair material immediately after placement.

8. MIXING, CONVEYING AND PLACING

Proprietary repair material shall be mixed and conveyed to the forms according to manufacturer's written recommendations. Material that cannot be placed within the manufacturer's time requirements shall not be placed in the forms and shall be discarded off-site at locations selected by the Contractor.

Concrete repair material shall not be placed until the subgrade, forms and steel reinforcement have been inspected and approved by the Engineer.

The Contractor shall have all equipment and materials required for curing available at the site ready for use before placement of repair material begins.

No concrete repair material shall be placed except in the presence of the Engineer. The Contractor shall give reasonable notice to the Engineer each time concrete repair material is scheduled for placement. Such notice shall be adequate to allow the Engineer sufficient time to review and approve the subgrade, forms, steel reinforcement and other preparations for compliance with the specifications. Other preparations include, but are not limited to, the mixing and delivery equipment and system, placing and finishing equipment and system, schedule of work, work force,

and heating and cooling facilities as applicable. All deficiencies are to be corrected before concrete repair material is mixed for placement.

The concrete repair material shall be deposited as closely as possible to its final position in the forms and shall be worked into the corners and angles of the forms and around all reinforcement and embedded items in a manner to prevent segregation of aggregates or excessive laitance. The depositing of repair material shall be regulated so that the material can be consolidated with a minimum of lateral movement.

Unless otherwise approved, concrete repair material shall not be dropped from a height greater than recommended by the manufacturer or five (5) feet whichever is less.

Unless otherwise specified, all concrete repair material required for each repair location shall be placed in one continuous operation. Successive layers or batches shall be placed at a rate sufficient to prevent setting of material between successive layers.

At the time of placement of repair material, existing concrete surfaces shall be damp, without free water, unless otherwise specified or required by manufacturer of the proprietary repair material being used.

9. CONSOLIDATING

Concrete repair materials shall be consolidated to ensure positive contact of repair material with all repair surfaces and reinforcing steel, to remove entrapped air pockets and voids, and to maximize the density of the repair material.

Vibration shall not be applied directly to the reinforcing steel or other embedded items, the forms, or to concrete repair material that has hardened to the degree that it is no longer plastic.

The use of vibrators to transport concrete repair material in the forms or conveying equipment will not be allowed.

Proprietary repair material shall be consolidated in accordance with the manufacturer's recommendations.

Unless otherwise specified in Section 18, conventional concrete mix repair material shall be consolidated in the following manner:

Conventional concrete mix repair material shall be consolidated with internal type mechanical vibrators capable of transmitting vibration to the concrete at frequencies not less than 8000 impulses per minute. Vibration shall be supplemented by spading, rodding, or hand tamping, as necessary to insure smooth and dense concrete along form surfaces, in corners, and around embedded items.

The location, manner, and duration of the application of the vibrators shall be such as to secure maximum consolidation of the concrete repair material without causing segregation of the mortar and coarse aggregate, and without causing water or cement paste to flush to the surface. Vibration shall compact the concrete repair material and bring it into intimate contact with the forms and embedded items while removing voids and pockets of entrapped air.

The Contractor shall provide a sufficient number of vibrators to properly consolidate the concrete repair material immediately after it is placed. Vibration shall be applied to the freshly deposited concrete repair material by slowly inserting and removing the vibrator at points uniformly spaced and not farther apart than twice the radius of action; i.e., the distance that the concrete repair material is visibly effected by the vibration. The area visibly effected by the vibrator shall overlap the adjacent, just vibrated area. The vibrator shall extend vertically into the previously placed layer of fresh concrete repair material, at all points, to insure effective bond between layers. In thin slabs, the vibrator(s) should be sloped toward the horizontal to allow operations in a fully embedded position.

The internal vibration of thin slabs (less than nine inches) may be augmented through use of surface vibrators when approved by the Engineer. Consolidation of the concrete repair material from the top surface down, along with a leveling effect to assist the finishing operation, may be provided by vibrating screeds, plate or grid vibratory tampers, or vibrating roller screeds. The Contractor's Plan, including equipment selection and specifications, shall be submitted to the Contracting Officer for approval a minimum of five (5) days prior to concrete repair material placement using surface vibrating methods.

10. REMOVAL OF FORMS

Unless otherwise approved, forms shall not be removed sooner than the minimum time recommended by the manufacturer of the repair material or 48-hours whichever is greater.

Forms shall be removed only when the Engineer is present. Forms shall be removed in a manner to prevent damage to the concrete repair material. Supports shall be removed in a manner that will permit the repair material to take the stresses due to its own weight uniformly and gradually.

11. FINISHING FORMED SURFACES

All repaired surfaces shall be true and even, and shall be free of open or rough spaces, depressions or projections.

Immediately after the removal of forms:

All bulges, fins, form marks or other irregularities which in the judgment of the Engineer will adversely affect the appearance or function of the structure shall be

removed. All form bolts and ties shall be removed to a minimum depth of one (1) inch below the surface of the repair. The cavities produced by form ties and all other holes of similar size and depth shall be thoroughly cleaned and, after the interior surfaces have been kept continuously wet for at least three (3) hours, shall be carefully repaired with a compatible patching mortar or packed with a dry patching mortar mixed not richer than one (1) part cement and three (3) parts sand. Dry patching mortar shall be mixed in advance and allowed to stand without addition of water until it has reached the stiffest consistency that will permit placing. Manipulation of the mortar with a trowel during this period shall be performed as required to insure the proper consistency.

Holes resulting from form bolts or straps which pass through the wall shall be entirely filled with mortar to form a dense, well-bonded unit. The mortar shall be tamped into place with a rod slightly smaller than the hole being filled. The hardened mortar shall be sound and free from shrinkage cracks.

All repaired areas shall be cured as specified in Section 13.

12. FINISHING UNFORMED SURFACES

All exposed surfaces of the concrete repair material shall be accurately screeded to grade and finished to match adjacent surfaces, unless otherwise specified. Water shall not be sprinkled or in any manner added to the surface of conventional concrete mix repair material during finishing operations.

Proprietary repair materials shall be finished in accordance with the manufacturer's recommendations.

Joints and edges on unformed surfaces shall be shaped the same as adjacent or similar edges or corners of the structure being repaired.

13. CURING

The repair material shall be protected against premature surface drying, rainfall, and freezing for a minimum of 72-hours. For proprietary repair materials, the manufacturer's recommendations for curing shall be followed. Replacement concrete repair material shall be protected from drying and freezing for seven (7) days after placement.

If curing compound is used, it shall be non-solvent type and shall conform to ASTM C 309, Type 1-D, Class B, non-pigmented with a fugitive dye, unless otherwise specified. Curing compounds shall not be used if specifically prohibited by the proprietary repair material user guides.

14. REMOVAL OR REPAIR

When the repaired area is honeycombed, damaged or otherwise defective, the Contractor shall remove and replace the defective repair. The Engineer will

determine the required extent of removal, replacement and/or repair. Removal and repair activities shall be performed only when the Engineer is present.

15. CONCRETE REPAIR IN COLD WEATHER

For proprietary repair materials, the manufacturer's recommendation together with the requirements below will be followed.

For conventional concrete mix repair material, the requirements below shall be followed.

Concrete repairing in cold weather shall be performed in accordance with ACI 306, *Cold Weather Concreting*, of which some specific interpretations are set forth below.

Cold weather concrete repairing shall apply when the three-day average daily outdoor temperature at the job site is less than 40°F. When cold weather conditions exist on the job site, the following additional provisions shall apply:

- a. The temperature of the concrete repair material at the time of placing shall not be less than 55°F nor more than 90°F. The temperature of the mixing water shall not exceed 140°F when the cement is added nor shall aggregate temperature exceed 150°F.
- b. Concrete structures shall be immediately protected after placement of the concrete repair material. The temperature of the concrete repair material at the concrete surface shall be maintained at not less than 55°F nor more than 90°F during the seven (7) day protection period.
- c. Proper methods of covering, insulating, housing, or heating concrete structures shall be implemented.
- d. Exhaust flue gases from combustion heaters shall be vented to the outside of the heating enclosure.
- e. Following the completion of the protection period, the concrete repair material shall be allowed to cool gradually. The concrete repair material surface shall not have a temperature decrease in excess of 40°F in a 24-hour period.
- f. Concrete repair material placed during cold weather not meeting the cold weather definition above, shall be protected by proper methods for a minimum of 24-hours after placement.

16. CONCRETE REPAIR IN HOT WEATHER

For proprietary repair materials, the manufacturer's recommendation together with the requirements below shall be followed.

For replacement concrete repair material, the requirements below shall be followed.

For the purpose of this specification, hot weather is defined as any combination of the following conditions that may impair the quality of the freshly mixed and/or hardened concrete repair material by accelerating the rate of moisture loss and rate of cement hydration, or any other action that could contribute to detrimental results:

- High ambient temperature
- High concrete temperature
- Low relative humidity
- Wind velocity
- Solar radiation

Whenever the above conditions exist or when climatic conditions are such that the temperature of the concrete repair material may reasonably be expected to exceed 90°F at the time of delivery to the work site or during the placement operations, the following provisions shall apply:

- a. The Contractor shall maintain the temperature of the concrete repair material below 90°F during mixing, conveying, and placing.
- b. Exposed concrete repair material surfaces which tend to dry or set too rapidly shall be continuously moistened by means of fog sprays or other suitable means to maintain adequate moisture during the period between placement and finishing, and following finishing. Water shall not be sprinkled or added directly to the surface of the concrete repair prior to, or during, finishing.
- c. Finishing of slabs and other exposed or non-formed surfaces shall be started as soon as the condition of the concrete repair material allows and shall be completed without delay.
- d. Formed surfaces shall be kept completely and continuously moist for the duration of the curing period or until the application of the curing compound is completed.
- e. Concrete repair material surfaces, especially flat-work placed with large surface areas, shall be covered with wet burlap or other similar material as soon as the concrete repair material has sufficiently hardened and shall be kept continuously moist for a minimum of 24-hours for the initial curing period. This protective method shall be continued for the required curing period or until the application of curing compound is completed.
- f. Moist curing may be discontinued before the end of the curing period if white, or other color selected in Section 18, pigmented curing compound is applied immediately.
- g. Under extreme conditions of high ambient temperature, high concrete temperature, low relative humidity, wind velocity and exposure to solar radiation, the Engineer may (1) restrict placement to the most favorable time of day, (2) restrict the depth of layers to assure coverage of the previous layer while it will still respond readily to vibration, (3) suspend placement until conditions improve,

and (4) require removal of forms, repair, patching and re-application of wet curing by small areas at a time.

17. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, concrete repair volume will be determined by computing the volume to the nearest 0.1 cubic foot between the neat lines shown on the drawings and the approved pay limit.

Method 2 For items of work for which specific unit prices are established in the contract, concrete repair volume will be determined by counting the number of pre-measured, pre-packaged units properly utilized to perform the approved repair. A pre-measured, pre-packaged unit is defined as a composite of all components and additives required to be mixed together before the repair material can be properly placed.

When only a part of a unit is needed to complete the filling of a repair void, it will be counted as one unit. Units required to fill voids outside the approved pay limits will not be counted for payment. Units mixed but not placed in a repair void due to Contractor's improper construction operation or management will not be counted.

Method 3 For items of work for which specific unit prices are established in the contract, concrete repair area will be determined by measuring the surfaces treated and computing the area to the nearest 0.1 square foot.

All Methods The following applies to all methods of measurement and payment:

Payment for concrete repair will be made at the contract unit price for the item. The payment for repair will constitute full compensation for all labor, materials, equipment, transportation, tools, forms, false-work, bracing and all other items necessary and incidental to the completion of the repair work.

Repair materials required to fill voids outside the neat lines or pay limits not directed or approved by the Engineer and resulting from excessive removal by the Contractor, damages caused by the Contractor activities, or improper construction operations as determined by the Contracting Officer will not be measured nor paid for under this item.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 18 of this specification.

REINFORCED CONCRETE PRESSURE PIPE CONDUITS

1. APPLICABILITY

Construction Specification 41 is applicable to the construction of principal spillway conduits appurtenant to earth dams using bedded or cradled reinforced concrete pressure pipe. It may also be applied to the construction of any type of reinforced concrete pipe conduit that crosses under or through an earth dam or other deep earth fill.

2. MATERIAL SPECIFICATIONS

The following specifications are complementary to Construction Specification 41:

- a. [Reinforced Concrete Pressure Pipe](#). Material Specification 541
- b. [Joint Sealing Compound](#). Material Specification 536
- c. [Preformed Expansion Joint Filler](#). Material Specification 535
- d. [Portland Cement Concrete for Bedding and Cradles](#). Construction Specification 31

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Line and grade of the conduit. Include statement in items of work that pipe shall be laid so that there is no reversal of grade between joints, unless shown on drawings.
- b. Details of the pipe bedding or cradle, including joint details.
- c. Excavation and backfill requirements, if applicable.
- d. Pay limits or actual limits for excavation.
- e. Details of wall fittings and other special pipe fittings.
- f. Special requirements for foundation preparation.
- g. Type of pipe.
- h. Size of pipe.
- i. Strength of pipe in terms of three-edge bearing load and internal pressure.
- j. Statement on acceptability for project use of pipe or pipe specimens tested in three-edge bearing test within the limits specified in Material Specification 541.
- k. Maximum allowable offset in alignment of interior pipe surface at joints, if tolerance is limited by cavitation hazard.

- l. Method of pressure test selected. See item 4b. Identify any variance from ASTM C 924 for air test criteria.
- m. Minimum joint length and minimum limiting angle of the joints according to definitions in Material Specification 541. Industry recommendation is to limit joint deflections to 1 1/2-inches.
- n. Type and class of expansion joint filler.
- o. Class of concrete for bedding or cradle and support blocks.
- p. Statement that metal strips covering the joints as specified in Section 4 are not required, if applicable. (If the conduit rests on bedrock so no appreciable movement will take place at the joints, metal cover strips generally will not be needed.)

4. DISCUSSION OF METHODS

a. Section 3, Laying the Pipe

- (1) Method 1 is the preferred method of stating the instructions for connecting pipe sections.
- (2) Method 2 is intended for use when special problems are anticipated or when the pipe to be furnished requires special methods of connection.

b. Section 5, Pressure Testing

- (1) Method 1 is considered adequate for principal spillway conduits that will operate under pressure intermittently at normal frequencies.
- (2) Method 2 may be required for principal spillway conduits that will operate under pressure for extended periods of time or at very frequent intervals.
- (3) Method 3 may be required where water is at a premium or unavailable, otherwise is not recommended because of potential size limitations and safety concerns.
- (4) Method 4 may be required for conduits that operate under pressure when large pipe diameters or other project restraints make method 2 and/or 3 difficult, expensive or unsafe to test.

c. Section 6, Measurement and Payment

- (1) Method 1 must be used when it is desired to base payment on the measurement of the laid length of the conduit.
- (2) Method 2 must be used when it is desired to base payment on the summation of the nominal laying lengths of the pipe sections used.

d. Sections 3 and 6

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete the following and left justify the remaining text.

(1) Section 3 "Use with Either Method"

(2) Section 6 "All Methods The following provisions apply to all methods of measurements and payment."

CONSTRUCTION SPECIFICATION

4I. REINFORCED CONCRETE PRESSURE PIPE CONDUITS

1. SCOPE

The work shall consist of furnishing and installing reinforced concrete pressure pipe conduits, fittings and accessories as shown on the drawings and/or specified herein.

2. MATERIALS

[Reinforced concrete pressure pipe, fittings and accessories](#) shall conform to the requirements of Material Specification 54I.

[Portland cement concrete for bedding and cradles](#) shall conform to the requirements of Construction Specification 3I for the specified class of concrete.

[Joint sealing compound](#) shall conform to the requirements of Material Specification 536.

[Preformed expansion joint filler](#) shall conform to the requirements of Material Specification 535.

[Filter Fabric](#) shall conform to Material Specification 592.

[Portland Cement Concrete for Bedding and Cradles](#) shall conform to Construction Specification 31.

3. LAYING THE PIPE

The pipe shall be set to the specified line and grade and temporarily supported on pre-cast concrete blocks or wedges. Concrete blocks and wedges used to temporarily support the pipe during placement of concrete bedding and/or cradle shall be of a class of concrete equal to or stronger than the concrete used to construct the bedding and/or cradle. Bell and spigot pipe shall be laid with the bells or grooves facing upstream unless otherwise specified in Section 7 or shown on the drawings. When pre-cast pipe risers and other similar pre-cast pipe structures are installed prior to pipe installation, pipe may be installed in the downstream direction with the belled end upstream. Adequate bell clearance in the subgrade/bedding shall be provided.

Just before each joint is connected the connecting surfaces of the bell and spigot or spigots and sleeve shall be thoroughly cleaned and dried, and the rubber gasket and the inside surface of the bell or sleeve shall be lubricated with a light film of soft vegetable soap compound (flax soap). The rubber gasket shall be stretched uniformly as it is placed in the spigot groove to insure a uniform volume of rubber around the circumference of the pipe.

Method 1 The joint shall be connected by means of a pulling or jacking force so applied to the pipe that the spigot enters squarely into the bell.

Method 2 The joint shall be connected in accordance with the manufacturer's instructions.

Use with Either Method When the spigot has been seated to within 1/2 inch of its final position, the position of the gasket in the joint shall be checked around the entire circumference of the pipe by means of a metal feeler gauge. In any case where the gasket is found to be displaced, the joint shall be disengaged and properly reconnected. After the position of the gasket has been checked, the spigot shall be completely pulled into the bell and the section of pipe shall be adjusted to line and grade.

4. FILLING JOINTS

Before the placement of the bedding or cradle, the exterior annular space between the ends of the pipe sections shall be cleaned and completely filled with joint sealing compound. Before the compound is applied, the surfaces against which it is to be placed shall be cleaned of all dust, lubricant and other substances that would interfere with a bond between the compound and the pipe. If recommended by the manufacturer of the compound, the concrete surfaces shall be coated with a primer in accordance with the manufacturer's recommendations. Primers shall be applied to the concrete surfaces only and shall not come in contact with the gasket or gasket sealing surfaces. Unless the compound or primer is specifically recommended for use on moist concrete, the surfaces shall be dry when it is applied.

The joint sealing compound shall be allowed to cure until it is sufficiently firm to prevent the entry of concrete or earth into the joint. Unless otherwise specified in Section 7 of this specification, prior to placing bedding or earth backfill (excluding concrete) containing particles larger than one-fourth inch in maximum dimension within 6 inches of the joint sealing compound, the compound shall be covered with a strip of 16-gage to 24-gage metal at least 2-inches wider than the space between the ends of the pipe sections. In lieu of metal strips, the joints shall be covered by a minimum of 2-foot wide, 4-ply thickness of filter fabric. Filter fabric shall be wrapped completely around the joint and overlapped a minimum of 12-inches at the top of the pipe. Lap shall be securely fastened to ensure filter fabric fits snugly during backfill operations. Filter fabric to be centered on the joint. Filter fabric shall conform to Material Specification 592, Table 2 Non-woven, Class II.

5. PRESSURE TESTING

Method 1 Pressure testing of the completed conduit will not be required.

Method 2 Prior to the placement of any concrete or earthfill around the conduit or filling of the pipe joints, the conduit shall be tested for leaks in the following manner: The ends of the conduits shall be plugged and a standpipe with a minimum diameter of two (2) inches shall be attached to the upstream plug. The conduit shall be braced at each end to prevent slippage. The conduit and the standpipe shall be filled with water. The water level in the standpipe shall be maintained a minimum of

10 feet above the invert of the upstream end of the conduit for a period of not less than two hours. Any leaks shall be repaired and the conduit shall be tested again as described above. The procedure shall be repeated until the conduit is watertight.

The pipe joints shall show no leakage. Damp spots developing on the surface of the pipe will not be considered as leakage.

Method 3 Prior to placement of any concrete or earthfill around the conduit or filling of the pipe joints, the conduit shall be air tested in accordance with ASTM C 924.

The conduit shall be braced on each end to prevent slippage. All end plugs used for the air test shall be capable of resisting the internal pressure and must be securely braced.

All testing equipment to be used shall be furnished by the Contractor and shall be inspected and approved by the Engineer. The pressure gauges used shall be graduated to read in increments of 0.1 psi and calibrated to provide accuracy within 10 percent plus or minus of the standard gauge. The Contractor has the option of pre-wetting the conduit or line prior to testing.

Any conduit that fails to pass this test must be repaired by a method satisfactory to the Engineer. After the repairs are made the conduit shall be re-tested until it passes the test requirements.

Method 4 Prior to the placement of concrete or earth backfill around the conduit joint to be tested or filling the pipe joints, the joint shall be tested in accordance to ASTM C 1103, *Standard Practice for Joint Acceptance Testing of Installed Pre-cast Concrete Sewer Line*. The test pressure shall specified in Section 7 of this specification. Any joints showing leaks shall be re-laid or repaired and the joint shall be re-tested. The procedure shall be repeated until the joint passes the test.

6. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the quantity of each size, type and class of pipe will be determined to the nearest 0.1 foot by measurement of the laid length of pipe along the invert centerline of the conduit. Payment for each size, type and class of reinforced concrete pressure pipe will be made at the contract unit price for that size, type and class of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe complete in place including accessories such as wall fittings, joint gaskets, coupling bands, sleeves or collars and all other items necessary and incidental to the completion of the work, except the special fittings and appurtenances listed separately in the bid schedule. Payment for each special fitting and appurtenance will be made at the contract price for that type and size of fitting or appurtenance.

Method 2 For items of work for which specific unit prices are established in the contract, the quantity of each size, type and class of pipe will be determined as the

sum of the nominal laying lengths of the pipe sections used. Payment for each size, type and class of reinforced concrete pressure pipe will be made at the contract unit price for that size, type and class of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe complete in place including accessories such as wall fittings, joint gaskets, coupling bands, sleeves or collars and all other items necessary and incidental to the completion of the work, except the special fittings and appurtenances listed separately in the bid schedule. Payment for each special fitting and appurtenance will be made at the contract price for that type and size of fitting and appurtenance.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

CONCRETE PIPE CONDUITS AND DRAINS

1. APPLICABILITY

Construction Specification 42 is applicable to all types of concrete pipe conduits except principal spillway conduits for earth dams or conduits under deep fills. It may be applied to culverts, to pipe collector systems in structure drains, to irrigation pipelines, or to portions of land drainage systems.

2. MATERIAL SPECIFICATIONS

The following specifications are complementary to Construction Specification 42:

- a. [Reinforced Concrete Pressure Pipe](#). Material Specification 541
- b. [Concrete Culvert Pipe](#). Material Specification 542
- c. [Concrete Irrigation Pipe, Drainage Pipe, and Drain Tile](#). Material Specification 543
- d. [Joint Sealing Compound](#). Material Specification 536
- e. [Preformed Expansion Joint Filler](#). Material Specification 535
- f. [Portland Cement Concrete for Bedding and Cradles](#). Construction Specification 31, [Concrete for Major Structures](#) or Construction Specification 32, [Structure Concrete](#).

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Line and grade of the conduit. Include statement in Section 11 that pipe shall be laid so that there is no reversal of grade between joints unless shown on the drawings.
- b. Details of concrete bedding or cradle, including class of concrete, joint details, and type of expansion joint filler.
- c. Details of earth, sand, or gravel bedding, including description and grading limits of the bedding material.
- d. Excavation and backfill requirements, if applicable.
- e. Pay limits or actual limits for excavation and backfill, if required.
- f. Special requirements for foundation preparation.
- g. Kind of pipe or tile by name and class. (See appropriate reference specifications.)
- h. Size of pipe or tile.

- i. Type of cement for pipe or tile if a certain type is necessary because of soil, water, or other environmental conditions.
- j. Strength of pipe, if not covered by reference specifications, in terms of three-edge-bearing load and internal pressure as appropriate.
- k. Type of joint and details of banded joints or other special joints.
- l. Details of wall fittings and other special fittings and appurtenances.
- m. Test pressure, if applicable.
- n. Method of measurement and payment if the standard specification includes more than one method.

4. DISCUSSION OF METHODS

a. Section 5a, Rubber Gasket Joint, Pressure Pipe.

(1) Method 1 is the preferred method of stating the instructions for connecting pipe sections.

(2) Method 2 is intended for use when special problems are anticipated or when the pipe to be furnished requires special methods of connection.

b. Section 9, Pressure Testing.

The methods are self-explanatory. The choice of method must be consistent with the function of the conduit and the required operating pressure.

c. Section 10, Measurement and Payment.

(1) Method 1 must be used when it is desired to base payment on the measurement of the laid length of the conduit.

(2) Method 2 must be used when it is desired to base payment on the summation of the nominal laying lengths of the pipe sections used.

d. Sections 5a, 9 and 10

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete the following and left justify the remaining text.

(1) Section 5a "Use with Either Method"

(2) Section 9 "For Methods 2, 3, 4" (Delete the entire paragraph when Methods 2, 3 and 4 are deleted.)

(3) Section 10 "All Methods The following provisions apply to all methods of measurements and payment."

CONSTRUCTION SPECIFICATION

42. CONCRETE PIPE CONDUITS AND DRAINS

1. SCOPE

The work shall consist of furnishing and installing concrete pipe or concrete drain tile and the necessary fittings as shown on the drawings.

2. MATERIALS

[Reinforced concrete pressure pipe](#) shall conform to the requirements of Material Specification 541 for the type and strength specified.

[Concrete culvert pipe](#) shall conform to the requirements of Material Specification 542 for the kind of pipe specified.

[Concrete irrigation pipe, drainage pipe and drain tile](#) shall conform to the requirements of Material Specification 543 for the kind of pipe or tile specified.

[Pipe fittings](#) shall conform to the requirements of the applicable pipe specifications.

[Sealing compound](#) for filling rubber gasket joints shall conform to the requirements of Material Specification 536.

[Hot-pour joint sealer](#) shall conform to the requirements of Material Specification 536.

[Cold-applied sealing compound](#) shall conform to the requirements of Material Specification 536.

[Preformed sealing compound](#) shall conform to the requirements of Material Specification 536.

[Joint packing](#) shall be commercial grade oakum.

[Preformed expansion joint filler](#) shall conform to the requirements of Material Specification 535.

[Portland Cement Concrete for Bedding and Cradles](#) shall conform to Construction Specification 31, [Concrete for Major Structures](#), or Construction Specification 32, [Structure Concrete](#).

3. LAYING AND BEDDING

Pipe and tile shall be laid to the line and grade shown on the drawings. Unless otherwise specified, belled pipe shall be laid with the bells or grooves facing upstream. When pre-cast pipe risers and other similar pre-cast pipe structures are installed prior to pipe installation, pipe may be installed in the downstream direction with the belled end upstream. Adequate bell clearance in the subgrade/bedding shall be provided.

- a. Concrete Cradles or Bedding. Pipe to be cradled or bedded on concrete shall be set to the specified line and grade and temporarily supported on pre-cast concrete blocks or wedges until the cradle or bedding concrete is placed. Concrete blocks or wedges used to temporarily support the pipe during placement of bedding or cradle shall be of a class of concrete equal to or stronger than that to be used in the bedding or cradle.
- b. Earth, Sand, or Gravel Bedding. The pipe shall be uniformly bedded throughout its entire length to the depth and in the manner specified on the drawings. The pipe shall be loaded sufficiently during backfilling around the sides to prevent displacement.

Perforated pipe shall be laid with the perforations down and oriented symmetrically about a vertical centerline. Perforations shall be clear of any obstructions when the pipe is laid.

Elliptical pipe and pipe with elliptical or quadrant reinforcement shall be laid so that the vertical axis, as indicated by markings on the pipe, is in a vertical position.

4. JOINTS

Pipe joints shall conform to the details shown on the drawings and to the requirements of Section 5 and 6 of this specification applicable to the type of joint specified. Except where unsealed joints are indicated, pipe joints shall be sound and watertight at the pressure specified.

5. JOINTING BELL AND SPIGOT PIPE

- a. Rubber Gasket Joint, Pressure Pipe. Just before the joint is connected the connecting surfaces of the spigot and the bell or coupling band, sleeve or collar shall be thoroughly cleaned and dried, and the rubber gasket and the inside surface of bell or coupling band, sleeve or collar shall be lubricated with a light film of soft vegetable soap compound (flax soap). The rubber gasket shall be stretched uniformly as it is placed in the spigot groove to insure a uniform volume of rubber around the circumference of the pipe.

Method 1 The joint shall be connected by means of a pulling or jacking force so applied to the pipe that the spigot enters squarely into the bell.

Method 2 The joint shall be connected in accordance with the manufacturer's recommendations.

Use with Either Method. When the spigot has been seated to within 1/2 inch of its final position, the position of the gasket in the joint shall be checked around the entire circumference of the pipe by means of metal feeler gauge. In any case where the gasket is found to be displaced, the joint shall be disengaged and properly reconnected. After the proper position of the gasket has been

confirmed, the spigot shall be completely pulled into the bell and the section of the pipe shall be adjusted to line and grade.

- b. Rubber Gasket Joints, Sewer and Culvert Pipe or Irrigation Pipe. The pipe shall be joined in accordance with the gasket manufacturer's recommendations except as otherwise specified.
- c. Mastic Sealed Joints. At the time of assembly the inside surfaces of the bell and the outside surfaces of the spigot shall be clean, dry and primed as recommended by the manufacturer of the sealing compound. A closely twisted gasket of joint packing of the diameter required to support the spigot at the proper grade and to make the joint concentric shall be made in one piece of sufficient length to pass around the pipe and lap at the top. The gasket shall be laid in the bell throughout the lower third of the circumference. The end of the spigot shall be laid in the bell throughout the lower third of the circumference. The end of the spigot shall be laid on the gasket and the spigot shall be fully inserted into the bell so that the pipe sections are closely fitted and aligned. The gasket then shall be lapped at the top of the pipe and thoroughly packed into the annular space between the bell and the spigot.
 - (1) Hot-Pour Joint Sealer. The sealing compound shall be heated to within the temperature range recommended by the manufacturer and shall not be overheated or subjected to prolonged heating. After the joint is assembled, with the pipe in its final location, a suitable joint runner shall be placed around the joint with an opening left at the top. Molten sealing compound shall be poured into the joint as rapidly as possible without entrapping air until the annular space between bell and spigot is completely filled. After the compound has set, the runner may be removed. Alternate joints may be poured before the pipe is lowered into the trench. In this case, the joint shall be poured with the pipe in a vertical position without the use of the runner. The compound shall have thoroughly set before the pipe is placed in the trench, and the pipe handled so as to cause no deformation of the joint during placement.
 - (2) Cold-Applied Sealing Compound. The annular space between bell and spigot shall be completely filled with the sealing compound. The compound shall be mixed on the job in accordance with the manufacturer's recommendations and in relatively small quantities so that setting will not be appreciable before application.
 - (3) Preformed Sealing Compound. Joint packing will not be required, except as recommended by the manufacturer of the sealing compound. Preformed strips or bands of the sealing compound shall be applied to the bell and spigot prior to assembly of the joint in accordance with the manufacturer's recommendations. Any compound extruded from the interior side of the joint during assembly shall be trimmed even with the interior surface of the pipe.

d. Cement Mortar Sealed Joints. Cement mortar for joints shall consist of one part by weight of portland cement and two parts by weight of fine sand with enough water added to produce a workable consistency. At the time of assembly the inside surface of the bell and the outside surface of the spigot shall be clean and moist.

(1) With Packing. A closely twisted gasket of joint packing of the diameter required to support the spigot at the proper grade and to make the joint concentric shall be made in one piece of sufficient length to pass around the pipe and lap at the top. The gasket shall be saturated with neat cement grout, laid in the bell throughout the lower third of the circumference and covered with mortar. The end of the spigot shall be fully inserted into the bell so that the pipe sections are closely fitted and aligned. A small amount of mortar shall be placed in the annular space throughout the upper two-thirds of the circumference. The gasket then shall be lapped at the top of the pipe and thoroughly packed into the annular space between the bell and the spigot. The remainder of the annular space then shall be filled completely with mortar and beveled off at an angle of approximately forty-five (45) degrees with the outside of the bell. If the mortar is not sufficiently stiff to prevent appreciable slump before setting, the outside of the joint thus made shall be wrapped with cheesecloth. After the mortar has set slightly, the joint shall be wiped inside the pipe. In pipe too small for a person to work inside, wiping may be done by dragging an approved swab through the pipe as the work progresses.

(2) Without Packing. The lower portion of the bell shall be filled with stiff mortar of sufficient thickness to make the inner surface of the abutting sections flush. The spigot end of the pipe to be joined shall be fully inserted into the bell so that the sections are closely fitted and aligned. The remaining annular space between the bell and spigot shall then be filled with mortar and the mortar neatly beveled off at an angle of approximately forty-five (45) degrees with the outside of the bell. After the mortar has set slightly, the joint shall be wiped inside the pipe. In pipe too small for a person to work inside, wiping may be done by dragging and approved swab through the pipe as the work progresses.

e. Unsealed Joints. When unsealed joints are specified, they shall conform to the details shown on the drawings.

6. JOINTING TONGUE AND GROOVE PIPE

a. Cement Mortar Sealed Joint. Mortar shall be as specified for bell and spigot joints. The tongue end of the section being placed shall be covered with mortar and firmly pressed into the groove of the laid section in such manner that the tongue fits snugly and truly in the groove and that mortar is squeezed out both on the interior and exterior of the joint. Care shall be taken that no mortar falls from the groove end during the abutting operation. Immediately after the pipe sections have been abutted, exposed external surface mortar shall be pressed into the

joint and any excess mortar removed, after which the interior surface of the joint shall be carefully pointed and brushed smooth, and all surplus mortar removed.

- b. Mastic Sealed Joints. Strips or bands of preformed sealing compound shall be applied to the tongue and groove prior to assembly of the joint in accordance with the manufacturer's recommendations. Any compound extruded from the interior side of the joint during assembly shall be trimmed even with the interior surface of the pipe.
- c. Rubber Gasket Joints. The pipe shall be joined in accordance with the gasket manufacturer's recommendations except as otherwise specified.
- d. Unsealed Joints. When unsealed joints are specified, they shall conform to the details shown on the drawings.

7. BANDING

When external mortar bands are specified, they shall conform to the details shown on the drawings.

8. CURING MORTAR JOINTS AND BANDS

The external surfaces of mortar joints shall be covered with moist earth, sand, canvas, burlap or other approved materials and shall be kept moist for 10-days or until the pipe is backfilled. Earth backfilling operations shall not begin until 24-hours after joints are finished.

Water shall not be turned into the conduit within 24 hours after the joints are finished. Hydrostatic pressure shall not be applied to the conduit prior to 14 days after the joints are finished.

9. PRESSURE TESTING

Method 1 Pressure testing of the completed conduit will not be required.

Method 2 Prior to the placement of concrete or earth backfill around the conduit, the conduit shall be tested for leaks in the following manner: The ends of the conduits shall be plugged and a standpipe with a minimum diameter of two (2) inches shall be attached to the upstream plug. The conduit shall be braced at each end to prevent slippage. The conduit and the standpipe shall be filled with water. The water level in the standpipe shall be maintained a minimum of 10 feet above the invert of the upstream end of the conduit for a period of not less than two hours. Any leaks shall be repaired and the conduit shall be re-tested as described above. The procedure shall be repeated until the conduit is watertight.

Method 3 Prior to the placement of concrete or earth fill around the conduit, the conduit shall be tested at the specified test pressure for a period of at least 2 hours.

Any leaks shall be repaired and the conduit shall be re-tested. The procedure shall be repeated until the conduit is watertight.

Method 4 Prior to the placement of concrete or earth backfill around the conduit joint to be tested, the joint shall be tested in accordance to ASTM C 1103, *Standard Practice for Joint Acceptance Testing of Installed Pre-cast Concrete Pipe Sewer Lines*. Any joints showing leaks shall be re-laid or repaired and the joint shall be re-tested. The procedure shall be repeated until the joint passes the test.

For Methods 2, 3, and 4 The pipe joints shall show no leakage. Damp spots developing on the surface of the pipe will not be considered as leaks.

10. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the quantity of each kind, size, and class of pipe or tile will be determined to the nearest 0.1 foot by measurement of the laid length along the invert centerline of the conduit. Payment for each kind, size, and class of pipe or tile will be made at the contract unit price for that kind, size, and class. Such payment will constitute full compensation for furnishing, transporting and installing the pipe or tile complete in place.

Method 2 For items of work for which specific unit prices are established in the contract, the quantity of each kind, size, and class of pipe or tile will be determined as the sum of the nominal laying lengths of the sections used. Payment for each kind, size, and class of pipe or tile will be determined as the sum of the nominal laying lengths of the sections used. Payment for each kind, size, and class of pipe or tile will be made at the contract unit price for that kind, size, and class. Such payment will constitute full compensation for furnishing, transporting and installing the pipe or tile complete in place.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 11 of this specification.

CLAY PIPE

1. APPLICABILITY

Construction Specification 43 is applicable to all types of clay pipe conduits. Application to pipe collector systems in structure drains or to portions of land drainage systems is applicable.

2. MATERIAL SPECIFICATIONS

The following specifications are complementary to Construction Specification 43:

- a. [Clay Pipe and Drain Tile](#). Specification 544
- b. [Sealing Compound for Joints in Concrete and Concrete Pipe](#). Specification 536

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Line and grade of the conduit. Include statement in items of work that pipe shall be installed in a manner that no reversal of grade between joints occurs, unless shown on the drawings.
- b. Details of the bedding, including description and grading limits of the bedding material.
- c. Excavation and backfill requirements, if applicable.
- d. Pay limits or actual limits for excavation and backfill, if required. When excavation requirements need to be performed to be in compliance with safety requirements, state clearly when those volumes are included or not in the pay limits.
- e. Kind and class of pipe or tile.
- f. Size(s) of pipe or tile.
- g. Type of joint and details of special joints.
- h. Details of wall fittings and other special fittings and appurtenances.
- i. Pressure testing requirements, if applicable.
- j. Method of measurement and payment if the standard specification includes more than one method.

4. DISCUSSION OF METHODS

a. Section 6, Measurement and Payment

- (1) Method 1 must be used when it is desired to base payment of the measurement of the laid length of the conduit.
- (2) Method 2 must be used when it is desired to base payment on the summation of the nominal laying lengths of the pipe conduit.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

43. CLAY PIPE

1. SCOPE

The work shall consist of furnishing and installing clay pipe and/or clay drain tile and the necessary fittings as shown on the drawings.

2. MATERIALS

Pipe, drain tile, and fittings shall conform to the requirements of Material Specification 544 for the kind of pipe or tile specified.

Sealing compound for filling rubber gasket joints shall conform to the requirements of Material Specification 536.

Compression joints using resilient materials shall conform to the requirements of ASTM C 425.

Non-pour joint sealer shall conform to the requirements of Material Specification 536.

Cold-applied sealing compound shall conform to the requirements of Material Specification 536.

Joint packing shall be commercial grade oakum.

3. LAYING AND BEDDING

Pipe and tile shall be installed to the line and grade shown on the drawings. Each pipe section shall be installed with the bell end upstream.

The pipe shall be firmly and uniformly bedded throughout its entire length to the depth and in the manner specified on the drawings. The pipe shall be loaded sufficiently during backfilling around the sides to prevent uplift of the pipe and the development of voids between the pipe and bedding.

Perforated pipe and tile shall be laid with the perforations down and oriented symmetrically about the vertical centerline. Perforations shall be clear of any obstructions when the pipe is installed.

4. JOINTS

Pipe joints shall conform to the details shown on the drawings, except where unsealed joints are indicated, and shall be sound and watertight at the pressures specified.

- a. Rubber gasket joints shall be assembled in accordance with the gasket manufacturer's recommendations, except as otherwise specified.

- b. Compression joints using resilient materials shall be assembled in accordance with the manufacturer's recommendations.
- c. Mastic Sealed Joints. At the time of pipe assembly, the inside surfaces of the bell and the outside surfaces of the spigot shall be clean, dry and primed as recommended by the manufacturer of the sealing compound. A closely twisted gasket of joint packing of the diameter required to support the spigot at the proper grade and to make the joint concentric shall be made in one piece of sufficient length to pass around the pipe and lap at the top of the pipe and be thoroughly packed into the annular space between the bell and the spigot.
 - (1) Hot-pour Joint Sealer. The sealing compound shall be heated to within the temperature range recommended by the manufacturer and shall not be overheated or subjected to prolonged heating. After the joint is assembled, with the pipe in its final location, a suitable joint runner shall be placed around the joint with an opening left at the pipe top. Molten sealing compound shall be poured into the joint as rapidly as possible without entrapping air until the annular space between bell and spigot is completely filled. After the compound has set, the runner may be removed. Alternate joints may be poured before the pipe is lowered into the trench. When this installation procedure is used, the joint shall be poured with the pipe in a vertical position without the use of a runner. The compound shall have thoroughly set before the pipe is placed in the trench, and the pipe shall be handled so as to cause no deformation of the joint during placement.
 - (2) Cold-Applied Sealing Compound. The annular space between bell and spigot shall be completely filled with the sealing compound. The compound shall be mixed on the job in accordance with the manufacturer's recommendations and in relatively small quantities so that setting will not be appreciable before application.
 - (3) Preformed Sealing Compound. Joint packing will not be required, except as recommended by the manufacturer of the sealing compound. Preformed strips or bands of the sealing compound shall be applied to the bell and spigot prior to assembly of the joint in accordance with the manufacturer's recommendations. Any compound extruded from the interior side of the joint during assembly shall be trimmed even with the interior surface of the pipe.
- d. Cement Mortar Sealed Joints. Cement mortar for joints shall consist of one part by weight of portland cement and two parts by weight of fine sand with; adequate water added to produce a workable consistency. At the time of assembly the inside surface of the bell and the outside surface of the spigot shall be clean and moist.
 - (1) With Packing. A closely twisted gasket of joint packing of the diameter required to support the spigot at the proper grade and to make the joint concentric shall be made in one piece of sufficient length to pass around the

pipe and lap at the pipe top. The gasket shall be saturated with neat cement grout, laid in the bell throughout the lower third of the circumference and covered with mortar. The end of the spigot shall be fully inserted into the bell so that the pipe sections are closely fitted and aligned. A small amount of mortar shall be placed in the annular space throughout the upper two-thirds of the circumference. The gasket then shall be lapped at the top of the pipe and thoroughly packed into the annular space between the bell and the spigot. The remainder of the annular space shall then be filled completely with mortar and beveled off of an angle of approximately forty-five (45) degrees with the outside of the bell. If the mortar is not sufficiently stiff to prevent appreciable slump before setting, the outside of the joint thus made shall be wrapped with cheesecloth. After the mortar has set slightly, the joint shall be wiped inside the pipe. In pipe too small for a person to work inside, wiping may be accomplished by dragging an approved swab through the pipe as the work progresses.

(2) Without Packing. The lower portion of the bell shall be filled with stiff mortar of sufficient thickness to make the inner surface of the abutting sections flush. The spigot end of the pipe to be jointed shall be fully inserted into the bell so that the sections are closely fitted and aligned. The remaining annular space between the bell and spigot shall be then filled with mortar and the mortar neatly beveled-off at an angle of approximately forty-five (45) degrees with the outside of the bell. After the mortar has set slightly, the joint shall be wiped inside the pipe. In pipe too small for a person to work inside, wiping may be accomplished by dragging an approved swab through the pipe as the work progresses.

e. Unsealed Joints. When unsealed joints are specified, they shall conform to the details shown on the drawings.

5. CURING MORTAR JOINTS

The external surfaces of mortar joints shall be covered with moist earth, sand, canvas, burlap or other approved materials and shall be kept moist for ten (10) days or until the pipe is backfilled.

Water shall not be turned into the conduit within 24 hours after the joints are finished.

6. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the quantity of each kind, size, and class of pipe or tile will be determined to the nearest foot by measurement of the laid length along the invert centerline of the conduit. Payment for each kind, size, and class of pipe or tile will be made at the contract unit price for that kind, size, and class. Such payment will constitute full

compensation for furnishing, transporting and installing the pipe or tile complete in place.

Method 2 For items of work for which specific unit prices are established in the contract, the quantity of each kind, size and class of pipe or tile will be determined as the sum of the nominal laying lengths of the sections satisfactorily installed. Payment for each kind, size and class of pipe or tile will be made at the contract unit price for that kind, size and class. Such payment will constitute full compensation for furnishing, transporting and installing the pipe or tile complete in place.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

CORRUGATED POLYETHYLENE TUBING

1. APPLICABILITY

Construction Specification 44 is applicable for use for land drainage and drains for embankments, foundations, structures, and other conduit systems.

2. MATERIAL SPECIFICATIONS

The following specification is complementary to Construction Specification 44:

- a. [Corrugated Polyethylene Tubing](#). Specification 548

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Line and grade of tubing. Include in the Items of Work and Construction Details, Section 9, any applicable limitations or restrictions on the grade of the tubing, such as, reverse grades will not be acceptable.
- b. Details of the trench bottom.
- c. Details of the bedding, including description and grading limits of the bedding material.
- d. Describe in Section 9 the range of over-excavation that will be permitted without corrective measures.
- e. Diameter(s) of the tubing and interior finish (corrugated or smooth wall).
- f. Describe any special filter envelope for tubing, if required.
- g. Type of joint and details for any special joints.
- h. Details of special fittings and appurtenances.
- i. Details for connections with other appurtenances and/or existing structures.
- j. Details and specifications for nylon sock, when required.

4. DISCUSSION OF METHODS

- a. Section 8, Measurement and Payment

(1) Method 1 includes all excavation and earth backfill to install the pipe.

(2) Method 2 is intended for use when separate payment items are identified for earthwork.

When a nylon sock or other special filter material is an installation requirement, mention the item in Section 9 of this specification as an included item for measurement and payment, if it is not a separate item in the bid schedule.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

Note: At the present time, ASTM does not have a standard for double wall or ribbed pipe, or the tubing covered by AASHTO M252 and M294.

CONSTRUCTION SPECIFICATION

44. CORRUGATED POLYETHYLENE TUBING

1. SCOPE

The work shall consist of furnishing and installing tubing and the necessary fittings and appurtenances as shown on the drawings and as outlined in this specification.

2. MATERIALS

[Corrugated polyethylene tubing and fittings](#) shall conform to the material requirements as outlined in Material Specification [548](#).

When perforations are specified, the water inlet area shall be a minimum of one (1) square inch per lineal foot of tubing. The inlets shall be either circular perforations or slots equally spaced along the length and circumference of the tubing. Unless otherwise specified, circular perforations shall not exceed 3/16-inch in diameter, and slot perforations shall not be more than 1/8-inch wide.

Geotextile filter socks, when required, shall meet the material requirements outlined in Section 9 of this specification.

Granular bedding material, when specified, shall conform to the requirements specified in Section 9 of this specification.

The tubing shall be appropriately marked with ASTM or AASHTO designation.

3. HANDLING AND STORAGE

Tubing shall be delivered to the job site and handled by means which provides adequate support to the tubing and does not subject it to undue stresses or damage. When handling and placing corrugated polyethylene tubing, care shall be taken to prevent impact blows, abrasion damage, and gouging or cutting (by metal edges and/or surfaces or rocks). All special handling requirements of the manufacturer shall be strictly observed. Special care shall be taken to avoid impact when the pipe must be handled at temperatures of 40° Fahrenheit or less.

Tubing shall be stored on a relatively flat surface so that the full length of the tube is evenly supported. Unless the tube is specifically manufactured to withstand exposure to ultraviolet radiation, it shall be covered with an opaque material when stored outdoors for a period of fifteen days or longer.

4. EXCAVATION

Unless otherwise specified or approved by the Engineer, excavation for and subsequent installation of each tube line shall begin at the outlet end and progress upgrade.

The trench or excavation for the tubing shall be constructed to the lines, depths, cross sections, and grade shown on the drawings, specified in Section 9 of this specification or as approved by the Engineer.

Trench shields, shoring and bracing, or other suitable methods necessary to safeguard the Contractor's employees and the works of improvement, and to prevent damage to the existing improvements shall be furnished, placed, and subsequently removed by the Contractor.

5. PREPARING THE TUBING BED AND BLINDING THE TUBING

When a granular filter or envelope is specified, the filter or envelope materials shall be placed in the bottom of the trench just prior to the laying of the tubing. The tubing shall then be laid and the filter and envelope material placed to a depth over the top of the tubing of not less than as shown on the drawings or as specified in Section 9 of this specification.

When a granular filter or envelope is not specified, the bottom of the trench shall be shaped to form a semicircular or trapezoidal groove in its center. This groove shall provide support for not less than one-fourth of the outside circumference of the tubing. After the tubing is placed in the excavated groove, it shall be capped with friable materials from the sides of the trench. The friable material shall be placed around the tubing, completely filling the trench to a depth of not less than three (3) inches over the top of the tubing. For materials to be suitable it must not contain hard clods, rocks, frozen soil, or fine material which will cause a silting hazard to the drain. Tubing placed during any day shall be blinded (place required soil material around and over pipe) and temporarily capped prior to the completion of construction activities for that day.

6. PLACEMENT AND JOINT CONNECTIONS

All tubing shall be installed to grade as shown on the drawings.

After placement of the tubing in the trench and blinding, sufficient time shall be allowed for the tubing to adapt to the soil temperature prior to backfilling.

Maximum allowable stretch of the tubing shall be five (5) percent. Special precautions must be implemented on hot, bright days to insure that the stretch limit is not exceeded, and excessive deflection does not occur as a result of installation procedures, including backfill operations.

Unless otherwise specified in Section 9 of this specification or shown on the drawings, connections will be made with manufactured junctions comparable in strength with the specified tubing. All split fittings shall be securely fastened with nylon cord or plastic zip-ties before any backfill is placed. All buried ends shall be supplied with end caps unless otherwise approved by the Engineer.

7. BACKFILLING

Unless otherwise specified in Section 9 of this specification, the backfilling of the trench shall be as shown on the drawings and completed as rapidly as is consistent with the soil conditions.

Automatic backfilling machines may be used only when approved by the Engineer. Backfill shall extend above the ground surface and be well rounded and centered over the trench.

8. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the quantity of each kind and size of tubing will be determined to the nearest foot of length measured along the centerline of the installed tubing. Payment for each kind and size of tubing will be made at the contract unit price for that kind and size of tubing. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to furnishing, transporting and installing the tubing, including excavation, shoring, geotextile or granular filter (when specified), backfill and all fittings, appurtenances and other items required to complete the work. Payment for appurtenances listed separately in the bid schedule will be made at the contract unit price(s) for that size and type of appurtenance listed.

Method 2 For items of work for which specific unit prices are established in the contract, the quantity of each kind, size, and class of tubing will be determined to the nearest foot by measurement of the laid length along the crown centerline of the tubing. Payment for each kind, size, and class of tubing will be made at the contract unit price for the kind, size, and class. Such payment will constitute full compensation for furnishing, transporting, and installing the tubing including shoring, all fittings, thrust blocks, appurtenances, and other items necessary and incidental to the completion of the work. Payment for appurtenances listed separately in the bid schedule will be made at the contract prices for those items.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 9 of this specification.

PLASTIC PIPE

1. APPLICABILITY

Construction Specification 45 is applicable for the use of plastic pipe conduits, except corrugated polyethylene tubing, see Construction Specification 44.

2. MATERIAL SPECIFICATION

Material Specification 547 is complementary to Construction Specification 45.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Line and grade of the conduit.
- b. Details of the bedding and shape and placement requirements.
- c. Description of the bedding materials and grading limits, if needed.
- d. Excavation requirements. Provide pay limits or actual limits for excavation, minimum trench width, if applicable and any special considerations necessary in case of unstable trench bottom and/or walls, safety, etc.
- e. Backfill requirements. Provide pay limits or actual limits of backfill, compaction requirements or other special methods of performing and controlling backfill, including the kind of material, as appropriate.
- f. Specify industry (ASTM or AWWA) material standards and/or specifications that the pipe material is required to meet, as applicable.

The designer may require a specific type of pipe by listing in Section 14 of this construction specification, and/or the appropriate reference specifications. The designer must be prepared to evaluate and accept pipe meeting other references that equal or exceed the minimums specified when proposed by the contractor or supplier. NRCS will maintain a limited list of reference specifications in NRCS offices for use of design and construction personnel.

- g. Specify the salient features of the pipe, which are required to meet the intent of the design.
 - (1) Size (diameter, include ID or OD if critical) and type of plastic (PE, HDPE, ABS, PVC 1120, etc.).
 - (2) Schedule, SDR or DR, pressure class and/or pressure rating, as appropriate.
 - (3) Perforation requirements if different from Material Specification 547.
- h. Type of joint by referring to a reference specification or details of any specific joint requirements.

- i. Details of special fittings, when applicable.
- j. Type of protective coatings for special fittings and appurtenances, when applicable (include field repair requirements).
- k. Pressure testing specifications, including rate of filling requirements, if applicable. The test pressure specified should not be less than the normal operating pressure together with the duration of the test with the allowable pressure change that will be acceptable.
- l. Specify and detail concrete thrust blocks, encasement, and anchors where applicable. Requirements for concrete encasement and for thrust blocks if other than Construction Specification [32, Structure Concrete](#), Class 3000M.
- m. Methods of measurement and payment.

4. DISCUSSION OF METHODS

a. Section 12, Pressure Testing

The methods are self-explanatory. The choice of method must be consistent with the function of the conduit and the required operating pressure.

b. Section 13, Measurement and Payment

The methods are self-explanatory.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

5. DISCUSSION

This specification is written to include cast iron pipe sizes, iron pipe sizes (IPS), sewer pipe, pressure pipe, water pipe, drainpipe, and plastic irrigation pipe (PIP).

In addition to the ductile iron and cast iron fittings, one piece, injection molded, gasketed PVC plastic fittings are available for PVC pipe. These fitting are available for sewer pipe sizes 4 inches to 15 inches, for IPS-PVC pipe sizes 1.5 inches to 8 inches, and for AWWA Standard C900 pipes which are compatible with cast iron pipe sizes 4 inches to 8 inches.

CONSTRUCTION SPECIFICATION

45. PLASTIC PIPE

1. SCOPE

The work shall consist of furnishing and installing plastic pipe, except corrugated polyethylene tubing, and the necessary fittings and appurtenances as shown on the drawings or as specified herein.

2. MATERIAL

Pipe, fittings, and gaskets shall conform to the requirements of Material Specification 547 and as specified in Section 14 of this specification or as shown on the drawings.

Perforated pipe shall conform to the requirements of Material Specification 547 and as specified in Section 14 of this specification or as shown on the drawings.

Unless otherwise specified, concrete shall conform to the requirements of Construction Specification 32, Structure Concrete, and Section 8 of this specification.

Unless otherwise specified, earth backfill shall conform to the requirements of Construction Specification 23, Earthfill.

Unless otherwise specified, drainfill shall conform to the requirements of Construction Specification 24, Drainfill.

3. HANDLING AND STORAGE

Pipe shall be delivered to the job site and handled by means which provide adequate support to the pipe and do not subject it to undue stresses or damage. When handling and placing plastic pipe, care shall be taken to prevent impact blows, abrasion damage, and gouging or cutting (by metal edges and/or surfaces or rocks). All special handling requirements of the manufacturer shall be strictly observed. Special care shall be taken to avoid impact when the pipe must be handled at temperatures of 40° Fahrenheit or less.

Pipe shall be stored on a relatively flat surface so that the barrels are evenly supported. Unless the pipe is specifically manufactured to withstand exposure to ultraviolet radiation, it shall be covered with an opaque material when stored outdoors for period of fifteen days or longer.

4. EXCAVATION

Excavation shall be in accordance with Construction Specification 21, Excavation, and Section 14 of this specification or as shown on the drawings.

The pipe foundation shall be excavated a minimum of four inches lower than the pipe grade shown on the drawings or staked in the field whenever bedrock,

boulders, cobbles, or other materials that may cause pipe damage are encountered at planned pipe grade.

5. LAYING THE PIPE

Plastic pipe conduits complete with fittings and other related appurtenances shall be installed to the lines and grades shown on the drawings or specified in Section 14 of this specification. The pipe shall be installed so that there is no reversal of grade between joints unless otherwise shown on the drawings. The pipe shall not be dropped or dumped on the bedding or into the pipe trench. The ground surface near the pipe trench shall be free of loose rocks and stones greater than one (1) inch in diameter to ensure that rock will not be displaced and impact the pipe.

Just prior to placement, each pipe section shall be inspected to insure that all foreign materials are removed from the inside of the pipe. The pipe ends and the couplings shall be free of foreign material when assembled. At the completion of a work shift, all open ends of the pipeline shall be temporarily closed off by a suitable cover or plug.

Care shall be taken to prevent distortion and damage during periods of hot or cold weather. During unusually hot weather (daytime high temperatures greater than 90° F), the pipe assembled in the trench shall be lightly backfilled or shaded to keep it as near to ground temperature as possible until final backfill is placed. Backfill operations should be performed during daily construction periods when the ground temperature and the temperature of the pipe does not vary more than 40° F.

Perforated pipe shall be installed with the perforations down and oriented symmetrically about the vertical centerline. Perforations shall be clear of any obstructions on the inside and outside of the pipe when the pipe is approved by the Engineer for backfill.

During installation, the pipe shall be firmly and uniformly bedded throughout its entire length, to the depth and in the manner specified in Section 14 of this specification or as shown on the drawings. Bell-holes shall be placed in bedding material under bells, couplings and other fittings to assure the pipe is uniformly supported throughout its entire length. Blocking or mounding beneath the pipe to bring the pipe to final grade will not be permitted.

6. PIPE EMBEDMENT

Earth Bedding. The pipe shall be firmly and uniformly placed on compacted earthfill bedding or an in-place earth material bedding of ample bearing strength to support the pipe without noticeable settlement. The earth material on which the pipe is placed shall be of uniform density to prevent differential settlement.

Unless otherwise specified, a groove that closely conforms to the outside surface of the pipe shall be formed in the bedding. The depth of the groove shall be equal to or greater than 0.3 of the pipe diameter.

Earth bedding shall be compacted to a density not less than adjacent undisturbed in-place earth materials or be compacted earth backfill. Earthfill materials used for compacted earth bedding shall be free of rocks or stones greater than one (1) inch in diameter and earth clods greater than two (2) inches in diameter. The pipe shall be loaded sufficiently during the compaction of bedding under the haunches and around the sides of the pipe to prevent displacement from its final approved placement.

Sand, Gravel, or Crushed Rock Bedding. When sand, gravel, or crushed rock bedding is specified, the pipe shall be firmly and uniformly placed on the bedding material. Material for bedding shall not exceed one (1) inch in diameter. Unless otherwise specified in Section 14 of this specification or shown on the drawings, the coarse-grained bedding material shall be carefully placed and compacted to a depth equal to or greater than 0.3 of the diameter of the pipe above the bottom of the pipe. The pipe shall be loaded sufficiently during backfilling and compaction around the sides to prevent displacement of the pipe from its final approved placement.

Pipe Encased in Drainfill. The pipe shall be firmly and uniformly placed on a bedding of specified drainfill. Drainfill shall be placed and compacted as specified in Section 14 of this specification or as shown on the drawings to form a continuous uniform support around the entire circumference of the pipe. The pipe shall be loaded sufficiently during backfilling around the sides and during compaction to prevent displacement of the pipe.

7. BACKFILL

a. Initial Backfill

Unless otherwise specified, initial backfill to six (6) inches above the top of the conduit is required. Earth haunching and initial backfill materials shall consist of soil material that is free of rocks, stones or hard clods greater than one (1) inch in diameter. Coarse backfill material shall be the specified sand, gravel, crushed rock or drainfill material.

Initial backfill shall be placed in two (2) stages. The first stage (haunching) backfill is placed to the pipe spring line (center of pipe). The second stage backfill is placed to six (6) inches above the top of the pipe. The first stage material shall be worked carefully under the haunches of the pipe to provide continuous support throughout the entire pipe length. The haunching backfill material shall be placed in layers approximately six (6) inches maximum thickness and compacted as specified in Section 14 of this specification or as shown on the drawings. During compaction operations, care shall be taken to ensure that the tamping or vibratory equipment does not come in contact with the pipe and the pipe is not deformed or displaced.

When pressure testing is not specified, the pipe shall be covered with a minimum of six (6) inches of backfill material as soon as possible following assembling of the pipe in the trench, but not later than within the same day that placement has

occurred. When pressure testing is specified, sufficient backfill material shall be placed over the pipe to anchor the conduit against movement during pressure testing activities.

b. Final Backfill

Final backfill shall consist of placing the remaining material required to complete the backfill from the top of the initial backfill to the ground surface, including mounding at the top of the trench. Final backfill material within two (2) feet of the top of the pipe shall be free of debris or rocks larger than three (3) inches nominal diameter. Coarse backfill materials shall be the specified sand, gravel, crushed rock or drainfill. Final backfill shall be placed in approximately uniform, compacted layers. Final backfill compaction requirements shall be as specified in Section 14 of this specification or as shown on the drawings.

Vehicles or construction equipment shall not be allowed to cross the pipe until the minimum earth cover and required density as specified in Section 14 of this specification has been obtained.

8. PIPE ENCASEMENT IN CONCRETE

Concrete encasement shall be carefully placed to form a continuous uniform support around the entire circumference of the pipe as specified in Section 14 of this specification or as shown on the drawings. Pipes encased in concrete shall be securely anchored to prevent movement of the pipe during concrete placement. A clear distance of 1 1/2 inches shall be maintained between the pipe and the reinforcing steel.

The concrete for the encasement shall conform to the requirements of Construction Specification [32, Structure Concrete](#), for Class 3000M concrete, unless otherwise specified.

9. JOINTS

Unless otherwise specified in Section 14 of this specification or shown on the drawings, joints shall be either bell and spigot type with elastomeric gaskets, coupling type, solvent cement bell and spigot, or jointed by butt heat fusion. When a lubricant is required to facilitate joint assembly, it shall be a type having no deleterious affect on the gasket or pipe materials.

Pipe joints shall be watertight at the pressures specified except where unsealed joints are indicated.

Pipe shall be installed and joined in accordance with the manufacturer's recommendations. Laying deflections and joint fitting or stab depths shall be within the manufacturer's recommended tolerances.

When solvent cement joints are specified for PVC or ABS pipe and fittings, they shall be made in accordance with the following ASTMs and the related appendix of each ASTM; D 2855 for PVC pipe and fittings, and D 2235 for ABS pipe and fittings.

Flanged, banded, heat-fusion, or elastomeric-sealed mechanical joints shall be used when joining polyethylene (PE) and high density polyethylene (HDPE) pipe and fittings, unless otherwise specified in Section 14 of this specification or as shown on the drawings.

Pipe ends shall be cut square and be de-burred to provide uniform, smooth surfaces for the jointing process. Reference marks shall be placed on the spigot ends to assist in determining when proper seating depth has been achieved within the joint.

10. FITTINGS

Unless otherwise specified, steel fittings, valves, and bolted connections shall be painted or coated as recommended by the manufacturer.

Fittings for non-pressure pipe shall be of the same or similar materials as the pipe and shall provide the same durability, watertightness, and strength as the pipe, unless otherwise specified.

11. THRUST BLOCKS AND ANCHORS

When specified, concrete thrust blocks and anchors shall be installed as shown on the drawings or specified in Section 14 of this specification.

The concrete for the thrust blocks and anchors shall conform to the requirements of Construction Specification 32, [Structure Concrete](#), for Class 3000M concrete, unless otherwise specified in Section 14 of this specification.

The thrust block cavity shall be hand dug into undisturbed soil or previously placed compacted backfill. The cavity shall be formed with soil or wood to hold the freshly place concrete without displacement until an initial set has occurred.

When excavation beyond the designated trench widths and depths as shown on the drawings or specified in Section 14 of this specification occurs at locations where installation of concrete thrust blocks is required, the Contractor shall install an alternative thrust block provision. The concrete thrust block shall have a thickness of one pipe diameter and a contact face area as shown on the drawings or specified in Section 14 of this specification which shall be formed against the pipe. Backfill shall be placed on all sides of the thrust block and to the sides of the excavation and compacted as specified for initial backfill.

12. PRESSURE TESTING

Method 1 Pressure testing of the completed conduit is not required.

Method 2 The conduit shall be tested for leaks in the following manner:

a. Prior to pressure testing:

- (1) Joints of the assembled pipeline shall be allowed to cure as recommended by the manufacturer.
- (2) Pipeline shall be flushed and cleaned.
- (3) All concrete anchors and thrust blocks shall be in place and allowed to cure for a minimum of three (3) days.
- (4) Earth backfill shall be sufficient to anchor the conduit against movement during the pressure testing and shall be compacted as specified in Section 14 of this specification or as shown on the drawings.
- (5) The conduit shall be braced and/or anchored at each end to restrict all potential pipe movement.
- (6) The ends of the conduit shall be plugged. The upstream plug shall have a standpipe installed vertically having a minimum diameter of two (2) inches and shall be equipped with a shutoff valve. All high points in the line shall be vented to evacuate air pockets. The conduit and the standpipe shall be slowly filled with water such that no air is entrapped during the filling operation. After filling is complete, all vents shall be closed.

b. During pressure testing, the water level in the standpipe shall be continuously maintained at a minimum of ten (10) feet above the highest invert elevation of the conduit for a period of not less than two (2) hours, unless otherwise specified in Section 14 of this specification or as shown on the drawings.

The volume of water leakage in the two (2) hour test period shall be recorded. The maximum allowable leakage (L) in gallons per hour shall not exceed 0.02 times the nominal pipe diameter (D) in inches for each 1000 feet of pipe line which is approximately 50 pipe joints ($L = 0.02 \times D$).

c. When observed leakage exceeds the allowable, leaks shall be sealed by replacement of pipe and fittings as necessary. The conduit shall be re-tested as described above. This procedure shall be repeated until the conduit leakage does not exceed the allowable specified above.

The Contractor shall be fully responsible for any and all work required to correct leakage exceeding the amount specified.

Method 3 The conduit shall be tested for leaks in the following manner:

a. Prior to pressure testing:

- (1) Joints of the assembled pipeline shall be allowed to cure as recommended by the manufacturer.
 - (2) Pipeline shall be flushed and cleaned.
 - (3) All concrete anchor and thrust blocks shall be in place and allowed to cure for a minimum of three (3) days.
 - (4) Earth backfill shall be sufficient to anchor the conduit against movement during the pressure testing and compacted as specified in Section 14 of this specification or as shown on the drawings.
 - (5) The conduit shall be braced and/or anchored at each end to prevent all potential pipe movement.
 - (6) The ends of the conduit shall be plugged and a pressure gauge shall be attached to the upstream and downstream ends. All high points along the pipeline shall be vented to permit the complete removal of all air within the pipeline. The conduit shall be slowly filled with water such that no air is entrapped during the filling operations.
- b. The testing pressure specified in Section 14 of this specification shall be continuously maintained at the upstream gauge for a minimum period of two (2) hours. The pressure at the downstream gauge shall not exceed the pressure rating of the pipe.
- c. The volume of water leakage for the two (2) hour test period shall be recorded. Maximum allowable leakage shall be in accordance with the following:

**ALLOWABLE LEAKAGE FOR PLASTIC PIPE
(GALLONS PER HOUR PER 1,000 FEET OR 50 PIPE JOINTS) ****

Nominal Pipe Size (Inches)	Test Pressure in the Pipeline – P. S. I.			
	50	100	150	200
		<u>Allowable Leakage</u>		
4	0.19	0.27	0.33	0.38
6	0.29	0.41	0.50	0.57
8	0.38	0.54	0.66	0.76
10	0.48	0.68	0.83	0.96
12	0.57	0.81	0.99	1.15
14	0.67	0.95	1.16	1.34
15	0.72	1.02	1.25	1.44
16	0.76	1.07	1.32	1.52
18	0.86	1.22	1.49	1.72

** Computation Basis

$$L = \frac{ND\sqrt{P}}{7,400}$$

Where: L = allowable leakage in gallons per hour
N = number of joints (pipe and fittings)
D = nominal diameter of pipe in inches
P = test pressure in pounds per square inch (psi)

- d. When observed leakage exceeds the allowable, leaks shall be sealed by replacement of pipe and fittings as necessary. The conduit shall be re-tested as described above.

The Contractor shall be fully responsible for any and all work required to correct leakage exceeding the amount specified.

13. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the quantity of each kind, size, and class of pipe will be determined to the nearest foot by measurement of the laid length along the crown centerline of the conduit. Payment for each kind, size, and class of pipe will be made at the contract unit price for that kind, size, and class. Such payment will constitute full compensation for furnishing, transporting, and installing the pipe including excavation, shoring, backfill, bedding, thrust blocks, and all fittings, appurtenances, and all other items necessary and incidental to the completion of the work. Payment for appurtenances listed separately in the bid schedule will be made at the contract prices for those items.

Method 2 For items of work for which specific unit prices are established in the contract, the quantity of each kind, size, and class of pipe will be determined as the sum of the nominal laying lengths of the sections used. Payment for each kind, size, and class of pipe will be made at the contract unit price for the kind, size, and class. Such payment will constitute for compensation for furnishing, transporting, and installing the pipe including excavation, shoring, backfill, bedding, thrust blocks, and all fittings, appurtenances, and other items necessary and incidental to the completion of the work. Payment for appurtenances listed separately in the bid schedule will be made at the contact prices for those items.

Method 3 For items of work for which specific unit prices are established in the contract, the quantity of each kind, size, and class of pipe will be determined to the nearest foot by measurement of the laid length along the crown centerline of the conduit. Payment for each kind, size, and class of pipe will be made at the contract unit price for the kind, size, and class. Such payment will constitute full compensation for furnishing, transporting, and installing the pipe including shoring, all fittings, thrust blocks, appurtenances, and other items necessary and incidental to the completion of the work. Payment for appurtenances listed separately in the bid schedule will be made at the contract prices for those items.

Methods 3 and 4 Excavation, backfill, and bedding will be paid separately under their respective bid items.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any items of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and items to which they are made subsidiary are identified in Section 14 of this specification.

TILE DRAINS

1. **APPLICABILITY**

Construction Specification 46 is applicable to the installation of clay and concrete drain tile for land drainage.

2. **MATERIAL SPECIFICATIONS**

The following material specifications are complementary to Construction Specification 46:

- a. **Clay Pipe and Drain Tile:** Specification [544](#)
- b. **Non-Reinforced Concrete Pipe:** Specification [543](#)

3. **ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS**

- a. Line and grade for tile/pipe. Include statement in items of work that pipe shall be installed so that there is no reversal of grade between joints unless specifically shown otherwise on the drawings.
- b. Kind, size and class of tile and/or pipe.
- c. Typical cross-sections, including typical bedding details.
- d. Special fittings, appurtenances, etc.
- e. Maximum and minimum trench widths.
- f. Procedures to use where unstable soils are encountered. Consider Contractor's responsibility for construction safety.
- g. Typical pipe outlets.
- h. Details of appurtenances.
- i. Location and details of any special tile/pipe bedding requirements.
- j. Use or restrictions of automatic backfillers.
- k. Location of required compacted backfill.
- l. Details of any special fittings.
- m. Type of joint required (including spacers where required).
- n. Type, kind and size of materials to be used to cover joint or pipe.
- o. Type of envelope or filter.

- p. Gradation of sand-gravel envelope or filter material. Note the limits of the moisture content of sand material so bulking will be avoided.
- q. Directions for covering pipe with envelope or filter material. Provide caution to avoid the dropping of gravel/rock materials directly on clay tile.

4. DISCUSSION OF METHODS

Methods are included in Section 4, 5, and 7. The methods are self-explanatory.

CONSTRUCTION SPECIFICATION

46. TILE DRAINS

1. SCOPE

The work shall consist of furnishing and installing drain tile and necessary fittings and appurtenances.

2. MATERIALS

Unless otherwise specified, the drain tile and fittings shall conform to the requirements of Material Specification 543 or Material Specification 544, whichever is applicable.

3. EXCAVATION

Unless otherwise specified, excavation for the installation of each tile line shall begin at the outlet end and progress upstream.

The trench or excavation for the tile shall be constructed to the depths and cross-sections shown on the drawings. The trench width may be increased above the top of the tile, at the option of the Contractor.

Trench shields, shoring and bracing, or other methods necessary to safeguard construction personnel and to prevent damage to the existing improvements shall be furnished, placed, and subsequently removed by the Contractor.

4. PREPARING THE TILE BED

Method 1 In stable soils the tile shall be firmly and uniformly bedded throughout its entire length to the specified depth and in the specified manner.

When the bottom of the trench does not provide a sufficiently stable or firm foundation for the drain tile, cradles for the tile (constructed of timber or fabricated lumber of a cleat-and-rail type construction), a sand-gravel mix or other approved materials shall be used to stabilize the bottom of the trench.

Drain tile shall not be laid on a rock foundation. In the event that boulders, rocks or ledge rock or cemented materials that prevent satisfactory bedding are encountered at the required grade with the trench cross-section, the trench shall be excavated to a minimum depth of six (6) inches below grade and backfilled to grade with a sand-gravel mixture or other approved material. The bedding material shall be shaped to grade and compacted.

Method 2 Tile shall be bedded as shown on the drawings or as specified in Section 10 of this specification.

5. LAYING TILE AND JOINT COVERING

Method 1 Gaps between tile ordinarily shall be from one-eighth (1/8) inch to one-quarter (1/4) inch in clay, clay loam and cohesive soils; and without gaps in sandy soils and on lines to convey water with no intention of providing drainage.

Where tile is installed with the width of joint opening exceeding the limits stated above for non-cohesive silts, and fine and medium sands, the joint shall be covered with a permanent type material such as coal tar pitch treated roofing paper, fiber glass sheet or mat, or plastic sheeting.

For tile installations on a curve alignment, the outside tile gap shall be covered with tile bats (broken tile) or covered as described above when the gap exceeds the recommended gap for the type of soil encountered. To maintain the gap within the allowable range, the inside pipe lip may be chipped and fitted to secure the required joint opening.

The ends and inside surfaces of all tile shall be kept clean during installation. All earth or other extraneous material within the tile shall be removed before installation of the next tile section. At the end of each day's work and when laying has been temporarily suspended, the inlet end shall be blocked so that earth or other extraneous materials will not enter the tile. The upper end of each tile line shall be blocked with permanent type materials following satisfactory completion of tile installation.

Method 2 Tile shall be laid and joints shall be covered in the manner shown on the drawings or as specified in Section 10 of this specification.

6. CONNECTIONS

Lateral connections will be made with manufactured junctions comparable in strength with the specified tile unless otherwise specified.

Where existing tile lines not shown on the drawings are crossed, they shall be bridged across the new trench or they shall be connected into the new tile lines, as directed by the Engineer.

7. BLINDING OR FILTER MATERIAL

Method 1 As soon as the tiles are placed satisfactorily, they shall be blinded by covering with friable soil materials to a minimum depth of six (6) inches. Material used for blinding shall not be frozen and, unless otherwise specified in Section 10 of this specification, shall contain no rocks or stones that when dropped may cause tile damage. Sandy and other non-cohesive soils shall not be used for blinding unless the joints are covered. All tile placed during any day shall be blinded at the completion of the day's work activities.

Method 2 Tile shall be covered with sand and gravel meeting the gradation, quality, quantities, and dimensions and installed as shown on the drawings or as specified in Section 10 of this specification. Material used for blinding shall not be frozen or contain rocks or stones that when dropped may cause tile damage. All tile placed during any day shall be blinded at the completion of the day's work activities.

Method 3 Unless otherwise specified, tile shall be covered with material obtained from required trench excavations.

8. BACKFILLING

The backfilling of the trench shall be completed as rapidly as consistent with the soil conditions.

Automatic backfilling machines may be used only when approved by the Engineer. Backfill shall extend above the ground surface, be well rounded and centered over the trench.

Unless otherwise specified, where drain tile are installed under roads and at other designated locations shown on the drawings, the backfill shall be placed in successive layers of not more than six (6) inches and each layer shall be compacted before the next layer is placed. The density of the compacted backfill shall not be less than the density of the surrounding adjacent earth materials unless otherwise specified in Section 10 of this specification.

9. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the quantity of each kind, size and class of tile will be determined to the nearest foot of length measured along the centerline of the installed tile. Payment for each kind, size and class of tile will be made at the contract unit price for that kind, size and class of tile. Such payment will constitute full compensation for furnishing, transporting and installing the tile, including excavation, shoring, backfill and all fittings, appurtenances and other items necessary and incidental to the completion of the work. Payment for appurtenances listed separately in the bid schedule will be made at the contract prices for the sizes and types of appurtenances listed.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 10 of this specification.

CORRUGATED METAL PIPE

1. APPLICABILITY

Construction Specification 51 is applicable to the installation of all types of corrugated metal pipe conduits.

2. MATERIAL SPECIFICATIONS

The following specifications are complementary to Construction Specification 51:

- a. [Coated Corrugated Steel Pipe](#). Specification 551
- b. [Aluminum Corrugated Pipe](#). Specification 552

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Line and grade of the conduit.
- b. Details of the pipe bedding including description and grading limits of the bedding material.
- c. Details of wall fittings, joint and other special pipe fittings.
- d. Details of struts or ties, as necessary.
- e. Pay limits or actual limits for excavation and backfill, if required. Due consideration of OSHA safety requirements for trench excavation should be considered for pay quantities.
- f. Applicable material specifications.
- g. Type, class, size, gauge, and length of pipe.
- h. Type of coupling and gasket, if required. Coupling bands may be detailed on the drawings and described in Section 11, or may be specified in Section 11 by describing the performance requirements by reference to ASTM A 798, Paragraph 8, Pipe Installation. Using ASTM A 798, joint watertightness may be specified per paragraph 8.2.4.6 Watertightness, however, the method of testing and the basis for determining acceptance is needed.
- i. Close riveting or double riveting, if required.
- j. Type of pipe coating, if required.
- k. Methods of measurement and payment if the contract specification includes more than one method.

- I. Backfill requirements. Compaction requirements should be equal to requirements for the adjacent embankment for principal spillways or similar installations.

4. DISCUSSION OF METHODS

a. Section 10, Measurement and Payment

The methods are self-explanatory.

When specifications are prepared using electronic procedures and all but one method is deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

51. CORRUGATED METAL PIPE

1. SCOPE

The work shall consist of furnishing and placing circular, arched or elliptical corrugated metal pipe and the necessary fittings.

2. MATERIALS

Pipe and fittings shall conform to the requirements of Material Specification 551 or Material Specification 552, whichever is specified.

Unless otherwise specified in Section 11 of this specification, perforated pipe furnished shall conform to the requirements for Class I perforations as described in ASTM A 760 or A 762.

3. COUPLING BANDS AND HARDWARE

Pipe joint coupling bands shall be provided meeting the requirements specified in Section 11 of this specification.

Hardware consisting of coupling bands and band fastening devices such as connecting bolts, rods, lugs and angles used in conjunction with zinc-coated iron or steel pipe shall be galvanized by the hot-dip method. Hardware used in conjunction with aluminum pipe and aluminum or aluminum-zinc alloy-coated iron and steel pipe shall be of the same material as the pipe except that hot-dip galvanized or cadmium-plated fasteners may be used. The surface of all band fastening devices for pipe specified with bituminous or polymer coating shall be coated with asphalt-mastic materials meeting the requirements of ASTM A 849. The coupling band shall be coated similar to that specified for the pipe unless otherwise specified in Section 11 of this specification.

Coupling bands shall be installed to provide straight alignment of the connecting pipe ends. Unless otherwise specified in Section 11 of this specification, the band width shall be as specified in ASTM A 760 and A 762. The bands shall be positioned to overlap adjacent pipe ends equally. The coupling bands shall be corrugated to match the corrugations of the pipe section ends being connected.

4. FABRICATION

Fabrication of appurtenant sections shall be performed as shown on the drawings and described in Section 11 of this specification. The items may consist of inlet sections, outlet sections, end sections, elbows, skew or beveled sections, rod reinforced ends, cut-off collars, or headwalls. Fabrication of these appurtenant sections shall be made from metallic-coated materials identical to those from which the attached pipe is fabricated. Fabrication shall be of a quality and finished workmanship equal to that required for the pipe.

5. HANDLING THE PIPE

The Contractor shall furnish equipment as necessary to install the pipe without damaging the pipe or coating. The pipe shall be transported and handled in a manner to prevent damage to the pipe and coating.

6. LAYING AND BEDDING THE PIPE

Unless otherwise specified, the pipe shall be installed in accordance with the manufacturer's recommendations. Pipe shall be installed so no reversal of grade between joints results unless otherwise shown on the drawings. The pipe shall be installed with the outside laps of circumferential joints pointing upstream and with longitudinal laps at the sides near the vertical midheight of the pipe.

Field welding of corrugated galvanized iron or steel pipe will not be permitted. The pipe sections shall be joined with fabricator-supplied coupling bands meeting the specified joint requirements. The coupling shall be installed as recommended by the fabricator.

The pipe shall be firmly and uniformly bedded throughout its full length to the depth and in the manner specified on the drawings.

Perforated pipe shall be installed with the perforations down and oriented symmetrically about a vertical centerline. Perforations shall be clear of any obstructions at the time the pipe is installed in its final position.

The pipe shall be loaded sufficiently during backfilling to prevent displacement from line and grade, and to maintain full contact with the bedding during the placement operations.

7. STRUTTING

When required, struts or horizontal ties shall be installed in the manner specified on the drawings. Struts and ties shall remain in position until the backfill has been placed above the top of the pipe to a height of five (5) feet or the pipe diameter, whichever is greater, or to the surface of the completed earth backfill when the fill height is less than five (5) feet above the top of the pipe. The Contractor shall remove the struts or ties following completion of the earth backfill requirements that apply.

8. EMBEDMENT IN CONCRETE

Special treatment shall be provided to pipe surfaces when embedded or attached to concrete and the pipe material is aluminum or aluminum-coated and aluminum-zinc alloy coated. Potential contact surfaces in contact with concrete and masonry surfaces shall be coated with two (2) coats of a bituminous paint of the cut-back type. Placement of the pipe shall be such that direct metal-to-metal contact with

other metallic materials, such as embedded steel reinforcement or water control gates, is prevented.

9. REPAIR OF DAMAGED COATING

Any damage to the metallic coating shall be repaired by cleaning the damaged surface area by sand blasting, power disk sanding or wire brushing. All loose and cracked coating, dirt, and any products of corrosion shall be removed prior to application of paint. Oil and grease materials shall be removed by use of a solvent. The surface shall be clean and dry during the painting period and until the coating has completely dried.

Painting shall be accomplished by one of the following options based upon installed exposure conditions of the pipe as determined by the Engineer.

Normal exterior or interior atmospheric exposure:

- a. Zinc dust - zinc oxide primer, ASTM D 79 and D 520
- b. Singles package, moisture cured urethane prime in silver metallic color, or
- c. Zinc-rich cold galvanized compound, brush, or aerosol application.

Submergence in water exposure:

- a. Zinc dust-zinc oxide primer, ASTM D 79 and D 520
- b. Zinc dust paint, ASTM D 4146

When the metallic coating is damaged in any individual area larger than twelve (12) square inches, or if more than 0.2 percent of the total surface area of a single pipe section is damaged, that section of pipe will be rejected.

Breaks or scuffs in bituminous coatings that are less than 36-square inches in area shall be repaired by the application of two coats of hot-asphaltic paint or a coating of cold-applied bituminous mastic. The repair coating shall be a minimum of 0.05-inches thick after hardening and shall bond securely and permanently to the pipe and coating. The material shall meet the minimum physical requirements for bituminous coating contained in ASTM A 849 and A 885. Whenever individual breaks exceed 36-square inches in area or when the total area of breaks exceeds 0.5 percent of the total surface area of an individual pipe section, that section of pipe will be rejected.

Bituminous coating damaged by welding of coated pipe or pipe fittings shall be repaired as specified in this Section for breaks or scuffs in bituminous coatings.

Breaks or scuffs in polymer coatings that are less than 36-square inches in area shall be repaired by the application of a polymer material similar to and compatible

with the durability, adhesion and appearance of the original polymer coating, as described in ASTM A 849, paragraph 6.8. The repair coating shall be a minimum thickness of 0.010-inches (10 mils) after drying. Whenever individual breaks exceed 36-square inches in area or when the total area of breaks exceed 0.5 percent of the total surface area of the individual pipe section, that section of pipe will be rejected.

10. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the quantity of each type, class, size and gauge of pipe will be determined to the nearest 0.1 foot by measurement of the laid length of the pipe along the centerline of the pipe. Payment for each type, class, size and gauge of pipe will be made at the contract unit price for that type, class, size and gauge of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe and fittings and all other items necessary and incidental to the completion of the work, except items designated as "special fittings". Special fittings are those sections of pipe requiring special fabrication to meet layout requirements. Payment for special fittings will be made at the contract unit price for special fittings (CMP).

Method 2 For items of work for which specific unit prices are established in the contract, the quantity of each type, class, size and gauge of pipe will be determined as the sum of the nominal laying lengths of the pipe sections installed. Payment for each type, class, size and gauge of pipe will be made at the contract unit price for that type, class, size and gauge of pipe. Such payment will constitute full compensation for furnishing, transporting and installing the pipe and fittings and all other items necessary and incidental to the completion of the work except items designated as "special fittings". Special fittings are those sections of pipe requiring special fabrication to meet layout requirements. Payment for special fittings will be made at the contract unit price for special fittings (CMP).

Method 3 For items of work for which specific lump sum prices are established in the contract, payment for corrugated metal pipe structures will be made at the contract lump sum price. Such payment will constitute full compensation for furnishing, fabricating, transporting, and installing the pipe structure complete with metal pipe, fittings, and appurtenances, and all other items necessary and incidental to completion of the work which includes, except as otherwise specified, required excavation, dewatering, and earth backfill.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and items to which they are made subsidiary are identified in Section 11 of this specification.

INSTRUCTIONS FOR USE OF CONSTRUCTION SPECIFICATION 52

STEEL PIPE

1. APPLICABILITY

Construction Specification 52 is applicable to the installation of steel pipe conduits.

2. MATERIAL SPECIFICATIONS

Material Specifications [554](#) and [581](#) are complementary to Construction Specification 52.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Details of the bedding, including description and grading limits of the bedding material.
- b. Excavation requirements. If Measurement and Payment Method 1 or 2 is used, a bid item and items of work and construction details for excavation and backfill would normally be covered under Construction Specification [21](#) and [23](#). If Measurement and Payment Method 3 or 4 is used, construction details for excavation can either be covered in Section 12, or as a subsidiary item under Construction Specification [21](#).
- c. Method of backfill selected from Section 10.
- d. Pay limits or actual limits for excavation and backfill, if required.
- e. Kind of pipe. Include name, type, grade, finish, weight class, and wall thickness as required. (See appropriate reference specifications.)
- f. Size of pipe.
- g. Length of pipe.
- h. Type of protective lining and coating if required (Refer to AWWA Standard C203, AWWA Standard C209, or AWWA Standard C214 for detailed information).

Note: In accordance with AWWA C203, field welded pipe 27-inch diameter and larger is large enough to allow entry of personnel to clean the welded surface and apply primer and enamel. Therefore, lined pipe smaller than 27-inch diameter should not be field welded.

- i. Type of joint and details of special joints.
- j. Details of wall fittings and other special fittings and appurtenances.
- k. Watertightness or pressure test requirements, if applicable.
- l. Shop coating of fittings if the vinyl option is specified as discussed in Section 6.

- m. Bonding details for cathodic protection, if applicable.
- n. Method of field lining, coating, wrapping, and repair selected from Section 7.
- o. Method of measurement and payment in Section 11.

4. DISCUSSION OF METHODS

a. Section 7, Field Lining, Coating, Wrapping, and Repair

- (1) Method 1 is intended for use when hot-applied linings and/or coatings are required, or for repairing hot applied linings and/or coatings.
- (2) Method 2 is intended for use when cold-applied tapes are required for wrapping assembled joints and for repair of hot applied coatings.
- (3) Method 3 is intended for use when the pipe is coated in accordance with AWWA Standard C214.

b. Section 10, Backfill

The methods are self-explanatory.

c. Section 11, Measurement and Payment

The methods are self-explanatory.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

52. STEEL PIPE

1. SCOPE

The work shall consist of furnishing and installing steel pipe complete with lining, coating, fittings, and appurtenances.

2. MATERIALS

[Steel pipe and fittings](#) shall conform to the requirements of Material Specification [554](#).

Unless otherwise specified, special fittings and appurtenances shall be of the same material as the pipe.

[Welding electrodes](#) shall conform to the requirements of Material Specification [581](#).

Coating and lining materials shall conform to the requirements of the following:

- a. AWWA C203, Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines, Enamel and Tape - Hot-Applied;
- b. AWWA C209, Standard for Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines;
- c. AWWA C214, Standard for Tape Coating Systems for the Exterior of Steel Water Pipelines;

and as specified below:

Shop coating materials shall conform to the requirements of AWWA Standard C203 and AWWA Standard C214 and as specified in Section 12 of this specification.

Shop lining materials shall conform to the requirements of AWWA Standard C203.

Field coating and coating repair materials shall conform to the requirements of AWWA Standard C203, AWWA Standard C209, AWWA Standard C214 and, as specified in Section 12 of this specification.

Field lining materials shall conform to the requirements of AWWA Standard C203 and as specified in Section 12 of this specification.

3. COATING AND LINING

Shop coating of pipe, specials, and fittings shall be in accordance with either AWWA Standard C203, AWWA Standard C209, or AWWA Standard C214 and as specified in Section 12 of this specification.

Shop lining of pipe, specials, and fittings shall conform to the requirements of AWWA Standard C203.

4. EXCAVATION

Excavation shall be in accordance with Construction Specification 21 or as specified in Section 12 of this specification.

5. LAYING AND BEDDING THE PIPE

Pipe shall be installed to the line and grade shown on the drawings. Unless otherwise specified, the pipe shall be installed so that there are no reversals of grade between joints, and shall also be installed in accordance with the manufacturer's recommendations. The pipe shall be firmly and uniformly bedded to the depth and in the manner specified on the drawings. An ample "bell hole" working area may be left at pipe joints to perform welding, coating, etc., activities. The "bell hole" area shall then be bedded, as specified, prior to backfill operations.

The pipe shall be weighed down sufficiently to prevent its displacement from the bedding during placement of the backfill under the haunches.

6. JOINTS AND CONNECTIONS

Pipe joints shall conform to the details shown on the drawings and shall be sound and watertight at the pressures specified in Section 12 of this specification.

Welded Joints. Welding and welded joints shall conform to the welding procedure details and requirements of AWWA Standard C206. Field welding shall be done in such a way as to avoid burning the protective coating on the pipe except in the immediate vicinity of the weld.

Where welded field joints are used, they shall be single welded butt joints or lap welded slip joints, as shown on the drawings. Special closure lap joints shall be used as described in AWWA Standard C206.

Bell and Spigot Joints. The dimensions of bells and spigots shall be in accordance with the manufacturer's standard design dimensions and tolerances.

The pipe shall be laid with the bell oriented upstream. The spigot end shall be seated in the bell to a depth as recommended by the manufacturer. The spigot, when seated, shall compress the gasket radially in its annular recess to provide a positive seal. Joints with fishmouthed gaskets will be taken apart and re-seated with a new gasket.

Rubber gaskets shall meet the requirements of AWWA Standard C200.

Mechanical Couplings. The ends of pipe to be connected with mechanical couplings shall be machined so as to allow coupling the pipe sections without damaging or displacing the gaskets and to insure uniform end separation of the pipes. Machined ends of the pipe that receive the coupling sleeves shall be free from dents, gouges, rust, or scale. The pipe and couplings shall be assembled with continuous rubber

ring gaskets conforming to the dimensions and tolerances recommended by the pipe manufacturer. Coupling followers shall be drawn up evenly to insure uniform pressure on the gaskets.

Grooved and shouldered joints shall be furnished and installed in accordance with AWWA Standard C606.

Flanged Joints. All steel ring flanges shall be fabricated in accordance with AWWA Standard C207. Gaskets shall be either a neoprene cloth-insert 1/16-inch or 1/8-inch thick or red rubber 1/16-inch thick. The gasket shall be full face where used between flat face flange surfaces. All flanged joints shall be made up tightly and shall not leak.

Fitting and Coupling Coatings. Compression couplings, mechanical couplings, and flanged fittings shall be shop coated with the AWWA Standard C203 coal tar enamel coating, as recommended by the coating manufacturer, or a factory-applied vinyl coating at least 12 mils thick and as specified in Section 12 of this specification. All bolts furnished for flanges, couplings, and other types of bolted connections shall be stainless steel or low alloy steel and shall be field coated with a coal tar enamel or vinyl coating after installation.

7. FIELD LINING, COATING, WRAPPING, AND REPAIR

Lining and coating or wrapping of field joints or connections and repair of damage to the wrap or coating on pipe, couplings, fittings, and appurtenances shall be made in accordance with Section 12 of this specification and one of the following methods:

Method 1 All field coating, lining, and repair shall be as specified in AWWA Standard C203;

Method 2 All field wrapping and repair shall be as specified in AWWA Standard C209 with Type I or II tape;

Method 3 All field wrapping and repair shall be as specified in AWWA Standard C214;

All Methods The following provisions apply to all methods of field coating, wrapping, and coating repair.

Surface Preparation. Bare steel surfaces shall be prepared for coating by removing all grease and oil or other soluble contaminants with solvent commercial cleaners (wiping, dipping, or steam) or vapor degreasing. After degreasing, surfaces shall be cleaned with hand tools to remove all loose scale rust and other loose detrimental foreign matter.

On previously coated surfaces, all dirt, paper and other foreign matter, and loose coating shall be removed. Kraft paper, whitewash, or other surface protective layers shall be removed at least 12 inches on either side of the bare steel to be coated.

Welds shall be cleaned of all welding slag, splatter, and scale. Sharp edges or burrs that could puncture or cut the coating shall be removed by grinding or filing. All welds shall be allowed to cool before applying primer or coatings.

Primer Application. After surface preparation is complete, primer shall be thoroughly mixed and applied in strict adherence to manufacturer's instructions. The primer shall be permitted to dry to the consistency recommended by the manufacturer prior to applying the coating. No foreign matter shall come in contact with the primed surface prior to application of the coating. Application of primer to surfaces shall be limited to that amount of area that can be wrapped during the same work-shift. Primed areas not wrapped during the same work-shift shall be re-primed. Cold weather applications of primer shall be done in accordance with AWWA Standard C203.

Coating Application. The specified coating shall be applied in accordance with the manufacturer's recommendations, unless otherwise specified.

After assembly, all pipe joints shall be field wrapped in accordance with AWWA C209 or AWWA C214, as appropriate. Surface preparation and primer application to the ends of the pipe to be wrapped shall be as previously described in this specification. A tape or filler tape shall be cigarette wrapped over the annular ring of the joint. The pipe coating shall be primed two (2) inches back from the coating cutback and two (2) layers of tape shall be wrapped overlapping two (2) inches of pipe coating on one side of the joint, extending across the joint and overlapping two (2) inches of coating on the other side of the joint. Coal tar enamel coating cutback edges shall be tapered back until one (1) inch of coal tar is exposed on the taper prior to priming and wrapping. Wraps shall be terminated on the underside of the pipe. Tape widths shall be six (6) inches for pipe greater than eight (8) inches diameter and four (4) inches for pipe two (2) to eight (8) inches in diameter.

Welded field joints, of lined pipe, shall be lined in accordance with AWWA Standard C203, Section 4.3, or as specified in Section 12 of this specification.

Repair and Patching Factory Coatings. All loose or disbanded material shall be removed from the area of the "holiday". All points, burrs, or rough edges shall be smoothed to a feathered edge. The surface shall be cleaned and prepared as specified for joints, couplings, and fittings. The area to be cleaned and prepared shall be at least twice the size of the "holiday". The repair coating shall be worked onto the surface of the steel so as to leave no voids or wrinkles on the surface.

Coal tar enamel coatings shall be repaired in accordance with AWWA Standard C203, Section 2.15. Tape coatings shall be repaired in accordance with AWWA Standard C214, Section 3.4, Coating Repair. The repair shall be made by wrapping tape around the circumference of the pipe.

All damaged vinyl coat areas shall be cleaned and recoated in accordance with the manufacturer's recommendation.

8. HANDLING THE PIPE

The Contractor shall furnish such equipment as is necessary to place the pipe without damaging the pipe or coating. Coated pipe shall be handled in the manner specified in AWWA Standard C203 or C214, as appropriate.

9. PRESSURE TESTING

If pressure testing of the conduit is specified, it shall be performed as follows:

- a. Placement of backfill before pressure testing shall be as specified in Section 10 of this specification.
- b. Before pressure testing, the pipeline shall be flushed and cleaned.
- c. The pipeline shall not be pressure tested until concrete in the anchor and thrust blocks has attained the minimum specified compressive strength.
- d. The total conduit, or section of the conduit, to be tested shall be filled with clean water at the rate specified and tested at the pressure specified in Section 12 of this specification.
- e. The section of conduit being tested shall be allowed to stand full of water for a minimum of 24 hours before the start of pressure and leakage test. Test pressure shall be held constant for 2 hours. If the amount of water loss exceeds the limit specified, the leaks shall be repaired and the conduit shall be re-tested. The procedure shall be repeated until the amount of water loss is within the limits specified in Section 12 of this specification.

10. BACKFILL

Method 1 Backfill, in accordance with Construction Specification 23 and Section 12 of this specification, shall be made only in sufficient amount to hold the conduit in place during testing, with the following exceptions:

- a. Compacted backfill shall be placed to its final depth as shown on the drawings at vertical and horizontal angle points, road crossings, and thrust blocks. Backfill shall be placed in such a way that the conduit and joints will not be subject to displacement or damage.
- b. All joints and connections shall be completely exposed for visual inspection during testing, except at locations that maybe exempt as outlined in 10.a.

Method 2 Backfill, in accordance with Construction Specification 23 and Section 12 of this specification, shall be to its final depth as shown on the drawings for the section of conduit being tested.

Use with Either Method The Contractor shall be fully responsible for any and all work required to repair any leakage when water loss exceeds the amount specified in Section 12 of this specification. After pressure testing is satisfactorily completed, the backfill shall be placed in accordance with Construction Specification 23 and Section 12 of this specification.

11. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the quantity of each type and size of pipe will be determined to the nearest 0.1 foot by measurement of the installed length of pipe along the centerline of the pipe. Payment for each type and size of pipe will be made at the contract unit price for that type and size of pipe. Such payment will constitute full compensation for furnishing, transporting, and installing the pipe, including the necessary fittings and all other items necessary and incidental to the completion of the work.

Method 2 For items of work for which specific unit prices are established in the contract, the quantity of each type and size of pipe will be determined to the nearest 0.1 foot by measurement of the installed length of pipe along the centerline of the pipe. Payment for each type and size of pipe will be made at the contract unit price for that type and size of pipe. Such payment will constitute full compensation for furnishing, transporting, and installing the pipe, complete in place, including the necessary fittings and all other items necessary and incidental to the completion of the work except the special fittings and appurtenances listed separately in the bid schedule. Payment for each special fitting and appurtenance will be made at the contract unit price for that type and size of fitting or appurtenance.

Method 3 For items of work for which specific unit prices are established in the contract, the quantity of each type and size of pipe will be determined to the nearest 0.1 foot by measurement of the installed length of pipe along the centerline of the pipe. Payment for each type and size of pipe will be made at the contract unit price for that type and size of pipe. Such payment will constitute full compensation for furnishing, transporting, and installing the pipe, including excavation, shoring, backfill, and all the necessary fittings and all other items necessary and incidental to the completion of the work.

Method 4 For items of work for which specific unit prices are established in the contract, the quantity of each type and size of pipe will be determined to the nearest 0.1 foot by measurement of the installed length of pipe along the centerline of the pipe. Payment for each type and size of pipe will be made at the contract unit price for that type and size of pipe. Such payment will constitute full compensation for furnishing, transporting, and installing the pipe, complete in place, including excavation, shoring, backfill, and all the necessary fittings and all other items necessary and incidental to the completion of the work except the special fittings and appurtenances listed separately in the bid schedule. Payment for each special fitting and appurtenance will be made at the contract unit price for that type and size of fitting or appurtenance.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract, but not listed in the bid schedule, will be included in the payment for the item of work to which it is made subsidiary. Such items, and the items to which they are made subsidiary, are identified in Section 12 of this specification.

DUCTILE-IRON PIPE

1. APPLICABILITY

Construction Specification 53 is applicable to the installation of ductile-iron pipe and fittings used in water distribution systems.

2. MATERIAL SPECIFICATIONS

Material Specification [553](#) is complementary to Construction Specification 53.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Line and grade of the conduit. Include a statement in items of work that the pipe shall be installed so reversal of grade between joints does not occur unless shown on the drawings.
- b. Details of bedding, including description and grading limits of bedding material.
- c. Method of backfill consistent with minimum job requirements, complexity, and inspection compliance considerations. Refer to Construction Specification [23](#), [Earthfill](#), if used.
- d. Pay limits or actual limits for excavation, minimum trench width, and any special considerations necessary. Consider the need for Contractor's compliance with the excavation safety requirements of OSHA.
- e. Pay limits or actual limits of backfill, compaction requirements or other special methods of performance and controlling backfill, as appropriate. (AWWA, Standard C600 provides a prepared standard that may be referenced for installation, as appropriate.) Provide the necessary guidance when sand bedding is specified so bulking potential is avoided.
- f. Kind of pipe (thickness class and rated working pressure).
- g. Size of pipe (diameter).
- h. Laying length of pipe.
- i. Type of joints for pipe and fittings (mechanical push-on or flanged). Pipe joining details if different than manufacturer's recommendations.
- j. Lining thickness and coating for pipe (interior and exterior) and methods of repair. Loose polyethylene pipe encasement, tube or sheet form, for corrosion protection can be specified as per ANSI A21.5 (AWWA C105). Provide placing and handling details as appropriate. Protective coatings applied to the pipe during manufacture must be specified on the job basis. Outline minimum repair procedures to correct tears and rips in the loose encasement coverings.

- k. Pressure and leakage test requirements including the duration of the test period.
- l. Details of special fittings and appurtenances.
- m. Concrete thrust and anchor block specifications and details.

4. DISCUSSION OF METHODS

a. Section 7, Backfill

Methods are self-explanatory.

b. Section 8, Measurement and Payment

When deduction in measured pipe length will be made for special fittings and other appurtenances, outline procedures in Section 9 that will be implemented to determine pipe length for payment purposes.

CONSTRUCTION SPECIFICATION

53. DUCTILE-IRON PIPE

1. SCOPE

The work shall consist of furnishing and installing ductile-iron pipe, fittings, and appurtenances as specified in Section 9 of this specification and as shown on the drawings.

2. MATERIALS

Ductile-iron pipe and fittings shall conform to the requirements of Material Specification [553, Ductile-Iron Pipe and Fittings](#). Thickness class of pipe and rated working pressure shall be as specified in Section 9 of this specification or as shown on the drawings.

Unless otherwise specified, special fittings and appurtenances shall be the same material as the pipe.

3. LAYING AND BEDDING THE PIPE

Pipe shall be installed to the lines and grades shown on the drawings with bell socket ends aligned upstream unless otherwise specified. The pipe shall be installed in accordance with the manufacturer's recommendations, unless otherwise specified. Two (2) copies of the pipe manufacturer's installation instructions shall be provided to the Engineer prior to any pipe placement. The pipe shall be firmly and uniformly bedded within the trench throughout the entire length of the pipe section to the depth and in the manner specified. Bell holes for flanged, push-on or mechanical joint pipe shall be provided as necessary to allow space for joint assembly and to permit the pipe barrel to be uniformly supported on the bedding.

4. JOINTS AND CONNECTIONS

Pipe joints shall conform to the details shown on the drawings and shall be sound and watertight at the pressures specified in Section 9 of this specification.

5. HANDLING THE PIPE

The Contractor shall furnish all equipment and facilities needed to handle, store, and place the pipe without damaging the pipe, lining, encasement or coating. Pipe coating, encasement or lining that is damaged shall be repaired by methods recommended by the manufacturer unless otherwise specified in Section 9 of this specification.

6. PRESSURE TESTING

Pressure testing of the conduit, when specified, shall be conducted as follows:

- a. Placement of backfill before pressure testing shall be as specified in Section 7 of this specification.

- b. Before pressure testing, the pipeline shall be flushed and free of all foreign material.
- c. The pipeline shall not be pressure tested until concrete for anchor and thrust blocks has attained the minimum specified compressive strength unless other specified methods of thrust restraint is provided.
- d. The total conduit or continuous section of conduit to be tested shall be filled with clean water at a rate not to exceed the maximum specified and tested at the pressures specified in Section 9 of this specification.
- e. The section of conduit being tested shall be allowed to stand full of water for a minimum of 24 hours before the start of pressure and leakage tests. Test pressures shall be held constant for two (2) hours. When the amount of water loss exceeds the maximum allowable loss specified in Section 9 of this specification, the leak(s) shall be repaired or otherwise corrected and the conduit shall be retested. The testing procedure shall be repeated until the requirements of the specifications are met.

7. BACKFILL

Method 1 Backfill in accordance with Section 9 of this specification shall be accomplished only in sufficient amount to hold the conduit in place during testing, with the following exceptions:

- a. Compacted backfill shall be placed to its final depth as shown on the drawings at vertical and horizontal deflection points, road crossings, and thrust blocks. Backfill shall be placed in a manner that conduit and joint displacement does not occur.
- b. All joints and connections shall be completely exposed for visual observation during testing, except at locations described in 10.a. above.

Method 2 Backfill in accordance with Section 9 of this specification shall be to the final depth as shown on the drawings for the section of conduit being tested.

Use with Either Method The Contractor shall be fully responsible for any and all work required to correct any leakage when the leakage test results in water loss that exceeds the amount specified in Section 9 of this specification.

8. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the quantity of each size, and thickness class of pipe will be determined to the nearest foot by measurement of the installed length of pipe along the crown centerline of the conduit. Payment for each size and thickness class of pipe will be made at the contract unit price for that size and thickness class of pipe. Such payment will

constitute full compensation for furnishing, transporting, handling and installing the pipe and necessary fittings and appurtenances complete in place.

Compensation for any item of work described in the contract but not listed will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 9 of this specification.

ROCK RIPRAP

1. APPLICABILITY

Construction Specification 61 is applicable to equipment placed or hand-placed rock riprap, granular filter and granular bedding. It is also applicable for riprap placed over geotextile fabrics installed in accordance with Construction Specification 95.

2. MATERIAL SPECIFICATIONS

Material Specifications 521, 523, and 592 are complementary to Construction Specification 61. Select Rock Type 1, 2, or 3 of Specification 523, Section 2, as appropriate and specify in Section 8.

- a. Rock Type 1 - For exposure conditions that will require sound and very durable material due to aggressive environment and demanding requirements, or in locations where replacement or repair would be very difficult if breakdown or other failure were to occur.
- b. Rock Type 2 - A lesser degree of durability is required while meeting a good standard of performance. The hazard is not a major consideration and accessibility for repair or replacement is practical. No design changes are necessary for utilization of this rock type.
- c. Rock Type 3 - Does not meet our normal requirements for quality, but due to the lack of on-site availability or availability of better materials, it is advantageous to use. Design changes, such as greater rock thickness and/or flatter slopes, may be required to compensate for the lack of long-term durability. More frequent repair and replacement should be anticipated.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Complete plans and cross-sections of the required riprap.
- b. Type of placement (equipment or hand-placed).
- c. Pay limits, where applicable.
- d. Foundation preparation requirements, if any.
- e. Gradation requirements for materials.
- f. Screening, selection or other processing requirements, to insure obtaining rock of the required quality and grading. For example, if angular to sub-angular rock is preferred over sub-rounded to rounded rock, specify this requirement in Section 8.
- g. Sources of materials, if the sources are to be specified. When sources are designated in the contract, the adequacy of quantity and quality of usable

material at each source must be determined in advance by: (1) geologic investigations with adequate sampling and testing, (2) specific case history which establishes the quality by satisfactory performance under comparable conditions of use and exposure or acceptable pre-qualification by other agencies.

- h. ASTM D 5240 should be specified to check for rock resistance to freeze-thaw damage on sites with large volumes of riprap, at highly hazardous locations, or on sites that would be very difficult to repair if rock breakdown occurs. Acceptance limits in the specification must be evaluated and strengthened, if needed, to ensure the use of the appropriate rock type and quality.
- i. Method(s) of measurement and payment.
- j. When geotextile filters are specified, Construction Specification 95 should be used.

4. DISCUSSION OF METHODS

a. Section 8, Measurement and Payment

The methods listed below provide two basic options for measuring and paying for rock riprap using either weight (ton) or volume (cubic yard) methods. Advantages of each option are as follows:

Weight - Ton methods would be more appropriate for quarried rock imported to a site. Contractors usually pay their supplier for quarried rock by the ton. Payment by the ton provides for direct pricing without the need to convert from a ton basis to cubic yards. Variations in riprap characteristics such as rock specific gravity, transportation and placement losses, denseness of placement, etc., make it necessary for the contractor to add contingencies that include these variations.

Volume - Cubic yard methods would be more appropriate for riprap that is produced from on-site locations, for gathered field stone, quarried rock sold by the truck load, and other situations where a certified scale is not readily available. It would also be appropriate for small quantities of rock where quantity measurement is not complex or a major task. Cubic yard methods can also be an advantage where the riprap end section is uniform for long reaches on larger projects. The elimination of the need to keep track of delivery tickets may be a considerable time saving.

Cubic yard methods can be expected to impose some contingency considerations from the contractor due to the necessity to convert from tons to cubic yards in quantity estimation.

- (1) Methods 1, 2, and 3 provide various means of measurement and are intended for use where filter or bedding aggregate, if any, is to be paid for as a separate item.

- (2) Method 4 is intended for use where filter or bedding aggregate is a minor item and payment for it is to be included in the payment for rock riprap.
- (3) Methods 5 and 6 are intended for use when geotextile filters are specified, or when no filter, bedding aggregate, or geotextile are specified.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

61. ROCK RIPRAP

1. SCOPE

The work shall consist of the construction of rock riprap revetments and blankets, including filter or bedding where specified.

2. MATERIALS

Rock riprap shall conform to the requirements of Material Specification 523 or, if so specified shall be obtained from designated sources. It shall be free from dirt, clay, sand, rock fines and other materials not meeting the required gradation limits.

At least thirty (30) days prior to delivery of rock from other than designated sources, the Contractor shall designate in writing the source from which rock materials will be obtained and provide information satisfactory to the Engineer that the material meets contract requirements. The Contractor shall provide the Engineer free access to the source for the purpose of obtaining samples for testing. The size and grading of the rock shall be as specified in Section 8.

Rock from approved sources shall be excavated, selected, and processed to meet the specified quality and grading requirements at the time the rock is installed.

When specified in Section 8 or, when requested by the Contracting Officer, a gradation quality control check shall be made by the Contractor and subject to inspection by the Engineer. The test shall be performed at the work site, in accordance to ASTM D 5519 Test Method B Size, *Size-Range Grading*, on a test pile of representative rock. The weight or size of the test pile shall be large enough to ensure a representative gradation of rock from the source and to provide test results within a five (5) percent accuracy.

Based on a specific gravity of 2.65 (typical of limestone and dolomite), and assuming the individual rock is shaped midway between a sphere and a cube, typical size/weight relationships are:

Sieve Size of Rock	Approximate Weight of Rock	Weight of Test Pile
16 inches	300 pounds	6000 pounds
11 inches	100 pounds	2000 pounds
6 inches	15 pounds	300 pounds

The results of the test shall be compared to the gradation required for the project. Test pile results that do not meet the construction specifications shall be cause for the rock to be rejected. The test pile that meets contract requirements shall be left on the job site as a sample for visual comparison. The test pile shall be used as part of the last rock riprap to be placed.

Filter or bedding aggregates when required, shall conform to Material Specification 521, unless otherwise specified. Geotextiles shall conform to Material Specification 592.

3. SUBGRADE PREPARATION

The subgrade surfaces on which the rock riprap, filter, bedding or geotextile is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved materials and shall conform to the requirements of the specified class of earthfill.

Rock riprap, filter, bedding or geotextile shall not be placed until the foundation preparation is completed and the subgrade surfaces have been inspected and approved.

4. EQUIPMENT-PLACED ROCK RIPRAP

The rock riprap shall be placed by equipment on the surfaces and to the depths specified. The rock riprap shall be installed to the full course thickness in one operation and in such a manner as to avoid serious displacement of the underlying materials. The rock for riprap shall be delivered and placed in a manner that will ensure that the riprap in-place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks. Some hand placing may be required to provide a neat and uniform surface.

Rock riprap shall be placed in a manner to prevent damage to structures. Hand placing will be required as necessary to prevent damage to any new and existing structures.

5. HAND-PLACED ROCK RIPRAP

The rock riprap shall be placed by hand on the surfaces and to the depths specified. It shall be securely bedded with the larger rocks firmly in contact one to another without bridging. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rock.

Flat slab rock shall be laid on its vertical edge; except where it is laid like paving stone and the thickness of the rock equals the specified depth of the riprap course.

6. FILTER OR BEDDING

When the contract specifies filter, bedding or geotextile beneath the rock riprap, the designated material shall be placed on the prepared subgrade surface as specified. Compaction of filter or bedding aggregate will not be required, but the surface of such material shall be finished reasonably smooth and free of mounds, dips, or windrows.

7. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the quantity of each type of rock riprap placed within the specified limits will be computed to the nearest ton by actual weight. The volume of each type of filter or bedding aggregate will be measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas. For each load of rock riprap placed as specified, the Contractor shall furnish to the Engineer a statement-of-delivery ticket showing the weight, to nearest 0.1 ton.

Payment will be made at the contract unit price for each type of rock riprap, filter or bedding. Such payment will be considered full compensation for completion of the work.

Method 2 For items of work for which specific unit prices are established in the contract, the quantity of each type of rock riprap placed within the specified limits will be computed to the nearest 0.1 ton by actual weight. The quantity of each type of filter or bedding aggregate delivered and placed within the specified limits will be computed to the nearest 0.1 ton. For each load of rock riprap placed as specified, the Contractor shall furnish to the Engineer a statement-of-delivery ticket showing the weight, to the nearest 0.1 ton. For each load of filter or bedding aggregate, the Contractor shall furnish to the Engineer a statement-of-delivery ticket showing the weight to the nearest 0.1 ton.

Payment will be made at the contract unit price for each type of rock riprap, filter or bedding. Such payment will be considered full compensation for completion of the work.

Method 3 For items of work for which specific unit prices are established by the contract, the volume of each type of rock riprap and filter or bedding aggregate will be measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas.

Payment will be made at the contract unit price for each type of rock riprap, filter or bedding. Such payment will be considered full compensation for completion of the work.

Method 4 For items of work for which specific unit prices are established by the contract, the volume of each type of rock riprap, including filter and bedding aggregate, will be measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas.

Payment will be made at the contract unit price for each type of rock riprap, including filter and bedding. Such payment will be considered full compensation for completion of the work.

Method 5 For items of work for which specific unit prices are established by the contract, the quantity of each type of rock riprap placed within the specified limits will

be computed to the nearest ton by actual weight. For each load of rock for riprap placed as specified, the Contractor shall furnish to the Engineer a statement-of-delivery ticket showing the weight to the nearest 0.1 ton.

Payment will be made at the contract unit price for each type of rock riprap, including geotextile used for filter or bedding. Such payment will be considered full compensation for completion of the work.

Method 6 For items of work for which specific unit prices are established by the contract, the volume of each type of rock riprap will be measured within the specified limits and computed to the nearest cubic yard by the method of average cross-sectional end areas.

Payment will be made at the contract unit price for each type of rock riprap, including geotextile used for filter or bedding. Such payment will be considered full compensation for completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 8.

No separate payment will be made for testing the gradation of the test pile. Compensation for testing will be included in the appropriate bid item for riprap.

GROUTED ROCK RIPRAP

1. APPLICABILITY

Construction Specification 62 is applicable to the placement of grouted rock riprap on channel slopes and other designated areas.

2. MATERIAL SPECIFICATIONS

Material Specifications [521](#), [522](#), [523](#), [531](#), [532](#), [533](#), [534](#), and [592](#) together with Construction Specification [31](#), [32](#) and [95](#) are complementary to Construction Specification 62.

3. ITEMS TO BE INCLUDED IN CONSTRUCTION SPECIFICATIONS AND DRAWINGS

- a. Complete plans and cross-sections clearly defining the grouted rock riprap requirements.
- b. Pay limits, where applicable.
- c. Gradation of rock.
- d. Gradation of filter or bedding materials, if used.
- e. Location of weep holes and pipe material for weep holes, if used.
- f. Placement tolerances.
- g. Design of grout mix together with the slump range and amount of air content.
- h. Type of cement.
- i. Type of admixtures, if any.
- j. Gradation of coarse aggregate.
- k. Designate equipment-placed or hand-placed rock.
- l. Designate if grout is to be placed or pumped.
- m. Method of measurement and payment.

4. DISCUSSION OF METHODS

a. Section 4, Placement of Rock Riprap

- (1) Method 1 is intended for use when rock placement operations that may cause some displacement of the filter or bedding materials is not critical. Access to the site for dumping by hauling and placing equipment is reasonable.

(2) Method 2 is intended for sites with limited access by hauling and placement equipment. This method should be considered when using geotextile filter materials and sharp angular rock so puncture of the geotextile can be minimized. Hand-placed operations should be considered on steeper slopes.

b. Section 12, Measurement and Payment

(1) Method 1 is intended for use when the volume of riprap and grout, together with the filter or bedding material when used, is computed as one quantity and paid for at the contract unit price for grouted rock riprap.

(2) Method 2 is intended for use when the volume of riprap, the volume of filter or bedding, the volume of concrete grout, and the area of geotextile are computed and paid as separate items.

(3) Method 3 is intended for use when the actual weight of rock and filter/bedding materials delivered is determined and paid to the nearest 0.1 ton, the grout volume is determined and paid to the nearest 0.1 cubic yard from batch volumes delivered, and the geotextile is determined and paid to the nearest square yard.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete, "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

62. GROUTED ROCK RIPRAP

1. SCOPE

The work shall consist of furnishing, transporting, and the installation of grouted rock riprap revetments and blankets, including filter or bedding where specified.

2. MATERIALS

Rock for riprap shall conform to the requirements of Material Specification 523 or, if so specified shall be obtained from designated sources. It shall be free from dirt, clay, sand, rock fines and other materials not meeting the required gradation limits.

At least thirty (30) days prior to delivery of rock from other than designated sources, the Contractor shall designate, in writing, the source from which rock materials will be obtained and provide information satisfactory to the Engineer that the material meets contract requirements. The Contractor shall provide the Engineer free access to the source for the purpose of obtaining samples for testing. The size and grading of the rock shall be as specified in Section 13 of this specification.

Rock from approved sources shall be excavated, selected, and processed to meet the specified quality and grading requirements at the time the rock is installed.

When specified in Section 13 of this specification or, when requested by the Contracting Officer, a gradation quality control check shall be made by the Contractor and subject to inspection by the Engineer. The test shall be performed at the work site, in accordance to ASTM D 5519 Test Method B Size, Size-Range Grading, on a test pile of representative rock. The weight or size of the test pile shall be large enough to ensure a representative gradation of rock from the source and to provide test results within a five (5) percent accuracy.

Based on a specific gravity of 2.65 (typical of limestone and dolomite), and assuming the individual rock is shaped midway between a sphere and a cube, typical size/weight relationships are:

Sieve Size of Rock	Approximate Weight of Rock	Weight of Test Pile
16 inches	300 pounds	6000 pounds
11 inches	100 pounds	2000 pounds
6 inches	15 pounds	300 pounds

The results of the test shall be compared to the gradation required for the project. Test pile results that do not meet the construction specifications shall be cause for the rock to be rejected. The test pile that meets contract requirements shall be left on the job site as a sample for visual comparison. The test pile shall be used as part of the last rock riprap to be placed.

Filter or bedding aggregates when required, shall conform to Material Specification 521, unless otherwise specified.

Portland cement shall conform to the requirements of Material Specification 531 for the specified type.

Pozzolan. Unless otherwise specified in Section 13 of this specification, pozzolans conforming to Specification ASTM C 618, Class F, in amounts not to exceed 25 percent, based on absolute volume, may be substituted for an equivalent amount of portland cement in the grout mixture.

Aggregates shall conform to the requirements of material Specification 522, except that the grading for coarse aggregate shall be as specified in Section 13 of this specification.

Water shall be clean and free from injurious amounts of oils, acid, alkali, organic matter or other deleterious substances.

Air-entraining admixtures shall conform to the requirements of Material Specification 533.

Curing compound shall conform to the requirements of Material Specification 534.

Other admixtures, when required, shall be as specified in Section 13 of this specification.

Geotextiles shall conform to the requirements of Material Specification 592.

3. SUBGRADE PREPARATION

The subgrade surfaces on which the grouted rock riprap, filter, bedding or geotextile is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. When fill to subgrade lines is required, it shall consist of approved materials and shall conform to the requirements of the specified class of earthfill.

Rock riprap, filter, bedding or geotextile shall not be placed until the foundation preparation is completed and the subgrade surfaces have been inspected and approved.

4. PLACEMENT OF ROCK RIPRAP

Method 1 - Equipment-Placed Rock The rock riprap shall be placed by equipment on the surfaces and to the depths specified. The rock riprap shall be installed to the full section thickness in one operation and in such a manner as to avoid serious displacement of the underlying materials. The rock for riprap shall be delivered and placed in a manner that will ensure that the riprap in place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks. Some hand placing may be required to provide a neat and uniform surface.

Rock riprap shall be placed in a manner to prevent damage to structures. Hand placing will be required as necessary to prevent damage to any new and existing structures.

Method 2 - Hand-Placed Rock The rock riprap shall be placed by hand on the surfaces and to the depths specified. It shall be securely bedded with the larger rocks firmly in contact one to another without bridging. Spaces between the larger rocks shall be filled with smaller rocks and spalls. Smaller rocks shall not be grouped as a substitute for larger rock. Flat slab rock shall be laid on its vertical edge; except where it is installed like paving stone and the thickness of the rock equals the specified depth of the riprap section.

5. FILTER OR BEDDING

When the contract specifies filter, bedding or geotextile beneath the rock riprap, the designated material shall be placed on the prepared subgrade surface as specified. Compaction of filter or bedding aggregate will not be required, but the surface of such material shall be finished reasonably smooth and free of mounds, dips, or windrows.

6. DESIGN OF THE GROUT MIX

The mix proportions for the grout mix shall be as specified in the construction details in Section 13 of this specification. During installation, the Engineer may require adjustment of the mix proportions whenever necessary. The mix shall not be altered without the approval of the Engineer.

7. HANDLING AND MEASUREMENT OF GROUT MATERIALS

Materials shall be stockpiled and batched by methods that will prevent segregation or contamination of aggregates and ensure accurate proportioning of the mix ingredients.

Except as otherwise provided in Section 13 of this specification, cement and aggregates shall be measured as follows:

Cement shall be measured by weight or in bags of 94 pounds each. When cement is measured in bags, no fraction of a bag shall be used unless weighed.

Aggregates shall be measured by weight. Mix proportions shall be based on the batch weight of each aggregate saturated, surface-dry weight plus the weight of surface moisture it contains at the time of batching.

Water shall be measured by volume or by weight, to an accuracy within one (1) percent of the total quantity of water required for the batch.

Admixtures shall be measured within a limit of accuracy of plus or minus three (3) percent.

8. MIXERS AND MIXING

The mixer, when operating at capacity, shall be capable of combining the ingredients of the grout mix into a thoroughly mixed and uniform mass, and of discharging the mix with a satisfactory degree of uniformity.

The mixer shall be operated within the limits of the manufacturer's guaranteed capacity and speed of rotation.

The time of mixing after all cement and aggregates have been combined in the mixer shall be a minimum of one (1) minute for mixers having a capacity of one (1) cubic yard or less. For larger capacity mixers, the minimum time shall be increased fifteen (15) seconds for each cubic yard or fraction thereof of additional capacity. The batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregates, with the balance of the mixing water introduced into the mixer before one-fourth (1/4) of the total minimum mixing time has elapsed.

When ready-mix grout is furnished, the Contractor shall furnish to the Engineer at the time of delivery a ticket showing the time of loading and the quantities of materials used for each load of grout mix delivered.

No mixing water in excess of the amount required by the approved job mix shall be added to the grout mix during mixing or hauling or after arrival at the delivery point.

9. CONVEYING AND PLACING

The grout mix shall be delivered to the site and placed within 1 1/2 hours after the introduction of the cement to the aggregates. In hot weather or under conditions contributing to accelerated stiffening of the concrete, the time between the introduction of the cement to the aggregates and complete discharge of the grout batch shall be a maximum of 45 minutes. The Engineer may allow a longer time provided the setting time of the grout is increased a corresponding amount by the addition of an approved set-retarding admixture. In any case, concrete shall be conveyed from the mixer to the final placement as rapidly as practicable by methods that will prevent segregation of the aggregates, loss of mortar, and/or displacement of the rock riprap.

Grout mix shall not be allowed to free fall more than five (5) feet unless suitable equipment is used to prevent segregation.

The grout mix shall not be placed until the rock riprap has been inspected and approved by the Engineer for the placement of grout.

Rock to be grouted shall be kept moist for a minimum of two (2) hours prior to grouting.

The rock riprap shall be flushed with water prior to placing the grout to remove the fines from the rock surfaces. The rock shall be kept moist prior to the grouting and

without placing in standing or flowing water. Grout placed on inverts or other nearly level areas may be placed in one operation. On slopes, the grout shall be placed in two (2) nearly equal applications consisting of successive lateral strips approximately ten (10) feet in width starting at the toe of the slope and progressing upward. The grout shall be delivered to the place of final deposit by approved methods and discharged directly on the surface of the rock, using a splash plate of metal or wood to prevent displacement of the rock directly under the grout discharge. The flow of grout shall be directed with brooms, spades or baffles to prevent grout from flowing excessively along the same path and to assure that all intermittent spaces are filled. Sufficient barring shall be conducted to loosen tight pockets of rock and otherwise aid in the penetration of grout to ensure the grout fully penetrates the total thickness of the rock blanket. All brooming on slopes shall be uphill. After the grout has stiffened, the entire surface shall be rebroomed to eliminate runs and to fill voids caused by sloughing. The surface finish, following the completion of grout installation, shall consist of 1/3 of the rock extended above the level of grout. The exposed rock will not have a plastered appearance.

After completion of any strip or panel, no individuals or equipment shall be permitted on the grouted surface for a period of twenty-four (24) hours. The grouted surface shall be protected from injurious action by the sun, rain, flowing water, mechanical injury, or other potential damaging activity.

10. CURING AND PROTECTION

The completed finished surface shall be prevented from drying for a minimum curing period of seven (7) days following placement. Exposed surfaces shall be maintained in a moist condition continuously for the seven (7) day curing period, or until curing compound has been applied as specified in this section. Moisture shall be maintained by sprinkling, flooding or fog spraying or by covering with continuously moistened canvas, cloth mats, straw, sand or other approved material. Water or moist covering shall be utilized to protect the grout during the curing process without causing damage to the grout surface by erosion or other mechanisms that may cause physical damage.

The grouted rock may be coated with an approved curing compound as an alternative method to maintaining a continuous moisture condition during the curing period. The compound shall be sprayed on the moist grout surfaces as soon as free water has disappeared and all surface finishing has been completed. The compound shall be applied at a minimum uniform rate of one (1) gallon per 175 square feet of surface and shall form a continuous adherent membrane over the entire surface. Curing compound shall not be applied to surfaces requiring bond to subsequently placed grout and/or concrete. If the membrane is damaged during the curing period, the damaged area shall be re-sprayed at the rate of application specified for the original treatment.

Grout mix shall not be placed when the daily minimum temperature is less than 40° F unless facilities are provided to ensure that the temperature of the materials is

maintained at a minimum temperature of 50° F and not more than 90° F during placement and the curing period. Grout mix shall not be placed on frozen surfaces. When freezing conditions prevail, rock to be grouted must be covered and heated to within a range of 50° F to 90° F for a minimum period of 24 hours prior to placing grouting materials.

11. INSPECTING AND TESTING FRESH GROUT

The grout material shall be checked and tested throughout the grouting operation. Sampling of fresh grout shall be conducted in conformance with ASTM C 172. The volume of each batch will be determined by methods prescribed in ASTM C 138.

The Engineer shall have free access to all parts of the Contractor's plant and equipment utilized for mixing and placing grout during the period of the contract. Proper facilities shall be provided for the Engineer to sample materials and view processes implemented in the mixing and placing of grout as well as for securing grout test samples. All tests and inspections shall be so conducted as a minimum of interference to the Contractor's operation occurs.

For ready-mixed grout, the Contractor shall furnish to the Engineer a statement-of-delivery ticket for each batch delivered to the site. The ticket shall provide as a minimum: weights in pounds of cement, aggregates (fine and coarse), water; weight in ounces of air-entraining agent; time of loading; and, the revolution counter reading at the time batching was started.

12. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the volume of grouted rock riprap, including filter layers or bedding, will be determined to the nearest cubic yard from the specified thickness shown on the drawings and the area on which acceptable placement has been installed. Payment for grouted rock riprap will be made at the contract unit price. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the grouted rock riprap, filter layers and bedding, and geotextile materials.

Method 2 For items of work for which specific unit prices are established in the contract, the volume of riprap and the volume of filter layers or bedding will be determined to the nearest cubic yard from the specified thickness shown on the drawings and the area on which acceptable placement has been installed. The volume of grout will be determined from the calculated batch volume and the number of mixed batches delivered to the site and placed in accordance with the specification. The area of geotextile will be determined to the nearest square yard from measurements of geotextile material installed according to the contract requirements. Payment will be made at the contract unit price for each type of rock riprap, filter or bedding, concrete grout, and geotextile. Such payment will be

considered full compensation for all labor, materials, equipment, and all other items necessary and incidental to the completion of the work.

Method 3 For items of work for which specific unit prices are established in the contract, the quantity of each type of rock riprap placed within the specified limits will be computed to the nearest 0.1 ton by actual weight. The quantity of each type of filter or bedding aggregate delivered and placed within the specified limits will be computed to the nearest 0.1 ton. For each load of rock riprap placed as specified, the Contractor shall furnish to the Engineer a statement-of-delivery ticket showing the weight to the nearest 0.1 ton. For each load of filter or bedding aggregate, the Contractor shall furnish to the Engineer a statement-of-delivery ticket showing the weight to the nearest 0.1 ton. The volume of grout will be determined from the calculated batch volume and the number of mixed batches delivered to the site and placed in accordance with the specifications and drawings. The area of geotextile will be determined to the nearest square yard from measurements of geotextile material installed according to the contract requirements. Payment will be made at the contract unit price for each type of rock riprap, filter or bedding, concrete grout, and geotextile. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 13 of this specification.

TREATMENT OF ROCK SURFACES

1. APPLICABILITY

Construction Specification 63 is applicable to the treatment of rock surfaces. Included are the cleaning and preparing of the surfaces and the furnishing and placing of the treatment materials. Where large volumes of concrete are involved or when desired, Construction Specification 32 may be used as an alternative to this specification. Treatment details would then be placed in construction details for Construction Specification 32.

2. MATERIAL SPECIFICATIONS

The following materials are complementary to Construction Specification 63:

- a. Portland Cement - Specification 531.
- b. Aggregate for Portland Cement Concrete - Specification 522
- c. Curing Compound - Specification 534

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Plan view showing location and extent of surface treatment.
- b. Details for cleaning and treatment of cracks, and dental excavation.
- c. Type of treatment, including design of mix, slump, air content, and special placement methods when required.
- d. Type of cement.
- e. Type of admixtures, include necessary material specifications.
- f. Gradation of coarse aggregate.
- g. Slope limitations for the finished surface(s), as determined by site topography, plasticity of available fill material, embankment zoning and other design considerations, stated as follows: "Except for small local areas, the slope of the finished surface shall not be steeper than ____ horizontal to ____ vertical. Steeper surfaces extending not more than ____ feet, measured vertically, will be permitted."
- h. Method of Curing and Protection in Section 8.
- i. Method of Measurement and Payment in Section 9.

4. DISCUSSION OF METHODS

a. Section 8, Curing and Protection

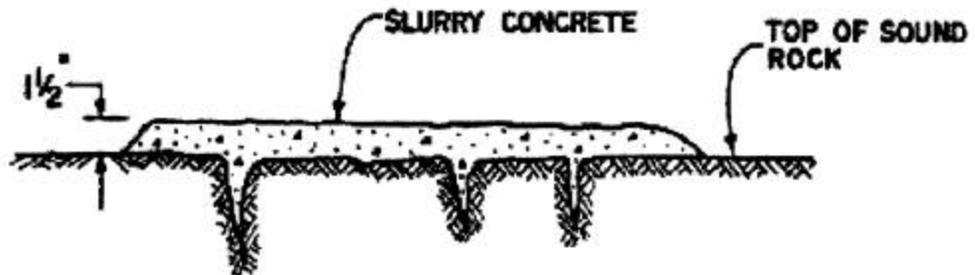
- (1) Method 1 Treatment of rock surfaces is intended to remove surface irregularities that could contribute to non-uniform installation of earth materials.
- (2) Method 2 Treatment of rock surfaces is an integral phase to insure blending and/or bonding of surface treatment and the proposed earth embankments. Water-tightness and the reduction of potential seepage paths are a major design consideration.

b. Section 9, Measurement and Payment

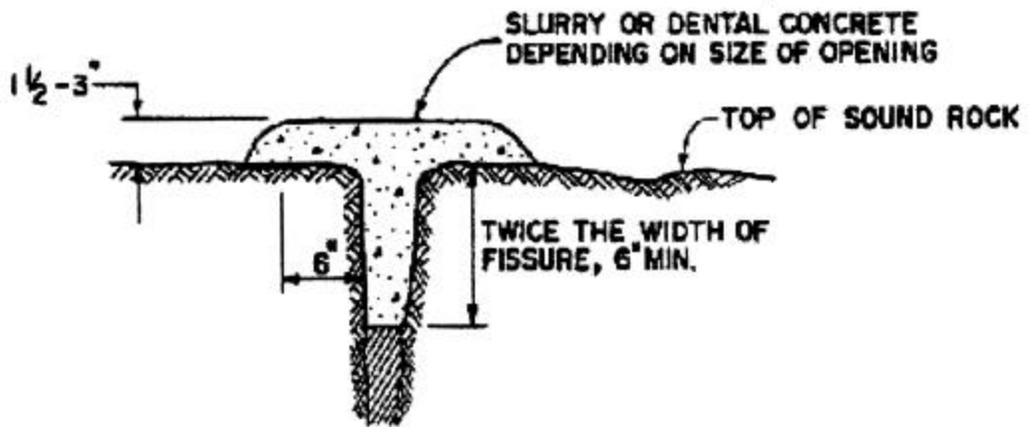
- (1) Method 1 is intended for use when the area to be treated is not fully definable and the full extent of treatment will need to be determined at the time of installation. This method applies to rock surfaces that have significant irregularities and are not readily determined prior to installation.
- (2) Method 2 is intended for use when the area to be treated is clearly definable and the extent of treatment has been determined. This method applies to rock surfaces that can be viewed and extent of treatment will not vary.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

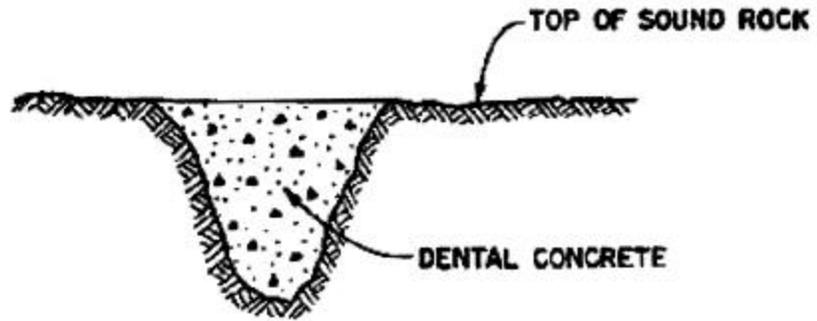
TYPICAL TREATMENTS OF ROCK SURFACES



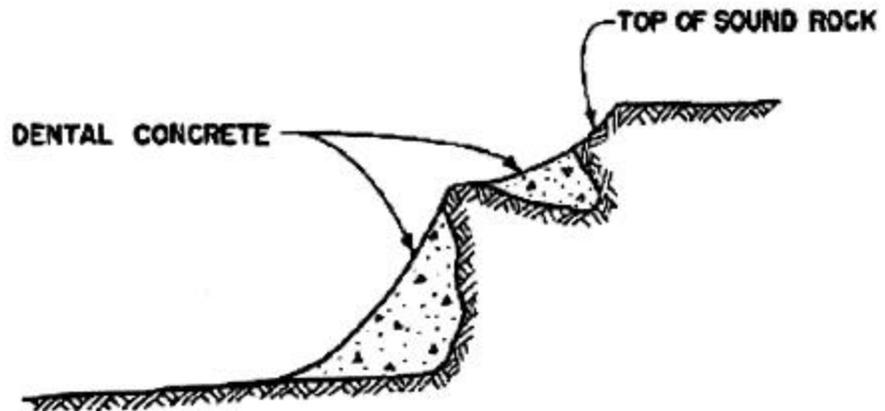
1.) THIN SURFACE CRACKS



2.) OPEN FISSURES



3.) HOLES OR SOLUTION CHANNELS



4.) OVERHANGS AND IRREGULAR SURFACES

CONSTRUCTION SPECIFICATION

63. TREATMENT OF ROCK SURFACES

1. SCOPE

This work shall consist of preparing and cleaning the designated rock surfaces, including the specified dental excavation, and the furnishing and placing of the specified treatment material for either dental or slurry grout.

2. MATERIALS

Portland cement shall conform to the requirements of Material Specification 531 for the type specified in Section 10 of this specification.

Pozzolans. Unless otherwise specified in Section 10 of this specification, pozzolans conforming to the ASTM C 618, Class C or F, may be used in amounts not to exceed 25 percent, based on absolute volume, to substitute for an equal amount of portland cement in the concrete grout mixture.

Aggregates shall conform to the requirements of Material Specification 522, except that the grading for coarse aggregate shall be as specified in Section 10 of this specification.

Water shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

Admixtures, when specified, shall be of the type and quality specified in Section 10 of this specification.

Curing compound shall conform to the requirements of Material Specification 534.

3. PREPARATION AND CLEANING

After excavation of the overburden has been completed, the rock surfaces shall be thoroughly cleaned and dewatered. All loose rock, ledges, and overhangs exposed during preparation of the rock surfaces shall be removed. Surfaces exceeding the slope limitations specified in Section 10 of this specification shall be eliminated by excavation or by filling with concrete as described in Section 7 of this specification.

Dental excavation shall consist of the removal of all soil and soft or loose rock from cracks, fissures, holes, and solution channels exposed during excavation activities. The extent of the dental excavation shall be as shown on the drawings with on-site adjustments as determined by the Engineer.

The surfaces shall be cleaned by air-water cutting, water jetting, wire brush scrubbing, or other suitable methods determined necessary to obtain an acceptable surface. No surface treatment material shall be applied until rock surfaces have been inspected and approved.

Rock surfaces shall be free of standing or running water during the placement of surface treatment material.

4. DESIGN OF-SURFACE TREATMENT MATERIAL

The treatment material and mix proportions shall be as specified in Section 10 of this specification. During the surface treatment operation, the Engineer may require adjustment of the mix proportions. The mix shall not be altered without the approval of the Engineer.

5. HANDLING AND MEASUREMENT OF MATERIALS

Materials shall be stockpiled and batched by methods that will prevent segregation or contamination of aggregates and insure accurate measurement and proportioning of the mix ingredients.

Except as otherwise provided in Section 10 of this specification, cement and aggregates shall be measured as follows:

- a. Cement shall be measured by weight or in bags of 94 pounds each. When cement is measured in bags, no fraction of a bag shall be used unless properly weighed.
- b. Aggregates shall be measured by weight. Mix proportions shall be based on saturated, surface-dry weights. The batch weight of each aggregate shall be required saturated, surface-dry weight plus the weight of the surface moisture it contains at the time of batching.
- c. Water shall be measured, by volume or weight, to an accuracy within one (1) percent of the total quantity of water required for the batch.
- d. Admixtures shall be measured within a limit of accuracy of three (3) percent.

6. MIXERS AND MIXING

The mixer, when operating at capacity, shall be capable of combining the ingredients of the concrete into a thoroughly mixed and uniform mass and of discharging the mix with a satisfactory degree of uniformity.

The mixer shall be operated within the limits of the manufacturer's guaranteed capacity and speed of rotation.

The time of mixing, after all cement and aggregates are combined in the mixer, shall be a minimum of one (1) minute for mixers having a capacity of one (1) cubic yard or less. For larger capacity mixers, the minimum time shall be increased fifteen (15) seconds for each cubic yard or fraction thereof of additional capacity. The batch shall be so charged into the mixer that some water will enter in advance of the

cement and aggregates, with the balance of the mixing water introduced into the mixer before one-fourth (1/4) of the total mixing time has elapsed.

No mixing water in excess of the amount required by the approved job mix shall be added to the grout mix during mixing or hauling or after arrival at the delivery point.

7. CONVEYING AND PLACING

Surface treatment materials shall be delivered to the site and placed within 1 1/2 hours after the introduction of the cement to the aggregates. In hot weather or under conditions contributing to accelerated stiffening of the concrete, the time between the introduction of the cement to the aggregates and complete discharge of the concrete shall be a maximum of 45 minutes. The Engineer may allow a longer period, provided the setting time of the concrete is increased a corresponding amount by the addition of an approved set-retarding admixture. In any case, concrete shall be conveyed from the mixer to the final placement as rapidly as practical by methods that will prevent segregation of the aggregates and/or loss of mortar.

Concrete shall not be allowed to free fall more than five (5) feet unless suitable equipment is used to prevent segregation.

Surface treatment materials shall not be placed until the rock surfaces have been inspected and approved by the Engineer.

All cracks, fissures, solution channels, and other surfaces within the designated area shall be treated as shown on the drawings. Surfaces to be treated shall be kept moist for a minimum of two (2) hours prior to treatment.

Concrete shall be filled against any specified remaining rock surfaces that exceed the slope limitations and shall be shaped so that no portion of the finished surface exceeds these limitations.

Material placed in cracks, fissures, and solution channels shall be consolidated by vibration, spading, or tamping as necessary to assure complete filling of the void.

8. CURING AND PROTECTION

Method 1 The surface of treatment materials shall be prevented from drying for a minimum curing period of seven (7) days after placement. Exposed surfaces shall be maintained in a moist condition continuously for the seven (7) day curing period, or until curing compound has been applied as specified in this section. Moisture shall be maintained by sprinkling, flooding or fog spraying or by covering with continuously moistened canvas, cloth mats, straw, sand or other acceptable material. Water or moist covering shall be utilized to protect the concrete treatment during the curing process without causing damage to the treatment surface by erosion or other mechanisms that may cause physical damage.

The concrete treatment material may be coated with an approved curing compound as an alternative method to maintaining a continuous moisture condition during the curing period. The compound shall be sprayed on the moist treatment surfaces as soon as free water has disappeared and all surface finishing has been completed. The compound shall be applied at a minimum uniform rate of one (1) gallon per 175-square feet of surface and shall form a continuous adherent membrane over the entire treated surface. Curing compound shall not be applied to surfaces requiring bond to subsequently placed grout and/or concrete. If the membrane is damaged during the curing period, the damaged area shall be re-sprayed at the rate application specified for the original treatment.

Backfilling operations shall not commence for a minimum period of 24 hours following the placement of concrete treatment, unless otherwise specified.

Method 2 A minimum earth cover of 1 1/2 feet depth shall be placed and compacted before the rock surface treatment material (concrete) has established an initial set. The earth cover may be placed on the concrete with a dragline, hoe, or else bladed onto the treated surface by lightweight dozer or similar equipment operating from a covered and compacted surface. Compaction shall be accomplished by pneumatic-tired equipment or by an alternative method that will provide an equivalent density.

Use With Either Method No backfill material shall be placed until the treated surfaces have been inspected and approved by the Engineer.

Surface treatment materials shall not be placed when the daily minimum temperature is less than 40° F unless facilities are provided to insure that the temperature of the materials is maintained at a minimum temperature of 50° F and not greater than 90° F during placement and the curing period. Concrete treatment material shall not be placed on frozen surfaces. When freezing conditions prevail, rock surfaces to be treated must be covered and heated to within a range of 50° F and 90° F for a minimum period of 24 hours prior to placing concrete treatment materials.

9. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the area of rock surfaces to be prepared, cleaned and treated will be measured to the nearest square yard within the limits established by the Engineer. The volume of surface treatment material placed within the established limits will be computed to the nearest 0.1 cubic yard of concrete placed. Payment will be made at the contract unit price for surface preparation, cleaning, and installation of surface treatment materials. Such payment shall constitute full compensation of all labor, equipment, materials and all other items necessary and incidental to the completion of the work.

Method 2 For items of work for which specific unit prices are established in the contract, the area of rock surfaces to be prepared, cleaned and treated will not be

measured. The volume of surface treatment materials delivered and properly installed to treat rock surfaces will be determined to the nearest 0.1 cubic yard. Areas to be treated are shown on the drawings with the final extent of rock surface treatment to be determined by the Engineer. The volume of any waste or otherwise unsuitable material will be determined by procedures established by the Engineer and deducted from the volume of concrete delivered to the site. Payment will be made at the contract unit price for surface preparation, cleaning, and installation of surface treatment materials. Such payment shall constitute full compensation of all labor, equipment, materials and all other items necessary and incidental to the completion of the work.

All Methods For each load of concrete delivered to the site for placement as rock treatment material, the Contractor shall furnish to the Engineer a delivery ticket at the time of delivery which shall provide as a minimum: Weights in pounds of cement, aggregates (fine and coarse), pozzolan (if used), water; weight in ounces of air-entraining agent; time of loading; and, the revolution counter reading at the time batching was started.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 10 of this specification.

WIRE MESH GABIONS AND MATTRESSES
TWISTED (WOVEN) OR WELDED MESH

1. APPLICABILITY

Construction Specification 64 is applicable to the installation of wire mesh gabion baskets and mattresses, including bedding, filter or geotextile where specified.

2. MATERIAL SPECIFICATIONS

Material Specification [523, Rock for Riprap](#), is complementary to this specification.

Material Specification [521, Aggregates for Drainfill and Filters](#), is complementary to this specification.

Material Specification [592, Geotextile](#), is complementary to this specification.

Construction Specification [95, Geotextile](#), is complementary to this specification.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Complete drawings showing alignment, layout, size of baskets or mattresses required, interior support details, lacing, connecting or fastening plans as applicable, and any other related appurtenances or details.
- b. Gabions designated as basket or mattress, as appropriate. Type of gabion construction: Twisted or Welded Mesh.
- c. Specify in Section 8 if alternate ring fasteners as recommended by the manufacturer, are to be allowed for basket interconnection and closure of tops. The specification only allows the use of alternative ring fasteners for the assembly of empty gabion baskets or mattresses. If it is determined that the use of these fasteners can provide a minimum strength of 1,400 lb. per linear foot for gabions and 900 lb. per linear foot for gabion mattresses; then Section 8 of this specification may be used to allow their use to join gabions together and to close the lids of gabions. The manufacturer's recommendations are to be followed concerning the proper interlocking of fasteners and their spacing to attain the required strength.
- d. Specify the type of wire (plain, galvanized, or PVC coated), if specific design requirements need to be met, coating color, and any special requirements such as different wire size or mesh openings, etc., as applicable, in Section 8. (Note that in Table 2 only PVC coated gabion mattresses are specified.)
- e. Details of bedding, filter material and/or geotextile; including gradation for materials, compaction requirements of materials, class of geotextile and any special requirements, if required. Refer to the respective construction specifications as applicable. Both types of gabions perform best when placed on relatively smooth and unyielding foundations. A coarse aggregate or a stone

leveling course can be successfully used under gabions to enhance good support and grade control.

- f. Source of rock and pre-qualification of other materials as appropriate.
- g. Rock size if different than that specified.
- h. Requirements for concrete cap, if applicable, including location and placement details. Include and refer to Construction Specifications 31, 32, or 33 as necessary.
- i. Rockfill and lid closure requirements for gabions placed on a slope to serve as a chute with flow down the top surface. It is very important that these gabions be filled as densely as possible to avoid movement and distortion during design flow events.
- j. The specified batter to the front face of vertical gabion walls. A maximum wall batter of 6 degrees is recommended (1 horizontal to 10 vertical). Where possible, design stepped faced gabion walls instead of vertical faced walls.
- k. Method of measurement and payment in Section 8.

4. DISCUSSION OF METHODS

a. Section 7, Measurement and Payment

- (1) Method 1 is used when payment is to be made for gabions or mattresses and rock filler. Bedding, filter or geotextile are to be paid under a separate item.
- (2) Method 2 is used when payment is made for gabions or mattresses and rock filler including the bedding or filter and geotextile. Include a description of the subsidiary items in Section 8 of this specification and in the items of work and construction details of the appropriate companion construction specification.
- (3) Method 3 is used when payment is to be made for gabion mattresses and rock filler. Bedding, filter or geotextile are to be paid under a separate item of work.
- (4) Method 4 is used when payment is made for completed gabion mattresses and rock filler including the bedding or filter and geotextile. Include a description of the subsidiary items in Section 8 and in the items of work and construction details of the appropriate companion construction specification.

When specifications are prepared using electronic procedures and all but one of the methods is deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

64. WIRE MESH GABIONS AND MATTRESSES **TWISTED (WOVEN) OR WELDED MESH**

1. SCOPE

The work shall consist of furnishing, assembling and installing rock filled wire mesh gabion baskets and mattresses.

2. TYPES

Gabions shall consist of rectangular wire mesh formed containers filled with rock. Gabions will conform to one of the following types:

Woven Mesh. Non-raveling double twisted hexagonal wire mesh, consisting of two wires twisted together in two 180 degree turns.

Welded Mesh. Welded-wire mesh with a uniform square or rectangular pattern and a resistance weld at each intersection. The welded wire connections shall conform with the requirements of ASTM A 185, including wire smaller than W1.2 (0.124 in.); except that the welded connections shall have a minimum average shear strength of 70% and a minimum shear strength of 60% of the minimum ultimate tensile strength of the wire.

Gabions. Gabions shall be furnished as baskets or mattresses, as specified in Section 8. Baskets and mattresses shall be fabricated within a dimension tolerance of plus or minus 5 percent.

Baskets. Baskets have a height of 12 inches or greater.

Mattresses. Mattresses have a thickness of 12 inches and less.

3. MATERIALS

Gabions shall be fabricated, assembled and installed in accordance with the nominal wire sizes and dimensions found in Tables 1 and 2, using the following materials, unless otherwise specified in Section 8.

Wire for fabrication and assembly shall be hot-dipped galvanized. The wire shall have a minimum tensile strength of 60,000 psi. Galvanized steel wire shall conform to ASTM A 641, Class 3, Soft Temper.

TABLE 1 (Minimum Requirements) *
GABION BASKETS--Height 12, 18, or 36 Inches; Length as Specified

Type of Wire	Mesh Size Inches	Wire Diameter Inches	PVC Coating Inches	Total Diameter Inches	Galvanized Coating (oz./SF)
Woven Mesh	3-1/4 x 4-1/2	0.118	None	0.118	0.80
	3-1/4 x 4-1/2	0.105	0.02	0.145	0.80
Selvage		0.153	None	0.153	0.80
		0.132	0.02	0.172	0.80
Lacing and Internal Connecting Wire		0.086	0.02	0.126	0.70
Welded Mesh	3 x 3	0.118	None	0.118	0.80
	3 x 3	0.105	0.02	0.145	0.80
Spiral Binder		0.105	0.02	0.145	0.80

TABLE 2 (Minimum Requirements) *
GABION MATTRESSES--Height 6, 9, or 12 Inches; Length as Specified

Type of Wire	Mesh Size Inches	Wire Diameter Inches	PVC Coating Inches	Total Diameter Inches	Galvanized Coating (oz./SF)
Woven Mesh	2-1/2 x 3-1/4	0.086	0.02	0.126	0.70
Selvage		0.105	0.02	0.145	0.80
Lacing and Internal Connecting Wire		0.086	0.02	0.126	0.70
Welded Mesh	1-1/2 x 3	0.080	0.02	0.120	0.70
Spiral Binder		0.105	0.02	0.145	0.80

*NOTE: The wire sizes and PVC coating thickness shown are nominal sizes.

The wire sizes include the galvanizing coating thickness.

When Epoxy or Polyvinyl Chloride (PVC) coated wire is specified in Section 8, the galvanized wire shall be coated by fusion bonded epoxy; or fusion bonded, extruded, or extruded and bonded PVC material. The wire coating shall be colored black, gray, green or silvery; and the initial properties of the PVC coating shall meet the following requirements:

- (a) Specific Gravity. In the range of 1.30 to 1.40, ASTM D 792.
- (b) Abrasion Resistance. The percentage of weight loss shall be less than 12%, when tested according to ASTM D 1242, Method B at 200 cycles, CSI-A Abrader Tape, 80 Grit.
- (c) Brittleness Temperature. Not higher than 15° F, ASTM D 746.
- (d) Tensile Strength. Extruded Coating (not less than 2,980 psi., ASTM D 412). Fusion Bonded Coating (not less than 2,275 psi., ASTM D 638).
- (e) Modulus of Elasticity. Extruded Coating (not less than 2,700 psi. at 100 percent strain, ASTM D 412). Fusion Bonded Coating (not less than 1980 psi. at 100 percent strain, ASTM D 638).
- (f) Ultraviolet Light Exposure. A test period of not less than 3000 hours, using apparatus type E at 63 C, ASTM G 23.
- (g) Salt Spray Test. A test period of not less than 3000 hours, ASTM B 117.

After the exposure to ultraviolet light and the salt spray test as specified above, the PVC coating shall not show cracks, blisters, splits, nor noticeable change of coloring (surface chalk). In addition, the specific gravity shall not change more than six (6) percent, resistance to abrasion shall not change more than ten (10) percent, tensile strength shall not change more than 25 percent, and modulus of elasticity shall not change more than 25 percent from their initial values.

The wire sizes shown in Tables 1 and 2 are the size of the wire after galvanizing and before coating with PVC.

Spiral binders are the standard fastener for welded-mesh gabion baskets and mattresses, and shall be formed from wire meeting the same quality and coating thickness requirements as specified for the gabion baskets and mattresses.

Alternate fasteners for use with wire mesh gabions, such as ring fasteners, shall be formed from wire meeting the same quality and coating thickness requirements as specified for the gabions.

Standard fasteners and alternate fasteners must provide a minimum strength of 1,400 lb. per lineal foot for gabion baskets and 900 lb. per lineal foot for gabion mattresses. When used to interconnect gabion baskets or mattresses with PVC coating, ring fasteners shall be made of stainless steel and spiral fasteners will be

PVC coated. All fasteners shall meet all of the closing requirements of the gabion manufacturer in addition to any requirements specified in Section 8.

Rock shall conform to the quality requirements in Material Specification 523, unless otherwise specified in Section 8. At least 85 percent of the rock particles, by weight, shall be within the predominant rock size range.

Gabion Basket or Mattress Height	Predominant Rock Size Inches	Minimum Rock Dimension Inches	Maximum Rock Dimension Inches
12, 18, or 36 Inch Basket	4 to 8	4	9
6, 9, or 12 Inch Mattress	3 to 6	3	7

At least 30 days prior to delivery to the site, the Contractor shall inform the Engineer in writing of the source from which the rock will be obtained, and include the test data and other information by which the material was determined by the Contractor to meet the specification. The Contractor shall provide the Engineer free access to the source for the purpose of obtaining samples for testing and source approval.

Bedding or filter material, when specified, shall meet the gradation shown on the plans or as specified in Section 8, and the requirements of Material Specification 521. Geotextile, when specified, shall conform to the requirements specified in Section 8, and those of Material Specification 592.

4. FOUNDATION PREPARATION

The foundation on which the gabions are to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. Surface irregularities, loose material, vegetation, and all foreign matter shall be removed from foundations. When fill is required, it shall consist of materials conforming to the specified requirements. Gabions and bedding or specified geotextiles shall not be placed until the foundation preparation is completed, and the subgrade surfaces have been inspected and approved by the Engineer.

Compaction of bedding or filter material will be required as specified in Section 8. The surface of the finished material shall be to grade and free of mounds, dips or windrows. Geotextile shall be installed in accordance with the requirements of Construction Specification 95.

5. ASSEMBLY AND PLACEMENT

Unless otherwise specified in Section 8, the assembly and placement of gabions shall be in accordance with the following procedures:

Assembly. Rotate the gabion panels into position and join the vertical edges with fasteners for gabion assembly. Where lacing wire is used, wrap the wire with alternating single and double half-hitches at intervals between four (4) to five (5) inches. Where spiral fasteners are used for welded-wire mesh, crimp the ends to secure the spirals in place. Where ring type alternate fasteners are used for basket assembly, install the fasteners at a maximum spacing of 6 inches. Use the same fastening procedures to install interior diaphragms where they are required.

Interior diaphragms will be required where any inside dimension exceeds three (3) feet. Diaphragms will be installed to assure that no open intervals are present that exceed three (3) feet.

Placement. Place the empty gabions on the foundation and interconnect the adjacent gabions along the top, bottom, and vertical edges using lacing wire. Wrap the wire with alternating single and double half-hitches at intervals between four (4) to six (6) inches. Unless otherwise specified in Section 8, lacing wire will be the only fastener allowed for interconnecting woven mesh gabions. Spiral fasteners are commonly used for the assembly and interconnection of welded mesh gabions. Spirals are screwed down at the connecting edges then each end of the spiral is securely tied down to prevent unraveling. Lacing may be used as needed to supplement the interconnection of welded mesh gabions, and the closing of lids.

Interconnect each layer of gabions to the underlying layer of gabions along the front, back, and sides. Stagger the vertical joints between the gabions of adjacent rows and layers by at least one-half of a cell length.

6. FILLING OPERATION

After adjacent empty woven wire gabion units are set to line and grade and common sides properly connected, they shall be placed in straight line tension and stretched to remove any kinks from the mesh and to gain a uniform alignment. Welded-mesh gabions do not require stretching. Staking of the gabions may be done to maintain the established proper alignment prior to the placement of rock. No stakes shall be placed through geotextile material. Connecting lacing wire and other fasteners, as allowed, shall be attached during the filling operation to preserve the strength and shape of the structure.

Internal connecting cross-tie wires shall be placed in each unrestrained gabion cell greater than 18 inches in height, including gabion cells left temporarily unrestrained. Two internal connecting wires shall be placed concurrently with rock placement, at each 12-inch interval of depth. In woven mesh gabions these cross-ties will be placed evenly spaced along the front face and connecting to the back face. All cross-tie wires shall be looped around two mesh openings and each wire end shall be secured by a minimum of five 180 degree twists around itself after looping.

In welded mesh gabions these cross-ties or stiffeners will be placed across the corners of the gabions (at 12 inches from the corners) providing diagonal bracing. Lacing wire or preformed hooked wire stiffeners may be used.

The gabions shall be carefully filled with rock, either by machine or hand methods, ensuring alignment, avoiding bulges, and providing a compact mass that minimizes voids. Machine placement will require supplementing with hand work to ensure the desired results. The cells in any row shall be filled in stages so that the depth of rock placed in any one cell does not exceed the depth of rock in any adjoining cell by more than 12 inches. Along the exposed faces, the outer layer of stone shall be carefully placed and arranged by hand to ensure a neat, compact placement with a uniform appearance.

The last layer of rock shall be uniformly leveled to the top edges of the gabions. Lids shall be stretched tight over the rock filling using only approved lid closing tools as necessary. The use of crowbars or other single point leverage bars for lid closing is prohibited as they may damage the baskets. The lid shall be stretched until it meets the perimeter edges of the front and end panels. The gabion lid shall then be secured to the sides, ends, and diaphragms with spiral binders, approved alternate fasteners, or lacing wire wrapped with alternating single and double half-hitches in the mesh openings.

Any damage to the wire or coatings during assembly, placement and filling shall be repaired promptly in accordance with the manufacturer's recommendations or replaced with undamaged gabion baskets.

7. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract; the volume of rock will be measured within the neat lines of the gabion structure and computed to the nearest cubic yard. Payment for gabions will be made at the contract unit price, and includes the wire mesh and rock. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to completion of the work.

Method 2 For items of work for which specific unit prices are established in the contract, the volume of the gabions will be measured within the neat lines of the gabion structure and computed to the nearest cubic yard. Payment for the gabions will be made at the contract unit price, and includes the wire mesh, rock and specified bedding material or geotextile. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work.

Method 3 For items of work for which specific unit prices are established in the contract, the surface area will be measured within the neat lines of the gabion mattress structure and computed to the nearest square yard. Payment for the gabion mattress will be made at the contract unit price, and includes the wire mesh

and rock. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work.

Method 4 For items of work for which specific unit prices are established in the contract, the surface area will be measured within the neat lines of the gabion mattress structure and computed to the nearest square yard. Payment for the gabion mattress will be made at the contract unit price, and include the wire mesh, rock and specified bedding material or geotextile. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Unless otherwise specified in Section 8, no deduction in volume will be made for any void or embedded item. Compensation for any item of work described in the contract, but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Each item and the items to which they are made subsidiary are identified in Section 8 of this specification.

WATER CONTROL GATES

1. **APPLICABILITY**

Construction Specification 71 is applicable to the installation of gates for the purpose of water control, including slide gates, flap gates and radial gates.

2. **MATERIAL SPECIFICATIONS**

Material Specifications [571](#), [572](#), and [573](#) are complementary to Construction Specification 71. Table A-71 is a guide to selection of metal water control gates. When fabricated wooden gates are required for special applications, a material specification tailored to the specific job is usually more appropriate.

3. **ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS**

- a. Plans, elevations and sections showing location of gates and type and size of openings.
- b. Types of gates and applicable material specifications.
- c. Class of gate (seating and unseating heads expressed as a numerical symbol). Example: Class 40-10 denotes a seating head of 40 feet and an unseating head of 10 feet.
- d. Type of frame (flat, spigot, flange, flange with spigot) and details of the method of attaching the gate to the structure or pipe. Include thimble details, when required, together with designation of type of thimble (Types: E, F, C, L, Flange and Bell, or Flange and Flare).
- e. Special gate requirements (self-contained, nonrising stem, flush-bottom opening, etc.); include material requirements for fabricated metal gates if other than steel is required.
- f. Type and capacity of gate stems, hoists, lifts, stem guides, stem housings, couplings, sleeves and other appurtenances.
- g. Paint systems to be used in shop and field painting. (Refer to Construction Specification [82, Cleaning and Painting Metalwork](#)).
- h. Special gate operating requirements, particularly if the gate is intended to operate in other than the fully open or fully closed position. Example: Gate will be required to operate in a partially open position under a full head.

4. **DISCUSSION OF METHODS**

No alternative methods are included.

TABLE A-71

GUIDE TO SELECTION OF METAL WATER CONTROL GATES

Type of Gate	Application	Frequency of Use	<u>Types of Gates Satisfactory for Exposure Condition</u>		
			Fresh Water or Slight Pollution	Moderate Pollution (Domestic & Agricultural Sewage, & Industrial Waste)	Extreme Pollution, Sea Water, Brackish Water
Slide	Drainage gates; Canal headgates	Frequent Infrequent	MLS-1&2, MMS-1 MMS-1, MHS-1	MHS-2	MHS-3
	Sediment pool drainage gate	Infrequent	MMS-2, MHS-1	MHS-2	MHS-3
	Reservoir water supply	Frequent	MMS-2, MHS-1	MHS-2	MHS-3
	Intake gates	Infrequent	MHS-1, MHS-2	MHS-3	MHS-3
Flap	Accessible gravity outlets		MMF-1, MLF-1	MHF-2	MHF-3
	Inaccessible gravity outlets		MHF-1, MMF-1	MHF-2	MHF-3
	Pump outlets, not subject to slamming		MHF-1, MMF-1	MHF-2	MHF-3
	Pump outlets, subject to slamming		MHF-1R	MHF-2R	MHF-3R

CONSTRUCTION SPECIFICATION

71. WATER CONTROL GATES

1. SCOPE

The work shall consist of furnishing and installing water control gates including gate stems, hoists, lifts and other appurtenances.

2. MATERIALS

The gates furnished shall conform to the requirements of Material Specifications [571](#), [572](#), and [573](#), as appropriate, and as specified in Section 8 of this specification and on the drawings. All gates shall be furnished complete with hoisting equipment and other specified appurtenances.

3. INSTALLING GATES

The Contractor shall install the gates in a manner that will prevent leakage around the seats and binding of the gates during normal operation.

Surfaces of metal against which concrete will be placed shall be free from oil, grease, loose mill scale, loose paint, surface rust, and other debris or objectionable coatings.

Anchor bolts, thimbles and spigot frames shall be secured in true position within the concrete forms and maintained in alignment during concrete placement.

Concrete surfaces against which rubber seals will bear or against which flat frames or plates are to be installed shall be finished to provide a smooth and uniform contact surface.

When a flat frame is installed against concrete, a layer of concrete mortar shall be placed between the gate frame and the concrete.

When a gate is attached to a wall thimble, a mastic or resilient gasket shall be applied between the gate frame and the thimble, in accordance with the recommendations of the gate manufacturer.

For radial gates, wall plates, sills and pin brackets shall be adjusted and fastened by grouting and bolting after the gates have been completely assembled in place.

4. INSTALLING HOISTS AND LIFTS

Gate stems, stem guides and gate lifts shall be carefully aligned so that the stem shall be parallel to the guide bars or angles on the gate frame following installation.

5. RADIAL GATE SEALS

The rubber seals for radial gates shall be installed so that the seals contact the walls or wall plates throughout the entire gate length when the gate is in the closed position.

6. OPERATIONAL TESTS

After the gate(s) and hoist(s) (or lifts) have been installed, they shall be cleaned, lubricated and otherwise serviced by the Contractor in accordance with the manufacturer's instructions. The Contractor shall test the gate and hoist by operating the system several times throughout its full range of operation. The Contractor shall make any changes and/or adjustments necessary to insure satisfactory operation of the complete gate system.

7. MEASUREMENT AND PAYMENT

The number of each type, size and class of gate will be counted. Payment for furnishing and installing each type, size and class of gate shall be made at the contract unit price for that type, size and class of gate. Such payment will constitute full compensation for all labor, equipment, materials and all other items necessary and incidental to the completion of the work including furnishing and installing anchor bolts and all specified appurtenances and fittings.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and items to which they are made subsidiary are identified in Section 8 of this specification.

METAL FABRICATION AND INSTALLATION

1. APPLICABILITY

Construction Specification 81 is applicable to the construction of items of metalwork not covered by other specifications. It is applicable to such items as trash guards, anti-vortex hoods and baffles, flashboard guides, and similar structures or parts. It is not applicable to the installation of concrete reinforcing steel, water control gates, fences, wells, piles or pipe conduits.

2. MATERIAL SPECIFICATIONS

Material Specification 581 and 582 and Construction Specification 82 are complementary to Construction Specification 81.

3. ITEMS TO BE INCLUDED IN CONSTRUCTION SPECIFICATIONS AND DRAWINGS

- a. Detailed drawings as necessary to show the dimensions and method of fabrication and erecting the item or structure.
- b. For aluminum, the alloy to be used in the work if other than specified in Material Specification 581. Alloys specified for use should be limited to those for which ASCE Specifications for Structures of Aluminum Alloy are available. Such specifications are published in Section A of the Aluminum Construction Manual of The Aluminum Association.
- c. Type of steel if other than structural quality. Use "commercial" or "merchant" quality only for small parts where the strength is not a major design consideration. Examples: Non-critical angles and other shapes less than three (3) inches in maximum dimension of Section; shear plates for construction joints in concrete; small trash rack parts; and, other similar metal features.
- d. Details of connections showing sizes and number of bolts; sizes, kinds and dimensions of welds; and sizes and number of rivets.
- e. Designation of items to be galvanized or painted and designation of paint systems to be used.
- f. Ordering data listed in the material specifications, as appropriate, including such items as:
 - (1) Type, kind, size, hardness and length of bolts.
 - (2) Class, grade, condition and finish of castings.
 - (3) Type, composition, hardness, size and form of other materials.

- g. Methods of measurement and payment, if the standard specification includes more than one method.

4. DISCUSSION OF METHODS

a. Section 6, Measurement and Payment

- (1) Method 1 is intended for use when the metalwork is a minor portion of the contract and consists largely of items that would normally be fabricated by the Contractor.
- (2) Method 2 is intended for use when the metalwork is a significant portion of the contract.
- (3) Method 3 is intended for use when the metalwork includes individual items of significant scope or complexity or which would usually be procured from outside sources or fabricated for the contractor by others.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

81. METAL FABRICATION AND INSTALLATION

1. SCOPE

The work shall consist of furnishing, fabricating and erecting metalwork, including the metal parts and fasteners of the composite structures.

2. MATERIALS

Unless otherwise specified, materials shall conform to the requirements of Material Specification [581, Metal](#). Steel shall be structural quality unless otherwise specified. Castings shall be thoroughly cleaned and subjected to careful inspection before installation. Finished surfaces shall be smooth and true to assure proper fit. Galvanizing shall conform to the requirements of Material Specification [582, Galvanizing](#).

3. FABRICATION

Fabrication of structural steel shall conform to the requirements of "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings (Riveted, Bolted and Arc-Welded Construction)," American Institute of Steel Construction.

Fabrication of structural aluminum shall conform to the requirements in the 'Aluminum Design Manual', available from The Aluminum Association.

4. ERECTION

The frame of metal structures shall be installed true and plumb. Temporary bracing shall be placed wherever necessary to resist all loads to which the structure may be subjected, including those applied by the installation and operation of equipment. Such bracing shall be left in place as long as may be necessary for safety.

As erection progresses the work shall be securely bolted up, or welded, to resist all dead load, wind and erection stresses. The Contractor shall furnish such installation assisting bolts, nuts and washers as may be required.

No riveting or welding shall be performed until the structure is stiffened and properly aligned.

Rivets driven in the field shall be heated and driven with the same care as those driven in the shop.

All field welding shall be performed in conformance to the requirements for shop fabrication, except those that expressly apply to shop conditions only.

5. PROTECTIVE COATINGS

Items specified to be galvanized shall be completely fabricated for field assembly before the application of the zinc coatings. Galvanized items shall not be cut, welded or drilled after the zinc coating is applied.

Items specified to be painted shall be painted in conformance to the requirements of Construction Specification 82 for the specified paint systems.

6. MEASUREMENT AND PAYMENT

Method 1 The work will not be measured. Payment for metal fabrication and installation will be made at the contract lump sum price in the contract. Such payment will constitute full compensation for all labor, equipment, materials and all other items necessary and incidental to the completion of the work, including connectors and appurtenances such as rivets, bolts, nuts, pins, studs, washers, hangers and weld metal.

Method 2 The weight of metal installed complete in place shall be determined to the nearest pound. Unless otherwise specified, the weight of metal shall be computed by the method specified in Section 3 of the "Code of Standard Practice for Steel Buildings and Bridges," American Institute of Steel Construction, except that the following unit weights shall also be used, as appropriate, as the basis of computation:

<u>Material</u>	<u>Unit Weight (lbs./ft.³)</u>
Aluminum alloy	173.0
Bronze or copper alloy	536.0
Iron, malleable	470.0
Iron, wrought	487.0

Payment for furnishing, fabricating and installing metalwork will be made at the contract unit price for the specified types of labor, materials, equipment and all other items necessary and incidental to the completion of the work.

Method 3 The work will not be measured. Payment for furnishing, fabricating and installing each item of metalwork will be made at the contract price for that item. Such payment will constitute full compensation for all labor, equipment, materials and all other items necessary and incidental to the completion of the work, including connectors and appurtenances such as rivets, bolts, nuts, pins, studs, washers, hangers and weld metal.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

PAINING METALWORK

1. **APPLICABILITY**

Construction Specification 82 is applicable to the painting of metalwork including structural metal, water control gates, piping, pumps and other metal equipment and machinery.

The durability of paint films on metal depends upon the exposure condition, the types of paints used, the thickness of the coating and the method of preparing the metal surface prior to the application of primers and paint. To a large extent the type of paint required is dictated by the exposure condition and the required surface preparation is dictated by the type of paint to be applied. Each paint system specifies the type and quality of paint, the number of coats or minimum paint film thickness required and the finish (gloss, semi-gloss, flat, etc.).

The paint systems are not equivalent optional methods. Each paint system is designed to provide protection for a particular exposure condition or to produce a particular finished appearance or both. The criteria for selection of the appropriate paint system and surface preparations for that finish are summarized in Table A-82 of these instructions.

Where a minor amount of painting is to be performed, and it is not required for protection, use a simple note on the drawings rather than Construction Specification 82.

2. **MATERIAL SPECIFICATIONS**

Material Specification [583, Coal Tar-Epoxy Paint](#), is complementary to Construction Specification 82 when Paint System F is specified. References to the Steel Structures Paint Council (SSPC) for surface preparation are summarized. Refer to SSPC for full text as appropriate. There are no other material specifications complementary to this specification. Any material requirements are to be specified in Section 10.

3. **ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS**

- a. Indicate by notes on the drawings, the surfaces and items to be painted.
- b. Designate the paint system (by letter) to be used for painting each indicated item. If all metalwork is to be painted by the same paint system, one standard note to that effect will be sufficient.
- c. Waiver of the requirement that the Contractor furnish a plan and materials list, if the plan is not necessary.
- d. Provide color requirements, finish (gloss, semi-gloss, etc.) and any special requirements as appropriate.

- e. Instructions for painting, surface preparation or other special conditions or methods not covered by the standard specification.
- f. Surface preparation for needed maintenance painting may be limited to those spots or areas having loss of protection by corrosion and/or wearing surfaces. A clean sound paint surface provides a good base for added layers.
- g. Provide tinting requirements as appropriate. Various coatings have a unique tolerance for pigmentation. Under or over-pigmentation can produce poor cover quality (hide) and less than desirable performance.
- h. Note in Section 10 if the Contractor is to provide paint specification information to the Engineer which is to be shared with the owners to use for their responsibility for operation and maintenance.

4. DISCUSSION OF METHODS

Select the method or methods for surface preparation that are appropriate for the durability and length of service required. Refer to Table A-82 for surface preparation recommendations. The quality of surface preparation diminishes as the Method number increases and the expected surface life is reduced accordingly. The small cost increase in selecting a higher quality preparation can significantly reduce O&M costs and untimely coating failure.

TABLE A-82**PAINT SYSTEMS FOR METALWORK**

Paint System	Type of Paint Material	Description and Conditions for Use	Example Applications	Surface Preparation
A	Alkyd Primer (Type 1) Alkyd Enamel (Type 2) Gloss or Semi-gloss (Type 3)	A good interior and exterior system. It is not intended for humid or damp environments. System A should not be applied to surfaces that constantly sweat or are immersed in water. It will chalk or oxidize when subjected to sunlight.	Interior and exterior surfaces of buildings, piping, pumps, and machinery above operating floors, doors, frames, tanks, etc.	Method 2 or 3, Commercial Blast or Brush-off Blast
B	Single package moisture cured urethane primer (Type 9) Alkyd Enamel (Type 2) Gloss or Semi-gloss (Type 3)	Similar to the qualities of System A. Urethane primer allows system to be applied over poorly prepared surfaces particularly in areas where proper preparation is difficult or impractical. It is a good system for repainting over old existing paint for rehabilitation.	Exterior or interior surfaces of buildings, piping, pumps, and machinery above operating level. Good rehabilitation system when preparation is minimal.	Method 2 or 3, Commercial Blast or Brush-off Blast
C	Epoxy Polyamide (Type 4) Epoxy Polyamide (Type 5)	An excellent system for constant or intermittent immersion in salts or fresh water. Excellent for surfaces exposed to constant humidity and sweating. Excellent chemical resistance and available in almost all colors. Will chalk or oxidize when exposed to sunlight.	Trash racks and guards or flap gates, stop logs and guides, pumps, piping, machinery, storage tanks, etc.	Method 1, near white Blast.
D	Epoxy Polyamide Primer (Type 4) Epoxy Polyamide (Type 5) Acrylic Polyurethane Gloss (Type 6) or Semi-gloss (Type 7)	Same as System C except is topcoated with acrylic polyurethane. Not recommended for immersed metals. Excellent interior or exterior in humid or arid environment. High abrasion resistance. Excellent color and gloss retention (15 times greater than Systems A, B, or C). Excellent on steel that sweats. Available in either gloss or semi-gloss. Should be considered for long-term exposure to sunlight or when esthetics are a factor.	Exterior surfaces of building such as drains, overflows, gutters and piping exposed to either humid or arid conditions. Any metal items that gather condensation and/or have high exposure to sunlight. Interior surfaces such as walls, ceilings, structural steel, equipment, piping, etc.	Method 2 or 3, Commercial Blast or Brush-off Blast

TABLE A-82 (Continued)

PAINT SYSTEMS FOR METALWORK

Paint System	Type of Paint Material	Description and Conditions for Use	Example Applications	Surface Preparation
E	Single package moisture cured Urethane Primer (Type 9) Acrylic Polyurethane Gloss (Type 6) or Semi-gloss (Type 7)	Good system for dry humid environments. Excellent color and gloss retention. Cannot be used for coating immersed metals and is not as good as System D in constant moisture. Excellent long-term esthetics.	Structural steel, siding, doors, frames, piping, machinery, storage tanks, etc.	Method 2 or 3, Commercial or Brush-off Blast
F	Coal Tar Epoxy (Type 10)	Excellent in constant or intermittent immersion in salt or fresh water. Excellent also for buried steel surfaces. Available in black only – will change to brown when exposed to sunlight, but sunlight does not adversely effect performance. Excellent chemical resistance and dependability exhibited in extensive use throughout the water and wastewater treatment industry. NOTE: Galvanized surfaces require a pre-treatment vinyl acid wash primer prior to applying paint, as noted in Type 8 Paints. Sandblasting or aged galvanized surfaces do <u>not</u> require a vinyl wash treatment.	Trash guards, water control gates, pipes, steel piling, stop logs and guides, water tanks, flumes, etc.	Method 1, Near White Blast
G	Epoxy Polyamide Primer (Type 4) Single package Moisture Cured Urethane (Type 9)	Excellent system for repair of damaged galvanized metal in humid or arid environments. Will provide protection for surfaces exposed to constant humidity and sweating.	Trash guards, CMP, stop logs and guides, and other galvanized metalwork.	Method 4 or 5, Hand Tool or Solvent Clean
H	Vinyl Acid Wash Treatment (Type 8)	For use as a pre-treatment wash for galvanized and non-ferrous metals that require painting.	Trash guards, CMP, stop logs and guides, gutters, downspouts, and other galvanized or non-ferrous metals.	Steam Clean with TSP, or Solvent clean, regularly changing rags.

TABLE A-82. PAINT SYSTEMS FOR METALWORK (Continued)

- a. All surface preparation referred to herein shall be performed in accordance with SSPC (Steel Structures Painting Council).
- b. All painting and coating shall be performed per SSPC Good Painting Practices and paint manufacturer's recommendations.
- c. Coated steel subjected to potable water service shall be coated in accordance with American Water Works Association (AWWA) provisions and directions. Said coatings shall meet United States National Sanitation Foundation (US-NSF) requirements.
- d. When special protective coatings or other specific painting recommendations are necessary, refer to the Paint Manual, United States Department of Interior (USDI), Bureau of Reclamation or paint manufacturer's data.
- e. Surface preparation indicated is the method that will provide coating quality appropriate for exposure conditions. Methods that produce a greater or a lesser quality can be chosen to produce the quality of work that is necessary. Hand Tool Cleaning (Method 4) and Solvent Cleaning (Method 5) are applicable for field applications, small areas requiring coating, or in making repairs to factory coatings.

CONSTRUCTION SPECIFICATION

82. PAINTING METALWORK

1 SCOPE

The work shall consist of cleaning metal surfaces and applying paints and protective coatings.

2. PAINT

For the purpose of this specification, paints and coatings shall be designated by types as defined below.

Materials for systems requiring two (2) or more coats shall be supplied by the same manufacturer.

Unless otherwise specified and prior to application, the Contractor shall furnish in writing to the Engineer for approval a plan outlining procedures proposed for painting metalwork and a list of materials including name of manufacturer, pertinent product identification names and numbers and product data sheets. Data shall reflect the requirements set forth in this section.

Type 1 Alkyd Primer. Alkyd based, rust inhibitive primer. Primer shall be lead and chromate free. Primer shall have a minimum of 54 percent solids by volume. Color availability shall be red, gray, and white. Primer shall be able to be applied satisfactory at 2.0 to 3.0 mils dry-film thickness in one coat.

Type 2 Alkyd Enamel (Gloss). Alkyd based enamel shall be lead free. Alkyd enamel shall have a minimum of 49 percent solids by volume. Alkyd enamel shall be able to be applied satisfactory at 2.0 to 3.0 mils dry-film thickness in one coat. Finish shall be gloss.

Type 3 Alkyd Enamel (Semi-gloss). Alkyd based enamel shall be lead free. Alkyd enamel shall have a minimum of 55 percent solids by volume. Alkyd enamel shall be able to be applied satisfactory at 2.0 to 3.0 mils dry-film thickness in one coat. Finish shall be semi-gloss.

Type 4 Epoxy Polyamide Primer. Epoxy polyamide primer shall be lead and chromate free. Epoxy primer shall have a minimum of 56 percent solids by volume. Epoxy primer shall be able to be applied satisfactory at 4.0 to 6.0 mils dry-film thickness in one coat. Color availability shall be red, gray, and white. Epoxy primer shall conform to AWWA Standard C 210 and AWWA Standard D 102.

Type 5 Epoxy Polyamide (intermediate or finish). Epoxy polyamide shall be lead free. Epoxy shall have a minimum of 56 percent solids by volume. Epoxy shall be able to be applied satisfactory at 4.0 to 6.0 mils dry-film thickness in one coat. Finish shall be semi-gloss. Epoxy finish shall conform to AWWA C 210 and AWWA D 102.

Type 6 Acrylic Polyurethane (Gloss). Acrylic polyurethane shall be lead free. Acrylic polyurethane shall have a minimum of 74 percent solids by volume. Polyurethane shall be able to be applied satisfactory at 3.0 to 5.0 mils dry-film thickness in one coat. Finish shall be gloss.

Type 7 Acrylic Polyurethane (Semi-gloss). Acrylic polyurethane shall be lead free. Acrylic polyurethane (semi-gloss) shall have a minimum of 58 percent solids by volume. Polyurethane shall be able to be applied satisfactory at 3.0 to 5.0 mils dry-film thickness in one coat. Finish shall be semi-gloss.

Type 8 Vinyl Acid Wash Treatment. Pre-treatment primer for galvanized and non-ferrous metal. Pre-treatment primer shall have a minimum of 8 percent solids by volume. The applied dry-film thickness of pre-treatment primer shall not exceed 0.5 mil. Steel primed with pre-treatment primer shall be top coated within six to eight hours in humid conditions.

Type 9 Single Package Moisture Cured Urethane Primer. Urethane primer shall have a minimum of 50 percent solids by volume. Primer shall be able to be applied satisfactory at 2.0 to 3.0 mils dry-film thickness in one coat. Color shall be metallic aluminum.

Type 10 Coal Tar Epoxy. Coal tar epoxy shall have a minimum of 75 percent solids by volume and conform to the requirements of NRCS Material Specification [583 Coal Tar Epoxy Paint](#) (Steel Structures Paint Council PS No. 16, Type I). Coal tar epoxy shall be able to be applied satisfactory at 8.0 to 15.0 mils dry-film thickness in one coat.

3. TINTING

Tinting shall not be performed in the field unless otherwise specified.

4. SURFACE PREPARATION

Surfaces to be painted shall be thoroughly cleaned prior to the application of paint or coatings. Surface preparations required by this specification are as designated by SSPC (Steel Structures Painting Council) and are summarized by the Methods listed in this section.

Method 1 Near White Blast (SSPC-SP10). All surfaces to be coated shall be prepared by removing all grease and oil using steam cleaning or solvent cleaning methods per Method 5. After degreasing is completed, sand or grit blasting shall be performed to remove all dirt, rust, mill scale and/or other foreign material or residue. The cleaned, finished surface shall be a minimum of 95 percent free of all visible foreign material and/or residue.

Method 2 Commercial Blast (SSPC-SP6). All surfaces to be coated shall be prepared by removing all grease and oil using steam cleaning or solvent cleaning methods per Method 5. After degreasing is completed, sand or grit blasting shall be

performed to remove all dirt, rust, mill scale or other foreign material or residue. The cleaned, finished surface shall be a minimum of 67 percent free of all visible foreign material or residue.

Method 3 Brush-off Blast Cleaning (SSPC-SP7). All surfaces to be coated shall be prepared by removing all grease and oil using steam cleaning or solvent cleaning methods per Method 5. After degreasing is completed, and or grit blasting shall be performed to remove dirt, rust, mill scale or other foreign material or residue. Tightly adherent mill scale, rust and paint are considered tightly adherent if they cannot be removed by lifting with a dull putty knife.

Method 4 Hand Tool Cleaning (SSPC-SP2). All surfaces to be coated shall be prepared by removing all oil or grease using steam cleaning or solvent cleaning methods per Method 5. After degreasing is completed, non-power hand tools shall be used to remove loose, detrimental foreign material. Adherent mill scale, rust and paint need not be removed.

Method 5 Solvent Cleaning (SSPC-SP1). Surfaces to be coated shall be prepared by removing all visible oil, grease, soil, drawing and cutting compounds and other soluble contaminants from surfaces with solvents or commercial cleaners using various methods of cleaning such as wiping, dipping, steam cleaning or vapor degreasing.

5. PAINT SYSTEMS

For the purposes of this specification, systems of painting and coating metalwork will be designated as defined in this section.

Paint System A shall consist of the application of one (1) primer coat of Type 1 and two (2) or more coats of Type 2 (gloss) or Type 3 (semi-gloss) to provide a minimum dry-film thickness of 6.0 mils.

Paint System B shall consist of the application of one (1) primer coat of Type 9 and two (2) or more coats of Type 2 (gloss) or Type 3 (semi-gloss) to provide a minimum dry-film thickness of 6.0 mils.

Paint System C shall consist of the application of one (1) coat of Type 4 and one (1) or more coats of Type 5 to provide a minimum dry-film thickness of 8.0 mils.

Paint System D shall consist of the application of one (1) coat of Type 4 primer, one (1) coat of Type 5 and one (1) coat of Type 6 (gloss) or Type 7 (semi-gloss) to provide a minimum dry-film thickness of 11.0 mils.

Paint System E shall consist of the application of one (1) coat of Type 9 and one (1) coat of Type 6 (gloss) or Type 7 (semi-gloss) to provide a minimum dry-film thickness of 5.0 mils.

Paint System F shall consist of the application of two (2) coats of Type 10 at a dry-film thickness of 8.0 mils. per coat. Total system shall provide a minimum dry-film thickness of 16.0 mils.

Paint System G shall consist of the application of two (2) coats of Type 4 and two (2) coats of Type 9 paint. Total system shall provide a minimum dry-film thickness of 14.0 mils.

6. APPLICATION OF PAINT

Surfaces shall be painted immediately after preparation or within the same day as prepared with a minimum of one (1) coat of the primer type specified. Remaining surfaces not required to be painted shall be protected against contamination and damage during the cleaning and painting operation.

Paints shall be thoroughly mixed immediately prior to application.

After erection or installation of the metalwork, all damage to shop applied coating shall be repaired and all bolts, nuts, welds and field rivet heads shall be cleaned and painted with one coat of the specified priming paint.

Except on surfaces accessible only to spray equipment, initial priming coats shall be applied by brush. All other coats may be applied by brush or spray. Each coat shall be applied in such a manner as to produce a paint film of uniform thickness with a rate of coverage within the guidelines and limits recommended by the paint manufacturer and as outlined in Section 2 of this specification.

The drying time between coats shall be as prescribed by the paint manufacturer, but not less than that required for the paint film to thoroughly dry. The elapsed time between coats in Paint System F shall not exceed 24 hours. If for any reason the critical re-coat time is exceeded, the coated surface shall be treated with the manufacturer's recommended tackifier solvent or brush blasted to roughen the surface.

The finished surface of each coat shall be free from runs, drops, ridges, laps or excessive brushmarks and shall present no variation in color, texture and finish.

The surface of each dried coat shall be cleaned as necessary before application of the next coat.

7. ATMOSPHERIC CONDITIONS

Paint application shall not be performed when the temperature of the item to be painted or the surrounding air is less than 50° F. Painting shall be performed only when the humidity and temperature of the surrounding air and the temperature of the metal surfaces are such that evaporation rather than condensation will result during the period of time required for application and drying. The surface shall be dry and a minimum of 5° F above the dew point. Surfaces protected from adverse

atmospheric conditions by special cover, heating or ventilation shall remain so protected until the paint is thoroughly dry.

8. TESTS

Dry-film thickness on ferrous metal shall be determined by the use of a non-destructive magnetic instrument such as an Elcometer or Mikrotest gauge. Instruments shall have been calibrated within one month prior to use. Film thickness on non-ferrous metal shall be determined with film gauges during the application process. Systems with film thickness less than specified shall be brought into conformance by the application of one or more additional coats of the specified material.

9. PAYMENT

For items of work for which lump sum prices are established in the contract, payment will be made as the work proceeds, after presentation of invoices by the Contractor supporting actual related costs and evidence of the charges of suppliers, subcontractors, and other for supplies furnished and work completed. If the total of such payments is less than the lump sum contract price for this item, the unpaid balance will be included in the next appropriate contract payment. Payment of the lump sum contract price will constitute full compensation for completion of the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 10 of this specification.

TIMBER FABRICATION AND INSTALLATION

1. APPLICABILITY

Construction Specification 83 is applicable to all types of timber construction (except pile driving or the use of round timber) that are normally an integral part of structures designed and installed under agency programs. Supplementary specifications will be required for works of a special nature, such as bridges or buildings.

2. MATERIAL SPECIFICATIONS

Material Specifications [581](#), [582](#), [584](#) and [585](#) and Construction Specification [84](#) are complementary to Construction Specification 83.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Plans and dimensions of all structural elements.
- b. Complete details of all connections including number, type and size and kind of nails or spikes or bolts with nuts if the design requires that these be specified; depth of embedment of screws and pins, etc.
- c. For lumber and timber, specify:
 - (1) Stress grade.
 - (2) Species according to standard commercial name.
 - (3) Heartwood requirements or other special requirements.
 - (4) Nominal size and dress requirements (rough or dressed).
 - (5) Preservative treatment, if required. (Refer to ASTM D 1760 for guidance to type of treatment.)
 - (6) Applicable grading rule, including the name of the agency that sponsors the rule (such as National Hardwood Lumber Association), the paragraph number and year of issue.
- d. For plywood and chipboard, specify:
 - (1) Number of plies, width and length of sheet.
 - (2) Species or group according to PS 1.
 - (3) Grade
 - (4) Type (exterior, interior)
 - (5) Finished thickness

- (6) Finish requirements (such as sanded or unsanded).
- e. Designation of surfaces to be painted.
- f. Special instructions concerning cutting of treated lumber or timber, if such operations are to be allowed.

4. DISCUSSION OF METHODS

a. Section 6, Measurement and Payment.

- (1) Method 1 is intended for use in cases where the quantities of lumber and timber are large and the measurement of structural elements is feasible.
- (2) Method 2 is considered more appropriate for structures of moderate size.
- (3) Method 3 provides a flexible method of payment when there are some structure units that can be paid for as completed structures and also structures that lend themselves to partial payment on a linear foot basis.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

83. TIMBER FABRICATION AND INSTALLATION

1. SCOPE

The work shall consist of the construction of timber structures and timber portions of composite structures.

2. MATERIALS

Structural timber and lumber shall conform to the requirements of Material Specification 584. **Treated timber and lumber** shall be impregnated with the specified type and quantity of preservative and in the manner specified in Material Specification 585.

Hardware, except cast iron, shall be galvanized as specified for iron and steel hardware in Material Specification 582. Unless otherwise specified, structural steel shapes, plates and rods shall not be galvanized. Nuts, driftbolts, dowels and screws shall be either wrought iron or steel.

Steel bolts shall conform to the requirements of ASTM A 307. When galvanized or zinc-coated bolts are specified, the zinc coating shall conform to the requirements of Material Specification 582.

Washers shall be ogee gray iron castings or malleable iron castings unless washers cut from medium steel or wrought iron plate are specified on the drawings or in Section 7 of this specification. Cast washers shall have a thickness equal to the diameter of the bolt and a diameter equal to four (4) times the thickness. The thickness for plate washers shall be equal to one-half (1/2) the diameter of the bolt, and the sides of the square shall be equal to four (4) times the diameter of the bolt. Holes in washers shall have a maximum diameter of one-eighth (1/8) inch larger than the diameter of the bolt. Split ring connectors, tooth ring connectors and pressed steel shear plate connectors shall be manufactured from hot-rolled, low carbon steel conforming to the requirements of ASTM A 711, Grade 1015. Malleable iron shear plate connectors and spike grid connectors shall be manufactured in conformance with the requirements of ASTM A 47, Grade No. 35018. All connectors shall be of approved design and the type and size specified.

Structural shapes, rods and plates shall be structural steel conforming to the requirements of Material Specification 581. No welds will be permitted in truss rods or other main members of trusses or girders.

3. WORKMANSHIP

All framing shall be true and exact. Timber and lumber shall be accurately cut and assembled to a close fit and shall have even bearing over the entire contact surfaces. No open or shimmed joints will be accepted. Nails and spikes shall be driven with just sufficient force to set the heads flush with the surface of the wood. Deep hammer marks in wood surfaces shall be considered evidence of poor workmanship and may be sufficient cause for rejection of the work.

Holes for round driftpins and dowels shall be bored with a bit one-sixteenth inch smaller in diameter than that of the driftpin or dowel to be installed. The diameter of holes for square driftpins or dowels shall be equal to one side of the driftpin or dowel. Holes for lag screws shall be bored with a bit not larger than the body of the screw at the base of the thread.

Washers shall be used in contact with all bolt heads and nuts that would otherwise be in contact with wood. Cast iron washers shall be used when the bolt will be in contact with earth. All nuts shall be checked or burred effectively with a pointed tool after finally tightened.

Unless otherwise specified, surfacing, cutting and boring of timber and lumber shall be completed prior to treatment. If field cutting or field repair of treated timber and lumber is approved, all cuts and abrasions shall be carefully trimmed and coated with two paint on or swab-applied applications of a wood preservative containing not less than 5 percent (by weight) pentachlorophenol. A copper metal solution of 2 percent (by weight) of copper naphthenate may be used as a replacement for pentachlorophenol, which is a controlled substance. After timber assembly, any unfilled holes shall be plugged with tightly fitting wooden plugs that have been treated with preservative as specified.

4. HANDLING AND STORING MATERIALS

All timber and lumber stored at the site of the work shall be neatly stacked on supports a minimum of 12 inches above the ground surface and protected from the weather by suitable covering(s). Untreated material shall be staked and stripped to permit free circulation of air between the tiers and courses. Treated timber may be close-staked. The ground surface for the stockpile of timber and lumber shall be free of weeds and rubbish. The use of cant hooks, peavies, or other pointed tools, except end hooks will not be permitted in the handling of structural timber and/or lumber. Treated timber shall be handled with rope slings or other methods that will prevent the breaking or bruising of outer fibers, or penetration of the surface in any manner.

5. PAINTING

Except as otherwise specified, surfaces designated for painting shall be prepared and painted in accordance with Construction Specification [84](#).

6. MEASUREMENT AND PAYMENT

Method 1 The unit of measurement of lumber and timber will be the number of thousand feet board measure (MBM) of each type, size, species and grade of lumber and timber installed in the completed structure. The quantity of each type, size, species and grade will be computed from the nominal dimensions and actual lengths of the pieces in the completed structure and will not include waste timber used for erection purposes) such as falsework or temporary sheeting and bracing) or

any portion of any pile or other round timber. The total quantity of lumber and timber in each type, size, species and grade will be computed to the nearest 0.01 MBM.

The unit of measurement of plywood will be the number of square feet of each type, species, grade and thickness installed in the completed structure.

Payment for each type, size, species and grade of lumber and timber will be made at the contract unit price for that type, size, species and grade. Payment for each type, species, grade and thickness of plywood will be made at the contract unit price for that type, species, grade and thickness. Such payment will be considered full compensation for completion of the work.

Method 2 No measurement of material quantities will be made. Payment for each structure, complete in place, will be made at the contract lump sum price for that structure. Such payment will be considered full compensation for completion of the work.

Method 3 For items of work for which specific unit prices are established in the contract, measurement and payment for each structure unit, except those for which a linear foot payment is established, will be counted and payment made at the contract unit price. Items for which a linear foot payment is established will be measured to the nearest linear foot and payment will be made at the contract unit prices as appropriate. Such payment will be considered full compensation for completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

INSTRUCTIONS FOR USE OF CONSTRUCTION SPECIFICATION 84

PAINING WOOD

1. APPLICABILITY

Construction Specification 84 is applicable to the exterior painting of wood materials.

2. MATERIAL SPECIFICATIONS

There are no material specifications complementary to Construction Specification 84.

3. ITEMS TO BE INCLUDED IN CONSTRUCT SPECIFICATIONS AND DRAWINGS

- a. Surfaces to be painted.
- b. Instructions for tinting if colors other than white are required.
- c. Paint and primer to be used if other than specified in Section 2.
- d. Number of paint and/or primer coats if other than specified in Section 4.

4. DISCUSSION OF METHODS

No methods are included.

NOTE: When ASTM or other applicable reference standards or specifications are available, reference to Federal Specifications will be replaced.

CONSTRUCTION SPECIFICATION

84. PAINTING WOOD

1. SCOPE

The work shall consist of cleaning and preparing wood surfaces and applying protective paint coatings.

2. MATERIALS

Unless otherwise specified in Section 7 of this specification, painting materials shall meet the following requirements:

Exterior paint primer shall conform to the requirements of Federal Specification TT-P-25.

Exterior oil paint shall conform to the requirements of Federal Specification TT-P-102. Unless otherwise specified, the color shall be white. The second coat of exterior oil paint may be thinned with mineral spirits conforming to the requirements of ASTM D 235 or with pure gum turpentine. The amount of thinner shall not exceed one (1) pint per gallon of paint.

When tinting is required, it shall be accomplished by the addition of pigment-in-oil tinting colors conforming to the requirements of Federal Specification TT-P-381.

3. SURFACE PREPARATION

All surfaces to be painted/primed shall be thoroughly cleaned prior to the application of paint/primer. Pitch pockets and knots shall be scraped and sealed with a shellac varnish conforming to the requirements of ASTM D 360. Previously painted surfaces shall be scraped and brushed to remove any checked or blistered paint and all excess chalk.

4. APPLICATION OF PAINT/PRIMER

Surfaces shall be clean and dry during paint/primer application. No paint/primer shall be applied until the prepared surfaces have been inspected and approved for paint/primer application.

Surfaces of new wood shall be painted with one (1) brush coat of exterior primer paint and two brush coats of exterior oil paint unless otherwise specified in Section 7 of this specification.

Paints/primers shall be thoroughly mixed at the time of application.

Each paint and primer coat shall be applied in such a manner as to produce a coating film of uniform thickness with a finished surface free of runs, drops, ridges, laps or excessive brush marks. The minimum drying time between applications shall be as prescribed by the manufacturer of the paint/primer and not prior to the previous paint/primer application being thoroughly dry.

The surface of each dried coating shall be cleaned as necessary before application of the next coat.

The first coat of exterior oil paint shall be tinted off-color by the addition of three (3) ounces of an appropriate tinting color per gallon of paint.

5. ATMOSPHERIC CONDITIONS

Unless otherwise specified in Section 7 of this specification or by the manufacturer of the coating products, paint and primer shall not be applied when the temperature of the wood surface or of the surrounding air is less than 45° F. Coatings shall not be applied when atmospheric conditions result in moisture condensation on the surface to be painted/primed. Surfaces protected from atmospheric conditions by special cover or enclosure, heating or ventilation shall remain to provide full protection until the paint/primer is thoroughly dry.

6. PAYMENT

For items of work for which specific lump sum prices are established in the contract, payment for priming and painting wood will be made at the contract lump sum price. Such payment will be full compensation for furnishing, preparing the surfaces, and applying all coating materials to wood surfaces designated to be painted including labor, tools, equipment, materials and all other items necessary and incidental to the completion of the work.

Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the item to which they are made subsidiary are identified in Section 7 of this specification.

INSTRUCTION FOR USE OF CONSTRUCTION SPECIFICATION 91

CHAIN LINK FENCE

1. APPLICABILITY

Construction Specification 91 is applicable to the installation of chain link fences.

2. MATERIAL SPECIFICATIONS

No material specifications are complementary to Construction Specification 91.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Plan showing the location and extent of fences including location of gates, corners, pull posts and end points.
- b. Dimensions of the fence including post spacing, clearance from ground and height of fence.
- c. Details of posts and assemblies:
 - (1) Types of post and top rails if other than specified in Section 2.
 - (2) Line post detail showing height of post, depth of embedment.
 - (3) Details of corner post assembly, pull post, and corner post, including embedment, top rail connections, tension wire detail, braces, trusses, etc.
 - (4) Show diameters of embedment items.
 - (5) Special anchor requirements, if any.
- d. Dimensions of gate opening (clear opening between inside faces of the gate posts).
- e. Dimensions of gates and type if other than specified in Section 2.
- f. Required appurtenances such as locks with number of keys, barbed wire arms, barbed wire, post tops, etc.
- g. Type, mesh, and gauge of chain link fabric, if other than specified in Section 2.
- h. If the fence materials are to be PVC coated, the following information should be included in the Items of Work and Construction Details:
 - (1) Specify PVC coating for the fence materials.
 - (2) Specify desired standard color of PVC Coating (See ASTM F 934) if other than black is to be used.

4. DISCUSSION OF METHODS

a. Section 5, Measurement and Payment

(1) Method 1 is intended for use when gates are a minor part of the work item.

(2) Method 2 is intended for use when gates form a substantial part of the work item or when gates must be installed in existing fences.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

91. CHAIN LINK FENCE

1. SCOPE

The work shall consist of furnishing and installing chain link fencing complete with all posts, braces, gates and all other appurtenances.

2. MATERIALS

The materials for the chain link fence shall be as follows:

Galvanized

Chain link fence fabric shall conform to the requirements of ASTM A 392, 2-inch mesh, and 9-gauge galvanized steel wire. Zinc coating shall be Class 2.

Posts and fence framework shall conform to the requirements of ASTM F 1043 Group 1A, for Heavy Industrial Fence. Coatings shall be a Type A galvanized coating for both internal and external surfaces. Steel pipe posts shall conform to the requirements of ASTM F 1043 and F 1083.

Fence fittings shall conform to the requirements of ASTM F 626. Fittings shall be galvanized steel. Wire ties and clips shall be 9-gage.

Gates, gate posts and gate accessories shall conform to the requirements of ASTM F 900. Coating shall be the same as selected for adjoining fence and framework.

Barbed wire shall be 12 1/2 gage and shall conform to the requirements of ASTM A 121, chain link fence grade.

Galvanized and PVC Coated

Chain link fence fabric shall conform to the requirements of ASTM F 668 for Class 2a or 2b, 2-inch mesh, and 9-gauge galvanized steel wire. The fabric shall have a polymer top coating of the color specified in Section 6.

Posts and fence framework shall conform to the requirements of ASTM F 1043 Group 1A, for Heavy Industrial Fence. Coatings shall be a Type A galvanized coating for both internal and external surfaces and covered with a polymer top coating of color as specified in Section 6.

Fence fittings shall conform to the requirements of ASTM F 626. Fittings shall be galvanized steel with a polymer top coating of color as specified in Section 6.

Any damage to the coating shall be repaired in accordance with the manufacturer's recommendations or the damaged fencing material shall be replaced. The Contractor shall provide the Engineer a copy of the manufacturer's recommended repair procedure and materials prior to correcting damaged coatings.

3. INSTALLING FENCE POSTS

Unless otherwise specified, line posts shall be placed at intervals of ten (10) feet measured from center to center of adjacent posts. In determining the post spacing, measurement will be made parallel with the ground surface.

Posts shall be set in concrete backfill in the manner shown on the drawings.

Posts set in the tops of concrete walls shall be grouted into preformed holes to a depth of 12-inches.

All corner posts, end posts, gate posts, and pull posts shall be embedded, braced and trussed as shown on the drawings or in accordance with appropriate industry practice if not otherwise shown or specified.

4. INSTALLING WIRE FABRIC

Fencing fabric shall not be stretched until at least four (4) days after the posts are grouted into walls or seven (7) days after the posts are set in the concrete backfill.

Fencing fabric shall be installed on the side of the posts designated on the drawings.

The fabric shall be stretched taut and securely fastened, by means of tie clips, to the posts at intervals not exceeding 15-inches and to the top rails or tension wires at intervals not exceeding two (2) feet. Care shall be taken to equalize the fabric tension on each side of each post.

Barbed wire shall be installed as shown on the drawings and shall be pulled taut and fastened to each post or arm with the tie wires or metal tie clips.

5. MEASUREMENT AND PAYMENT

Method 1 The length of fence will be measured to the nearest 0.1 foot along the fence, including gates. Payment will be made at the contract unit price for the specified height of fence. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work.

Method 2 The length of fence will be measured to the nearest 0.1 foot along the fence, excluding gate openings. Payment will be made at the contract unit price for the specified height of fence. The number of each size and type of gate installed will be determined. Payment will be made at the contract unit price for that type and size of gate. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed

in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 6 of this specification.

INSTRUCTION FOR USE OF CONSTRUCTION SPECIFICATION 92

FIELD FENCE

1. APPLICABILITY

Construction Specification 92 is applicable to the installation of field fence of the barbed wire, woven wire or wire netting types.

2. MATERIAL SPECIFICATIONS

Material Specification 591 is complementary to Construction Specification 92.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Plan showing the location and extent of fences including location of gates, corners, braces, and end points.
- b. Dimensions of the fence including post spacing, clearance from ground and height of fence.
- c. Details of concrete or other specialty post, if required.
- d. Details of posts and assemblies.
 - (1) Type and type of posts as defined and referenced in Material Specification 591.
 - (2) Line post detail showing height of post, depth of embedment.
 - (3) Details of end panel assembly, pull post assembly, brace panel assembly and corner assembly including types of posts, types of backfill, types and dimensions of braces, gauges of tension wires and details of fastening of tension wires to post.
 - (4) Special anchor requirements for posts at crossings over depressions or waterways.
 - (5) Where fencing is to be placed on a curved alignment, special consideration should be given to providing adequate vertical stability for prevention of pull-over. Consideration should include spacing of end panels, post spacing, type of posts and post depth.
- e. Details of gates. The details listed in b, c, d, and e, may often be shown on a standard drawing developed for use for fencing projects within an agency administrative area.
- f. Type and kind of fencing, as defined in Section 11.
 - (1) For barbed wire fencing, specify the type, gauge of wire, gauge and spacing of barbs and the number of points per barb.

(2) For woven wire fencing, specify the type, style, design number, and tensile strength grade.

(3) For wire netting, specify the type, style, height of netting, size of mesh and gauge of wire, or design number and coating class.

(4) For high tensile strength wire fencing material, specify the strength grade classification.

g. Species of wood posts.

h. Preservative treatment of wood posts and braces, as applicable.

i. Protective coating (painted or zinc-coated) for steel posts and braces.

4. DISCUSSION OF METHODS

a. Section 10, Measurement and Payment

(1) Method 1 is intended for use when gates are simple and are considered to be of field fabricated type.

(2) Method 2 is intended for use when gates must be shop fabricated, available on the market, or when gates must be installed within existing fences.

When specifications are prepared using electronic procedures and all but one method is deleted for use in a contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

92. FIELD FENCE

1. SCOPE

The work shall consist of furnishing and installing field fence, including gates and fittings.

2. MATERIALS

Materials for field fence shall conform to the requirements of Material Specification [591](#). All wooden posts shall be of the same species, when available.

3. SETTING POSTS

Concrete or wood posts shall be set in holes and backfilled with earth except where otherwise specified. Wood posts may be driven when approved by the Engineer. Steel posts shall be driven unless otherwise specified.

Holes for installing fence posts shall be at least six (6) inches larger than the diameter or side dimension of the posts.

Earth backfill around posts shall be thoroughly tamped in layers not thicker than four (4) inches and shall completely fill the posthole up to the ground surface. Concrete backfill around posts shall be rodded into place in layers not thicker than 12-inches and shall completely fill the posthole to the surface of the ground. Backfill, either earth or concrete, shall be crowned-up around posts at the ground surface.

No stress shall be applied to posts set in concrete for a period of not less than 24-hours following the development of a firm set of the concrete.

4. CORNER ASSEMBLY

Unless otherwise specified in Section 11, corner assemblies shall be installed at all points where the fence alignment changes 15 degrees or more.

5. END PANELS

End panels shall be built at gates and fence ends.

6. PULL POST ASSEMBLY

Pull post assembly (bracing within a section of straight fence) shall be installed at the following locations:

- a. In straight fence sections, at intervals not to exceed 660 feet.
- b. At any point where the vertical angle described by two adjacent reaches of wire is upward and exceeds ten (10) degrees (except as provided in Section 11 of this specification).

- c. At the beginning and end of each curved fence section.

7. ATTACHING FENCING TO POSTS

The fencing shall be stretched and attached to posts as follows:

- a. The fencing wire or netting shall be placed on the side of the post opposite the area being protected, except for installation along curved sections.
- b. The fencing wire or netting shall be placed on the outside for installation along curved sections.
- c. The fencing wire or netting shall be fastened to each end post, corner post and pull post by wrapping each horizontal strand around the post and tying it back on itself with not less than three (3) tightly wound wraps.
- d. The fencing wire or netting shall be fastened to wooden line posts by means of steel staples. Woven wire fencing shall be attached at alternate horizontal strands. Each strand of barbed wire shall be attached to each post. Steel staples shall be driven diagonally with the grain of wood and at a slight downward angle and shall not be driven so tightly as to bind the wire against the post.
- e. The fencing wire or netting shall be fastened to steel or concrete line posts with either two turns of 14 gauge galvanized steel or iron wire or in accordance with recommendations provided by the post's manufacturer.
- f. Wire shall be spliced by means of a Western Union splice or by suitable splice sleeves applied with a tool designed for that purpose. The Western Union splice shall have no less than eight (8) wraps of each end about the other. All wraps shall be tightly wound and closely spaced. Splices made with splice sleeves shall have a tensile strength no less than 80 percent of the strength of the wire being spliced.

8. STAYS

Stays shall be attached to the fencing, at the spacing outlined in Section 11 or as shown on the drawings, to ensure maintenance of the proper spacing of the fence wire strands.

9. CROSSINGS AT DEPRESSIONS AND WATERCOURSES

Where fencing is installed parallel to the ground surface, the line posts subject to upward pull shall be anchored.

- a. If the fence wire or netting is installed parallel to the ground surface, the line posts subject to uplift shall be anchored by means of extra embedment or by special anchors as detailed on the drawings.

- b. If the fence wire is installed with the top wire straight and parallel to the ground surface on either side of the depression, extra length posts shall be used to allow normal post embedment. Unless otherwise specified, excess space between the bottom of the fence and the ground shall be closed with extra strands of barbed wire or with netting.

10. MEASUREMENT AND PAYMENT

Method 1 The length of each type and kind of fence will be measured to the nearest foot along the profile of the fence, including gate openings. Payment for each type and kind of fence will be made at the contract unit price for that type and kind of fence. Such payment will constitute full compensation for completion of the work, including fabricating and installing gates.

Method 2 The length of each type and kind of fence will be measured to the nearest foot along the profile of the fence, excluding gate openings. Payment will be made at the contract unit price for the specified height of fence. The number of each size and type of gate installed will be determined. Payment will be made at the contract unit price for that type and size of gate. Such payment will constitute full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 11 of this specification.

IDENTIFICATION MARKER OR PLAQUES

1. APPLICABILITY

The construction specification is applicable to the installation of identification markers or plaques to the works of improvement.

2. MATERIAL SPECIFICATIONS

There are no material specifications complementary to this specification. Any specific material requirements must be indicated in the specifications or on the drawings.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. Complete detail drawings for each type, kind, and size of marker or plaque, including material requirements.
- b. The style of letters and height of each line.
- c. A carefully worded exhibit showing the exact arrangement of words.
- d. The physical description for the installation location for each type, size of marker or plaque to be installed. Location selected should consider the audience intended and the potential for vandalism.
- e. Type of required monument or type of structure to which marker or plaque will be mounted.
- f. For markers signifying buried structures, state and/or local government regulations for sign specifications may apply. Ensure that project sign message and state and/or local government rules do not conflict.

4. DISCUSSION OF METHODS

a. Section 5, Measurement and Payment

(1) Method 1 is intended for use when various, sizes and types of markers or plaques are to be installed.

(2) Method 2 is intended for use when a single marker or plaque is to be installed or multiple number of markers are to be installed and they are of similar type and size.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

93. IDENTIFICATION MARKERS OR PLAQUES

1. SCOPE

The work shall consist of furnishing and installing identification markers or plaques at the designated locations.

2. MATERIALS

The markers or plaques shall be constructed of the specified materials, and shall meet all requirements for lettering, painting, finishing, and related items as shown on the drawings or as specified in Section 6 of this specification.

3. CONSTRUCTION METHODS

The markers or plaques shall be installed at location(s) as shown on the drawings and in the manner or condition specified in Section 6.

4. MONUMENTS

Unless otherwise specified, the markers or plaques shall be mounted on concrete monuments, on existing structures, or on structures proposed for installation under this contract.

5. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, payment for each type, kind, and size of marker or plaque complete in place, will be made at the contract unit price for that type, kind, and size. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

Method 2 For items of work for which specific lump sum prices are established in the contract, payment for identification markers or plaques will be made at the contract lump sum price. Such payment will constitute full compensation for all labor, equipment, tools, and all other items necessary and incidental to the completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 6 of this specification.

CONTRACTOR QUALITY CONTROL

1. APPLICABILITY

Construction Specification 94 is applicable to contracts that require the Contractor to provide quality control (QC), material testing and verification of material quality prior to use.

2. MATERIAL SPECIFICATIONS

There are no material specifications complementary to Construction Specification 94. Any material requirements are to be specified in Section 10 (see 3.b. below).

3. ITEMS TO BE INCLUDED IN THE CONTRACT SPECIFICATION AND DRAWINGS

- a. Develop specific requirements for the quality control testing that the Contractor is to provide. Establish, as appropriate for the method selected, the types of material the Contractor will be required to test, types of representative tests required, frequency of tests and other site specific related details.
- b. Provide details on the required intensity of Contractor's quality control inspection efforts with emphasis on the site specific aspects of the work, equipment and materials to be used. Specify, as appropriate for the method selected, the documentation required for: verification of foundations and cutoff trench excavations, subgrade for fills, placement of reinforcement and forming prior to ordering concrete, equipment operational tests and available equipment backups, safety measures specified, etc. Prescribe specific requirements regarding:
 - (1) Reliance on Contractor for initial or benchmark testing, production testing and testing to adjust to changes in materials or methods.
 - (2) Standards to be used as reference for quality control testing and field inspections of materials, methods and procedures.
 - (3) Special testing or inspection procedures that need to be included in the quality control system.
- c. Contract specific qualifications or requirements for professional registration or certification of QC personnel if necessary to meet federal, state or local statutes or job requirements.
- d. Specify the required approvals by the Contracting Officer, not covered in the basic specification for items such as: personnel qualifications, equipment condition, format of record keeping and documentation, etc.
- e. Describe the cooperation and communication aspects for the quality control and quality assurance (QA) activities.

4. DISCUSSION OF METHODS

a. Section 3, Quality Control System and Section 4, Quality Control Personnel

- (1) Method 1 is for use with the smaller or less complex work where the Contractor's staff is expected to understand and be qualified to perform routine quality control. The Contractor must develop an effective quality control system. The Contractor and Contracting Officer will meet and reach agreement on the system. Specify in Section 10 if the Contracting Officer will document by correspondence to the Contractor the understanding reached concerning the quality control system. When the project foreman can also function as the Contractor's quality control manager, so state in Section 10.
- (2) Method 2 is for use with large or complex work where the Contractor is required to have qualified quality control testing and inspection personnel on their staff or will subcontract for these services and provide NRCS with a written quality control plan and regularly submit quality control documentation.

Selection of either Method 1 or Method 2 in Sections 3 and 4 must be uniformly made within the specification for each contract.

b. Section 9, Payment

- (1) Method 1 is for use for larger more complex projects where uniformity in QC activities may not exist.
- (2) Method 2 is for smaller, simpler projects. The use of Method 2 is encouraged when fair and equitable treatment will occur.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete "All Methods The following provisions apply to all methods of payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

94. CONTRACTOR QUALITY CONTROL

1. SCOPE

The work consists of developing, implementing, and maintaining a quality control system to ensure that the specified quality is achieved for all materials and work performed.

2. EQUIPMENT AND MATERIALS

Equipment and materials used for quality control shall be of the quality and condition required to meet the test specifications cited in the contract. Testing equipment shall be properly adjusted and calibrated at the start of operations and the calibration maintained at the frequency specified. Records of equipment calibration tests shall be available to the Engineer at all times. Equipment shall be operated and maintained by qualified operators, as prescribed in the manufacturer's operating instructions, the references specified and as specified in Section 10 of this specification. All equipment and materials used in performing quality control testing shall be as prescribed by the test standards referenced in the contract or in Section 10.

All equipment and materials shall be handled and operated in a safe and proper manner and shall comply with all applicable regulations pertaining to their use, operation, handling, storage, and transportation.

3. QUALITY CONTROL SYSTEM

Method 1 The Contractor shall develop, implement and maintain a system of quality control to provide the specified material testing and verification of material quality before use. The system activities shall include procedures to verify adequacy of completed work, initiate corrective action to be taken and document the final results. The identification of the quality control personnel and their duties and authorities shall be submitted to the Contracting Officer in writing within 15 calendar days after notice of award.

Method 2 The Contractor shall develop, implement and maintain a system adequate to achieve the specified quality of all work performed, material incorporated and equipment furnished prior to use. The system established shall be documented in a written plan developed by the Contractor and approved by the Contracting Officer. The system activities shall include the material testing and inspection needed to verify the adequacy of completed work and procedures to be followed when corrective action is required. Daily records to substantiate the conduct of the system shall be maintained by the Contractor. The quality control plan shall cover all aspects of quality control and shall address, as a minimum, all specified testing and inspection requirements. The plan provided shall be consistent with the planned performance in the Contractor's approved construction schedule. The plan shall identify the Contractor's on-site quality control manager and provide an organizational listing of all quality control personnel and their specific duties. The

written plan shall be submitted to the Contracting Officer within 15 calendar days after notice of award. The Contractor shall not proceed with any construction activity which requires inspection until the written plan is approved by the Contracting Officer.

All Methods The quality control system shall include, but not be limited to, a rigorous examination of construction materials, processes and operation, including testing of materials and examination of manufacturer's certifications as required, to verify that work meets contract requirements and is performed in a competent manner.

4. QUALITY CONTROL PERSONNEL

Method 1 Quality control activities shall be accomplished by competent personnel. A competent person is: one who is experienced and capable of identifying, evaluating, and documenting that materials and processes being used will result in work that complies with the contract; and, who has authority to take prompt action to remove, replace, or correct such work or products not in compliance. Off-site testing laboratories shall be certified or inspected by a nationally recognized entity. The Contractor shall submit to the Contracting Officer, for approval, the names, qualifications, authorities, certifications, and availability of the competent personnel who will perform the quality control activities.

Method 2 Quality control activities shall be accomplished by competent personnel who are separate and apart from line supervision and who report directly to management. A competent person is: one who is experienced and capable of identifying, evaluating, and documenting that materials and processes being used will result in work that complies with the contract; and, who has authorization to take prompt action to remove, replace, or correct such work or products not in compliance. Off-site testing laboratories shall be certified or inspected by a nationally recognized entity. The Contractor shall submit to the Contracting Officer, for approval, the names, qualifications, authorities, certifications, and availability of the competent personnel who will perform the quality control activities.

5. POST-AWARD CONFERENCE

The Contractor shall meet with the Contracting Officer prior to the beginning of any work and discuss the Contractor's quality control system. The Contracting Officer and the Contractor shall develop a mutual understanding regarding the quality control system.

6. RECORDS

The Contractor's quality control records shall document both acceptable and deficient features of the work and corrective actions taken. All records shall be on forms approved by the Contracting Officer; legible; and dated and signed by the competent person creating the record.

Unless otherwise specified in Section 10 of this specification, records shall include:

- a. Documentation of shop drawings including date submitted to and date approved by the Contracting Officer, results of examinations, any need for changes or modifications, manufacturer's recommendations and certifications, if any, and signature of the authorized examiner.
- b. Documentation of material delivered including quantity, storage location, and results of quality control examinations and tests.
- c. Type, number, date, time, and name of individual performing of quality control activities.
- d. The material or item inspected and tested, the location and extent of such material or item, and a description of conditions observed and test results obtained during the quality control activity.
- e. The determination that the material or item met the contract provisions and documentation that the Engineer was notified.
- f. For deficient work the nature of the defects, specifications not met, etc., corrective action taken and results of quality control activities on the corrected material or item.

7. REPORTING RESULTS

The results of Contractor quality control inspections and tests shall be communicated to the Engineer immediately upon completion of the inspection or test. Unless otherwise specified in Section 10, the original plus one copy of all records, inspections, tests performed and material testing reports shall be submitted to the Engineer within one working day of completion. The original plus one copy of documentation of materials delivered shall be submitted to the Engineer before the material is used.

8. ACCESS

The Contracting Officer and the Engineer shall be given free access to all testing equipment, facilities, sites, and related records for the duration of the contract.

9. PAYMENT

Method 1 For items of work for which lump sum prices are established in the contract, payment will be made as the work proceeds, after presentation by the Contractor of invoices showing related costs and evidence of charges by suppliers, subcontractors, and others for furnishing supplies and work performed. If the total of such payments is less than the lump sum contract price for this item, the remaining balance will be included in the final contract payment. Payment of the lump sum contract price will constitute full compensation for completion of the work.

Payment is not made under this item for the purchase cost of materials and equipment having a residual value.

Method 2 For items of work for which lump sum prices are established in the contract, payment will be prorated and paid in equal amounts on each monthly estimate. The number of months used for prorating shall be the number estimated to complete the work. The final month's prorate amount will be made with the final payment. Payment as described above will constitute full compensation for completion of the work.

Payment will not be made under this item for the purchase cost of materials and equipment having a residual value.

All Methods The following provisions apply to all methods of payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 10.

GEOTEXTILE

1. APPLICABILITY

This specification is applicable for the installation of both woven and nonwoven geotextiles used for purposes of slope protection, subsurface drains and stabilization of soils.

2. MATERIAL SPECIFICATIONS

Material Specification [592](#) is complementary to Construction Specification 95.

3. ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS

- a. The purpose or use of the geotextile (i.e., slope protection) and the selection of Class I, II, III or IV, as appropriate, woven or nonwoven, (See Design Note 24).
- b. The range of apparent opening size (AOS) for woven geotextiles. Any increase or change from those parameters shown in Tables 1 and 2 that are desired and based on specific design data.
- c. When specified, size and configuration of panels for payment (e.g., Method 2). Note: A panel represents pieces from a roll that have been seamed together to create the specified size and shape.
- d. Details of panel joining and splicing, i.e., seaming, overlap or folding (Method 1 or Method 2 in Section 5).
- e. The required roll width, when necessary.
- f. Details of panel placement, orientation and anchorage, when necessary. Perimeter and toe anchorage details, as necessary. When the use of pins is acceptable as temporary anchorage, so specify.
- g. Requirements of cushioning or bedding materials used to cover the geotextile to protect against damage during placement of surface material, such as rock riprap.
- h. Special installation requirements.
- i. Ultraviolet exposure requirements for conditions where the potential exposure is considered severe (use 500 hours). The 150 hours requirement listed in Tables 1 and 2 are recommended for normal exposure conditions.
- j. In Section 6 for measurement when Method 1 or 2 is selected, note the method of measurement being horizontal or slope measurement in determining surface area of the geotextile for payment purposes.

4. DISCUSSION OF METHODS

a. Section 5, Placement.

- (1) Method 1 is intended to be used when the primary use of the geotextile is to function as a filter and holes or "holidays" from anchoring pins might compromise the integrity of the installation.
- (2) Method 2 is intended to be used when the primary use of the geotextile is to function as a bedding and as a separator of materials. Seepage may be present but the potential for piping in the base soil materials is not a concern.

May also need to specify whether a., b., or c applies.

b. Section 6, Measurement and Payment.

- (1) Method 1 is intended for use when the geotextile is measured for payment based on the total surface area covered. The additional lap material needed for joining is not measured for payment.
- (2) Method 2 is intended for use when the geotextile is measured for payment based on the roll width and length used to cover the area. The measurement includes that amount needed for overlap and joining panels.
- (3) Method 3 is intended for use when the quantity will not be measured for payment and there is not likely to be any change in quantity.

When specifications are prepared using electronic procedures and all but one method are deleted for use in the contract specification, delete, "All Methods The following provisions apply to all methods of measurement and payment." and left justify the remaining text.

CONSTRUCTION SPECIFICATION

95. GEOTEXTILE

1. SCOPE

This work shall consist of furnishing all materials, equipment, and labor necessary for the installation of geotextiles.

2. QUALITY

Geotextiles shall conform to the requirements of Material Specification 592 and this specification.

3. STORAGE

Prior to use, the geotextile shall be stored in a clean dry location, out of direct sunlight, not subject to extremes of either hot or cold temperatures, and with the manufacturer's protective cover undisturbed. Receiving, storage, and handling at the job site shall be in accordance with the requirements listed in ASTM D 4873.

4. SURFACE PREPARATION

The surface on which the geotextile is to be placed shall be graded to the neat lines and grades as shown on the drawings. The surface shall be reasonably smooth and free of loose rock and clods, holes, depressions, projections, muddy conditions and standing or flowing water (unless otherwise specified in Section 7 of this specification).

5. PLACEMENT

Prior to placement of the geotextile, the soil surface will be reviewed for quality assurance of the design and construction. The geotextile shall be placed on the approved prepared surface at the locations and in accordance with the details shown on the drawings and specified in Section 7 of this specification. The geotextile shall be unrolled along the placement area and loosely laid, without stretching, in such a manner that it will conform to the surface irregularities when material or gabions are placed on or against it. The geotextile may be folded and overlapped to permit proper placement in designated area(s).

Method 1 The geotextile shall be joined by machine sewing using thread material meeting the chemical requirements for the geotextile fibers or yarn. The sewn overlap shall be six (6) inches and the sewing shall consist of two (2) parallel stitched rows at a spacing of approximately one (1) inch and shall not cross (except for any required re-stitching). The stitching shall be a lock-type stitch. Each row of stitching shall be located a minimum of two (2) inches from the geotextile edge. The seam type and sewing machine to be used shall produce a seam strength, in the specified geotextile, that provides a minimum of 90-percent of the tensile strength in the weakest principal direction of the geotextile being used, when tested in accordance with ASTM D 4884. The seams may be factory or field sewn.

The geotextile shall be temporarily secured during placement of overlying materials to prevent slippage, folding, wrinkling, or other displacement of the geotextile. Unless otherwise specified, methods of securing shall not cause punctures, tears or other openings to be formed in the geotextile.

Method 2 The geotextile shall be joined by overlapping a minimum of 18 inches (unless otherwise specified), and secured against the underlying foundation material. Securing pins, approved and provided by the geotextile manufacturer, shall be placed along the edge of the panel or roll material to adequately hold it in place during installation. Pins shall be steel or fiberglass formed as a “U”, “L”, or “T” shape or contain “ears” to prevent total penetration through the geotextile. Steel washers shall be provided on all but the “U” shaped pins. The upstream or up-slope geotextile shall overlap the abutting down-slope geotextile. At vertical laps, securing pins shall be inserted through the bottom layers along a line through approximately the mid-point of the overlap. At horizontal laps and across slope laps, securing shall be inserted through the bottom layer only. Securing pins shall be placed along a line approximately two (2) inches in from the edge of the placed geotextile at intervals not to exceed 12 feet unless otherwise specified. Additional pins shall be installed as necessary and where appropriate, to prevent any undue slippage or movement of the geotextile. The use of securing pins will be held to the minimum necessary. Pins are to remain in-place unless otherwise specified.

Should the geotextile be torn or punctured, or the overlaps or sewn joint disturbed, as evidenced by visible geotextile damage, subgrade pumping, intrusion, or grade distortion, the backfill around the damaged or displaced area shall be removed and restored to the original approved condition. The repair shall consist of a patch of the same type of geotextile being used and overlaying the existing geotextile. When the geotextile seams are required to be sewn, the overlay patch shall extend a minimum of one (1) foot beyond the edge of any damaged area and joined by sewing as required for the original geotextile except that the sewing shall be a minimum of six (6) inches from the edge of the damaged geotextile. Geotextile panels joined by overlap shall have the patch extend a minimum of two (2) feet from the edge of any damaged area.

Geotextile shall be placed in accordance with the following applicable specification according to the use indicated in Section 7:

- a. Slope Protection The geotextile shall not be placed until it can be anchored and protected with the specified covering within 48 hours or protected from exposure to ultraviolet light. In no case shall material be dropped on uncovered geotextile from a height greater than three (3) feet.
- b. Subsurface Drains The geotextile shall not be placed until drainfill or other material can be used to provide cover within the same working day. Drainfill material shall be placed in a manner that prevents damage to the geotextile. In no case shall material be dropped on uncovered geotextile from a height greater than five (5) feet.

- c. Road Stabilization The geotextile shall be unrolled in a direction parallel to the roadway centerline in a loose manner permitting conformation to the surface irregularities when the roadway fill material is placed on its surface. In no case shall material be dropped on uncovered geotextile from a height greater than five (5) feet. Unless otherwise specified, the minimum overlap of geotextile panels joined without sewing shall be 24 inches. The geotextile may be temporarily secured with pins recommended or provided by the manufacturer, but they shall be removed prior to placement of the permanent covering material.

6. MEASUREMENT AND PAYMENT

Method 1 For items of work for which specific unit prices are established in the contract, the quantity of geotextile for each type placed within the specified limits will be determined to the nearest specified unit by measurements of the covered surfaces only, disregarding that required for anchorage, seams, and overlaps. Payment will be made at the contract unit price. Such payment will constitute full compensation for the completion of the work.

Method 2 For items of work for which specific unit prices are established in the contract, the quantity of geotextile for each type placed with the specified limits will be determined to the nearest specified unit by computing the area of the actual roll size, or partial roll size installed. The computed area will include the amount required for overlap, seams, and anchorage as specified. Payment will be made at the contract unit price. Such payment will constitute full compensation for the completion of the work.

Method 3 For items of work for which specific lump sum prices are established in the contract, the quantity of geotextile will not be measured for payment. Payment for geotextiles will be made at the contract lump sum price and will constitute full compensation for the completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. Compensation for any item of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

FIELD OFFICE

1. **APPLICABILITY**

Construction Specification 96 is applicable when an on-site project field office with the basic facilities for material testing and construction office needs is to be furnished by the Contractor.

2. **MATERIAL SPECIFICATIONS**

There are no material specifications complementary to Construction Specification 96.

3. **ITEMS TO BE INCLUDED IN CONTRACT SPECIFICATIONS AND DRAWINGS**

- a. Type of field office; identify Type A, B, or C from Table I. If other equipment than that specified is required or is not necessary, supplement or amend Table I in Section 5 of this specification to provide appropriate requirements.
- b. Identify any exception, deletion, or special needs in the equipment, materials or furnishings, such as blinds, lighting, testing equipment (microwave oven, etc.), toilet facilities, typewriter (electric or manual), secure storage for nuclear equipment, computer (minimum features need to be identified), copy machine, FAX machine, telephone with answering equipment, etc. It should be determined if NRCS or Sponsors are to furnish any required items or if they should be included in the contract for the Contractor to provide.
- c. Include the responsibility for providing service during the construction period; such as delivery of bottled water, sanitary facility service, cleaning service, snow removal, maintenance of the field office equipment, electric service, etc. Include any requirements for inspections by utilities or government authorities, such as electrical safety inspection, fire department, etc.
- d. Show on the drawings the approximate location where facilities are to be placed. When known, show the location of the utility services (electricity, natural gas, telephone, water, sewer, etc.) available.

4. **DISCUSSION OF METHODS**

No Methods are outlined in the Specification.

CONSTRUCTION SPECIFICATION

96. FIELD OFFICE

1. SCOPE

This work shall consist of furnishing and maintaining a field office for the exclusive use of the Engineer and other employees of the owner.

2. LOGISTICS

The approximate location of the office shall be as shown on the drawings. Office space provided under this contract item shall be separated from any space used by the Contractor for other purposes.

The field office and appurtenances shall be set up, equipped, and made ready for use within twenty (20) days of the receipt of the written Notice to Proceed, unless otherwise specified in Section 5. The field office and appurtenances shall remain the property of, and shall be maintained in good condition and appearance by the Contractor until completion of the contract work.

When a mobile field office facility is furnished, it shall be leveled, blocked, and anchored in accordance with Standard A 225.1 of *Manufactured Home Installations, 1987 of the National Conference of States on Building Codes and Standards, Inc.* or the requirements of the local government that has jurisdiction.

The Contractor shall install, provide and maintain all utilities, except telephone service, as outlined in Section 5. Contractor shall provide access to the telephone company and authorization for the installation of telephone service for the use of NRCS and their agents. Utility service maintenance may include: heating fuel, electricity, water, sewer, etc. Contractor shall provide a sanitary facility (toilet) in accordance with the minimum OSHA Safety and Health Requirements for use by NRCS and their agents (See Table I footnote **).

The Contractor shall provide and maintain a reasonable access road to the field office location together with parking for a minimum of four (4) vehicles in the proximity of the field office site.

Upon completion and acceptance of the project work the Contractor shall remove the field office from the project site, and unless otherwise directed, shall restore all areas affected by the field office installation, including the entrance road and parking areas, to a condition equal to or better than existed prior to installation of the field office.

3. MATERIALS AND FURNISHINGS

The Contractor shall furnish all materials and furnishings as set forth below:

- a. The Contractor shall provide the type of field office as specified in Section 5 of this specification.

b. The field office shall include or possess as a minimum, the features shown below and as specified in Table I for the Office Type specified.

- (1) Be provided with all items in a clean, usable condition.
- (2) Be structurally sound, entirely enclosed, secure, and waterproof.
- (3) Have a ceiling height of not less than seven (7) feet.
- (4) Be attractively painted on the outside with a finished interior.
- (5) Be provided with two (2) exterior doors, except Type C Office shall have one door, that shall be equipped with dead-bolt type cylinder locks, including four (4) keys for each lock. Exterior lock and hasps, or equivalent, shall also be provided for each door.
- (6) Windows shall be equipped with screens and with provisions for opening and closing. Latches or other approved locking provisions to secure the windows shall be provided.
- (7) Window blinds shall be available and provided for all windows.
- (8) Be provided with adequate artificial lighting to provide an average of fifty (50) candlepower to all work areas within the office. Overhead lamps for each desk and drafting table shall be provided. Electric service shall be continuous for the period the field office is being utilized to service this contract. Electric lights and power service shall be supplied with at least four (4) grounded duplex convenience outlets installed in each room.
- (9) Be provided with an approved heating system capable of maintaining a temperature of at least 70° F throughout the office during the periods of cold weather that can be expected to occur during the construction period.
- (10) Be provided with an approved air conditioner(s) with a minimum capacity of 15,000 BTUs for each office room.
- (11) Be provided with an electric or gas hot water heater with a five (5) gallon minimum capacity.

c. The field office shall be furnished with the following listed minimum equipment in good condition and as specified in Table I.

- (1) Desk(s) shall have a minimum of two (2) drawers on each side and have minimum surface dimensions of 30 inches by 60 inches. A standard office chair with arm rests and casters shall be provided with each desk.

- (2) A slant-top adjustable height drafting table with the approximate dimensions 36-inches wide by 60-inches long and 36-inches height with an adjustable height drafting stool.
- (3) Work table with the approximate dimensions of 30-inches wide by 60-inches long and 30-inches high, a portable meeting table of approximate dimensions 36-inches wide by 72 inches long and 30-inches high, and a minimum of six folding or stacking office chairs.
- (4) Closets with a minimum clear height of seven (7) feet and approximately 24-inches by 30-inches equipped with two adjustable and removable shelves.
- (5) Bookcases or built-in shelving equivalent to five-4 feet long shelves, each ten (10) inches wide and twelve (12) inches in height, suitably located to reflect an office environment.
- (6) One (1) two-burner propane or natural gas stove or electric grill that can accommodate two 12-inch diameter pans. Heating capacity shall be adequate to remove soil moisture to meet the requirements of the ASTM quick dry method.
- (7) Underwriters Laboratory approved wall mounted Fire Extinguisher with a minimum rating of 10 ABC.
- (8) Minimum of one (1) 16-unit first aid kit, approved by or certified by the American Red Cross or equivalent.
- (9) Four (4) drawer locking fireproof metal file cabinet with two (2) keys provided.
- (10) Electrical refrigerated cold water drinking equipment supplied with potable drinking water and disposable cups for the duration of the contract.
- (11) Racks for hanging drawings, together with holders or clamps, to accommodate 24" by 36" maximum size sheets.
- (12) Each field office entrance will be provided with non-skid steps and landing platform with safety handrail.
- (13) One (1) electric typewriter.
- (14) One (1) inside and usable sanitary facility (flush type) located within a private room.
- (15) One (1) utility sink approximately 24-inches by 24-inches equipped with hot and cold running water.

- (16) One laboratory oven with two adjustable shelves, thermostatically controlled, minimum 800 watts with minimum inside dimensions of 12" by 10" by 10", capable of maintaining a constant temperature in the range of 100° C to 110° C, suitable for drying samples in accordance with ASTM Testing Procedures. The oven shall operate on 120 volt, AC current.
 - (17) One microwave oven with specifications as listed in footnote (****) to Table I
- d. Prior to mobilizing and setting up the field office, the Contractor shall prepare and submit detailed plans of the office to the Engineer.
 - e. The Contractor shall provide access to the Engineer for visual verification that the office and equipment meet contract requirements prior to mobilizing the field office to the work site.

4. PAYMENT

This item will not be measured but will be paid at the contract lump sum price established for this bid item in the contract, including mobilization and demobilization.

The following progress payment schedule will apply unless other provisions are outlined in Section 5 of this specification: Basis of payment will be forty (40) percent of the lump sum price bid will be payable for the first monthly progress payment following satisfactory delivery and set-up complete with full service installed. Twenty (20) percent will be retained to cover the removal of service and demobilization following completion of the work and will be included in the final payment. The forty (40) percent remaining will be prorated over the balance of the contract in accordance with the planned construction schedule. Payment as described herein will be full compensation for all labor, materials, supplies, equipment, rental fees, utility charges (excluding telephone service charges), and incidentals required to provide, equip, maintain, insure, and clean-up the site following demobilization of the field office unit.

TABLE I

Equipment	Field Office Type		
	Type A	Type B	Type C
Floor space (sq. ft.)	480 (2 rooms)	360 (2 rooms)	120 (1)
Window Space (sq. ft.)	66	50	30
Air Conditioning	Yes	Yes	Yes
Desk and Chair	3	2	1
Rack for Drawings	1	1	-
Work Tables	2	1	1
Meeting Table	1	1	-
Drafting Table and Stool	2	1	-
4-drawer file (D label) metal file cabinet	2	1	-
Folding/Office Chairs	10	8	4
Electric water cooler	1	1	1
Inside sanitary facility	1* *	1* *	1* *
Oven, electric	1	1	-
Oven, Microwave	1* * * *	1* * * *	-
Cupboards, closets, etc.	*	*	*
2-burner stove	1	1	-
Fire Extinguisher	1	1	1
First Aid Kit (16 unit)	1	1	1
Utility Sink	1	1	-
Window Blinds	Yes	Yes	No
Electrical Service	Yes	Yes	* * *
Desk and Table Lamps	Yes	Yes	No

Footnotes:

- * Reasonable number for the size of the office.
- * * Exterior self-contained sanitary facilities within 100 feet of the office with maintenance service is an option.
- * * * A generator to provide electric service for heating, lighting, and calculators is sufficient. Contractor is responsible for maintenance, fuel supplies, and service.
- * * * * A variable power microwave oven with minimum inside dimensions of 12" X 10" X 10". The maximum power setting on the microwave oven shall operate at approximately 650 watts. The microwave oven shall have at least one power setting that operates at between 300 and 400 watts.

INSTRUCTIONS FOR USE OF CONSTRUCTION SPECIFICATION 97

HDPE AND LLDPE LINER

1. APPLICABILITY

Construction Specification 97 is applicable to the placement of HDPE and LLDPE geosynthetic liners in liquid containment systems to control seepage.

2. MATERIAL SPECIFICATIONS

Material Specification [594, HDPE and LLDPE Flexible Membrane Liner](#), complements Construction Specification 97.

3. INCLUDED ITEMS

Items to be included in the contract drawings and specifications follow:

- a. The type of liner material being used either HDPE or LLDPE and the required thickness.
- b. Details of panel placement, orientation, and anchorage.
- c. Requirements of any cushioning material to be used and the material references for the same.
- d. Requirements for subgrade compaction.
- e. Requirements for under drains and the associated materials.
- f. Details for gas vents and their locations.
- g. Details for any loading, unloading, or cleanout ramps; including batten strips or other means of fastening.
- h. Details for pipe outlets and boots or appurtenances to fit the liner to the outlet.
- i. Details for fences, ladders, or other safety features.
- j. Any special instructions related to the materials or the installation.

CONSTRUCTION SPECIFICATION

97. HDPE AND LLDPE LINER

1. SCOPE

The work shall consist of furnishing and installing an HDPE or LLDPE liner and the necessary mechanical attachments as shown in the drawings or as specified herein.

2. MATERIAL

The liner, welding rod, gaskets, metal battens, clamps, embed channel, and sealant shall conform to the requirements of Material Specification 594, the applicable provisions in this specification, and those shown on the drawings. Subgrade soils and their surface conditions shall conform to the requirements in this specification and as shown in the drawings.

Cover soils, if applicable, shall conform to this specification and as shown on the drawings.

3. SHIPPING AND STORAGE

Liner rolls shall be shipped to the job site in a manner not to damage the rolls. The rolls shall be stored and protected from puncture, dirt, grease, excessive heat, or other damage. They shall be stored on a prepared smooth surface (not wooden pallets) and shall be stacked no more than two rolls high.

4. SUBGRADE PREPARATION

Subgrade soil shall be compacted to provide a firm, unyielding foundation for the liner. All surfaces shall be smooth, free of foreign and organic material, rocks larger than 3/8 inch, any angular rocks, and any sharp objects. Standing water or excessive moisture shall not be allowed.

5. ANCHOR TRENCH

The anchor trench shall provide permanent anchoring for the liner and shall be in accordance with the drawings. The trench shall be excavated according to a daily schedule for liner installation. It shall be backfilled incrementally as needed. Backfill soil shall be compacted by rolling with rubber-tired equipment or a manually directed power tamper to provide a stable anchor trench for the liner.

6. LINER PLACEMENT

Liner rolls shall be deployed using a spreader bar assembly attached to a front-end loader bucket or by other methods approved by the liner manufacturer. The liner shall be placed in the general direction of maximum slope. All of the placed liner shall be adequately ballasted by sandbags to protect it from wind uplift forces. The liner shall be placed on a daily basis and seamed and secured by the end of the workday. No construction equipment shall be allowed directly on the liner except for light ATVs and generators to power the seaming machines.

The liner shall not be placed during fog, precipitation, in the presence of excessive winds, or in temperatures less than 50 degrees Fahrenheit. The liner shall be loosely laid over the foundation with sufficient slack (about 2 percent) to accommodate thermal expansion and contraction encountered during construction. Each panel shall be laid out and positioned to minimize the number and length of the geomembrane field joints and to be consistent with accepted installation practice. The methods used to place panels shall minimize wrinkles especially along field seams. When necessary, a geosynthetic rub sheet will be used under the membrane to prevent damage when dragging or moving the panels.

7. SEAMING

The primary method of seaming shall be hot shoe fusion welding. Fillet extrusion welding shall be used for repairs, T-seams, and detail work. Before fusion welding or extrusion welding, all areas that are to become seam interfaces shall be cleaned of dust and dirt. Seam joining shall not take place unless the sheet is dry and shall not be attempted when the ambient sheet temperature is below 45 degrees Fahrenheit or above 90 degrees Fahrenheit.

Hot shoe welding—Hot shoe welding shall be accomplished by a double-wedge fusion welder that produces a double track weld. All accessories shall be approved by the liner manufacturer. To produce acceptable seams for the site-specific condition, the welder shall be calibrated at the beginning of each seaming period. Seaming procedures shall be in accordance with liner manufacturer specifications.

Fillet extrusion welding—Extrusion welding equipment and accessories shall be approved by liner manufacturer. To produce acceptable seams for the site-specific condition, the extrusion welder shall be calibrated once per day at the beginning of each seaming period. Seaming procedures shall be in accordance with liner manufacturer specifications.

Seam overlap—Liner panels shall have a minimum overlap of 4 inches for hot shoe welding and 3 inches for extrusion welding. Upslope panels shall overlap downslope to provide a shingle effect for drainage.

Seaming equipment and accessories:

- Hot shoe welder, 110 or 220 volts
- Extrusion welder, 220 volts
- Grinder, 10,000 rpm, 4.5-inch side grinder with 80-grit discs
- Generator, 6.5 kW, 110/220 volt output
- Power cord, OSHA approved cords and twist-type plugs and connections
- Vacuum box test equipment, approved by the liner manufacturer

- Air pressure test equipment, approved by the liner manufacturer
- Tensiometer, capable of performing quantitative shear and peel tests

8. SEAM TESTING

Seams shall be tested under field conditions at the beginning of each seaming period and once in the morning and once in the afternoon. Three specimens shall be tested by a tensiometer in shear and peel modes. Test seams shall meet the requirements of Material Specification 594. Each specimen shall be 1 inch wide with the grip separation rate of 2 inches per minute. All peel tests shall result in film tear bond (FTB) value. The FTB is defined as a failure of one of the bonded sheets before complete separation in the bonded area.

Nondestructive seam testing—Air pressure tests shall be performed on all double-wedge fusion seams. The air pressure test equipment and procedures shall conform to this specification and the liner manufacturer's specifications. Seal both ends of the seam to be tested. Insert the pressure needle into the seam's air channel. Pressurize the air channel through the needle to 25 to 30 pounds per square inch.

Monitor any pressure drops for 5 minutes. A loss of pressure in excess of 4 pounds per square inch or a continuous loss of pressure is an indication of a leak. Terminate the test by relieving the pressure from the opposing end of the seam. The pressure shall immediately drop to zero upon opening the opposing end of the seam. If this does not occur, the seam channel shall be checked for obstructions and retested. All defects shall be marked for repair.

Vacuum box tests shall be performed on all extrusion welds. The vacuum box equipment and test procedure shall conform to this specification and the liner manufacturer's specifications. Apply soapy water solution to the seam area to be tested. The vacuum box, equipped with a transparent viewing window, shall be centered over the seam area and a vacuum of 3 pounds per square inch shall be drawn. The seam area shall be visually monitored for any soap bubbles for 15 seconds. Seam testing shall continue by overlapping a minimum of 3 inches between each test interval. All defects shall be marked for repair.

Destructive seam testing—If required, seam samples shall be cut at no more than one sample per 500 feet of weld for destructive seam testing. All destructive seam samples shall be tested by a tensiometer in shear and peel modes to verify seams meet the requirements of Material Specification 594.

9. REPAIRS

All defective liner areas and bad seams shall be repaired and tested before the installation is completed.

Tears, punctures, material defects—All tears, punctures, and material defects in liner shall be repaired by installing a patch over the defective area. Surfaces of the liner to

be patched shall be cleaned before the repair. To ensure proper bonding of the extrusion weld, edges of the patch material and the adjacent liner shall be properly abraded by a light grinding. This operation shall be done no more than 15 minutes before the welding operation. The abrasion shall remove no more than 10 percent of the material thickness. All patches shall be of the same liner material and extend a minimum of 6 inches beyond the edges of the defect area. All patches shall have rounded corners and shall be extrusion welded to the liner. Alternatively, a bead of extrudate shall be placed over all holes that are less than 0.25 inch in diameter.

Seam repair—All failed seams shall be repaired by installing a cap strip over the entire length of failed seam. The cap strip shall be of the same liner material and shall extend the failed seam a minimum of 6 inches in all directions. Alternatively, the seam along the upper flap can be extrusion welded to the liner along the entire length of the failed seam.

10. MECHANICAL ATTACHMENTS

The liner shall be mechanically attached to pipe, concrete, or steel structure as shown in the drawings and according to the liner manufacturer's specification.

Pipe boots—Pipe boots shall be fabricated in the field from the same liner as that shown in the drawings. The boots shall be welded and clamped to polyethylene pipe. They shall be clamped to nonpolyethylene pipe as shown in the drawing to provide a leak-free attachment.

Metal battens—Metal battens shall meet the requirements of Material Specification [594](#) and shall be installed according to the drawings and the liner manufacturer's specifications. The battens shall be bolted to structure concrete by epoxy coated bolts on 6-inch intervals to create a leak-free connection under submerged conditions. Bolt spacing shall be increased to 12 inches for connections above the fluid level.

Embed channel—HDPE embed channel shall meet Material Specification [594](#) and be installed according to drawings and the liner manufacturer's specification. The embed channel shall be prefabricated to the dimensions as shown in the drawings. All sections of the channel shall be welded to the next section continuously to prevent gaps between sections or pieces of the embed channel before their installation in the concrete forms. All corners shall be miter cut and welded all around.

11. GAS VENTS AND DRAINAGE

When specified, gas vent flaps or vent pipes shall be installed in accordance with the drawings to provide adequate venting for the liner system. Drainage systems will be installed as specified and as shown on the drawings.

12. PLACEMENT OF COVER SOIL (OPTIONAL)

Cover soil and its placement method shall be in accordance to the drawings and shall conform to this specification and liner manufacturer's specification. Cover soil material shall not consist of any angular rocks or sharp objects that could damage liner. Placement shall be by a loader or bulldozer. No construction equipment or machinery shall be allowed to drive directly on the liner. A minimum of 12 inches of cover soil is required under the tracks or tires of construction equipment, with ground pressures of less than 5 pounds per square inch, before operating on the liner. The depth of cover soil shall be proportionally higher for heavier equipment. Cover material shall be placed during the cool times of the day or at night to prevent liner folds.

13. PLACEMENT OF CONCRETE

Concrete placement for ramps and other appurtenances shall be in accordance to the drawings and specifications. All reinforcement steel shall be placed on flat-footed plastic rebar chairs. All rebar splices shall be fully tied to avoid loose ends. On slopes, concrete shall be placed from the bottom of the slope to the top and have a low slump to prevent sloughing down slope during placement. Only plastic shovels and internal vibrators shall be used to place concrete. Metal shovels and rodding are not allowed. Concrete forms shall be held in place by methods that avoid damaging the liner.

14. MEASUREMENT AND PAYMENT

For the work for which specific unit prices are established in the contract, the quantity of liner shall be determined to the nearest square foot by measuring the installed liner with a calibrated measuring wheel. The total pay quantity shall include the liner installed in the anchor trench, in areas with double liner, and rub sheets according to the drawings, but shall exclude scrap, waste, overlap, and compensations for expansion and contraction of liner. Such payment shall constitute full compensation for furnishing, shipping, and installing the liner, all pipe boots, mechanical attachments to structures, and other items necessary and incidental to the completion of the work. Payment for items listed separately in the bid schedule shall be made at the contract prices for those items.

GEOSYNTHETIC CLAY LINER

1. **APPLICABILITY**

Construction Specification 98 is applicable to the placement of geosynthetic clay liners in liquid containment systems to control seepage.

2. **MATERIAL SPECIFICATIONS**

Material Specification [595, Geosynthetic Clay Liner](#), complements this specification. Construction Specification [95, Geotextile](#), also complements this specification.

3. **INCLUDED ITEMS**

Items to be included in the contract drawings and specifications follow:

- a. Compaction requirements of the subgrade.
- b. Details of panel placement, orientation, and anchorage.
- c. Requirements of any cushioning material to be used and material references for the same.
- d. Requirements for under drains or interceptors and the associated material.
- e. Physical requirements, depth of placement, and source of the backfill material.
- f. Details for any loading, unloading, or cleanout ramps.
- g. Details for installation at the inlet pipe and at other appurtenances.
- h. Details for fences or other safety features.
- i. Any special instructions related to the materials or the installation.

CONSTRUCTION SPECIFICATION

98. GEOSYNTHETIC CLAY LINER

1. SCOPE

The work shall consist of furnishing and installing a geosynthetic clay liner (GCL) with the necessary appurtenances as shown on the drawings or as specified.

2. MATERIAL

The liner material shall comply with the requirements of Material Specification 595, the applicable provisions in this specification, and those shown on the drawings.

Cover soil shall conform to this specification and those requirements shown on the drawings.

3. SHIPPING AND STORAGE

The liner material shall be transported to the job site in a manner that does not damage the rolls. The rolls shall be handled at the site with equipment capable of safely doing the job with no damage to the material. An appropriately sized core bar in combination with a spreader bar and lifting chains is one alternative. Another alternative is a forklift with a stinger attachment.

At the job site, the rolls shall be stored on a flat dry surface. They shall be kept dry at all times. A covering is recommended to prevent unnecessary stress on the packaging.

4. SUBGRADE PREPARATION

When the GCL is placed, the subgrade shall be a dry, smooth surface that is free of debris, roots, ruts, and stones or any projection of more than 0.5 inch. All projections shall be removed, crushed, or pushed into the surface with a smooth-drum roller. The smooth-drum roller shall be used to remove all irregularities and any abrupt grade changes.

5. GCL INSTALLATION

The contractor shall confine the work to an area that can be completely installed and covered to prevent hydration by the end of the normal working day. Daily completion shall be defined as the full installation of the liner, covering around appurtenances, and placement of the specified cover soils.

The liner rolls may need to be placed with a spreader bar to prevent damage to the ends of the roll. The rolls shall be carefully rolled down the slope and not allowed to unroll freely and out of control. Liner panels may be pulled up from the bottom of the slope, but care must be taken to minimize dragging across the subgrade and damaging the GCL surface. A temporary geosynthetic subgrade covering known as a rub sheet may be used to reduce friction and protect the GCL during placement.

The rolls are placed with the nonwoven geotextile side up and the woven geotextile side against the subgrade. The GCL panels are placed so that the seams are parallel to the direction of the slope. This is also true in the corners. All seams parallel to the slope direction shall be overlapped a minimum of 6 inches. End-of-roll seams shall be located at least 3 feet from the toe or crest of the slope. Seams at the base of the slope shall be a minimum of 6 feet from the toe.

When a roll end seam or joint occurs on a slope, construction adhesive shall be used in the lap area, with the overlap increased to 2 feet and shingled in the direction of the slope. All seam areas or runs shall be augmented with granular bentonite, of the same quality of that encapsulated in the liner, to ensure seam integrity. Granular bentonite shall be dispersed evenly from the panel edge to the lap line at a minimum rate of 1 pound per 4 linear feet continuously along all seams or overlap area. Construction adhesives may be used on seams to keep panels in contact during backfill operations if necessary.

For any penetrations or structures the liner will contact, a small notch shall be cut or dug against the edge of the area. The liner shall be brought up to the appurtenance and trimmed to fit into the notch. The contractor shall then apply granular bentonite or compact a mixture of 1 part bentonite to 4 parts soil (by volume), blended dry, into the bottom half of the notch. The liner shall then be inserted into the notch, with the remaining area in the notch filled with the granular bentonite or the 1 to 4 mixture, and compacted.

The GCL shall be anchored at the top of the slope with a proper anchor trench as shown on the drawings. The GCL is placed in the anchor trench in such a manner that it covers the entire trench bottom, but does not extend up the rear trench wall.

Horizontal joints on the slopes shall be avoided if possible. The GCL shall not be placed in the rain, at times of impending precipitation, or in ponded water. Replace any GCL that has begun to hydrate before cover soil can be placed.

6. REPAIRS DURING INSTALLATION

All damaged or flawed material shall be repaired by completely exposing the affected area, removing all soil or other foreign objects, and placing a patch over the damage with a minimum overlap of 24 inches on all edges. Accessory bentonite shall be placed between the patch and the damaged area at the rate of 1 pound per 4 linear feet of edge, and spread to a 6-inch width. When the above procedures are to be implemented on a sloping surface, the edges of the patch shall be fastened to the repaired liner with construction adhesive in addition to the bentonite-enhanced seam.

7. PROTECTIVE SOIL COVER

A soil cover is placed for both protection of the liner and to provide a loading to develop the designed permeability characteristics of the liner system. The cover

shall be placed to the final depths and moisture content as specified in section 9 of this specification or as shown on the plans.

At all times during the soil cover operation, a minimum of 12 inches of soil material shall be kept between the liner and any equipment being used to spread soil cover. In frequently trafficked areas or roadways, a minimum cover thickness of 2 feet is required. The soil cover on all slopes shall be pushed up the slopes not down the slopes to prevent any downhill stress on the liner material. Avoid any sharp turns and quick starts or stops that could pinch or shift the liner.

8. MEASUREMENT AND PAYMENT

For work for which specific unit prices are established in this contract, the quantity of liner installed shall be determined to the nearest square foot by measurement in place using a calibrated measuring wheel or other method acceptable to both contract parties. The total pay quantity shall include the liner installed in the anchor trench and areas of double liner, but shall exclude scrap, waste, overlap, and compensations for expansion and contraction of the liner. Such payments shall constitute full compensation for furnishing, shipping, and installing the liner including all pipe boots or shirts, mechanical attachments to pipes and structures, and other items necessary and incidental to the completion of the work. Payment for items listed separately in the contract bid schedule shall be made at the contract price for those items.

CONSTRUCTION SPECIFICATION

204. SODDING

1. SCOPE

The work shall consist of preparing the area for sodding, furnishing and placing the sod, fertilizer and lime, stakes, watering and rolling on the designated areas.

2. MATERIALS

All sod shall conform to state and federal laws with respect to inspection and quality. Any inspection certificate required by law to this effect shall accompany each shipment. The sod shall consist of strips or blocks of adapted species as specified in section 7. The sod shall be freshly cut, moist, and have a uniform thickness and quality as specified in section 7.

The limestone, where required, shall be standard agricultural ground limestone or approved equivalent with a moisture content not in excess of 10 percent. The rate of application shall be as specified on the drawings or in section 7.

Fertilizer shall be a commercial grade fertilizer, unless otherwise specified. It shall meet the standard for grade and quality specified by state law. Where furnished from bulk storage, the contractor shall furnish a supplier's certification of analysis and weight. When required by the contract, a representative sample shall be furnished for chemical analysis. Rates and methods of application shall be as specified on the drawings or in section 7.

Stakes used to anchor the sod on slopes and in areas of concentrated flow can be wooden, plastic or metal. They must be long enough to be driven in to firm soil to anchor the sod, generally they shall be 6-8 inches long. Anchoring shall be as specified on the drawings or in section 7.

3. SITE PREPARATION

The entire surface to be sodded shall be uniformly smooth, free of stones, roots, clods and other debris, and conform to the alignments, grade and cross section indicated on the drawings.

At this stage, unless topsoiling or other surface modifying feature is specified, the contractor shall apply the fertilizer and/or lime as required, and mix them into the upper 3 inches of the soil surface. The soil will be re-smoothed, if necessary, and lightly rolled. Prior to laying the sod, the area to be sodded will be dampened if not already in a moist condition. The quantities, techniques and locations of site preparation shall be as specified on the drawings or in section 7.

4. PLACING THE SOD

The sod shall be carefully placed, rolled, and anchored as specified on the drawings or in section 7.

5. ESTABLISHING THE SOD

The contractor shall water the sod after placing, and for a period specified in section 7, to ensure establishment.

6. MEASUREMENT AND PAYMENT

For items of work for which specific unit prices are established in the contract, the total area of surface sodded will be measured to the nearest square yard. Such payment shall constitute full compensation for all materials, labor, equipment, and all other items necessary and incidental to completion of the work.

Compensation for any type of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary. Such items and the items to which they are made subsidiary are identified in Section 7 of this specification.

CONSTRUCTION SPECIFICATION

707. DIGGING, TRANSPORTING, PLANTING, AND ESTABLISHMENT OF TREES, SHRUBS AND VINES

1. SCOPE

- a. Description: This work shall consist of digging and preparing plant holes, and of furnishing, transporting, temporary storage, planting and establishment of trees, shrubs, vines and other materials.

It shall also include all incidental operations such as mulching, wrapping, care of living plants and replacement of unsatisfactory plants.

- b. Restrictions:

- (1) Working Conditions: Tree planting shall be performed only when water and soil conditions are favorable for such operations. Operations will be suspended or postponed whenever conditions are unfavorable for such work.
- (2) Equipment: Equipment of a type, size, capacity or condition unsuited for obtaining first class work and expedition of the job shall be restricted to areas designated by the Engineer.

2. MATERIALS

- a. Plants: Trees, Shrubs, Vines and Seedlings. Trees, shrubs, vines and seedlings shall conform to the standards adopted by the American Association of Nurserymen.

- (1) Quality of Plant Material:

- (a) Unless otherwise specified plants shall be high quality nursery grown representatives of their normal species and varieties. They shall have average or normal well developed branches, together with vigorous root systems. Plants shall be free from insects, diseases, sunscald, knots, stubs, or other objectionable disfigurements. Thin weak plants shall not be accepted. Plants must show appearance of normal health and vigor in strict accordance with these specifications.
- (b) Trees shall be free of branches (undetermined) no higher from the ground line than 1/2 the total height of the tree; shall have single leaders, be well branched, and with reasonably straight stems. This requirement shall cover all species unless otherwise specified in detailed specifications.
- (c) Plants shall be true to their name as specified.
- (d) Wherever the word "specimen" is used, it denotes trees that are symmetrical, exceptionally heavy and full branched. When more than one is required, all shall be uniform in size and shape.

(e) The southernmost limits for the source of plant materials shall be one sub-zone south of the site of the work. Plant Hardiness Zones shall be as designated in the current Miscellaneous Publication No. 814, Agricultural Research Service USDA.

(2) Measurement for Size: The size of trees and shrubs is shown on the landscape plans.

(a) Diameter or Caliper Trees up to 4 inch diameter size, shall be measured for diameter 6 inches above the ground line and 12 inches above the ground for larger tree sizes.

(b) Root System: The root system of all plants shall be sufficient to insure plant growth.

1. Bare Root Trees: All bare root trees shall have heavy fibrous root system that has been developed by proper cultural treatment, transplanting and root pruning. The spread of the root system shall be 12 times the trunk diameter (caliper) in inches, plus an additional 6 inches.

CALIPER (in.)	AVERAGE HEIGHT RANGE (ft.)	MINIMUM ROOT SPREAD (in.)
½	5 – 6	12
¾	6 – 8	15
1	8 – 10	18
1 ¼	8 – 10	21
1 ½	10 – 12	24
1 ¾	10 – 12	27
2	12 – 14	30
2 ½	12 – 14	36
3	14 – 16	42

2. Bare Root Shrubs: All bare root shrubs shall have a well branched fibrous root system, the minimum spread of which shall be as follows:

HEIGHT OF PLANT (in.)	MINIMUM SPREAD OF ROOTS (in.)
18 – 24	10
2 – 3	11
3 – 4	14
4 – 5	16
5 - 6	18
6 – 8	20

3. Container Grown Plants. Container grown plants shall be well rooted and established in the container in which they are growing. They shall be grown in the container for a sufficient length of time for the root system to hold the earth when taken from the container, but not long enough to become pot bound. The size of the containers shall be not less than 75 percent of the ball sizes for comparable balled and burlapped plant material. Containers shall be stable and not deteriorated to a degree that will cause breaking up of the root ball during the planting operations.
4. Balled and Burlapped Plants. Balled and burlapped plants shall be dug with a sufficient quantity of earth taken equally on all sides and bottoms of the plants to include the necessary roots to insure growth. The thickness of depth of the balls shall be sufficient to include the depth of the root according to species. The balls shall be prepared in a workmanlike manner and firmly bound.

With relation to the height and trunk diameter of the plants, the top diameter of the balls of earth must be equal or greater than those given in the schedule of minimum sizes in Table 1. It shall be understood that the ball sizes are the minimum that will be accepted for the corresponding height and trunk diameter of the plants. Where soil types, climatic conditions, or infrequent root pruning or transplanting in the nurseries have caused roots greater than 1/2 inch in thickness to extend beyond the above minimum ball diameter, the ball diameter

must be increased so that no roots greater than 1/2 inch in thickness, except tap roots, are cut.

TABLE 1

SHRUBS and SMALL TREES

TREE HEIGHT (ft.)	MINIMUM BALL DIAMETER (in.)
Up to 3	12
3 – 4	13
4 – 5	15
5 – 6	16
6 – 7	18
7 – 8	20
8 – 9	22
9 – 10	24
10 – 12	26
12 – 14	32
14 – 16	36

STANDARD SHADE TREES

TREE CALIPER (in.)	MINIMUM BALL DIAMETER(in.)
Up to 1 ½	18
1 ½ to 2	22
2 to 2 ½	24
2 ½ to 3	28
3 to 3 ½	32
3 ½ to 4	36
4 to 4 ½	40
4 ½ to 5	44
5 to 5 ½	48
5 ½ to 6	52

Ball depth shall be approximately 65% of ball diameter.

5. Collected Stock: When collected plants are specified, the spread of roots, bareroot, shall be 1/3 greater than the spread of roots, bareroot nursery grown. If collected material is moved as balled and burlapped, the minimum ball sizes shall be equal to those specified for the next larger size nursery grown stock, balled and burlapped.

(3) Inspection o Plant Material

- (a) Inspection of plant material will be made at the nursery by the Engineer, or his duly authorized representative, whenever such an examination is deemed needed and practical, and must be in the field (or in storage houses) of the nursery supplying the material. Collected stock will be inspected before digging or lifting.
- (b) Approval of material on such an examination shall not be construed as an acceptance of it. Final acceptance will not be made until the plant material is determined to be in a healthy, growing condition at end of establishment period.
- (c) All plant material, including collected stock, shall comply with the State and Federal laws with respect to inspection for plant diseases and insect infestation. An inspection certificate, required by law to this effect shall accompany each shipment and on arrival the certificate shall be filed with the engineer.

(4) Shipment:

- (a) Each species or variety shall be handled and packed in the manner approved for that plant, having regard for the soil and climatic conditions at the time and place of digging and of delivery, and to the time that will be consumed while in transit of delivery. All precautions that are customary in good trade practice shall be taken to insure the arrival of the plants in good condition.
- (b) Plants shall be packed or covered in such a manner as to insure adequate protection against damage while in transit. The roots of bare root plants shall be carefully protected with wet straw or other suitable material to insure the arrival of the plants at destination with roots in a moist condition.
- (c) When shipment is made by enclosed vehicle, the vehicle shall be adequately ventilated to prevent any "heating" in transit.
- (d) All stock furnished must be legibly tagged with the name or the corresponding key designation as indicated on the plans.

- (e) All material shall conform to size and grade according to the current American Standards for Nursery Stock ASA Z60.1 adopted by the American Association of Nurserymen.
- b. Topsoil: Topsoil shall be free from large roots, sticks, weeds, brush or stones larger than 1 inch in diameter or other litter and waste products. It shall be a loamy mixture having at least 90 percent passing the No. 10 sieve.
- c. Backfill Material: Unless otherwise specified backfill material will consist of a mixture of 3 cubic feet of topsoil and one cubic foot of sand. Fertilizer will not be used unless specified. All backfill material shall be in a loose, friable condition when mixed and at the time of planting. The method of mixing the components shall meet the approval of the Engineer.
- d. Fertilizer: Fertilizer (when required) shall be ready mixed material of an analysis specified on the plans or as directed by the Engineer. In cases where a single nutrient is requested, unless otherwise specified, the analysis will be optional, provided that it carries sufficient filler to insure adequate distribution of the nutrient.

The following information shall be shown on the fertilizer bag or package or on a tag attached thereto:

- (1) Name and address of manufacturer.
 - (2) Name, brand or trade mark.
 - (3) Number of net pounds.
 - (4) Chemical composition or analysis.
 - (5) Guarantee of analysis.
- e. Tree Wrapping Materials :
- (1) The wrapping materials shall be commercially available tree wrapping paper.
 - (2) Cord - Jute twine not less than two ply.
- f. Mulch Material: The mulch material for planting shall be approved by the Engineer. The mulching material shall be uniformly graded and have the ability to completely block sunlight from reaching the surface of the soil. The mulch material will consist of one or more of the following as specified in detailed specifications.
- (1) Processed hardwood tree bark
 - (2) Cottonseed hulls
 - (3) Crushed corn cobs
 - (4) Wood chips
 - (5) Nut shells
 - (6) Buckwheat hulls

- (7) Aggregates
- (8) Small grain straw

g. Materials for staking and guying trees:

(1) Post, stakes, and anchors.

- (a) Metal "tee posts" - length specified in bracing specifications.
- (b) Wooden stakes - 2 1/2" x 2 1/2" length specified in construction details standard drawing [IL-687-2 GUY METHOD-TREES UNDER 8'](#).
- (c) Anchors for guying shall be 36" long wooden 2" x 4"s or auger type anchors, as shown standard drawing [IL-688-3 GUY METHOD TREES OVER 8"](#).

(2) Wire - Malleable No. 12 or larger gauge galvanized annealed steel wire.

(3) Hose - New two-ply reinforced hose having an inside diameter of not less than 1/2 inch.

3. CONSTRUCTION

a. Planting Time: Regardless of calendar date, plants must be dormant at the time they arrive at the site of the work or storage site.

(1) Spring planting of balled and burlapped and container stock shall be performed from the time the soil can be worked until the plant, under field conditions, is not dormant except that: Evergreen planting shall be terminated on June 1 in northern Illinois and May 15 in central and southern Illinois unless otherwise specified in the detailed specifications.

(2) All bare root plant material shall be planted in the spring. It shall be planted only when the temperature exceeds 35 degrees F. Planting shall terminate on May 15 in northern Illinois on May 5 in central Illinois April 25 in southern Illinois.

(3) Fall planting of balled and burlapped stock. This work shall start when the plant (under field conditions) becomes dormant and shall stop when the ground cannot be satisfactorily worked except that evergreen planting shall be performed between September 1 and December 1 in central and southern Illinois unless otherwise specified in the detailed specifications.

(4) Plantings shall not be made in frozen ground, holes shall not be dug in frozen ground and frozen backfill material shall not be used.

b. Digging Plants: Plants shall not be dug until Contractor is ready to transport them or to have them transported from their original locations to the site of the work or

approved storage. The maximum time lapse between digging and being properly loaded for delivery to the site of the work or being placed in approved storage shall be 4 days for balled and burlapped plants and one day for bare root plants. They shall be dug with care avoiding injury to the plants or loss or damage of the roots, particular attention being given to fibrous roots. Immediately after digging, roots shall be protected against drying out and freezing. Bare root plants shall be dug only when air temperatures exceed 35 degrees F. Stock shall not be dug, balled and burlapped when the soil is frozen.

- c. Transportation. During transportation, the contractor or those transporting the plants for the Contractor shall exercise care to prevent injury and drying out of plants. Upon arrival at the temporary storage location or the work site, plants shall be inspected for proper shipping procedures. Should the roots be dried out, large branches broken, ball of earth broken, or loosened, or areas of bark torn, the Engineer may reject the injured tree. When a tree has been so rejected, the Contractor shall at once remove it from the storage: No plant shall remain in temporary storage over the summer or winter unless otherwise specified in the detailed specifications. Plants that are not to be planted immediately shall be protected in the following manner:
- (1) Bare Root Plants may remain on the site of the work only 24 hours prior to being planted or placed in storage. The roots of plants to be placed in storage shall first be puddled in a paste solution of topsoil and water. The plants shall then be protected and kept moist by "heeling-in" the roots or be separated and the roots heeled in a suitable moist soil. If plants are stored in a building, the roots shall be covered with a suitable moist mulch. Planting materials not planted by the end of the planting periods shall be removed from the site and not returned to the site for use.
 - (2) The earth balls of balled and burlapped planting stock shall be kept moist and their solidity carefully preserved. Plants may remain on the work site only 72 hours prior to being planted or placed in storage. To prevent drying out or freezing they shall be stored either in a cool moist storage building or placed in a compact group with a suitable mulch material placed around and between the balls so they are completely covered. The duration of storage and mulch material shall meet the approval of the Engineer.
 - (3) The roots and rooting material of container grown planting stock will be kept moist. To prevent freezing, they shall be stored either in a cool moist storage building or placed in a compact group with a suitable mulch material placed around and between the containers so they are completely covered. The duration of storage for balled and burlapped and container grown deciduous planting stock will terminate in the spring when the plants, under field conditions, break dormancy and in the fall when the ground cannot be satisfactorily worked.

The duration of spring storage for evergreen planting materials shall terminate on June 1 in northern Illinois and on May 15 in central and southern Illinois. Fall storage of evergreen planting material shall terminate on November 1 in Plant Suitability Zone 1 and on December 1 in Plant Suitability Zones II and III.

Planting materials not planted by the end of the storage periods shall be removed from the site and not returned to the site for use.

- e. Layout of Planting. The area to be planted will be finished to line and grade before planting operations are begun. The Contractor shall furnish and place all stakes for locating the planting sites. The stakes will be marked with the species code on the plans. The Contractor will place stakes and outline each area for mass or solid planting or plantings with less than 6' spacing. The spacing and locations of species shall be shown on the plans or as directed by Engineer.
- f. Site Preparation. Unless otherwise specified, the immediate planting areas for trees, shrubs and vines shall be treated prior to planting. An area extending a minimum of 2 feet in all directions from where any plant is to be planted and entire plant beds where the spacing of the plants are 6 feet or less shall be treated. Treatment shall be by either mechanical or chemical means. If a mechanical method is used, the area shall be cultivated to a depth of not less than 2 inches, with equipment approved by the Engineer, until the surface is smooth and free of debris, gullies, clods, stones, grass, weeds and any other living vegetation. If chemical control is used, the treated area does not have to be disturbed prior to planting when the surface is smooth and free of debris, gullies, clods and stones.
- g. Pruning. Pruning shall be the responsibility of the Contractor. It may be done at the nursery or at the planting site in such a manner as to preserve the natural growth habit of the tree, shrub, or vine. Pruning shall meet the approval of the Engineer. All pruning shall be done with sharp tools and in accordance with good horticultural practices.
 - (1) Deciduous Trees. Pruning shall consist of removing twigs and branches as dictated by the growth habit of the trees being pruned. Unless otherwise specified or otherwise directed by the Engineer, branches shall not be removed from a height exceeding 1/2 the total height of the tree, neither shall the leader or terminal buds of the leader be removed unless specified.
 - (2) Deciduous Shrubs. Unless otherwise specified, multi-stemmed shrubs shall be cut back to one-half the height that they attained in the nursery during the previous growing season. Single stemmed shrubs shall be pruned in the same manner as deciduous trees.
 - (3) Evergreens. Evergreens shall not be pruned except to remove broken branches and roots.

The ends of all broken roots and damaged roots shall be pruned before planting. All broken twigs, shrubs, limbs, stubs, and improper cuts from previous pruning shall be removed either before or within 2 days following planting.

- h. Excavation of Plant Holes: The sides of all plant holes shall be sloped to 1:1 or flatter and the bottoms shall be horizontal. On slopes, the depth of excavation shall be measured at the center of the hole. Unless specified in the detailed specifications, watering saucers will be constructed around all single plants where the spacing is 6 feet or more on centers. The saucers shall be a minimum of 4 feet in diameter and a minimum of 4 inches deep unless otherwise specified in detailed specifications. The saucers may be all or partially above or below the normal ground elevation. Material excavated from the plant hole shall be used as needed to construct the watering saucer and the remainder will be disposed of as indicated in the detailed specifications.
- (1) Excavation of holes for planting balled and burlapped or container grown trees, shrubs, or vines. The holes shall be dug at the locations indicated by the stakes or on the plans. They shall be excavated 2 feet greater in diameter than the earthen balls or containers. Unless otherwise specified in the detailed specifications excavate to a depth 1 to 2 inches greater than the depth of the ball or container, plus depth needed for construction of a watering saucer when required.
 - (2) Plant holes for bare rooted trees, shrubs, and vines shall be wide enough and deep enough to accommodate the spread out roots of the plants. The holes will be deep enough to allow the plant to be planted one inch deeper than it grew in the nursery, plus depth needed for construction of a watering saucer when required.
 - (3) When planting trees, shrubs, and vines all stones, debris, and all living herbaceous and wood material, within the area to be mulched shall be killed or removed.
- i. Planting Procedures. All plants shall be planted in the plumb position. Plants will be set at the same depth or up to one inch deeper than they grew in the nursery.

Prepared backfill material shall be placed around the balls of balled and burlapped plants, around the container or mass of soil and roots of container grown plants or around the roots of bare rooted plants being planted in excavated holes. See [standard drawing IL-689 PLANTING PROCEDURES FOR SHRUBS](#) for shrub planting detail and [standard drawing IL-687-2 GUY METHOD-TREES UNDER 8'](#) for tree planting detail or [standard drawing No. IL - 685-PLANTING PROCEDURES FOR BALLED AND BURLAPPED \(B&B\) or CONTAINER-GROWN TREES AND SHRUBS](#).

Tamp the backfill material during placement and thoroughly water after backfilling has been completed. This watering shall completely saturate planting. After the

ground settles, as a result of watering, the voids shall be filled to the proper level with prepared backfill material. Approved watering equipment shall be at the site for the work and in operating condition prior to starting the planting operation.

- (1) Balled and Burlapped Plants. Remove all cords, wires and burlap from the trunk of the plant during or at the end of the backfilling operation.
- (2) Container Grown Plants. Prior to placing the plant in the excavated hole, the container shall be removed with care so as to not disturb the soil in which the root system is growing. Care shall be taken during backfilling operations not to destroy the solidity of the mass of soil. Containers of material that will decompose within one growing season after planting need not be moved.
- (3) Bare Root Plants.
 - (a) When planting in excavated holes the roots shall be carefully spread in a natural position and prepared backfill material shall be worked in around the roots to eliminate air pockets.
 - (b) When planting in a slot made with a tree planting machine or a planting bar (a special planting spade manufactured for planting seedlings), the slot shall be of adequate depth to allow the roots to be fully extended vertically when the seedling is placed in the slot at the proper depth. Care shall be taken when planting to prevent the end of the roots from being turn upward. Pruning for large massive root systems into balance with top growth will help in ease of planting and possibly prevent "J" roots from occurring. After placing the seedling in the slot at the proper depth, the slot shall be completely closed to eliminate all air pockets. These plants shall not be watered unless otherwise specified.
- j. Mulch Cover. Within 5 days after planting, a mulch cover shall be placed around all plants, unless otherwise specified, to control the growth of competing vegetation. Unless otherwise specified an area extending a minimum of 2 feet from any plants spaced greater than 6 feet apart shall be mulched. Where plants are on less than 6 foot spacing the entire bed or areas, plus an area extending a minimum of 3 feet beyond the peripherals of the plants, shall be mulched unless otherwise specified.

Small grain straw shall be relatively free of any viable seed and shall be applied evenly at the rate of 3/4 pound per square foot unless otherwise specified.

All other mulching material shall be applied to a minimum depth of 6 inches. Depth of mulching material should not exceed 6 inches. The mulch shall not be covered with hold down material unless specified in detailed specifications.

- k. Wrapping. Within 10 days after planting, all deciduous trees shall be wrapped from the ground to the lowest major branch unless otherwise specified in detailed specifications.

Unless otherwise specified in the detailed specifications, the following method of wrapping shall be used. Bare root stock does not have to be wrapped.

The tree wrapping paper shall be wrapped tightly around the trunk from the bottom to the lowest major branch with a minimum of one inch overlap. At top and bottom and at 2 intermediate intervals not greater than 18 inches, the wrapping paper shall be secured with ties of stout cord that will stretch with the growth of the tree. Remove after one growing season from fast growing species.

- I. Bracing. Unless otherwise specified all trees over 4 feet in height shall be braced within 10 days after planting.

- (1) Trees 4 to 8 feet tall shall be braced by securing each tree to (2) metal "tee" posts or two (2) 2 1/2" x 2 1/2" wooden stakes. The wooden stakes shall be durable for a minimum for 12 months after being placed in the ground. See standard drawing [IL-687-2 GUY METHOD - TREES UNDER 8'](#).

Use stakes or posts with a minimum length of 6.5 feet if they are placed adjacent to the ball, container or bare rooted plant. Use stakes or post with a minimum length of 6 feet if they are placed a minimum of 6 inches outside the area excavated for planting.

Placement of stakes or posts:

Balled and burlapped - beyond the edge of the ball.

Container stock - beyond the edge of the container.

Bare root stock - 12 to 15 inches from the trunk of the tree.

Place one stake or post on the west side of the tree and one on the east side. Drive the stakes or posts into the ground leaving 4 feet to 4.5 feet above the ground. The anchor plate on the metal post shall be perpendicular to a line between the tree and the post.

Secure each tree firmly to each of the two posts or stakes with No. 12 or larger malleable wire. The wires shall be installed on a horizontal plane at a height approximately one half that of the tree. The portion of the wire in contact with the tree shall be enclosed in 1/2" two ply reinforced hose.

The area inside the loop around the tree shall not be less than 2 times the cross sectional area of the tree at the contact point. Provisions shall be made to tighten the wires if they become loose.

- (2) Trees over 8 ft. in height shall be braced by using 3 guy wires and 3 anchors per tree. See standard drawing [IL-688-3 GUY METHOD - TREES OVER 8'](#). The guy wires shall be placed around the tree immediately above branches located from one-half to two-thirds the height of the tree. No more than one

guy wire shall be placed above any branch if a higher branch exists. The portion of the guy wire that contacts the tree shall be enclosed in the 1/2" two ply reinforced hose. The inside area of the loop around the tree shall not be less than 2 times the cross sectional area of the tree at the point of contact.

The guy wire shall be securely fastened to an anchor post or stake, at or below the ground line, which is driven at least 30 inches into the ground at an angle that is perpendicular to the line of pull. Distance of anchors from the base of the tree shall not be less than two-thirds nor greater than the vertical distance from the base of the tree and the point where the guy wire contacts the tree.

One anchor shall be placed on the west side of the tree and the others placed so all guy wires are equidistant. Provision will be made to tighten the guy wires if they become loose.

4. ESTABLISHMENT

During the period of establishment, the Contractor shall be responsible for properly caring for plants to assure maximum possible survival and vigorous healthy plants. Such care will consist of, but not be limited to the following work:

- a. Watering
- b. Replenishing mulch
- c. Repairing stakes, guy wire, etc.
- d. Restoring saucers
- e. Weeding
- f. Seasonal spraying (insect/disease problems)
- g. Repairing tree wrapping and ties
- h. Fertilizing
- i. Application of herbicide

The period of establishment shall extend from the time the plants are planted through the month of September and shall not be less than ninety (90) calendar days.

5. GUARANTEE

Prior to the September following the planting operations, the Contractor shall contact the Engineer to inspect the planted areas. At the end of the establishment period in September, the Engineer will determine the number and species of missing, dead, diseased, or unhealthy plants and will inform the Contractor in writing which plants are rejected. All rejected plants shall be replaced, within the next appropriate planting period.

No additional guarantee will be required for replacement plants. The guarantee and establishment period will end on the date of this inspection and said inspection will

be considered final provided the Contractor has complied with the following requirements:

- a. Complete replacement of dead, missing, and defective plant material.
- b. Mulch and weed plant beds and plant saucers. Just prior to this inspection, treat these areas to an application of approved pre-emergence herbicide, if chemical site preparation was originally used.
- c. Assure stakes, guys, and required tree wrappings are in good condition.
- d. Complete remedial measures directed by the Engineer to ensure plant survival.
- e. Repair damage caused while making plant replacements.

6. SUPPLEMENTAL WATERING OF PLANTINGS

This work shall consist of supplemental watering of plantings. Supplemental watering of balled and burlapped, containerized planting stock and bare root planting stock planted in excavated holes shall be performed at least once every 30 days from the date of planting until the month of September, unless the Engineer determines that it is needed more or less often due to moisture provided by rainfall. Slot planted trees, shrubs, and vines shall not be watered. Sufficient water will be applied at each watering to thoroughly saturate the soil in an area extending a minimum of 12 inches beyond and below the sides and bottom of the hole excavated for planting.

7. MEASUREMENT AND PAYMENT

For items for which specific unit prices are established in the contract, each type and size of plant will be counted. Payment for each type and size of plant will be made at a contract unit price for that type and size of plant. Such payment will constitute full compensation for all labor, materials, equipment and other items necessary and incidental to the performance of the work including:

- a. Replacement of any plants required to fulfill the guarantee provision of this specification.
- b. Removal from the site and replacement of any planting stock not conforming to the specification.
- c. Care of plants during period of establishment.

The supplemental water shall be measured and paid for at the contract unit price per 1,000 gallons of water applied. Such payment shall constitute full compensation for all labor, equipment, materials, and all other items necessary and incidental to watering.

Compensation for any items of work described in the contract but not listed in the bid schedule will be included in the payment for the item of work to which it is made

subsidiary. Such items and the items to which they are subsidiary are identified in the detailed specifications.

CONSTRUCTION SPECIFICATION

750. USE OF DORMANT WOODY PLANTINGS FOR STREAMBANK STABILIZATION

1. SCOPE

Dormant woody planting, as referred to in Practice Standard [995-Vegetative Streambank Stabilization](#), is the use of live dormant stem cuttings of woody plant species of one-half inch to over three (3) inches in diameter for the purpose of vegetatively reproducing a selected tree or shrub species. This work shall consist of furnishing and installing the necessary vegetative materials, woody or grass species, as specified in Section 7 of this specification or related standard drawings.

2. PREPARATION AND HANDLING OF MATERIALS

The proper preparation and handling of selected materials is very important. The following guidelines will increase the chances of success:

- a. Always select healthy materials native or adaptable to the planting site.
- b. Make clean cuts and avoid split ends. Cutting tools to be used, including pruning shears, bow saws, chain saws, etc., should be based on the diameter of materials to be cut.
- c. Always plant materials with the butt end down. The butt end should be tapered to mark it for proper orientation as well as facilitate driving it into the soil if done so manually. The top end should be flat, especially on stakes and posts, to facilitate manual driving (see Figure 1).
- d. Trim lateral branches as shown in Figure 1 to leave the bark ridge and branch collar intact.
- e. The diameter and length of the plant materials varies with the type:

Dormant "cutting" - The diameter of cuttings shall be a minimum of one-half inch and a maximum of less than one (1) inch. Cuttings shall be at least 12 inches but less than 18 inches in length.

Dormant "stake" - "Stakes" will be one (1) to three (3) inches in diameter at the top and 30 inches to six (6) feet in length.

Dormant "Posts" - "Posts" will be greater than three (3) inches in diameter at the top end. Length will vary with the depth to saturated soil and the difference in feet between the channel bottom and low bank elevation. However, posts will be a minimum length equal to the difference in feet between the lowest point of channel scour and the low bank elevations or 7 feet, whichever is less.

All "stakes" and "posts" shall extend a minimum of two (2) feet below the maximum depth of the streambed scour.

- f. At least two (2) lateral buds and/or terminal bud scars will be above the ground on "cuttings". It is recommended that a terminal bud scar be located within 1 to 4 inches of the top. Cuttings put out the largest number and strongest shoots just below a terminal bud scar (annual growth scar).
- g. Planting materials must not be allowed to dry out. They will be kept moist and covered during transport to the planting site and during planting operations. Material will be kept submerged in water up to the time of planting. It is best to plant materials the same day they are cut and prepared. One exception to this is eastern cottonwood which has exhibited increased survival rates if soaked in water for 1 to 2 days prior to planting.

3. SITE EVALUATION

A number of considerations will be addressed during the planning and design phases of a streambank stabilization project. Some of these considerations include:

- a. Streambank Characteristics - What is the stream channel bottom to low bank height difference for determining minimum "post" length, the existing bank slope or planned bankslope to determine the row placement requirements, and the existing vegetation in relation to its incorporation into the final project design?
- b. Soil Types - What soil type(s) are present and what plant species will grow well on the site, especially in relation to tree, shrub and grass/legume species planted in the riparian zone? How stable are the soil types present on the project site(s)?
- c. Stream Channel Characteristics - The important consideration here is the stability of the channel bottom. This method of stabilization will be limited to those streams with a stable channel bottom characterized by the lack of channel scour and overfalls and having a typical "meandering" channel.

See "Streambank Stabilization Site Evaluation Worksheet" at the end of this specification for additional information.

- d. Equipment, Time and Costs - Based on the above items, what kind of equipment will be needed to prepare the site and install the planting materials? How many man-hours will be required to complete the project? How much will it cost, including equipment, materials and labor?

4. SPECIES TO PLANT

For dormant planting materials, select native or naturalized species that are known to root readily with or without the use of rooting hormones. Rooting hormones, if used, shall be applied according to manufacturers' recommendations. Eastern cottonwood (*Populus deltoides*) and Black willow (*Salix nigra*) are native species which root readily without hormonal treatments.

Woody species with short, dense, flexible top growth and large, deep, fibrous root systems are recommended. Other desirable characteristics include rapid initial growth, ability to reproduce by seed or vegetatively, and resistance to insects and diseases.

Species suitable for use as planting materials or bare-root planting stock are listed in Table 1.

5. DESIGN AND LAYOUT

Spacing of dormant "stakes" and "posts" will be on 2'x 2', 2'x4', or 4'x4' staggered spacings. Dormant "cuttings" may be scattered between rows of "stakes" and "posts" in Plant Zone 1 and the lower one-half of Plant Zone 2 (see Figure 3 for a sample layout).

On eroding streambanks over 15 feet high, a minimum of 4 rows of dormant "stakes" or "posts" will be included in the design.

Planting row arrangement shall conform to those minimums listed in the standard and specification for this practice (see Figure 4).

6. INSTALLATION

Dormant planting materials must be properly installed to improve the chances of success. The following guidelines shall be followed:

- a. Be sure that the planting material is planted correctly. (Butt end in the ground.)
- b. Set the materials as deep as possible with at least the bottom 12 inches into a saturated soil layer. Deep planting insures an adequate moisture supply for root development, minimizes water loss due to transpiration and prevents root breakage caused by movement between the planting material and the soil during high velocity water flows.
- c. Avoid excessive damage to the bark of the planting material, especially stripping.
- d. Be sure there is good contact between the soil and planting material. "Dormant cuttings" will have the soil tamped around them. Dormant materials may be installed using an iron bar for "cuttings" and a post hole digger, powered auger or a metal ram on a backhoe or similar equipment for "stakes" and "posts". In soft, non-restricted soils, "stakes" or "posts" may be manually driven into place using a wooden maul. If a sledge is used, care must be taken to avoid splitting the planting material. Extreme care in driving the stakes or posts is needed and shall be limited to those soils where use of the other methods is not feasible, such as sandy soils. Post lengths will be extended 4" to 6" to allow for a new flat cut to eliminate any damaged materials after manual driving. At least 40 percent, and preferably 50 percent or more, of the planting material shall be below ground level after planting.

- e. Where damage by beaver may occur, treating materials with a repellent, such as ropel, or enclosing them with chicken wire is recommended.
- f. All "stakes" and "posts" located in the stream channel shall have a minimum of 12 inches extending above the normal water level.

All materials will be cut and installed while in a dormant stage. Therefore, the following periods will be used for practice installation: November 1 until ground becomes frozen or February 1 to April 1 provided ground is not frozen or buds have not broken dormancy.

7. SPECIAL SITE SPECIFICATIONS

Species selection shall consider the position of the plant in the bank profile (see Figure 2).

Zone 1 - Below normal waterline to upper limit of saturation area kept moist by capillary water movement. This zone includes the greatest potential for periodic inundation and the least moisture stress.

Zone 2 - Area from upper limit of Zone 1 to 2-3 feet from the top of the bank. This area may be subject to rapid drying and greater moisture stress.

Zone 3 - Area 2-3 feet below the top of the bank to a minimum of 30 feet into the floodplain (riparian area)

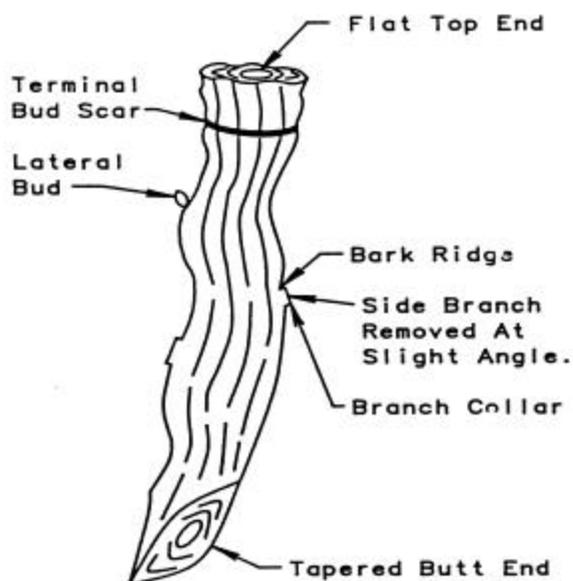
Table 1.
Recommended Woody Species for Streambank and Shoreline Protection

<u>Plant Zone</u>	<u>Common Name</u>	<u>Genus Species</u>	<u>Growth Form</u>
1	*Black Willow	Salix nigra	Tree
1	*Bankers Willow	Salix cottettii	Shrub
1	*Purple-osier Willow	Salix purpurea	Shrub
1	*Sandbar Willow	Salix interior	Tree
1	*Carolina Willow	Salix caroliniana	Tree
1	*Peach-leaved Willow	Salix amygdaloides	Tree
1	*Buttonbush	Cephalanthis occidentalis	Shrub
1,2,3	*Red-osier Dogwood	Cornus stolonifera	Shrub
2,3	*Silky Dogwood	Cornus amomum	Shrub
2,3	Flowering Dogwood	Cornus florida	Tree
2,3	Green Ash	Fraxinus pennsylvanica	Tree
2,3	*Sycamore	Platanus occidentalis	Tree
1,2,3	Baldcypress	Taxodium distichum	Tree
1,2	River Birch	Betula nigra	Tree
1,2,3	*Eastern Cottonwood	Populus deltoides	Tree
1,2,3	*Swamp Cottonwood	Populus heterophylla	Tree

* These species are suitable for use as dormant woody cuttings, stakes or posts. All species of willow and cottonwood do not require hormone treatment for rooting.

Any deciduous hardwood species listed in the corresponding Woodland Planting Group in the NRCS Field Office Technical Guide for the applicable soil type is suitable for planting as bareroot stock in zones 2 and 3.

Figure 1
Planting Material Preparation



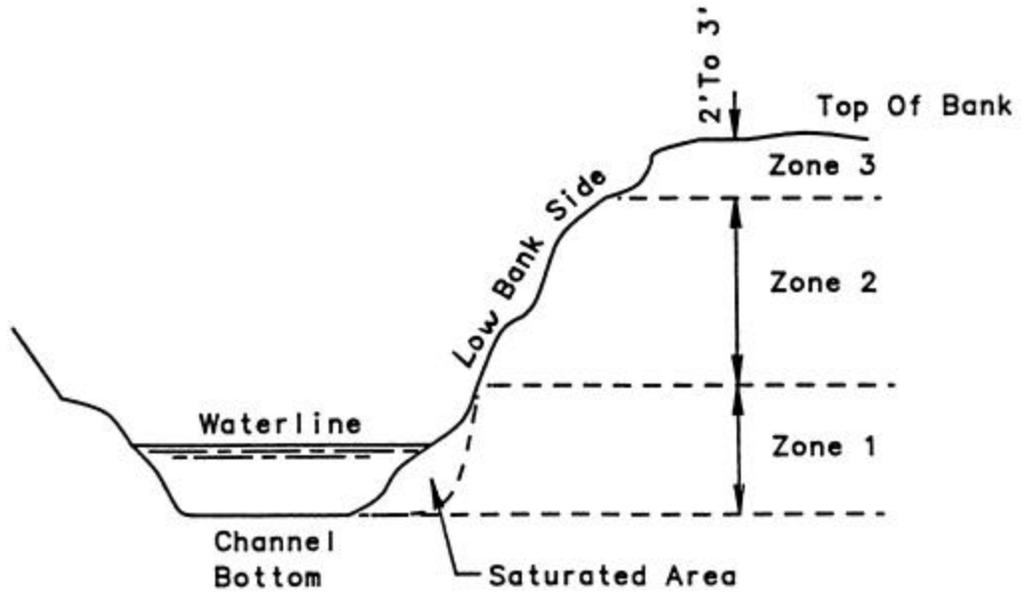


Figure 2
Plant Zones

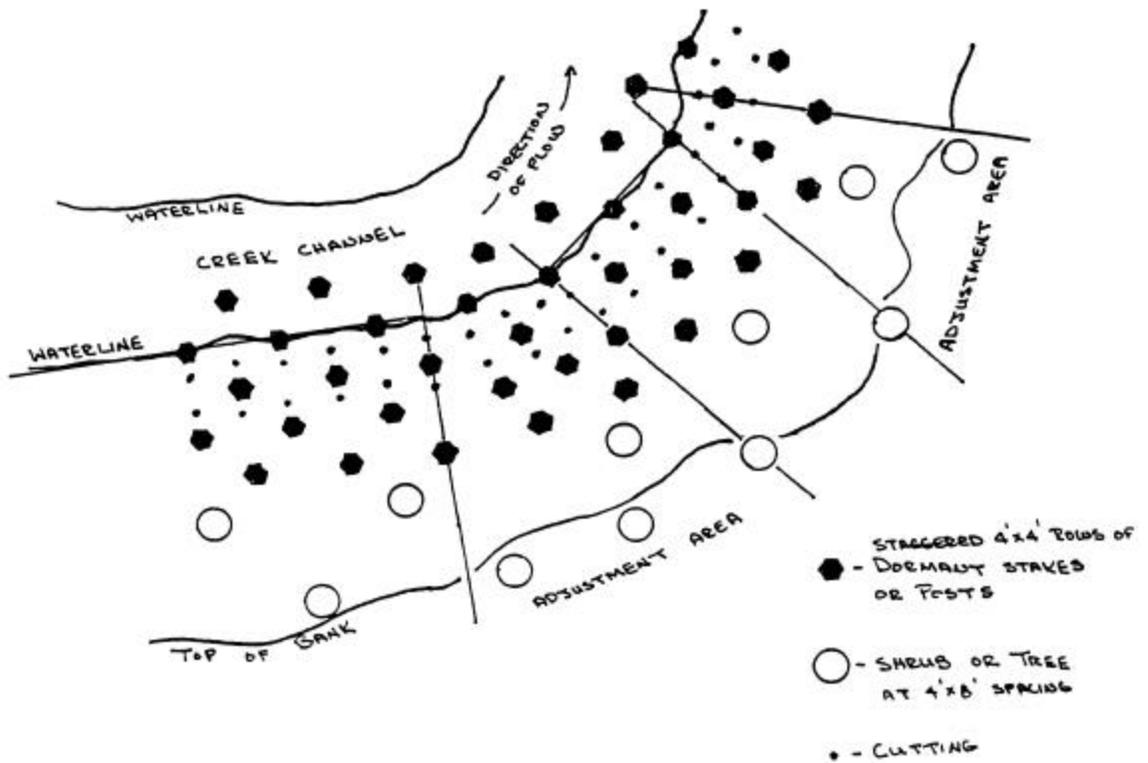


Figure 3
Sample Layout

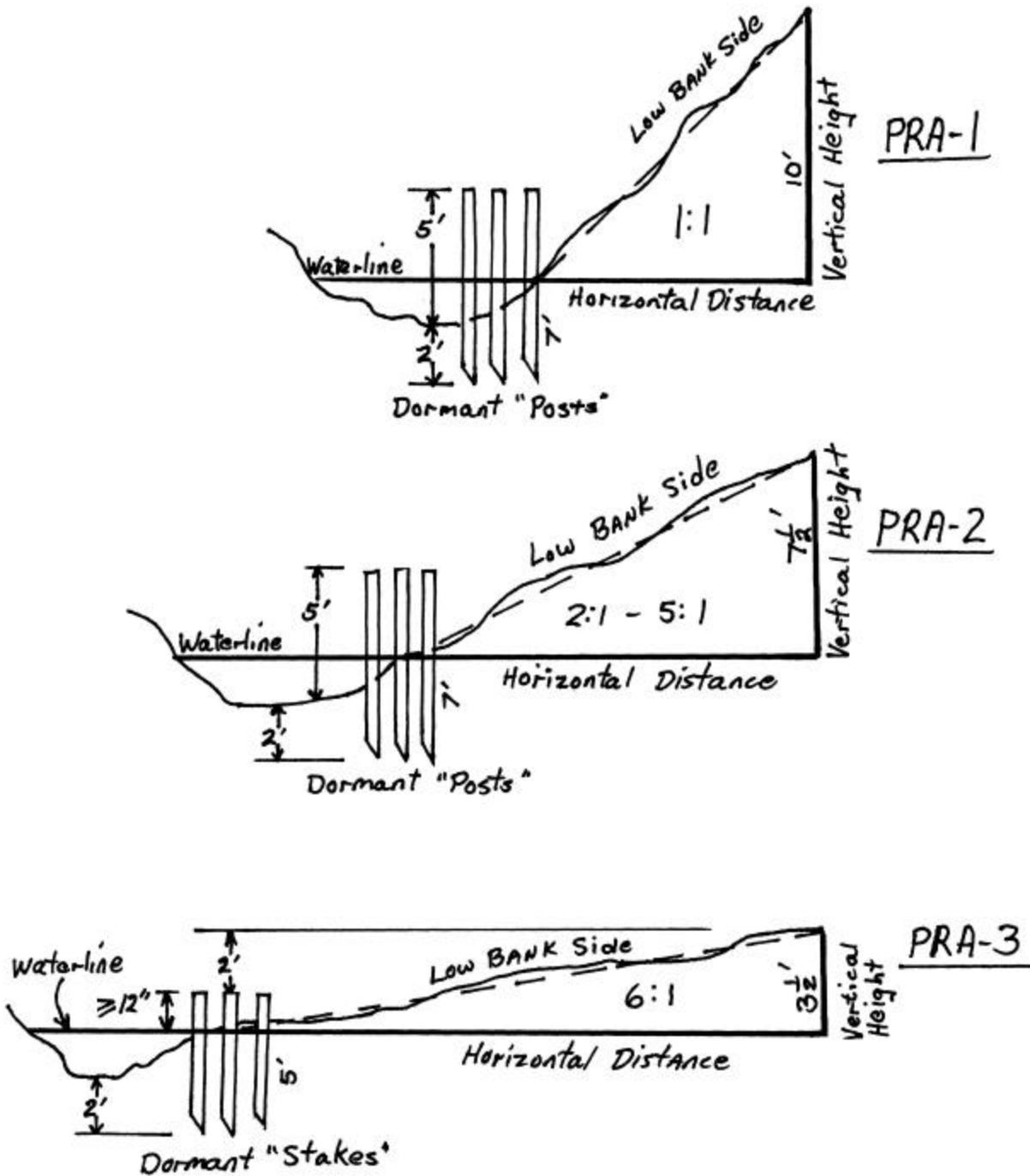


Figure 4
Minimum Planting Row Arrangements (PRA)

STREAMBANK STABILIZATION SITE EVALUATION WORKSHEET

1. Determine channel bottom to low bank height differences:

A = Elevation of low bank at lowest point on its profile = _____

B = Elevation of channel bottom at lowest point of channel scour = _____

C = Difference in elevation (A - B) = _____

2. Determine minimum length of "stake" or "post" required:

If difference (C) exceeds 5 feet – Use a minimum length of 7 feet.

If difference (C) is less than 5 feet – Use a minimum length equal to C.

3. Determine the ratio of horizontal distance to vertical height of the streambank (low bank side) for row arrangement to be used (see figure 4):

Example: Horizontal distance of streambank equals 12 feet vertical height of streambank equals 6 feet Horizontal distance to vertical height ratio equals 12:6 or 2:1

Horizontal Distance to Vertical Height Ratio	Minimum Planting Row Arrangement to Use
Steeper than 2:1	PRA-1
2:1 to 5:1	PRA-2
Flatter than 5:1	PRA-3

4. Will it be necessary to regrade the streambank to a different ratio? If yes:

A. To what ratio will the completed project be graded? ____:____

B. Based on "A" above, what PRA will be used? PRA-____

C. What equipment will be needed to complete the regrading? _____

5. Determine soil type(s) at the project site:

A. Predominant soil type(s) in the riparian zone for design purposes: _____

B. Other major soil types present: _____

C. Determine Woodland Planting Group(s) (WPG) to use from Section II-F of the Field Office Technical Guide.

<u>Predominant Soil Type(s)</u>	<u>WPG</u>	<u>Species to be Used</u>
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____

D. Are predominant soil type(s) considered stable if properly protected? _____
 If no, what alternative actions might be needed to assure stability? _____

6. Determine stream channel bottom stability:

- A. Does stream channel bottom have "overfalls" in or immediately below the project site? _____
- B. Does the stream channel bottom continuously fluctuate in elevation due to scour holes? _____
- C. Does the stream have segments of rushing water in an otherwise tranquil stream flow? _____

If any of the above can be answered "yes," careful evaluation by an experienced hydrologist may be needed before designing or installing this project.

7. Determine cost estimates: 1/

- A. Equipment: _____ hours x _____/hour \$ _____
 - B. Labor: _____ hours x _____/hour \$ _____
 - C. Materials: _____ \$ _____
- Total \$ _____

1/ Average cost of \$77/100' length for sloping 12' high bank to 1:1 slope. Cost per hole @ \$2.40/6' post and \$2.90/9' post. Average of 10 posts/person/hour labor costs for cutting and transporting posts.

CONSTRUCTION SPECIFICATION

751. USE OF GRASSES FOR STREAMBANK STABILIZATION

1. SCOPE

Where a good seedbed can be prepared and on smaller streams where flow velocities are less than 5 feet per second, it may be feasible to stabilize eroding streambanks by seeding grasses above or in combination with dormant woody plantings. This work shall consist of furnishing and installing the necessary materials as specified in Section 7 of this specification.

2. SEEDBED PREPARATION

The seedbed shall be roughened with a rake or similar tool and fertilized with 1000 lbs. per acre of 12-12-12- (23 lbs./1000 square feet) or bulk equivalent.

For projects where seeding will be done as construction progresses during seeding periods, apply any required fertilizer and seed within 24 hours after final shaping of the streambanks is completed.

3. SEED

Seed will be clean and relatively free of weed seed and other contaminants. Wet, moldy or otherwise damaged seed will not be acceptable. Seed, except warm season grasses, with less than 80% pure live seed will not be acceptable.

$$\% \text{ pure live seed (PLS)} = \frac{\% \text{ germination} \times \% \text{ purity}}{100}$$

Percent hard seed will be added to percent germination to determine total percent germination for warm season grasses and legumes.

All legumes not preinoculated will be inoculated with a pure culture of nitrogen-fixing bacteria, specifically formulated for the species, within 12 hours of seeding.

4. PLANT SELECTION AND ESTABLISHMENT

The grass or grass mixture to be seeded will be selected from Table 1 of this construction specification based on the soil/site conditions present at the planting site and the objectives of the project. A companion crop of spring oats, rye or wheat will be included in all permanent seeding mixtures per Table 1 seeding mixture rates.

A temporary seeding or mulching will be completed on those sites where a permanent seeding will not be established within 30 days following installation of a project. Temporary seeding will consist of a species or mixture of species as listed in Table 1 of this construction specification. Temporary mulching will be completed in conformance with guidelines provided in PRACTICE STANDARD [875-MULCHING](#) and any applicable construction or material specifications and standard drawings.

Seeding of the selected grass or grass mixture will be completed using one of the following methods:

- a. Conventional Method - Prepare a seedbed as instructed in the section "Seedbed Preparation" and uniformly apply the seed or seeding mixture at the required rate(s). Cover the seed with a rake or similar tool to a depth of 1/4 to 1/2 inch.
- b. Dormant Seeding - Prepare a seedbed as instructed in the section "Seedbed Preparation". Apply and anchor mulch in conformance with PRACTICE STANDARD 875 - MULCHING. Broadcast seed or hydroseed over the top of mulch during dormant seeding periods.
- c. Hydroseeding - Seed, fertilizer and lime may be applied together using no more than 125 pounds of solids per 100 gallons of water. If legume seed is hydroseeded, triple the recommended rate of inoculant. Hydrated lime will not be used in a slurry mix.

5. SEEDING PERIODS

All seedings will be completed within the seeding period shown on the plans for the appropriate seeding mixture and location in the state in which the project site is located.

6. MAINTENANCE

Sites will be protected from damage by vehicular and human traffic for a length of time necessary to get the vegetative cover well established but no less than one full growing season.

To improve the establishment of vegetative grass cover, topdress late summer seeding the spring following seeding and spring seeding in late August or early September with 2.5 pounds of actual nitrogen per 1000 square feet of surface area.

Weeds will be controlled by mowing where bank slopes make this feasible. Otherwise, weeds will be controlled by other mechanical means or through the use of environmentally safe and acceptable herbicides which are labeled for this purpose and site situation.

Damaged areas or those sites where additional cover is needed following the establishment period, will be reseeded during the next recommended seeding period as shown in Table 1.

TABLE 1

VEGETATIVE STREAMBANK STABILIZATION

Seeding Mixture	Rate (lb.) PLS/Acre	Rate (lb.) PLS/1000 Sq. Ft.	Suitable pH	Site Suitability			Plant Suitability Zone	Seeding Period		
				Droughty	Well Drained	Wet		Spring 1/	Summer	Dormant
1. Smooth Bromegrass and Alfalfa	24	0.55	6.0-7.5	X	X		I	Early spring-June 1	Aug 1-Sept 1	Nov 1-Mar 15
	8	0.2		II	Early spring-May 15	Aug 1-Sept 10	Nov 15-Mar 1			
				III	Early spring-May 15	Aug 1-Sept 20	Nov 15-Mar 1			
2. Tall Fescue or Redtop	12	0.3			X	X	I	Early spring-June 1	Aug 1-Sept. 1	Nov 1-Mar 15
	2.5	0.06	II	Early spring-May 15	Aug 1-Sept 10	Nov 15-Mar 1				
			III	Early spring-May 15	Aug 1-Sept 15	Nov 15-Mar 1				
3. Redtop and Ladino Clover	2.5	0.06		X	X	X	I	Early spring-June 1	Aug 1-Sept 1	Nov 1-Mar 15
	2.5	0.06	II	Early spring-May 15	Aug 1-Sept 10	Nov 15-Mar 1				
			III	Early spring-May 15	Aug 1-Sept 20	Nov 15-Mar 1				
4. Creeping Red Fescue	15	0.34		X	X	X	I	Early spring-June 1	Aug 1-Sept 1	Nov 1-Mar 15
			II	Early spring-May 15	Aug 1-Sept 10	Nov 15-Mar 1				
			III	Early spring-May 15	Aug 1-Sept 20	Nov 15-Mar 1				
5. Switchgrass	8	0.2	5.5-7.0	X	X	X	I	Early spring-June 10		Nov 1-Mar 15
							II, III	Early spring-June 1		Nov 1-Mar 1
6. Temporary Seedings a. Cereal Rye or Wheat b. Oats c. Perennial Ryegrass	90	2.5	5.5-7.5	X	X	X	I	Early spring-Sept 30		
							II	Early spring-Oct 5		
							III	Early spring-Oct 10		
	24	0.55	5.5-7.5	X	X	X	All	Early spring-July 1		
							I	Early spring-Sept 30		
							II	Early spring-Oct 5		
7. Companion Crops a. Spring Oats b. Cereal Rye or Wheat	1 bu.			X	X	X	I	Early spring-Sept 1		
							II	Early spring-Sept 8		
							III	Early spring-Sept 15		
161							I	Early spring-Sept 30		
							II	Early spring-Oct 5		
							III	Early spring-Oct 10		

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CONSTRUCTION SPECIFICATION

752. STRIPPING, STOCKPILING, SITE PREPARATION, AND SPREADING TOPSOIL

1. SCOPE

The work shall consist of stripping, stockpiling, site preparation, and spreading topsoil in accordance with the applicable specifications.

2. STRIPPING

Strip topsoil only from those areas that will be disturbed by excavation, filling, road building, or compaction by equipment. A 4 to 6 inch stripping depth is common, but depth varies depending on site.

Determine depth of stripping by taking soil cores at several locations within each area to be stripped. Topsoil depth generally varies along a gradient from hilltop to toe of the slope.

All planned erosion and sediment control practices shall be in place and functioning properly prior to stripping.

3. STOCKPILING

Select a stockpile location to avoid slopes and natural drainageways, and to avoid traffic routes. On large sites, respreading is easier and more economical when topsoil is stockpiled in small piles located near areas where they will be used.

Perimeter controls shall be placed around the stockpile immediately. Examples of suitable control measures include [DIVERSION DIKE 820](#), [SILT FENCE 920](#), and [STRAW BALE BARRIER 935](#).

Temporary stabilization of the stockpile shall be completed within seven (7) days of the formation of the stockpile, in accordance with practice standard [TEMPORARY SEEDING 965](#), if it is to remain dormant (undisturbed) for longer than thirty (30) days.

Permanent stabilization of the stockpile shall be completed within seven (7) days of the formation of the stockpile, in accordance with practice standard [PERMANENT VEGETATION 880](#), if it is to remain dormant (undisturbed) for longer than 12 months.

4. SITE PREPARATION

Before spreading topsoil, assure that all necessary erosion and sediment control practices such as diversions, berms, dikes, waterways, and sediment basins are in place and functioning properly. These practices must be maintained until the site is permanently stabilized.

Grading - Maintain grades on the areas to be topsoiled according to the approved plan and do not alter them by adding topsoil.

Liming of subsoil - Where the pH of the existing subsoil is 6.0 or less, or the soil is composed of heavy clays, incorporate agricultural limestone in amounts recommended by soil tests or specified for the seeding mixture to be used (Practice

PERMANENT VEGETATION 880). Incorporate lime to a depth of at least 2 inches by disking.

Roughening - Immediately prior to spreading the topsoil, loosen the subgrade by disking or scarifying to a depth of at least 4 inches, to ensure bonding of the topsoil and subsoil. If no amendments have been incorporated, loosen the soil to a depth of at least 6 inches before spreading the topsoil.

5. SPREADING TOPSOIL

Uniformly distribute topsoil to a minimum compacted depth of 2 inches on 3:1 slopes and 4 inches on flatter slopes. To determine the volume of topsoil required for application to various depths, use Table 1.

Topsoil shall not be spread while it is frozen or muddy or when the subsoil is frozen or muddy.

Irregularities in the surface that result from topsoiling or other operations shall be corrected to prevent the formation of depressions or water pockets.

Compact the topsoil enough to ensure good contact with the underlying soil, but avoid excessive compaction, as it increases runoff and inhibits seed germination and seedling growth. Light packing with a roller is recommended where high-maintenance turf is to be established.

In areas that are not going to be mowed, the surface shall be left rough.

TABLE 1
CUBIC YARDS OF TOPSOIL REQUIRED
FOR APPLICATION TO VARIOUS DEPTHS

DEPTH (in.)	PER 1,000 FT. ²	PER ACRE
2	6.2	269
3	9.3	403
4	12.3	537
5	15.4	672
6	18.5	807

SECTION 6 - MATERIAL SPECIFICATIONS

INTRODUCTION

This section contains material specifications. The material specifications are from the NRCS's National Engineering Handbook (NEH) Series Part 642 (formerly referred to as NEH Section 20) as well as several state interim specifications. The interim specifications are numbered starting at 800. The material specifications along with construction specifications (see Section 5) make up the contract specifications and can be used as the requirements in construction contracts. The materials selected will be shown on the drawings and/or also in the construction specifications.

See the general discussion in Section 5 for a description on specifications (construction and material) and their use in construction contracts.

Current updates of material specifications from NRCS's National Engineering Handbook Series Part 642 can be found at <http://www.ftw.nrcs.usda.gov/nehms.html>. The notice for the May 2001 release of the construction specifications in Part 642 identified revisions to Material Specification 523 - Rock for Riprap and Material Specification 581 - Metal. These changes are reflected in this release of Chapter 6 of the Illinois Urban Manual. The dates on the other material specifications have not been updated; however, the technical content of all other material specifications has not likely changed.

This section was updated in November 2002.

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LIST OF MATERIAL SPECIFICATIONS

(Alphabetical)

<u>Material Specification Name</u>	<u>Number</u>
Aggregates for Drainfill and Filters	521
Aggregates for Portland Cement Concrete	522
Aluminum Corrugated Pipe	552
Cast-in-Place Concrete Piles with Shells	514
Chemical Admixtures for Concrete	533
Clay Pipe and Drain Tile	544
Coal Tar-Epoxy Paint	583
Coated Corrugated Steel Pipe	551
Concrete Culvert Pipe	542
Concrete Curing Compound	534
Corrugated Polyethylene Tubing	548
Ductile-Iron Pipe	553
Excelsior Blankets	802
Field Fencing Materials	591
Flap Gates, Metal	572
Galvanizing	582
Geosynthetic Clay Liner	595
Geotextile	592
HDPE and LLDPE Flexible Membrane Liner	594
Jute Netting	801
Lime	593
Material for Topsoiling	804
Metal	581
Metal Waterstops	538
Mineral Admixtures for Concrete	532
Non-Metallic Waterstops	537
Non-Reinforced Concrete Pipe	543
Paper and Plastic Netting	800
Plastic Pipe	547
Portland Cement	531
Precast Concrete Piles	513
Preformed Expansion Joint Filler	535
Radial Gates	573
Reinforced Concrete Pressure Pipe	541
(Reserved)	545
(Reserved)	546
Rock for Riprap	523
Sealing Compound for Joints in Concrete and Concrete Pipe	536
Slide Gates	571
Steel Piles	511
Steel Pipe	554
Steel Reinforcement (for Concrete)	539
Straw Blankets	803
Structural Timber and Lumber	584
Wood Piles	512
Wood Preservatives and Treatment	585

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LIST OF MATERIAL SPECIFICATIONS
(Numerical and Topical)

	Date
<u>Foundation Materials</u>	
511. Steel Piles	10/98
512. Wood Piles	10/98
513. Precast Concrete Piles	10/98
514. Cast-in-Place Concrete Piles with Shells	10/98
 <u>Aggregates and Rock</u>	
521. Aggregates for Drainfill and Filters	10/98
522. Aggregates for Portland Cement Concrete	10/98
523. Rock for Riprap	5/01
 <u>Concrete Materials</u>	
531. Portland Cement	10/98
532. Mineral Admixtures for Concrete	10/98
533. Chemical Admixtures for Concrete	10/98
534. Concrete Curing Compound	10/98
535. Preformed Expansion Joint Filler	11/97
536. Sealing Compound for Joints in Concrete and Concrete Pipe	11/97
537. Non-Metallic Waterstops	10/98
538. Metal Waterstops	10/98
539. Steel Reinforcement (for Concrete)	1/97
 <u>Non-metal Pipe and Fittings</u>	
541. Reinforced Concrete Pressure Pipe	11/97
542. Concrete Culvert Pipe	11/97
543. Non-Reinforced Concrete Pipe	10/98
544. Clay Pipe and Drain Tile	10/98
545. (Reserved)	
546. (Reserved)	
547. Plastic Pipe	10/98
548. Corrugated Polyethylene Tubing	10/98
 <u>Metal Pipe and Fittings</u>	
551. Coated Corrugated Steel Pipe	10/98
552. Aluminum Corrugated Pipe	10/98
553. Ductile-Iron Pipe	10/98
554. Steel Pipe	10/98
 <u>Water Control Gates and Valves</u>	
571. Slide Gates	10/98
572. Flap Gates, Metal	10/98
573. Radial Gates	10/98

LIST OF MATERIAL SPECIFICATIONS cont.
(Numerical and Topical)

	Date
<u>Miscellaneous Structural Materials</u>	
581. Metal	5/01
582. Galvanizing	10/98
583. Coal Tar-Epoxy Paint	10/98
584. Structural Timber and Lumber	10/98
585. Wood Preservatives and Treatment	11/97
 <u>Miscellaneous Construction Materials</u>	
591. Field Fencing Materials	11/97
592. Geotextile	10/98
593. Lime	11/97
594. HDPE and LLDPE Flexible Membrane Liner	5/01
595. Geosynthetic Clay Liner	5/01
 <u>Miscellaneous Materials</u>	
800. Paper and Plastic Netting	8/94
801. Jute Netting	8/94
802. Excelsior Blankets	8/94
803. Straw Blankets	8/94
804. Material for Topsoiling	8/94

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MATERIAL SPECIFICATION

511. STEEL PILES

1. SCOPE

The specification covers the type and quality of steel piles.

2. BEARING PILES

Steel bearing piles shall be structural steel H-piles conforming to the requirements of ASTM A 36.

The required length of pile may be fabricated by butt welding shorter lengths of pile stock. Unless otherwise specified, the cross-section of each pile shall be constant throughout its length. The axis of the pile shall be straight and the number of welded joints in the length of the pile shall be as few as practicable. Pieces below the top piece shall have a minimum length of ten (10) feet.

3. SHEET PILES

Steel sheet piles shall conform to the requirements of ASTM A 328, A 572 or A 690.

Fabrication of piles from shorter lengths of pile stock will not be permitted.

MATERIAL SPECIFICATION

512. WOOD PILES

1. SCOPE

This specification covers the quality of wood piles.

2. QUALITY OF PILES

The piles shall conform to the requirements of ASTM D 25 for the specified classes and sizes of piles.

3. TREATMENT

Piles shall be treated with the specified type and amount of preservative and in conformance with the requirements of Material Specification [585](#).

4. MARKING

Each treated pile delivered to the job site shall be marked as specified in Material Specification [585](#).

MATERIAL SPECIFICATION

513. PRE-CAST CONCRETE PILES

1. SCOPE

This specification covers the quality of pre-cast concrete piles.

2. GENERAL REQUIREMENTS

The piles shall conform to the details shown on the drawings. The piles shall be cast of portland cement concrete mixed, placed, and cured by the methods specified in Construction Specification 31, except as amended in the specification. The finished piles shall be true to line with smooth surfaces free from stone pockets, honeycomb or other surface defects.

3. CLASSES OF CONCRETE

Unless otherwise specified, Class 4000 concrete applies.

4. REINFORCEMENT

Reinforcement steel shall conform to the requirements of Construction Specification 34.

5. FORMS

Forms shall be constructed of plywood, metal or dressed lumber and shall have one (1) inch chamfer strips at all corners. They shall be mortar tight, true to line and adequately supported to prevent deformation or settlement during concrete placement. They shall be designed to be removable without damaging the completed piles.

6. PLACING CONCRETE

The concrete shall be placed in each pile in one continuous operation. The concrete shall be compacted and worked into the forms and around the reinforcement by procedures outlined in Construction Specification 31.

7. CURING

The piles shall be cured for a minimum period of 14 days by a method specified in Construction Specification 31.

Test cylinders cast for the purpose of determining when the piles may be subjected to handling stresses shall be cured by the same method as the pile, at the same location and under the same conditions as those applied to the piles.

The steam curing process may be used as an alternative to moist curing or membrane curing. The piles shall be cured in-place on the casting bed by the introduction of steam into a steam tight housing that completely encloses the casting

bed. The first application of steam shall be applied after the concrete has gained an initial set but in no case sooner than two (2) hours after the concrete is placed unless a set-retarding admixture is an ingredient of the approved concrete mix. When a set-retarding admixture is used, the first application of steam shall be applied no sooner than four (4) hours after the concrete is placed. Moist curing methods shall be applied during the interval between the placement of the concrete and the application of the steam.

The steam shall be at 100 percent relative humidity and shall not be applied directly on the concrete. During application of the steam, the ambient air temperature within the housing shall be increased at a maximum rate of 40° F per hour until the maximum temperature is reached. The temperature within the housing shall be maintained between 140° F and 160° F until the concrete has reached the specified strength. In discontinuing the application of the steam, the ambient air temperature within the housing shall be decreased at a maximum rate of 40° F per hour until the temperature within the housing is not more than 20° F above the ambient air temperature outside the housing.

The concrete shall not be exposed to temperatures below freezing for a minimum of six (6) days after placement.

8. REMOVING FORMS

Side forms shall remain in place a minimum 24 hours.

9. HANDLING AND STORING PILES

The contractor shall handle and store piles by methods that will not cause spalling, cracking or other damage to the piles. The Contractor shall furnish all bridles, slings and other handling equipment as necessary.

Piles shall not be moved until the tests indicate a minimum compressive strength of 80 percent of the design 28-day compressive strength. Piles shall not be transported or driven until the field cure test cylinders indicate a minimum compressive strength equal to the design 28-day compressive strength.

Piles that are cracked, spalled or otherwise damaged during handling will be rejected.

MATERIAL SPECIFICATION

514. CAST-IN-PLACE CONCRETE PILES WITH-SHELLS

1. SCOPE

This specification outlines the quality of piles formed by driving shells to the required bearing, leaving the shells permanently in place, and placing concrete within the shells.

2. GENERAL REQUIREMENTS

The piles may have constant diameter or may be tapered. The diameter of the tapered pile shall increase uniformly from bottom to top. The pile may be stepped increasing in diameter from bottom to top with the diameter changes between steps to be gradual and uniform throughout the total pile length. Unless otherwise specified, the average diameter of each pile shall not be less than eleven (11) inches. The minimum tip diameter of a tapered pile shall be eight inches.

3. SHELL

The shell shall be made of reinforced concrete or steel. It shall have sufficient strength and rigidity to prevent distortion during driving or after driving by soil or water pressures or pressures caused by the driving of adjacent piles. It shall be sufficiently watertight to exclude water during placement of concrete. Driven shells shall be clean and free of water before reinforcing steel and/or concrete is placed.

4. REINFORCEMENT

When internal reinforcement is specified, it shall conform to the details on the drawings and to the requirements of Construction Specification [34](#).

5. CONCRETE

Concrete shall not be placed in any pile until the driven shell complete with reinforcement in-place has been inspected and approved by the Engineer.

Unless otherwise specified, the concrete: (1) shall conform to the requirements of Construction Specification [31](#), and shall be Class 4000; (2) shall be placed in each pile in one continuous operation; and, (3) shall be placed and consolidated into the shell in conformance with the requirements of Construction Specification [31](#).

MATERIAL SPECIFICATION

521. AGGREGATES FOR DRAINFILL AND FILTERS

1. SCOPE

This specification covers the quality of mineral aggregates for the construction of drainfill and filters.

2. QUALITY

Drainfill and filter aggregates shall be sand, gravel or crushed stone or mixtures thereof. Aggregates shall be composed of clean, hard, durable mineral particles free from organic matter, clay balls, soft particles or other substances that would interfere with the free-draining properties of the aggregates.

Coarse aggregate may be crushed limestone or other materials with limestone particles included. Aggregates from crushed limestone shall be thoroughly washed and screened to remove limestone dust, limestone fines, and fine soil particles. For coarse aggregate containing limestone, the total portion finer than the No. 4 sieve shall not contain more than three (3) percent by weight of limestone. Limestone shall not be used for fine aggregates except in combination with other materials such that not more than five (5) percent of the portion finer than the No. 4 sieve shall be limestone.

Aggregates shall be tested for soundness according to ASTM Method C 88, and shall have a weighted average loss in five (5) cycles of not more than twelve (12) percent when sodium sulfate is used or eighteen (18) percent when magnesium sulfate is used.

3. GRADING

Drainfill and filter aggregates shall conform to the specified grading limits after being placed or after being compacted when compaction is specified. Grading shall be determined by ASTM Method C 136. The percentage of material finer than the No. 200 sieve shall be determined by the method in ASTM Designation C 117.

4. STORING AND HANDLING

Drainfill and filter aggregates shall be stored and handled by methods that prevent segregation of particle sizes or contamination by mixing with other materials.

MATERIAL SPECIFICATION

522. AGGREGATES FOR PORTLAND CEMENT CONCRETE

1. SCOPE

This specification covers the quality of fine aggregate and coarse aggregate for use in the manufacture of portland cement concrete.

2. QUALITY

Aggregate shall conform to the requirements of ASTM Specification C 33 for the specified sizes. Aggregates that fail to meet any requirement may be accepted only when: (1) the specified alternate conditions of acceptance can be proven prior to the use of the aggregates on the job and within a period of time such that no work under the contract will be delayed by the requirements of such proof; or, (2) the specification for concrete expressly contains a provision of special mix requirements to compensate for the effects of the deficiencies.

3. REACTIVITY WITH ALKALIES

The potential reactivity of aggregates with the alkalis in cement shall be evaluated by petrographic examination and, where applicable, the chemical method of test, ASTM Designation C 289, or by the results of previous tests or service records of concrete made from similar aggregates from the same source. The standards for evaluating potential reactivity shall be as described in ASTM Specification C 33, Appendix A1.

Aggregates indicated by any of the above to be potentially reactive shall not be used, except under one of the following conditions:

- a. Applicable test results of mortar bar tests, made according to ASTM Method C 227, are available which indicate an expansion of less than 0.10 percent at six (6) months in mortar bars made with cement containing not less than 0.8 percent alkalis expressed as sodium oxide; or
- b. Concrete made from similar aggregates from the same source has been demonstrated to be sound after three (3) years or more of service under conditions of exposure to moisture and weather similar to those anticipated for the concrete under these specifications.

Aggregates indicated to be potentially reactive, but within acceptable limits as determined by mortar bar test results or service records, shall be used only with "low alkali" cement, containing less than 0.60 percent alkalis expressed as sodium oxide.

4. STORING AND HANDLING

Aggregates of each class and size shall be stored and handled by methods that prevent segregation of particle sizes or contamination by intermixing with other materials.

MATERIAL SPECIFICATION

523. ROCK FOR RIPRAP

1. SCOPE

This specification covers the quality of rock to be used in the construction of rock riprap.

2. QUALITY

Individual rock fragments shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering. Except as otherwise specified, the rock fragments shall be angular to subrounded in shape. The least dimension of an individual rock fragment shall be not less than one-third the greatest dimension of the fragment. ASTM D 4992 provides guidance on selecting rock from a source.

Except as otherwise provided, the rock shall be tested and shall have the following properties:

a. Rock Type 1

- (1) Bulk Specific Gravity (saturated surface-dry basis). Not less than 2.5 when tested in accordance with ASTM C 127 on samples prepared as described for soundness testing.
- (2) Absorption. Not more than 2 percent when tested in accordance with ASTM C 127 on samples prepared as described for soundness testing.
- (3) Soundness. The weight loss in five (5) cycles shall not be more than ten (10) percent when sodium sulfate is used or more than fifteen (15) percent when magnesium sulfate is used.

b. Rock Type 2

- (1) Bulk Specific Gravity (saturated surface-dry basis). Not less than 2.5 when tested in accordance with ASTM C 127 on samples prepared as described for soundness testing.
- (2) Absorption. Not more than 2 percent when tested in accordance with ASTM C 127 on samples prepared as described for soundness testing.
- (3) Soundness. The weight loss in five (5) cycles shall be not more than twenty (20) percent when sodium sulfate is used or more than twenty-five (25) percent when magnesium sulfate is used.

c. Rock Type 3

- (1) Bulk Specific Gravity (saturated surface-dry basis). Not less than 2.3 when tested in accordance with ASTM C 127 on samples prepared as described for soundness testing.

(2) Absorption. Not more than 4 percent when tested in accordance with ASTM C 127 on samples prepared as described for soundness testing.

(3) Soundness. The weight loss in five (5) cycles shall be not less than twenty (20) percent when sodium sulfate is used or more than twenty-five (25) percent when magnesium sulfate is used.

3. METHODS OF SOUNDNESS TESTING

- a. Rock Cube Soundness. The sodium or magnesium sulfate soundness test for all rock Types (1, 2, or 3) shall be performed on a test sample of 5000 ± 300 grams of rock fragments, reasonably uniform in size and cubical in shape and weighing, after sampling, approximately 100 grams each. They shall be obtained from rock samples that are representative of the total rock mass, as noted in ASTM D 4992, and that have been sawed into slabs as described in ASTM D 5121. The samples shall further be reduced in size by sawing the slabs into cubical blocks. The thickness of the slabs and the size of the sawed fragments shall be determined by the size of the available test apparatus and as necessary to provide, after sawing, the approximate 100 gram samples. The cubes shall undergo five cycles of soundness testing in accordance with ASTM C 88.

Internal defects may cause some of the cubes to break during the sawing process or during the initial soaking period. Do not test any of the cubes that break during this preparatory process. Such breakage, including an approximation of the percentage of cubes that break, shall be noted in the test report.

After the sample has been dried, following completion of the final test cycle and washed to remove the sodium sulfate or magnesium sulfate, the loss of weight shall be determined by subtracting from the original weight of the sample the final weight of all fragments that have not broken into three or more fragments.

The test report shall show the percentage loss of the weight and the results of the qualitative examination.

- b. Rock Slab Soundness. When specified, the rock shall also be tested in accordance with ASTM D 5240. Deterioration of more than 25 percent of the number of blocks shall be cause for rejection of rock from this source. Rock shall also meet the requirements for average percent weight loss stated below.

(1) For projects located north of the Number 20 Freeze-Thaw Severity Index Isoline (Map below approximates the map located in ASTM D 5312): Unless otherwise specified, the average percent weight loss for Rock Type 1 shall not exceed 20 percent when sodium sulfate is used or 25 percent when magnesium sulfate is used, and for Rock Types 2 and 3, the average percent weight loss shall not exceed 25 percent for sodium sulfate soundness or 30 percent for magnesium sulfate soundness.

(2) For projects located south of the Number 20 Freeze-Thaw Severity Index Isoline, unless otherwise specified, the average percent weight loss for Rock Type 1 shall not exceed 30 percent when sodium sulfate is used or 38 percent when magnesium sulfate is used, and for Rock Types 2 and 3, the average percent weight loss shall not exceed 38 percent for sodium sulfate soundness or 45 percent for magnesium sulfate soundness.



Map of the Conterminous United States
Showing the Number 20
Freeze-Thaw Severity Index Isoline

Adapted from ASTM D 5312

4. FIELD DURABILITY INSPECTION

Rock that fails to meet the material requirements stated above in a, b, or c (if specified), may be accepted only if similar rock from the same source has been demonstrated to be sound after five (5) years or more of service under conditions of weather, wetting and drying, and erosive forces similar to those anticipated for the rock to be installed under this specification.

A rock source may be rejected if the rock from that source deteriorates in three (3) to five (5) years under similar use and exposure conditions expected for the rock to be installed under this specification, even though it meets the testing requirements stated above.

Deterioration is defined as the loss of more than one-quarter (1/4) of the original rock volume, or severe cracking that would cause a block to split. Measurements of deterioration are taken from linear or surface area particle counts to determine the percentage of deteriorated blocks. Deterioration of more than 25 percent of the blocks shall be cause for rejection of rock from the source.

5. GRADING

The rock shall conform to the specified grading limits after it has been placed within the matrix of the rock riprap.

MATERIAL SPECIFICATION

531. PORTLAND CEMENT

1. SCOPE

This specification covers the quality of portland cement.

2. QUALITY

Portland cement shall conform to the requirements of ASTM Specification C 150 for the specific types of cement. When Type I portland cement is specified, Type IS portland blast-furnace slag cement or Type IP portland-pozzolan cement conforming to the requirements of ASTM Specification C 595 may be used unless prohibited by the specifications.

When air-entraining cement is required, the Contractor shall furnish the manufacturers written statement providing the source, amount and brand name of the air-entraining component.

3. STORAGE AT THE CONSTRUCTION SITE

Cement shall be stored and protected at all times from weather, dampness or other destructive elements. Cement that is partially hydrated or otherwise damaged will not be accepted.

MATERIAL SPECIFICATION

532. MINERAL ADMIXTURES FOR CONCRETE

1. SCOPE

This specification covers the quality of mineral admixtures for concrete.

2. QUALITY

Fly ash used as a partial substitution of portland cement shall conform to the requirements of ASTM C 618, Class C or F except the loss on ignition shall not exceed three (3) percent, unless otherwise specified. Lot-to-lot variation in the loss on ignition shall not exceed one (1) percent.

Blast-furnace slag used as a partial substitution of portland cement shall conform to ASTM Standard C 989 for ground granulated blast-furnace slag.

MATERIAL SPECIFICATION

533. CHEMICAL ADMIXTURES FOR CONCRETE

1. SCOPE

This specification covers the quality of chemical admixtures for manufacturer of portland cement concrete.

2. QUALITY

Air-entraining admixtures shall conform to the requirements of ASTM Specification C 260.

Water reducing and/or retarding admixtures shall conform to the requirements of ASTM Specification C 494, Types A, B, D, F, or G.

Plasticizing or plasticizing and retarding admixtures shall conform to ASTM Specification C 1017.

Accelerating or water-reducing and accelerating admixtures shall be non-corrosive and conform to the requirements of ASTM Specification C 494, Types C and E. The manufacturer shall provide long-term test data results from an independent laboratory verifying that the product is non-corrosive when used in concrete exposed to continuously moist conditions.

MATERIAL SPECIFICATION

534. CONCRETE CURING COMPOUND

1. SCOPE

This specification covers the quality of liquid membrane-forming compounds suitable for spraying on concrete surfaces to retard the loss of water during the concrete curing process.

2. QUALITY

The curing compound shall meet the requirements of ASTM Specification C 309.

Unless otherwise specified, the compound shall be Type 2.

3. DELIVERY AND STORAGE

All curing compound shall be delivered to the site of the work in the original container bearing the name of the manufacturer and the brand name. The compound shall be stored in a manner that prevents damage to the container and protects water-emulsion types from freezing.

MATERIAL SPECIFICATION

535. PREFORMED EXPANSION JOINT FILLER

1. SCOPE

This specification covers the quality of preformed expansion joint fillers for concrete.

2. QUALITY

Preformed expansion joint filler shall conform to the requirements of ASTM Specification D 1752, Type I, Type II, or Type III, unless bituminous type is specified. Bituminous type preformed expansion joint filler shall conform to the requirements of ASTM Specification D 994, or D 1751.

MATERIAL SPECIFICATION

536. SEALING COMPOUND FOR JOINTS IN CONCRETE AND CONCRETE PIPE

1. SCOPE

This specification covers the quality of sealing compound for filling joints in concrete pipe and concrete structures.

2. TYPE

The compound shall be a cold-application material, unless otherwise specified, and shall be a single component or multiple component type.

3. QUALITY

The sealing compound shall conform to the requirements of one of the following specifications:

ASTM Specification C 990; Joints for Concrete Pipe, Manholes, and Pre-cast Box Sections using Pre-formed Flexible Joint Sealants.

ASTM Specification C 877; External Sealing Bands for Non-Circular Concrete Sewer, Storm Drain, and Culvert Pipe.

ASTM Specification D 1190; Concrete Joint Sealer, Hot Poured Elastic Type.

ASTM Specification C 920; Elastomeric Joint Sealants for cold applied sealing and caulking of joints on mortar and concrete structures not subject to fuel spills. Use Type S or M, Grade NS for vertical joints; Type S or M, Grade P or NS for horizontal joints. Class 25, Use M, quality materials shall be used for both vertical and horizontal joints unless otherwise specified.

The sealing compound, if used with other joint materials, such as fillers or gaskets, shall be compatible.

MATERIAL SPECIFICATION

537. NON-METALLIC WATERSTOPS

1. SCOPE

This specification covers non-metallic waterstops for use in joints of concrete structures.

2. CLASSIFICATION

- a. Classes. Non-metallic waterstops shall be of the following classes, as specified:

Class I shall be fabricated of either natural or synthetic rubber.

Class II shall be fabricated of vinyl chloride polymer or copolymer.

- b. Types. Non-metallic waterstops may be either split or solid and shall conform to the following types, as specified, (see figure 1):

Type A shall have ribbed anchor flanges and a smooth web. Flanges may be of uniform thickness or may have either a converging or a diverging taper toward the edges.

Type B shall have ribbed anchor flanges and a smooth web containing a hollow tubular center bulb having: (1) a wall thickness equal to at least one-half (1/2) the web thickness, and; (2) the inside diameter (D) specified in the specifications or shown on the drawings. Flanges may be of uniform thickness or may have either a converging or a diverging taper toward the edges.

Type C shall have a single, circular bulb-type anchor flange at each edge and a smooth web.

Type D shall have a single, circular bulb-type anchor flange at each edge and a smooth web containing a hollow tubular center bulb having: (1) a wall thickness equal to a least one-half (1/2) the thickness of the web, and; (2) the inside diameter (D) specified in the contract.

Type E shall have ribbed anchor flanges and a web molded or extruded in the form of a round or U-shaped bulb of the dimensions specified in the contract or shown on the drawings. The web bulb shall be connected at the open-end of the "U" by a thin membrane having a minimum thickness of 1/64-inch and a maximum thickness of 1/5 of the web thickness and design to: (1) prevent infiltration of wet concrete into the bulb, and; (2) tear when expansion of the joint occurs. Flanges may be of uniform thickness or may have either a converging or a diverging taper toward the edges. Auxiliary positioning or nailing flanges may be provided as long as the functioning of the web bulb is not altered.

Type F shall have ribbed anchor flanges with a minimum of two (2) extra heavy ribs, designed to resist displacement of the waterstop during concrete placement

on each flange, and a smooth web having a positioning or nailing flange attached at the center.

Type G shall be of special design conforming to the details shown on the drawings.

- c. Sizes. Waterstops of Types A through F shall be of the sizes specified in the specifications or shown on the drawings and listed in Table 1 of this specification. Type G waterstops shall have the dimensions shown on the drawings.

3. PHYSICAL REQUIREMENTS

The extruded or molded materials shall exhibit the properties specified herein when tested by the methods specified in Section 4 of this specification.

a. Class I Waterstops

- (1) The hardness as determined by the Shore A durometer method shall be a minimum of 60.
- (2) The specific gravity shall be a maximum of 1.2.
- (3) The tensile strength shall be a minimum of 2500 pounds per square inch (psi).
- (4) The ultimate elongation shall be a minimum of 450 percent.
- (5) The compression set shall be a maximum of 30 percent.
- (6) The water absorption in weight measurements shall not exceed five (5) percent.
- (7) The decrease in tensile strength and ultimate elongation after aging shall not exceed 20 percent.
- (8) There shall be no sign of failure due to brittleness at a temperature of minus 35° F.

b. Class II Waterstops

- (1) The hardness as determined by the Shore A durometer method shall be a minimum of 60.
- (2) The specific gravity shall be a maximum of 1.4.
- (3) The tensile strength shall be a minimum of 1400 pounds per square inch (psi).

- (4) The ultimate elongation of the web shall be a minimum of 280 percent and the flanges shall be a minimum of 200 percent.
- (5) There shall be no sign of failure due to flange brittleness at a temperature of 0° F nor of web brittleness at a temperature of minus 35° F.
- (6) The decrease in either tensile strength or ultimate elongation after accelerated extraction shall not exceed 15 percent.
- (7) Results of alkali exposure:
 - (a) After immersion for seven (7) days, the sample shall exhibit no loss of weight and a maximum weight gain of 0.25 percent, and the hardness measured by the Shore A durometer method shall not vary more than 5 points either plus or minus from the untreated sample.
 - (b) After immersion for 30 days, the sample shall exhibit no loss of weight and a maximum weight gain of 0.40 percent, and the dimensions of the treated sample shall not vary by more than one (1) percent from the untreated sample.

4. TEST METHODS

Testing shall be conducted by the methods cited herein. All cited test methods are included in ASTM as follows:

- a. Hardness shall be determined by ASTM D 2240.
- b. Specific gravity shall be determined by ASTM D 792.
- c. Tensile strength shall be determined by ASTM D 412 for Class I waterstops and ASTM D 638 for Class II waterstops.
- d. Ultimate elongation shall be determined by ASTM D 412 for Class I waterstops and ASTM D 638 for Class II waterstops.
- e. Compression set shall be determined by ASTM D 395.
- f. Water absorption shall be determined by ASTM D 570.
- g. Tensile strength and ultimate elongation after aging shall be determined by ASTM D 412 for Class I waterstops and ASTM D 638 for Class II waterstops.
- h. Brittleness shall be determined by ASTM D 746 for Class II waterstops.
- i. Accelerated extraction shall be accomplished by procedures outlined by United States Army Corps of Engineers (USACE) Concrete Research Division (CRD) C 572 under the following conditions:

- (1) Samples shall not be less than 1/16 inch nor more than 1/8 inch in thickness;
 - (2) The immersion medium shall be a solution prepared by dissolving five (5) grams of chemically pure sodium hydroxide and five (5) grams of chemically pure potassium hydroxide in, one (1) liter of water;
 - (3) The samples shall be immersed in the medium for 14 days at a temperature of $145^{\circ} \text{F} \pm 5^{\circ} \text{F}$;
 - (4) During the period of immersion, air shall be gently bubbled through the medium from a 1/4 inch diameter glass tube at an approximate rate of one (1) bubble per second;
 - (5) Fresh medium shall be provided each day;
 - (6) Samples need not be dipped in acetone.
- j. The effects of alkalies shall be determined by USACE CRD C 572 under the following conditions:
- (1) Sample shall have a maximum thickness of 1/4 inch;
 - (2) The immersion medium shall be as described in (i) above;
 - (3) Fresh medium shall be provided every seven (7) days;
 - (4) The samples shall be immersed in the medium for a period of 30 days;
 - (5) Samples need not be dipped in acetone.

5. CONDITION

Waterstops shall be extruded or molded in such a manner that the material is dense and homogeneous throughout and free from voids, tears, thins, indentations, or other imperfections. Unless otherwise specified, waterstops shall be symmetrical in shape and uniform in dimensions and shall be furnished in continuous strips of minimum length of fifty (50) feet. Factory splices shall have a minimum tensile strength of fifty (50) percent of the unspliced section.

6. PACKAGING AND STORING

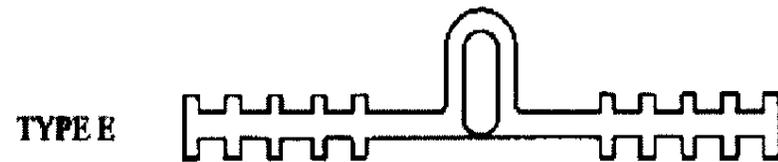
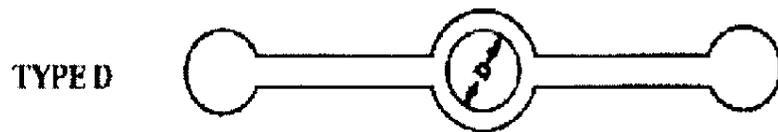
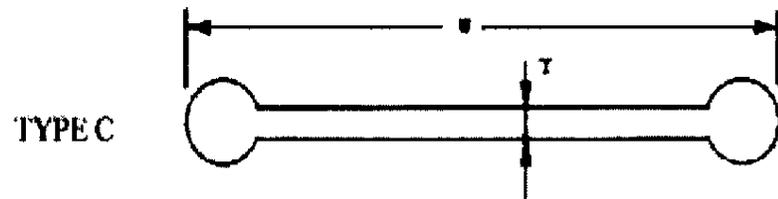
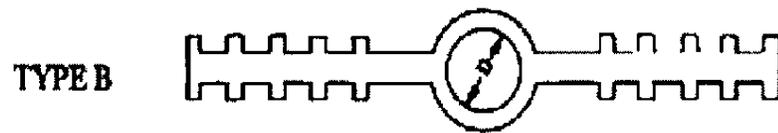
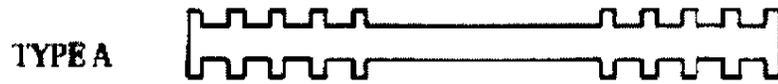
Waterstops shall be packaged and stored by methods that will provide protection from prolonged exposure to direct sunlight and/or excessive heat.

TABLE 1 SIZES OF WATERSTOPS

Size Designation	Web Thickness (T) Inches	Width (W) Inches
1	1/16	5 1/4
2	3/32	3 3/4
3	3/32	4
4	3/32	5 1/4
5	3/32	6
6	1/8	4
7	1/8	5 1/4
8	1/8	6
9	5/32	4
10	5/32	4 1/2
11	5/32	9
12	3/16	4
13	3/16	5
14	3/16	6
15	3/16	9
16	1/4	6
17	1/4	9
18	3/8	5
19	3/8	6
20	3/8	9
21	1/2	6
22	1/2	9
23	1/2	12

Figure 1

TYPES OF NON-METALLIC WATERSTOPS



MATERIAL SPECIFICATION

538. METAL WATERSTOPS

1. SCOPE

This specification covers the quality of materials for metal waterstops as specified for reinforced concrete installation.

2. MATERIALS

Metal waterstops shall be made of copper or galvanized steel as specified. Waterstops that require forming of the metal involving sharp bends shall be made of copper which shall be soft and pliable so bending to an inside radius equal to its thickness without cracking will occur at temperatures less than 180° F.

3. QUALITY

Metal for waterstops shall conform to the requirements of the applicable ASTM Standard below:

Copper - ASTM Specification B 152

Zinc-coated (Galvanized) steel - ASTM Specification A 653

MATERIAL SPECIFICATION

539. STEEL REINFORCEMENT (FOR CONCRETE)

1. SCOPE

This specification covers the quality of steel reinforcement for reinforced concrete.

2. QUALITY

All reinforcement shall be free from loose or flaky rust, soil, oil, grease, paint or other deleterious matter.

Steel bars for concrete reinforcement shall be Grade 40, 50, or 60 deformed bars conforming to one of the following specifications:

Deformed and Plain Billet-Steel Bars for Concrete Reinforcement - ASTM A 615

Rail-Steel Deformed and Plain Bars for Concrete Reinforcement - ASTM A 616 with the S1 supplemental requirements

Axle-Steel Deformed and Plain Bars for Concrete Reinforcement - ASTM A 617.

Dowels shall be plain round bars conforming to the same specifications listed above for steel bars.

Fabricated deformed steel bar mats for concrete reinforcement shall conform to the requirements of ASTM A 184.

Plain steel welded wire fabric for concrete reinforcement shall conform to the requirements of ASTM A 185.

Deformed steel welded wire fabric for concrete reinforcement shall conform to the requirements of ASTM A 497.

Epoxy-coated steel bars for concrete reinforcement shall conform to the requirements of ASTM A 775.

3. DIMENSIONS OF WELDED WIRE FABRIC

Gauges, diameters, spacing and arrangement of wires for welded steel wire fabric shall be as defined for the specified style designations.

4. STORAGE

Steel reinforcement inventories at the site of the work shall be stored above the ground surface on platforms, skids or other supports and shall be kept clean and protected from mechanical injury and corrosion.

MATERIAL SPECIFICATION

541. REINFORCED CONCRETE PRESSURE PIPE

1. SCOPE

This specification covers the quality of reinforced concrete pressure pipe and fittings.

2. MANUFACTURE AND FABRICATION

The pipe, the materials used in its manufacture, and the methods of fabrication shall conform to the requirements of the following specifications applicable to the specified type of pipe.

- a. Steel Cylinder Type, Pre-stressed: AWWA Standard C301 for Pre-stressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids.
- b. Steel Cylinder Type, Not Pre-stressed: AWWA Standard C300 for Reinforced Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids.
- c. Non-cylinder Type, Not Pre-stressed: AWWA Standard C302 for Reinforced Concrete Pressure Pipe, Non-cylinder Type, for Water and Other Liquids.
- d. Steel Cylinder Type, Pre-tensioned: AWWA Standard C303 for Concrete Pressure Pipe, Bar-Wrapped, Steel Cylinder Type for Water and Other Liquids.
- e. Low Head Pressure Pipe: ASTM Specification C 361. The following Specification Sections shall not apply:
 - AWWA C300 and C301, Sections 1.5 and 1.6.
 - AWWA C302 and C303, Sections 4.2 and 4.3.

3. DESIGN

The actual pipe and fittings shall be designed by the manufacturer to withstand the specified external loads and internal pressures. Designs shall be by either of the following methods as applicable to the type of pipe specified:

- a. Indirect Design: ASTM C497 for Standard Test Method for Concrete Pipe, Manhole Sections, or Tile.

Pipe design shall be based on the results of external crushing strength tests on a minimum two-foot length of the pipe or a specimen of equivalent size, design, and materials. The test shall demonstrate the following bearing loads:

- (1) For pipe manufactured according to ASTM C361, AWWA C300, or AWWA C302, the load required to produce a 0.01-inch crack on foot long.
- (2) For pipe manufactured according to ASTM C301, the load required to produce a 0.001-inch crack one foot long that is 10-percent greater than the specified three-edge bearing strength, whichever is lower.

In lieu of actual testing for this contract, pipe design may be based on Design Curve previously approved and published by the Natural Resources Conservation Service (formerly the Soil Conservation Service).

- b. Direct Design: AWWA C304 for Design of Pre-stressed Concrete Cylinder Pipe or AWWA Manual M9 for Concrete Pressure Pipe.

Pipe design shall be based on structural analysis and design calculations.

- c. Standard Design: ASTM C361 for Reinforced Concrete Low Head Pressure Pipe.

Pipe design shall be as published in the standard.

4. STEEL REINFORCEMENT

The steel reinforcements shall conform to the requirements of the specifications cited in Section 2 for the specified type of pipe, except that elliptical reinforcing cages or other reinforcements that require special orientation of the pipe during placement will not be allowed.

5. JOINTS

The pipe joints shall conform to the requirements of the applicable specification for the pipe. They shall be bell-and-spigot type or double-spigot-and-sleeve type and shall have a positive groove in the spigot to contain the rubber gasket. The size and shape of the groove shall be such that it will prevent displacement of the gasket by either internal or external water pressure when the joint is in any position within the required range of movement capability. Joint sleeves, also referred to as "collars" or "coupling bands," shall conform to the requirements for bell rings in the applicable pipe specification.

The joints shall be constructed so as to permit relative movement of the adjoining pipe sections with no reduction of watertightness. The joint length and the limiting angle defining the required capability of relative movement at each joint shall be no less than specified.

Joint length refers to the permissible axial movement in the joint, and is defined as the maximum distance through which the spigot can move, relative to the bell or sleeve, from the fully engaged to the fully extended condition of the joint when the adjoining pipe sections are in parallel, concentric alignment. The joint is considered to be fully engaged when the spigot is inserted as far as it will go into the bell or sleeve, and fully extended when it is inserted the least amount that will ensure full confinement of the gasket and complete watertightness.

Joint length specified for double-spigot joints refers to the permissible movement in each of the spigot-to-sleeve connections, not the sum of the two.

The limiting angle of the joint is defined as the maximum deflection angle between adjoining pipe sections the joint will permit before the outer surface of the spigot comes into direct contact with inside of the mating bell or sleeve. If both spigot-to-sleeve connections of a double-spigot joint permit angular movement, the limiting angle of the joint is the sum of the two deflection angles permitted by the two connections.

6. GASKETS

The pipe joint gaskets shall conform to the requirements of the specifications cited in Section 2 of this specification. They shall be endless rubber gaskets having circular cross section. The cross-sectional diameter of the gaskets shall conform to the pipe manufacturer's recommendation for the type and size of pipe furnished.

7. MARKING

All pipe sections and special fittings shall be marked by the manufacturer with the manufacturer's name or trademark, the date of manufacture, the nominal size, design head, design external load and the structure site for which it was designed and manufactured.

8. CERTIFICATION

All component materials and actual pipe fabrication shall be tested, inspected, and documented as prescribed in the manufacturing specifications for the type of pipe specified. All documentation noted in the manufacturing specifications shall be submitted to the Engineer. Documentation shall include current test reports on steel and steel wire reinforcing and compression tests of concrete used in the manufacture of the furnished pipe.

For pipe design based on actual external crushing strength tests, the Engineer shall witness the actual test.

For pipe design based on published Design Curves, a copy of the appropriate design curve marked to show the resultant concrete core stress and corresponding three-edge bearing load, and a specification sheet showing all data and dimensions necessary to calculate the resultant core stress, for the pipe furnished shall be submitted to the Engineer.

For pipe design based on structural analysis and calculations, such analysis and calculations shall be submitted to the Engineer. Printouts of such calculations by computer programs shall be sufficiently detailed to enable comparison with standardized procedures and methods.

Drawings, details, and descriptions of the pipe joints as necessary to show that the joint conforms to the specified requirements shall also be submitted.

MATERIAL SPECIFICATION

542. CONCRETE CULVERT PIPE

1. SCOPE

This specification covers the quality of non-reinforced and reinforced concrete culvert pipe.

2. NON-REINFORCED PIPE

Non-reinforced concrete culvert pipe shall conform to the requirements of ASTM Specification C 14 for the class of pipe specified.

3. REINFORCED PIPE

- a. Round pipe. Round reinforced concrete culvert pipe shall conform to the requirements of ASTM Specification C 76 or ASTM C 655 for the class of pipe specified.
- b. Arch pipe. Reinforced concrete arch culvert pipe shall conform to the requirements of ASTM Specifications C 506 for the class of pipe specified.
- c. Elliptical pipe. Reinforced concrete elliptical culvert pipe shall conform to the requirements of ASTM Specification C 507 for the class of pipe specified.

4. REINFORCED BOX SECTIONS

Reinforced concrete box sections shall be manufactured meeting the requirements of ASTM Specifications C 789 or C 850 based on the design specified.

5. RUBBER GASKET JOINTS

When rubber gasket joints are specified, the joints and gaskets shall conform to the requirements of ASTM Specification C 443.

MATERIAL SPECIFICATION

543. NON-REINFORCED CONCRETE PIPE

1. SCOPE

This specification covers the quality of non-reinforced concrete irrigation pipe, drainage pipe, and drain tile.

2. IRRIGATION PIPE

Unless rubber gasket joints are specified, non-reinforced concrete irrigation pipe shall conform to the requirements of ASTM Specification C 118 for Standard Concrete Irrigation Pipe.

3. IRRIGATION PIPE WITH RUBBER GASKET JOINTS

Non-reinforced concrete irrigation pipe with rubber gasket joints shall conform to the requirements of ASTM Specification C 505.

4. DRAINAGE PIPE

Non-reinforced concrete drainage pipe shall conform to the requirements of ASTM Specification C 118 for the class of pipe specified.

5. PERFORATED PIPE

Perforated non-reinforced concrete pipe shall conform to the requirements of ASTM Specification C 444 for the class of pipe specified.

6. DRAIN TILE

Concrete drain tile shall conform to the requirements of ASTM Specification C 412 for the class of tile specified.

MATERIAL SPECIFICATION

544. CLAY PIPE AND DRAIN TILE

1. SCOPE

This specification covers the quality of clay pipe and drain tile.

2. PIPE

Standard strength clay pipe and extra strength clay pipe shall conform to the requirements of ASTM Specification C 700 for the specified class of pipe.

3. PERFORATED PIPE

Perforated clay pipe shall conform to the requirements of ASTM Specification C 700 for the specified class of pipe.

4. DRAIN TILE

Clay drain tile shall conform to the requirements of ASTM Specification C 4 for the specified class of tile. Perforated drain tile shall conform to the requirements of ASTM Specification C 498 for the specified class.

5. COMPRESSION JOINT MATERIAL

Compression joints using material having resilient properties shall conform to the requirements of ASTM Specification C 425.

MATERIAL SPECIFICATION

547. PLASTIC PIPE

1. SCOPE

This specification covers the quality of Poly Vinyl Chloride (PVC), Polyethylene (PE), High Density Polyethylene (HDPE), and Acrylonitrile-Butadiene-Styrene (ABS) plastic pipe, fittings and joint materials.

2. MATERIALS

a. Pipe

The pipe shall be as uniform as commercially practicable in color, opaqueness, density, and other specified physical properties and free from visible cracks, holes, foreign inclusions, or other defects. The dimensions of the pipe shall be measured as prescribed in ASTM D 2122.

Unless otherwise specified, the pipe shall conform to the requirements listed in this specification and the applicable reference specifications in Table 547-2, the requirements specified in Construction Specification [45, Plastic Pipe](#), and the requirements shown on the drawings.

b. Fittings and Joints

Fittings and joints shall be of a schedule, SDR or DR, pressure class, external load carrying capacity, or pipe stiffness that equals or exceeds that of the plastic pipe. The dimensions of fittings and joints shall be compatible with the pipe and measured in accordance with ASTM D 2122. Joint and fitting material shall be compatible with the pipe material. The joints and fittings shall be as uniform as commercially practicable in color, opaqueness, density, and other specified physical properties and free from visible cracks, holes, foreign inclusions, or other defects.

Fittings and joints shall conform to the requirements listed in this specification, the requirements of the applicable specification referenced in the ASTM or AWWA specification for the pipe, the requirements specified in Construction Specification 45, and the requirements shown on the drawings.

c. Solvents

Solvents for solvent welded pipe joints shall be compatible with the plastic pipe used and shall conform to the requirements of the applicable specification referenced in the ASTM or AWWA specification for the pipe, fitting, or joint.

d. Gaskets

Rubber gaskets for pipe joints shall conform to the requirements of ASTM F 477, Elastomeric Seals (Gaskets) for Jointing-Plastic Pipe.

3. PERFORATIONS

When perforated pipe is specified, perforations shall conform to the following requirements, unless otherwise specified in Construction Specification 45 or shown on the drawings:

- a. Perforations shall be either circular or slots.
- b. Circular perforations shall be $1/4 \pm 1/16$ -inch diameter holes arranged in rows parallel to the axis of the pipe. Perforations shall be evenly spaced along each row such that the center-to-center distance between perforations is not less than eight (8) times the perforation diameter. Perforations may appear at the ends of short and random lengths. The minimum perforation opening per foot of pipe shall be as shown in Table 547-1.

Rows shall be arranged in two (2) equal groups at equal distance from the bottom on each side of the vertical centerline of the pipe. The lowermost rows of perforations shall be separated by an arc of not less than 60° or more than 125° . The uppermost rows of perforations shall be separated by an arc not to exceed 166° . The spacing of rows between these limits shall be uniform. The minimum number of rows shall be as shown in Table 547-1.

- c. Slot perforations shall be symmetrically located in two (2) rows, one on each side of the pipe centerline. Slot perforations shall be located within the lower quadrants of the pipe with slots no wider than $1/8$ inch and spaced not to exceed 11 times the perforation width. Minimum perforation opening per lineal foot of pipe shall be as shown in Table 547-1.

TABLE 547-1
PERFORATIONS

NOMINAL PIPE SIZE	MINIMUM NUMBER OF ROWS		MINIMUM OPENING/FOOT
	(Inches)	CIRCULAR	SLOT
4	2	2	0.22
6	4	2	0.44
8	4	2	0.44
10	4	2	0.44
12	6	2	0.66

- d. On both the inside and outside of the pipe, perforations shall be free of cuttings or frayed edges, and any materials that would reduce the effective opening.

TABLE 547-2

PIPE SPECIFICATIONS

<u>POLY VINYL CHLORIDE (PVC) PIPE</u>	<u>SPECIFICATION</u>
Plastic Pipe – Schedules 40, 80, 120	ASTM D 1785 ASTM D 2466
Pressure-Rated Pipe – SDR Series	AWWA C 900 ASTM D 2241
Plastic Drain, Waste, and Vent Pipe and Fittings	ASTM D 2665
Joints for IPS PVC Pipe Using Solvent Weld Cement	ASTM D 2672
Composite Sewer Pipe	ASTM D 2680
Type PSM PVC Sewer Pipe and Fittings	ASTM F 3034
Large-Diameter Gravity Sewer Pipe and Fittings	ASTM F 679
Smooth-Wall Underdrain Systems for Highway Airport, and Similar Drainage	ASTM F 758
Type PS-46 Gravity Flow Sewer Pipe and Fittings	ASTM F 789
Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter	ASTM F 794
Corrugated Sewer Pipe With a Smooth Interior and Fittings	ASTM F 949
Pressure Pipe, 4-inch through 12-inch for Water Distribution	AWWA C 900
Water Transmission Pipe, Nominal Diameters 14-inch through 36-inch	AWWA C 905

TABLE 547-2 (CONTINUED)

PIPE SPECIFICATIONS

<u>POLYETHYLENE (PE) PLASTIC PIPE</u>	<u>SPECIFICATION</u>
Schedule 40	ASTM D 2104
SDR-PR Based on Controlled Inside Diameter	ASTM D 2239
Schedules 40 and 80 Based on Outside Diameter	ASTM D 2447
SDR-PR Based on Controlled Outside Diameter	ASTM D 3035
<u>HIGH DENSITY POLYETHYLENE (HDPE) PLASTIC PIPE</u>	<u>SPECIFICATION</u>
Plastic Pipe and Fittings	ASTM D 3350
SDR-PR Based on Controlled Outside Diameter	ASTM F 714
Plastic Moldings and Extrusion Compounds	ASTM D 1248
Heat Joining Polyolefin Pipe and Fittings	ASTM D 2657
<u>ACRYLONITRILE-BUTADIENE-STYRENE (ABS) PIPE</u>	<u>SPECIFICATION</u>
Plastic Pipe, Schedules 40 and 80	ASTM D 1527
Plastic Pipe, SDR-PR	ASTM D 2282
Schedule 40 Plastic Drain, Waste, and Vent Pipe	ASTM D 2661
Composite Sewer Pipe	ASTM D 2680
Sewer Pipe and Fittings	ASTM D 2751

MATERIAL SPECIFICATION

548. CORRUGATED POLYETHYLENE TUBING

1. SCOPE

The specification covers the quality of corrugated polyethylene tubing and fittings.

2. TUBING

Corrugated polyethylene tubing shall conform to the requirements of ASTM F 405, ASTM F 667, ASTM F 894, AASHTO M 252, or AASHTO M 294 for the appropriate tubing sizes and fittings.

3. FITTINGS

ASTM F 405	3 - 6 inch diameter pipe and fittings
ASTM F 667	8, 10, 12, 15, 18, and 24 inch diameter pipe and fittings
ASTM F 894	18 - 120 inch diameter pipe and fittings
AASHTO M 252	3 - 10 inch diameter N12 pipe and fittings
AASHTO M 294	12 - 36 inch diameter N12 pipe and fittings

MATERIAL SPECIFICATION

551. COATED CORRUGATED STEEL PIPE

1. SCOPE

This specification covers the quality of zinc-coated, aluminum-coated, aluminum-zinc alloy-coated, and polymer-coated corrugated steel pipe and fittings.

2. PIPE

All pipe shall be metallic zinc-coated, aluminum-coated, or aluminum-zinc alloy-coated corrugated steel pipe and fittings conforming to the requirements of ASTM A 742, A 760, A 761, A 762, A 849, A 875, A 885, and A 929 for the specified type, class, fabrication of pipe and coating, and to the following additional requirements:

a. When closed riveted pipe is specified:

(1) Pipe shall be fabricated with circumferential seam rivet spacing that does not exceed three (3) inches, except that twelve (12) rivets will be sufficient to secure the circumferential seams in twelve (12) inch pipe.

and,

(2) Longitudinal seams that will be within the coverage area of a coupling band, the rivets shall have flat heads or the rivets and holes shall be omitted and the seams shall be connected by welding to provide a minimum of obstruction to the seating of the coupling bands.

b. Double riveting or double spot welding for pipe less than 42 inches in diameter may be required. When double riveting or double spot welding is specified, the riveting or welding shall be performed in a manner specified for pipe 42 inches or greater in diameter.

3. COATINGS

Coatings described herein, unless otherwise specified, refer to equally both the inside and outside pipe surfaces.

When coatings in addition to metallic coatings are specified, they shall conform to the requirements of ASTM A 742, A 760, A 761, A 762, A 849, A 875, A 885, and A 929 for the specified type.

Polymer-coated pipe, unless otherwise specified on the drawings or in the construction specifications, shall be coated on each side with a minimum thickness of 0.01 inches (10 mils), designated as grade 10/10 in ASTM A 762.

4. COUPLING BANDS

Coupling bands are to be provided for each section of pipe. The hardware for fastening the coupling band tightly to the connecting pipe shall be fabricated to

permit tightening sufficiently to provide the required joint tensile strength and, if required, watertightness without failure of its fastening.

Gaskets, if specified, are to be provided for each coupling band. The fabrication of coupling bands and fastening hardware, in addition to the above, shall be sufficient to provide the required gasket seating without warping, twisting or bending.

5. FITTINGS

Fittings shall be fabricated from steel conforming to ASTM A 444, A 742, A 806, A 819, A 849, A 875, A 885, and A 929. The coating of fittings shall be the same as that specified for the contiguous corrugated coated pipe.

Welded surfaces and adjacent surfaces damaged during welding shall be treated by removal of all flux residue and weld splatter. The affected surfaces shall be cleaned to bright metal by sand blasting, power disk sanding, or wire brushing. The cleaned area shall extend a minimum of one-half (1/2) inch into the undamaged section of the coated area. Repair and coating application of damaged and uncoated pipe surface areas shall be in accordance with ASTM A 780.

MATERIAL SPECIFICATION

552. ALUMINUM CORRUGATED PIPE

1. SCOPE

This specification covers the quality of aluminum corrugated pipe and fittings.

2. PIPE

Aluminum corrugated pipe and fittings shall conform to the requirements of ASTM B 745, B 746, or B 790 for the specified pipe sheet thickness, shape type, fabrication methods, and the following additional requirements:

a. When close-ribbed pipe is specified:

(1) Pipe shall be fabricated with circumferential seam rivet spacing that does not exceed three (3) inches, except that twelve (12) rivets will be sufficient to secure the circumferential seams in twelve (12) inch pipe.

and,

(2) Longitudinal seams that will be within the coverage area of a coupling band, the rivets shall have flat heads or the rivets and holes shall be omitted and the seams shall be connected by welding to provide a minimum of obstruction to the seating of the coupling bands.

3. COATINGS

Bituminous coatings, when specified, shall conform to the requirements of ASTM A 849.

4. COUPLING BANDS

Coupling bands are to be provided for each section of pipe. The hardware for fastening the coupling band tightly to the connecting pipe shall be fabricated to permit tightening sufficiently to provide the required joint tensile strength and, if required, watertightness without failure of its fastening.

Gaskets, if specified, are to be provided for each coupling band. The fabrication shall also be sufficient to provide the required gasket seating without warping, twisting or bending.

Gaskets provided with connecting bands meeting requirements for special joints in erodible soil conditions shall be as specified in ASTM A 762.

5. FITTINGS

Fittings shall be fabricated from sheet aluminum meeting the requirements contained in ASTM B 744. The coating for fittings shall be the same as that specified for the contiguous corrugated aluminum pipe.

Fittings that are welded during fabrication shall be accomplished in a good workmanship like manner resulting in a continuous smooth surface finish. Aluminum welding electrodes used shall conform to the requirements of American Welding Society (AWS) specification AWS A5.10, "Specification for Aluminum and Aluminum Alloy Welding Rods and Bare Electrodes." Welded surfaces and adjacent surfaces damaged during welding shall be treated by removal of all weld splatter. The affected surface shall be cleaned to bright metal by sand blasting, power disk sanding, or wire brushing. The cleaned area shall extend a minimum of one-half (1/2) inch into the undamaged section of coated area. Within 24 hours of completion of surface preparation all treated surfaces shall be painted with two (2) coats of a chromate rich primer and allowed to fully dry prior to exposure to weathering conditions.

Aluminum surfaces fabricated that will have contact with steel, iron, or other metals shall be coated with a zinc-chromate primer and allowed to fully dry prior to final installation.

MATERIAL SPECIFICATION

553. DUCTILE-IRON PIPE

1. SCOPE

This specification covers the quality of ductile-iron pipe and fittings.

2. PIPE

Ductile-Iron Pipe shall conform to the requirements of ANSI/AWWA C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids and ANSI/AWWA C115/A21.15, Flanged Ductile-Iron Pipe with Threaded Flanges.

3. FITTINGS

Ductile-Iron Pipe Fittings shall conform to the requirements of ANSI/AWWA C110/A21.10, Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids. Also, ANSI/AWWA C153/A21.53, Ductile-Iron Compact Fittings, 3-inch through 12-inch, for Water and Other Liquids.

4. JOINTS

Rubber-gasket joints for ductile-iron pipe and fittings where either mechanical or push-on joints are used shall conform to the requirements of ANSI/AWWA C111/A21.11, Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

5. LINING

Interior lining for Ductile-Iron Pipe and Fittings shall conform to the requirements of ANSI/AWWA C104/A21.4, Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

6. ENCASEMENT

Encasement for ductile-iron pipe and fittings shall conform to the requirements of ANSI/AWWA C105/A21.5-88, Polyethylene Encasement for Ductile-Iron Pipe for Water and Other Liquids.

MATERIAL SPECIFICATION

554. STEEL PIPE

1. SCOPE

This specification covers the quality of steel pipe and fittings.

2. PIPE

Steel pipe shall conform to the requirements of the applicable specification listed below for the kind of pipe and the type, weight, grade, and finish specified:

<u>Kinds of Pipe</u>	<u>ASTM Specification</u>
Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless	A 53
Pipe, Steel, Electric-Fusion (ARC) - Welded (Sizes NPS 16 and Over)	A 134
Electric-Resistance-Welded Steel Pipe	A 135
Electric-Fusion (ARC) - Welded Steel Pipe (NPS 4 and Over)	A 139
	<u>AWWA Standard</u>
Steel Water Pipe 6 Inches and Larger	C 200

3. FITTINGS

Fittings shall conform to the requirements for the types and kinds specified.

<u>Fittings</u>	<u>ASTM Specification</u>
Heat-Treated Carbon Steel Fittings for Low-Temperature and Corrosive Service	A 858
Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints	A 865

MATERIAL SPECIFICATION

571. SLIDE GATES

1. SCOPE

This specification covers the quality of metal slide gates for water control.

2. CLASS AND TYPE OF GATE

The class of gate will be expressed as a numerical symbol composed of the seating head and unseating head. The two numbers will be separated by a hyphen with the seating head listed first. For this purpose, the heads shall be expressed in terms of feet of water.

Gates shall be of the specified types as defined below:

Light Duty:

Type MLS-1 gates shall be cast iron with cast iron seat facings.

Type MLS-2 gates shall be fabricated metal gates.

Moderate Duty:

Type MMS-1 gates shall be cast iron with bronze seat facings, cast iron or galvanized structural steel guides, and galvanized steel, bronze, or stainless steel fasteners.

Type MMS-2 gates shall be cast iron with bronze seat facings, cast iron or stainless steel guides, and bronze or stainless steel fasteners. Guides and fasteners shall be stainless steel, when specified.

Heavy Duty:

Type MHS-1 gates shall have gray cast iron slides, frames, guides and yokes and shall be fitted with: (1) bronze seat facings, bronze wedges and wedge blocks or wedge seat facings, and bronze stem blocks or thrust nuts, (2) bronze or stainless steel fasteners, and (3) cold rolled steel stems, except that stems shall be stainless steel where so specified.

Type MHS-2 gates shall have gray cast iron slides, frame, guides, and yokes and shall be fitted with: (1) Stainless steel seat facings, wedges, wedge seat facings, stems and fasteners, and (2) austenitic cast iron stem blocks or thrust nuts.

Type MHS-3 gates shall have austenitic gray cast iron slides, frames, guides, and yokes and shall be fitted with: (1) nickel-copper alloy seat facings, wedges, wedge seat facings, stems and fasteners, and (2) austenitic cast iron stem blocks or thrust nuts.

3. QUALITY OF MATERIALS

Materials for slide gates and appurtenances shall conform to the requirements of the applicable specifications listed below for the alloy, grade, type, or class of material and the condition and finish appropriate to the structural and operational requirements.

<u>Material</u>	<u>ASTM Specification</u>
Cast iron and Gray cast iron	A 48, Class 30, or A 126, Class B
Austenitic cast iron	A 436
Structural steel shapes, plates, and bars	A 36
Cold rolled steel	A 108
Carbon steel bars	A 108 or A 575
Stainless steel	A 167, A 276, or A 582 Type 302, 303, 304, or 304L
Castings, nickel and nickel alloy	A 494
Carbon steel sheets and strips	A 569
Zinc-coated carbon steel sheets	A 653 or A 924
Bronze bar, rods, shapes	B 21 or B 98
Naval bronze	B 21
Phosphor bronze	B 103 or B 139
Manganese bronze	B 138 or B 584
Silicon bronze	B 98 or B 584
Cast bronze	B 584
Nickel-copper alloy plate, sheet, strip	B 127
Nickel-copper alloy rod or bar	B 164
Rubber for gaskets and seals	D 2000

Galvanizing (zinc coating) shall conform to the requirements of Material Specification 582.

4. FABRICATED METAL GATES (LIGHT DUTY GATES)

Fabricated metal gates shall be built to withstand the seating head expressed by the gate class designation. Unless otherwise specified, the gates shall be galvanized steel with flat-back frames.

5. CAST IRON GATES (LIGHT DUTY GATES)

The frame shall be cast iron of the specified type. The front face shall be machined to receive the gate guides.

The gate slide shall be cast iron and shall be fabricated to withstand the seating and unseating heads expressed by the gate class designation as defined in Section 2 of this specification.

Grooves shall be cast on the vertical sides of the slide to match the guide angles.

The gates guides shall be galvanized structural steel and shall be fabricated to withstand the total thrust of the gate slide due to water pressure and wedge action under maximum operating conditions.

Wedges and wedge seats shall have smooth bearing surfaces. Wedges may be cast as integral parts of the slide. Removable wedges and wedge seats shall be fastened to the slide, frame or guides by means of suitable studs, screws, or bolts and shall be firmly locked in place after final adjustment. Each interacting set of wedge and wedge seat shall be adjustable as needed to insure accurate and effective contact. Adjusting bolts or screws shall be bronze or galvanized steel.

Seat facings shall be machined to a smooth finish to insure proper watertight contact.

6. FRAME OR SEAT (MODERATE AND HEAVY DUTY GATES)

The frame shall be cast iron and of the specified type. The front face shall be machined to receive the gates guides and the rear face shall be machined as required to match the specified attaching means. For heavy-duty gates, a dovetailed groove shall be machined on the perimeter of the front face to receive the seat facing.

7. GATE SLIDE (MODERATE AND HEAVY DUTY GATES)

The gate slide shall be cast iron, rectangular in shape and shall have horizontal and vertical stiffening ribs of sufficient section to withstand the seating and unseating heads expressed by the gate class designation as defined in Section 2 of this

specification. For heavy-duty gates, a dovetailed groove shall be machined on the perimeter of the slide face to receive the seat facing.

Tongues shall be machined on the vertical sides of the slide along its entire height to match the guide grooves and angles with a maximum clearance of 1/16 inch for gates smaller than 54 inches by 54 inches, and 1/8 inch for larger gates.

A nut pocket with reinforcing ribs shall be integrally cast on the vertical centerline and above the horizontal centerline of the slide. The pocket shall be of a shape adequate to receive a flat-backed thrust nut or stem block and shall be built to withstand the opening and closing thrust of the stem.

8. GATE GUIDES (MODERATE AND HEAVY DUTY GATES)

The gate guides shall be built to withstand the total thrust of the gate slide due to water pressure and wedge action. The gate guides shall be cast iron for heavy-duty gates.

Grooves shall be machine-in cast iron guides to receive the tongue on the gate slide throughout the entire length of the guide.

The guides shall be of adequate length to retain a minimum of one-half the height of the gate slide when the gate is fully opened.

9. WEDGES AND WEDGE SEATS (MODERATE AND HEAVY DUTY GATES)

Pads for supporting wedges, wedge seats (or blocks) and wedge loops (or stirrups) shall be cast as integral parts of the gate frame, slide, or guides and shall be accurately machined to receive those parts.

Wedges and wedge seats shall have smooth bearing surfaces for moderate duty gates and shall have machine finish bearing surfaces for heavy-duty gates. Removable wedges may be cast as integral part of the slide for moderate duty gates. Wedges shall be fastened to the gate slide, frame or guides by means of suitable studs, screws, or bolts and shall be firmly locked in place after final adjustment. Each interacting set of wedge and wedge seat shall be adjustable as needed to insure accurate and effective contact.

10. SEAT FACING

Moderate Duty Gates - Seat facings shall be machined to a smooth finish to insure proper watertight contact. Bronze facings shall be securely attached by welding or by other approved methods.

Heavy Duty Gates - Seat facings shall be pressed or impacted into the machined dove tailed grooves on the gate slide and frame and machined to a smooth finish to insure proper watertight contact.

11. YOKE

When a self-contained gate is specified, the yoke shall be of such design as to withstand the loads resulting from normal operation of the gate. For moderate and heavy duty gates, cast iron yokes shall be provided with machined pads for connecting to the ends of gates guides and to receive the stem thrust cap or handwheel lift.

12. FLUSH BOTTOM SEAL (HEAVY DUTY GATE)

When a flush bottom sealing gates is specified, a solid, square-corner type rubber seal shall be provided at the bottom of the gate opening. It shall be securely attached either to the bottom of the slide or to the frame. Metal surfaces bearing on the rubber seal shall be smooth and rounded as necessary to prevent cutting of the seal during gate operation.

13. GATE STEM AND LIFT (OR HOIST)

The gate stem and lift/hoist shall be of the specified type, size and capacity and, if hand operated, shall be capable of moving the gate slide under normal conditions, following unseating from the wedging device, with a pull on the handwheel or crank of not more than 25 pounds with the specified seating and/or unseating head of water against the gate.

Unless otherwise specified, the stem shall be carbon steel and shall be furnished in sections as necessary to permit reasonable ease in installation. Couplings shall be bolted, pinned, or keyed to the stem. The stem shall be furnished with rolled or machine-cut 29° Acme threads of sufficient length to completely open the gate. The threads shall be smooth and of uniform lead and cross-section, such that the nut can travel the full length without binding or excessive friction. For moderate and heavy-duty gates, the stem shall be threaded for connection to the stem block or thrust nut on the gate slide.

The lift shall be compatible with the type of stem furnished. Unless otherwise specified, the lift nut shall be cast bronze for light and moderate duty gates and cast manganese bronze for heavy duty gates and shall be fitted with ball or roller thrust bearings designed to withstand the normal thrust developed during opening and closing of the gate at the maximum operating heads. All gears, sprockets and pinions shall be machine-cut, with ratios and strength adequate to withstand expected operating loads. Sufficient grease fittings shall be provided to allow lubrication of all moving parts. An arrow and the word "open" shall be cast on the rim of the handwheel or on the lift housing to indicate the direction of gate opening. Unless otherwise specified, the lift for the non-rising-stem gate shall be provided with an indicator capable of showing both when the gate is fully open and when it is fully closed for the moderate and heavy-duty gates.

Provisions shall be made to prevent stem rotation within the stem block or thrust nut or at the connection the gate slide.

Stop collars shall be provided to prevent over-travel in opening and closing the gate.

14. STEM GUIDES

Unless otherwise specified, stem guides shall be cast iron for light duty gates and cast iron with bronze bushed collars for moderate and heavy-duty gates, and be fully adjustable in two directions.

15. WALL THIMBLE (MODERATE AND HEAVY DUTY GATES)

When a wall thimble is specified, it shall be of the same cast iron used in the gate frame and of the section, type, and depth specified. The front flange shall be machined to match the gate frame and drilled and tapped to accurately receive the gate attachment studs.

Gaskets or mastic to be installed between the thimble and the gate frame shall conform to the recommendations of the gate manufacturer and shall be furnished with the thimble.

16. FASTENERS

Unless otherwise specified, all anchor bolts and other fasteners shall be galvanized steel or bronze for light duty gates; galvanized steel or stainless steel or bronze for moderate duty gates; and, of the quality and size as recommended by the gate manufacturer for heavy duty gates. All anchor bolts, assembly bolts, screws, nuts, and other fasteners shall be of ample section to withstand the forces created by operation of the gate while subjected to the specified seating and unseating heads. Anchor bolts shall be furnished with two (2) nuts to facilitate installation.

17. INSTALLATION INSTRUCTIONS

Prior to installation, the Contractor shall provide to the Engineer the manufacturer's complete installation data, instructions for adjustments and drawings or templates showing the location of all anchor bolts for each gate.

18. PAINTING

When specified, gates and accessories shall be painted by the designated paint system.

19. CERTIFICATION

The supporting data submitted to the Engineer shall include the name of the manufacturer, the manufacturer's model number (for standard catalogue items) or the seating and unseating heads for which the gate is designed together with such drawings and specifications as may be necessary to show that the gate conforms to the requirements of this specification.

MATERIAL SPECIFICATION

572. FLAP GATES, METAL

1. SCOPE

This specification covers the quality of metal flap gates for water control.

2. CLASS AND TYPE OF GATE

The class of gate will be expressed as the numerical value of the seating head, which the gate must be built to withstand. For this purpose, the head shall be expressed in terms of feet of water measured to the center of the gate.

Gates shall be of the specified type as defined below:

Light Duty:

Type MLF-1 gates shall be cast iron or cast steel and shall be fitted with unbushed linkage systems and galvanized steel fasteners, or with bronze bushed linkage systems and bronze or stainless steel fasteners.

Moderate Duty:

Type MMF-1 gates shall be cast iron or cast steel and shall be fitted with bronze seat facings, bronze bushed linkage systems and bronze or stainless steel fasteners.

Heavy Duty:

Type MHF-1 gates shall have gray cast iron frames and flaps and shall be fitted with naval bronze seat facings, gray cast iron or high-strength bronze hinge arms, bronze bushings, bronze hinge pins, and bronze fasteners.

Type MHF-1R gates shall be the same as Type MHF-1 gates except that the frame shall be fitted with a rubber seat facing instead of a metal seat facing.

Type MHF-2 gates shall have gray cast iron frames and flaps and shall be fitted with stainless steel seat facings, gray cast iron or stainless steel hinge arms, and stainless steel bushings, hinge pins, and fasteners.

Type MHF-2R gates shall be the same as Type MHF-2 gates except that the frame shall be fitted with a rubber seat facing instead of a metal seat facing.

Type MHF-3 gates shall have austenitic gray cast iron frames, flaps and hinge arms and shall be fitted with nickel-copper alloy seat facings, bushings, hinge pins and fasteners.

Type MHF-3R gates shall be the same as Type MHF-3 except that the frame shall be fitted with a rubber seat facing instead of a metal seat facing.

3. QUALITY OF MATERIALS

Materials in flap gates and appurtenances shall conform to the requirements of the applicable specifications listed below for the alloy, grade, type, or class of material and the condition and finish appropriate to the structural and operational requirements:

<u>Materials</u>	<u>ASTM Specifications</u>
Cast iron and Gray cast iron	A 48, Class 30, or A 126, Class B
Cast Steel	A 27 or A 148
Structural steel shapes, plates, and bars	A 36
Carbon steel bars	A 108 or A 575
Stainless steel	A 167, A 276 or A 582 Type 302, 303, 304, or 304L
Austenitic gray cast iron	A 436
Castings, nickel and nickel-alloy	A 494
Carbon steel sheets & strips	A 569
Bronze bar, rods, shapes and Naval bronze	B 21 or B 98
Red Brass	B 43
Silicon bronze	B 98 or B 584
Phosphor bronze	B 103 or B 139
Manganese bronze	B 138 or B 584
Nickel-copper alloy plate, sheet, strip	B 127
Nickel-copper alloy rod, bar	B 164
Cast bronze	B 584
Rubber gaskets and seals	D 2000

4. FRAME

The frame shall be cast iron or cast steel for light and moderate duty gates and as specified for heavy-duty gates, and of the specified type. For moderate and heavy-duty gates, the rear face shall be machined as required to match the specified attaching means. For the heavy-duty gate, a groove shall be machined on the perimeter of the front face to receive the seat facing.

5. FLAP

For light and moderate duty gates, the flap shall be cast iron or cast steel and shall be built to withstand the seating head expressed by the gate class designation, as defined in Section 2 of this specification.

For heavy-duty gates, the flap shall be built to withstand the seating head expressed by the gate class designation, as defined in Section 2 of this specification. A groove shall be machined on the perimeter of the face to receive the seat facing.

6. LINKAGE SYSTEM

The linkage system by which the flap is mounted onto the frame shall be double-pivoted type for gates over eight (8) inches in diameter. It shall be designed to prevent the flap from folding inside of the seat and wedging in the open position. For the moderate heavy-duty gates, the top pivot shall be so designed as to allow adjustment of gate alignment and sensitivity.

7. SEAT FACINGS

Light Duty Gates - All facings shall be machined to a smooth finish to insure proper contact.

Moderate Duty Gates - Seat facings shall be securely attached by welding, or other approved means, and machined to a smooth finish to insure proper contact.

Heavy Duty Gates - Metal facings shall be pressed or impacted into machined dovetailed grooves on the flap and frame (or securely attached in the seat grooves by means of studs, set screws or other approved means) and machined to a smooth finish to insure proper contact. Rubber facings shall be pressed into a dovetailed groove in the frame.

8. WALL THIMBLE

For moderate and heavy-duty gates when a wall thimble is specified, it shall be of the same cast iron used in the gate frame and of the section, type, and depth specified. The front flange shall be machined to match the gate frame and drilled and tapped to accurately receive the gate attachment studs.

Gaskets or mastic to be installed between the thimble and the gate frame shall conform to the recommendations of the gate manufacturer and shall be furnished with the thimble.

9. GALVANIZING

Unless otherwise specified, cast steel and fabricated steel parts shall be galvanized in accordance with Material Specification [582](#).

10. PAINTING

When specified, gates and accessories shall be painted by the designated paint system.

11. INSTALLATION INSTRUCTIONS

The Contractor shall provide the Engineer with the manufacturer's complete installation data, instructions for adjustments, and drawings or templates showing the location of anchor bolts for each gate.

12. CERTIFICATION

The supporting data submitted to the Engineer shall include the name of the manufacturer, the manufacturer's model number (for standard catalogue items) or the seating head for which the gate is designed together with such drawings and specifications as may be necessary to show that the gate conforms to the requirements of this specification.

MATERIAL SPECIFICATION

573. RADIAL GATES

1. SCOPE

This specification covers the quality of radial (Tainter) gates for water control.

2. QUALITY OF MATERIALS

Materials in radial gates and appurtenances shall conform to the requirements of the applicable specifications listed below for the alloy, grade, type, or class of material and the condition and finish appropriate to the structural and operational requirements:

<u>Material</u>	<u>ASTM Specifications</u>
Cast iron	A 48, Class 30, or A 126, Class B
Cast steel	A 27 or A 148
Structural steel shapes, plates and bars	A 36
Carbon steel bars	A 108 or A 575
Stainless steel	A 167, A 276, or A 582 Type 302, 303, 304, or 304L
Zinc-coated steel sheets	A 653 or A 924
Bronze bar, rods, shapes	B 21 or B98
Cast Bronze	B 584

Galvanizing (zinc coating) shall conform to the requirements of Material Specification 582.

3. GATES

Unless otherwise specified, the gates shall be fabricated from structural steel with skin plates made of smooth or corrugated iron or steel sheets. They shall conform to the dimensions shown on the drawings and shall be built to withstand the specified head. The curvature of the skin plate shall be concentric with the pivot pins or trunnions. Gates shall be supplied with pin bearings, pins, hoist, galvanized hoisting cable and all anchor bolts. Unless otherwise specified, the pin bearings shall be cast iron and of the embedded type.

4. HOIST

Hoists shall be of the worm-gear type and shall be equipped with hand crank or be power operated as specified on the drawings. Hoists shall be furnished complete with all lubricants, anchor bolts and other appurtenances necessary for their installation and operation.

5. RUBBER SEALS

Each gate shall be fitted with rubber seals along the side and bottom edges of the gate face. The seals shall be of the belt type or "J" type, as specified, and shall be designed to bear on the walls and bottom of the structure or on rubbing plates and sills to insure a watertight fit when the gate is closed. When specified, a rubber seal shall also be provided at the top edge of the gate.

6. INSTALLATION INSTRUCTIONS

Prior to gate installation, the Contractor shall provide the Engineer with the manufacturer's complete installation data, instructions for adjustments and drawings or templates showing the location of anchor bolts and pin bearings for each gate.

7. PAINTING

Gates and accessories shall be galvanized or painted with the specified paint system.

8. CERTIFICATION

The supporting data submitted to the Engineer shall include the manufacturer's name and the hydraulic head for which the gate is designed together with such drawings and specifications as may be necessary to show that the gate conforms to the requirements of this specification.

MATERIAL SPECIFICATION

581. METAL

1. SCOPE

This specification covers the quality of steel and aluminum alloys.

2. STRUCTURAL STEEL

Structural steel shall conform to the requirements of ASTM A 36.

High-strength low-alloy structural steel shall conform to ASTM A 242 or A 588.

Carbon steel plates of structural quality to be bent, formed, or shaped cold shall conform the ASTM A 283, Grade C.

Carbon steel sheets of structural quality shall conform to ASTM Standard A 570, Grade D or A 611, Grade 40.

Carbon steel strip of structural quality shall conform to ASTM Standard A 570, Grade 36.

3. COMMERCIAL OR MERCHANT QUALITY STEEL

Commercial or merchant quality steel shall conform to the requirements of the applicable ASTM listed below:

<u>Product</u>	<u>ASTM Standards</u>
Carbon steel bars	A 575, Grade M 1015 to Grade M 1031
Carbon steel sheets	A 569
Carbon steel strips	A 569
Zinc-coated carbon steel sheets	A 653 or A 924

4. ALUMINUM ALLOY

Aluminum alloy products shall conform to the requirements of the applicable ASTM Standard listed below. Unless otherwise specified, alloy 6061-T6 shall be used.

<u>Product</u>	<u>ASTM Standards</u>
Standard Structural Shape	B 308
Extruded structural pipe and tube	B 429
Extruded bars, rods, shapes and tubes	B 221
Drawn seamless tubes	B 210
Rolled or cold-finished bars, rods and wire	B 211
Sheet and plate	B 209

5. BOLTS

Steel bolts shall conform to the requirements of ASTM Standard A 307. If high-strength bolts are specified, they shall conform to the requirements of ASTM A 325.

When galvanized or zinc-coated bolts are specified, the zinc coating shall conform to the requirements of ASTM Standard A 153; except that bolts 1/2 inch or less in diameter may be coated with electro-deposited zinc or cadmium coating conforming to the requirements of ASTM Standard B 633, Service Condition SC 3 or ASTM A 165, Type TS, unless otherwise specified.

6. RIVETS

Unless otherwise specified, steel rivets shall conform to the requirements of ASTM Specification A 502, Grade 1. Unless otherwise specified, aluminum alloy rivets shall be Alloy 606-T6 conforming to the requirements of ASTM Standard B 316.

7. WELDING ELECTRODES

Steel welding electrodes shall conform to the requirements of American Welding Society Specification AWS A5.1, "Specification for Mild Steel Covered Arc-Welding Electrodes," except that they shall be uniformly and heavily coated (not washed) and shall be of such a nature that the coating will not chip or peel while being used with the maximum amperage specified by the manufacturer.

Aluminum welding electrodes shall conform to the requirements of American Welding Society Specification AWS A5.10, "Specification for Aluminum and Aluminum-Alloy Welding Rods and Bare Electrodes."

MATERIAL SPECIFICATION

582. GALVANIZING

1. SCOPE

This specification covers the quality of zinc coatings applied to iron and steel productions.

2. QUALITY

Zinc coatings shall conform to the requirements of ASTM A 123 for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products or as otherwise specified in the items of work and construction details of the Construction Specification.

ASTM A 123 covers both fabricated and non-fabricated products e.g., assembled steel products, structural steel fabrications, large tubes already bent or welded before galvanizing, and wire work fabricated from non-coated steel wire. It also covers steel forgings and iron castings incorporated into pieces fabricated before galvanizing or which are too large to be centrifuged (or otherwise handled to remove excess galvanizing bath metal). Items to be centrifuged or otherwise handled to remove excess zinc shall meet the requirements of ASTM A 153, except: bolts, screws and other fasteners 1/2 - inch or less in diameter may be coated with electro-deposited zinc or cadmium coating conforming to the requirements of ASTM B 766, coating thickness Class 5, Type III or ASTM B 633, Service Condition SC-3 unless otherwise specified.

MATERIAL SPECIFICATION

583. COAL TAR-EPOXY PAINT

1. SCOPE

This specification covers the quality of a coal tar polyamide epoxy paint suitable for use on structural steel or concrete. Paint supplied meeting Paint Specification No. 16, Type 1, Class II, of the Steel Structures Painting Council will meet the requirements of this specification.

2. COMPOSITION AND PROCESSING

- a. Composition. The paint shall be a two-component system containing the pitch, filler and catalyst in one component and the resin in another. Each component of this paint based on the specified ingredients shall be uniform, stable in storage, and free from grit and coarse particles. The components shall contain the followings types and proportions of ingredients:

<u>Ingredient</u>	<u>COMPONENT A</u>		<u>COMPONENT A and B</u>
	<u>Percent by Weight Minimum</u>	<u>Maximum</u>	<u>Typical Composition Percent by Weight</u>
Coal Tar Pitch	33.0	36.0	28.2
Polyamide	11.0	12.0	9.5
Magnesium Silicate	30.0	33.0	25.8
Xylene	18.0	21.0	15.4
Gelling Agent and Activator	2.5	2.6	2.0
Catalyst (accelerator)	1.2	1.3	<u>1.1</u>
		Sub-Total	82.0
<u>COMPONENT B</u>			
Epoxy Resin (100% non-volatile)	100.0	----	<u>18.0</u>
		TOTAL	100.0

- b. Processing. Magnesium silicate and gelling agent shall be thoroughly dispersed in Component A by means of grinding equipment capable of developing substantial shear values. Gellant shall be mixed with an equal weight of magnesium silicate and then dampened by stirring-in all of the alcohol; the resultant mixture shall be added to and thoroughly dispersed into Component A. (The viscosity of Component A will be markedly influenced by the degree of dispersion of gellant and magnesium silicate.)

- c. Quality of Ingredients. Ingredient materials shall exhibit the following properties:

- (1) Coal Tar Pitch. Coal tar pitch is a product obtained from the distillation of high temperature crude coke oven tar, which in itself is a product obtained during the destructive distillation of coal in slot ovens operated at a

temperature above 700° C. Coal tar pitch shall have the following characteristics:

<u>Characteristic</u>	<u>Minimum</u>	<u>Maximum</u>
Softening point, in water, degree C (ASTM D 36)	70	75
Ash, percent by weight (ASTM D 2415)	--	0.5
Insolubles in carbon disulfide, percent by weight (ASTM D 4)	--	20
Volatiles, percent by weight Under 250° C	--	0.0
Under 300° C	--	5.0

- (2) Gellant The gellant or thixotropic-producing additive shall be an organic derivative of magnesium montorillonite or hydrogenated castor oil. It shall be a creamy white powder having a bulking value of 15 ± 0.2 pounds per gallon and water content of 3.0% maximum.
- (3) Activator The activator, if used, shall be methanol, ethanol, or propylene carbonate.
- (4) Catalyst The catalyst (accelerator) shall be 2, 4, 6 - tri (dimethylamino methyl) phenol.
- (5) Epoxy Resin Epoxy resin shall be a di-epoxide condensation product of bisphenol-A and epichlorohydrin with terminal epoxide group. It shall be clear, free of turbidity, crystals, and particulate matter with the following properties:

<u>Property</u>	<u>Requirements</u>	
	<u>Minimum</u>	<u>Maximum</u>
Non-volatile content (1-2 grams after 1 hour @ 105 ± 2°C), % by weight	99	--
Epoxide equivalent (ASTM D 1652)	180	200
Color, Gardner (ASTM D 1544)	--	5.0
Specific Gravity (ASTM D 1475)	1.15	1.18
Viscosity, Brookfield, Poises @ 25° C	100	160

- (6) Polyamide Resin. Polyamide resin shall be a condensation product of a dimerized fatty acid in polyamides. It shall be clear, free of turbidity and particulate matter with the following characteristics:

<u>Characteristic</u>	<u>Requirements</u>	
	<u>Minimum</u>	<u>Maximum</u>
Amine Value <u>1/</u>	330	360
Color, Gardner (ASTM D 1544)	--	9
Specific Gravity (ASTM D 1475)	0.96	0.98
Viscosity, Brookfield, Poises @ 25° C	7	9
Non-volatile Content, (1-2 grams after 1 hour/105 ± 2° C), percent by weight	97	--

1/ The amine value is defined as the milligrams of potassium hydroxide equivalent to the amine alkalinity potentiometric titration with standard perchloric acid according to the following method:

- A. Weigh the approximate amount of well mixed resin to give a titration in the range of 12 to 18 milliliters(ml) into a tared 200 ml berzelius tall form beaker on an analytical balance. Cover the beaker with aluminum foil to minimize contact with air.
- B. From a graduated cylinder, carefully add 90 ml of solvent (suitable solvents are nitrobenzene, propylene carbonate, or acetonitrile), insert a stirring bar, cover the beaker with aluminum foil, and stir on a magnetic stirrer to dissolve the sample. Add the solvent immediately after weighing the sample. A fume hood should be used for all operations.
- C. From a graduated cylinder, add 20 ml of glacial acetic acid to the sample solution and stir for several minutes.
- D. Immerse the electrodes into the sample solution, stir for two (2) minutes and titrate potentiometrically with 0.1 N perchloric acid using the millivolt scale. Record the millivolt reading every 0.1 ml. Plot a graph showing the millivolts against the titration. The endpoint is the midpoint of the inflection on the titration curve.
- E. Conduct a blank determination on 90 ml of the solvent and 20 ml of acetic acid. The blank need only be determined once for each lot of solvent used. on the majority of lots used, the blank has been found to be zero.
- F. Calculate the amine value using the following formula:

$$\text{AMINE VALUE} = \frac{(\text{sample Titration} - \text{Solvent Blank}) \times \text{Normality} \times 56.1}{\text{Weight of Sample}}$$

(7) Xylene Xylene shall conform to ASTM D 846.

(8) Magnesium Silicate Magnesium silicate shall conform to ASTM Standard D 605 "Magnesium Silicate Pigment (Talc)". When a dark red colored coating is specified, a dark red coating shall be furnished in 50% or more (by volume) of the magnesium silicate is replaced by synthetic red iron conforming to ASTM Standard D 3721. The red coating shall meet all of the test requirements prescribed for the black coating, except that the non-volatile content of Component A shall be an amount reflecting the greater specific gravity of the iron oxide pigment.

3. PHYSICAL REQUIREMENTS

When tested by the methods described in Section 4:

a. Component A shall exhibit the following properties:

- (1) Viscosity, Brookfield, @ 25° C poises 160 maximum
- (2) Non-volatile residue, percent by weight 77 minimum

b. The mixed paint shall exhibit the following properties:

- | | |
|---------------------------------|-----------|
| (1) Sag, 14 mil wet film | None |
| (2) Pot life at 24-27° C, hours | 4 Minimum |
- c. The cured film shall exhibit the following properties:
- | | |
|--|-----------------|
| (1) Penetration, 200 grams, 5 seconds, 25° C, hundredth centimeter units | 3 Maximum, |
| (2) Odor after 48 hours curing | Pass test |
| (3) Flexibility on 1/2 inch mandrel | Pass test |
| (4) Adhesion | No delamination |

4. TEST METHODS

a. Viscosity of Component A Fill a container having a minimum diameter of 3-inches, a minimum height of 3 3/4 inches, and a minimum depth of 3 inches with a representative sample of Component A. Set up a Model RVT or RVF-100 Brookfield Synochro-Electric Viscometer with a No. 7 spindle and with guard removed. Bring the sample to (and thereafter maintain) a temperature of 25° C and stir vigorously for two (2) minutes with a stiff spatula. Immediately after stirring, lower the viscometer, immersing the spindle until one-half (1/2) of the "neck" mark on the spindle is covered. Run the viscometer at 100 rpm for one (1) minute and record the pointer position on the dial. If the dial reading is 40 or less, the viscosity shall be considered to be 160 Poises or less. If the reading is

over 40, immediately start the motor and take additional readings at one (1) minute intervals. If one or more readings of 40 or less are obtained out of 10 readings, taken at 1-minute intervals, the viscosity of the material shall be considered to be with specification limits

- b. Non-volatile Content of Component A Place a stirrer (e.g., short length of stiff wire such as a partially-straightened paper clip) into a small disposable aluminum dish of about two (2) inches in diameter and weigh to the nearest 0.1 milligram. As rapidly as possible, place between 2 and 3 grams of Component A into the dish and weigh immediately to the nearest 0.1 milligram. After weighing, spread the material over the bottom of the dish. Heat the dish, wire, and contents in a well ventilated convection-type oven maintained at $105^{\circ}\text{C} \pm 2^{\circ}\text{C}$, for three (3) hours. After the material has been in the oven for a few minutes, and periodically thereafter, stir the material. Cool in a desiccator, weigh to the nearest 0.1 milligram, and calculate the percentage of non-volatile on a weight basis.
- c. Sag Test of Coal Tar-Epoxy Paint Prepare approximately 500 milliliters of the material by thoroughly mixing 100 ml of Component B into 400 ml of Component A. Determine its viscosity immediately after mixing, using the same procedure as for Component A above but employing a No. 5 spindle. If all of five (5) readings recorded at 1-minute intervals are above 50, reduce the viscosity by adding xylene in small increments until a reading not greater than 50 is obtained. Press a strip of 1-inch masking tape across the full width of a solvent-cleaned 3-inch by 6-inch cold-rolled steel panel. The tape should be parallel to and centered on the shorter axis of the panel. Within five (5) minutes after making the final check of viscosity, apply the material to the panel to a wet film thickness at least 14 mils as determined by an Interchemical wet film doctor blade having a gap of approximately 25 mils or by brush. Immediately after applying the material, carefully remove the masking tape and stand the panel in a vertical position (with the bare strip horizontal) in a draft-free, $24\text{-}27^{\circ}\text{C}$ location. Examine the panel after 4 hours. Sagging or running of the coating into the bare area shall constitute failure of the material to pass the sag test.
- d. Pot Life Test of Coal Tar-Epoxy Paint Mix 100 ml of Compound B into 400 ml of Component A with both components having a temperature of $24\text{-}27^{\circ}\text{C}$ before mixing. Pour the material at once into a pint metal can, seal tightly, and maintain at $24\text{-}27^{\circ}\text{C}$. Examine the material 4 hours after it was mixed.

For its pot life to be considered satisfactory, the mixed material must have remained in a fluid condition and, when thinned with no more than 100 ml of xylene, shall be lump-free and brushable.

- e. Penetration Test on Coal Tar-Epoxy Film Select and solvent spray-clean two 3-inch by 6-inch cold-rolled steel panels in accordance with ASTM D 609. Draw down in accordance with a coat of the paint prepared as described in 4.c. for the sag test. Allow the film to dry 18 to 24 hours in a horizontal position at $24\text{-}27^{\circ}\text{C}$ and at a relative humidity of not over 60%. Apply a second coat over and at right

angles to the first coat, using freshly mixed paint prepared identically to that used for the first coat. The draw down applicator(s) shall be such as to provide a total dry-film thickness for the two coats of 20-25 mils, and the coats shall be of approximately equal thickness. Allow the second coat to dry in a horizontal position for 120 hours at 24-27° C. After 120 hours of curing, and daily thereafter, clamp the panel into the table of a penetrometer (ASTM D 5) so that the needle is over an area which is within the prescribed thickness range (as measured by ASTM D 1186) and determine the penetration, using a total load of 200 grams applied for 5 seconds at 25° C. The average of the three lowest out of five penetration readings, all taken within a 1 centimeter square, shall not exceed 0.03 of a centimeter after 120 hours of curing.

- f. Odor of Dried Coal Tar-Epoxy Film Examine the paint film on one of the flexibility panels for odor after it has cured for 48-hours. The film shall be free of any odor except for a faint odor of xylene.
- g. Flexibility of Coal Tar-Epoxy Film Sand blast three (3) steel panels (similar to those used in the penetration test) at low pressure with a clean, 30 to 50 mesh, non-metallic abrasive until a uniform, gray-white surface, with well developed anchor pattern, is achieved. (Note: It may be necessary to blast both sides of panel, in stages, to avoid warping.) Blow off any dust with a clean air blast. Apply two (2) coats of paint as described in 4.e. for the penetration test. Allow the film to cure in the period equal to that required to reach a penetration of 0.03 centimeter on the penetration test panel, whichever occurs first. With the film side up, and in a time interval of approximately one (1) second, bend each of the flexibility panels double over a 1/2 inch diameter mandrel. Cracks in any of the panels visible to the naked eye shall constitute failure except that edge cracks extending no further than 1/2-inch or small local fissures emanating from air bubbles, craters, and similar imperfections shall be disregarded.
- h. Adhesion of Coal Tar-Epoxy Film Test the adhesion of the coating on an unbroken area of the flexibility panel with a sharp knife after the coating has cured for 120 hours. It shall strongly resist being removed from the metal. Also, test the intercoat adhesion of the film on a penetration panel after 120 hours curing, with a knife. Any delamination of the two (2) coats shall constitute failure.

MATERIAL SPECIFICATION

584. STRUCTURAL TIMBER AND LUMBER

1. SCOPE

The specification covers the quality of structural timber, lumber and plywood.

2. GRADING

Structural timber and lumber shall be graded in accordance with the grading rules and standards, applicable to the specified species, adopted by a lumber grading or inspection bureau or agency recognized as being competent and that conform to the basic principles of ASTM Standard D 245. The material supplied according to the commercial grading rules shall be of equal or greater stress value than the specified stress-grade.

3. QUALITY

All materials shall be sound wood free from decay and disease damage. Boxed heart pieces of Douglas fir or redwood shall not be used in stringers, floor beams, caps, posts, sills or other principal structural members. Boxed heart pieces are defined as timber so sawed that at any section in the length of a sawed piece the pith lies entirely inside the four faces.

4. HEARTWOOD REQUIREMENTS

All timber and lumber specified for use without preservative treatment shall contain a minimum of 75 percent heartwood on any diameter or on any side or edge, measured at the point where the greatest amount of sapwood occurs. This requirement shall not apply to timber and lumber for which pressure treatment with wood preservative is specified.

5. SIZES

The sizes specified are nominal sizes. Unless otherwise specified, the material shall be furnished in American Standard dressed sizes.

6. MARKING

Each piece of timber and lumber shall be legibly stamped or branded with an official grade identification. Plywood shall be legibly stamped with an official mark designating the grade, type and surface finish as described in the cited Product Standard.

MATERIAL SPECIFICATION

585. WOOD PRESERVATIVES AND TREATMENT

1. SCOPE

This specification covers the quality of wood preservatives and methods of treatment of wood products.

2. TREATING PRACTICES

Treating practices and sampling, inspection and test procedures shall conform to the requirements of ASTM D 1760, "Standard Specification for Pressure Treatment of Timber Products".

3. PRESERVATIVES

The wood shall be treated with the specified type of preservative. Wood preservatives shall conform to the requirements of the applicable specifications list in ASTM D 1760.

4. QUALITY OF TREATED MATERIALS

Treated lumber, timber, piles, poles, or posts shall be free from heat checks, water bursts, excessive checking, results of chafing or from any other damage or defects that would impair their usefulness or durability for the purpose intended. The use of "s" irons will not be permitted. Holes bored for tests shall be filled with tight fitting treated wood plugs.

5. MARKING

Each treated wood item delivered to the job site shall be marked as specified in ASTM D 1760, unless otherwise specified.

MATERIAL SPECIFICATION

591. FIELD FENCING MATERIALS

1. SCOPE

This specification provides the minimum quality requirements for the material used in the construction of field fences.

2. WIRE GAUGE

When the size of steel wire is designated by gage number, the diameter shall be as defined for U. S. Steel Wire Gage.

3. FENCING

Fencing materials shall conform to the requirements of ASTM A 121 for barbed wire, ASTM A 116 for woven wire, ASTM A 390 for poultry fence or netting, and ASTM A 854 for high-tensile wire. Barbed wire and woven wire shall be Class 3 zinc coated, unless otherwise specified. High-tensile wire shall have Type I zinc coating, unless otherwise specified.

4. STAYS, FASTENERS, AND TENSION WIRE

Stays and fasteners shall conform to the requirements of the appropriate ASTM for the fencing material specified, unless otherwise specified. Tension wires shall have a tensile strength not less than 58,000 pounds per square inch. Stays, fasteners and tension wire shall have Class 3 zinc coating as specified in ASTM A 641.

5. WOOD FENCE POSTS AND BRACES

Unless otherwise specified, wood posts shall be of black locust, red cedar, osage orange (Bois d'Arc), redwood, pressure treated pine or other wood of equal life and strength. At least half the diameter or diagonal dimension of red cedar or redwood posts shall be in heartwood. Pressure treatment shall conform to Material Specification [585, Wood Preservatives and Treatment](#). The posts shall be sound, new, and free from decay, with all limbs trimmed substantially flush with the body. All posts shall be substantially straight throughout their full length.

Wood braces shall be of wood material equal to or better than construction grade Douglas Fir. Wood braces shall be pressure treated in conformance with Material Specification 585.

6. STEEL FENCE POSTS AND BRACES

Steel fence posts and braces shall conform to the requirements of ASTM A 702 for steel fence posts and ASTM A 53 for bracing pipes. Posts with punched tabs for fastening the wires shall not be installed.

7. CONCRETE FENCE POSTS

Concrete fence posts shall be manufactured to the specified requirements of size, shape, and strength.

8. PANEL GATES

Panel gates shall be the specified types, sizes, and quality and shall include the necessary fittings required for installation. The fittings shall consist of not less than two hinges and one latch or galvanized chain for fastening. Latches shall be of such design that a padlock may be used for locking. All fittings shall not be of lesser quality than the gate manufacturer's standard.

9. WIRE GATES

Wire gates shall be the type shown on the drawings, constructed in accordance with specifications, at the locations, and to the dimensions shown on the drawings. The materials shall conform to the kinds, grades, and sizes specified for new fence, and shall include the necessary fittings and stays.

10. STAPLES

Staples required to secure the fence wire to wood posts shall be 9-gauge galvanized wire with a minimum length of 1-1/2 inches for soft woods and a minimum length of one (1) inch for close-grain hardwoods.

11. GALVANIZING

All iron and steel fencing materials, except as otherwise specified, shall be zinc coated by the hot dip process meeting the requirements of Material Specification [582](#), except that clips, bolts, and other small hardware may be protected by electro-deposited zinc or cadmium coating.

MATERIAL SPECIFICATION

592. GEOTEXTILE

1. SCOPE

This specification covers the quality of geotextiles.

2. GENERAL REQUIREMENTS

Fibers (threads and yarns) used in the manufacture of geotextile shall consist of synthetic polymers composed of a minimum of 85 percent by weight polypropylenes, polyesters, polyamides, polyethylene, polyolefins, or polyvinylidene-chlorides. They shall be formed into a stable network of filaments or yarns retaining dimensional stability relative to each other. The geotextile shall be free of defects and conform to the physical requirements contained in Tables 1 and 2. The geotextile shall be free of any chemical treatment or coating that significantly reduces its porosity. Fibers shall contain stabilizers and/or inhibitors to enhance resistance to ultraviolet light.

Thread used for factory or field sewing shall be of contrasting color to the fabric and made of high strength polypropylene, polyester, or polyamide thread. Thread shall be as resistant to ultraviolet light as the geotextile being sewn.

3. CLASSIFICATION

Geotextiles shall be classified based on the method used to place the threads or yarns forming the fabric. The geotextiles will be grouped into the types described below:

- a. Woven. Fabrics formed by the uniform and regular interweaving of the threads or yarns in two directions.

Woven fabrics shall be manufactured from monofilament yarn formed into a uniform pattern with distinct and measurable openings, retaining their position relative to each other. The edges of fabric shall be selvaged or otherwise finished to prevent the outer yarn from unraveling.

- b. Non-woven. Fabrics formed by a random placement of threads in a mat and bonded by heat-bonding, resin-bonding, or needle punching.

Non-woven fabrics shall be manufactured from individual fibers formed into a random pattern with distinct but variable small openings, retaining their position relative to each other when bonded by needle punching, heat, or resin bonding. The use of non-wovens, other than the needle-punched geotextiles, is somewhat restricted (see Note 3 of Table 2).

4. SAMPLING AND TESTING

The geotextile shall meet the specified requirements (Table 1 or 2) for the product style shown on the label. Product properties as listed in the latest edition of the "Specifiers Guide", Geotechnical Fabrics Report, ADDRESS: Industrial Fabrics

Association International, 1801 County Road BW, Roseville, MN 55113-4061; and that represents minimum average roll values, will be acceptable documentation that the product style meets the requirements of these specifications.

For products that do not appear in the above directory, or do not have minimum average roll values listed, typical test data from the identified production run of the geotextile will be required for each of the specified tests (Table 1 or 2) as covered under clause AGAR 452.236-76.

5. SHIPPING AND STORAGE

The geotextile shall be shipped/transported in rolls wrapped with a cover for protection from moisture, dust, dirt, debris, and ultraviolet light. The cover shall be maintained undisturbed to the maximum extent possible prior to placement.

Each roll of geotextile shall be labeled or tagged to clearly identify the brand, Class and the individual production run in accordance with ASTM D 4873.

TABLE 1
REQUIREMENTS FOR WOVEN GEOTEXTILES

Property	Test Method	Class I	Class II & III	Class IV
Tensile Strength (pounds) <u>1/</u>	ASTM D 4632 Grab Test	200 minimum in any principal direction	120 minimum in any principal direction	180 minimum in any principal direction
Bursting Strength (psi) <u>1/</u>	ASTM D 3786 Diaphragm Tester	400 minimum	300 minimum	NA
Elongation at Failure (percent) <u>1/</u>	ASTM D 4632 Grab Test	<50	<50	<50
Puncture (pounds) <u>1/</u>	ASTM D 4833	90 minimum	60 minimum	60 minimum
Ultraviolet Light (percent residual tensile strength)	ASTM D 4355 150-hours exposure	70 minimum	70 minimum	70 minimum
Apparent Opening Size (AOS)	ASTM D 4751	As specified or a minimum # 100 <u>2/</u>	As specified or a minimum # 100 <u>2/</u>	As specified or a minimum # 100 <u>2/</u>
Percent Open Area (percent)	CWO-02215-86	4.0 minimum	4.0 minimum	1.0 minimum
Permittivity sec ⁻¹	ASTM D 4491	0.10 minimum	0.10 minimum	0.10 minimum

1/ Minimum average roll value (weakest principal direction).

2/ U.S. Standard Sieve Size.

NOTE: CWO is a USACE reference.

TABLE 2
REQUIREMENTS FOR NON-WOVEN GEOTEXTILES

Property	Test Method	Class I	Class II	Class III	Class IV <u>3/</u>
Tensile Strength (pounds) <u>1/</u>	ASTM D 4632 Grab Test	180 minimum	120 minimum	90 minimum	115 minimum
Bursting Strength (psi) <u>1/</u>	ASTM D 3786 Diaphragm Tester	320 minimum	210 minimum	180 minimum	NA
Elongation at Failure (percent) <u>1/</u>	ASTM D 4632	≥50	≥50	≥50	≥50
Puncture (pounds) <u>1/</u>	ASTM D 4833	80 minimum	60 minimum	40 minimum	40 minimum
Ultraviolet Light (percent residual tensile strength)	ASTM D 4355 150-hours exposure	70 minimum	70 minimum	70 minimum	70 minimum
Apparent Opening Size (AOS)	ASTM D 4751	As specified or a maximum #40 <u>2/</u>	As specified or a maximum # 40 <u>2/</u>	As specified or a maximum # 40 <u>2/</u>	As specified or a maximum # 40 <u>2/</u>
Permittivity sec ⁻¹	ASTM D 4491	0.70 minimum	0.70 minimum	0.70 minimum	0.10 minimum

1/ Minimum average roll value (weakest principal direction).

2/ U.S. Standard Sieve Size.

3/ Heat-bonded or resin-bonded geotextile may be used for Class III and IV. They are particularly well suited for Class IV. Needle-punched geotextiles are required for all other classes.

MATERIAL SPECIFICATION

593. LIME

1. SCOPE

This material specification covers the quality of hydrated lime used in the treatment of clayey soils.

2. QUALITY

a. Hydrated Lime

- (1) Hydrated lime shall meet the following requirements when tested in accordance with ASTM C 25 or ASSHTO T 219.

Minimum available lime, reported as $\text{Ca}(\text{OH})_2$ = 90 percent.

Maximum carbon dioxide (as-received basis) = seven (7) percent.

- (2) The physical gradation of hydrated lime when tested in accordance with ASTM C 110 shall meet the requirements of ASTM C 977.

MATERIAL SPECIFICATION

594. HDPE AND LLDPE FLEXIBLE MEMBRANE LINER

1. SCOPE

This specification covers the quality of High Density Polyethylene (HDPE) and Low Linear Density Polyethylene (LLDPE) flexible liner, seams, gaskets, metal battens, embed channels, clamps, and sealant.

2. MATERIAL

Liner. The HDPE or LLDPE liner shall have a nominal thickness of 30 mils, 40 mils, or 60 mils as specified. The liner shall be manufactured to be suitable for use in either exposed or buried conditions. It shall conform to the requirements of this specification as shown in tables 594–1 through 594–4. It shall also meet the requirements of Construction Specification 97 and the requirements shown on the drawings.

Gaskets, metal battens, clamps, embed channels, and sealant. Gasket material shall be neoprene, closed cell medium, 0.25 inch thick, with adhesive on one side, or other gasket material as approved by the liner manufacturer. Metal battens shall be 0.25 inch thick by 2 inches wide stainless steel. Clamps shall be 0.5-inch-wide stainless steel. Embed channel shall have the same properties as the liner. Sealant shall be General Electric Silicone, RTV 103, or equivalent.

3. HDPE AND LLDPE LINER PROPERTIES

The HDPE or LLDPE liner shall be manufactured from virgin polymer material and shall meet the property values specified under tables 594–1 through 594–4 as applicable.

Table 594-1 Requirements for smooth HPDE liner

Property	Test methods	Requirements*		
		----- nominal thickness -----		
		30 mil	40 mil	60 mil
Density, g/cc	ASTM D 1505	0.940	0.940	0.940
Tensile properties	ASTM D 638			
yield stress, lb/in	(type IV at 2 in/min)	63	84	126
break stress, lb/in		114	152	228
yield elongation, %		12	12	12
break elongation, %		560	560	560
Tear resistance, lb	ASTM D 1004	21	28	42
Puncture resistance, lb	ASTM D 4833	54	72	108
Carbon black content, %	ASTM D 1603	2-3	2-3	2-3
Carbon black dispersion	ASTM D 5596	Cat 1-2	Cat 1-2	Cat 1-2
Seam properties	ASTM D 4437 (1 in wide at 2 in/min)			
shear strength, lb/in		60	80	120
peel strength, lb/in**		39/FTB	52/FTB	78/FTB

* All values, unless specified otherwise, are minimum average roll values as reported for the test method.

** Film tear bond: A failure of one of the bonded sheets by tearing prior to complete separation in the bonded area.

Table 594-2 Requirements for textured HDPE liner

Property	Test methods	Requirements*		
		30 mil	40 mil	60 mil
Density, g/cc	ASTM D 1505	0.940	0.940	0.940
Tensile Properties	ASTM D 638 (type IV at 2 in/min)			
yield stress, lb/in		63	84	126
break stress, lb/in		45	60	90
yield elongation, %		12	12	12
break elongation, %		100	100	100
Tear resistance, lb	ASTM D 1004	21	28	42
Puncture resistance, lb	ASTM D 4833	45	60	90
Carbon black content, %	ASTM D 1603	2 - 3	2 - 3	2 - 3
Carbon black dispersion	ASTM D 5596	Cat 1-2	Cat 1-2	Cat 1-2
Seam properties	ASTM D 4437 (1 in wide at 2 in/min)			
shear strength, lb/in		60	80	120
peel strength, lb/in**		39/FTB	52/FTB	78/FTB

* All values, unless specified otherwise, are minimum average roll values as reported by the specified test methods.

** Film tear bond: A failure of one of the bonded sheets by tearing prior to complete separation in the bonded area.

Table 594-3 Requirements for smooth LLDPE liner

Property	Test methods	Requirements*		
		30 mil	40 mil	60 mil
Density, g/cc	ASTM D 1505	0.915	0.915	0.915
Tensile properties	ASTM D 638 (type IV at 2 in/min)			
yield stress, lb/in		45	60	94
break stress, lb/in		128	170	255
yield elongation, %		13	13	13
break elongation, %		800	800	800
Tear resistance, lb	ASTM D 1004	17	22	33
Puncture resistance, lb	ASTM D 4833	51	68	102
Carbon black content, %	ASTM D 1603	2-3	2-3	2-3
Carbon black dispersion, %	ASTM D 5596	Cat 1-2	Cat 1-2	Cat 1-2
Seam properties	ASTM D 4437 (1 in wide at 2 in/min)			
shear strength, lb/in		44	58	90
peel strength, lb/in		37/FTB**	50/FTB	90/FTB

* All values, unless otherwise specified, are minimum average roll values as reported for each test method

** Film tear bond: A failure of one of the bonded sheets by tearing prior to complete separation in the bonded area.

Table 594-4 Requirements for textured LLDPE liner

Property	Test methods	Requirements*		
		30 mil	40 mil	60 mil
Density, g/cc	ASTM D 1505	0.915	0.915	0.915
Tensile properties	ASTM D 638 (type IV at 2 in/min)			
yield stress, lb/in		44	58	87
break stress, lb/in		60	80	120
yield elongation, %		13	13	13
break elongation, %		350	350	350
Tear resistance, lb	ASTM D 1004	17	23	35
Puncture resistance, lb	ASTM D 4833	51	68	102
Carbon black content, %	ASTM D 1603	2-3	2-3	2-3
Carbon black dispersion, %	ASTM D 5596	Cat 1-2	Cat 1-2	Cat 1-2
Seam properties	ASTM D 4437 (1 in wide at 2 in/min)			
shear strength, lb/in		40	53	79
peel strength, lb/in		33/FTB**	44/FTB	66/FTB

* All values, unless otherwise specified, are minimum average roll values as reported for each test method

** Film tear bond: A failure of one of the bonded sheets by tearing prior to complete separation in the bonded area.

MATERIAL SPECIFICATION

595. GEOSYNTHETIC CLAY LINER

1. SCOPE

This specification covers the quality of geosynthetic clay liner (GCL) material and workmanship.

2. GENERAL REQUIREMENTS

The GCL is composed of a layer of high shrink-swell sodium bentonite sandwiched between a layer of 6 ounces per square yard nonwoven polypropylene geotextile and a layer of 3.2 ounces per square yard woven geotextile. The GCL material shall be manufactured by one of the following processes:

- a. Needle punched process by which the bentonite is encapsulated between the geotextile layers by a mechanical bonding process without the use of any chemical binders or adhesive, or
- b. Lock stitched to provide internal shear strength and the integrity and consistency to the thickness and unit weight of the material.

The bentonite shall have the following base properties:

- a. A minimum of 0.75 pound per square foot of high shrink/swell sodium bentonite at 12 percent moisture. If the liner material is manufactured at higher moisture content, it shall still meet the above requirements when adjusted to the 12 percent moisture level.
- b. Swell index—minimum 24 ml per 2 grams.
- c. Fluid loss—maximum 18 ml

The GCL shall have an index flux value no larger than 1×10^{-8} m/s

3. PACKAGING AND LABELING

All material shall be packaged in individual rolls of a minimum of 3.65 meters wide and with at least 30.5 meters in length on the roll. All rolls shall be labeled and in a wrapping that is resistant to UV light deterioration. The labels on each roll shall identify the length and width of the roll, the manufacturer, the product, lot number, and the roll number.

4. TESTING AND QUALITY CONTROL

The following tests shall be performed and the results certified by the manufacturer:

Swell index	ASTM D 5890
Fluid loss	ASTM D 5891
Bentonite mass/unit area	ASTM D 5993
Index flux	ASTM D 5887
Mass/unit area, geotextile	ASTM D 3776

5. INSPECTION AND MAINTENANCE

No liner material shall be accepted for placement in the permanent works that has not been certified by the manufacturer as meeting all specified requirements. No liner material shall be accepted that exhibits any visible defects. The liner material shall be subject to quality assurance testing at any time before and during installation.

MATERIAL SPECIFICATION

800. PAPER AND PLASTIC NETTING

1. SCOPE

This specification covers the quality of paper netting, plastic netting, and staples.

2. PAPER NETTING

Paper netting shall be made of tight twisted, paper yarn, plain woven and shall be furnished in rolls and meet the following minimum requirements:

- a. Width - minimum 45 inches, + or -1 inch from manufacturer's rated width.
- b. Spacing between strands shall be approximately 1/2 to 1 inch by 2 inches.
- c. Selvage edges shall be reinforced with polypropylene filament.
- d. Weight shall average 8.8 pounds per 100 square yards with a tolerance of + or - 5%.
- e. All material shall be new and unused, and the length and weight shall be marked on each roll.

3. PLASTIC NETTING

Plastic netting shall be made of extruded polypropylene (plastic) and shall be furnished in rolls and shall meet the following minimum requirements:

- a. Width - Minimum 48 inches, + or - 1 inch from manufacturer's rated width.
- b. Spacing between strands shall be approximately 1 x 2 inches.
- c. Weight shall average 2.4 pounds per 100 square yards with a tolerance of + or - 5%.
- d. All material shall be new and unused and the length and weight shall be marked on each roll.

4. STAPLES

"U" shaped wire staples of 0.12 inch in diameter (No. 11 wire gage) or greater, with a minimum leg length of 6 inches and a minimum crown of 1 inch shall be used. In sandy soils the minimum leg length of staples shall be 9 inches.

MATERIAL SPECIFICATION

801. JUTE NETTING

1. SCOPE

This specification covers the quality of jute netting and staples.

2. JUTE NETTING

Jute netting shall be of a uniform, open, plain weave, undyed and unbleached single jute yarn. The yard shall be of loosely twisted construction and shall not vary in thickness by more than one-half its normal diameter. Jute netting shall be furnished in rolls and shall meet the following minimum requirements:

- a. Width - Minimum 48 inches, + or - 1 inch from manufacturer's rated width.
- b. Seventy-eight warp ends per 4 feet of width.
- c. Forty-one weft ends per yard.
- d. Weight shall average 1.22 pounds per linear yard (based on 48 inch width) with a tolerance of + or - 5%.
- e. All material shall be new and unused, and the length shall be marked on each roll.

3. STAPLES

"U" shaped wire staples of 0.12 inch in diameter (No. 11 wire gage) or greater, with a minimum leg length of 6 inches and minimum crown of 1 inch shall be used. In sandy soils the minimum leg length of staples shall be 9 inches.

MATERIAL SPECIFICATION

802. EXCELSIOR BLANKETS

1. SCOPE

This specification covers the quality of excelsior blankets and staples.

2. EXCELSIOR EROSION CONTROL BLANKETS

The blanket shall consist of a machine produced mat of curled wood excelsior and shall be furnished in rolls and meet the following minimum requirements:

- a. Width - 48 inches, + or - 1 inch.
- b. Length - approximately 180 feet.
- c. Weight - 0.8 lbs. per square yard, + or - 10%.
- d. Fiber length - 80% shall be 6 inches or longer.
- e. Fiber dimension - 0.021 inch x 0.042 inch, + or - 25%.
- f. The top of each blanket shall be covered with 1 x 2 inch extruded plastic mesh.
- g. Blankets shall be smolder resistant and shall meet the test of no-flame or smolder for more than a distance of 12 inches from a spot where a lighted cigarette is placed on the blanket's surface.
- h. All material shall be new and unused and the length shall be marked on each roll.

3. STAPLES

"U" shaped wire staples of 0.12 inch in diameter (No. 11 wire gage) or greater, with a minimum leg length of 6 inches and minimum crown of 1 inch shall be used. In sandy soils the minimum leg length of staples shall be 9 inches.

MATERIAL SPECIFICATION

803. STRAW BLANKETS

1. SCOPE

This specification covers the quality of straw blankets and staples.

2. STRAW EROSION CONTROL BLANKET

The blanket shall consist of a machine produced mat of straw or combination of straw and coconut fiber and shall be furnished in rolls and meet the following minimum requirements:

- a. Width - 66 inches, + or - 1 inch.
- b. Length - 83.5 feet.
- c. Weight - 0.75 lbs. per sq. yd., + or - 10%.
- d. Material - not less than 70 percent straw.
- e. The blanket shall be bound with a biodegradable cotton thread.
- f. The top of each blanket shall be covered with a photodegradable netting.
- g. All material shall be new and unused and the length shall be marked on each roll.

3. STAPLES

"U" shaped wire staples of 0.12 inch in diameter (No. 11 wire gage) or greater, with minimum leg length of 6 inches and minimum crown of 1 inch shall be used. In sandy soils the minimum leg length of staples shall be 9 inches.

MATERIAL SPECIFICATION

804. MATERIAL FOR TOPSOILING

1. SCOPE

This specification covers the quality of material for use in topsoiling.

The site shall be explored to determine if sufficient surface soil of good quality exists to justify stripping. Stripping of topsoil from areas where it will later be reapplied is not recommended if bedrock or other root limiting layer is within a depth of 20 inches.

2. QUALITY

Topsoil shall be friable and loamy (loam, sandy loam, silt loam, sandy clay loam, or clay loam). Sand content shall generally be less than 70% by weight, and clay content shall generally be less than 35% by weight.

Organic soils, such as peat or muck, shall not be used as topsoil material.

Organic matter content shall be not less than 1.5% by weight.

pH shall be within the range 6.0 to 7.5. If pH is less than 6.0, lime shall be added in accordance with soil test results or in accordance with the recommendations of the vegetative establishment practice being used.

Soluble salts shall not exceed 500 ppm. (Natural soils in Illinois rarely exceed this parameter.)

Sodium adsorption ratio shall be less than 12. (Natural soils in the northern one-half of Illinois rarely exceed this parameter.)

It shall be free of debris, trash, stumps, rocks, and noxious weeds, and shall give evidence of being able to support healthy vegetation. It shall contain no substance that is potentially toxic to plant growth.

The material meeting the above qualifications should be at least 2 inches thick. Soil factors such as rock fragments, slope, depth to water table, and layer thickness affect the ease of excavation and spreading of topsoil.

Generally, the upper part of the soil profile, which is richest in organic matter, is most desirable; however, material excavated from deeper layers may be worth storing if it meets the other criteria listed above.

SECTION 7 - STANDARD DRAWINGS

INTRODUCTION

This section contains standard drawings to be used with the construction and material specifications. Together with the specifications many jobs can be designed and constructed without a large engineering input. Standard drawings are intended for small jobs and usually have limits to avoid situations that require more detailed engineering design.

Many of the standard drawings require additional information before use. Practice dimensions often vary with site features. The dimensions and labels to make the drawings match the requirements imposed by site conditions should be included on the provided blanks in the drawings where appropriate.

The standard drawings dated before January 1999 were created using VersaCad Version 6.0 Software. New and revised drawings since January 1999 were created using AutoCad version 14, AutoCad LT 97, and AutoCAD 2000 software. All of the standard drawings created in versions prior to AutoCAD 2000 have been converted to AutoCAD 2000 (.dwg) format. This conversion from VersaCad to AutoCAD 2000 format resulted in some loss of information. Every effort has been made to rectify these discrepancies, but some caution is recommended to ensure that the drawings contain the required information before use.

All references to IDOT in the standard drawings refer to the *Illinois Department of Transportation Standard Specifications for Road and Bridge Construction*, Adopted January 1, 2002. The standard drawings use an 'RR' designation in place of a gradation number. Assume the 'RR' to be synonymous with 'Gradation'.

All of the drawings are available in the DXF format. This will allow conversion of the drawings into most CAD systems. For non-AutoCAD users, the drawings are also available in DWF and PDF format. DWF files can be viewed and printed by downloading Autodesk WHIP! software. PDF files can be viewed and printed by downloading Adobe Acrobat software. Using WHIP! software with the DWF files is the preferred method for obtaining electronic versions of the standard drawings for non-AutoCAD users because it preserves many of the AutoCAD features, such as layer control and cursor location.

This section was revised in December 2002.

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LIST OF STANDARD DRAWINGS

(Alphabetical)

<u>Drawing Name</u>	<u>Number</u>
Bridge Scour Protection	IL-700
CMP Drop Inlet and Baffle	IL-578 (3 sheets)
CMP Water Control Structure	IL-594 (2 sheets)
Construction Road Stabilization	IL-506
Corrugated Metal Pipe Diaphragm	IL-579 (2 sheets)
Corrugated Metal Pipe Support	IL-586 (2 sheets)
Coupling Band for Corrugated Metal Pipe	IL-580 (2 sheets)
Culvert Flared End Section	IL-545 (2 sheets)
Culvert Inlet Protection - Silt Fence	IL-508SF
Culvert Inlet Protection - Stone	IL-508ST
Detail for PVC Canopy Inlet	IL-592
Diversion Plan	IL-515
Drain Details for Ponds with CMP Risers Using 8", 10", and 12" Valves	IL-121
Drop Inlet Structure Plan	IL-583 (2 sheets)
Dry Fire Hydrant Details	IL-120 (2 sheets)
Earth Dam Structure Plan	IL-585 (2 sheets)
Erosion Blanket Plan	IL-530 (2 sheets)
Fabric Checks for Waterways	IL-542 (2 sheets)
Filter Strip - Grassed	IL-535
Flexible Antiseep Collar	IL-593
Headwall & Safety Guard for Pipe Risers	IL-576 (2 sheets)
Hood Inlet Structure Plan	IL-584 (2 sheets)
Hood Inlet with Baffle for CMP	IL-577 (2 sheets)
Infiltration Trench	IL-547
Inlet for Underground Outlet - Metal	IL-543 (2 sheets)
Inlet for Underground Outlet - Plastic	IL-544 (2 sheets)
Inlet Protection - Block and Gravel Plan	IL-550
Inlet Protection - Excavated Drain Plan	IL-555
Inlet Protection - Fabric Drop Plan	IL-560
Inlet Protection - Gravel & Wire Mesh Plan	IL-561
Inlet Protection - Sod Filter Plan	IL-562
Inlet Protection - Straw Bale Barrier Plan	IL-563
Level Spreader	IL-570 (2 sheets)
Paved Flume	IL-567
Pipe Outlet to Channel	IL-611
Pipe Outlet to Flat Area	IL-610
Planting Procedure for Balled and Burlapped or Container Grown Trees and Shrubs	IL-685
Planting Procedure for Shrubs	IL-689
Portable Sediment Tank Plan	IL-595
Right-of-Way Diversion Plan	IL-600
Rock Check Dam - Coarse Aggregate	IL-605CA
Rock Check Dam - Riprap	IL-605R

LIST OF STANDARD DRAWINGS cont.

(Alphabetical)

<u>Drawing Name</u>	<u>Number</u>
Rock Checks for Waterways	IL-541 (2 sheets)
Sediment Basin Dewatering Device	IL-615
Silt Fence Plan	IL-620 (2 sheets)
Silt Fence with Wire Support Plan	IL-620W (2 sheets)
Stabilized Construction Entrance Plan	IL-630 (2 sheets)
Straw Bale Barrier Plan	IL-635
Structural Streambank Stabilization - Gabions Assembly and Lacing Details	IL-645
Structural Streambank Stabilization - Gabions 1 Basket High with Slope Mat	IL-646
Structural Streambank Stabilization - Gabions 2 Baskets High with Mat	IL-642
Structural Streambank Stabilization - Gabions 2 Baskets High w/o Mat	IL-641
Structural Streambank Stabilization - Gabions 3 Baskets High with Mat	IL-644
Structural Streambank Stabilization - Gabions 3 Baskets High w/o Mat	IL-643
Structural Streambank Stabilization - Riprap	IL-640
Sump Pit Plan	IL-650
Temporary Diversion Plan	IL-655
Temporary Sediment Trap	IL-660
Temporary Slope Drain Plan	IL-670
Temporary Stream Crossing Plan	IL-675
Temporary Rock Swale Plan	IL-680R
Temporary Vegetated Swale Plan	IL-680V
Three Guy Method - Trees Over 8'	IL-688
Timber Prop for 18" - 30" Dia. CMP	IL-581
Timber Prop for 36" - 48" Dia. CMP	IL-582
Trash Racks for Hooded Inlet	IL-591
Trash Racks for Pipe Drop Inlet	IL-590 (2 sheets)
Tree and Shrub Planting Site Plan	IL-686 (2 sheets)
Tree Protection - Fencing	IL-690
Two Guy Method - Trees Under 8'	IL-687
Vegetative Streambank Stabilization - Details	IL-696
Vegetative Streambank Stabilization Site Plan	IL-695 (3 sheets)
Waterway Plan (Parabolic)	IL-540P
Waterway Plan (Trapezoidal)	IL-540T
Waterway Plan (V Bottom)	IL-540V

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LIST OF STANDARD DRAWINGS

(Numerical)

<u>Drawing Name</u>	<u>Number</u>
Dry Fire Hydrant Details	IL-120 (2 sheets)
Drain Details for Ponds with CMP Risers Using 8", 10", and 12" Valves	IL-121
Construction Road Stabilization	IL-506
Culvert Inlet Protection - Silt Fence	IL-508SF
Culvert Inlet Protection - Stone	IL-508ST
Diversion Plan	IL-515
Erosion Blanket Plan	IL-530 (2 sheets)
Filter Strip - Grassed	IL-535
Waterway Plan (Parabolic)	IL-540P
Waterway Plan (Trapezoidal)	IL-540T
Waterway Plan (V Bottom)	IL-540V
Rock Checks for Waterways	IL-541 (2 sheets)
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Inlet for Underground Outlet - Metal	IL-543 (2 sheets)
Inlet for Underground Outlet - Plastic	IL-544 (2 sheets)
Culvert Flared End Section	IL-545 (2 sheets)
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Inlet Protection - Excavated Drain Plan	IL-555
Inlet Protection - Fabric Drop Plan	IL-560
Inlet Protection - Gravel & Wire Mesh Plan	IL-561
Inlet Protection - Sod Filter Plan	IL-562
Inlet Protection - Straw Bale Barrier Plan	IL-563
Paved Flume	IL-567
Level Spreader	IL-570 (2 sheets)
Headwall & Safety Guard for Pipe Risers	IL-576 (2 sheets)
Hood Inlet with Baffle for CMP	IL-577 (2 sheets)
CMP Drop Inlet and Baffle	IL-578 (3 sheets)
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Drop Inlet Structure Plan	IL-583 (2 sheets)
Hood Inlet Structure Plan	IL-584 (2 sheets)
Earth Dam Structure Plan	IL-585 (2 sheets)
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Detail for PVC Canopy Inlet	IL-592
Flexible Antiseep Collar	IL-593
CMP Water Control Structure	IL-594 (2 sheets)
Portable Sediment Tank Plan	IL-595
Right-of-Way Diversion Plan	IL-600

LIST OF STANDARD DRAWINGS cont.
(Numerical)

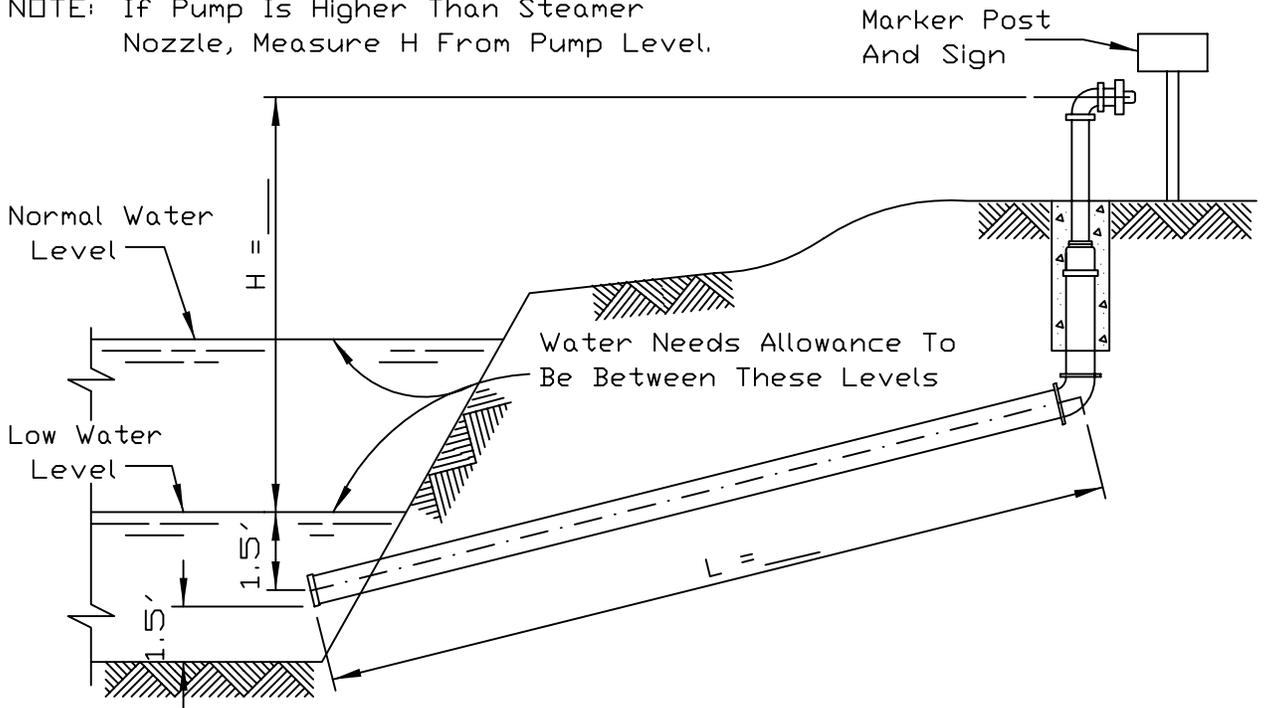
<u>Drawing Name</u>	<u>Number</u>
Rock Check Dam - Coarse Aggregate	IL-605CA
Rock Check Dam - Riprap	IL-605R
Pipe Outlet to Flat Area	IL-610
Pipe Outlet to Channel	IL-611
Sediment Basin Dewatering Device	IL-615
Silt Fence Plan	IL-620 (2 sheets)
Silt Fence with Wire Support Plan	IL-620W (2 sheets)
Stabilized Construction Entrance Plan	IL-630 (2 sheets)
Straw Bale Barrier Plan	IL-635
Structural Streambank Stabilization - Riprap	IL-640
Structural Streambank Stabilization - Gabions 2 Baskets High w/o Mat	IL-641
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Structural Streambank Stabilization - Gabions 3 Baskets High w/o Mat	IL-643
Structural Streambank Stabilization - Gabions 3 Baskets High with Mat	IL-644
Structural Streambank Stabilization - Gabions Assembly and Lacing Details	IL-645
Structural Streambank Stabilization - Gabions 1 Basket High with Slope Mat	IL-646
Sump Pit Plan	IL-650
Temporary Diversion Plan	IL-655
Temporary Sediment Trap	IL-660
Temporary Slope Drain Plan	IL-670
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Tree and Shrub Planting Site Plan	IL-686 (2 sheets)
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Three Guy Method - Trees Over 8'	IL-688
Planting Procedure for Shrubs	IL-689
Tree Protection - Fencing	IL-690
Vegetative Streambank Stabilization Site Plan	IL-695 (3 sheets)
Vegetative Streambank Stabilization - Details	IL-696
Bridge Scour Protection	IL-700

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DRY FIRE HYDRANT - DETAILS

NOTE: If Pump Is Higher Than Steamer Nozzle, Measure H From Pump Level.



PROFILE OF INSTALLATION

CALCULATING REQUIRED LIFT

TOTAL REQUIRED LIFT =
 HEAD LOSS IN HYDRANT, + HEAD LOSS IN INTAKE + STATIC LIFT (H)
 FITTINGS AND GUARD PIPE (HL)

USING 500 GALLONS/MIN.

$$\text{TOTAL REQUIRED LIFT} = 7.6' + \frac{L \times \text{HL}}{100} + H = 7.6' + \underline{\quad} + \underline{\quad} = \underline{\quad}$$

USING 250 GALLONS/MIN.

$$\text{TOTAL REQUIRED LIFT} = 1.9' + \frac{L \times \text{HL}}{100} + H = 1.9' + \underline{\quad} + \underline{\quad} = \underline{\quad}$$

ILLINOIS	
Altitude (Feet)	Allowable Lift (Feet)
300	22.7
1,000	22.0
1,300	21.8

HEAD LOSS IN FEET (HL)		
Gallons Per Minute	Plastic Pipe	Smooth Steel Pipe
500	2.3	5.3
250	0.6	1.3

NOTE: Total required lift value not to exceed value obtained from table of allowable lifts (above).

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



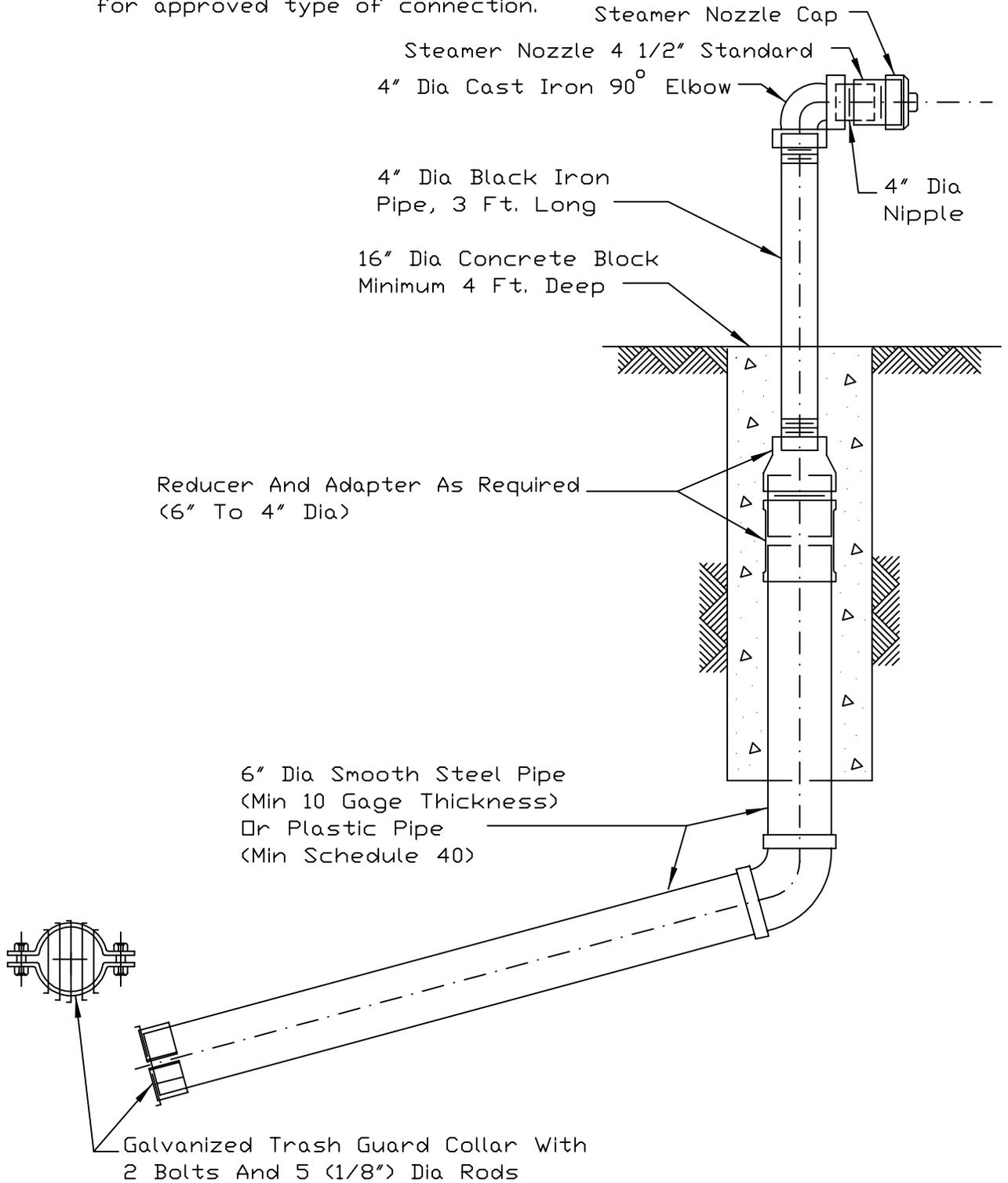
NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
 IL-120
 SHEET 1 OF 2
 DATE 9-29-94

DRY FIRE HYDRANT - DETAILS

NOTE: Check with local Fire Department
for approved type of connection.



DETAIL OF HYDRANT

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

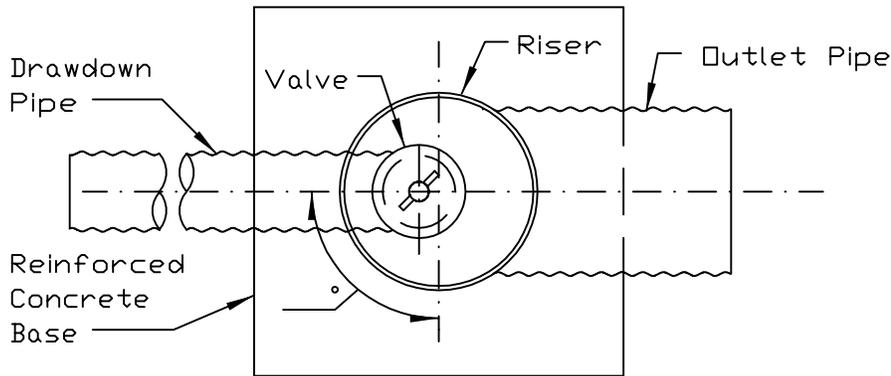


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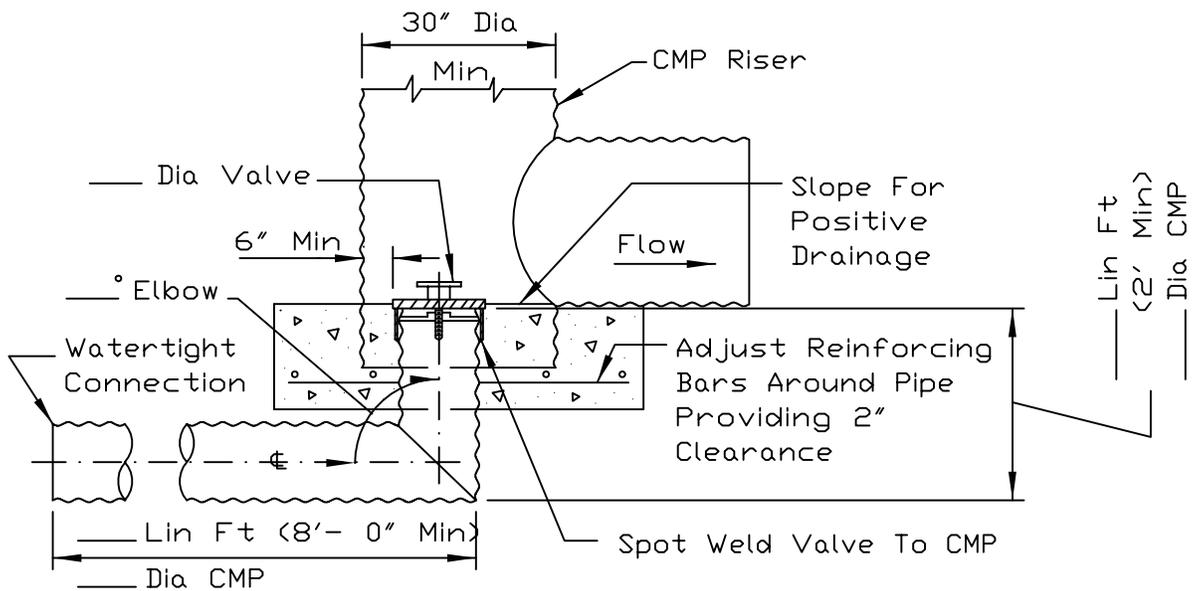
Natural Resources Conservation Service

STANDARD DWG. NO.
IL-120
SHEET 2 OF 2
DATE 9-29-94

DRAIN DETAILS FOR PONDS WITH CMP RISERS USING 8", 10" & 12" VALVES

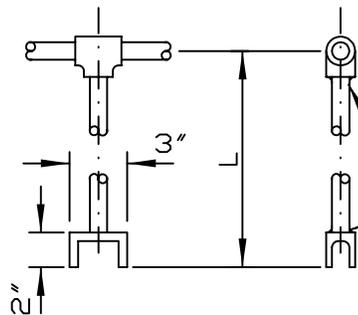


PLAN



SECTION ON CENTERLINE

NOTE:
Dimension "L"
Equals Distance
From Valve To
Top Of Trash
Rack Plus 4".



NOTE:
Use Alfalfa Valve Similar
To Thompsons Alfalfa Valve
Or Waterman's Type 3 Alfalfa
Frame And Valve, With Frame
Welded To Drawdown Pipe As
Shown.

1/8 Fillet Weld All Around

Fabricate From 3/4" Pipe And 1/4" x 2" Strap Iron

VALVE WRENCH DETAIL

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

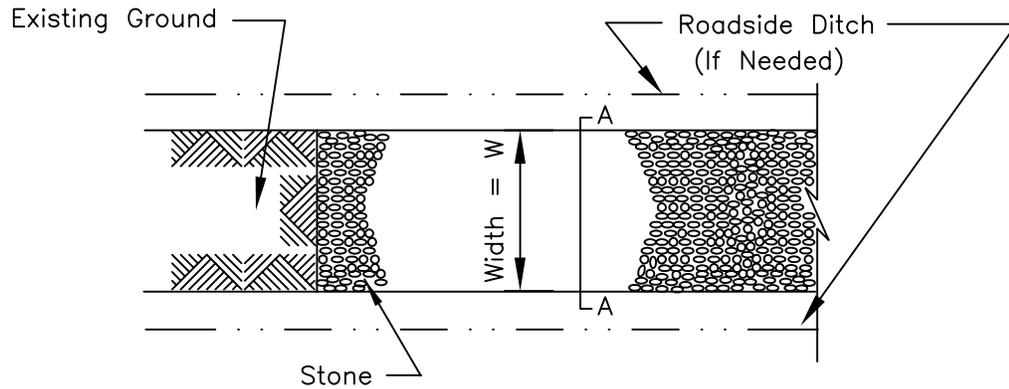


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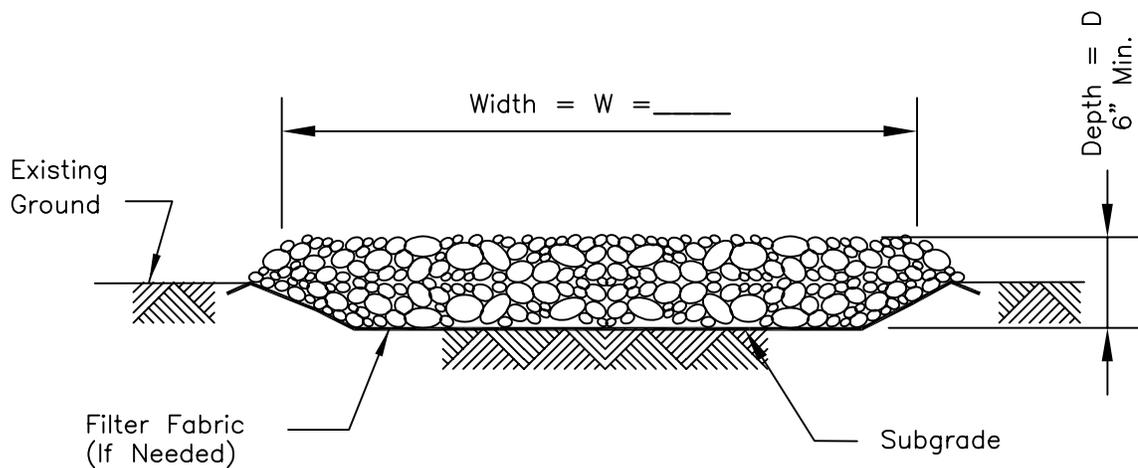
Natural Resources Conservation Service

STANDARD DWG. NO.	IL-121
SHEET	1 OF 1
DATE	3-1-95

CONSTRUCTION ROAD STABILIZATION



PLAN VIEW



SECTION A-A

NOTES:

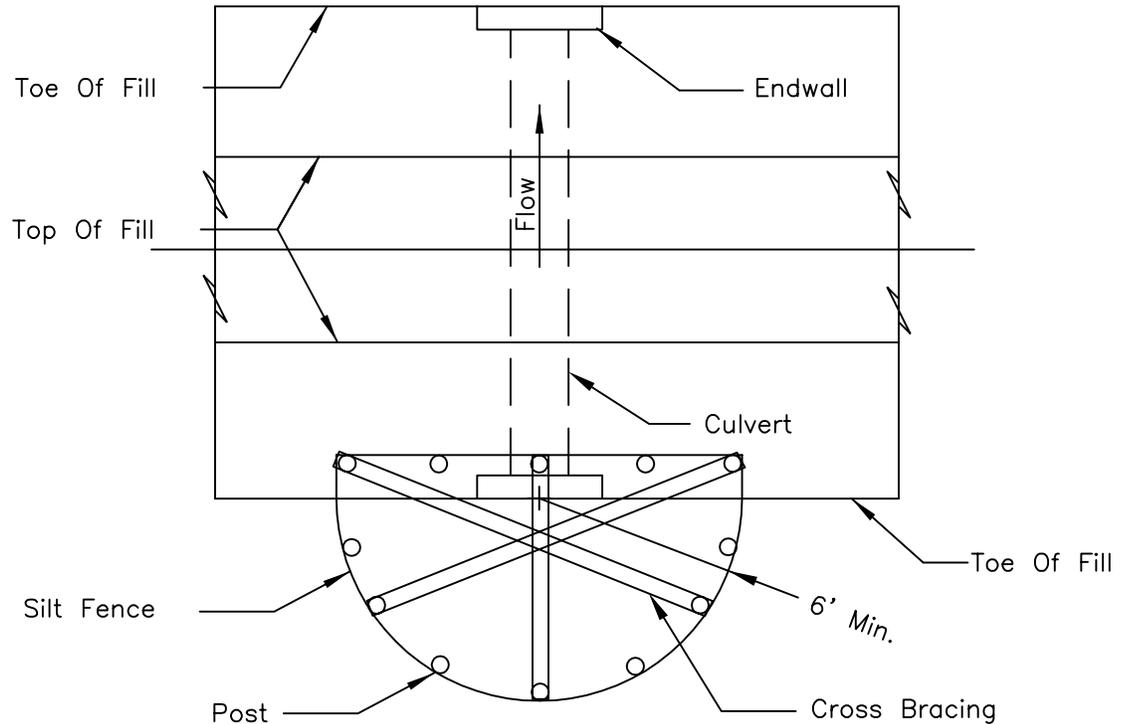
1. Filter fabric shall meet the requirements of material specification 592 GEOTEXTILE, Table 1 or 2, Class I, II or IV and shall be placed over the cleared area prior to the placing of rock.
2. Stone shall meet one of the following IDOT coarse aggregate gradations, CA-1, CA-2, CA-3, or CA-4 and be placed according to construction specification 25 ROCKFILL using placement Method 1 and Class III compaction.
3. See plans for construction road location, D and W dimensions.
4. Minimum width is 14 feet for one-way traffic and 20 feet for two-way traffic. Two-way traffic widths shall be increased a minimum of 4 feet for trailer traffic. Depending on the type of vehicle or equipment, speed, loads, climatic and other conditions under which vehicles and equipment operate an increase in the minimum widths may be required.
5. Roadway shall follow the contour of the natural terrain to the extent possible.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



STANDARD DWG. NO.
 IL-506
 SHEET 1 OF 1
 DATE 1-29-99

CULVERT INLET PROTECTION - SILT FENCE



PLAN VIEW

NOTES:

1. The silt fence shall meet the requirements as shown on standard drawing IL-620 SILT FENCE except the maximum post spacing shall be 3 feet and the tops of posts shall be cross braced.
2. Sediment shall be removed when the sediment has accumulated to one-half the height of the silt fence.
3. The maximum drainage area to the culvert being protected is 1 acre.

REFERENCE

Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



NRCS

Natural Resources Conservation Service

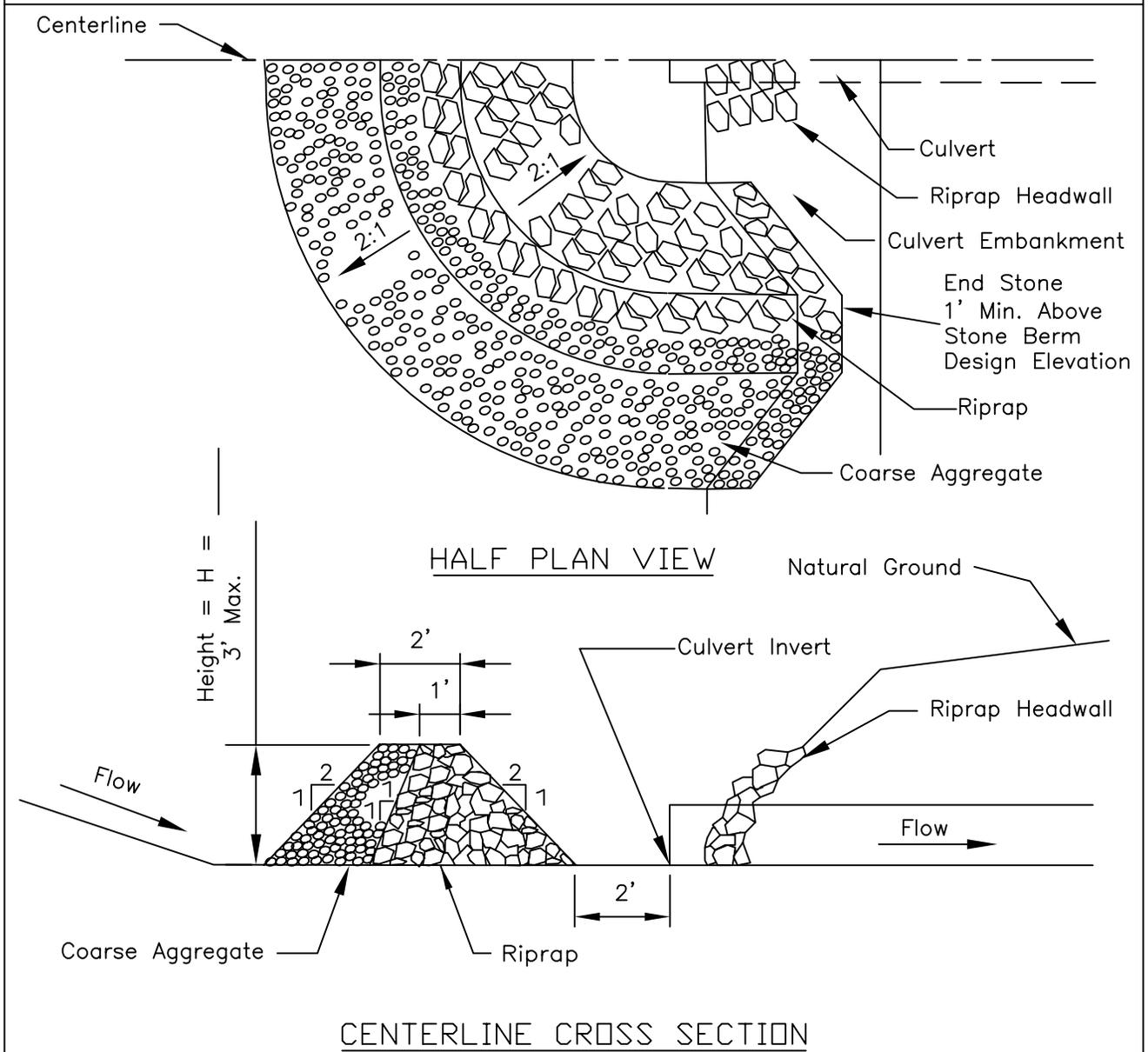
STANDARD DWG. NO.

IL-508SF

SHEET 1 OF 1

DATE 1-29-99

CULVERT INLET PROTECTION - STONE



Notes:

1. Sediment shall be removed when the sediment has accumulated to one-half the height of the stone berm.
2. Coarse aggregate shall meet one of the following IDOT coarse aggregate gradations, CA-1, CA-2, CA-3 or CA-4.
3. Riprap shall meet IDOT gradation RR-3 or RR-4. Any permanent riprap, such as for the culvert headwall, shall meet IDOT Quality Designation A.
4. Coarse aggregate and riprap shall be placed according to construction specification 25 ROCKFILL using placement Method 1 and Class III compaction.
5. The maximum drainage area to the culvert being protected is 3 acres.
6. See plans for H dimension.
7. Tie the stone berm into the culvert embankment a minimum of 1 foot above the design elevation of the stone berm.

REFERENCE

Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



Natural Resources Conservation Service

NRCS

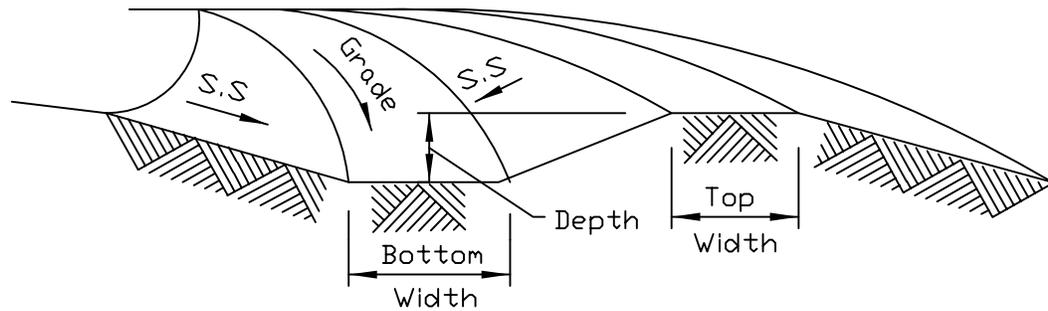
STANDARD DWG. NO.

IL-508ST

SHEET 1 OF 1

DATE 1-29-99

DIVERSION PLAN



Diversion No.			
From Station			
To Station			
Design Data			
Grade, %			
Drainage Area, Ac			
Construction Layout Data			
Bottom Width, Ft.			
Depth, Ft. (Includes Freeboard & Settlement)			
Side Slopes, Ft./Ft.			
Top Width (Berm), Ft.			
Seeding Width, Ft.			
Seeding Area, Sq.Ft.			

NOTES:

1. All trees stumps, brush and debris shall be removed from the construction area and disposed of properly. All old terraces, fence rows, or other obstructions that will interfere with construction or operation shall be removed. All dead furrows, ditches, or gullies to be crossed shall be filled in prior to construction or as part of construction operations.
2. When required topsoil shall be salvaged and spread uniformly over disturbed areas.
3. The diversion will be constructed to the specified lines, grades, width and depth.

Notes: _____

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____

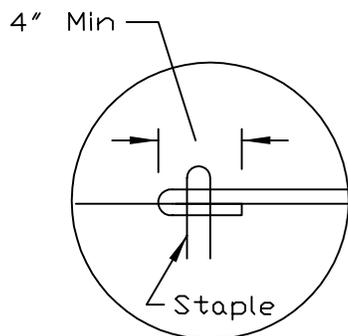
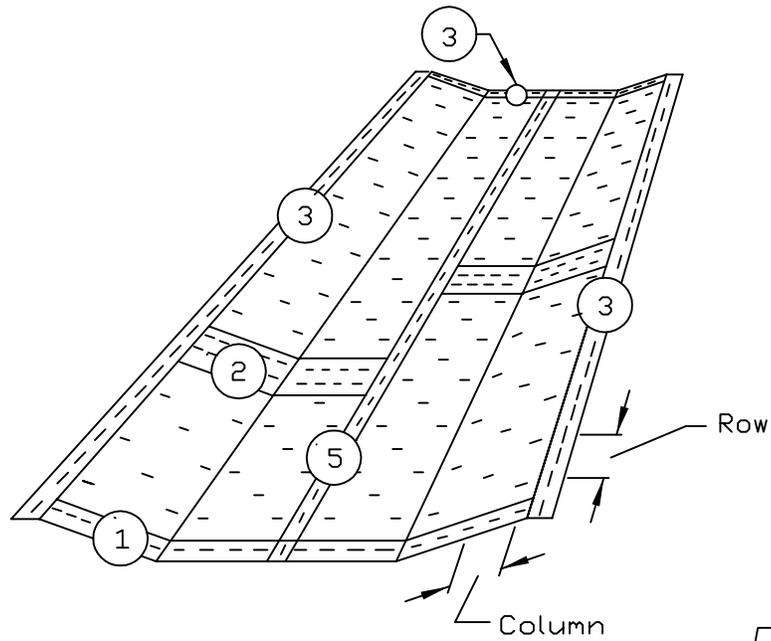


NRCS

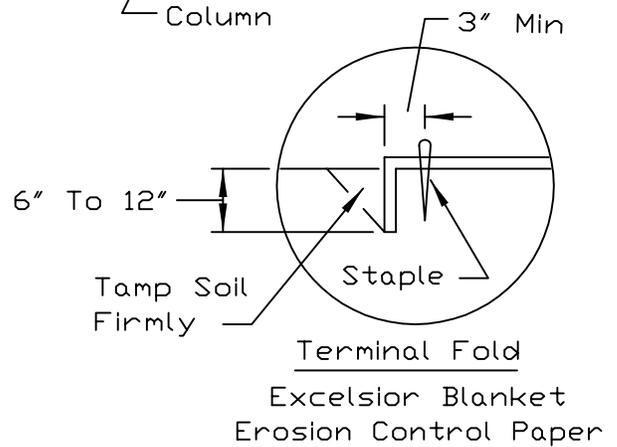
Natural Resources Conservation Service

STANDARD DWG. NO.
 IL-515
 SHEET 1 OF 1
 DATE 5-26-93

EROSION BLANKET PLAN

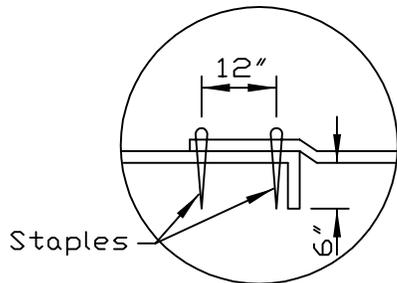


Terminal Fold
Jute Mesh Only

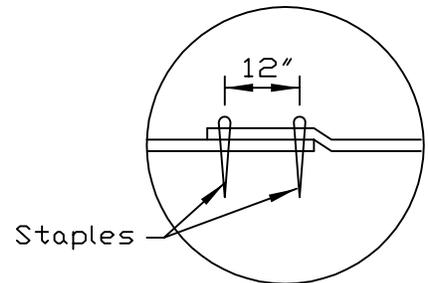


Terminal Fold
Excelsior Blanket
Erosion Control Paper

DETAIL 1



Junction Slot
Jute Mesh
Erosion Control Paper



Junction Slot
Excelsior Blanket

DETAIL 2

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

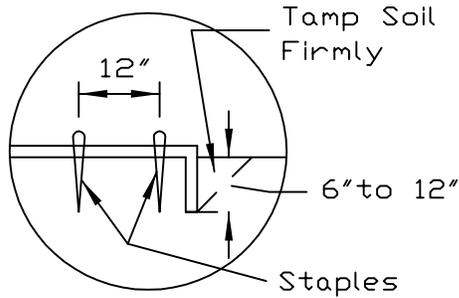


NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
IL-530
SEET 1 OF 2
DATE 5-24-94

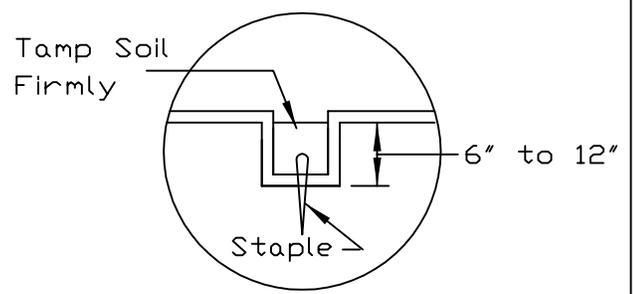
EROSION BLANKET PLAN



Anchor Slot

Jute Mesh
Excelsior Blanket
Erosion Control Paper

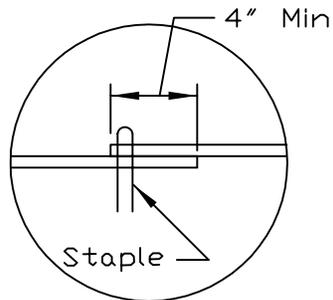
DETAIL 3



Check Slot

Erosion Control Paper

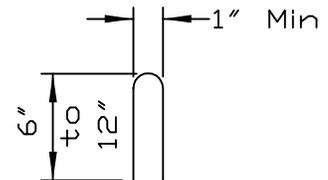
DETAIL 4



Lap Joint

Jute Mesh
Erosion Control Paper
Excelsior Blanket Shall
Be Butted Together.

DETAIL 5



STAPLE DETAIL

NOTES:

1. On erosion control paper, check slots, in ditch channel shall be spaced so that one occurs within each 50' on slopes of more than 4% and less than 6%. On slopes of 6% or more, they shall be spaced so that one occurs within each 25'.
2. Staples are to be placed alternately, in columns approximately 2' apart and in rows approximately 3' apart. Approximately 175 staples are required per 4'x 225' roll of material and 125 staples are required per 4'x 150' roll of material.
3. Erosion control material shall be placed loosely over ground surface. Do not stretch.
4. All terminal ends and transverse laps shall be stapled at approximately 12" intervals.

REFERENCE

Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



NRCS

Natural Resources Conservation Service

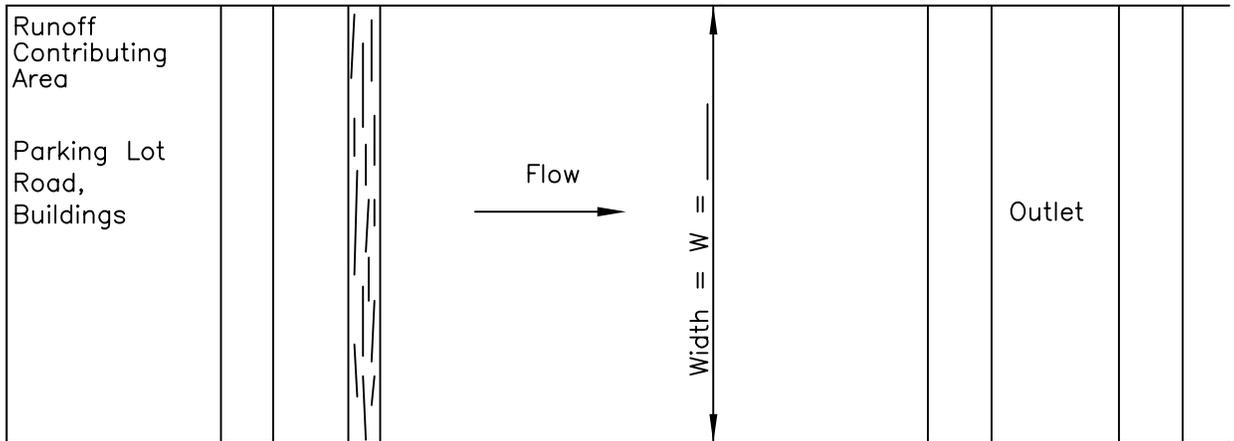
STANDARD DWG. NO.

IL-530

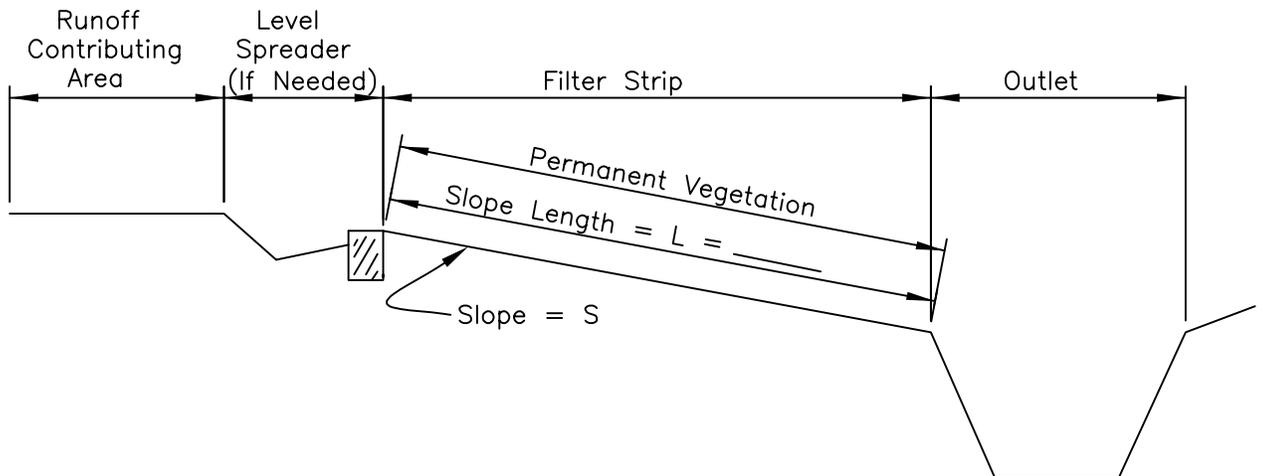
SHEET 2 OF 2

DATE 3-1-95

FILTER STRIP - GRASSED



PLAN VIEW



SECTION VIEW

Area To Be Seeded $L \times W = \underline{\hspace{2cm}}$

See plans for permanent vegetation requirements.

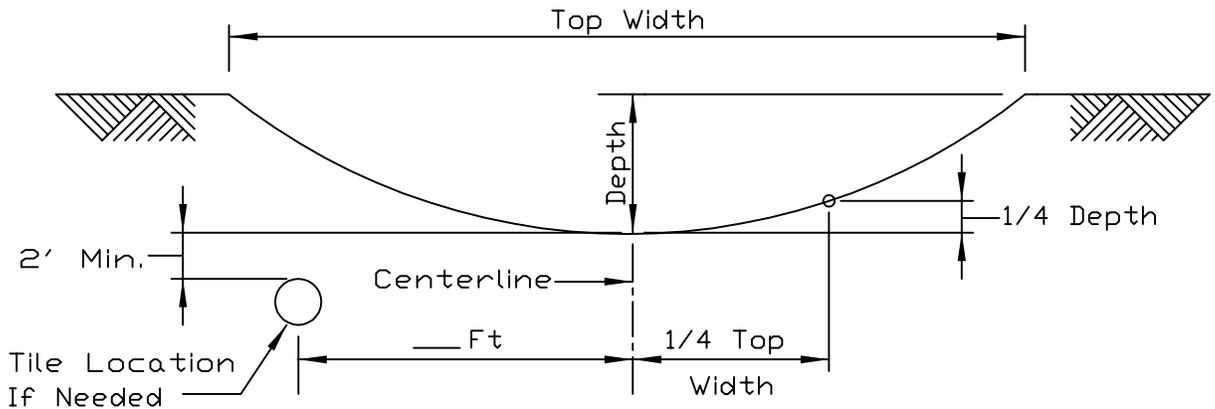
See plans for S, L and W dimensions.

Slope shall not exceed 15% (0.15 foot of fall per foot of horizontal distance).

See sheet LEVEL SPREADER IL-570 for level spreader requirements.

<p>REFERENCE</p> <p>Project _____</p> <p>Designed _____ Date _____</p> <p>Checked _____ Date _____</p> <p>Approved _____ Date _____</p>		<p>STANDARD DWG. NO.</p> <p style="font-size: 1.2em;">IL-535</p> <p>SHEET 1 OF 1</p> <p>DATE 1-29-99</p>
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WATERWAY PLAN



Waterway No.			
From Station			
To Station			
Grade, %			
Drainage Area, Ac			
Construction Layout Data			
Top Width, Ft.			
Depth, Ft.			
Tile Diameter, In.			
Tile Length, Ft.			
Grade Check Spacing, Ft.			
Rock _____ Fabric _____			

NOTES:

1. All trees, stumps, brush and debris shall be removed from the construction area and disposed of properly.
2. When required, topsoil shall be salvaged and spread uniformly over disturbed areas.
3. Spoil material from construction will be deposited in low areas or otherwise spread so as not to interfere with flow of water into the waterway. Any earth fill shall be compacted to prevent differential settlement in the completed waterway. The waterway will be constructed to the specified grade, width and depth. The quarter points of parabolic waterways shall be constructed to the required depth, plus or minus 0.2 feet. The waterway center shall be the lowest point.
4. Temporary dikes may be constructed around the tops and sides of waterways to divert runoff from new seedlings. Temporary dikes shall be removed as soon as vegetation is established.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____

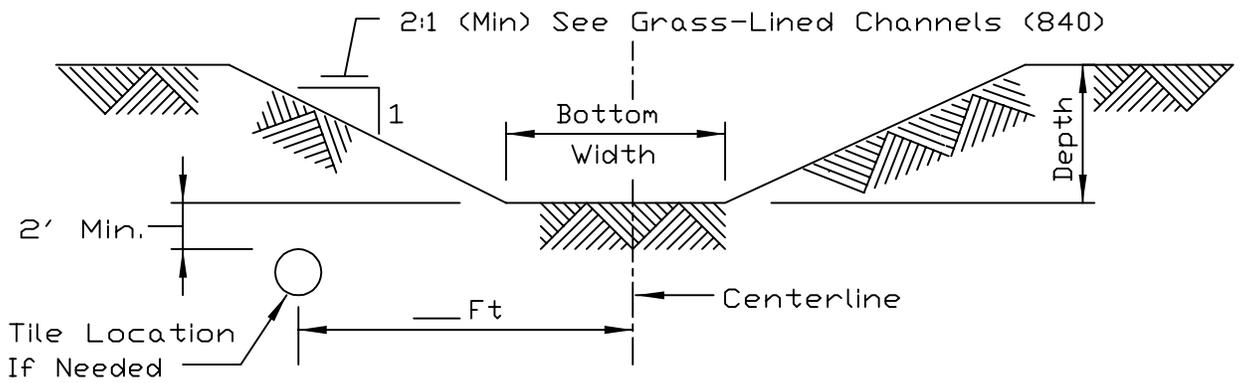


NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
 IL-540P
 SHEET 1 OF 1
 DATE 6-24-93

WATERWAY PLAN



Waterway No.			
From Station			
To Station			
Grade, %			
Drainage Area, Ac			
Construction Layout Data			
Top Width, Ft.			
Bottom Width			
Side Slope			
Depth, Ft.			
Tile Diameter, In.			
Tile Length, Ft.			
Grade Check Spacing, Ft.			
Rock _____ Fabric _____			

NOTES:

1. All trees, stumps, brush and debris shall be removed from the construction area and disposed of properly.
2. When required, topsoil shall be salvaged and spread uniformly over disturbed areas.
3. Spoil material from construction will be deposited in low areas or otherwise spread so as not to interfere with flow of water into the waterway. Any earth fill shall be compacted to prevent differential settlement in the completed waterway. The waterway will be constructed to the specified grade, width and depth.
4. Temporary dikes may be constructed around the tops and sides of waterways to divert runoff from new seedlings. Temporary dikes shall be removed as soon as vegetation is established.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____

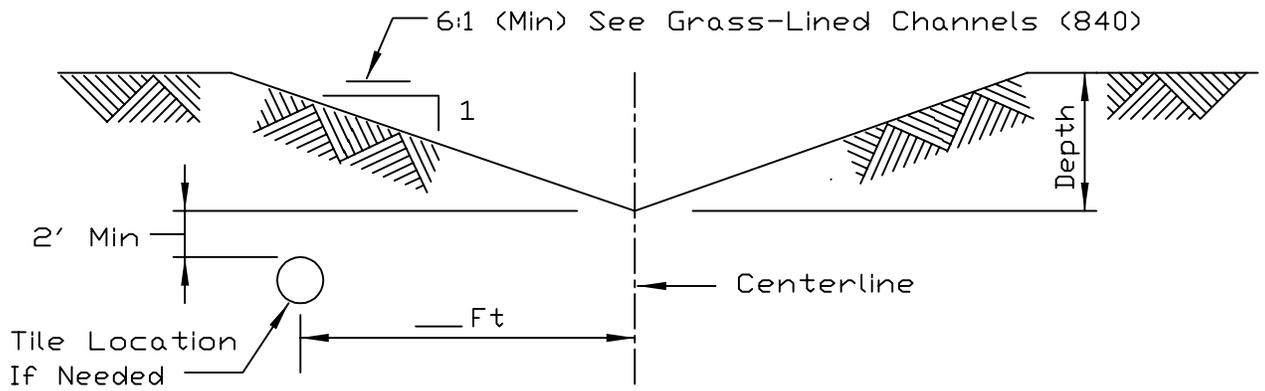


NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
 IL-540T
 SHEET 1 OF 1
 DATE 6-24-93

WATERWAY PLAN



Waterway No.			
From Station			
To Station			
Grade, %			
Drainage Area, Ac.			
Construction Layout Data			
Top Width, Ft.			
Side Slope			
Depth, Ft.			
Tile Diameter, In.			
Tile Length, Ft.			
Grade Check Spacing, Ft.			
Rock _____ Fabric _____			

NOTES:

1. All trees, stumps, brush and debris shall be removed from the construction area and disposed of properly.
2. When required, topsoil shall be salvaged and spread uniformly over disturbed areas.
3. Spoil material from construction will be deposited in low areas or otherwise spread so as not to interfere with flow of water into the waterway. Any earth fill shall be compacted to prevent differential settlement in the completed waterway. The waterway will be constructed to the specified grade, width and depth.
4. Temporary dikes may be constructed around the tops and sides of waterways to divert runoff from new seedlings. Temporary dikes shall be removed as soon as vegetation is established.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____

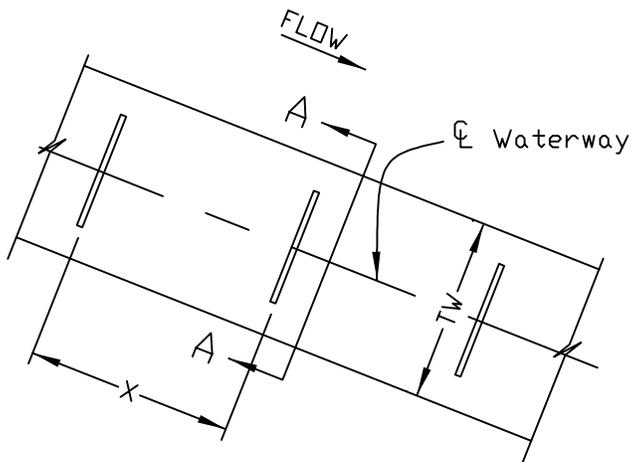


NRCS

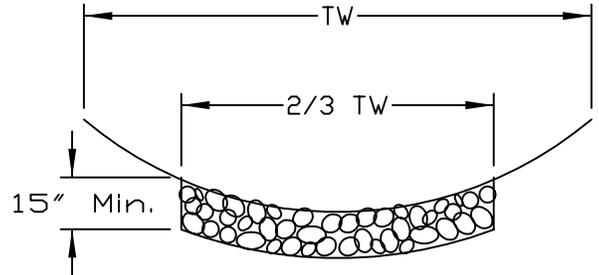
Natural Resources Conservation Service

STANDARD DWG. NO.
 IL-540V
 SHEET 1 OF 1
 DATE 6-24-93

ROCK CHECKS FOR WATERWAYS



PLAN VIEW



SECTION A-A

WATERWAY NUMBER _____
 FROM STATION _____
 TO STATION _____
 CHECK SPACING (X) .. _____
 CHECK WIDTH (2/3 TW) _____

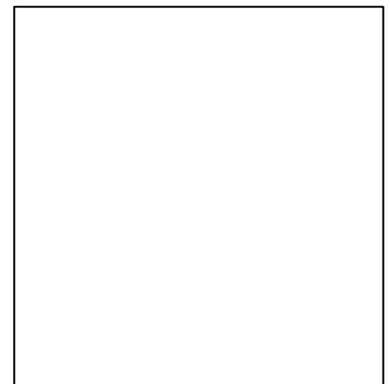
BILL OF MATERIALS

Rock - IDOT RR3, or equivalent - _____ Tons

NOTES:

1. Excavate trench 12 inches wide or one backhoe bucket wide, whichever is greater.
2. Compact rock backfill by rolling with construction equipment.
3. Finished rock surface will be flush with the ground surface when completed.

LOCATION PLAN



County _____

Sec. _____ T _____ R _____

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
 IL-541
 SHEET 1 OF 2
 DATE 8-17-94

ROCK CHECKS FOR WATERWAYS

ROCK CHECK SPACING

WATERWAY GRADE %	MAXIMUM SPACING FT.
0 - 1.5	100
1.5 - 3.0	75
> 3.0	50

ROCK QUANTITIES IN TONS - PER ROCK CHECK

DEPTH <In.>	ROCK CHECK WIDTH - 2/3 TW - IN FEET										
	10	12	14	16	18	20	22	24	26	28	30
15	1.5	1.8	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.1	4.4
18	1.8	2.1	2.5	2.8	3.2	3.6	3.9	4.3	4.6	5.0	5.3
24	2.4	2.8	3.3	3.8	4.3	4.7	5.2	5.7	6.2	6.6	7.1

Note: Quantities based on 2 foot wide trench and 1.6 Tons/Cu. Yd.
(Divide quantities by 2 for 12 inch trench widths.)

ROCK GRADATION - IDOT RR3

Size	% Passing By Weight
50 Lb.	100
10 Lb.	30 - 70
1 Lb.	0 - 16

Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



NRCS

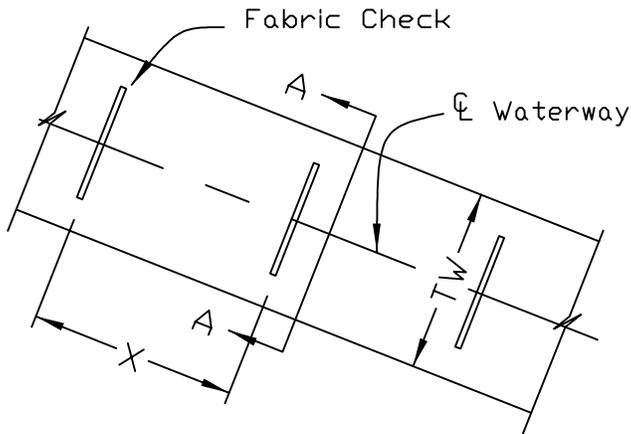
Natural Resources Conservation Service

IL-541

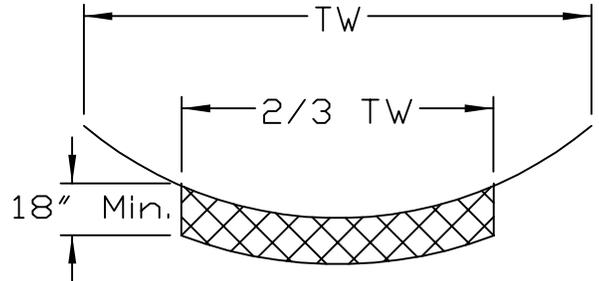
SHEET 2 OF 2

DATE 8-17-94

FABRIC CHECKS FOR WATERWAYS



PLAN VIEW



SECTION A-A

WATERWAY NUMBER _____

FROM STATION _____

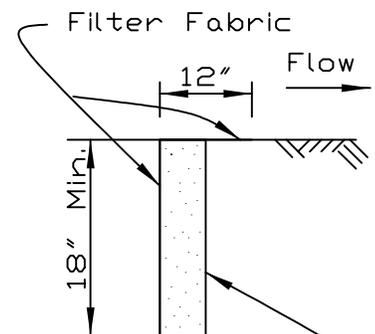
TO STATION _____

CHECK SPACING (X) .. _____

CHECK WIDTH (2/3 TW) _____

BILL OF MATERIALS

Filter Fabric ___ Sq. Yds.
 (___ Pieces, @ ___ In. x 30 In.)

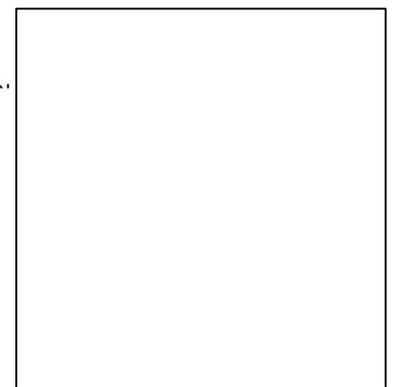


TYPICAL SECTION

NOTES:

1. Excavate a trench 18 inches deep, wide enough to allow hand compaction of backfill.
2. Place the fabric against the upstream wall of the trench. Backfill the trench in hand compacted, 6 inch lifts. Lay 12 inch fabric flap downstream.

LOCATION PLAN



County _____

Sec. _____ T _____ R _____

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
IL-542
SHEET 1 OF 2
DATE 8-17-94

FABRIC CHECKS FOR WATERWAYS

FABRIC CHECK SPACING (FT.)

WATERWAY GRADE %	MAXIMUM SPACING FT.
0 - 1.5	100
1.5 - 3.0	75
> 3.0	50

FABRIC QUANTITIES PER CHECK IN SQUARE YARDS

CHECK LENGTH (FT.)	15	18	21	24	27	30	33	36	39
FABRIC QUANTITY (SQ. YDS)	4.2	5.0	5.8	6.7	7.5	8.3	9.2	10.0	10.8

FILTER FABRIC SPECIFICATION

1. Openings in filter fabric shall be equal to or smaller than the openings in a #40 sieve (0.42mm).
2. Filter fabric shall have a tear strength in excess of 50 pounds.

REFERENCE

Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



Natural Resources Conservation Service

NRCS

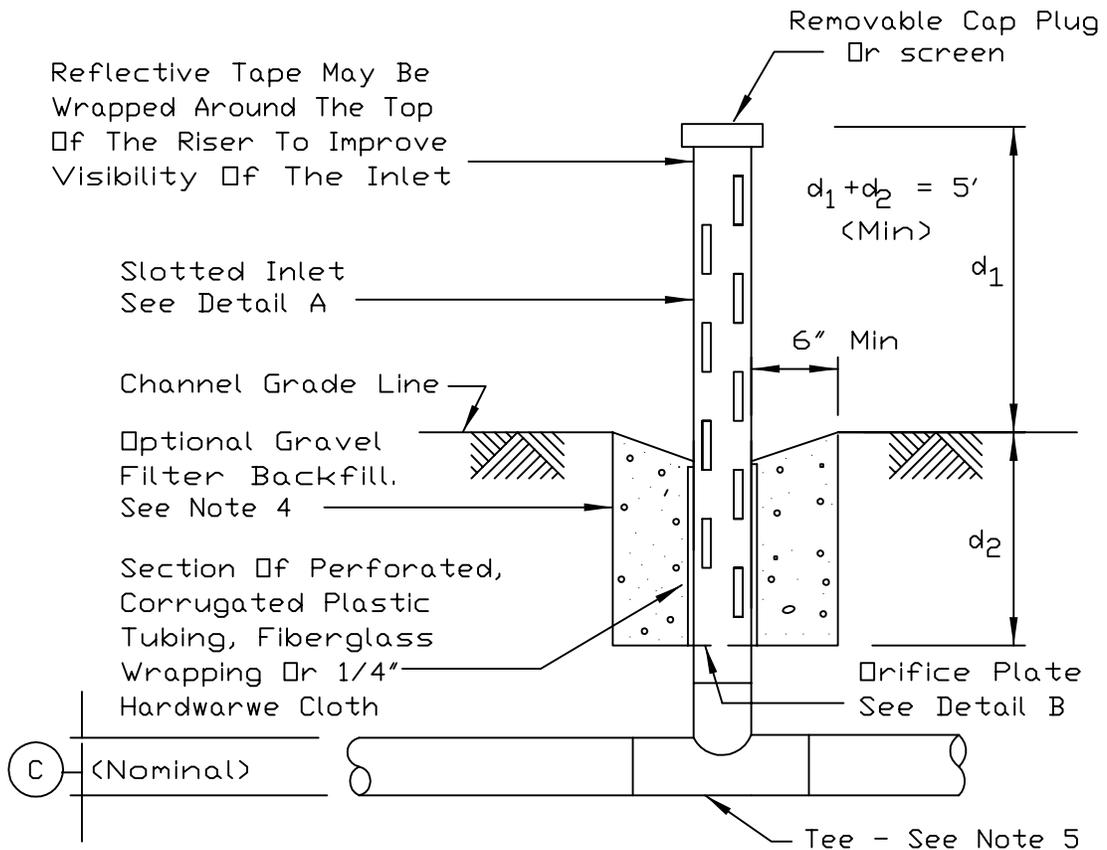
STANDARD DWG. NO.

IL-542

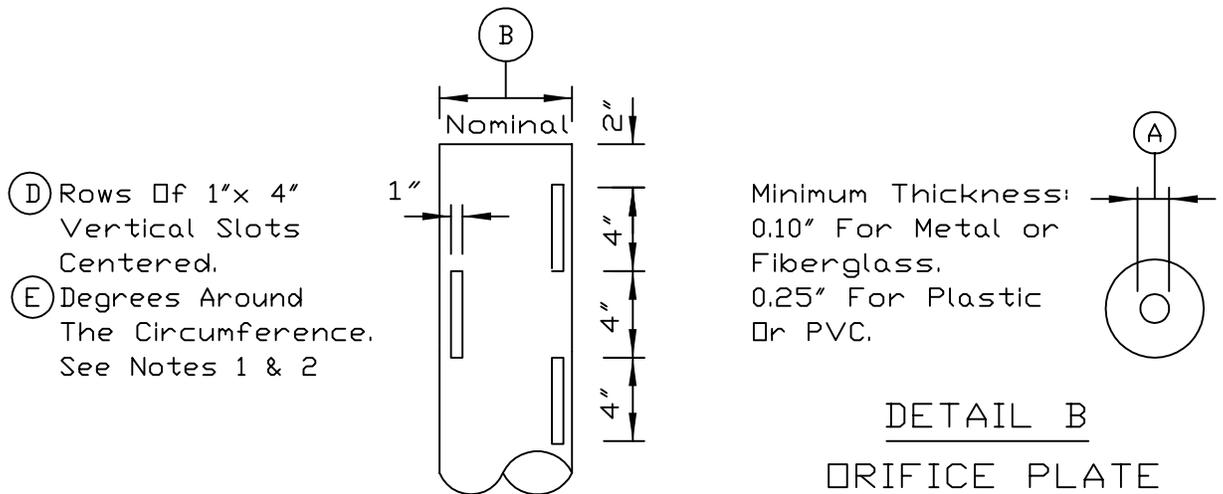
SHEET 2 OF 2

DATE 8-17-94

INLET FOR UNDERGROUND OUTLET - METAL



INLET FOR UNDERGROUND OUTLET



DETAIL A - SLOTTED INLET

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____

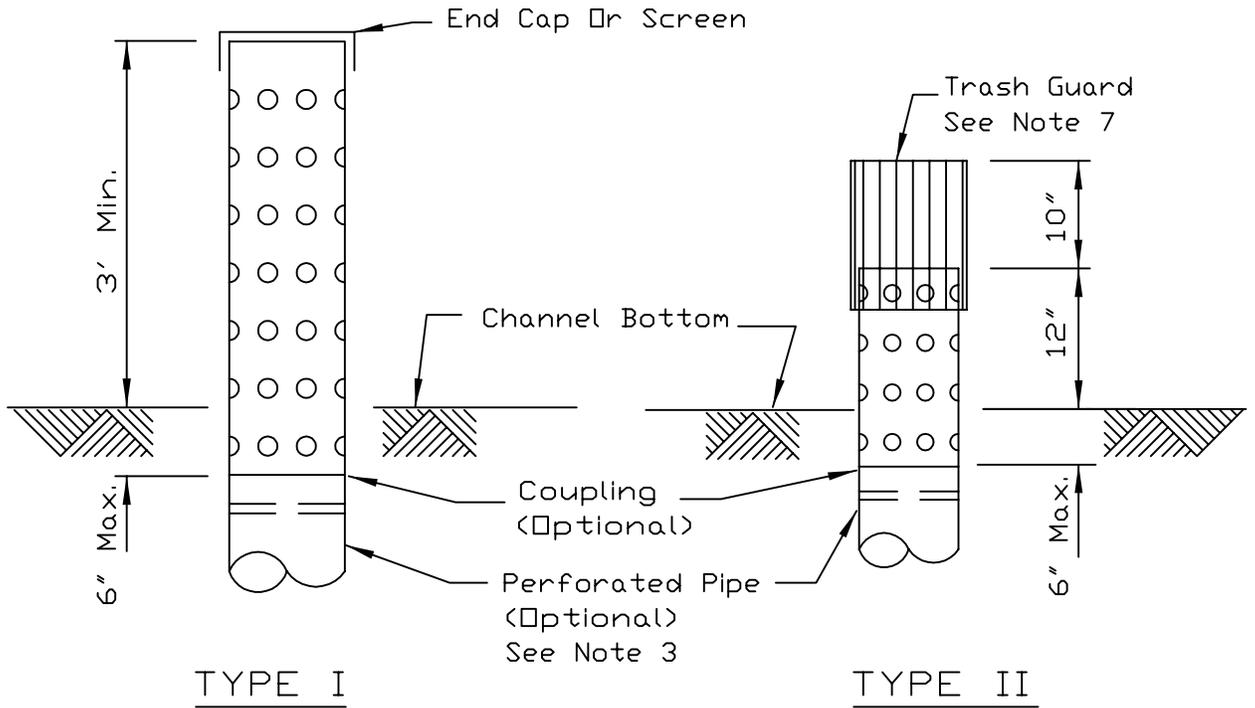


NRCS

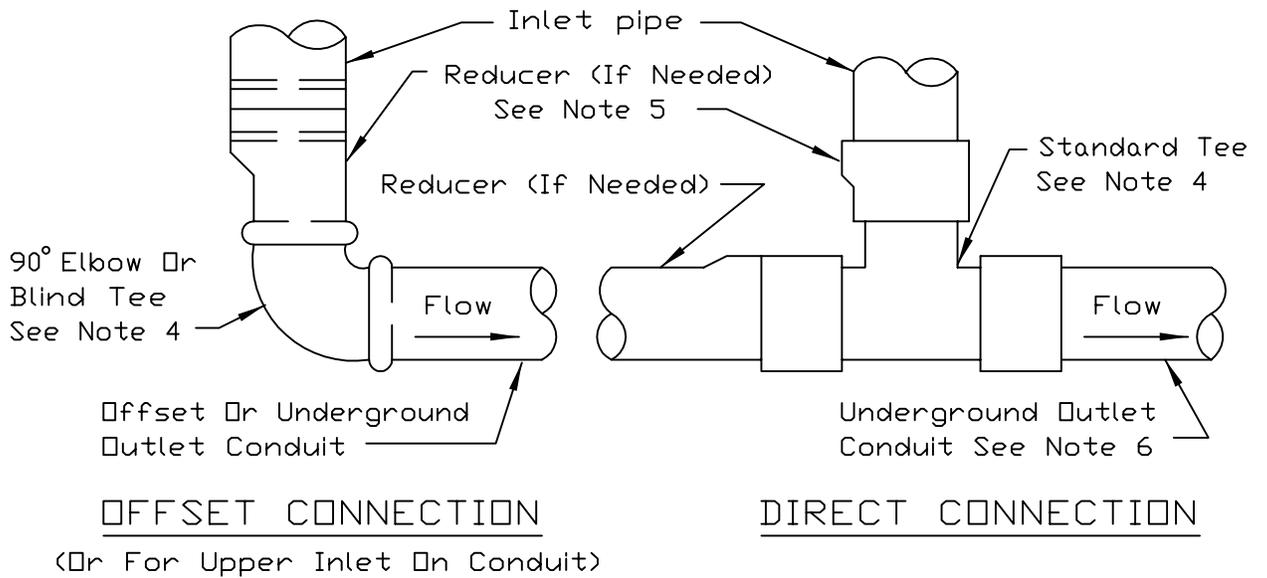
Natural Resources Conservation Service

STANDARD DWG. NO.
 IL-543
 SHEET 1 OF 2
 DATE 6-28-93

INLET FOR UNDERGROUND OUTLET - PLASTIC



INLET ALTERNATIVES



CONNECTION OF INLET TO CONDUIT

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
IL-544
SHEET 1 OF 2
DATE 8-17-94

INLET FOR UNDERGROUND OUTLET - PLASTIC

NOTES:

1. Plastic Pipe: Polyvinyl Chloride (PVC) or High Density Polyethylene (PE) pipe with SDR equal to 43 or less.
2. The above ground portion of the inlet, must have holes evenly spaced around the circumference of the pipe, as shown below:

Inlet Diameter (Inches)	Minimum Number Of 1" Diam. Holes Per Ft. Of Inlet
5	25
6	30
8	40
10	50
12	60

3. The below ground portion of the inlet, may be perforated with holes 5/16 inch diameter or less, to provide drainage around the inlet.
4. The tee or elbow diameter must be equal to or larger than the diameter of the conduit downstream from inlet.
5. Install a reducer immediately above the tee or elbow if the inlet diameter is greater than the diameter of the tee or elbow.
6. The underground outlet conduit, must be installed deep enough to provide a minimum 24" of cover (after construction) to prevent crushing.
7. The trash guard for Type II inlets shall be securely fastened to the inlet. Trash guards may be fabricated from metal rods (1/8" diameter or larger) or galvanized welded wire fabric (16 gage or larger). The spacing between vertical members should be 1 inch.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____

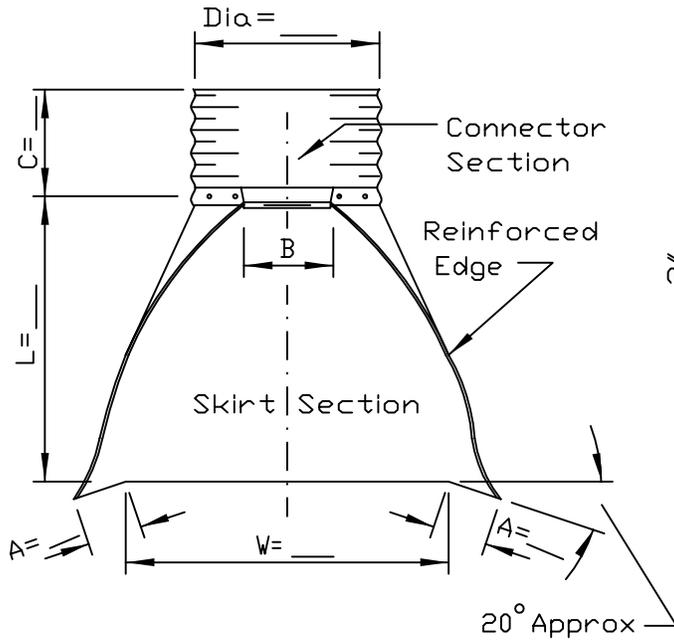


NRCS

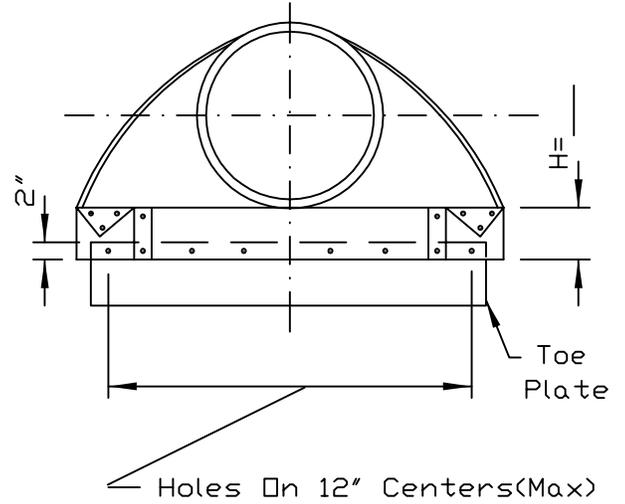
Natural Resources Conservation Service

STANDARD DWG. NO.
 IL-544
 SHEET 2 OF 2
 DATE 8-17-94

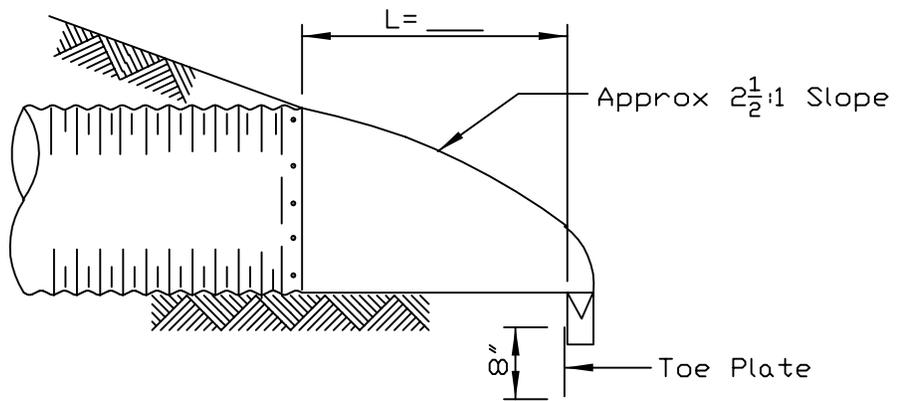
CULVERT FLARED END SECTION



PLAN



ELEVATION



TYPICAL CROSS SECTION

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

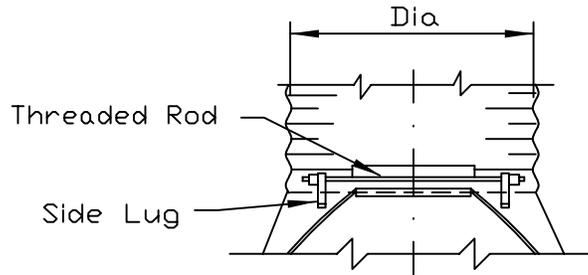


NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
IL-545
SHEET 1 OF 2
DATE 3-1-95

CULVERT FLARED END SECTION



ALTERNATE CONNECTION

PIPE DIA	SHEET THICKNESS	DIMENSIONS					
		A * 1"	B MAX	H * 1"	L * 1 1/2"	W * 2"	C
12"	.064"	6"	6"	6"	21"	24"	24"
15"	.064"	7"	8"	6"	26"	30"	24"
18"	.064"	8"	10"	6"	31"	36"	24"
24"	.064"	10"	13"	6"	41"	48"	24"
30"	.079"	12"	16"	8"	51"	60"	24"
36"	.079"	14"	19"	9"	60"	72"	36"
42"	.109"	16"	22"	11"	69"	84"	36"
48"	.109"	18"	27"	12"	78"	90"	24"
54"	.109"	18"	30"	12"	84"	102"	36"
60"	.109"-.138"	18"	33"	12"	87"	114"	36"

* = Tolerance

NOTES:

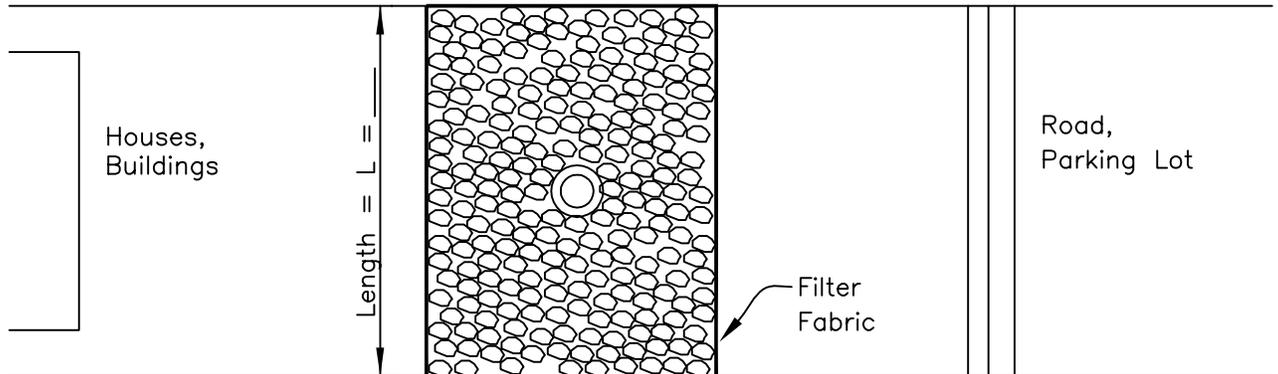
1. Toe plate, where needed, to be punched to match holes in skirt lip. 3/8" galv, bolts to be furnished. Length of toe plate is W+10" for 12" to 30" dia. pipe and W+22" for 36" to 60" dia. pipe.
2. Skirt section for 12" to 30" dia. pipe to be made in one piece.
3. Skirt section for 36" to 54" pipe to be made from two sheets joined by riveting or bolting on center line, 60" may be constructed in 3 pieces.
4. Connector section, corner plate and toe plate to be same sheet thickness as skirt.
5. End sections and fittings are to be galvanized steel or aluminum alloy for use with like pipe.
6. Where flared end sections are to be used with bituminous coated and paved metal pipe, they are to be galvanized only.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____

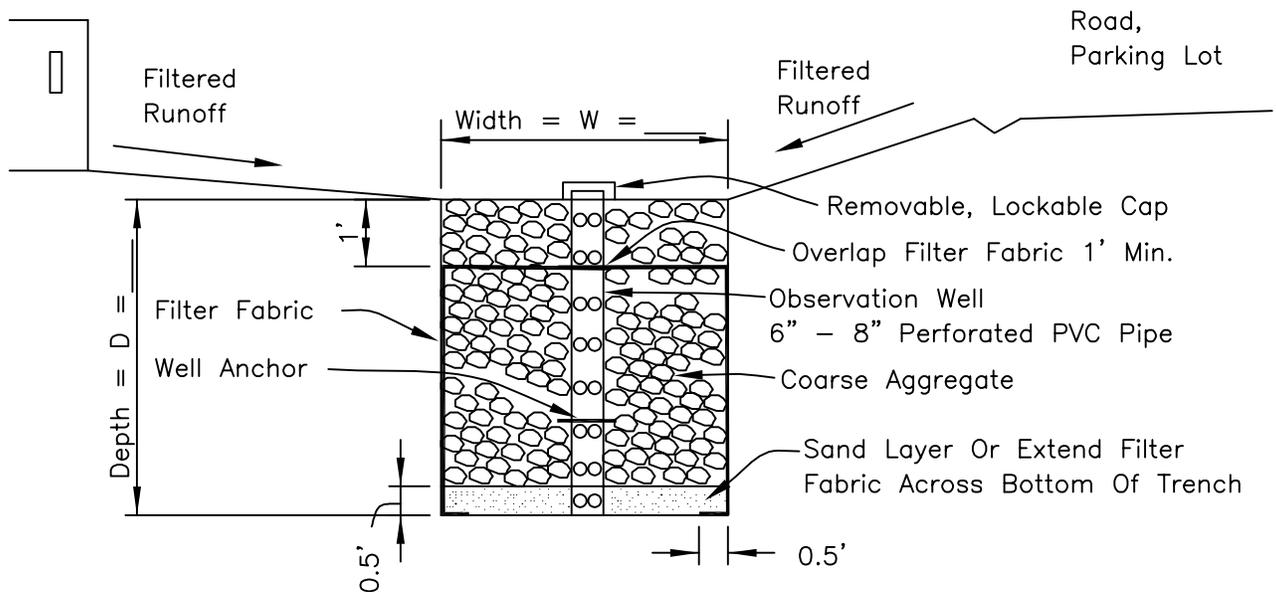


STANDARD DWG. NO.
 IL-545
 SHEET 2 OF 2
 DATE 3-1-95

INFILTRATION TRENCH



PLAN VIEW



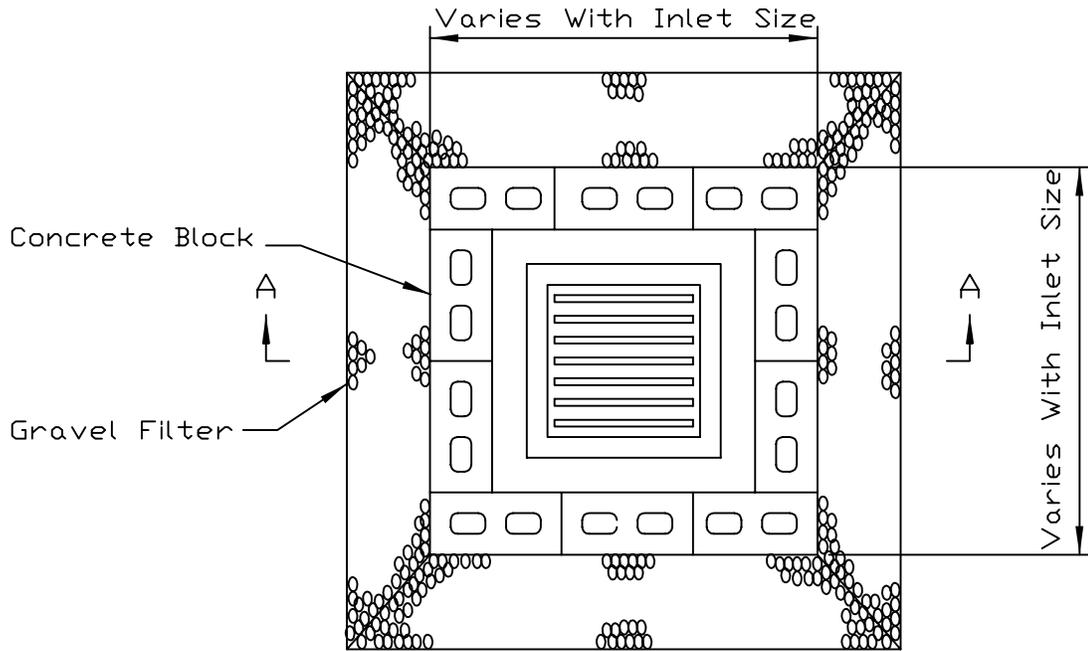
SECTION VIEW

NOTES:

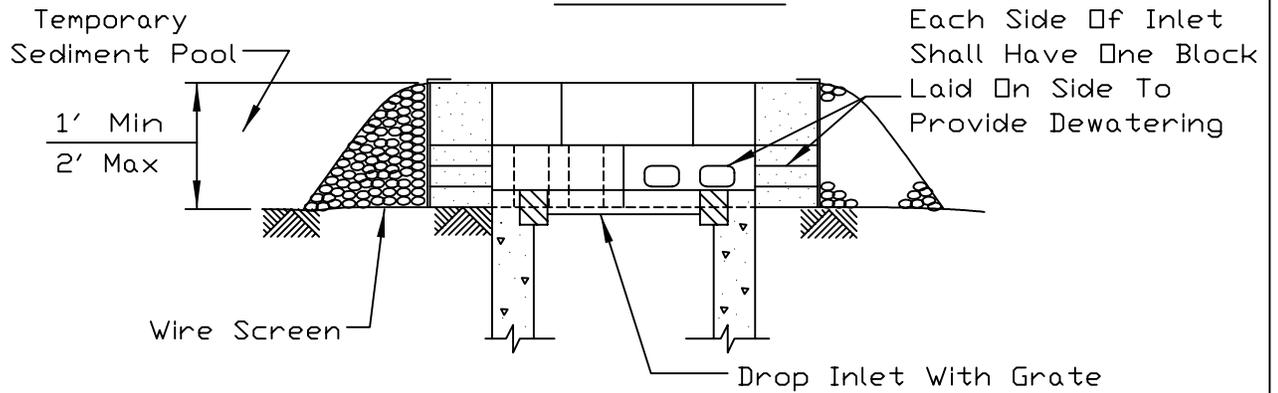
1. Coarse aggregates shall meet one of the following IDOT gradations: CA-1 or CA-3.
2. Sand, if used, shall meet one of the following IDOT gradations: CA-14, CA-15 or CA-16.
3. Filter fabric shall meet the requirements of material specification 592 GEOTEXTILE Table 1 or 2, Class I with an apparent opening size of at least 30 for non-woven and 50 for woven.
4. PVC pipe shall meet material specification 547 PLASTIC (PVC, PE, ABS) PIPE.
5. See plans for L, W and D dimensions.

<p>REFERENCE</p> <p>Project _____</p> <p>Designed _____ Date _____</p> <p>Checked _____ Date _____</p> <p>Approved _____ Date _____</p>		<p>STANDARD DWG. NO.</p> <p style="font-size: 1.2em;">IL-547</p> <p>SHEET 1 OF 1</p> <p>DATE 1-29-99</p>
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INLET PROTECTION - BLOCK AND GRAVEL PLAN



PLAN VIEW



SECTION A-A

NOTES:

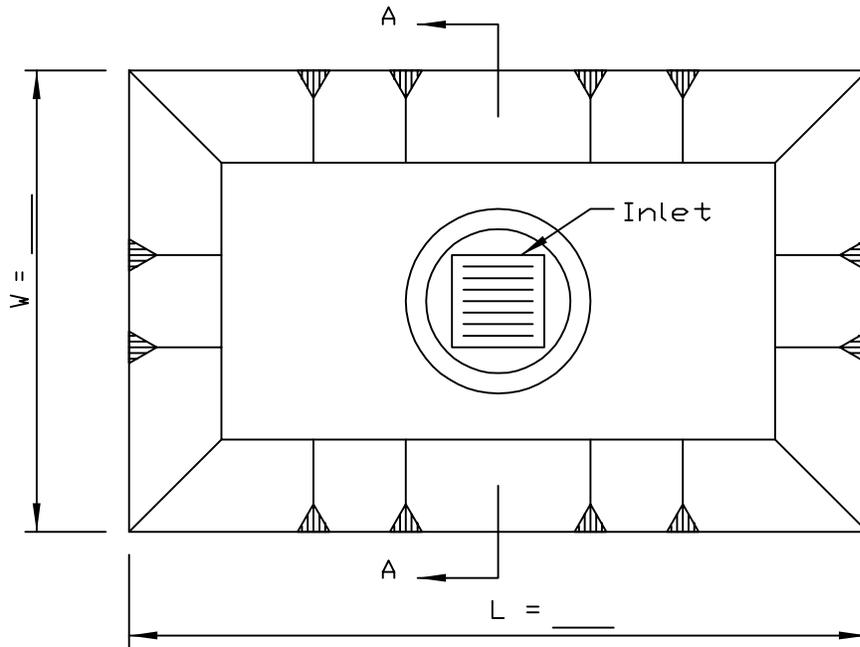
1. Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to 1/2 the design depth. Removed sediment shall be deposited in a suitable area and in such a manner that it will not erode.
2. The sediment trap shall be removed and the area stabilized when the constructed drainage area has been properly stabilized.
3. The wire screen shall be hardware cloth or comparable wire mesh with 1/2 inch openings.
4. The gravel shall meet requirements for coarse aggregate with IDOT gradations of CA-1, CA-2 or CA-3.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

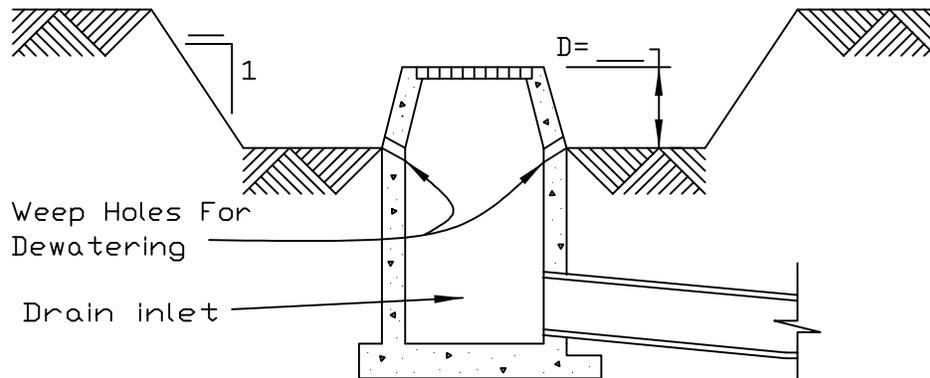


STANDARD DWG. NO.	IL-550
SHEET	1 OF 1
DATE	8-17-94

INLET PROTECTION - EXCAVATED DRAIN PLAN



PLAN VIEW



TYPICAL SECTION A-A

NOTES:

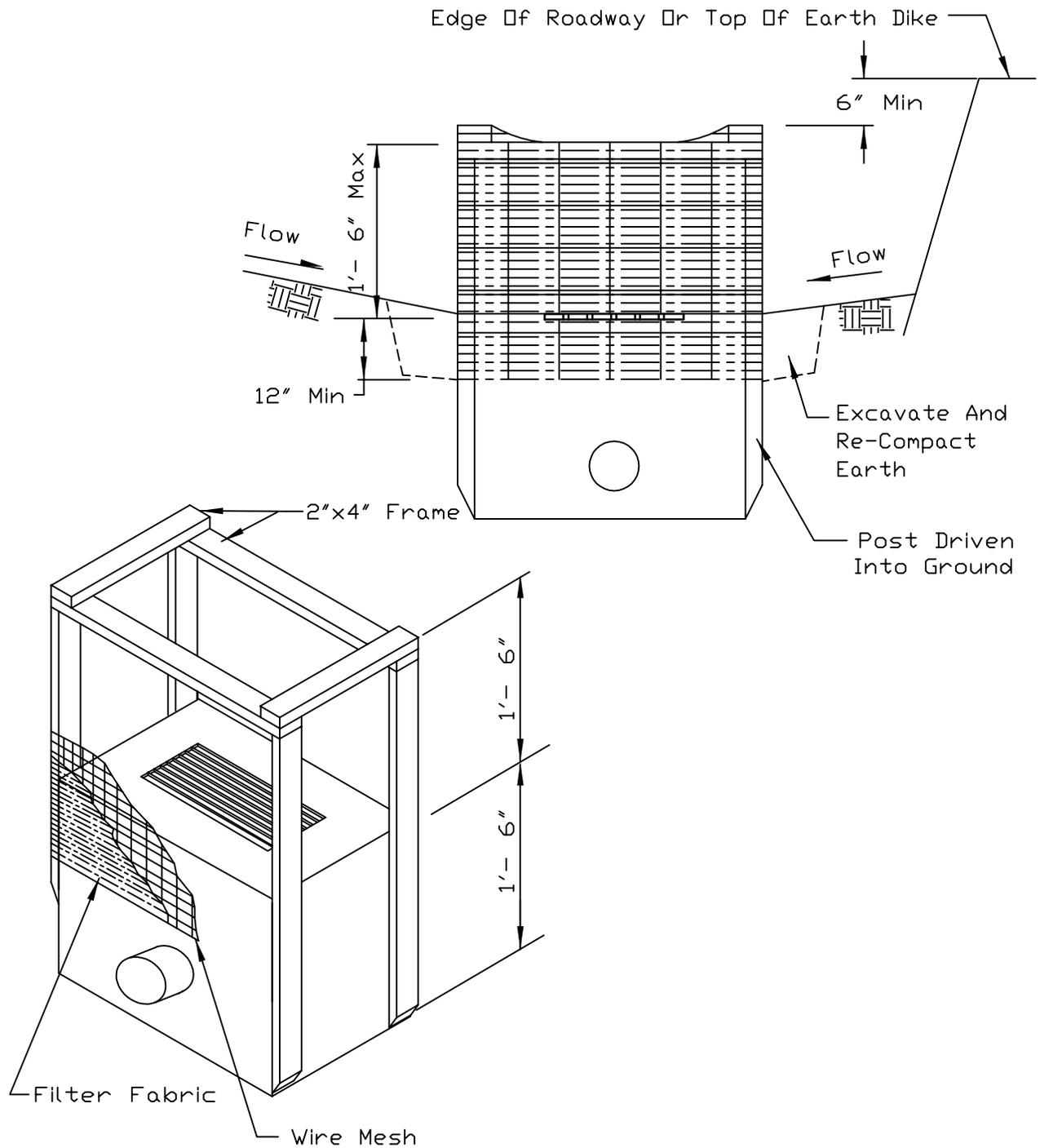
1. Sediment shall be removed and the trap restored to its original dimensions when the sediment has accumulated to 1/2 the design depth of the trap. Removed sediment shall be deposited in a suitable area and in such a manner that it will not erode.
2. The sediment trap shall be removed and the area stabilized when the constructed drainage area has been properly stabilized.
3. All cut slopes shall be 2:1 or flatter.

REFERENCE	Project _____
Designed _____	Date _____
Checked _____	Date _____
Approved _____	Date _____



STANDARD DWG. NO.	IL-555
SHEET	1 OF 1
DATE	3-11-93

INLET PROTECTION - FABRIC DROP PLAN



NOTES:

1. Filter fabric shall meet the requirement of material specification 592 GEOTEXTILE table 1 or 2, class I, with an EDS of at least 30 for nonwoven and 50 for woven.
2. The wire mesh shall have a maximum opening of at least 6 inches.
3. Limit drainage area to the inlet protection to 1 acre.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

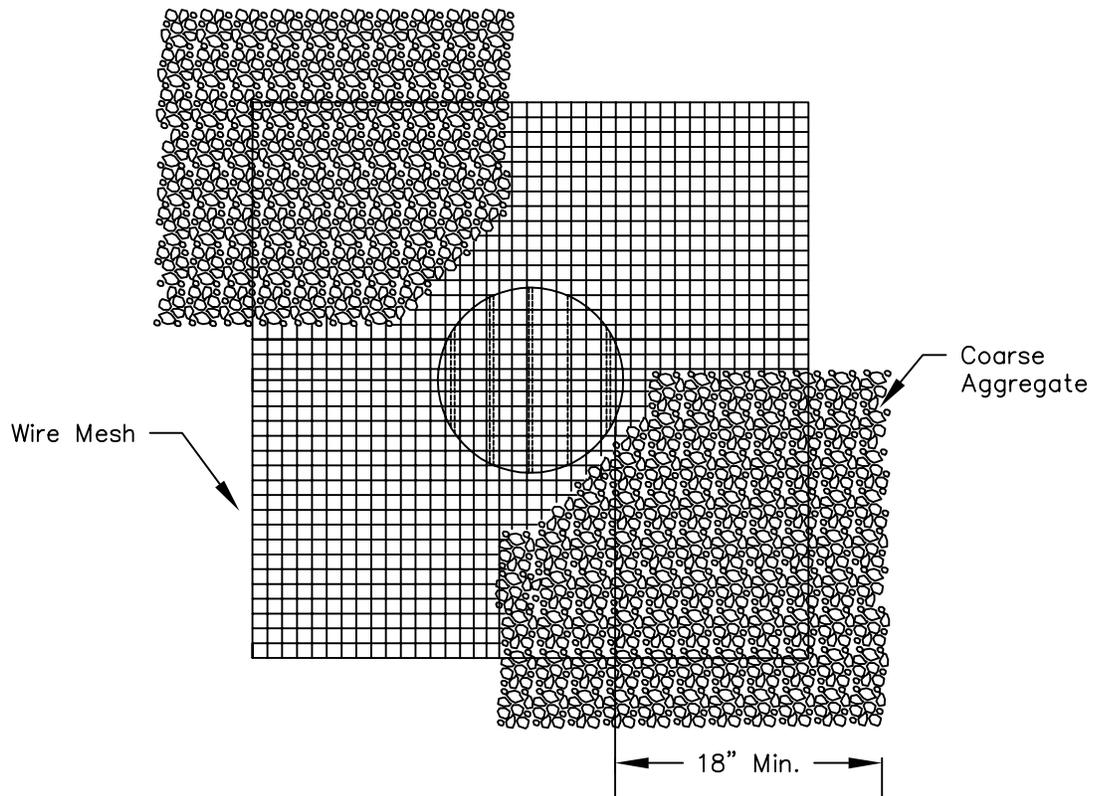


NRCS

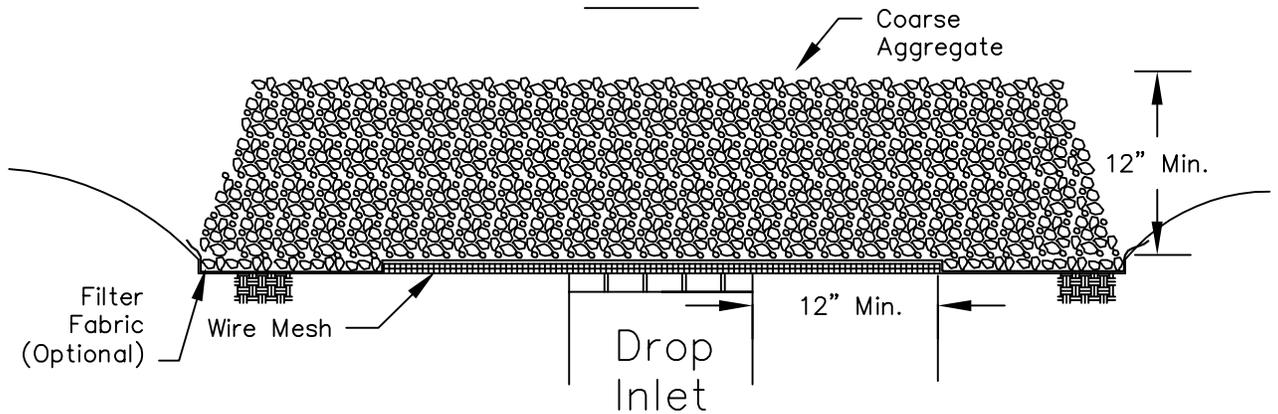
Natural Resources Conservation Service

STANDARD DWG. NO.
IL-560
SHEET 1 OF 1
DATE 6-29-93

INLET PROTECTION GRAVEL AND WIRE MESH PLAN



PLAN



SECTION

NOTES:

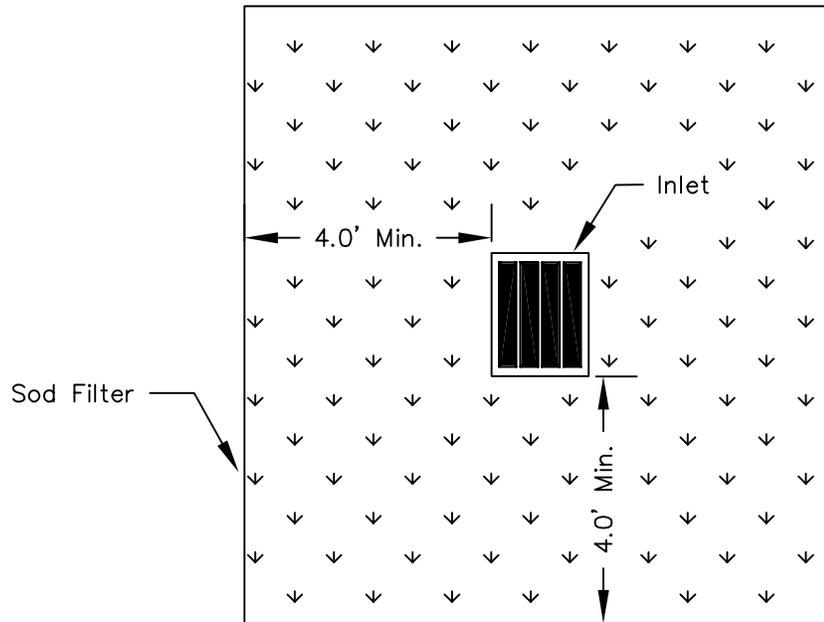
1. Hardware cloth or comparable wire mesh must have a maximum of $\frac{1}{2}$ inch openings.
2. Hardware cloth or wire mesh must extend a minimum of 12 inches beyond each side of the inlet opening; if more than one strip of mesh is necessary, strips shall be overlapped a minimum of 6 inches.
3. Coarse aggregate shall meet one of the IDOT gradations CA-1 or CA-3. CA-2 can be used when filter fabric is used.
4. Filter fabric shall meet the requirements of material specification 592 GEOTEXTILE Table 1 or 2, Class 1 with AOS of at least 30 for nonwoven and 50 for woven.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

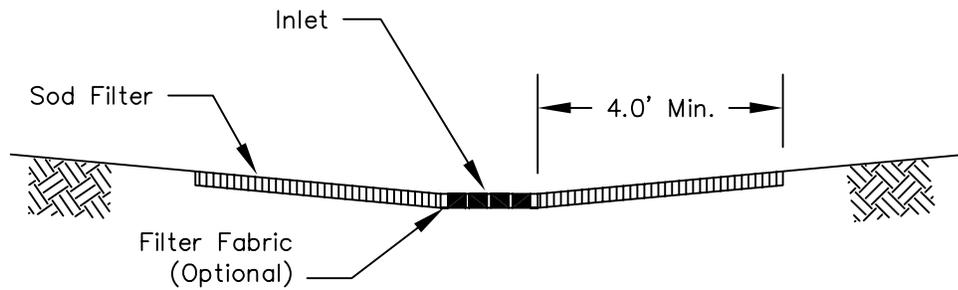


STANDARD DWG. NO.	IL-561
SHEET	1 OF 1
DATE	10/28/01

INLET PROTECTION SOD FILTER PLAN



PLAN



SECTION

NOTES:

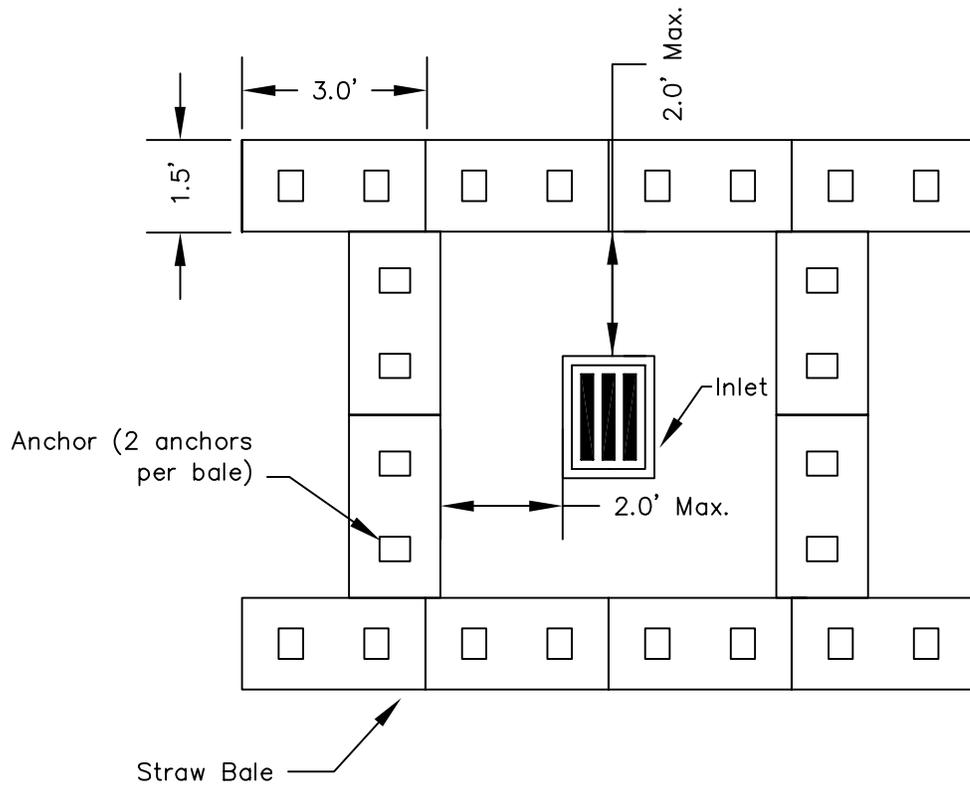
1. The sod should be flush with surrounding ground surface.
2. If used, filter fabric shall meet the requirements of material specification 592 GEOTEXTILE Table 1 or 2, Class 1 with AOS of at least 30 for nonwoven and 50 for woven.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

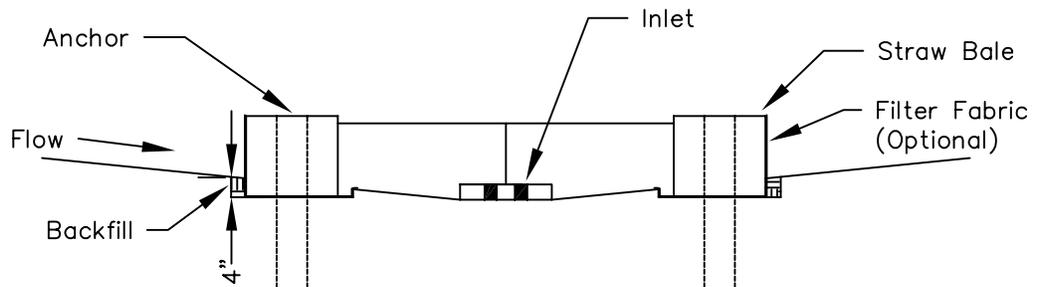


STANDARD DWG. NO.	IL-562
SHEET	1 OF 1
DATE	11-23-01

INLET PROTECTION STRAW BALE BARRIER PLAN



PLAN



SECTION

NOTES:

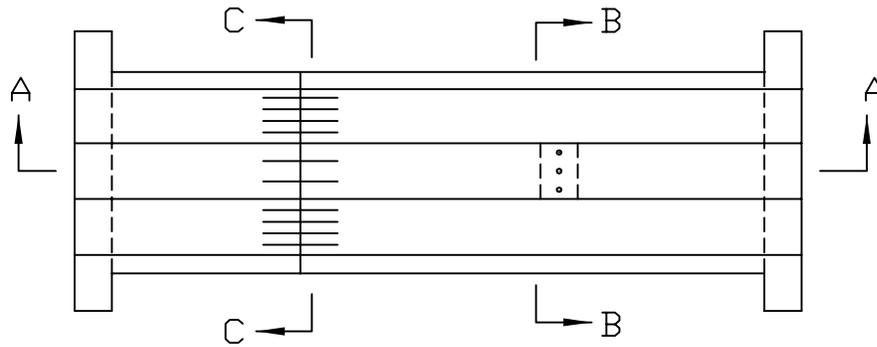
1. The immediate land area around the inlet should be relatively flat (less than 1% slope) and located so that the accumulated sediment can be easily removed.
2. The inside edge of the bales shall be a maximum of 2 feet from the edge of the inlet.
3. Filter fabric shall meet the requirements of material specification 592 GEOTEXTILE Table 1 or 2, Class 1 with AOS of at least 30 for nonwoven and 50 for woven.
4. Anchors shall be rebar, steel pickets or 2" x 2" stakes, and shall be long enough to extend at least 1.5 to 2.0 feet into the ground when the top is flush with the bale.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

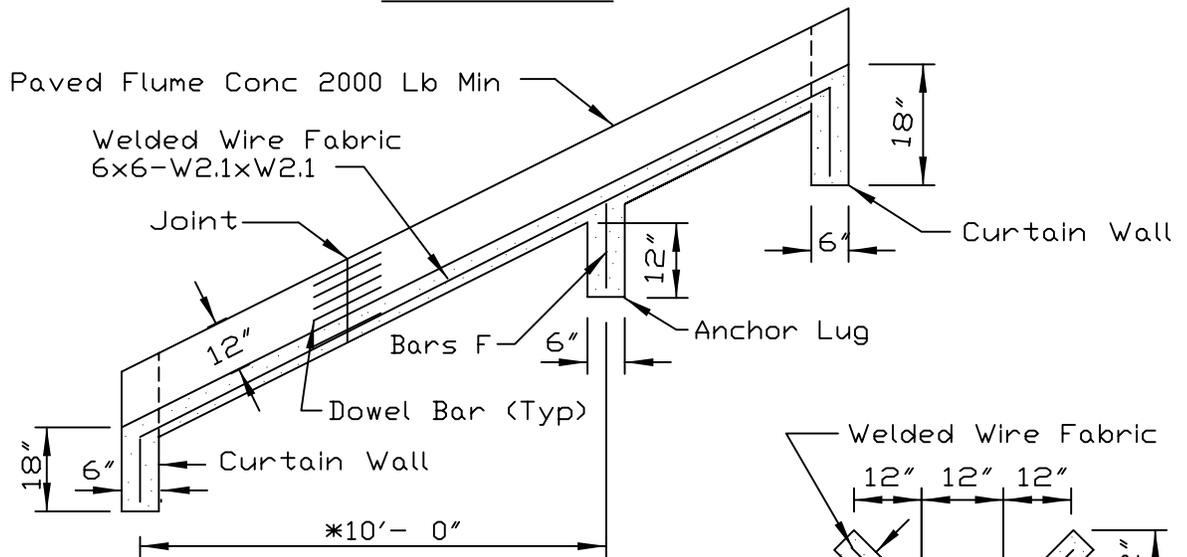


STANDARD DWG. NO.	IL-563
SHEET	1 OF 1
DATE	11-23-01

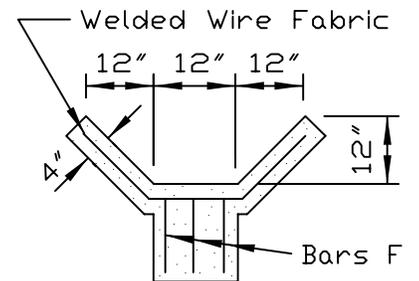
PAVED FLUME



PLAN VIEW



SECTION A-A



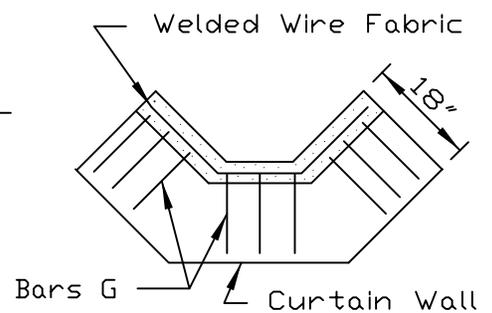
SECTION B-B

*The maximum typical spacing between Anchor Lugs and Curtain Walls shall be 10'- 0" from center to center.

SCHEDULE OF REINFORCING STEEL

MARK	NO.	LENGTH	SIZE	SPACING C-C	TYPE
F	3	1'- 1"	4"	4"	Str
G	9	1'- 3"	4"	6'	Str
Dowels	10	1'- 6"	4"	5"	Str

No. shown are for each anchor lug, curtain wall and joint.



SECTION C-C

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____

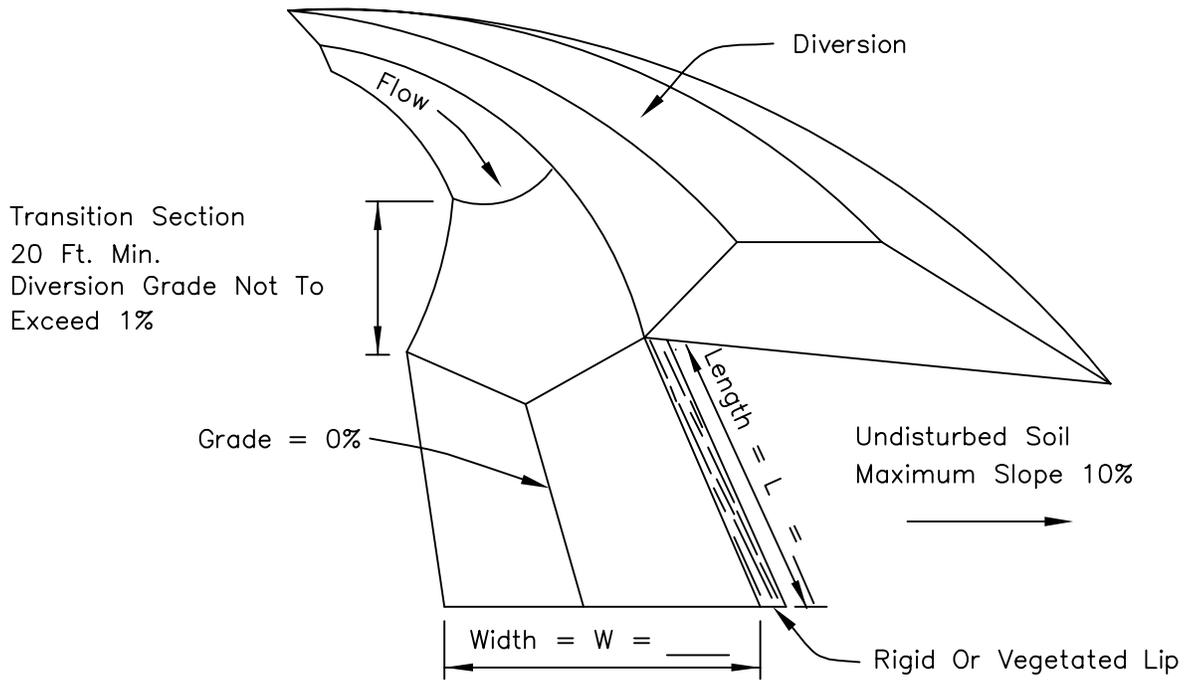


NRCS

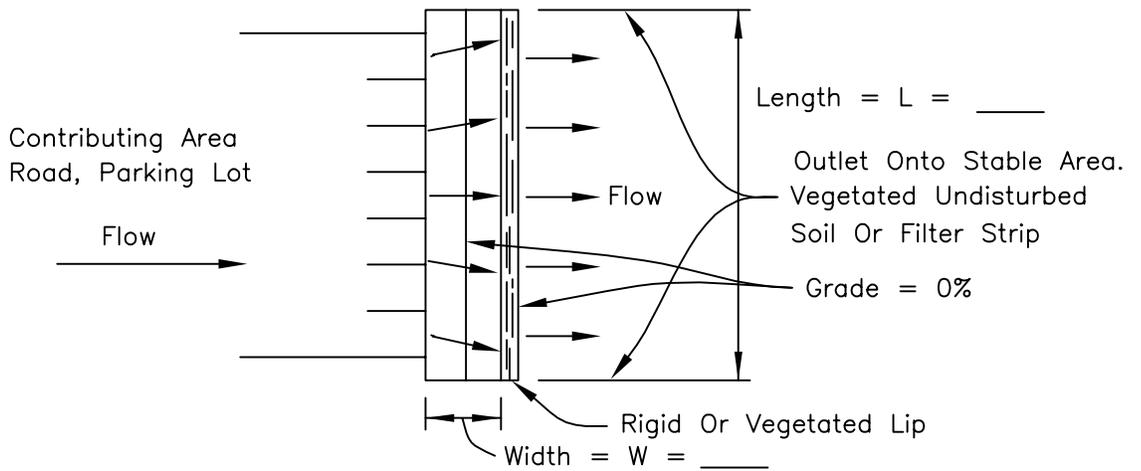
Natural Resources Conservation Service

STANDARD DWG. NO.
 IL-567
 SHEET 1 OF 1
 DATE 9-23-93

LEVEL SPREADER



LEVEL SPREADER FOR DIVERSION OUTLET



LEVEL SPREADER FOR IMPERVIOUS AREAS

NOTES:

1. Ends of spreader shall be tied into higher ground to prevent flow around the level spreader.
2. See plans for L and W dimensions.

REFERENCE

Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



Natural Resources Conservation Service

NRCS

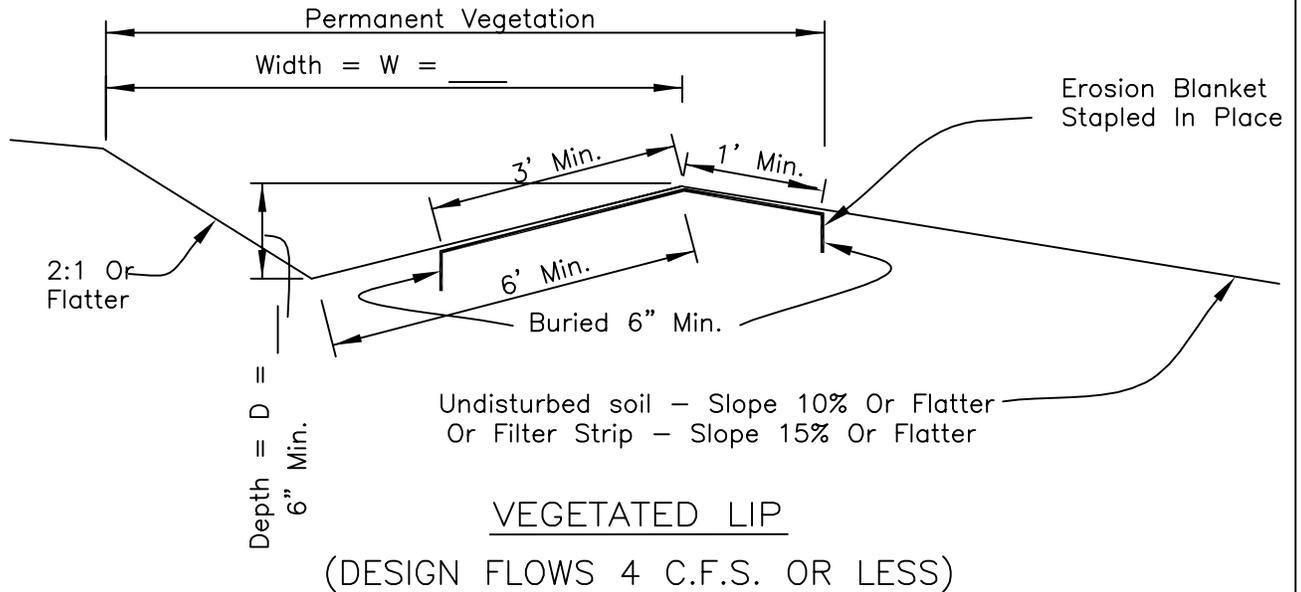
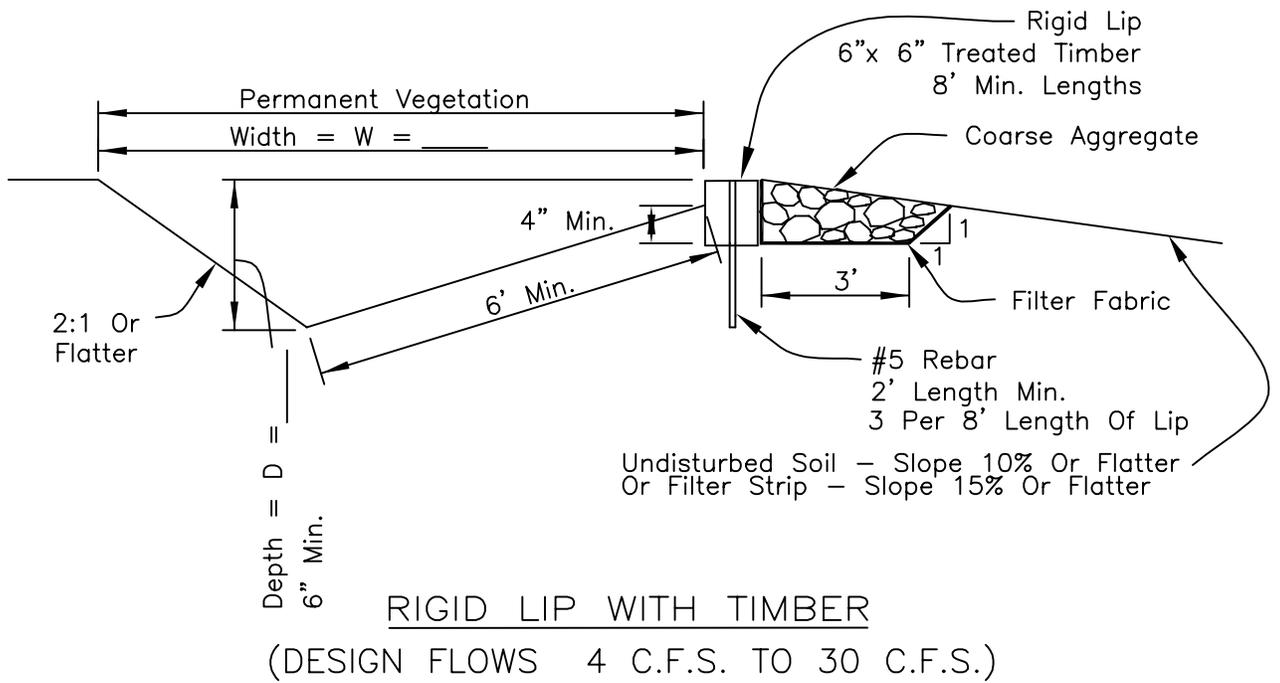
STANDARD DWG. NO.

IL-570

SHEET 1 OF 2

DATE 1-29-99

LEVEL SPREADER

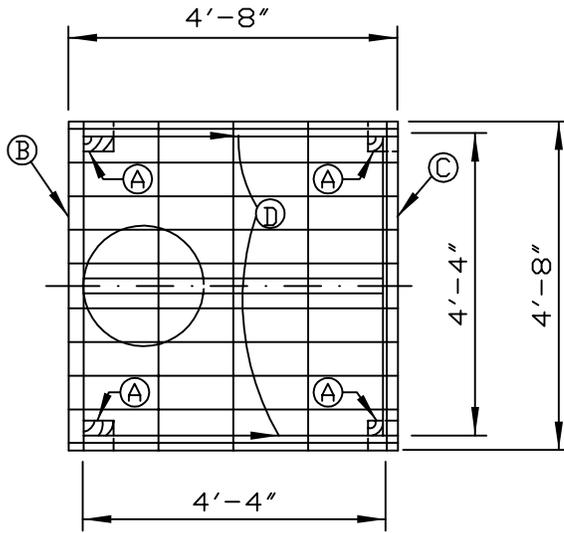


NOTES:

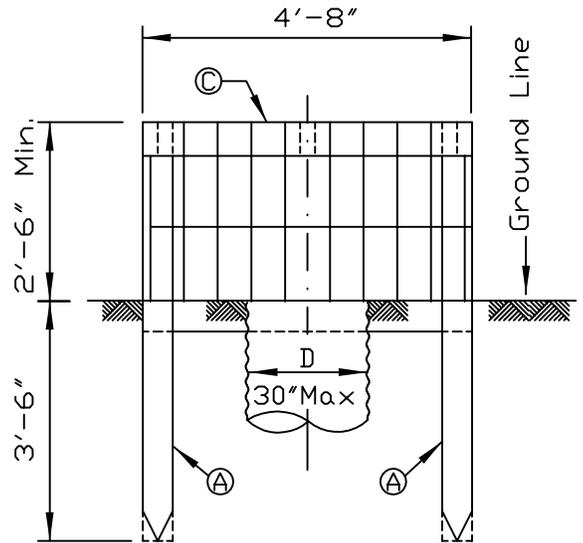
1. Coarse aggregate shall meet one of the following IDOT gradations: CA-1, or CA-3.
2. Filter fabric shall meet the requirements of material specification 592 GEOTEXTILE, Table 1 or 2, Class I, II, or IV.
3. See sheet FILTER STRIP-GRASSED IL-535 for filter strip requirements.
4. See sheet EROSION BLANKET IL-530 for blanket material and installation requirements.
5. See plans for permanent seeding requirements.
6. See plans for D and W dimensions.

<p>REFERENCE</p> <p>Project _____</p> <p>Designed _____ Date _____</p> <p>Checked _____ Date _____</p> <p>Approved _____ Date _____</p>	 <p style="font-size: 2em; font-weight: bold; margin: 0;">NRCS</p> <p style="font-size: 0.8em; font-weight: bold; margin: 0;">Natural Resources Conservation Service</p>	<p>STANDARD DWG. NO.</p> <p style="font-size: 1.5em; font-weight: bold; margin: 0;">IL-570</p> <p>SHEET 2 OF 2</p> <p>DATE 1-29-99</p>
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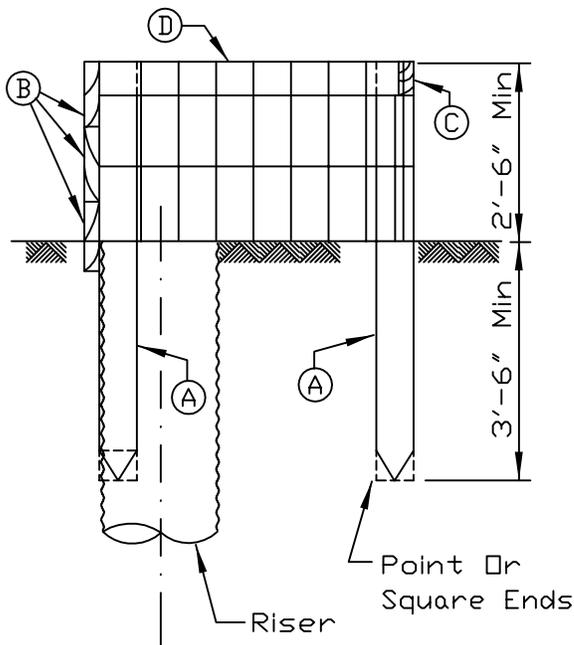
HEADWALL & SAFETY GUARD FOR PIPE RISERS



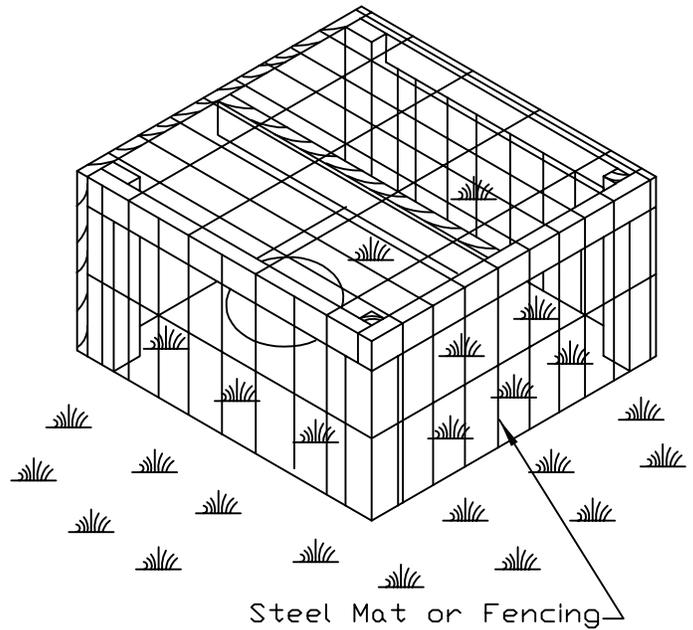
PLAN VIEW



FRONT ELEVATION



SIDE ELEVATION



ISOMETRIC VIEW

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.

IL-576

SHEET 1 OF 2

DATE 4-1-94

HEADWALL & SAFETY GUARD FOR PIPE RISERS

ESTIMATED QUANTITIES			
MARK	NO.	SIZE	LENGTH
A	4	4" x 4"	6'- 0"
B	3	2" x 12"	4'- 8"
C	1	2" x 6"	4'- 8"
D	3	2" x 6"	4'- 4"
Board Feet - 77			

NOTES:

1. All wood shall be pressure-treated with a creosote-coaltar solution or a pentachlorophenol solution.
2. All joints shall be nailed with spikes using at least 2 in each joint.
3. Posts shall be 4" square, notched as shown, with bottom left square if not driven.
4. The steel mat covering shall be 6x12 style two-way welded galvanized wire fabric or welded galvanized cattle panels with 1/4" rods and 4"x 8" openings. All splices shall be made at the corners. The edge of the mat shall be made at corners. The edge of the mat shall be bent at least 2" around the corners and the mat fasten to the frame by 2" long galvanized staples on 6" centers.

REFERENCE
Project _____
Designed _____ Date _____
Checked _____ Date _____
Approved _____ Date _____



Natural Resources Conservation Service

NRCS

STANDARD DWG. NO.

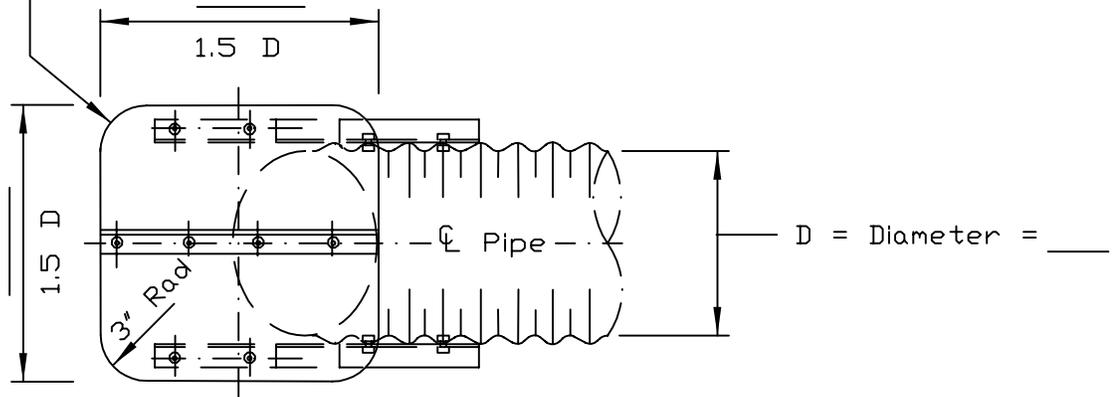
IL-576

SHEET 2 OF 2

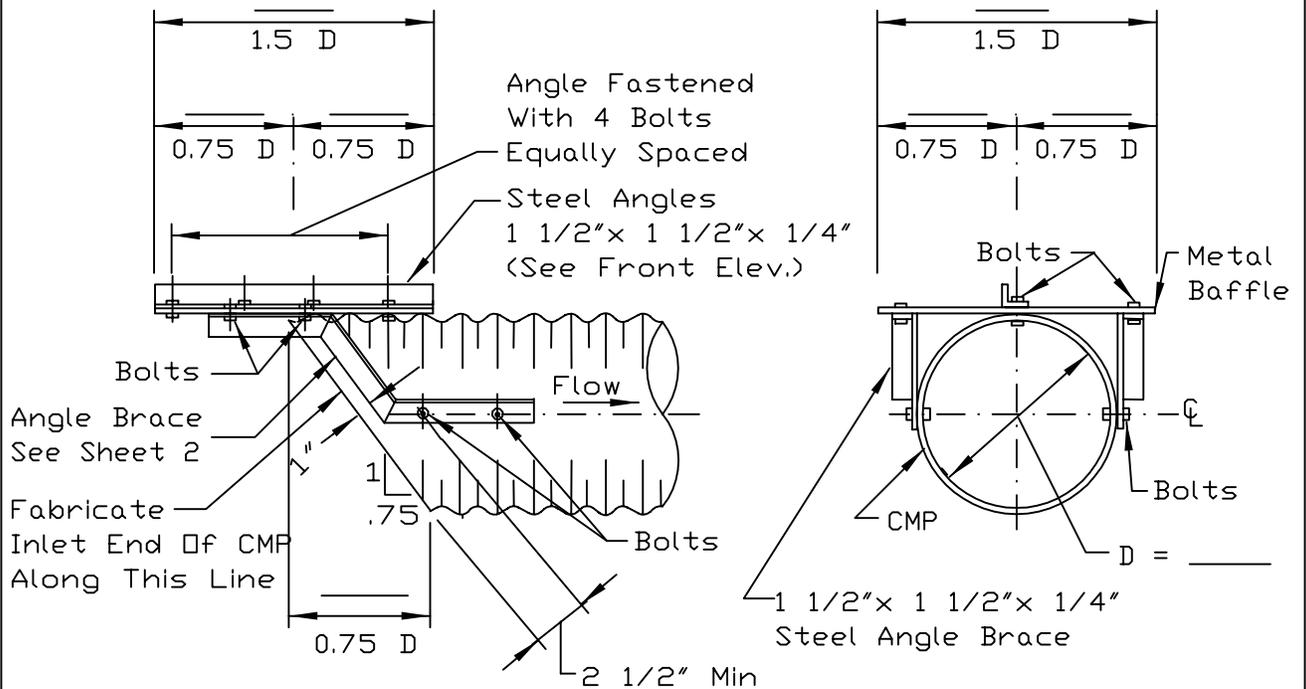
DATE 2-18-94

HOOD INLET WITH BAFFLE FOR CMP

Metal Baffle Shall Have The Same Coating As The Pipe To Which It Is Attached. Where Metal Baffle Is Fabricated Of More Than One Piece Of Metal, The Separate Pieces Shall Be Securely Fastened To Each Other. Sharp Corners Shall Be Removed. Metal Baffle May Be Made Of Corrugated Or Smooth Sheet Metal And Shaped Circular, Square Or As Shown.



PLAN



SIDE ELEVATION

FRONT ELEVATION

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____

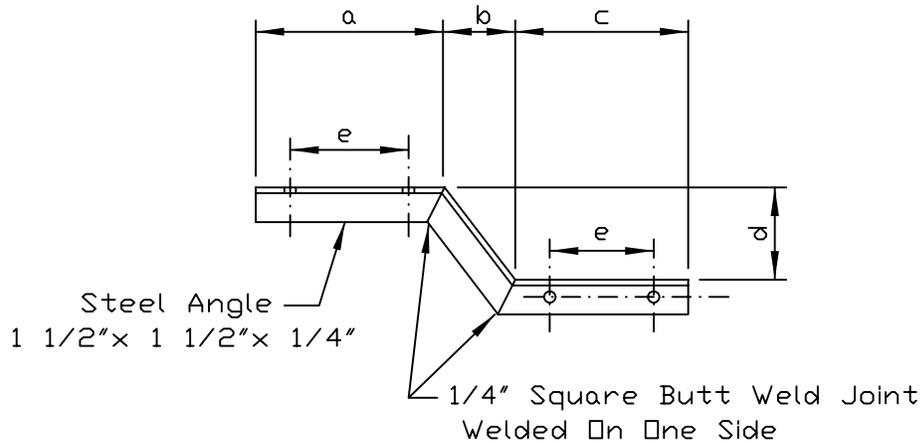


NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
 IL-577
 SHEET 1 OF 2
 DATE 2-18-94

HOOD INLET WITH BAFFLE FOR CMP



ANGLE BRACE DETAIL

(1 Left And 1 Right Required Each Baffle)

GAGE OF METAL BAFFLE AND DIMENSIONS OF ANGLE BRACE						
Diam. of Pipe D	Gage of Baffle	Angle Brace Dimensions In Inches When Used				
		a	b	c	d	e
6"	16	*	*	*	*	*
8"	16	*	*	*	*	*
10"	16	*	*	*	*	*
12"	16	8	3 3/4	9	5	5-1/3
15"	16	9	4 7/8	9	6 1/2	5-1/3

* = No Brace Required

NOTE: Angle Brace Is Optional

NOTES:

1. All bolts shall be 3/8"x 1 1/2" with nut and split washers.
2. All holes for bolts shall be drilled 7/16" in diameter.
3. All nuts, bolts and washers shall be galvanized, cadmium plated, or stainless steel.
4. All cuts shall be saw or shear cut.
5. Holes in the angle brace shall be spaced and located to match corrugations in pipe and baffle.
6. Steel angles shall be galvanized.
7. All galvanizing damaged by cutting, drilling or welding shall be repaired by painting with two (2) coats of zinc dust-oxide primer.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
 IL-577
 SHEET 2 OF 2
 DATE 3-1-95

CMP DROP INLET AND BAFFLE

RISER DIA (A)	CONDUIT DIA (B)	ANTI-VORTEX BAFFLE DIMENSIONS				BASE DIMENSIONS	
		(D)	(E)	(F)	(G)	(M)	(N)
12"	6",8"	24"	4"	16"	4 1/2"	6"	3'-0"
15"	8",10"	30"	5"	17"	6"	7 1/2"	3'-3"
18"	10",12"	36"	6"	18"	7 1/2"	3"	3'-6"
24"	15",18"	48"	8"	20"	10 1/2"	6"	4'-0"
30"	21",24"	60"	10"	22"	13 1/2"	3"	4'-6"
36"	24",30"	72"	12"	24"	16 1/2"	6"	5'-0"

RISER DIA (A)	REINFORCING BARS			VOLUME OF CONCRETE
	NUMBERS	(L)	TOTAL WEIGHT	
12"	6"	2'-6"	10.0 LB.	0.3 CU.YD.
15"	6"	2'-9"	11.0 LB.	0.4 CU.YD.
18"	8"	3'-0"	16.0 LB.	0.5 CU.YD.
24"	8"	3'-6"	18.7 LB.	0.6 CU.YD.
30"	10"	4'-0"	26.7 LB.	0.8 CU.YD.
36"	10"	4'-6"	30.0 LB.	0.9 CU.YD.

NOTES:

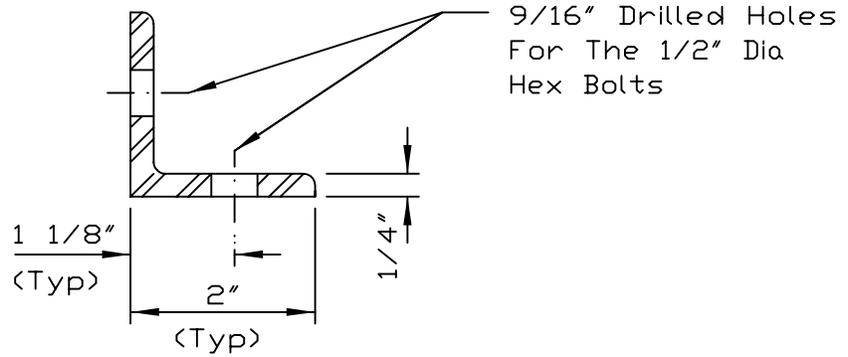
1. There are no riser height restrictions as long as the riser is located in compacted earth fill.
2. The corrugated metal riser with 4 feet conduit stub shall be fabricated from galvanized steel or aluminum. If fabricated from steel, any zinc coating damaged by welding shall be repaired as follows:
 - A) All loose and cracked coating shall be removed by wire brushing and all dirt and greasy material by a suitable solvent.
 - B) The damaged area shall be painted with two coats of Zinc Dust-Zinc Oxide primer, followed by a heavy coat of Fibrated Asphalt Mastic.
3. The angles and anti-vortex baffle plate shall be fabricated from the same material as the riser to which they will be attached. If fabricated from steel, the angles and anti-vortex baffle plate shall be galvanized after cutting and drilling.
4. The anti-vortex baffle plate can be left square, if all corners are rounded with a 6 inch radius.
5. All bolts, nuts and washers shall be galvanized steel.
6. Corrugated aluminum risers and conduits shall be separated from the reinforced concrete base by at least 2 layers of plastic tape with a total thickness of at least 24 mils or by a heavy coat of Alkali-Resistant Bituminous paint.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



STANDARD DWG. NO.
 IL-578
 SHEET 2 OF 3
 DATE 3-1-95

CMP DROP INLET AND BAFFLE



ANGLE DETAIL

TABLE SHOWING DIMENSIONS AND MATERIAL

DIMENSIONS	
Nominal Length (H) In Feet	
Gage Of Riser In Inches	
Gage Of Conduit In Inches	
∠ Angle In Degrees	
MATERIAL	
(D) Long 2"x 2"x 1/4" Angles	2
(F) Long 2"x 2"x 1/4" Angles	4
2" Long 2"x 2"x 1/4" Angle Clips	2
(D) Dia. 1/4" Thick Metal Plate	1
1/2"x1 1/2" Hex Bolts	20
1/2" Split Lockwashers	20
1/2" Hex Nuts	20
Number Of (L) Long #4 Reinforcing Bars	
Weight Of #4 Reinforcing Bars In Pounds	
Volume of Concrete In Cubic Yards	

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____

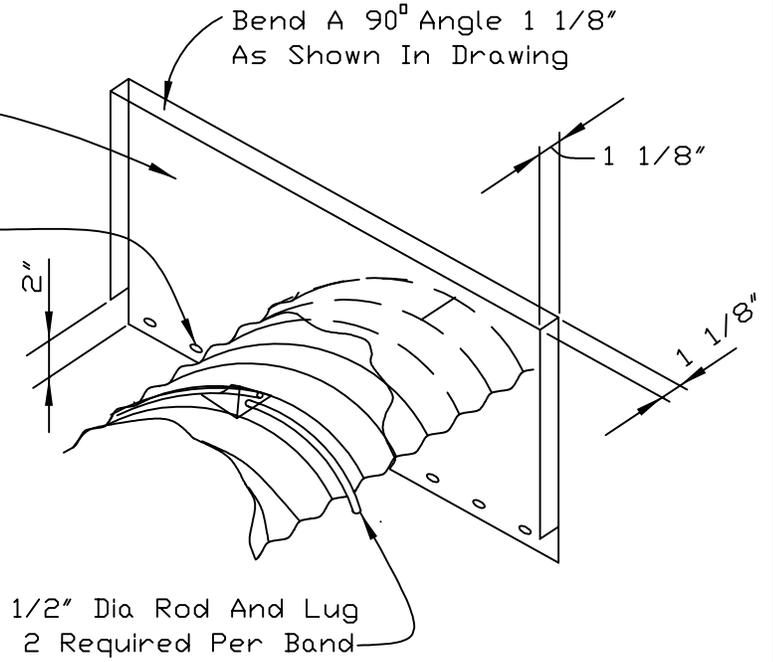
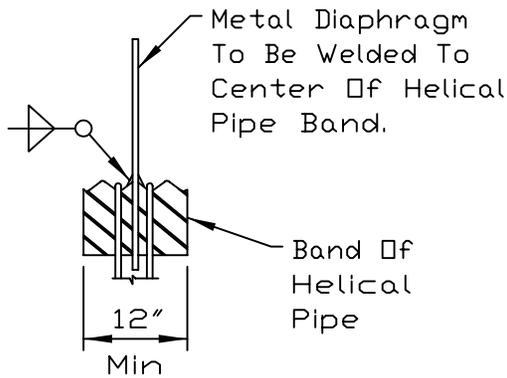


STANDARD DWG. NO.
 IL-578
 SHEET 3 OF 3
 DATE 3-1-95

CORRUGATED METAL PIPE DIAPHRAGM

Flat Sheet Metal Diaphragm Shall Be Cut To Fit Corrugations Of Helical Band And Welded With A Continuous Weld.

Size And Spacing Of Slotted Openings Shall Be The Same As Shown For C.M. Diaphragms.



NOTE: For Details of Fabrication Dimensions, Slotted Holes And Notes, See Notes And Dimension Table Shown On Sheet 2.

PARTIAL ELEVATION

ISOMETRIC VIEW

DETAILS OF HELICAL PIPE DIAPHRAGMS

NOTES:

1. Materials and coatings for all diaphragms shall be the same as that specified for the pipe.
2. Diaphragms shall be shop fabricated, assembled and marked by painting to identify matching half sections of each diaphragm.
3. The laps between the half sections and between the pipe and connecting bands shall be caulked with fibrated asphalt mastic at the time of installation.
4. All tank lugs, rods and nuts shall be galvanized steel. Where aluminum diaphragms are used, the rods and lugs shall be separated from the aluminum bands by at least two (2) layers of 2" wide plastic tape with a total thickness of 24 mils or more.
5. The diaphragms shall be welded to the connecting bands as shown on the drawings. All welds and damaged galvanized metal shall be cleaned and painted with 2 coats of zinc dust-zinc oxide primer. (Fed Spec TT-P-641 Type III)
6. Bands shall be fabricated from material having the same class of corrugation as the pipe to which it is to be attached.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



NRCS

Natural Resources Conservation Service

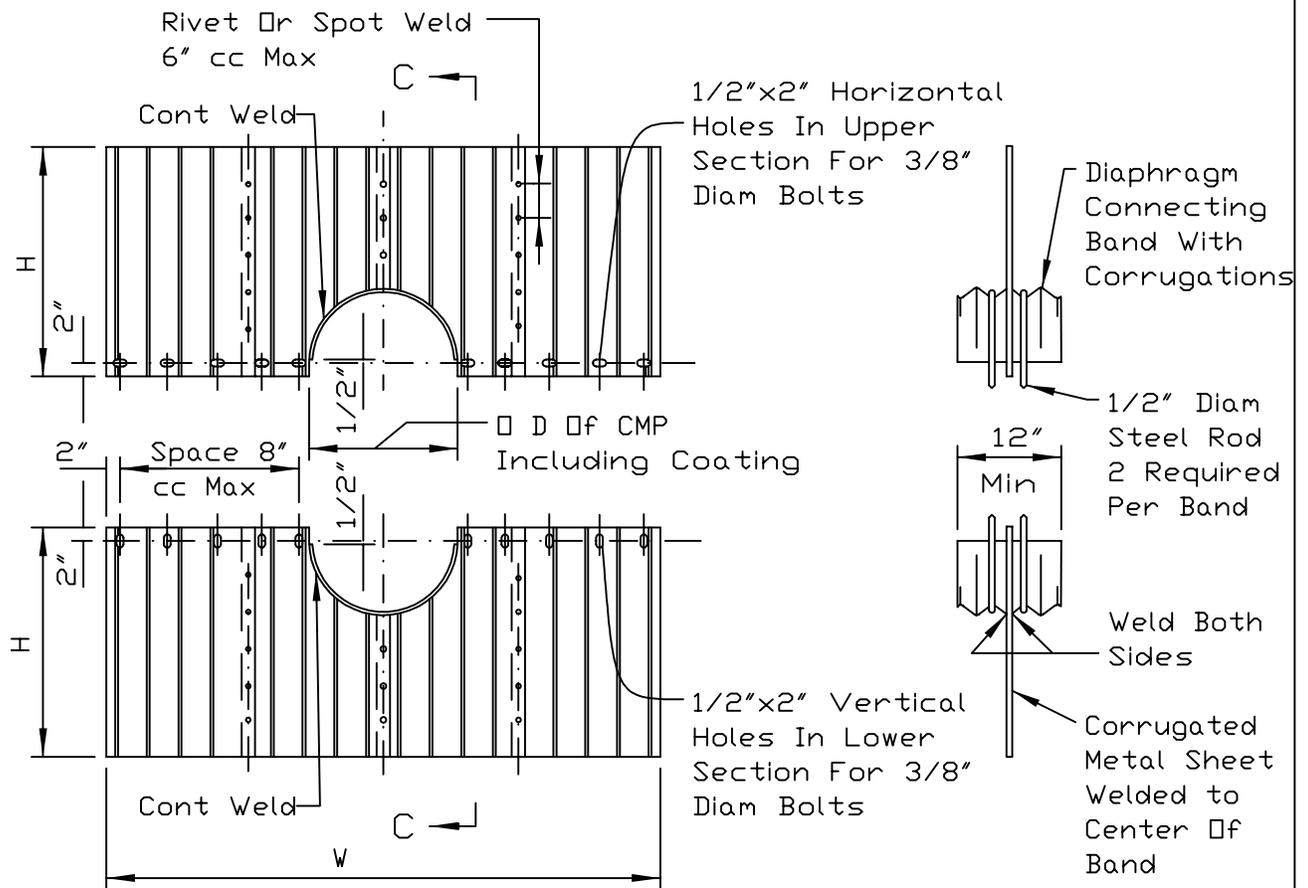
STANDARD DWG. NO.
IL-579
SHEET 1 OF 2
DATE 3-1-95

CORRUGATED METAL PIPE DIAPHRAGM

DIAPHRAGM DIMENSION TABLE

Pipe Dia.	Nominal Diaphragm Size	Fabrication Dimensions	
		W	H
15", 18" 21", 24"	8'x 6'	8'- 0"	3'- 2"
27", 30"	8'x 7'	8'- 0"	3'- 8"
36", 42" 48"	10'x 7'	10'- 0"	3'- 8"

Diaphragm dimensions shown may be increased to allow fabrication from standard size sheet.



DETAILS OF ANNULAR PIPE
DIAPHRAGMS

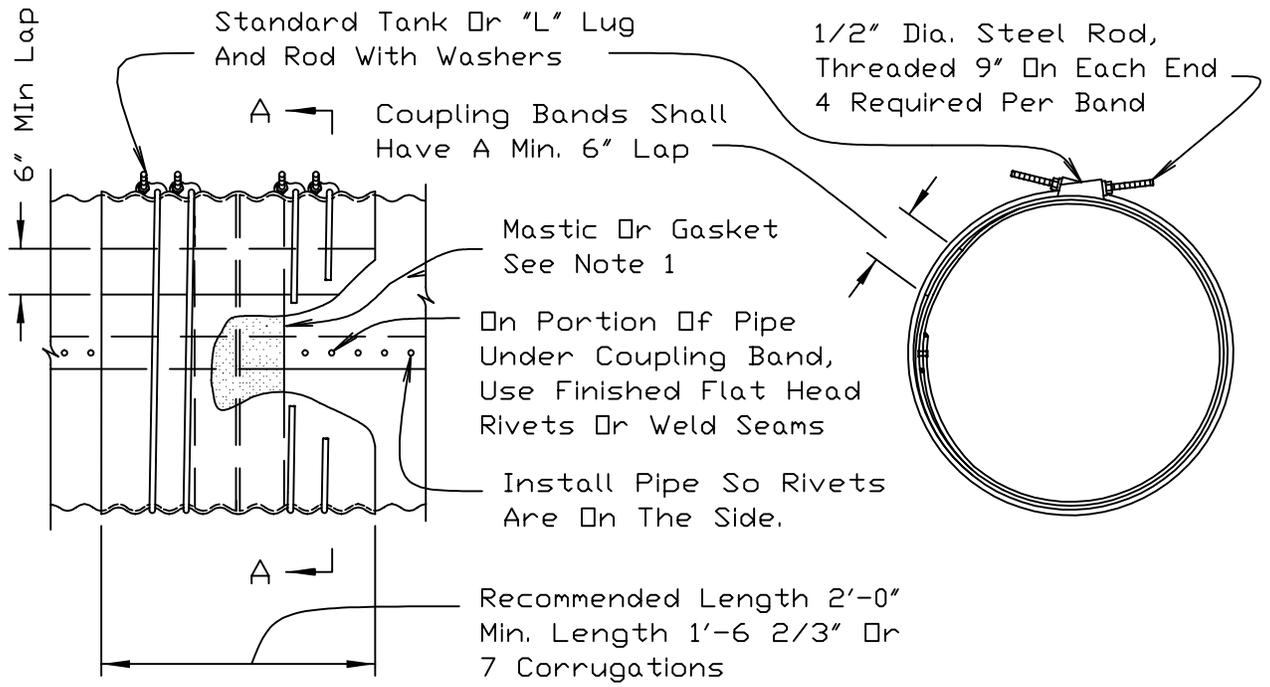
SECTION C-C

REFERENCE			
Project	_____		
Designed	_____	Date	_____
Checked	_____	Date	_____
Approved	_____	Date	_____



STANDARD DWG. NO.
IL-579
SHEET 2 OF 2
DATE 8-1-94

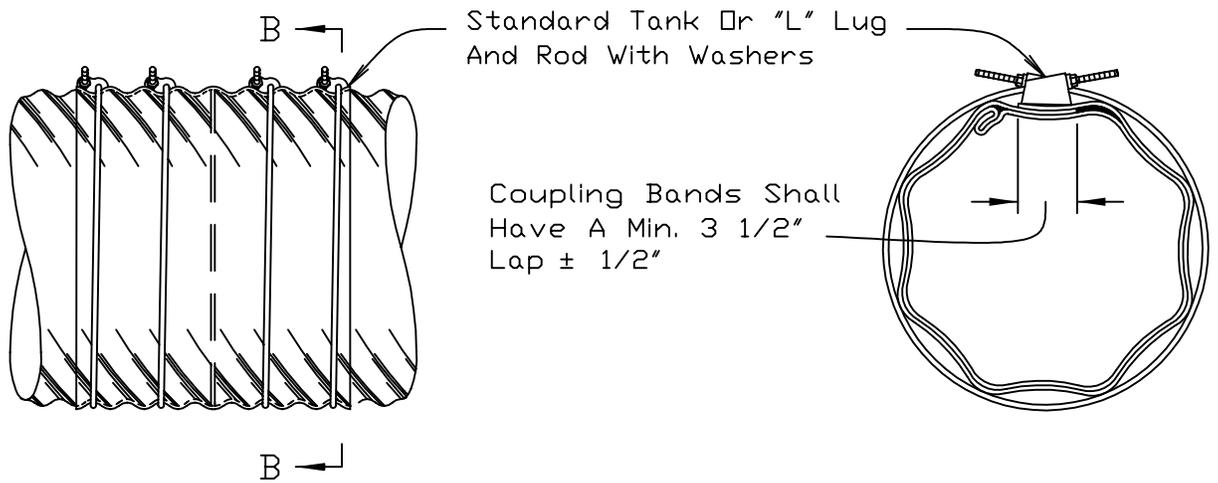
COUPLING BANDS FOR CORRUGATED METAL PIPE



ELEVATION

SECTION A-A

WATER TIGHT COUPLING BAND FOR ANNULAR PIPE



ELEVATION

SECTION B-B

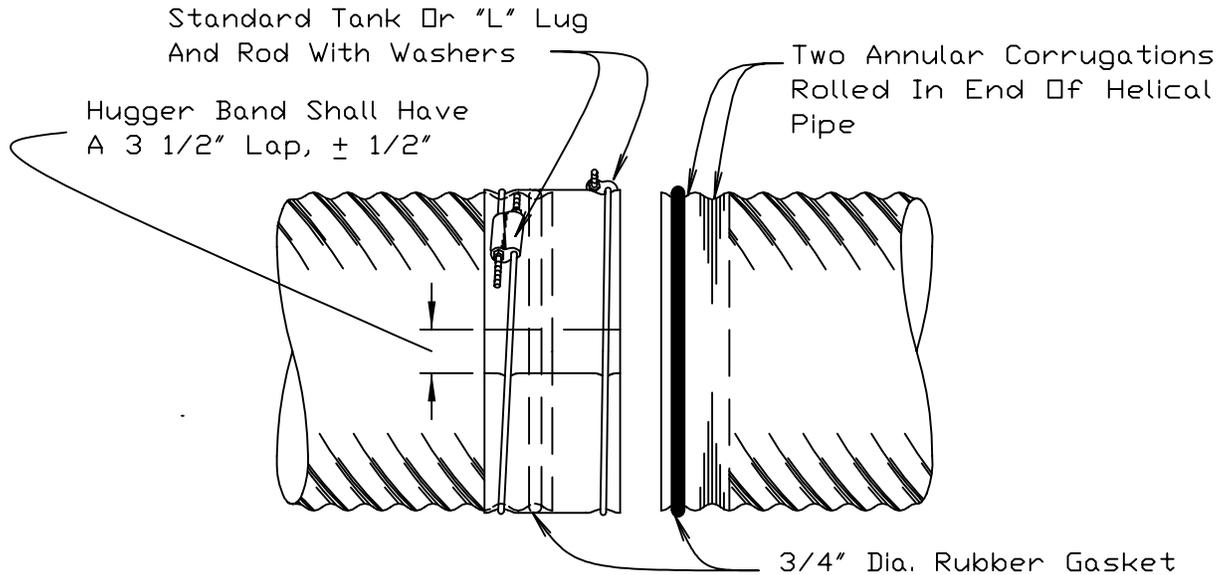
HELICAL CORRUGATED COUPLING BAND

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

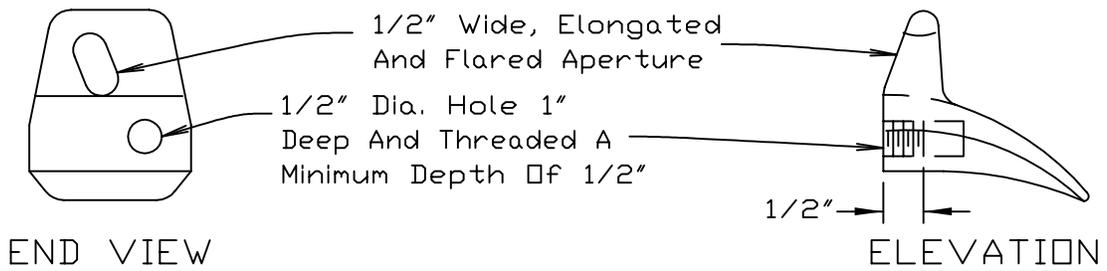


STANDARD DWG. NO.
IL-580
SHEET 1 OF 2
DATE 7-25-94

COUPLING BANDS FOR CORRUGATED METAL PIPE



WATER TIGHT HUGGER TYPE COUPLING BAND



END VIEW

ELEVATION

ALTERNATE "L" LUG

NOTES:

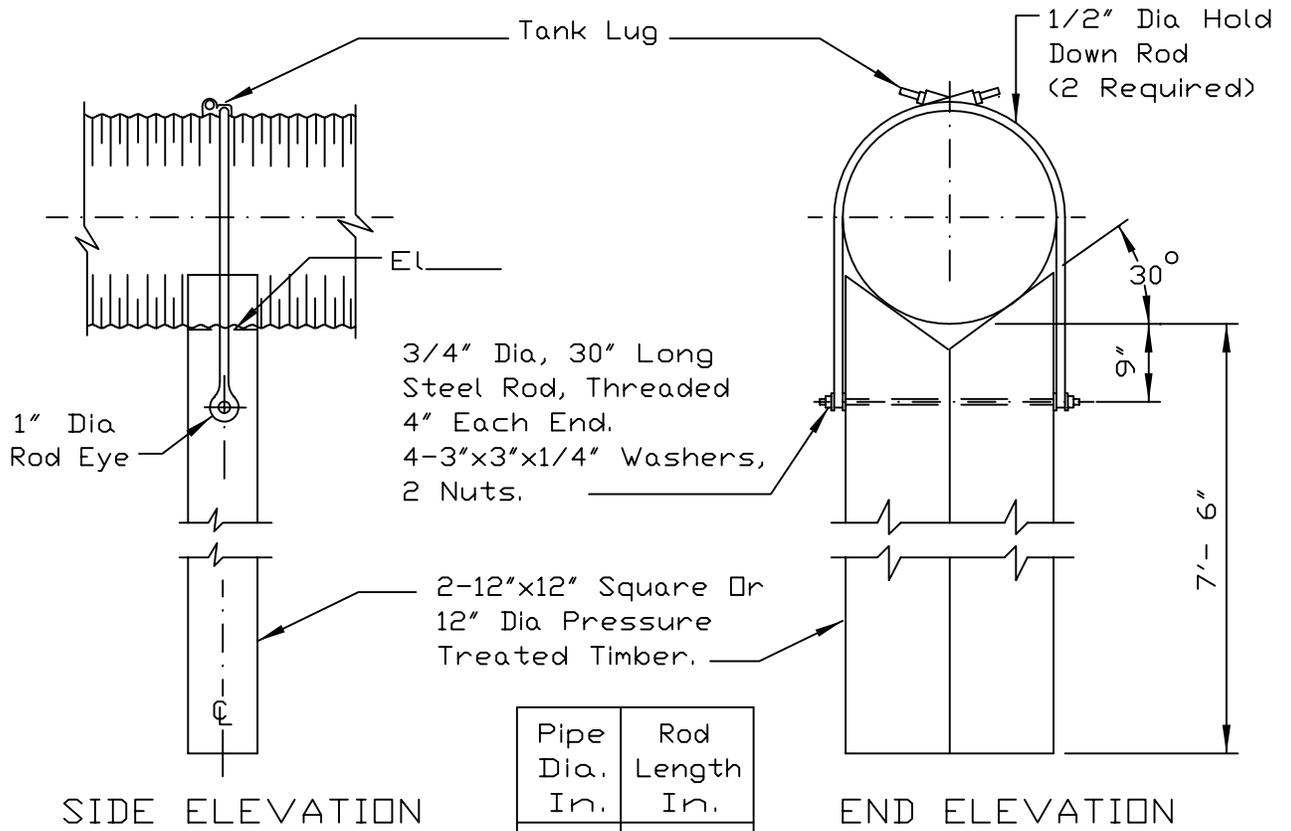
1. The Pipe Ends Covered By A Coupling Band And The Lap Seam Shall Be Coated With Bituminous Mastic. A Neoprene Gasket May Be Used In Lieu Of The Bituminous Mastic. The Gasket Size Shall Be 3/8" Thick With A Minimum Width Of 7" Centered On The Pipe Joint And Fastened At The Ends To Form A Full Circle.
2. Materials and coatings of watertight coupling bands, sleeve joints and helical metal bands shall be the same as that specified for the pipe.
3. All tank lugs, rods, and nuts shall be galvanized steel. Where aluminum bands are used, the rod and lugs shall be separated from the aluminum by at least two (2) layers of plastic tape with a total thickness of 24 mils or more.
4. Corrugated metal coupling bands may be fabricated from one or two pieces with equal minimum lap lengths.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



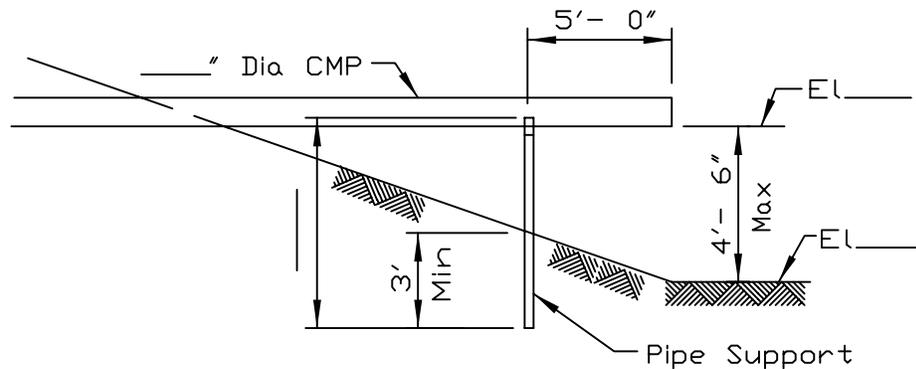
STANDARD DWG. NO.
 IL-580
 SHEET 2 OF 2
 DATE 7-25-94

TIMBER PROP FOR 18"- 30" DIAMETER CMP



Pipe Dia. In.	Rod Length In.
18	43
21	47
24	51
30	60

HOLD DOWN ROD DIMENSIONS



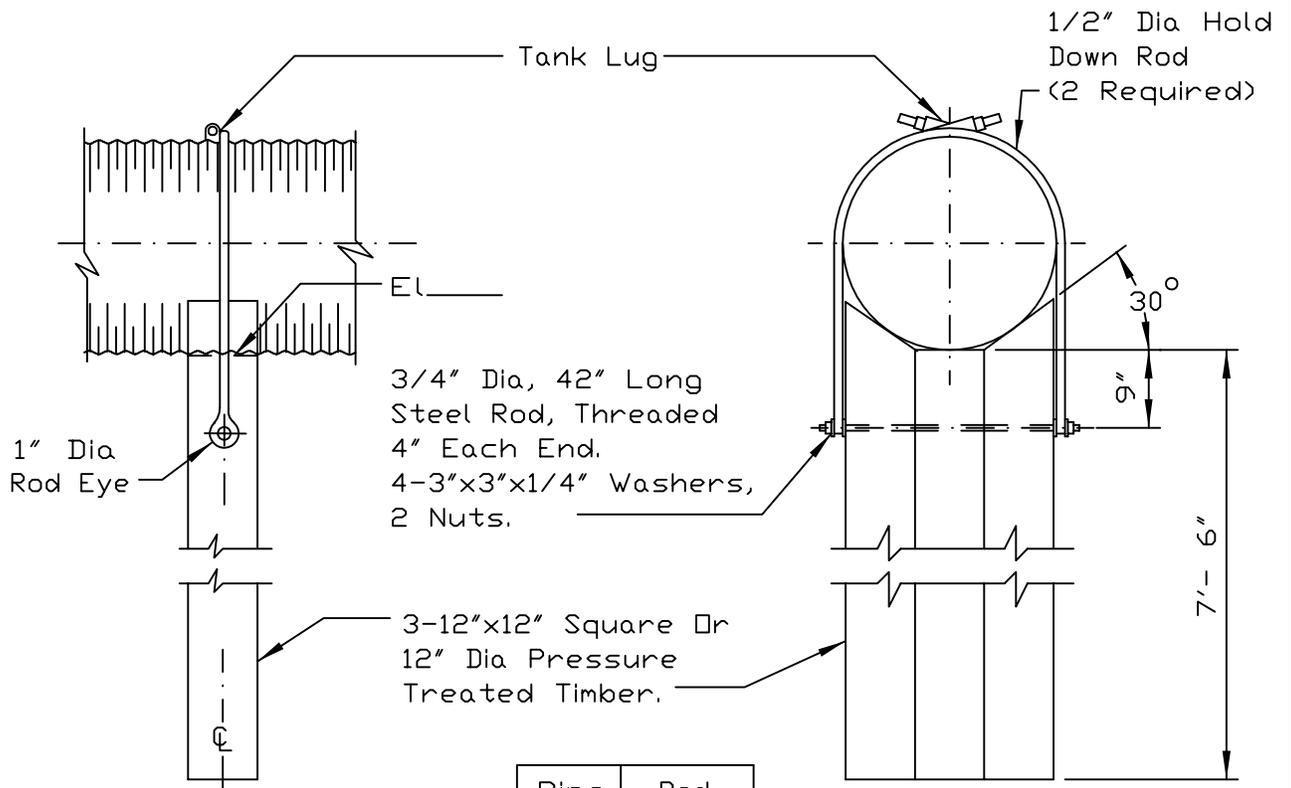
PROFILE ALONG ϕ OF OUTLET END OF PIPE

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



STANDARD DWG. NO.
 IL-581
 SHEET 1 OF 1
 9-30-93

TIMBER PROP FOR 36"- 48" DIAMETER CMP

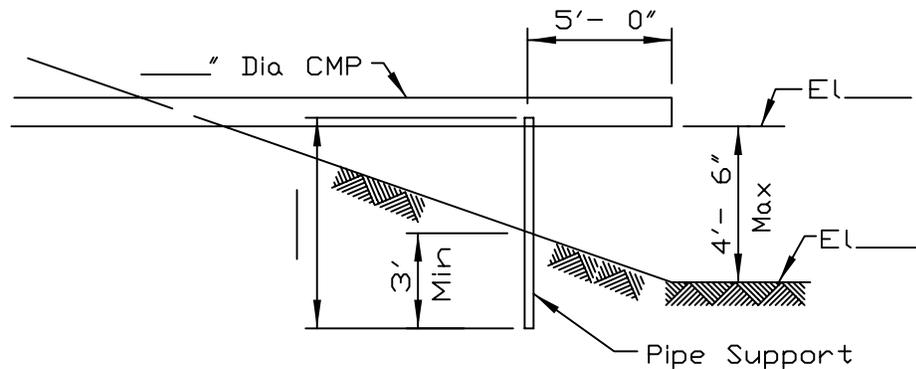


SIDE ELEVATION

END ELEVATION

Pipe Dia. In.	Rod Length In.
36	65
42	72
48	80

HOLD DOWN ROD DIMENSIONS



PROFILE ALONG ϕ OF OUTLET END OF PIPE

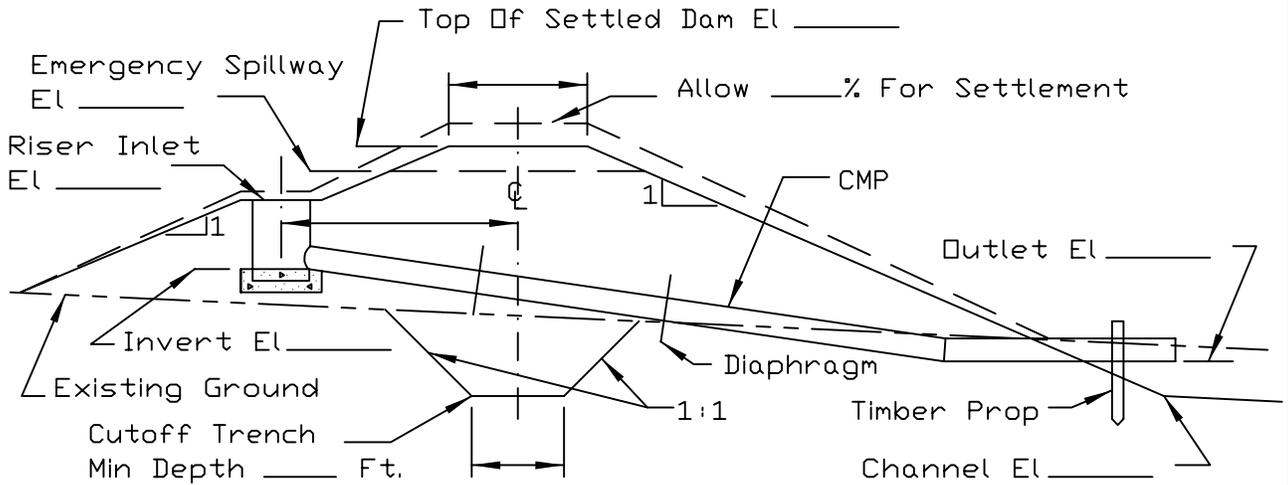
REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



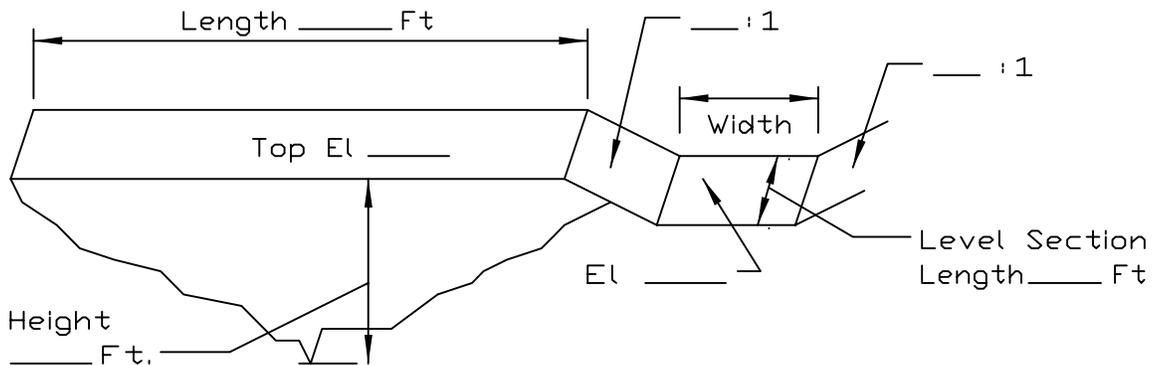
STANDARD DWG. NO.
 IL-582
 SHEET 1 OF 1
 DATE 9-30-93

DROP INLET STRUCTURE PLAN

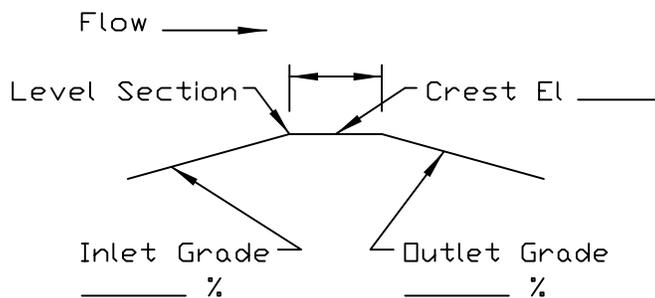
IDOT PERMIT REQUIRED Yes ___ No ___



MAXIMUM CROSS SECTION OF DAM

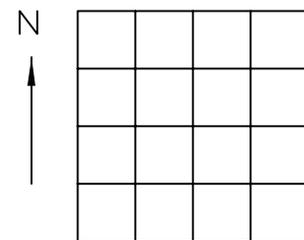


SKETCH OF DAM



PROFILE ON CENTERLINE
OF EMERGENCY SPILLWAY

LOCATION MAP



Sec. _____ T. _____ R. _____
 B.M. Elevation _____
 B.M. Description _____

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



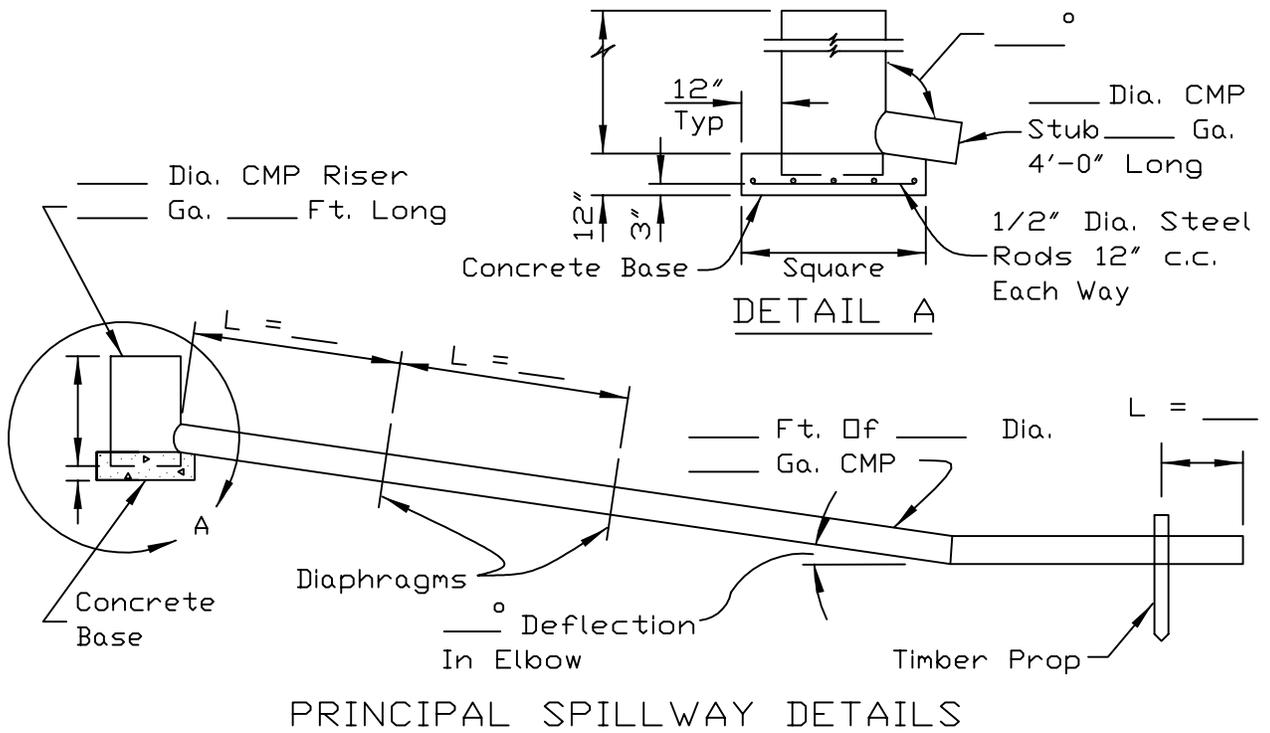
Natural Resources Conservation Service

NRCS

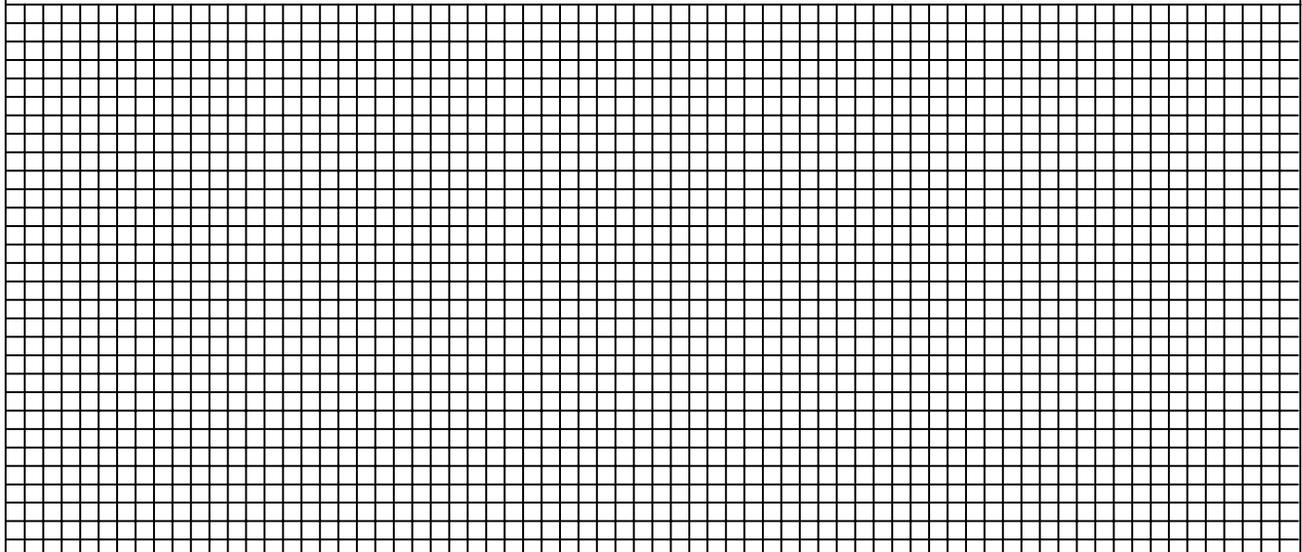
STANDARD DWG. NO.
 IL-583
 SHEET 1 OF 2
 DATE 3-3-95

DROP INLET STRUCTURE PLAN

DRAWING NUMBERS REQUIRED		ESTIMATED TABLE OF QUANTITIES		
Drop Inlet	IL-578	ITEM	UNIT	QUANTITY
Timber Prop		Total Earth Fill	Cu. Yd.	
Diaphragms		Excavation-Cutoff Trench	Cu. Yd.	
Coupling Bands	IL-580	Excavation-Principal Spillway	Cu. Yd.	
		Excavation-Emergency Spillway	Cu. Yd.	



PROFILE ALONG CENTERLINE OF FILL



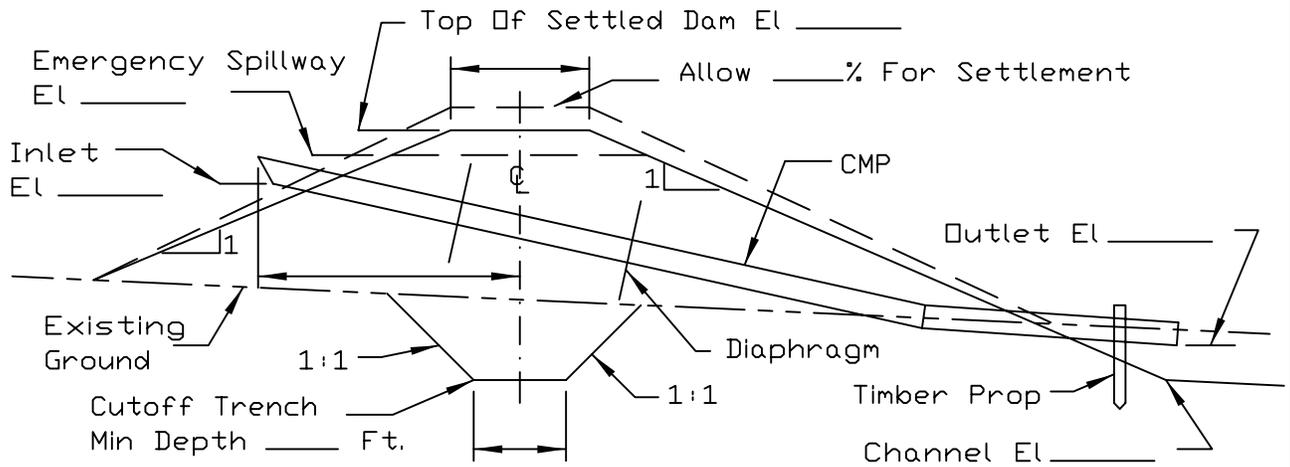
REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



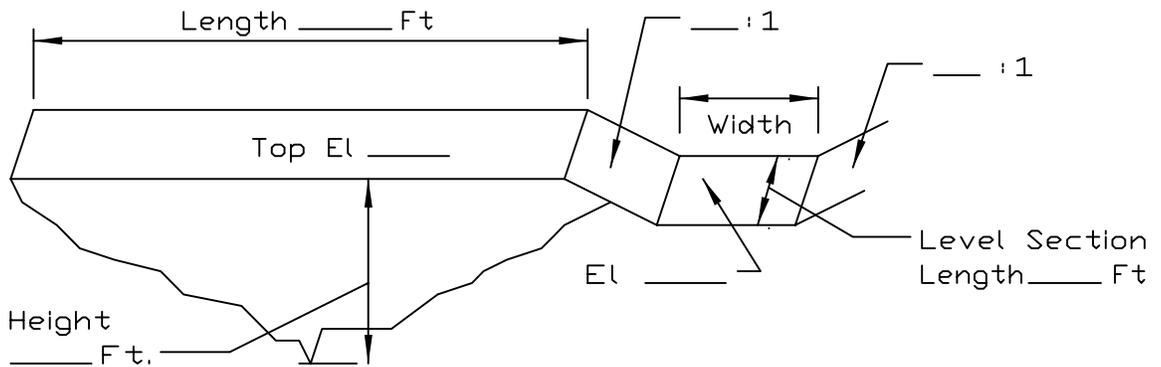
STANDARD DWG. NO.
 IL-583
 SHEET 2 OF 2
 DATE 6-22-94

HOOD INLET STRUCTURE PLAN

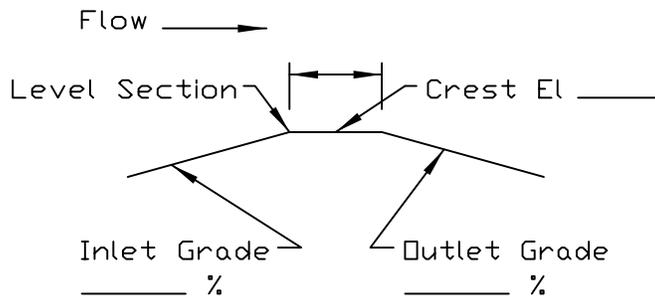
IDOT PERMIT REQUIRED Yes No



MAXIMUM CROSS SECTION OF DAM

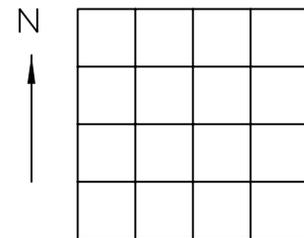


SKETCH OF DAM



PROFILE ON CENTERLINE OF EMERGENCY SPILLWAY

LOCATION MAP



Sec. _____ T. _____ R. _____
 B.M. Elevation _____
 B.M. Description _____

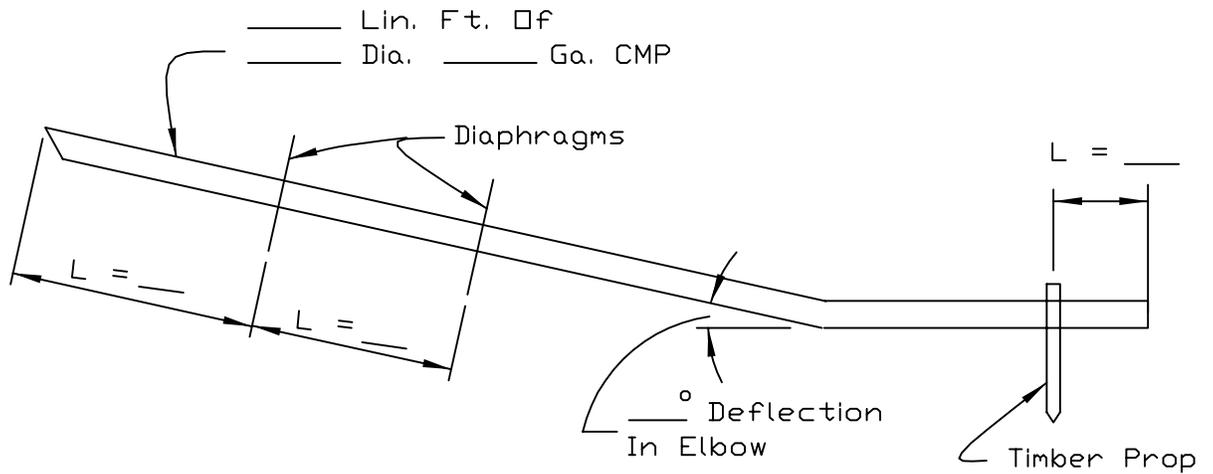
REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



STANDARD DWG. NO.
 IL-584
 SHEET 1 OF 2
 DATE 3-3-95

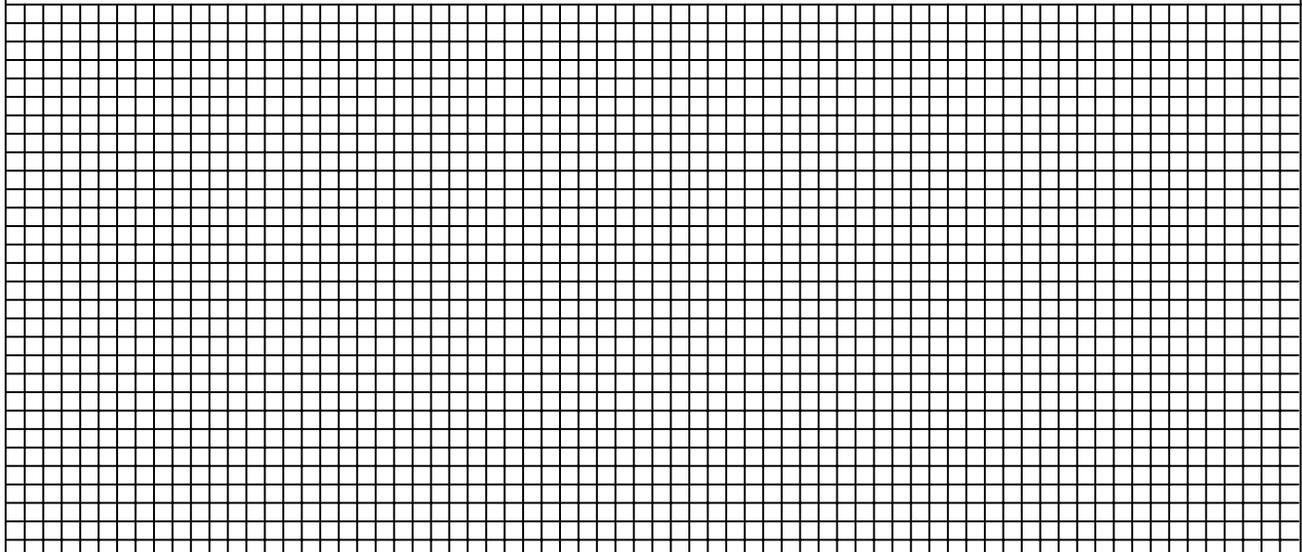
HOOD INLET STRUCTURE PLAN

DRAWING NUMBERS REQUIRED		ESTIMATED TABLE OF QUANTITIES		
Hood Inlet	IL-577	ITEM	UNIT	QUANTITY
Timber Prop		Total Earth Fill	Cu. Yd.	
Diaphragms		Excavation-Cutoff Trench	Cu. Yd.	
Coupling Bands	IL-580	Excavation-Principal Spillway	Cu. Yd.	
		Excavation-Emergency Spillway	Cu. Yd.	



PRINCIPAL SPILLWAY DETAILS

PROFILE ALONG CENTERLINE OF FILL



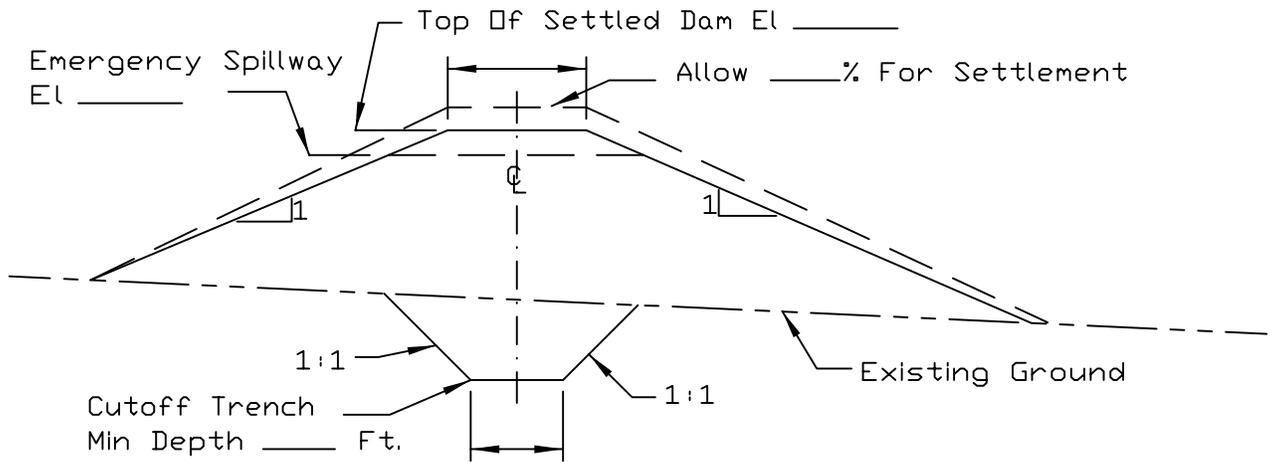
REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



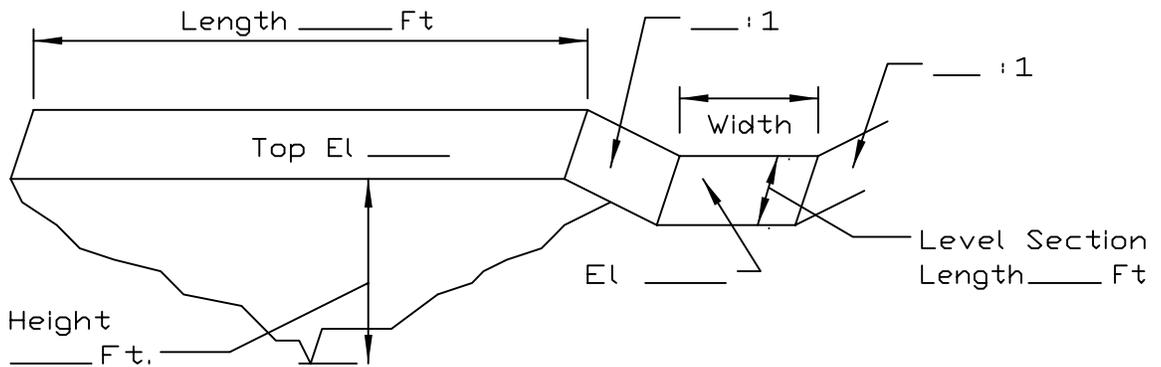
STANDARD DWG. NO.
 IL-584
 SHEET 2 OF 2
 DATE 6-20-94

EARTH DAM STRUCTURE PLAN

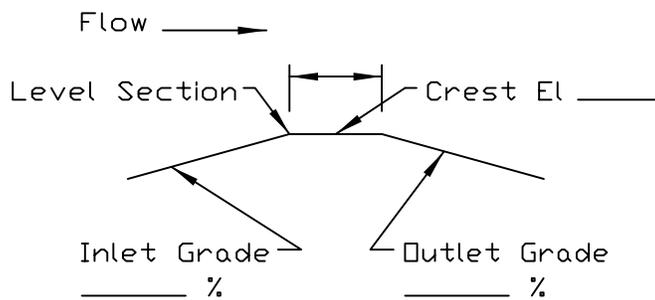
IDOT PERMIT REQUIRED Yes ___ No ___



MAXIMUM CROSS SECTION OF DAM

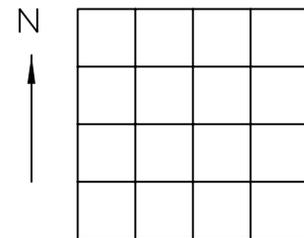


SKETCH OF DAM



PROFILE ON CENTERLINE
OF EMERGENCY SPILLWAY

LOCATION MAP



Sec. _____ T. _____ R. _____
 B.M. Elevation _____
 B.M. Description _____

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



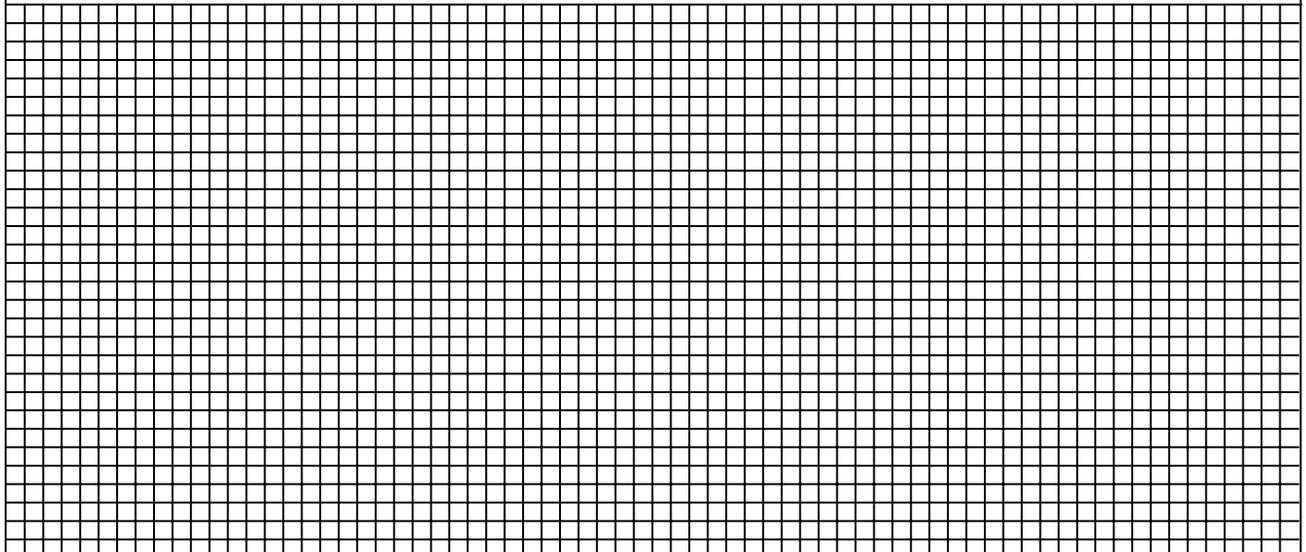
STANDARD DWG. NO.
 IL-585
 SHEET 1 OF 2
 DATE 3-3-95

EARTH DAM STRUCTURE PLAN

ESTIMATED TABLE OF QUANTITIES

ITEM	UNIT	QUANTITY
Total Earth Fill	Cu. Yd.	
Excavation- Cutoff Trench	Cu. Yd.	
Excavation-Emergency Spillway	Cu. Yd.	

PROFILE ALONG CENTERLINE OF FILL

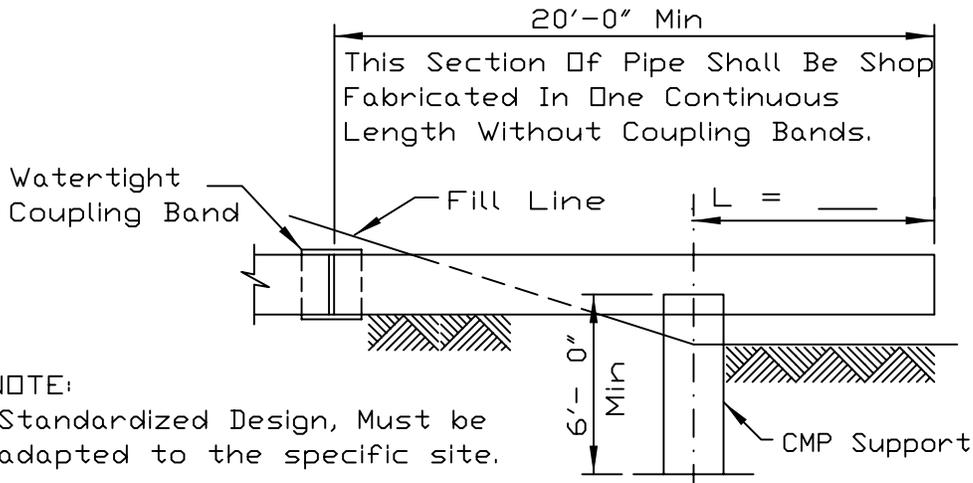


REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



STANDARD DWG. NO.
 IL-585
 SHEET 2 OF 2
 DATE 6-16-94

CORRUGATED METAL PIPE SUPPORT



NOTE:
Standardized Design, Must be adapted to the specific site.

SECTION ON CENTERLINE

TABLE OF DIMENSIONS				
C.M. PIPE DIA (INCHES)	BOTTOM PLATE (METAL THICKNESS AND GAGE)	VOLUME OF CONC. (CU YDS / LIN FT) OF CMP	7/16" DIA HOLD DOWN ROD LENGTH	3/4" DIA ROD LENGTH
8	.064, 16 GA.	.01	2'-3"	1'-2"
10	.064, 16 GA.	.02	2'-6"	1'-4"
12	.064, 16 GA.	.03	2'-8"	1'-6"
15	.079, 14 GA.	.05	3'-0"	1'-9"
18	.079, 14 GA.	.07	3'-4"	2'-0"
21	.079, 14 GA.	.09	3'-8"	2'-3"
24	.109, 12 GA.	.12	4'-0"	2'-6"
30	.109, 12 GA.	.18	4'-8"	3'-0"
36	.138, 10 GA.	.26	5'-4"	3'-6"
42	.168, 8 GA.	.36	6'-0"	4'-0"
48	.188, 7 GA.	.47	6'-7"	4'-6"

BILL OF MATERIAL

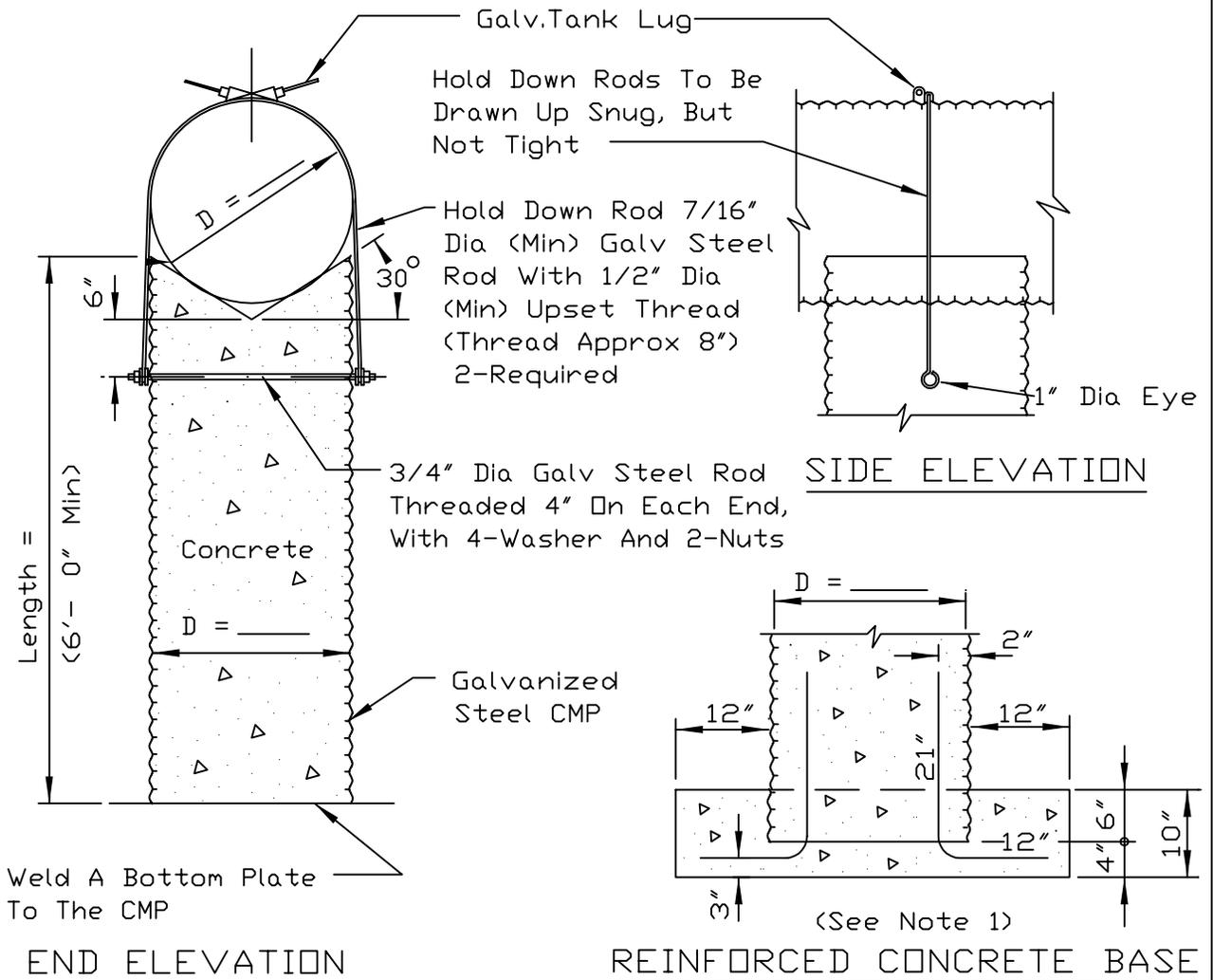
Galv Steel CMP ___ dia, ___ lin. ft. Metal Thickness ___, Gage ___
 Galv Steel Bottom Plate ___' ___" x ___' ___" Metal Thickness ___, Gage ___
 3/4" Dia. Galv Steel Rod ___ feet, threaded 4" on each end with
 4 washers and 2 nuts.
 7/16" Dia. (min) Galv. Steel Rod ___ feet, with 1/2" dia. (min) upset
 thread (thread approx. 8")
 Galv. Tank Lug - 1 each
 Concrete _____ cu. yds.
 Steel Reinforcement 6.7 pounds

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



STANDARD DWG. NO.
 IL-586
 SHEET 1 OF 2
 DATE 4-6-94

CORRUGATED METAL PIPE SUPPORT



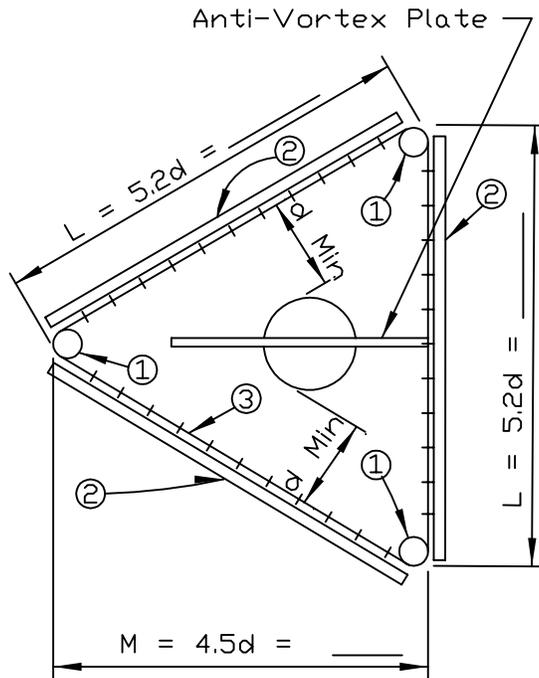
- NOTES:**
1. If the pier has to be shortened because of bedrock, a 10" reinforced concrete base must be provided, instead of bottom plate, extending 12" beyond the pipe diameter using 4 - #4 re-bars, 33" long; bent as shown.
 2. If principal spillway conduit is aluminum, the surfaces in contact with the concrete shall be separated with a layer of heavy roofing felt.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

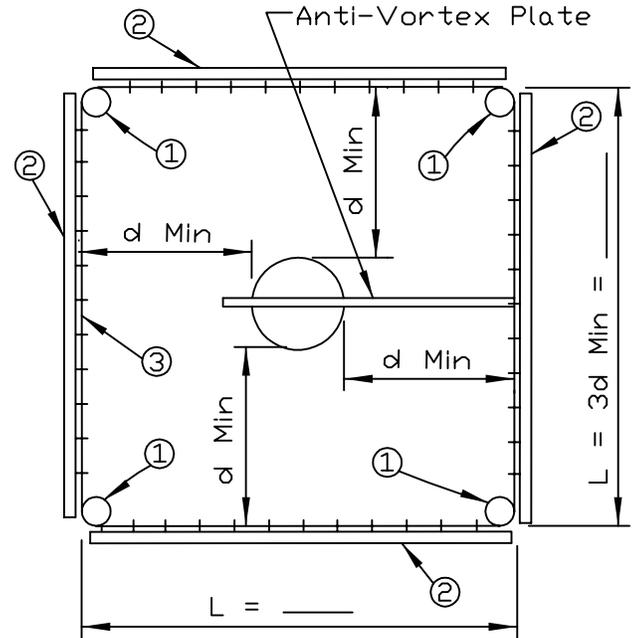


STANDARD DWG. NO.
IL-586
SHEET 2 OF 2
DATE 4-6-94

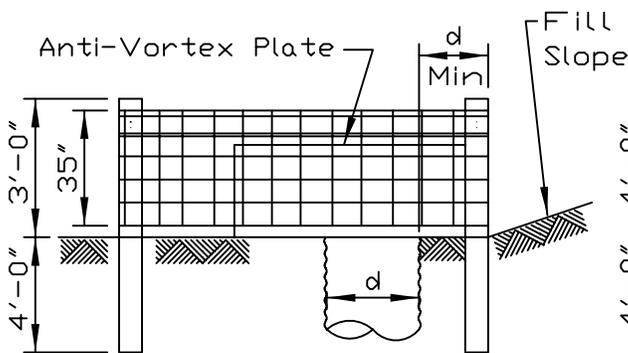
TRASH RACKS FOR PIPE DROP INLET



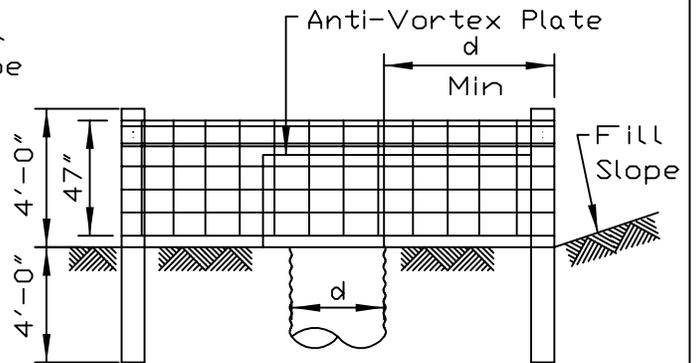
PLAN



PLAN



ELEVATION



ELEVATION

NOTE:
Triangle use limited to:
1. Stage of 2'-6" maximum
2. Riser dia. of 2'-0" maximum

NOTE:
Square use limited to:
1. Stage of 3'-6" max. with 47" fence
2. Riser dia. of 4'-0" maximum

REFERENCE
Project _____
Designed _____ Date _____
Checked _____ Date _____
Approved _____ Date _____



STANDARD DWG. NO.
IL-590
SHEET 1 OF 2
DATE 4-4-94

TRASH RACKS FOR PIPE DROP INLET

BILL OF MATERIALS

MARK	QUANTITY	DESCRIPTION	LENGTH
1		Wood posts, 6" tip pressure treated	
2		Wood plank 2" thick x 6" wide x L, pressure treated	
3	1	Fence, woven wire, No. 9 top & bottom, with 12" stays ____" high	
—	As req'd	Staples - Mark ③ to ① and ②	1 1/4"
—		3/8" dia lag screws with flat washers, mark ② to ①	4 1/2"

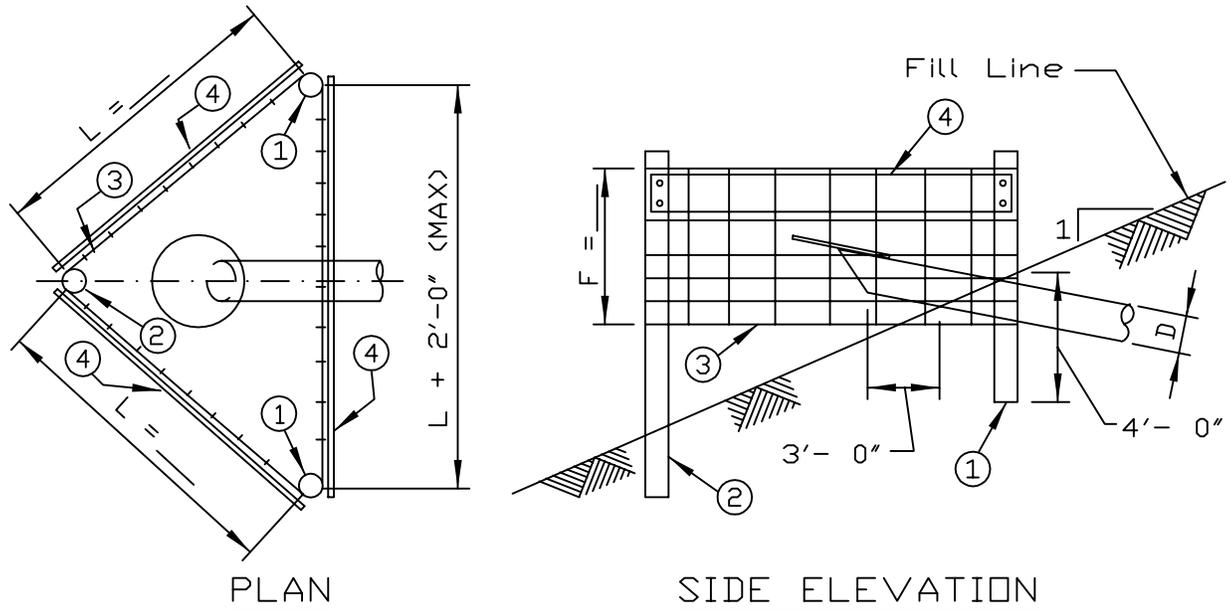
NOTE: Fence and staples to be galvanized and lag screws cadmium plated.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



STANDARD DWG. NO.
 IL-590
 SHEET 2 OF 2
 DATE 4-4-94

TRASH RACKS FOR HOODED INLET



BILL OF MATERIALS			
MARK	QUANTITY	DESCRIPTION	LENGTH
1	2	Wood post, 6" tip, pressure treated	
2	1	Wood post, 6" tip, pressure treated	
3	1	Fence, woven wire, No. 9 top and bottom, with 12" stays ___ " high.	
—		Staples - Mark (3) to (1) and (2)	1 1/4"
4	3	Wood plank 2" thick x 6" wide x L + 6", pressure treated.	
	12	3/8" dia lag screws with flat washers, mark (4) to (1) and (2)	4 1/2"

NOTE: Fence and staples to be galvanized and lag screws cadmium plated.

DIMENSIONS					
D PIPE	L FT.	F IN.	LIN.FT. OF FENCE	POST LENGTH FT.*	
				(1)	(2)
6" - 12"	8 - 0	35		7 - 0	9 - 0
15" - 18"	10 - 0	47		8 - 0	10 - 0

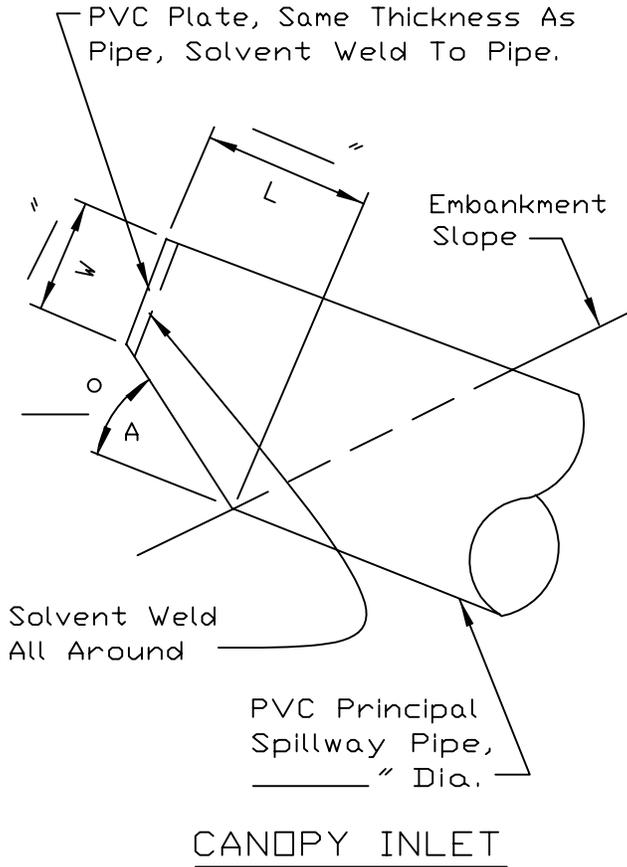
* Length of post based on 3:1 slope.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



STANDARD DWG. NO.
 IL-591
 SHEET 1 OF 1
 DATE 8-11-93

DETAIL FOR PVC CANOPY PIPE



PIPE DIA. <In.>	PIPE GRADE <%>	W <In.>	L <In.>	A <Deg>
6	0-5	1 1/8	3 1/4	56
	5.1-15	1 1/4	4 7/8	45
	15.1-25	1 5/8	6 5/8	33
8	0-5	1 1/2	4 3/8	56
	5.1-15	1 5/8	6 7/8	45
	15.1-25	2 1/8	8 3/4	33
10	0-5	1 7/8	5 3/8	56
	5.1-15	2	8	45
	15.1-25	2 5/8	11	33
12	0-5	2 1/4	6 1/2	56
	5.1-15	2 3/8	9 5/8	45
	15.1-25	3 1/4	13 1/4	33

NOTES:

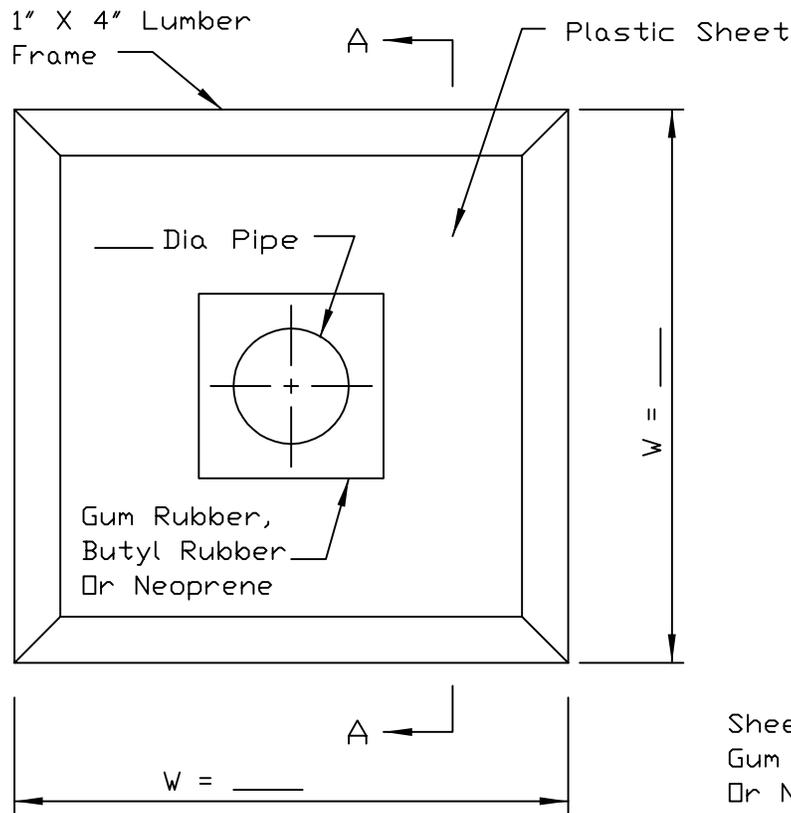
1. SDR 26 pressure rated PVC pipe shall conform to ASTM standard D-2241. Schedule 40 and 80 PVC shall conform to ASTM standard D-1785.
2. Pipe material designation shall be PVC 1120 OR PVC 1220.
3. The longest section of pipe in the installation shall not exceed 20 ft. in length.
4. PVC pipe shall be joined by double gasketed couplings capable of withstanding 160 PSI internal pressure. Minimum length of coupling shall be 7.8" for 6" dia., 8.2" for 8" dia., 9.1" for 10" dia and 10" for 12" dia.
5. PVC solvent cement shall be formulated for the intended use to produce a weld of maximum strength.
6. Pipe must be manufactured from ultra-violet decay resistant material. Areas of pipe that will be exposed after installation is completed must be further protected from ultra-violet degradation. Wrapping the exterior of exposed pipe with plastic tape or by painting is acceptable.
7. The pipe shall be firmly and uniformly bedded so the lower one-sixth of the circumference will bear against original or compacted earth.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

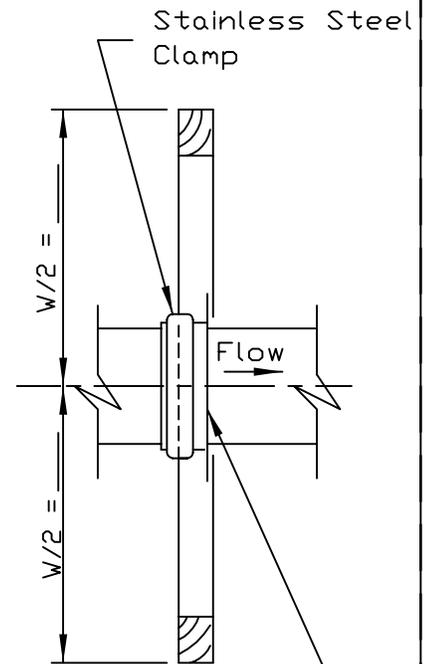


STANDARD DWG. NO.
IL-592
SHEET 1 OF 1
DATE 3-3-95

FLEXIBLE ANTISEEP COLLAR



ELEVATION



Sheet Of Non-Reinforced
Gum Rubber, Butyl Rubber
Or Neoprene Membrane

SECTION A-A

NOTES:

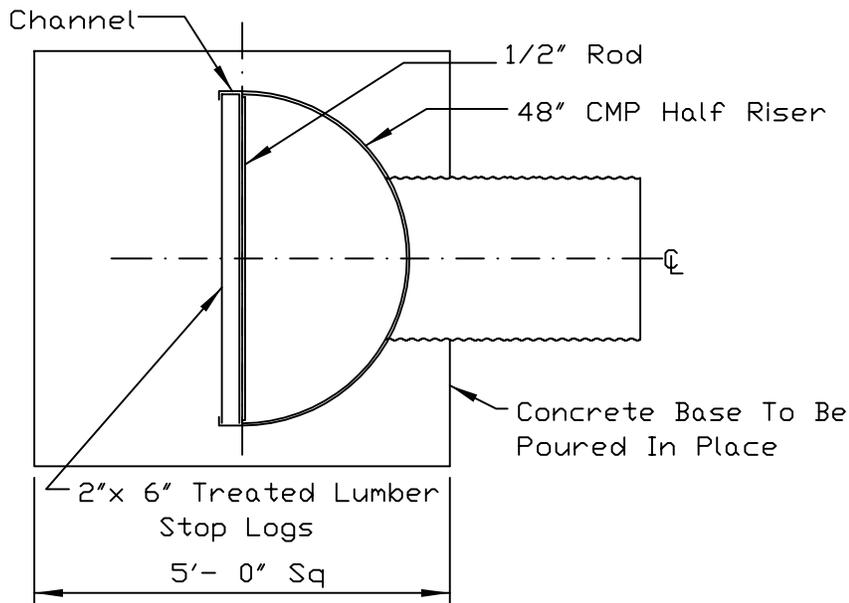
1. Helical pipe shall have a mastic sealer applied at the collar location. The sealer will not be required for PVC or annular pipe.
2. The center membrane section may be 1/16 inch gum rubber, butyl rubber or neoprene. The entire antiseep may be made of these materials.
3. The outer portion of the antiseep collar, away from the pipe, may be made of a minimum 20 mil plastic sheet.
4. Cut a hole, 3 inches smaller than the diameter of the pipe, centered on the material used at the pipe and force it over the end of the pipe.
5. The antiseep material shall be fastened to the pipe using a stainless steel clamp.
6. Completed installation must be watertight.
7. Care must be taken to back fill equally on both sides of the antiseep collar.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

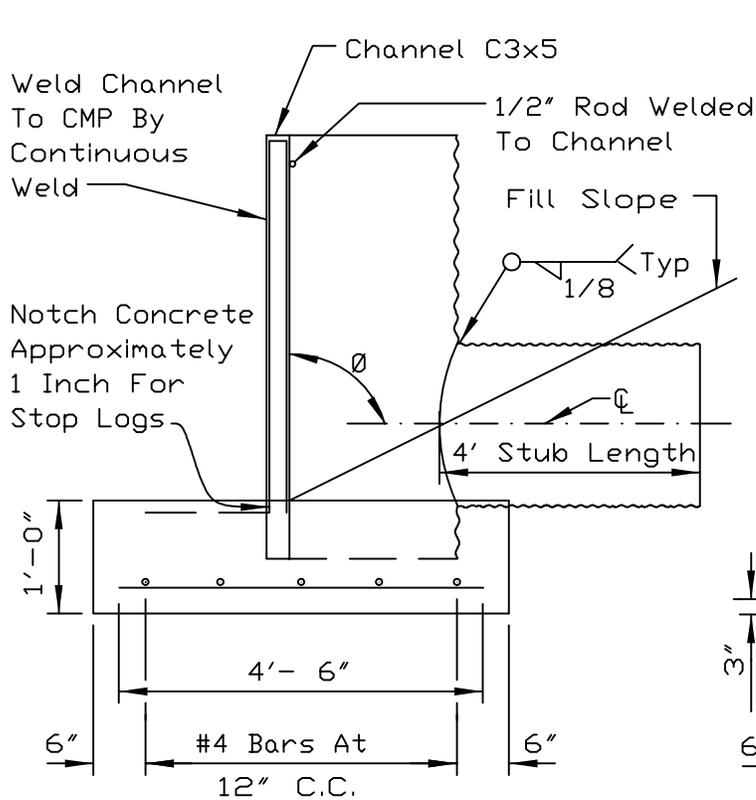


STANDARD DWG. NO.	
IL-593	
SHEET	1 OF 1
DATE	7-12-95

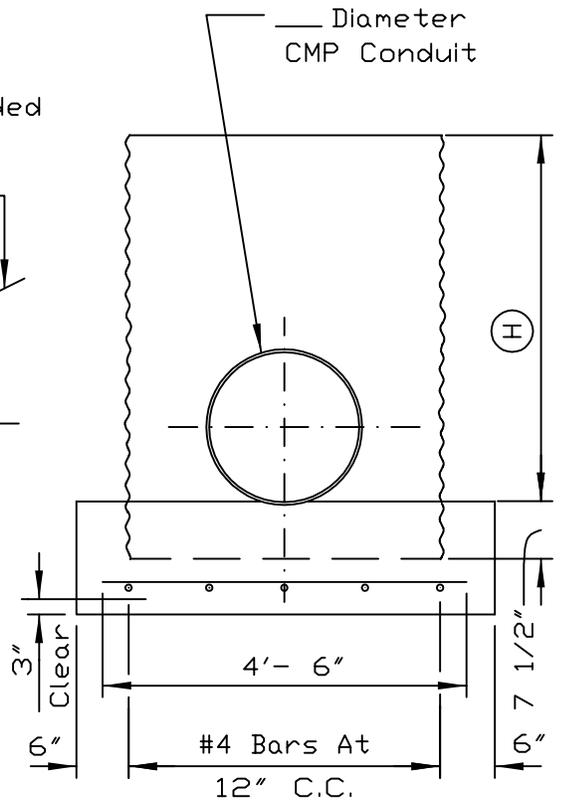
CMP WATER CONTROL STRUCTURE



PLAN



SIDE ELEVATION



DOWNSTREAM ELEVATION

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.	IL-594
SHEET	1 OF 2
DATE	4-29-94

CMP WATER CONTROL STRUCTURE

TABLE SHOWING DIMENSIONS AND MATERIAL	
	Dimensions
Nominal Length (H) In Feet Of CMP Riser And Channels	
Gage Of Riser In Inches	
Gage Of Conduit In Inches	
Ø Angle In Degrees	
MATERIALS	
Number Of #4 Reinforcing Bars 4'- 6" Long	Quantity Required
	10
Weight Of #4 Reinforcing Bars In Pounds	30
Volume Of Concrete In Cubic Yards	1.0
Number Of 1/2 Inch Rods 48" Long	1.0
Number Of 2"X 6" Stop Logs (Approximate Length 48")	

NOTES:

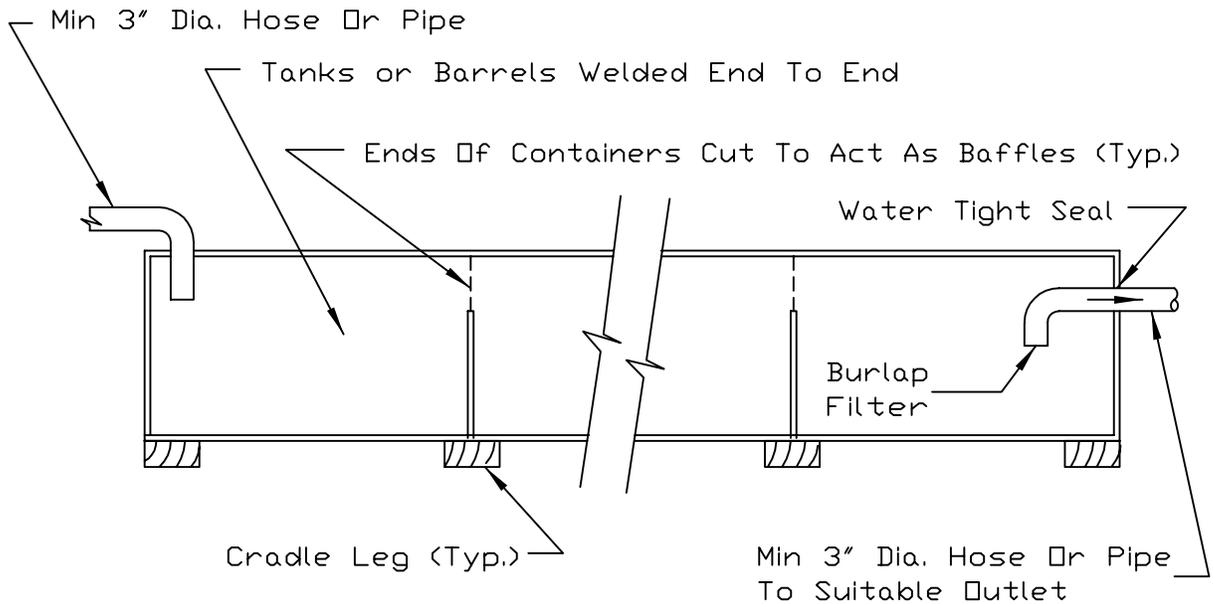
1. The riser height shall be limited to 5 feet.
2. The conduit diameter shall be limited to 12" thru 27".
3. The corrugated metal riser with 4 feet conduit stub shall be fabricated from galvanized steel or aluminum. If fabricated from steel, any zinc coating damaged by welding shall be repaired as follow:
 - A) All loose and cracked coating shall be removed by wire brushing and all dirt and greasy material by a suitable solvent.
 - B) The damaged area shall be painted with two coats of Zinc Dust-Zinc Oxide Primer, follow by a heavy coat of Fibrated Asphalt Mastic.
4. Corrugated aluminum risers and conduits shall be separated from the reinforced concrete base by at least 2 layers of plastic tape with a total thickness of at least 24 mils or by a heavy coat of Alkali-Resistant Bituminous paint.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____

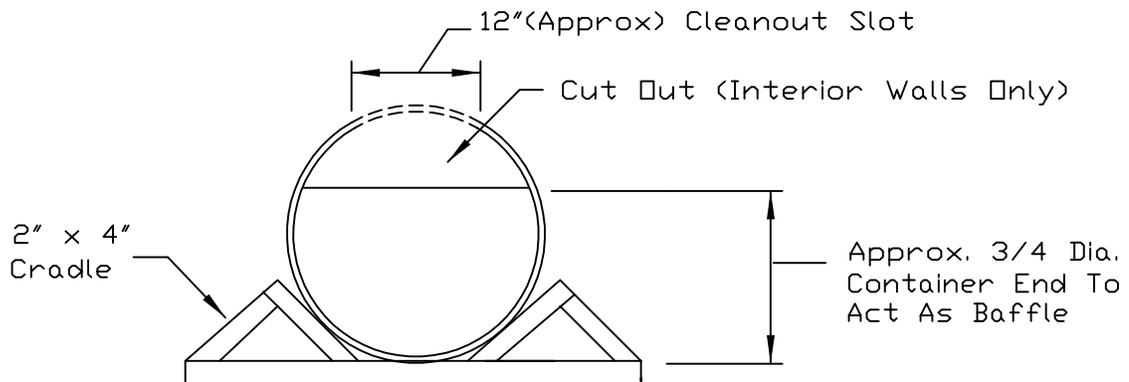


STANDARD DWG. NO.
 IL-594
 SHEET 2 OF 2
 DATE 4-4-94

PORTABLE SEDIMENT TANK PLAN



SECTION ON CENTERLINE



TYPICAL SECTION A-A

NOTES:

1. Clean out the sediment tank when one-third filled with sediment.
2. Steel drums are used as an example due to their ready availability. Any tanks may be used, providing that the volume requirements are met.
3. All sediment collected in the tank shall be disposed of in a sediment trapping device or as approved by the engineer/inspector.

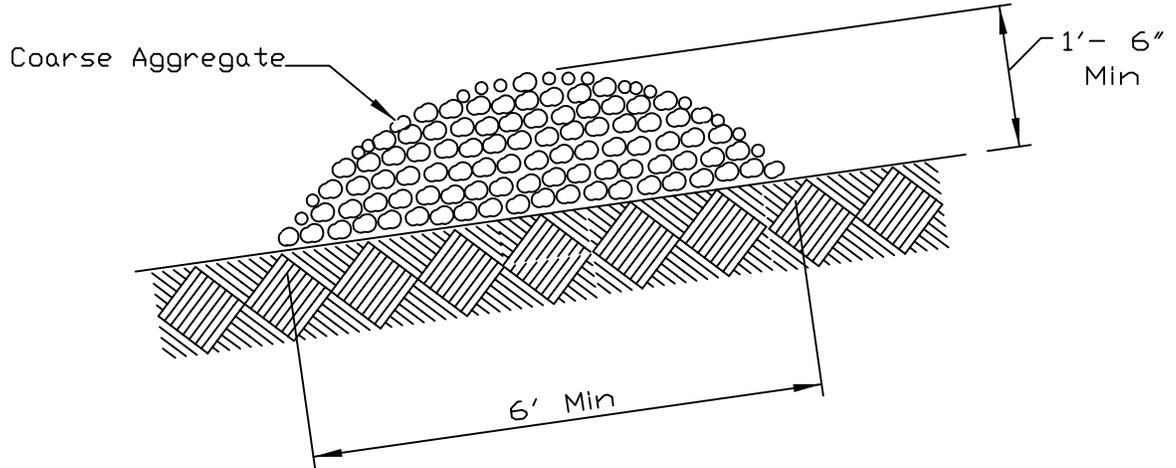
Volume required in tank: _____ cubic feet.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

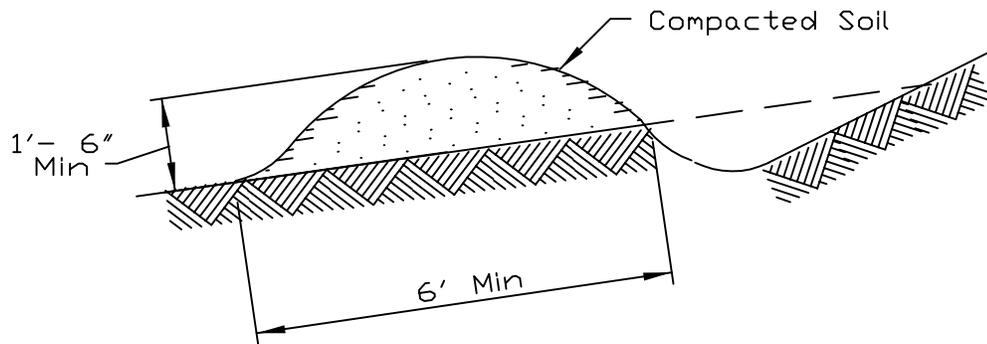


STANDARD DWG. NO.
IL-595
SHEET 1 OF 1
DATE 3-3-95

RIGHT OF WAY DIVERSION PLAN



TYPICAL GRAVEL STRUCTURE



TYPICAL EARTHEN STRUCTURE

NOTES:

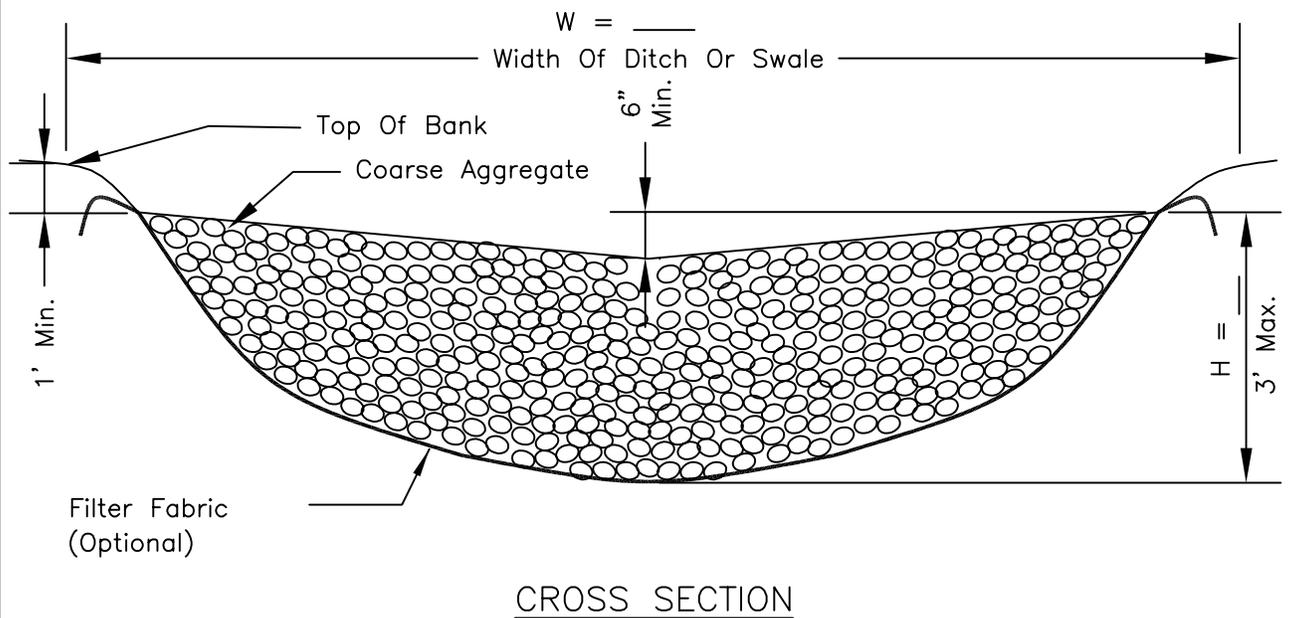
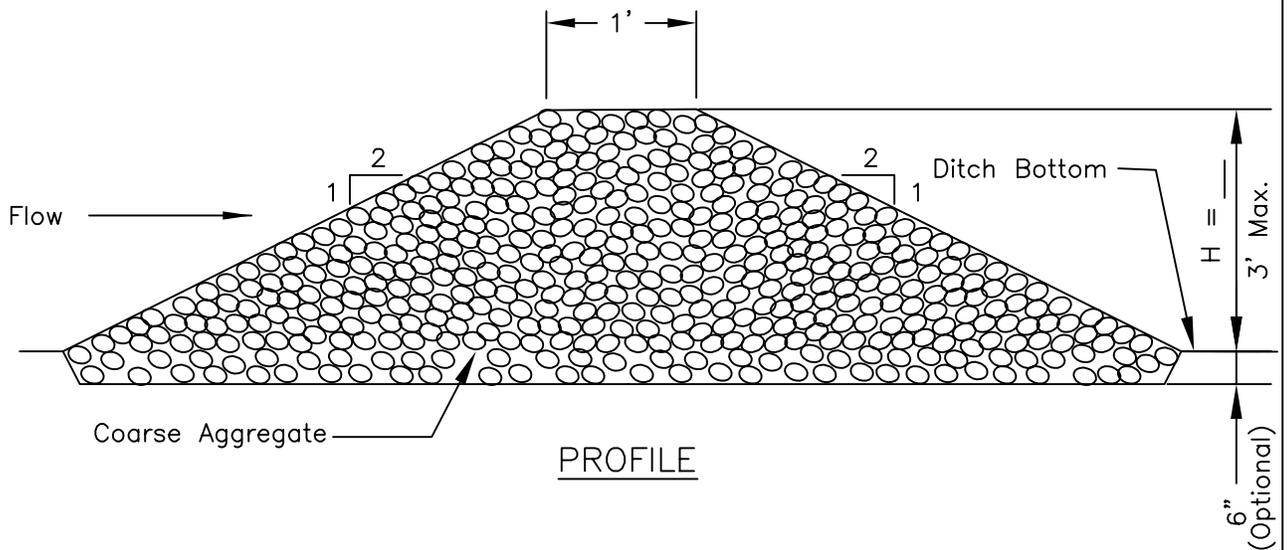
1. Install the diversion as soon as right-of-way has been cleared and graded.
2. Disc the base for the constructed ridge before placing fill.
3. Track the ridge to compact it to the design cross section.
4. Locate the outlet on an undisturbed area. Adjust field spacing of the diversion to use the most stable outlet areas. When natural areas are not deemed satisfactory, provide outlet protection.
5. Immediately seed and mulch the portions of the diversions not subject to construction traffic. Stabilize with gravel areas to be crossed by vehicles.
6. Coarse aggregate, if used, shall meet one of the following IDOT gradations: CA-1, CA-2, CA-3, OR CA-4.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



STANDARD DWG. NO.
IL-600
SHEET 1 OF 1
DATE 3-3-95

ROCK CHECK DAM - COARSE AGGREGATE



NOTES:

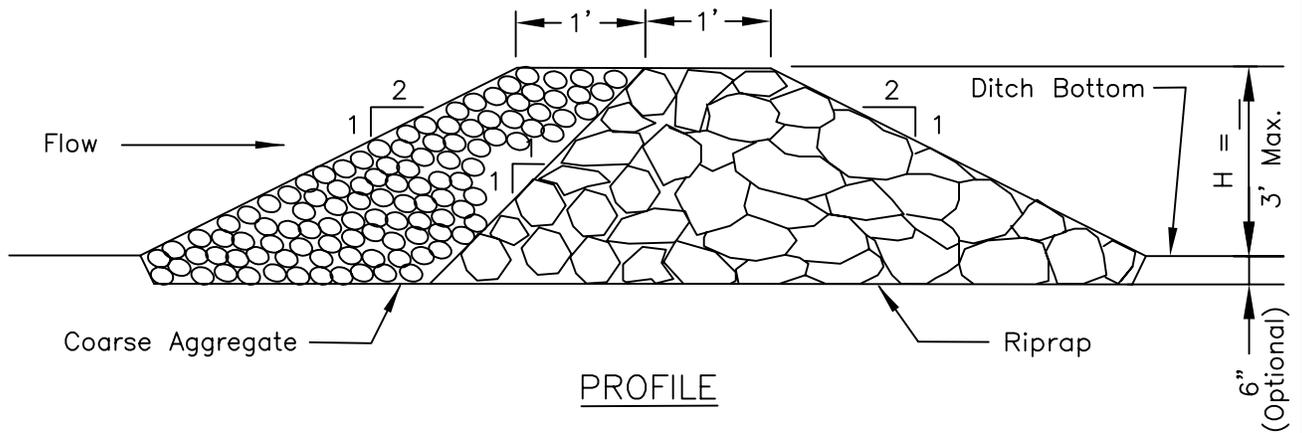
1. Filter fabric shall meet the requirements of material specification 592 GEOTEXTILE, Table 1 or 2, Class I, II, or IV and shall be placed over the cleared area prior to the placing of rock.
2. Coarse aggregate shall meet one of the following IDOT gradations, CA-1, CA-2, CA-3, or CA-4 and be placed according to construction specification 25 ROCKFILL using placement Method 1 and Class III compaction.
3. For added stability, the base of the dam may be keyed 6 inches into the soil.
4. See plans for spacing of dams and H dimensions.
5. Drainage area to each dam shall be less than 2 acres.
6. Use ROCK CHECK DAM-RIPRAP IL-605R for drainage areas of 2 to 10 acres.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

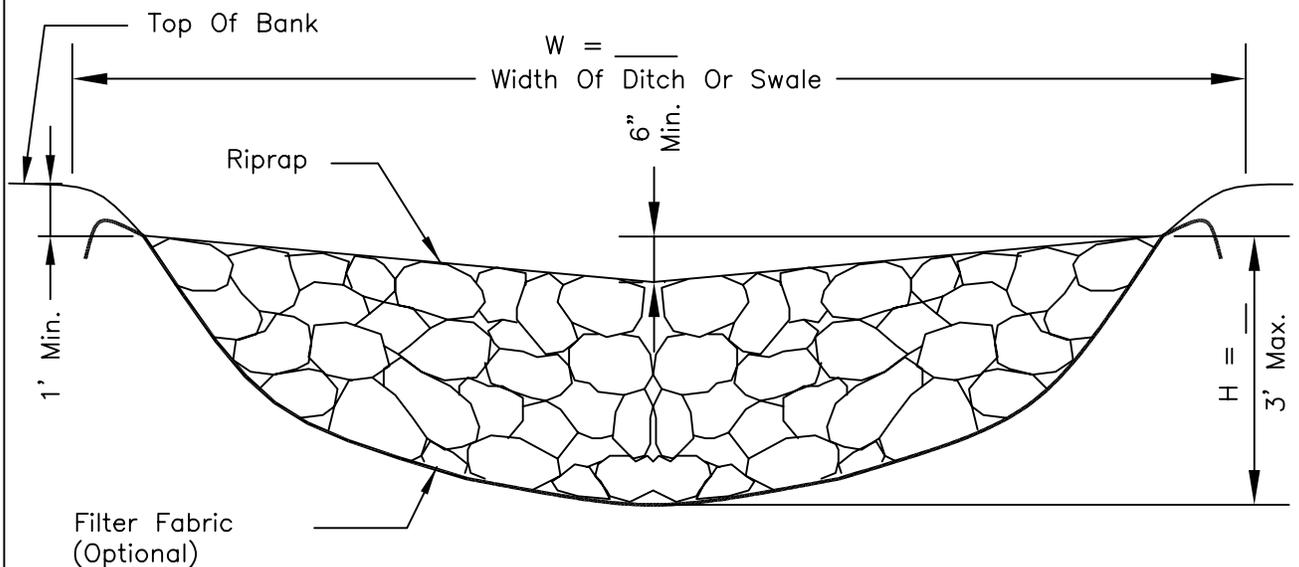


STANDARD DWG. NO.
 IL-605CA
 SHEET 1 OF 1
 DATE 1-29-99

ROCK CHECK DAM - RIPRAP



PROFILE



CROSS SECTION

CENTERLINE LOOKING DOWNSTREAM

NOTES;

1. Filter fabric shall meet the requirements of material specification 592 GEOTEXTILE, Table 1 or 2, Class I, II, or IV and shall be placed over the cleared area prior to the placing of rock.
2. Coarse aggregate shall meet one of the following IDOT gradations, CA-1, CA-2, CA-3, or CA-4.
3. Riprap shall meet IDOT gradation RR-3 or RR-4 and meet Quality Designation A.
4. Coarse aggregate and riprap shall be placed according to construction specification 25 ROCKFILL using placement Method 1 and Class III compaction.
5. For added stability, the base of the dam may be keyed 6 inches into the soil.
6. See plans for spacing of dams and H dimensions.
7. Maximum drainage area to each dam is 10 acres.
8. ROCK CHECK DAM-COARSE AGGREGATE IL-605CA may be used for drainage areas under 2 acres.

REFERENCE

Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



NRCS

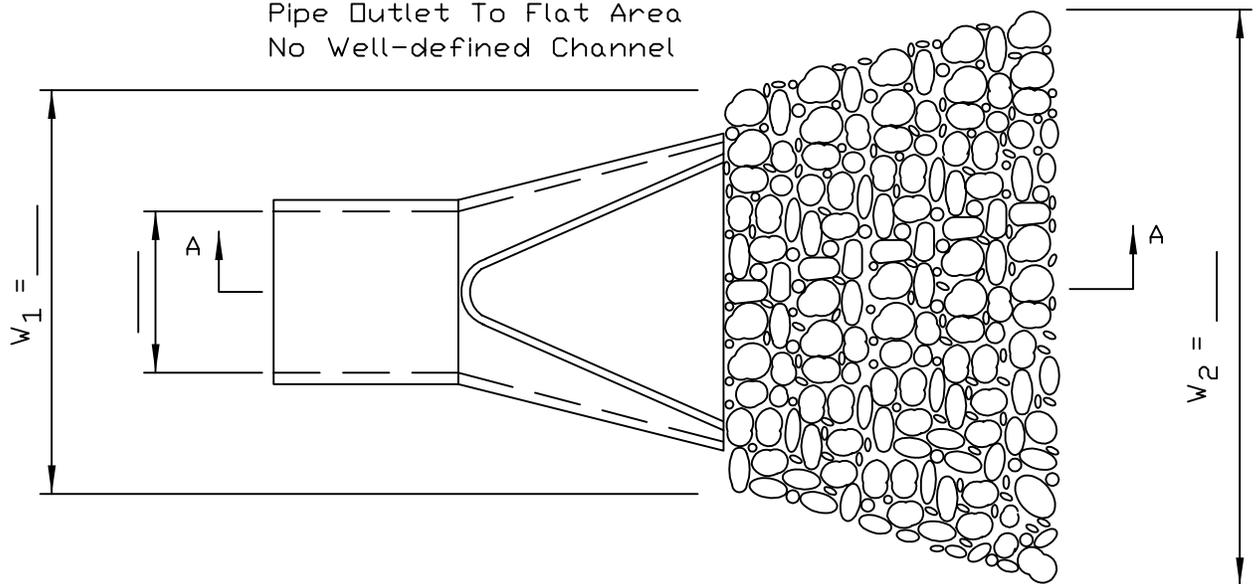
Natural Resources Conservation Service

STANDARD DWG. NO.

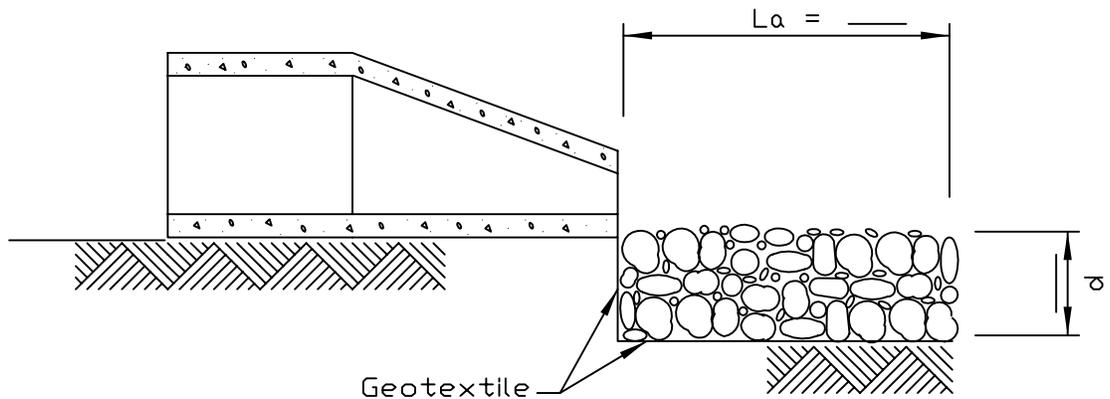
IL-605R
 SHEET 1 OF 1
 DATE 1-29-99

PIPE OUTLET TO FLAT AREA

Pipe Outlet To Flat Area
No Well-defined Channel



PLAN



SECTION A-A

NOTES:

1. The filter fabric shall meet the requirements in material specifications 592 GEOTEXTILE Table 1 or 2, class I, II or III .
2. The rock riprap shall shall meet the IDOT requirements for the following gradation: RR _____ , Quality _____ .
3. The riprap shall be placed according to construction specification 61 LOOSE ROCK RIPRAP. The rock may be equipment placed.

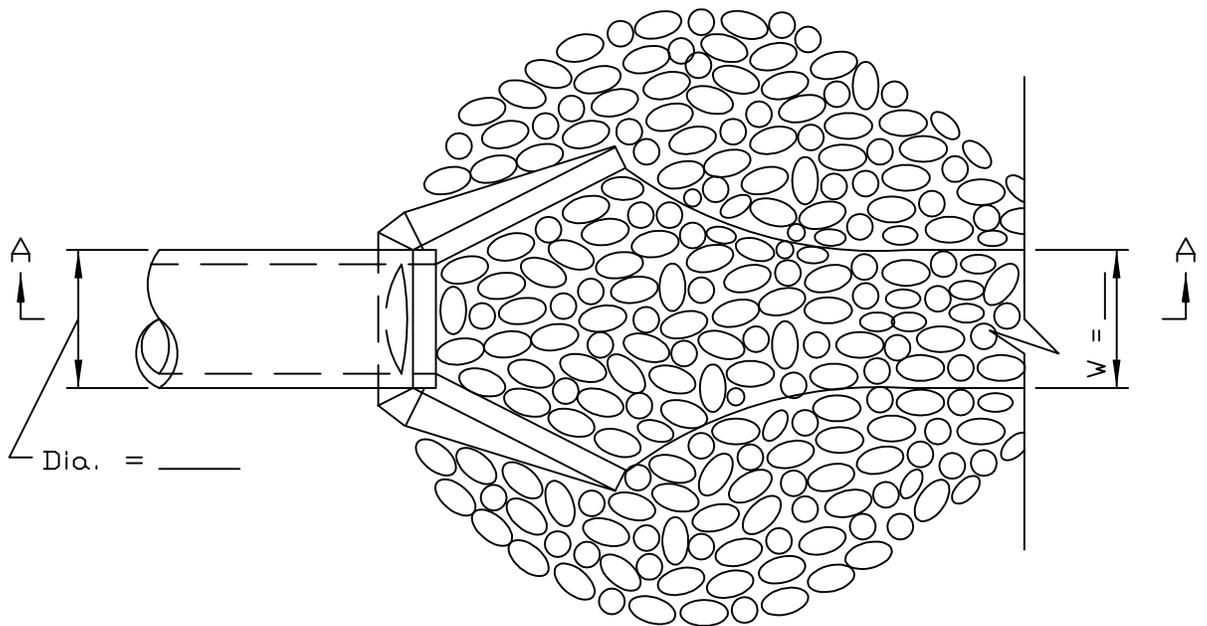
REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



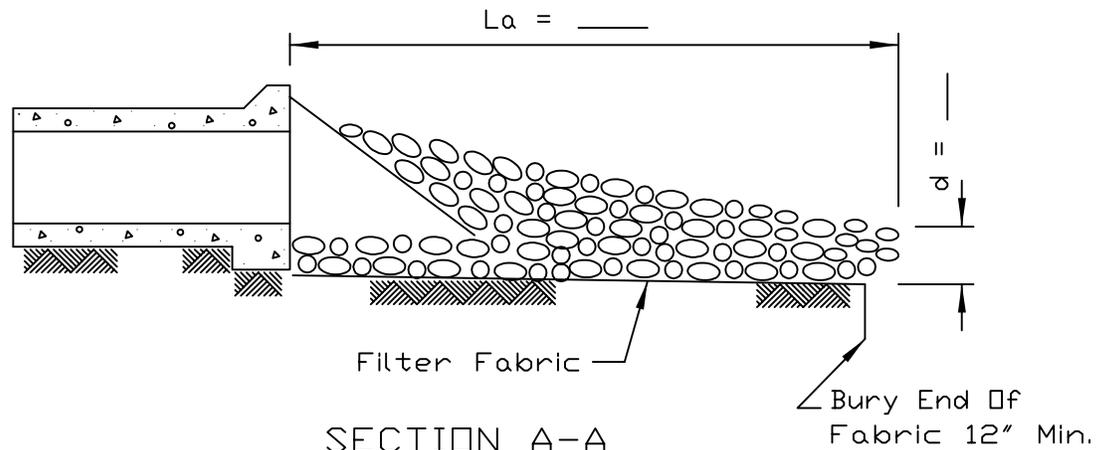
STANDARD DWG. NO.
IL-610
SHEET 1 OF 1
DATE 9-15-93

PIPE OUTLET TO CHANNEL

Pipe Outlet To Well-Defined Channel



PLAN



SECTION A-A

NOTES:

1. The filter fabric shall meet the requirements in material specification 592 GEOTEXTILE Table 1 or 2, Class I, II or III.
2. The rock riprap shall meet the IDOT requirements for the following gradation _____.
3. The riprap shall be placed according to construction specification 61 LOOSE ROCK RIPRAP. The rock may be equipment placed.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

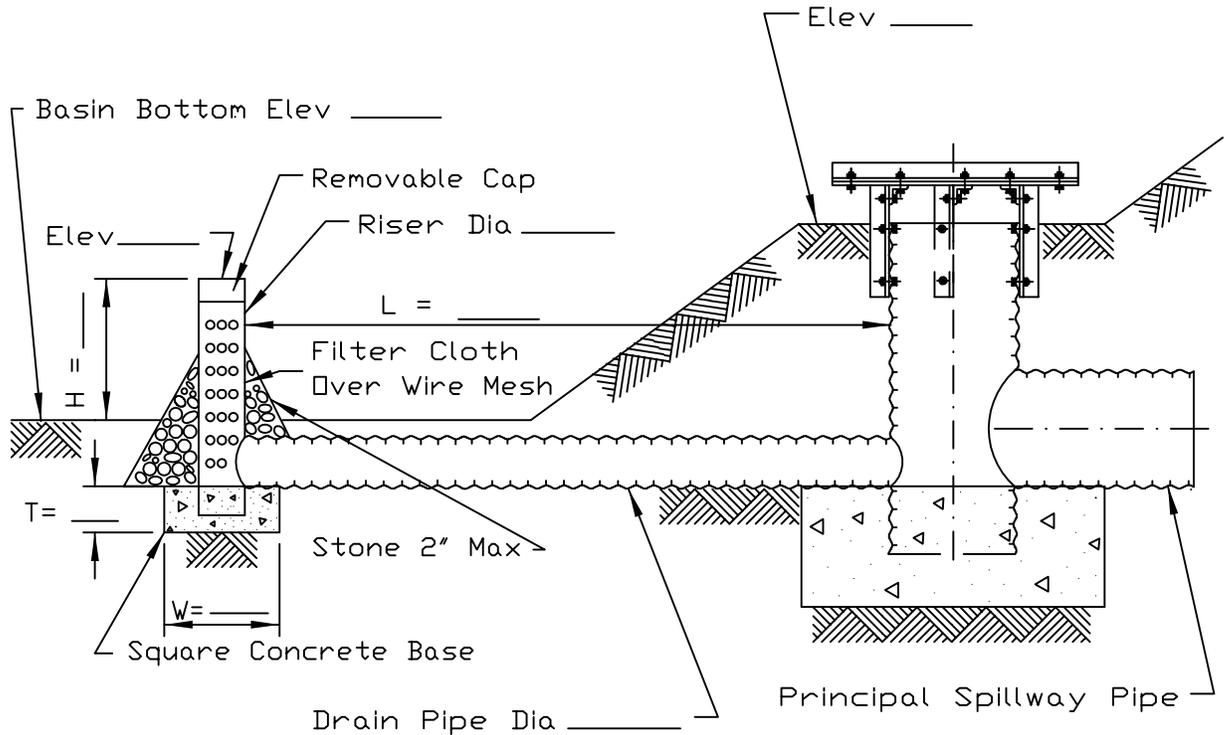


NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
IL-611
SHEET 1 OF 1
DATE 8-18-94

SEDIMENT BASIN DEWATERING DEVICE



SECTION ON CENTERLINE

NOTES:

1. Slotted inlets shall be fabricated from corrugated metal or smooth steel.
2. Slots shall be cut cleanly and deburred. Ends of slots may be round or square.
3. Gravel filter, if used, shall be pit run sand and gravel with a maximum particle diameter of 2".
4. Fabricated or standard elbow; fabricated or standard tee with the pipe or plug in upstream end; or standard tee with one end embedded in concrete.
5. Thirty 1" diameter holes per foot of riser may be substituted for the 1"x 4" slots for 6" diameter risers.
6. Drain pipe shall be the same material and gauge as the principle spillway pipe.
7. Slot spacing and size shall be as shown on standard drawing IL-580.
8. Coupling bands shall be as shown on standard drawing IL-580.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

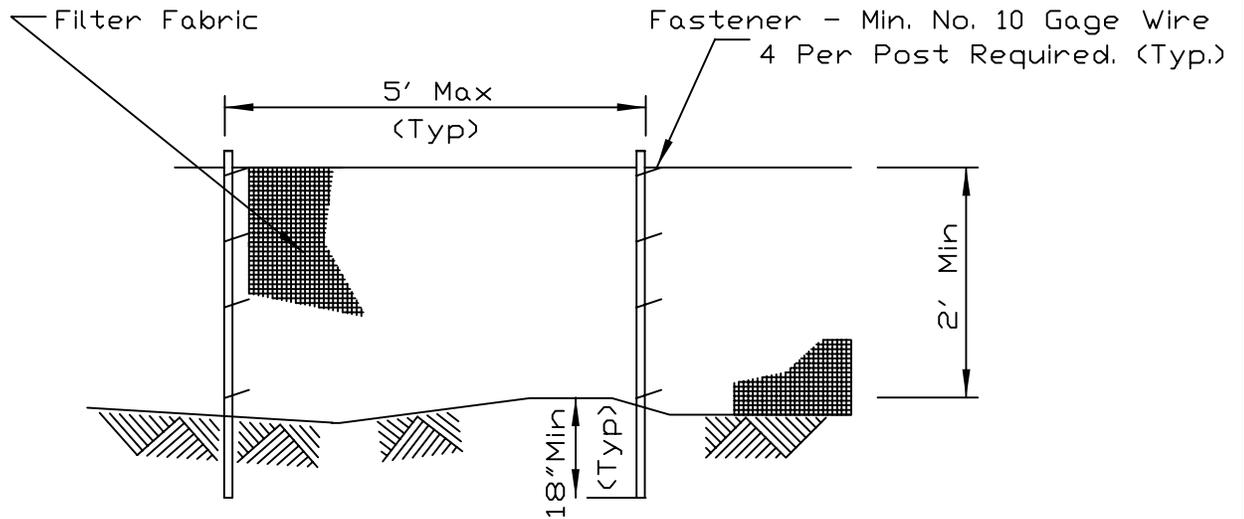


NRCS

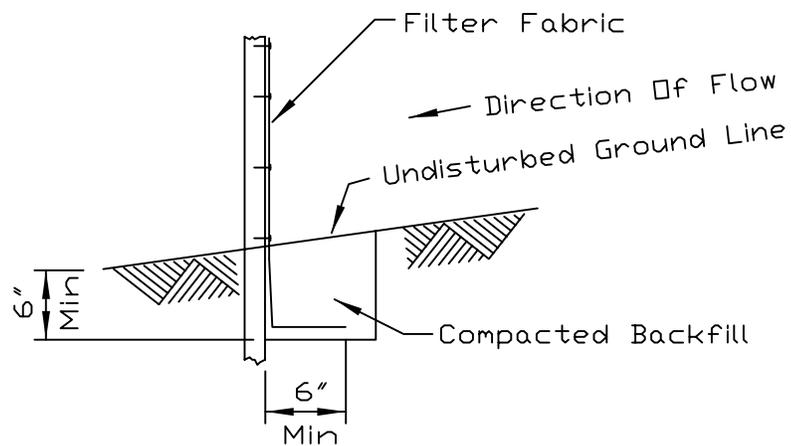
Natural Resources Conservation Service

STANDARD DWG. NO.
IL-615
SHEET 1 OF 1
DATE 9-22-93

SILT FENCE PLAN



ELEVATION



FABRIC ANCHOR DETAIL

NOTES:

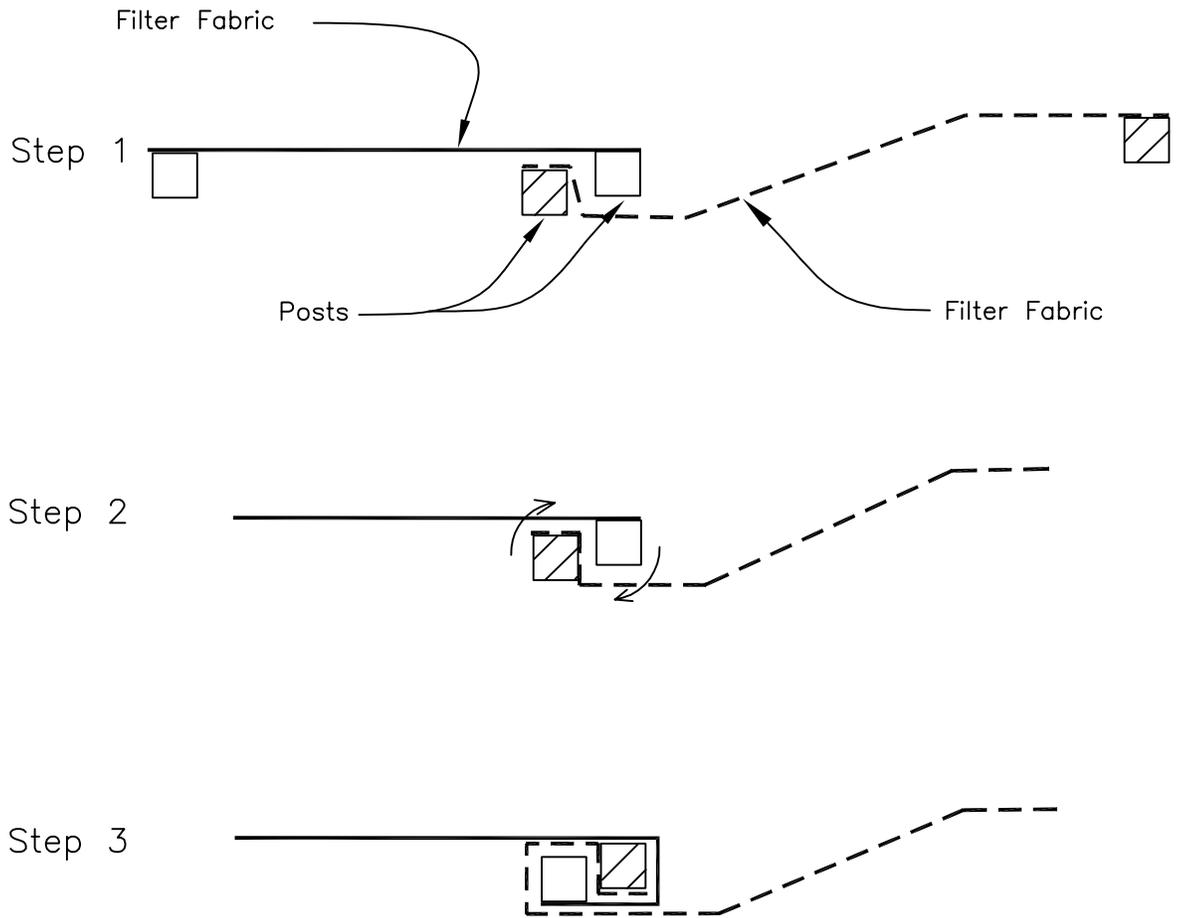
1. Temporary sediment fence shall be installed prior to any grading work in the area to be protected. They shall be maintained throughout the construction period and removed in conjunction with the final grading and site stabilization.
2. Filter fabric shall meet the requirements of material specification 592 Geotextile Table 1 or 2, Class I with equivalent opening size of at least 30 for nonwoven and 50 for woven.
3. Fence posts shall be either standard steel post or wood post with a minimum cross-sectional area of 3.0 sq. in.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



STANDARD DWG. NO.
 IL-620
 SHEET 1 OF 2
 DATE 11-20-01

SILT FENCE



ATTACHING TWO SILT FENCES

NOTES:

1. Place the end post of the second fence inside the end post of the first fence.
2. Rotate both posts at least 180 degrees in a clockwise direction to create a tight seal with the fabric material.
3. Drive both posts a minimum of 18 inches into the ground and bury the flap.

REFERENCE

Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



NRCS
 Natural Resources Conservation Service

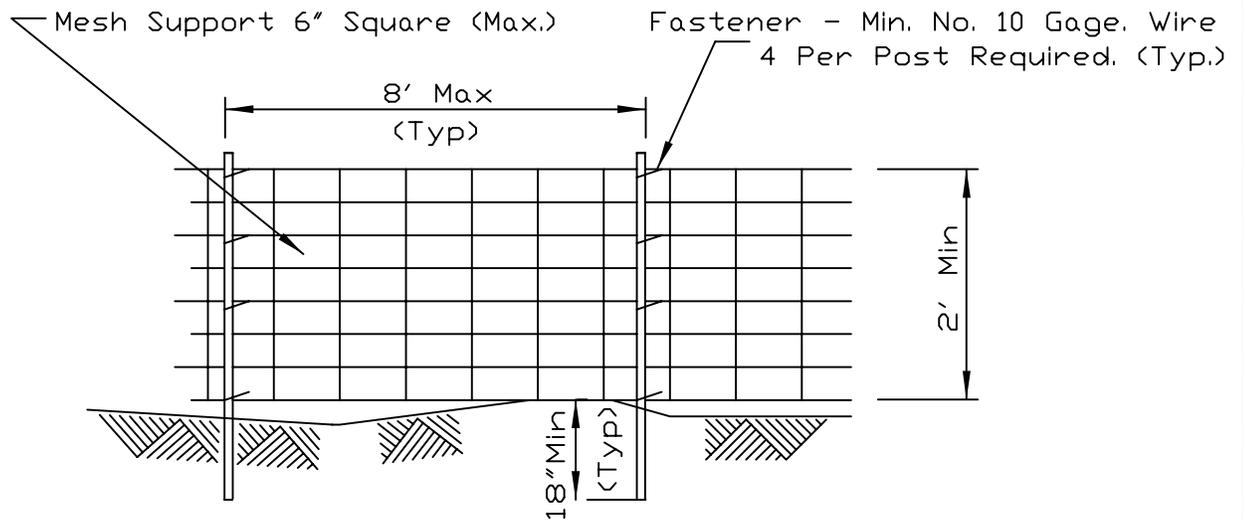
STANDARD DWG. NO.

IL-620(W)

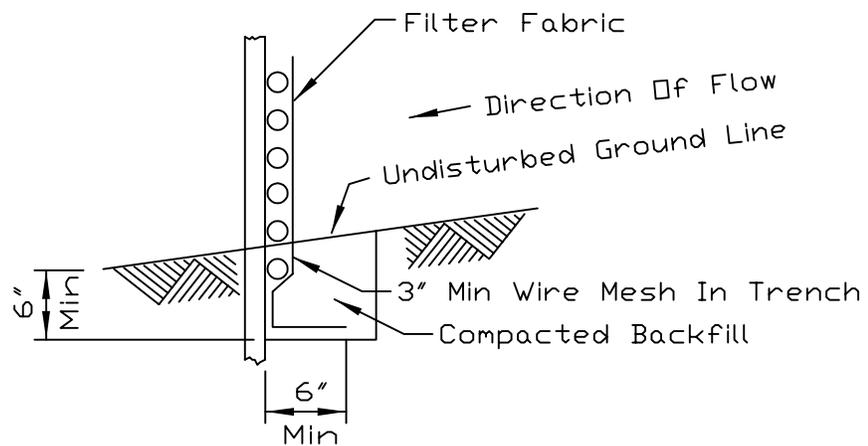
SHEET 2 OF 2

DATE 1-29-99

SILT FENCE WITH WIRE SUPPORT PLAN



ELEVATION



FABRIC ANCHOR DETAIL

NOTES:

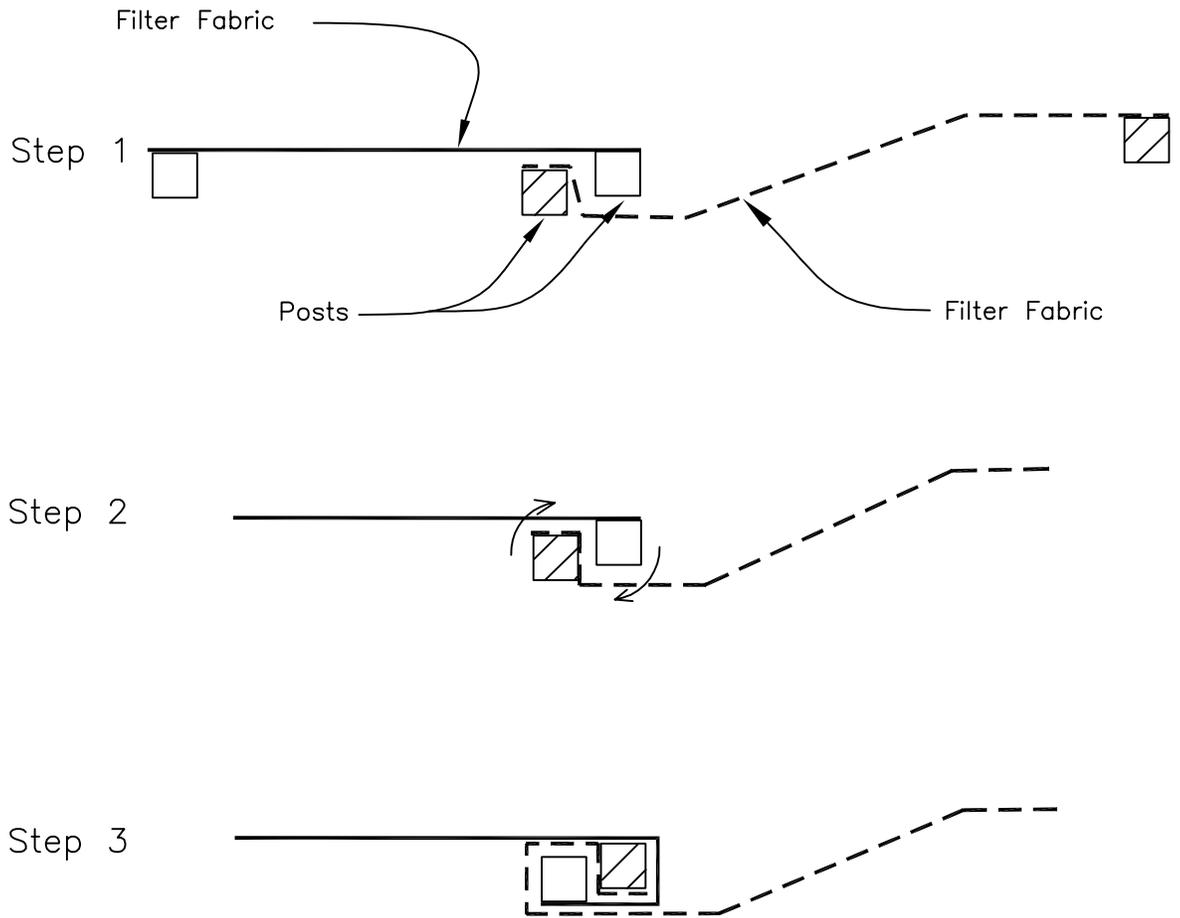
1. Wires of mesh support shall be min. gage no. 12.
2. Temporary sediment fence shall be installed prior to any grading work in the area to be protected. They shall be maintained throughout the construction period and removed in conjunction with the final grading and site stabilization.
3. Filter fabric shall meet the requirements of material specification 592 Geotextile Table 1 or 2, Class I with equivalent opening size of at least 30 for nonwoven and 50 for woven.
4. Fence posts shall be either standard steel post or wood post with a minimum cross-sectional area of 3.0 sq. in.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



STANDARD DWG. NO.
IL-620W
SHEET 1 OF 2
DATE 3-3-95

SILT FENCE



ATTACHING TWO SILT FENCES

NOTES:

1. Place the end post of the second fence inside the end post of the first fence.
2. Rotate both posts at least 180 degrees in a clockwise direction to create a tight seal with the fabric material.
3. Drive both posts a minimum of 18 inches into the ground and bury the flap.

REFERENCE

Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



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 Natural Resources Conservation Service

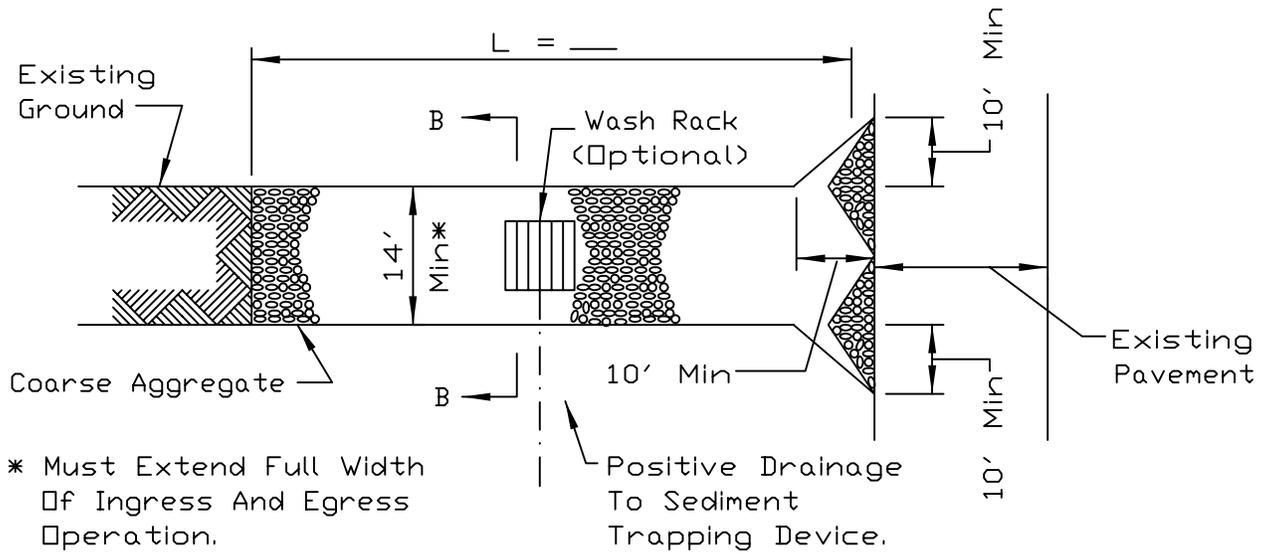
STANDARD DWG. NO.

IL-620(W)

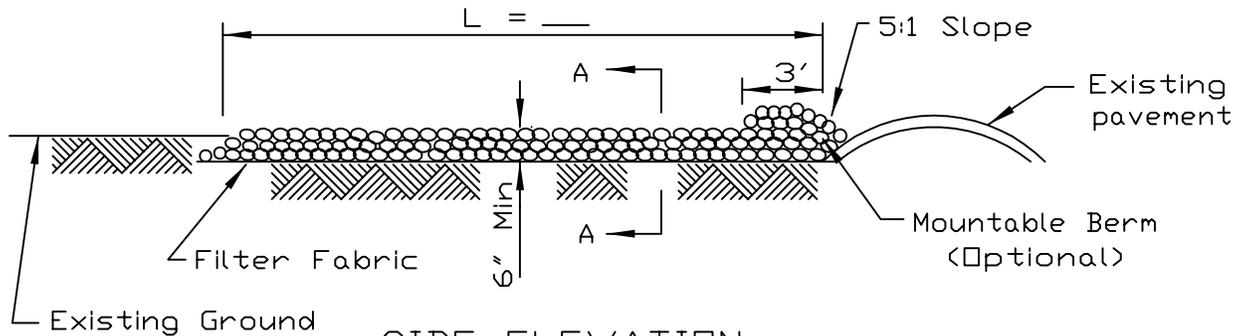
SHEET 2 OF 2

DATE 1-29-99

STABILIZED CONSTRUCTION ENTRANCE PLAN



PLAN VIEW



SIDE ELEVATION

NOTES:

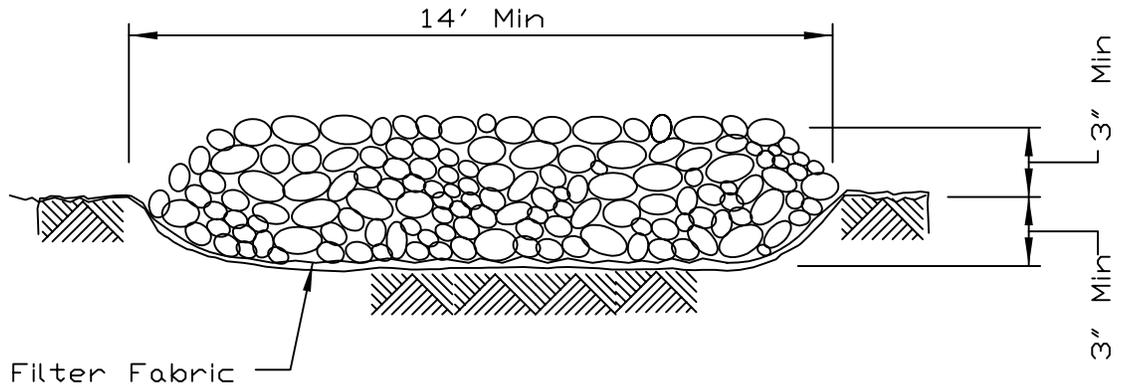
1. Filter fabric shall meet the requirements of material specification 592 GEOTEXTILE, Table I or 2, Class I, II or IV and shall be placed over the cleared area prior to the placing of rock.
2. Rock or reclaimed concrete shall meet one of the following IDOT coarse aggregate gradation, CA-1, CA-2, CA-3 or CA-4 and be placed according to construction specification 25 ROCKFILL using placement Method 1 and Class III compaction.
3. Any drainage facilities required because of washing shall be constructed according to manufacturers specifications.
4. If wash racks are used they shall be installed according to the manufacturer's specifications.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

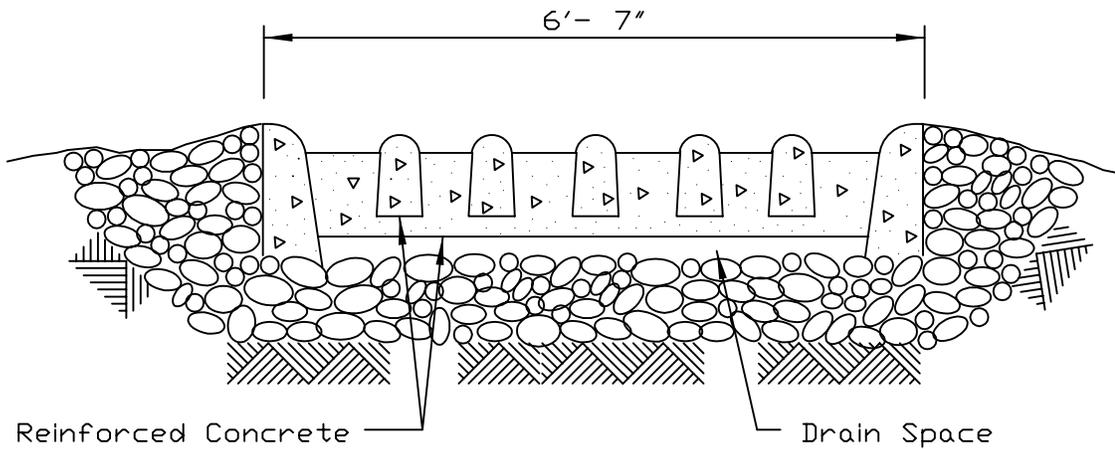


STANDARD DWG. NO.
IL-630
SHEET 1 OF 2
DATE 8-18-94

STABILIZED CONSTRUCTION ENTRANCE PLAN



SECTION A-A



SECTION B-B

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



NRCS

Natural Resources Conservation Service

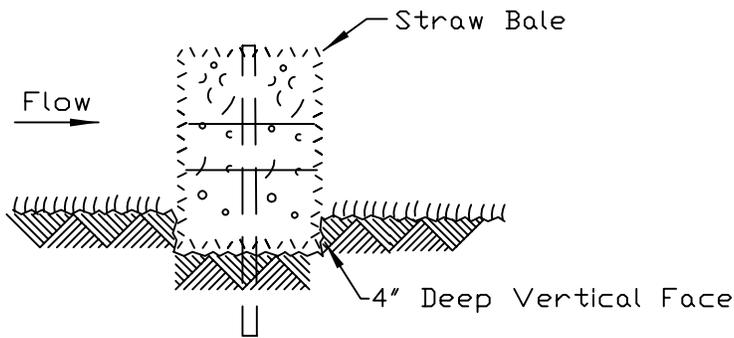
STANDARD DWG. NO.

IL-630

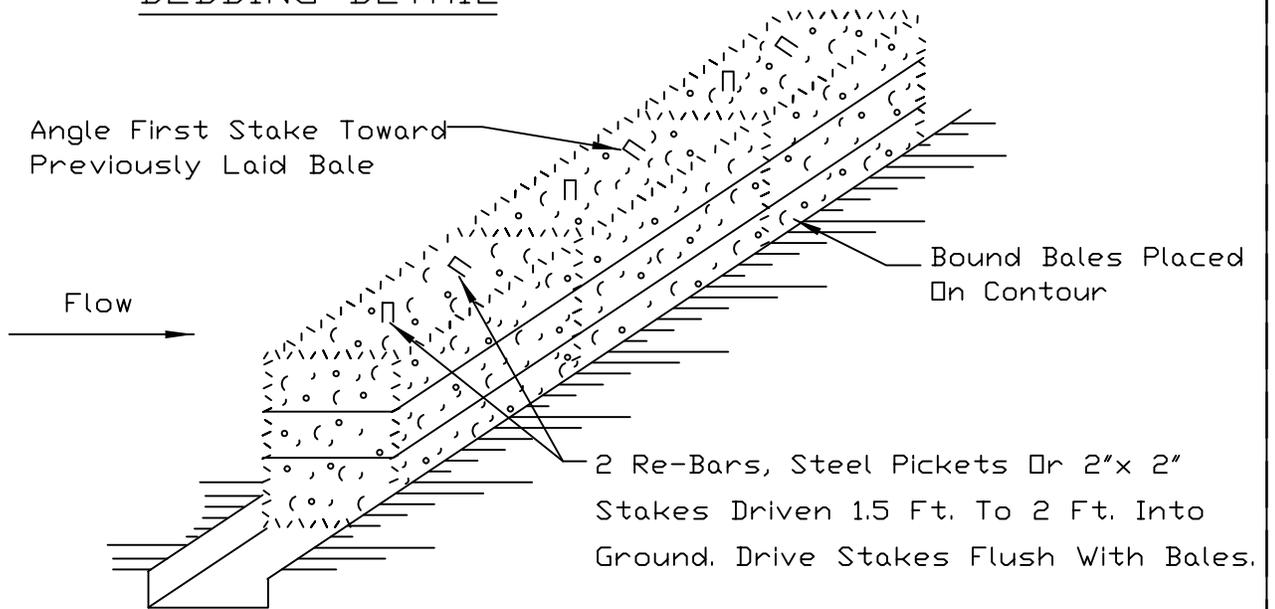
SHEET 2 OF 2

DATE 8-18-94

STRAW BALE BARRIER PLAN



BEDDING DETAIL



ANCHORING DETAIL

NOTES

1. Bales shall be placed at the top of slope or on the contour and in a row with ends tightly abutting the adjacent bales.
2. Each bale shall be embedded in the soil a minimum of 4", and placed so that bindings are horizontal.
3. Bales shall be securely anchored in place by either two stakes or re-bars driven through the bale. The first stake in each bale shall be driven toward the previously laid bale at an angle to force the bales together. Stakes shall be driven flush with the bale.
4. Inspection shall be frequent and repair replacement shall be made promptly as needed.
5. Bales shall be removed when they have served their usefulness so as not to block or impede storm flow or drainage.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____

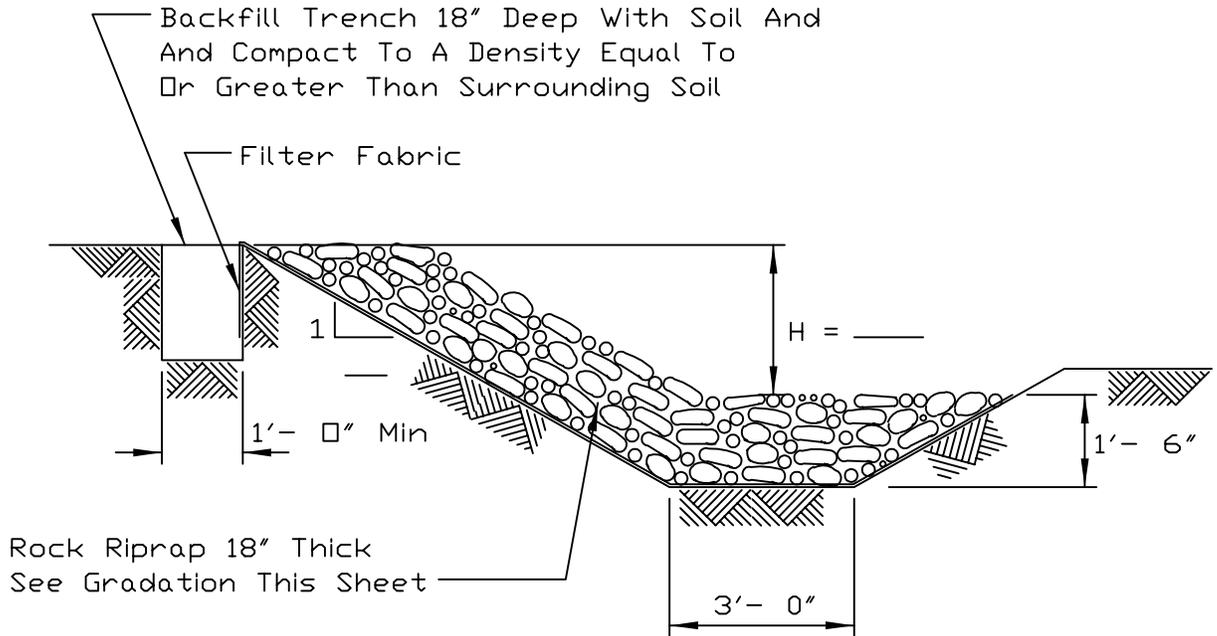


NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
IL-635
SHEET 1 OF 1
DATE 8-18-94

STRUCTURAL STREAMBANK STABILIZATION - RIPRAP



SECTION

NOTES:

1. The filter fabric shall meet the requirements in material specification 592 GEOTEXTILE ,Table 1 or 2, Class I, II or III .
2. The rock riprap shall meet the IDOT requirement for the following gradation: RR____ , Quality ____ .
3. The riprap shall be placed according to construction specification 61 LOOSE ROCK RIPRAP. The rock may be equipment placed.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



Natural Resources Conservation Service

NRCS

STANDARD DWG. NO.

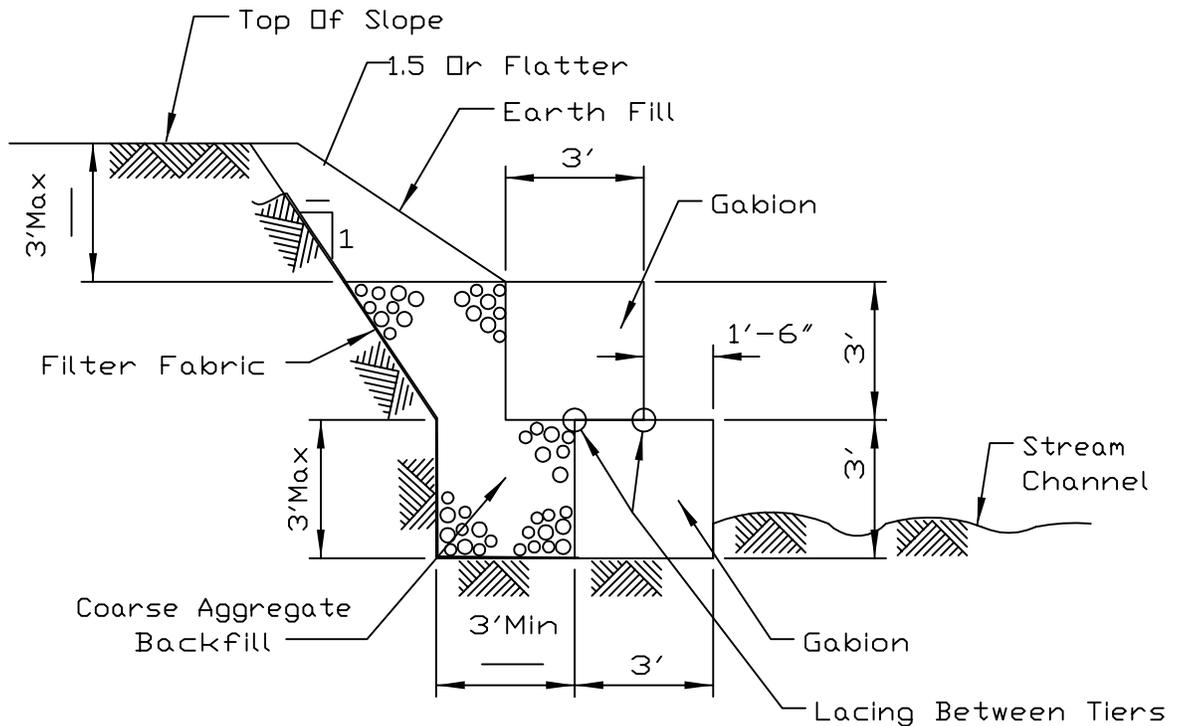
IL-640

SHEET 1 OF 1

DATE 3-3-95

STRUCTURAL STREAMBANK STABILIZATION - GABIONS

2 BASKETS HIGH W/O MAT



SECTION

NOTES:

1. The filter fabric shall meet the requirements in material specification 592 GEOTEXTILE Table 1 or 2, Class I, II or III.
2. The coarse aggregate backfill shall meet the IDOT requirement for the following gradations CA-1, CA-3 or RR-1.
3. The Gabions shall be installed according to construction specification 64 WIRE MESH GABIONS
4. Baskets which are stacked in tiers shall have vertical seams staggered for each row and tier.
5. The coarse aggregate backfill shall be placed level with the top of the lower basket before the upper basket is installed.

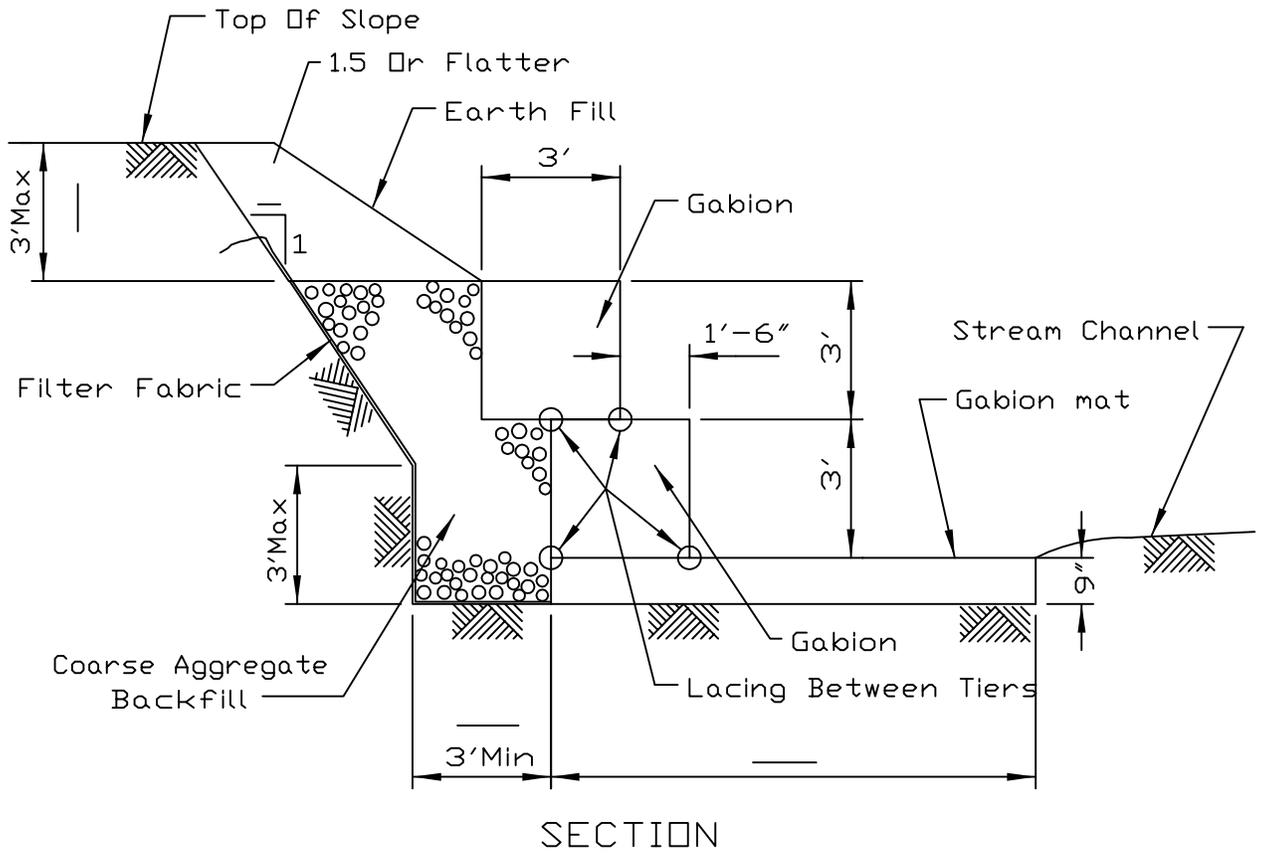
REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



STANDARD DWG. NO.
 IL-641
 SHEET 1 OF 1
 DATE 5-16-94

STRUCTURAL STREAMBANK STABILIZATION - GABIONS

2 BASKETS HIGH WITH MAT



NOTES:

1. The filter fabric shall meet the requirements in material specification 592 GEOTEXTILE Table 1 or 2, Class I, II or III.
2. The coarse aggregate backfill shall meet the IDOT requirement for the following gradations CA-1, CA-3 or RR-1.
3. The Gabions shall be installed according to construction specification 64 WIRE MESH GABIONS
4. Baskets which are stacked in tiers shall have vertical seams staggered for each row and tier.
5. The coarse aggregate backfill shall be placed level with the top of the lower basket before the upper basket is installed.

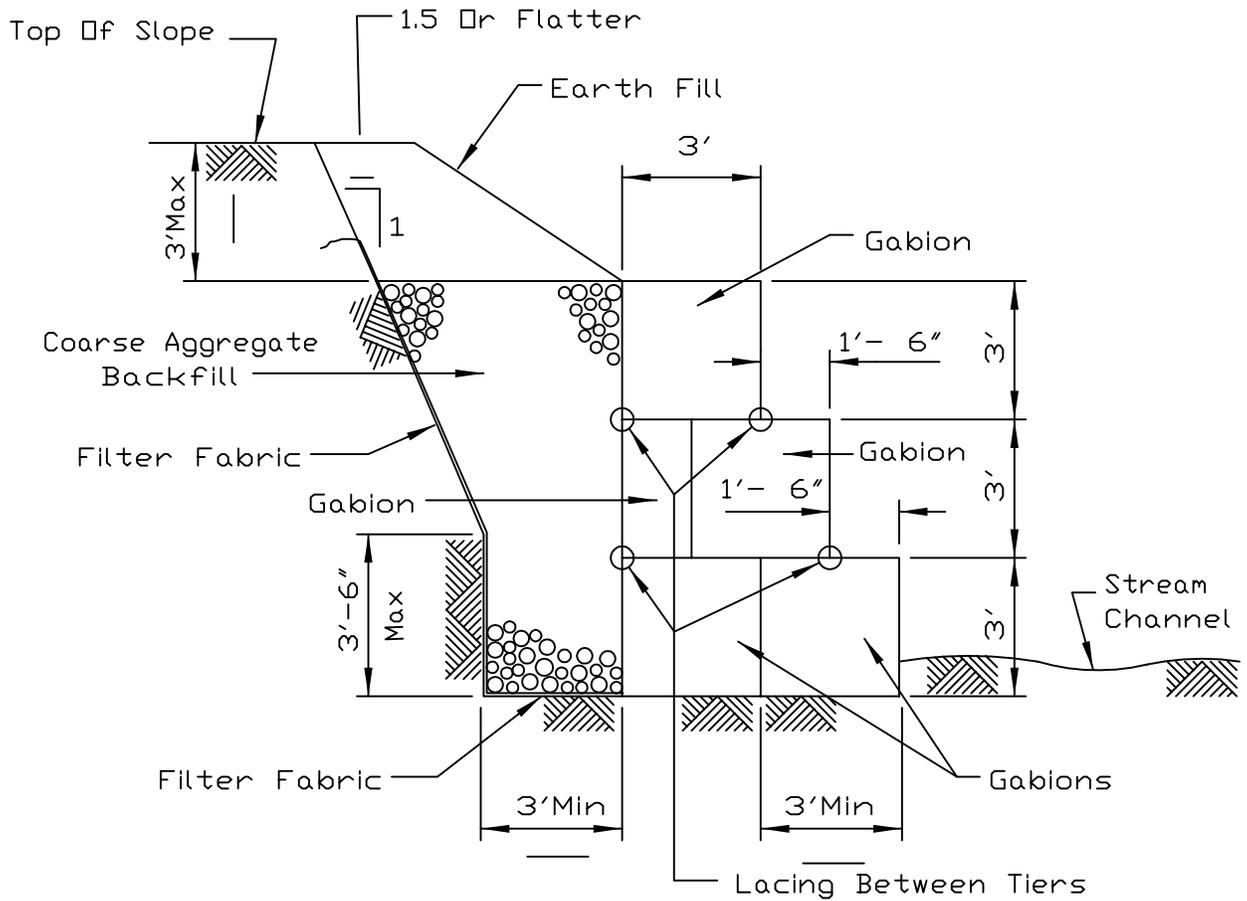
REFERENCE
Project _____
Designed _____ Date _____
Checked _____ Date _____
Approved _____ Date _____



STANDARD DWG. NO.
IL-642
SHEET 1 OF 1
DATE 5-16-94

STRUCTURAL STREAMBANK STABILIZATION - GABIONS

3 BASKETS HIGH W/O MAT



SECTION

NOTES:

1. The filter fabric shall meet the requirements in material specification 592 GEOTEXTILE Table 1 or 2, Class I, II or III.
2. The coarse aggregate backfill shall meet the IDOT requirement for the following gradations CA-1, CA-3 or RR-1.
3. The Gabions shall be installed according to construction specification 64 WIRE MESH GABIONS
4. Baskets which are stacked in tiers shall have vertical seams staggered for each row and tier.

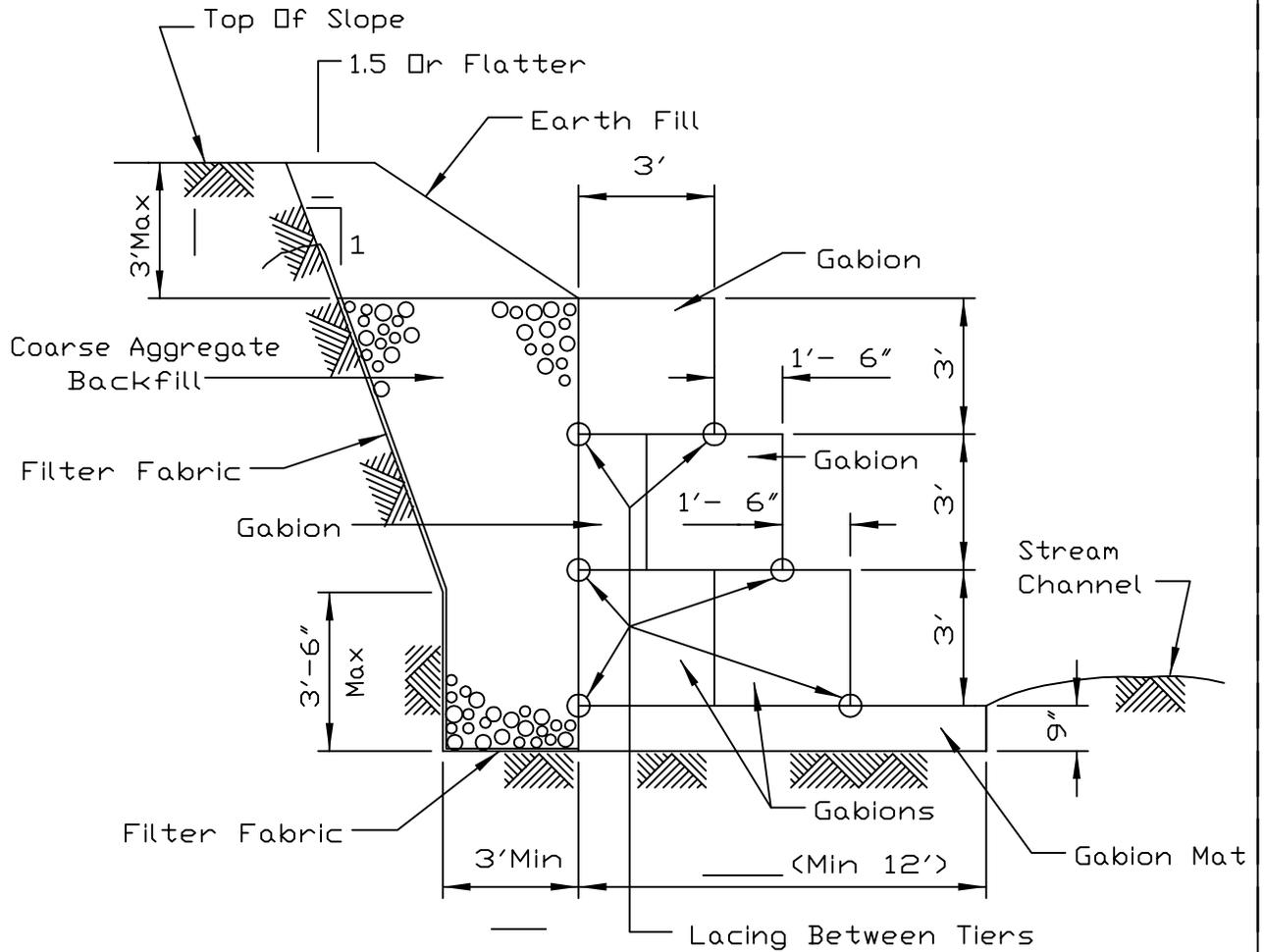
REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



STANDARD DWG. NO.
IL-643
SHEET 1 OF 1
Date 5-16-94

STRUCTURAL STREAMBANK STABILIZATION - GABIONS

3 BASKETS HIGH WITH MAT



SECTION

NOTES:

1. The filter fabric shall meet the requirements in material specification 592 GEOTEXTILE Table 1 or 2, Class I, II or III.
2. The coarse aggregate backfill shall meet the IDOT requirement for the following gradations CA-1, CA-3 or RR-1.
3. The Gabions shall be installed according to construction specification 64 WIRE MESH GABIONS
4. Baskets which are stacked in tiers shall have vertical seams staggered for each row and tier.

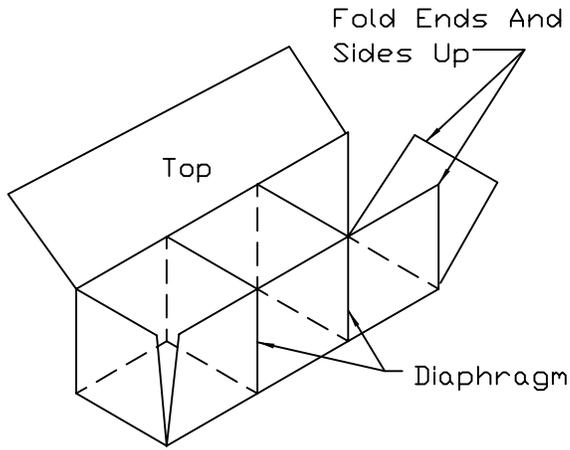
REFERENCE
Project _____
Designed _____ Date _____
Checked _____ Date _____
Approved _____ Date _____



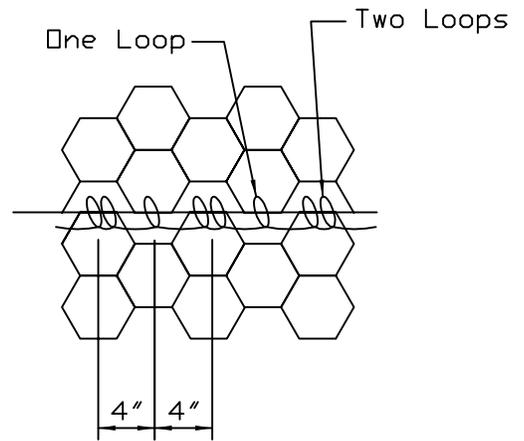
STANDARD DWG. NO.
IL-644
SHEET 1 OF 1
DATE 5-16-94

STRUCTURAL STREAMBANK STABILIZATION - GABIONS

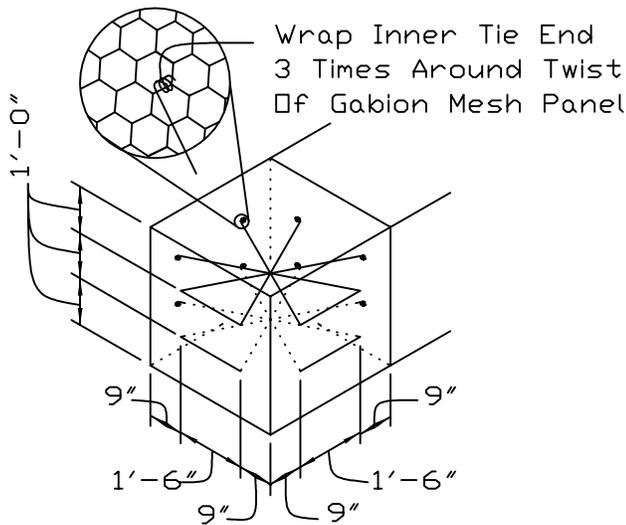
ASSEMBLY AND LACING DETAILS



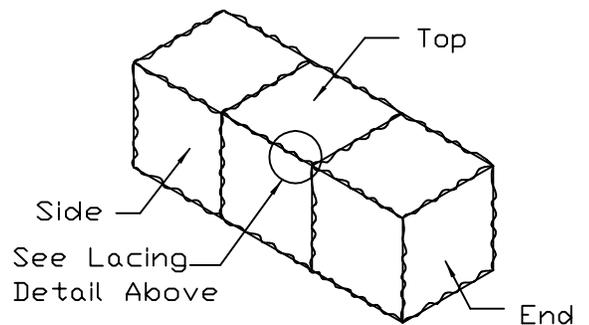
ASSEMBLY DETAIL



LACING DETAIL



INNER TIE WIRE DETAILS



WIRE LACING DETAIL

NOTES

1. The ends of a lacing wire will be secured by looping it thru the mesh and twisting. Proceed to lace with alternate two loops and one loop at approximately 4 inch intervals.
2. Other lacing methods may be used if recommended by the manufacturer and approved by the engineer/inspector.
3. The "X" shaped inner tie may be twisted at the "X" to tighten, if placed too loosely.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



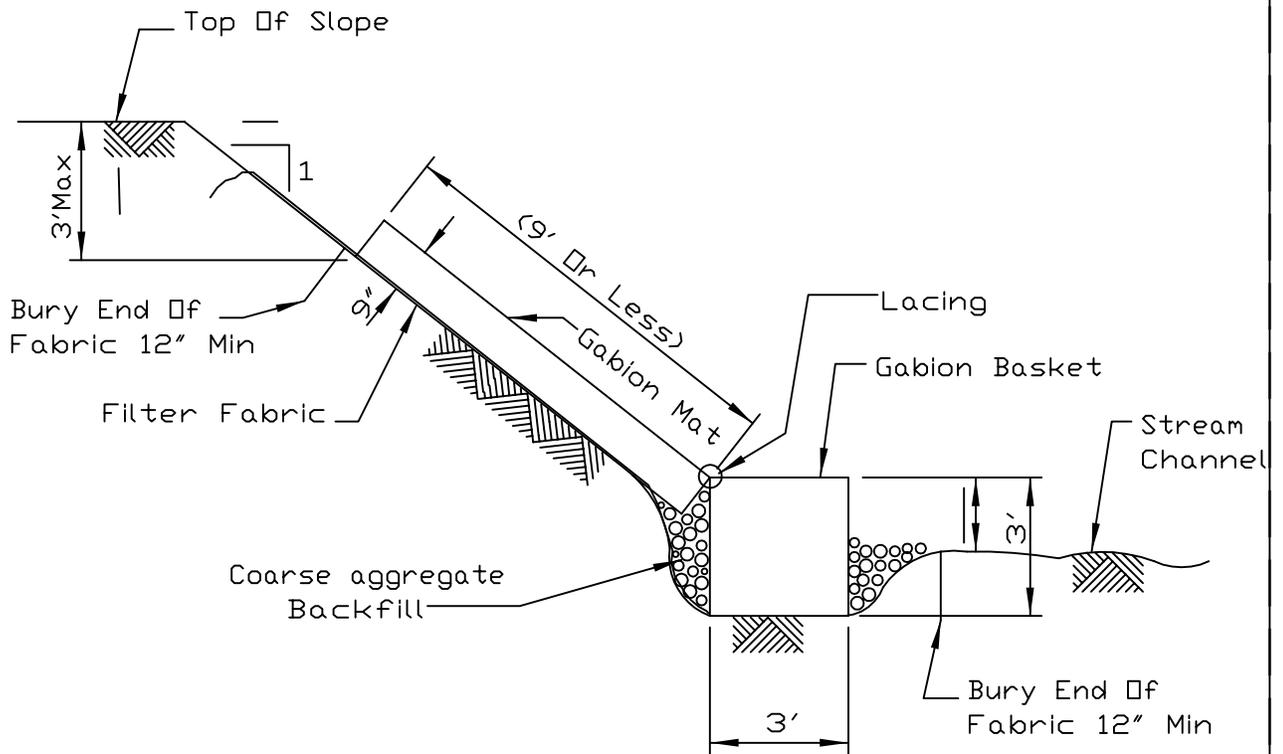
Natural Resources Conservation Service

NRCS

STANDARD DWG. NO.	IL-645
SHEET	1 OF 1
DATE	5-18-94

STRUCTURAL STREAMBANK STABILIZATION - GABIONS

1 BASKET HIGH WITH SLOPE MAT



SECTION

NOTES:

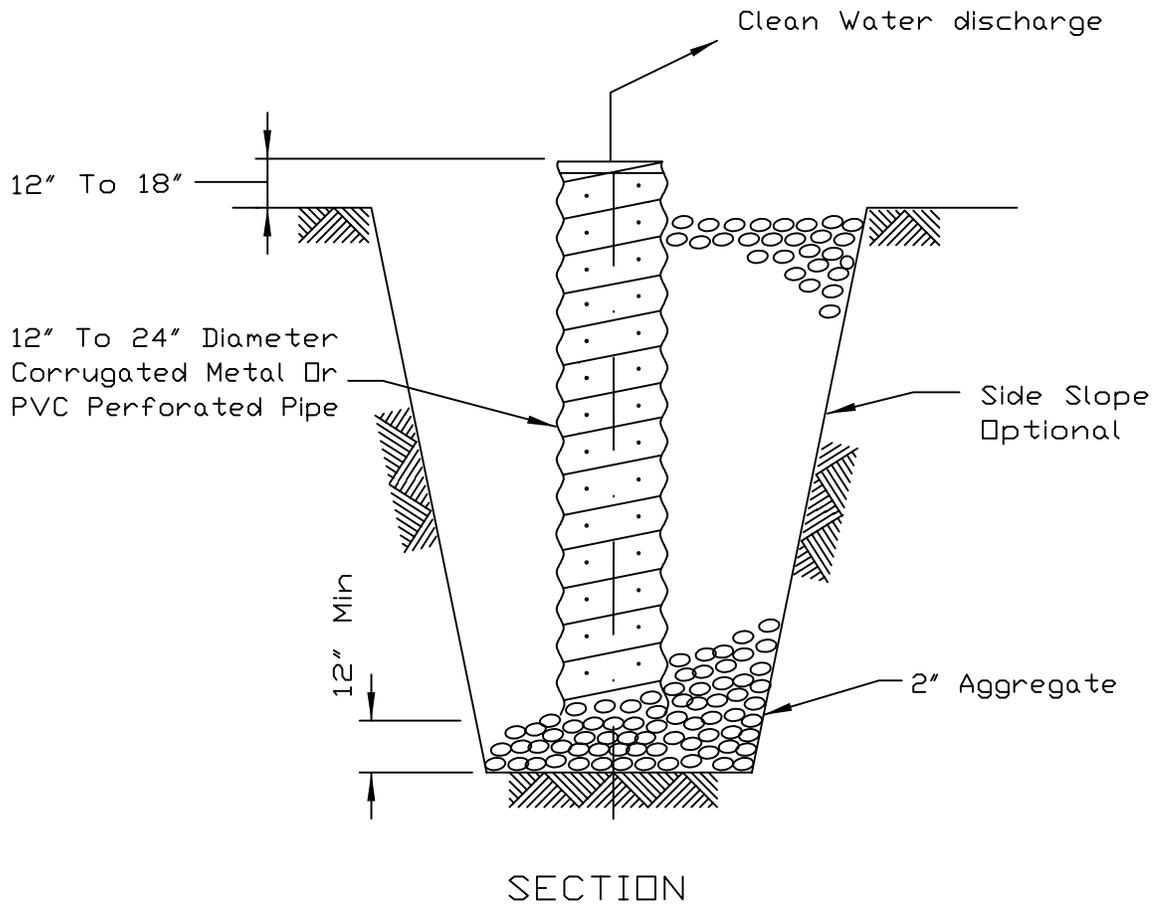
1. The filter fabric shall meet the requirements in material specification 592 GEOTEXTILE Table 1 or 2, Class I, II or III.
2. The coarse aggregate backfill shall meet the IDOT requirement for the following gradations CA-1, CA-3 or RR-1.
3. The Gabions shall be installed according to construction specification 64 WIRE MESH GABIONS
4. The gabion mat will be placed on a side slope of 2:1 or flatter.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



STANDARD DWG. NO.
 IL-646
 SHEET 1 OF 1
 DATE 8-18-94

SUMP PIT PLAN



NOTES:

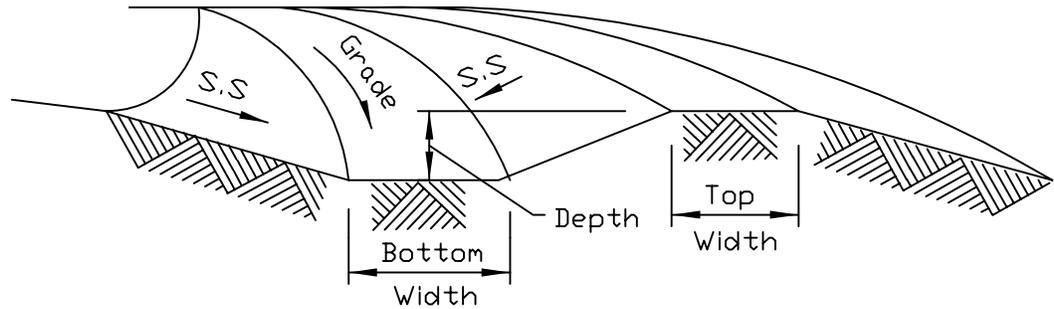
1. Pit dimensions are optional.
2. The standpipe will be constructed by perforating a 12"-24" diameter corrugated metal or PVC pipe.
3. A base of 2" aggregate will be placed in the pit to a minimum depth of 12". After installing the standpipe, the pit surrounding the standpipe will then be backfilled with 2" aggregate.
4. The standpipe will extend 12" to 18" above the lip of the pit.
5. If discharge will be pumped directly to a storm drainage system, the standpipe will be wrapped with filter fabric before installation.
6. If desired, 1/4"-1/2" hardware cloth may be placed around the standpipe prior to attaching the filter fabric. This will increase the rate of water seepage into the pipe.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



STANDARD DWG. NO.
IL-650
SHEET 1 OF 1
DATE 8-11-94

TEMPORARY DIVERSION PLAN



Diversion No.			
From Station			
To Station			
Design Data			
Grade, %			
Drainage Area, Ac			
Construction Layout Data			
Bottom Width, Ft.			
Depth, Ft. (Includes Freeboard & Settlement)			
Side Slopes, Ft./Ft.			
Top Width (Berm), Ft.			
Seeding Width, Ft.			
Seeding Area, Sq.Ft.			

NOTES:

1. All trees stumps, brush and debris shall be removed from the construction area and disposed of properly. All obstructions that will interfere with construction or operation shall be removed. All ditches or gullies to be crossed shall be filled in prior to construction or as part of construction operations.
2. When required topsoil shall be salvaged and spread uniformly over disturbed areas.
3. The diversion will be constructed to the specified lines, grades, width and depth.

Notes: _____

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____

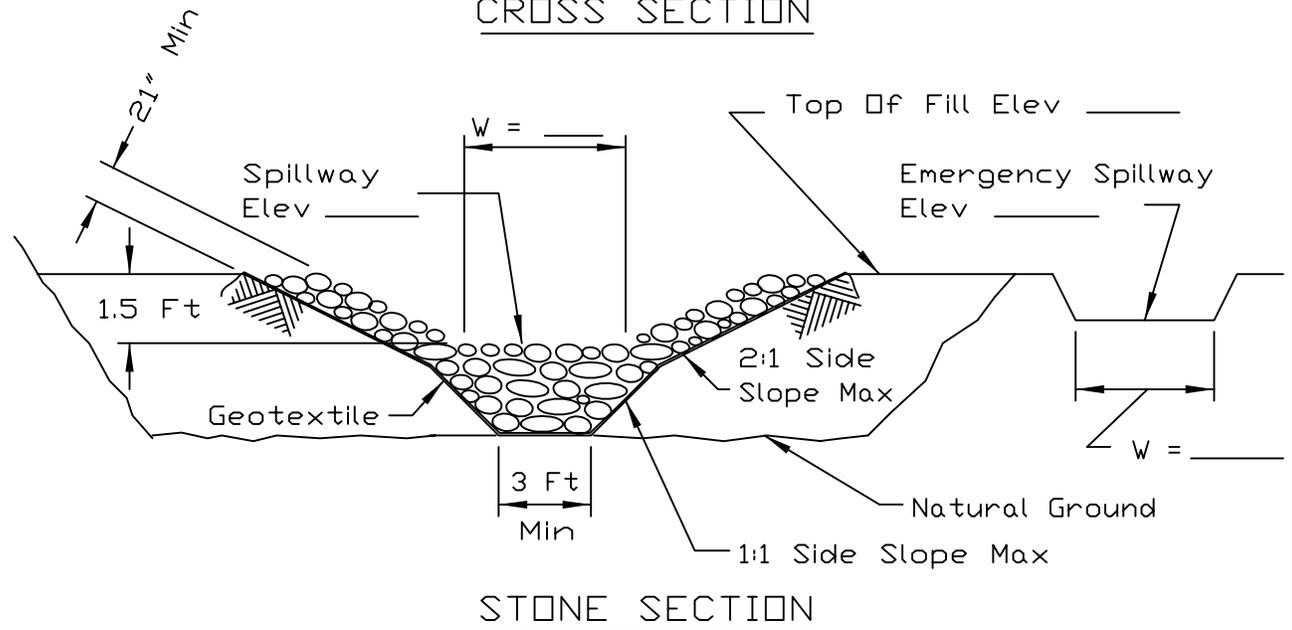
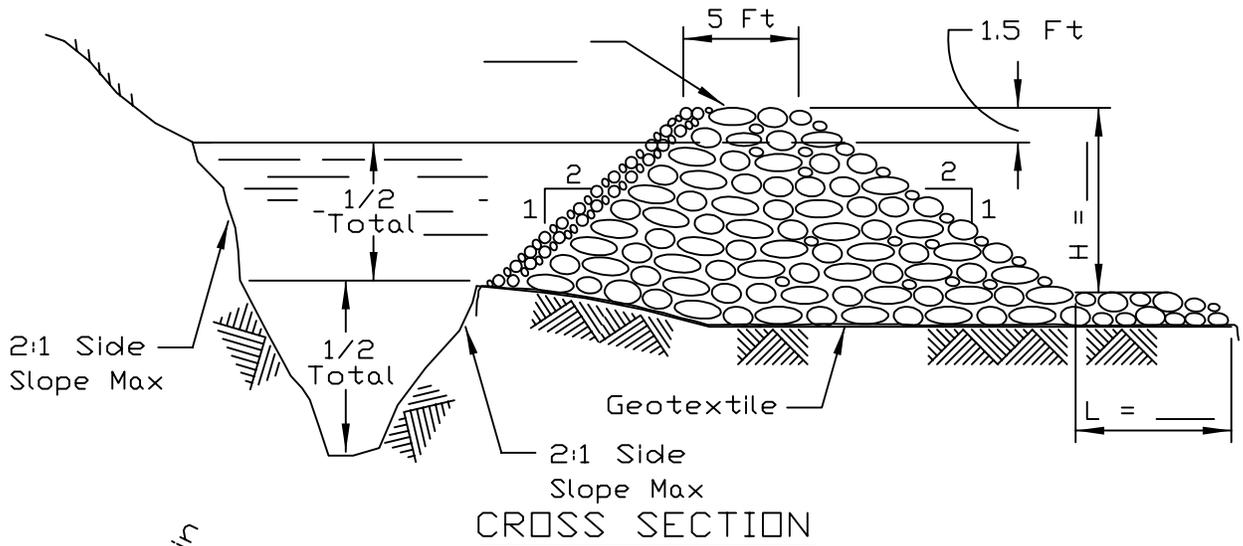


NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
 IL-655
 SHEET 1 OF 1
 DATE 11-21-01

TEMPORARY SEDIMENT TRAP



NOTES:

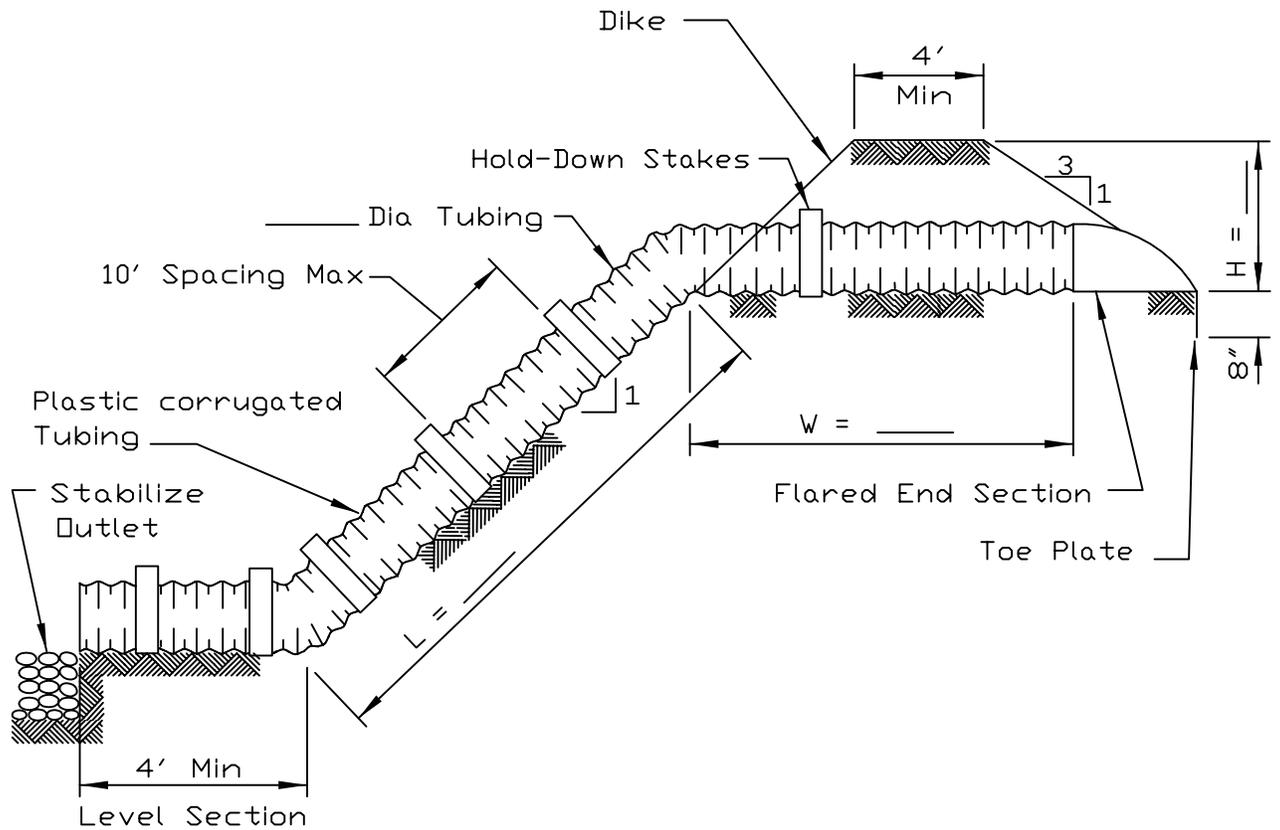
1. If the sediment pool is formed or enlarged the side slope will be 2:1 or flatter.
2. The fill shall be constructed using IDOT RR-4 stone size. A 1' layer of IDOT CA-2 should be placed on the inside face to reduce the flow rate.
3. The rock will be placed according to construction specification 25 ROCKFILL. Placement will be by Method 1 and compaction will be class III.
4. The geotextile shall meet the requirements in material specification 592 GEOTEXTILE table 1 or 2, class I, II or IV.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



STANDARD DWG. NO.
IL-660
SHEET 1 OF 1
DATE 11-20-01

TEMPORARY SLOPE DRAIN PLAN



SECTION

NOTES:

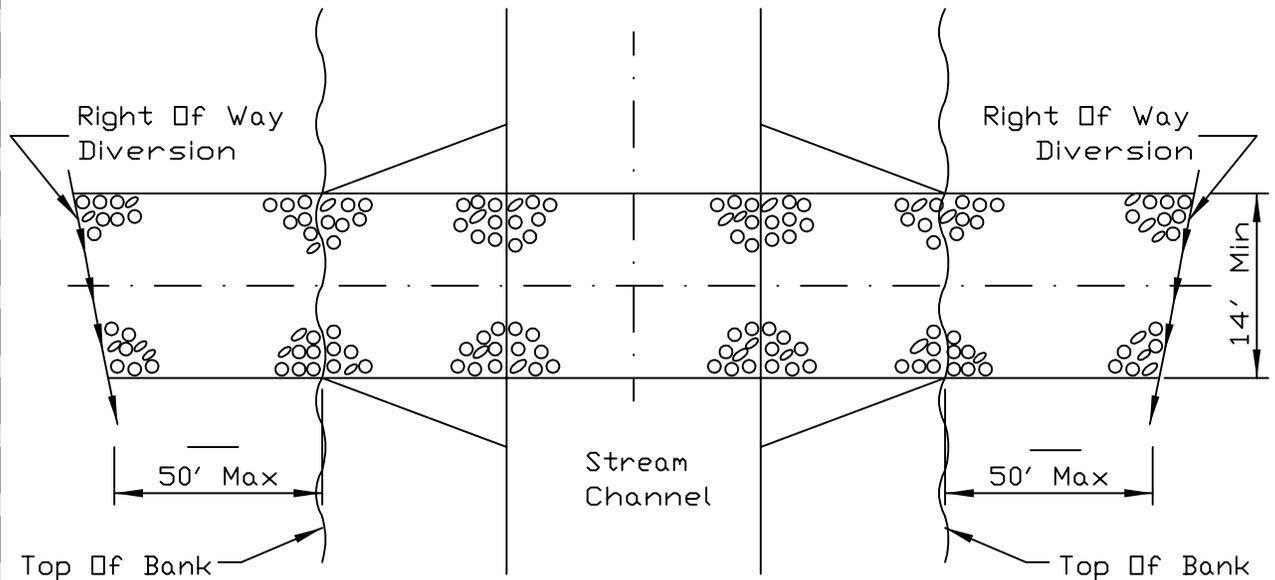
1. Conduit material shall be heavy duty flexible material such as non-perforated corrugated plastic tubing or specially designed flexible tubing.
2. The flared end section shall meet the requirements as shown on standard drawing IL-545.
3. The soil material around the pipe shall be hand compacted in 6" lifts to fill all voids in the tubing corrugations.

REFERENCE	Project _____
Designed _____	Date _____
Checked _____	Date _____
Approved _____	Date _____

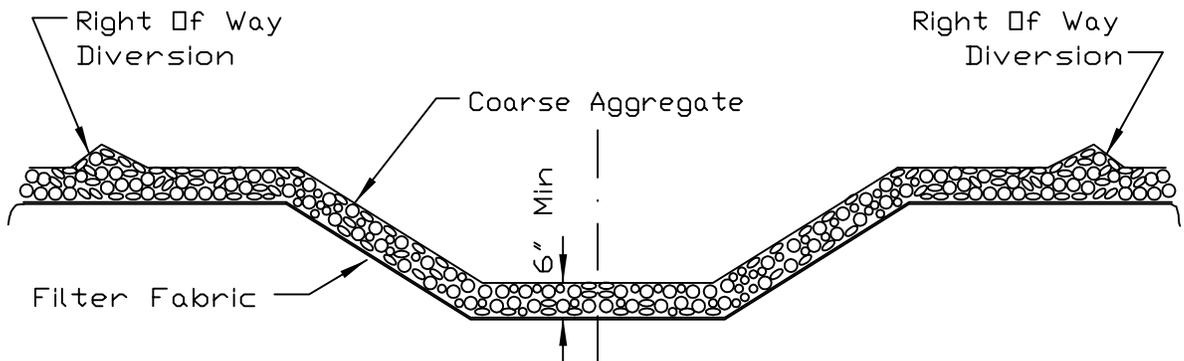


STANDARD DWG. NO.
IL-670
SHEET 1 OF 1
DATE 9-29-93

TEMPORARY STREAM CROSSING PLAN



PLAN VIEW



SECTION

NOTES:

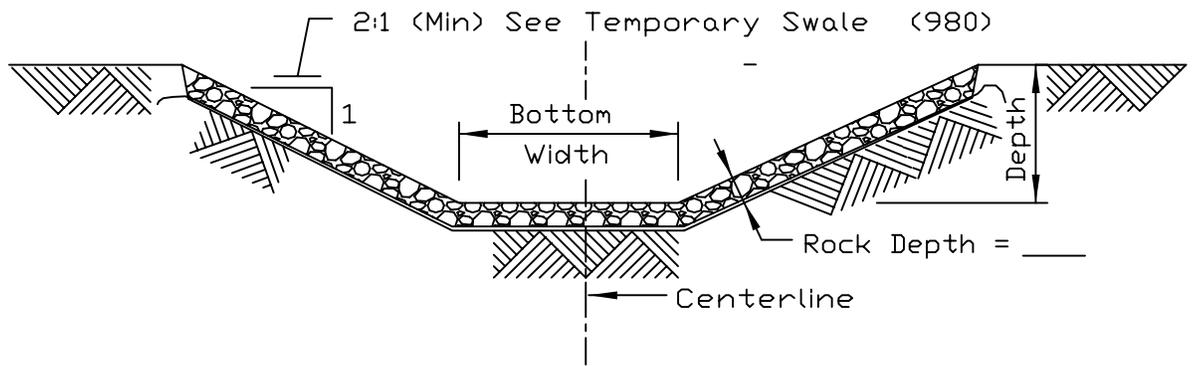
1. Filter fabric shall meet the requirements of material specification 592 GEOTEXTILE, Table 1 or 2, Class I, II or IV and shall be placed over the cleared area prior to the placing of rock.
2. Rock or reclaimed concrete shall meet one of the following IDOT coarse aggregate gradation, CA-1, CA-2, CA-3 or CA-4 and be placed according to construction specification 25 ROCKFILL using placement Method I.
3. The stream crossing shall be made as perpendicular to the centerline of the stream as possible.
4. The crossing shall be removed immediately when no longer needed and the stream channel restored to its original cross section.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



STANDARD DWG. NO.
IL-675
SHEET 1 OF 1
DATE 4-1-94

TEMPORARY ROCK SWALE PLAN



Reach No.			
From Station			
To Station			
Grade, %			
Drainage Area, Ac			
Construction Layout Data			
Top Width, Ft.			
Bottom Width			
Side Slope			
Depth, Ft.			
Stabilization Material			

NOTES:

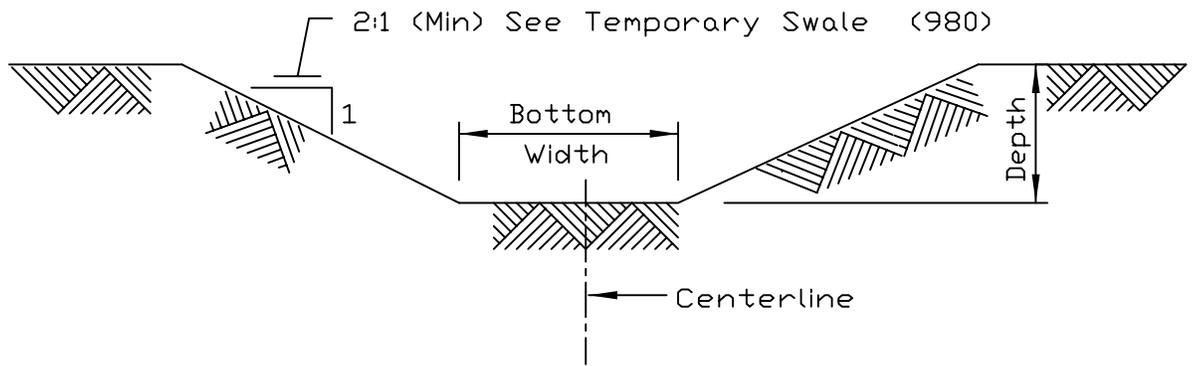
1. All trees, stumps, brush and debris shall be removed from the construction area and disposed of properly.
2. Riprap shall meet IDOT gradation RR-3 Quality Designation A or B. Aggregate shall meet IDOT coarse aggregate gradations CA-2 or CA-3. Rock shall be placed according to construction specification 25 ROCKFILL using placement Method 1 and Class III compaction.
3. Filter fabric shall meet the requirements of material specification 592 592 GEOTEXTILE, Table 1 or 2, Class I, II, or IV and shall be placed over the area prior to the placing of rock.
4. Spoil material from construction will be deposited in low areas or otherwise spread so as not to interfere with flow of water into the swale. Any earth fill shall be compacted to prevent differential settlement in the completed swale. The swale will be constructed to the specified grade, width and depth.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



STANDARD DWG. NO.
 IL-680R
 SHEET 1 OF 1
 DATE 11-21-01

TEMPORARY VEGETATED SWALE PLAN



Reach No.			
From Station			
To Station			
Grade, %			
Drainage Area, Ac			
Construction Layout Data			
Top Width, Ft.			
Bottom Width			
Side Slope			
Depth, Ft.			
Stabilization Material			

NOTES:

1. All trees, stumps, brush and debris shall be removed from the construction area and disposed of properly.
2. When required, topsoil shall be salvaged and spread uniformly over disturbed areas.
3. Spoil material from construction will be deposited in low areas or otherwise spread so as not to interfere with flow of water into the swale. Any earth fill shall be compacted to prevent differential settlement in the completed swale. The swale will be constructed to the specified grade, width and depth.
4. If required, excelsior blankets shall meet the requirements of material specification 802 EXCELSIOR BLANKETS and jute netting shall meet the requirements of 801 JUTE NETTING.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____

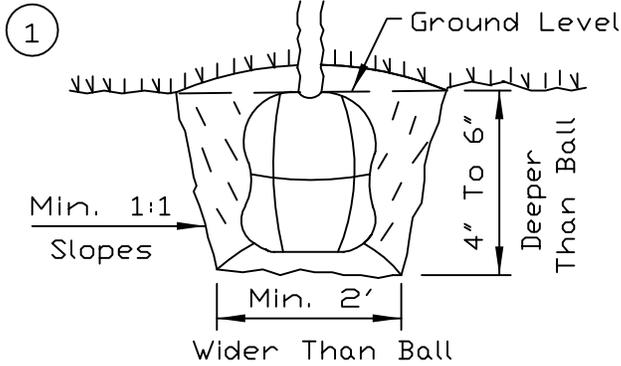


NRCS

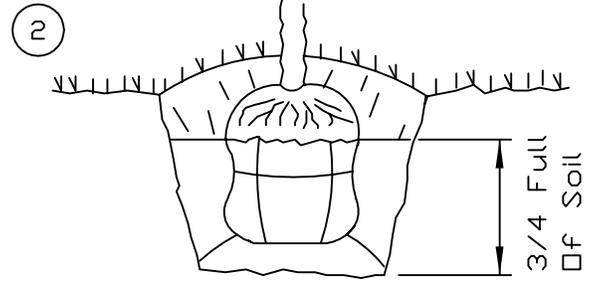
Natural Resources Conservation Service

STANDARD DWG. NO.
 IL-680V
 SHEET 1 OF 1
 DATE 11-21-01

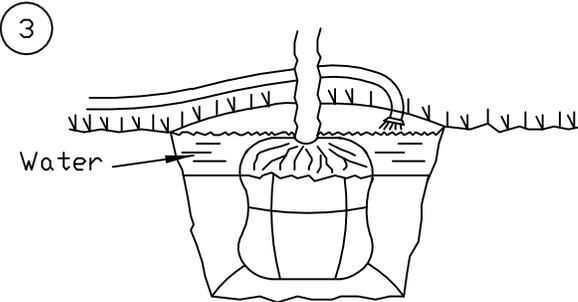
PLANTING PROCEDURE FOR BALLED AND BURLAPPED OR CONTAINER GROWN TREES AND SHRUBS



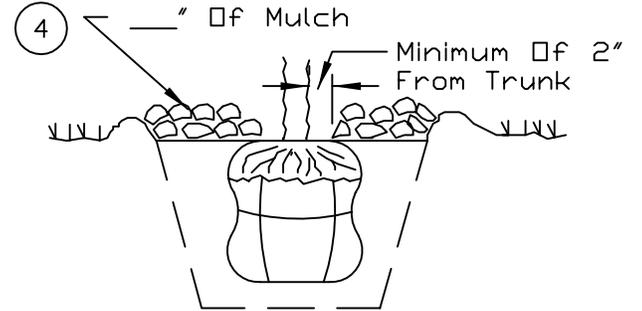
Add enough tamped soil in the bottom of the hole to set the ball at or slightly higher than the original planting depth.



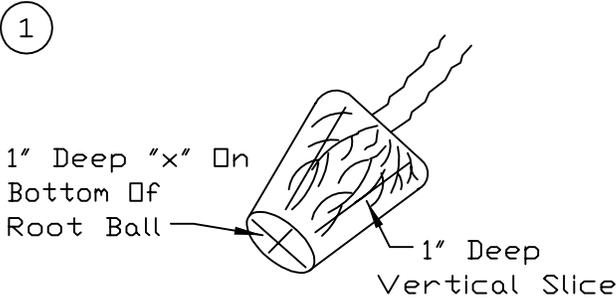
Fill the hole 3/4 full of tamped soil then remove all exposed burlap and twine using a sharp utility knife.



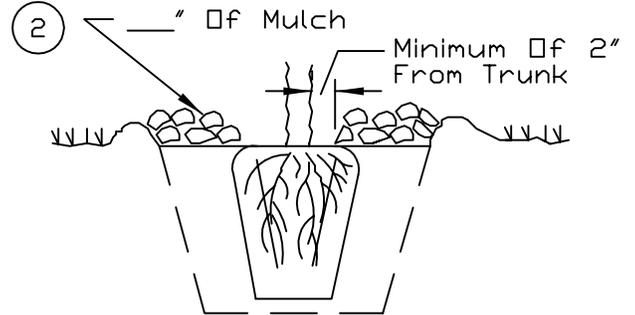
Fill the remaining 1/4 of the hole with water to remove air pockets and settle the soil. Finish filling the hole with soil after all the water has drained.



Unless soil is poorly drained, mound soil around edges of hole 4" to 6" high. Add a minimum of 4" of approved mulching material. Keep mulch about 2" from tree trunk.



Cut the circling roots of container grown trees with a sharp utility knife. Make 4 vertical slices on the sides and an "x" on the bottom. All slices should be 1-inch in depth.



Plant container-grown trees using same steps as for B & B trees except that the plastic container should be completely removed.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



STANDARD DWG. NO.
 IL-685
 SHEET 1 OF 1
 DATE 8-22-94

TREE AND SHRUB PLANTING SITE PLAN

SITE MAP

Show Location And Name Of Streets, Buildings, Landmarks, Trees, And Shrubs To Be Planted.

REFERENCE
Project _____
Designed _____ Date _____
Checked _____ Date _____
Approved _____ Date _____



NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.

IL-686

SHEET 1 OF 2

DATE 1-31-94

TREE AND SHRUB PLANTING SITE PLAN

Site No.	Acres	Species	Map Sym.	Distance Between Rows (Ft.)	Spacing of Plants In Rows (Ft.)	Number of Plants Per Acre	Total No. of Plants Needed

SITE PREPARATION

MULCHING REQUIREMENT

MAINTENANCE

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____

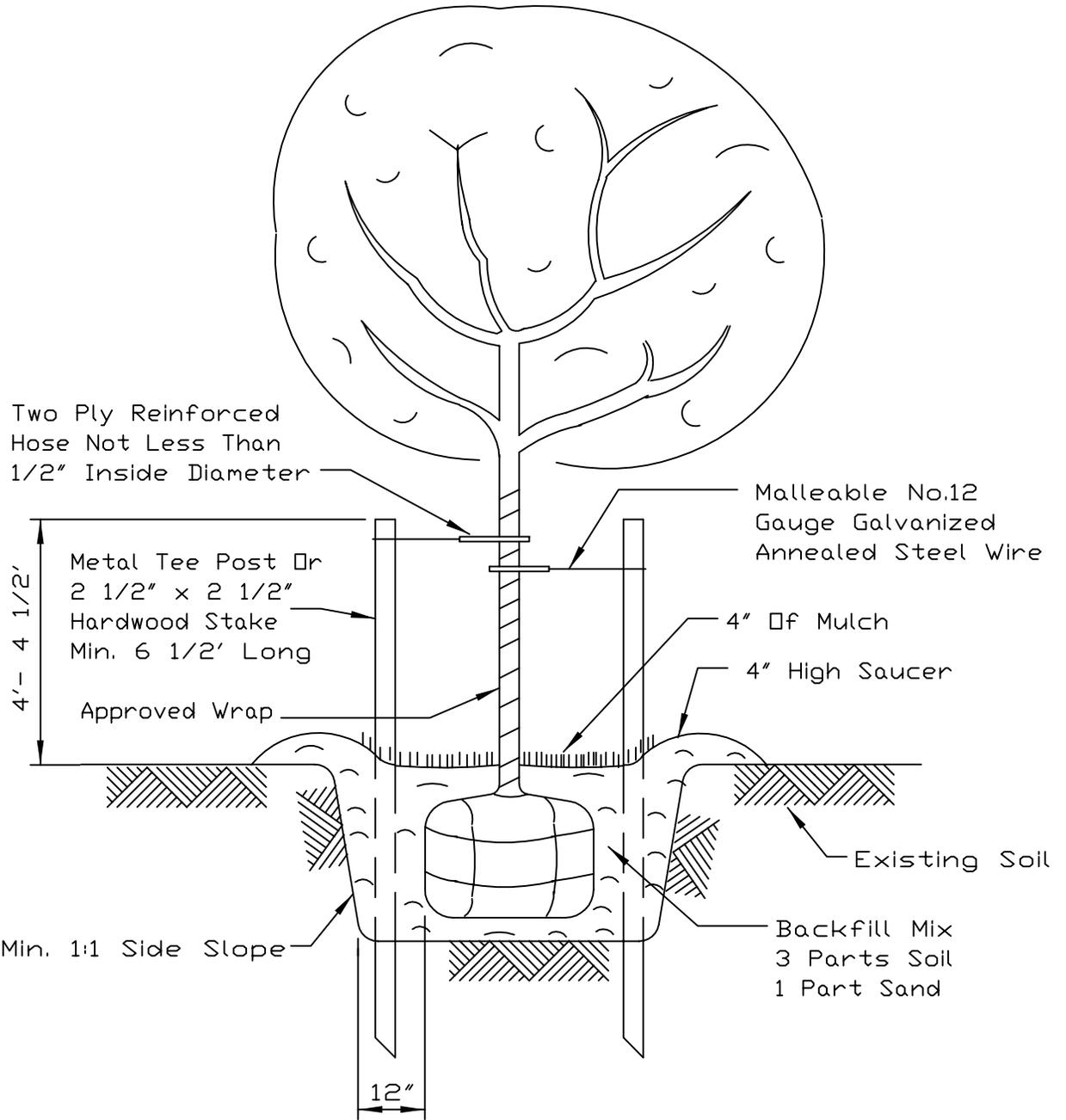


NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
 IL-686
 SHEET 2 OF 2
 DATE 1-31-94

TWO GUY METHOD-TREES UNDER 8'



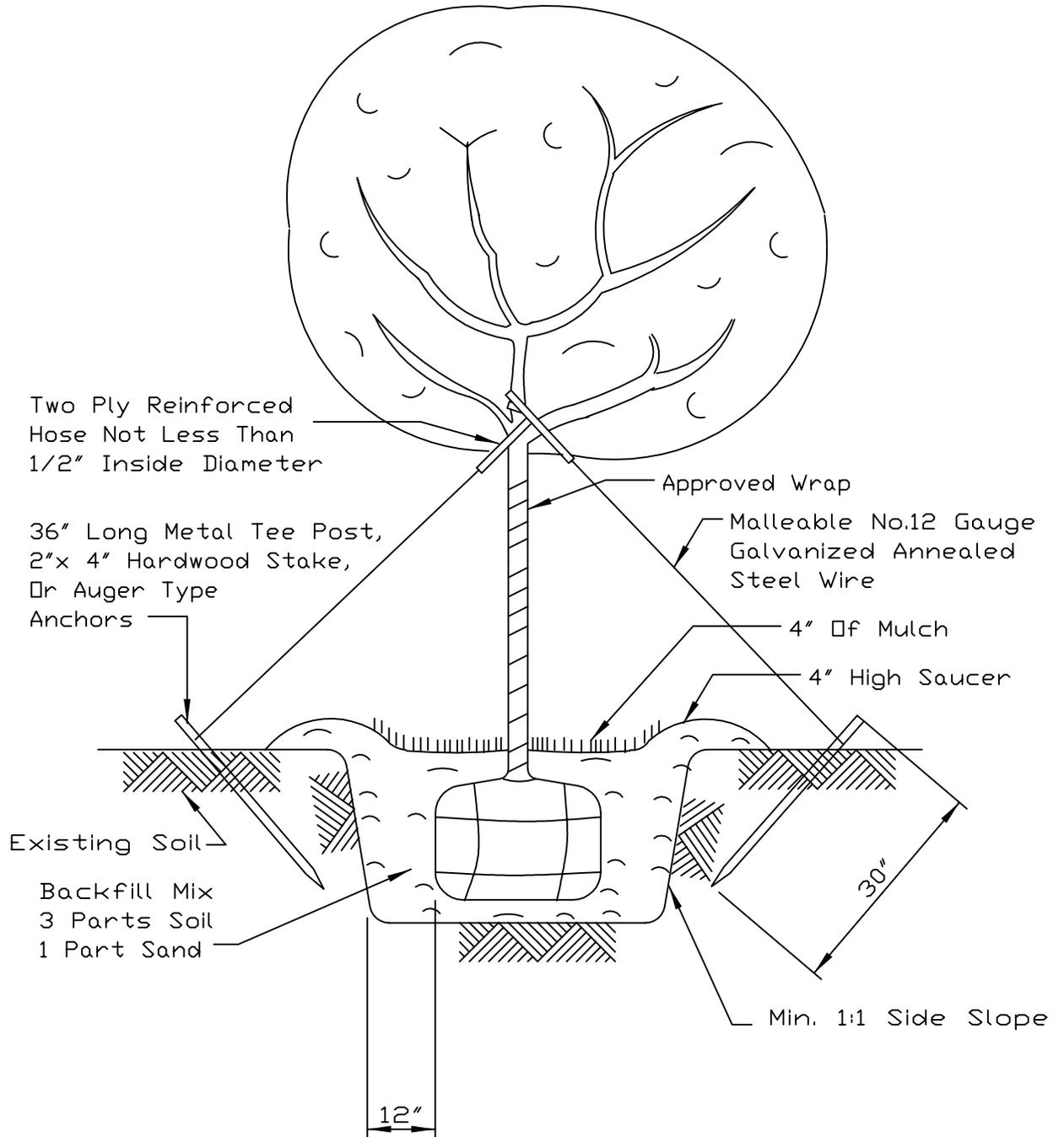
No Scale

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



STANDARD DWG. NO.
 IL-687
 SHEET 1 OF 1
 DATE 8-25-93

THREE GUY METHOD-TREES OVER 8'



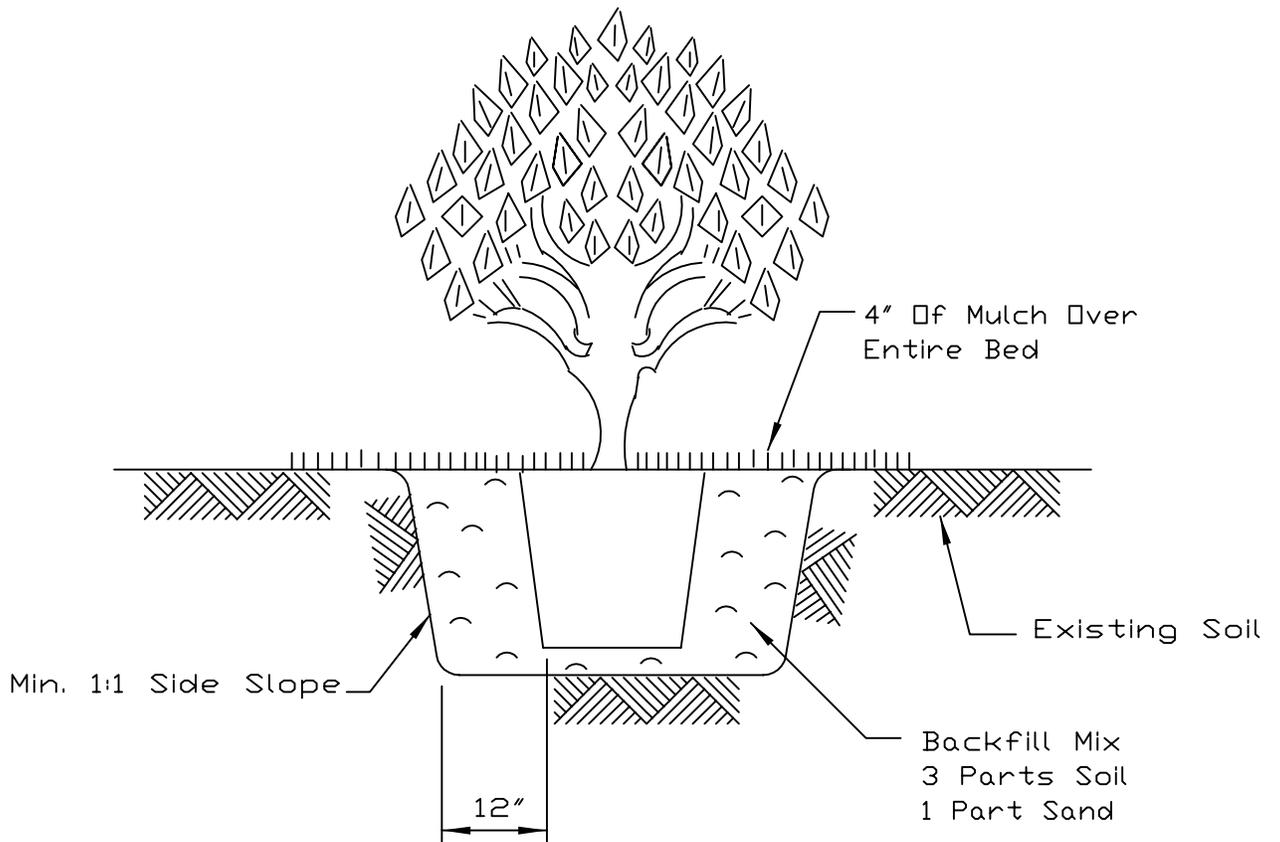
No Scale

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



STANDARD DWG. NO.	IL-688
SHEET	1 OF 1
DATE	9-17-93

PLANTING PROCEDURE FOR SHRUBS



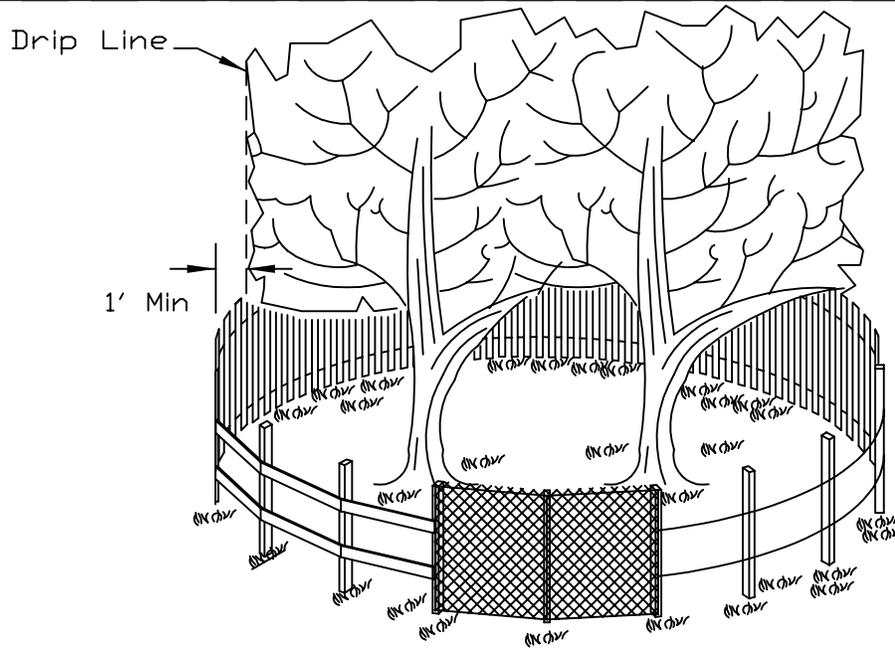
No Scale

REFERENCE
Project _____
Designed _____ Date _____
Checked _____ Date _____
Approved _____ Date _____

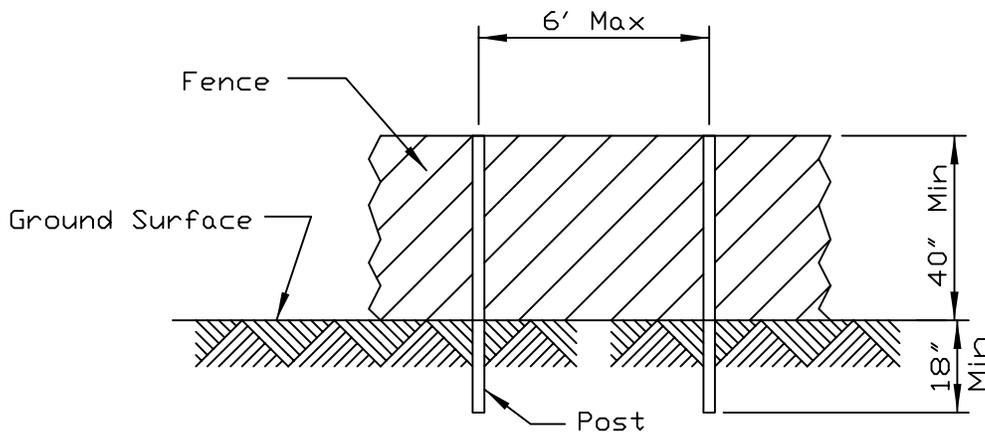


STANDARD DWG. NO.
IL-689
SHEET 1 OF 1
DATE 8-25-93

TREE PROTECTION - FENCING



SIDE VIEW



POST AND FENCE DETAIL

NOTES:

1. The fence shall be located a minimum of 1 foot outside the drip line of the tree to be saved and in no case closer than 5 feet to the trunk of any tree.
2. Fence posts shall be either standard steel posts or wood posts with a minimum cross sectional area of 3.0 sq. in.
3. The fence may be either 40" high snow fence, 40" plastic web fencing or any other material as approved by the engineer/inspector.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



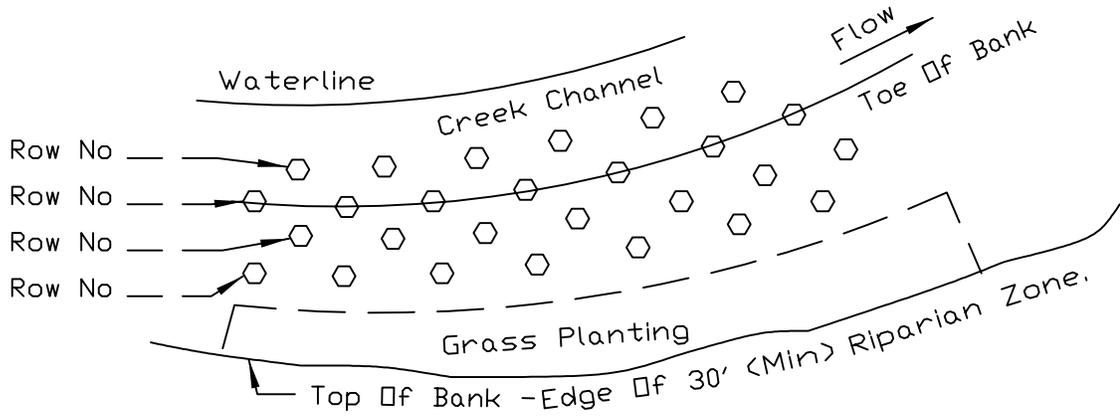
NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
IL-690
SHEET 1 OF 1
DATE 4-7-94

VEGETATIVE STREAMBANK STABILIZATION

SAMPLE SITE PLAN



- - Dormant Cutting
- ◡ - Dormant Posts Or STakes
- - Shrub Or Tree

SITE PLAN

GRASSES					
Reach No.	Length	Area (Sq.Ft.)	Species To Be Seeded	Lbs. Of PLS Per 1000 Sq. Ft.	Total Lbs.

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



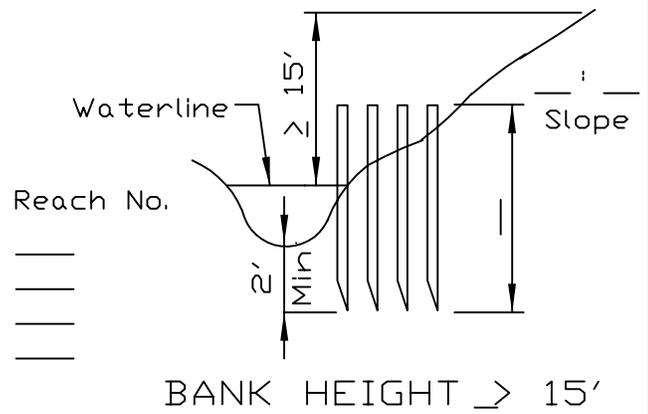
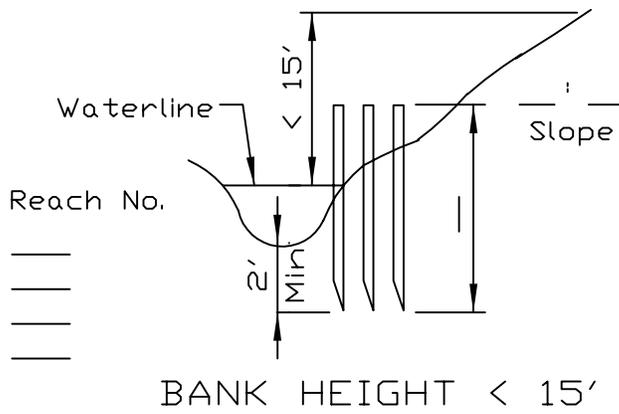
NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
 IL-695
 SHEET 1 OF 3
 DATE 9-29-93

VEGETATIVE STREAMBANK STABILIZATION

SITE PLAN



WOODY PLANTS

Reach No.	Length (Feet)	Row No.	Species To Plant	Between Row Spacing (Ft.)	In Row Spacing (Ft.)	Number Plants Per Row	Total Plants

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



STANDARD DWG. NO.
 IL-695
 SHEET 2 OF 3
 DATE 3-3-95

VEGETATIVE STREAMBANK STABILIZATION

SITE PLAN

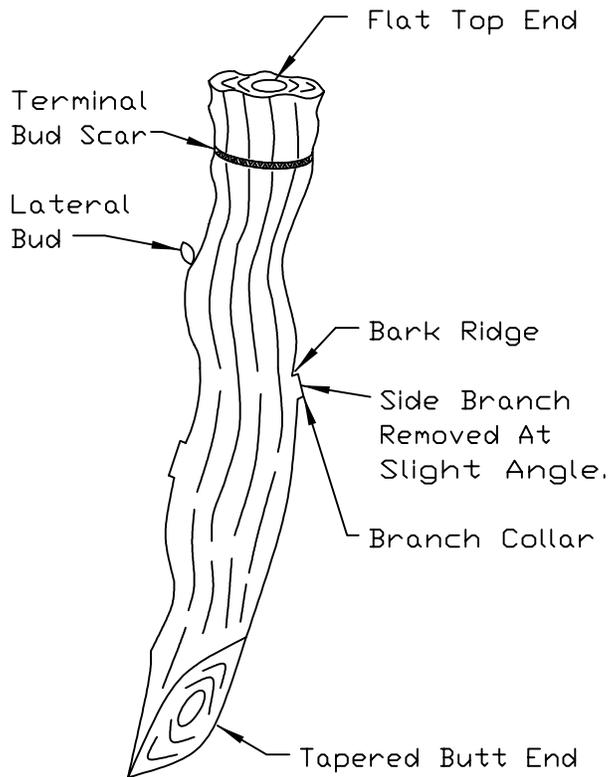
RIPARIAN ZONE TREE AND SHRUB PLANTING						
Reach No.	Length (Feet)	Row No.	Species To Plant	Between Row Spacing (Ft.)	In-Row Spacing (Ft.)	Total Plants

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____



STANDARD DWG. NO.
 IL-695
 SHEET 3 OF 3
 DATE 9-16-93

VEGETATIVE STREAMBANK STABILIZATION - DETAILS



Material Type (Circle One)

Cutting Stake Post

Minimum Length = _____ Ft. _____ Inches
 Minimum Diameter At Top = _____ Inches

Figure 1

PLANTING MATERIAL PREPARATION

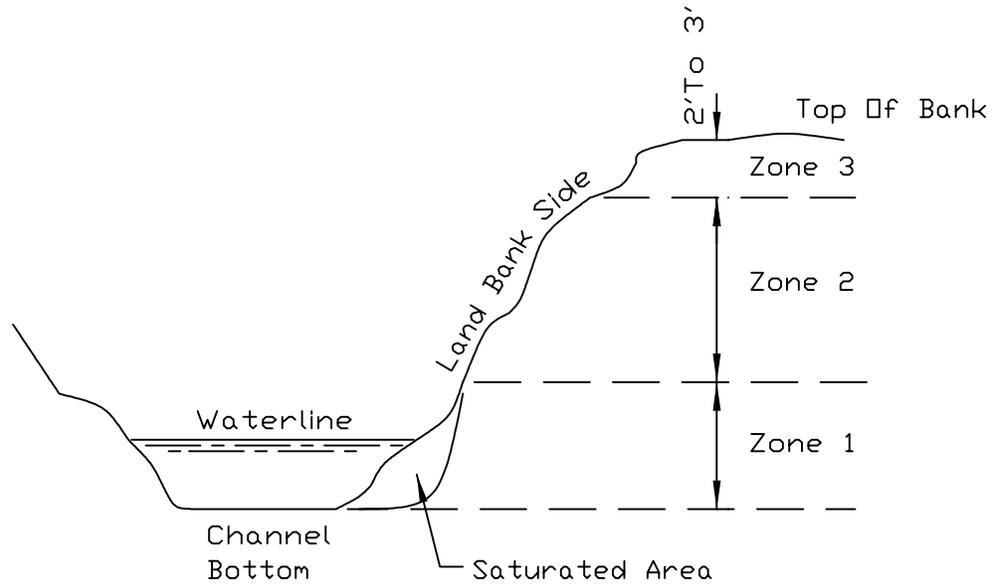


Figure 2

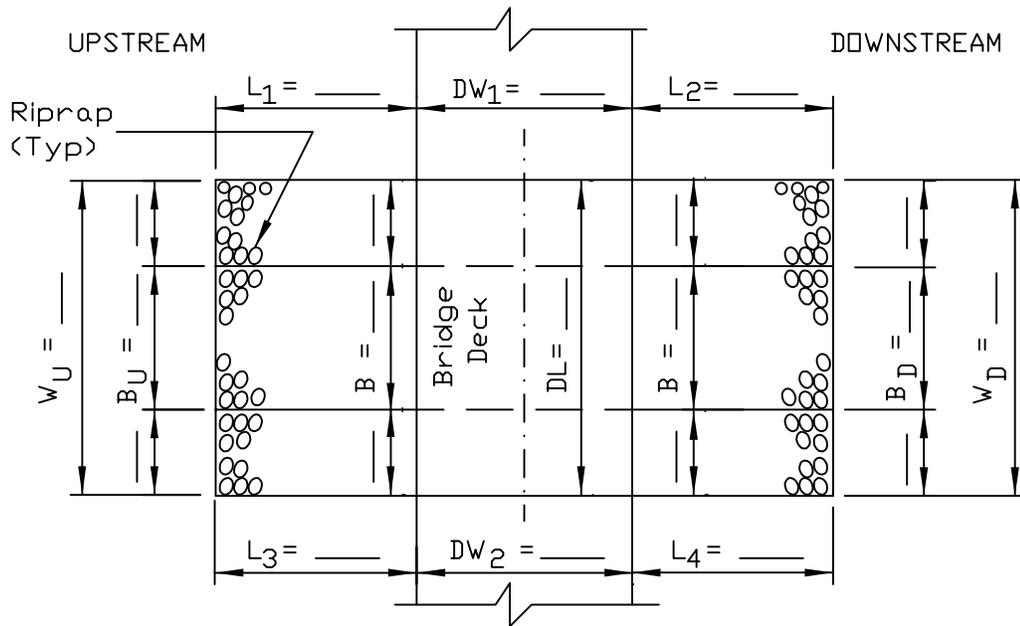
PLANT ZONES

REFERENCE
 Project _____
 Designed _____ Date _____
 Checked _____ Date _____
 Approved _____ Date _____

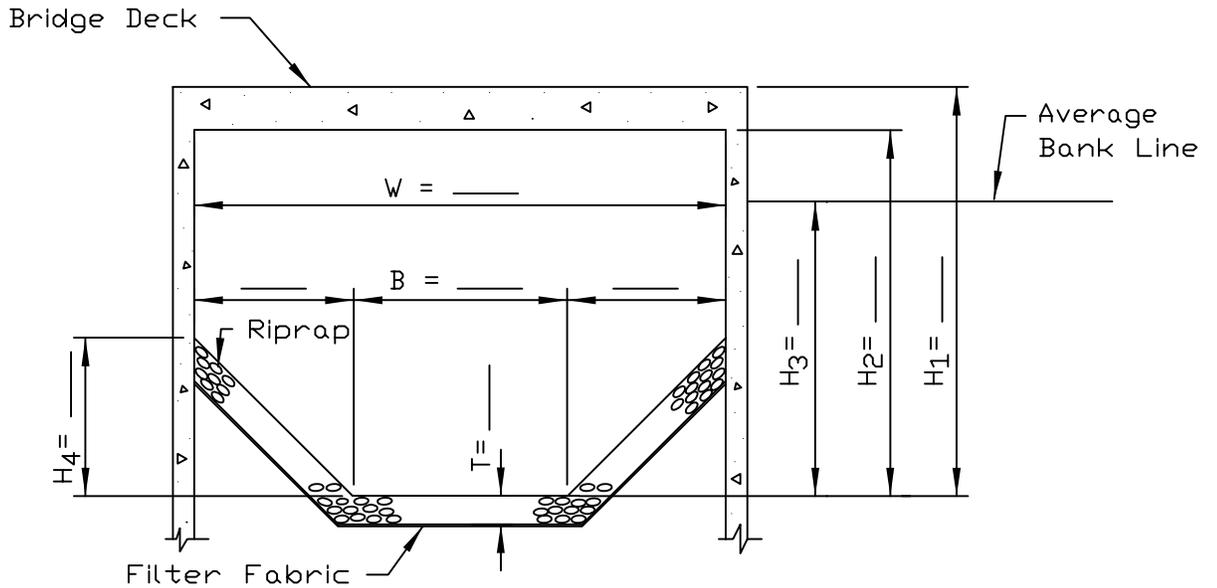


STANDARD DWG. NO.
 IL-696
 SHEET 1 OF 1
 DATE 9-30-94

BRIDGE SCOUR PROTECTION



PLAN



SECTION ON CENTERLINE

NOTES:

1. The filter fabric shall meet the requirements for the following specification 592 GEOTEXTILE table I, II OR III .
2. The rock riprap shall meet IDOT requirement for the following gradation: RR ___ Quality ___ .
3. The riprap shall be placed according to construction specification 61 LOOSE ROCK RIPRAP. The rock may be equipment placed.

REFERENCE	
Project	_____
Designed	_____ Date _____
Checked	_____ Date _____
Approved	_____ Date _____



NRCS

Natural Resources Conservation Service

STANDARD DWG. NO.
IL-700
SHEET 1 OF 1
DATE 9-15-93

SECTION 8 - PRACTICE EVALUATION

INTRODUCTION

This section provides information on the effects of urban conservation practices on Soil, Water, Air, Plant and Animal (SWAPA) resources within the urban ecosystem.

Urban resource planning cannot be properly completed without considering the interrelationships of the SWAPA resources within the urban ecosystem. As the public's concern for the environment, whether urban or rural, increases, the interrelationships of these resources will become more critical as project plans are developed.

Urban Conservation Practices Physical Effects (CPPE) sheets can provide details on the physical effects that specific urban practices have on the SWAPA resources. These, in turn, can be used to guide decisions on the best practices to use as a part of the resource management system needed to address the resource concerns identified for the project. The estimation of the physical effects for a practice is based on professional experience and available technical information.

The key question that should be asked when reviewing the CPPE is, "if this practice is applied, what effect will it have not only on the identified or potential target resource concerns or considerations, but also on all the others contained in the column headings?". The planner needs to recognize the effect of applying urban conservation practices in order to select combinations of practices that solve the identified or potential concerns without creating new problems.

Conservation practice physical effects for new Illinois Urban Manual practice standards prepared since the original 1995 version of the manual have not yet been completed. Once completed this section will be updated.

This section was prepared in August 1994.

NRCS IL August 1994

urbse_8.doc

URBAN CONSERVATION PRACTICE PHYSICAL EFFECTS

RESOURCE

CONTENTS

Soil	Effects of urban practices on the soil resources as these relate to urban soil erosion, soil condition and deposition
Water	Effects of urban practices on the water resources especially as these relate to water quantity and quality
Air	Effects of urban practices on the air resources as these relate to air quality and condition
Plants	Effects of urban practices on the plant resources as these relate to plant suitability, condition and management
Animals	Effects of urban practices on the animal resources as these relate to urban wildlife habitat and management

CONSIDERATIONS:		(1) EROSION					(2) CONDITION			
ASPECTS/ PROBLEMS	PRACTICE	CLASSIC GULLY	STREAMBANK	SOIL MASS MOVEMENT	ROADBANK AND CONSTRUCTION SITES	SHEET AND RILL	SOIL COMPACTION	SOIL CONTAMINANTS		
								EXCESS CHEMICAL CONTENT, SALINITY, SELENIUM, BORON, HEAVY METAL	EXCESS FERTILIZER	EXCESS PESTICIDES
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Gullies are channels that may grow or enlarge from year to year by headcutting and lateral widening. They are too deep to be erased by normal operations.	Sloughing of banks caused by overbank flow, unstable soils, obstructions, unstable channel bottom, or all of these.	Soil slippage, landslides, or slope failure, normally on hillsides, in deep cuts or through unstable soil on sloping land that creates a large volume of soil movement.	The erosion as identified is causing problems and damage, both on-site and off-site.	The movement of soil from water forces, requiring treatment when soil loss tolerance level is exceeded.	Compaction is excess compressing of soil particles and aggregates by machine and natural consolidation, thereby effecting plant-soil-moisture-air relationship.	Excess chemical content, salinity, selenium, boron, heavy metals. Includes the amounts of desirable and undesirable chemical elements and compounds consisting of either organic or inorganic forms and restricts the desired use of soil.	Excess fertilizer occurs if the application of fertilizer or quantity of nutrients restricts the desired use of the soil.	Excess pesticides occur if the application method type or the quantity of the residuals restrict desired use of the soil.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
800 - Urban Stormwater Wetlands	A constructed system of shallow pools that create growing conditions for wetland plants to lessen the impacts of stormwater quality and quantity in urban areas.	Negligible.	Slight to significant decrease due to establishment of protective riparian vegetation.	Negligible.	Negligible.	Negligible.	Significant decrease due to establishment and management of permanent cover, deposition of organic material, and increased microbial action.	Moderate to significant decrease due to uptake of chemicals by hydrophytes.	Moderate to significant decrease due to uptake of chemicals by hydrophytes.	Moderate to significant decrease due to less pesticide use and some uptake by hydrophytes.
806 - Construction Road Stabilization	The stabilization of temporary construction access routes, subdivision roads, on-site vehicle transportation roads, and construction parking areas with stone immediately after grading.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
808 - Culvert Inlet Protection	A temporary sediment filter located at the inlet to storm sewer culverts.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
815 - Diversion	A channel and supporting ridge constructed across the slope to collect and divert runoff.	Slight to significant decrease due to interception of concentrated flow.	Slight to moderate decrease because of reduction in overbank flow.	Negligible to moderate decrease if water is diverted from top of slope.	Moderate to significant decrease due to interception of surface flow.	Negligible to slight decrease if slope length is reduced.	Negligible.	Negligible to slight decrease due to increased infiltration.	Negligible.	Negligible.
820 - Diversion Dike	A dike or dike and channel constructed along the perimeter of a disturbed construction area.	Slight to significant decrease due to interception of concentrated flow.	Slight to moderate decrease because of reduction in overbank flow.	Negligible to moderate decrease if water is diverted from top of slope.	Moderate to significant decrease due to interception of surface flow.	Negligible to slight decrease if slope length is reduced.	Negligible.	Negligible to slight decrease due to increased infiltration.	Negligible.	Negligible.

CONSIDERATIONS:		(3) DEPOSITION							
ASPECTS/ PROBLEMS	PRACTICE		DAMAGE		SAFETY				
			ON-SITE	OFF-SITE	ON-SITE	OFF-SITE			
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION		Vegetation destroyed or structural practices damaged or rendered inoperable due to excessive sediment deposition.	Same as on-site damage.	Deposition on roads and railroads that cause accidents, loss of life, and loss of access for emergency vehicles.	Same as on-site safety.			
PRACTICE CODE AND NAME	OTHER EXPLANATIONS								
800 - Urban Stormwater Wetlands	A constructed system of shallow pools that create growing conditions for wetland plants to lessen the impacts of stormwater quality and quantity in urban areas.		Slight to significant decrease due to establishment of impoundments and hydrophytic plants which trap sediment.	Negligible to significant decrease due to trapping of sediment on site.	Negligible to slight decrease due to establishment of impoundments and hydrophytic plants which trap sediment.	Negligible to significant decrease due to trapping of sediment on site.			
806 - Construction Road Stabilization	The stabilization of temporary construction access routes, subdivision roads, on-site vehicle transportation roads, and construction parking areas with stone immediately after grading.		Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
808 - Culvert Inlet Protection	A temporary sediment filter located at the inlet to storm sewer culverts.		Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
815 - Diversion	A channel and supporting ridge constructed across the slope to collect and divert runoff.		Slight to significant decrease due to reduced runoff and sedimentation.	Negligible to moderate decrease due to reduced runoff and sedimentation.	Slight to significant decrease due to reduced runoff and sedimentation.	Negligible to moderate decrease due to reduced runoff and sedimentation.			
820 - Diversion Dike	A dike or dike and channel constructed along the perimeter of a disturbed construction area.		Slight to significant decrease due to reduced runoff and sedimentation.	Negligible to moderate decrease due to reduced runoff and sedimentation.	Slight to significant decrease due to reduced runoff and sedimentation.	Negligible to moderate decrease due to reduced runoff and sedimentation.			

CONSIDERATIONS:		(1) EROSION					(2) CONDITION			
ASPECTS/ PROBLEMS	PRACTICE	CLASSIC GULLY	STREAMBANK	SOIL MASS MOVEMENT	ROADBANK AND CONSTRUCTION SITES	SHEET AND RILL	SOIL COMPACTION	SOIL CONTAMINANTS		
								EXCESS CHEMICAL CONTENT, SALINITY, SELENIUM, BORON, HEAVY METAL	EXCESS FERTILIZER	EXCESS PESTICIDES
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Gullies are channels that may grow or enlarge from year to year by headcutting and lateral widening. They are too deep to be erased by normal operations.	Sloughing of banks caused by overbank flow, unstable soils, obstructions, unstable channel bottom, or all of these.	Soil slippage, landslides, or slope failure, normally on hillsides, in deep cuts or through unstable soil on sloping land that creates a large volume of soil movement.	The erosion as identified is causing problems and damage, both on-site and off-site.	The movement of soil from water forces, requiring treatment when soil loss tolerance level is exceeded.	Compaction is excess compressing of soil particles and aggregates by machine and natural consolidation, thereby effecting plant-soil-moisture-air relationship.	Excess chemical content, salinity, selenium, boron, heavy metals. Includes the amounts of desirable and undesirable chemical elements and compounds consisting of either organic or inorganic forms and restricts the desired use of soil.	Excess fertilizer occurs if the application of fertilizer or quantity of nutrients restricts the desired use of the soil.	Excess pesticides occur if the application method type or the quantity of the residuals restrict desired use of the soil.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
825 - Dust Control	Controlling dust blowing and movement on construction sites and roads.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Negligible to slight increase if runoff occurs.	Negligible to significant increase if water vehicle is used.	Negligible.	Negligible.	Negligible.
830 - Erosion Blanket	The application of a preformed protective blanket of straw or other plant residue, or plastic fibers formed into a mat, usually with a plastic mesh on one or both sides.	Slight unless combined with a vegetative cover seeding.	Slight unless combined with a vegetative cover seeding.	Slight unless combined with a vegetative cover seeding.	Slight unless combined with a vegetative cover seeding.	Moderate to significant decrease because of increased surface cover.	Slight decrease due to protection of soil surface from impact of raindrops.	Negligible.	Negligible.	Negligible.
835 - Filter Strip	A created or preserved area of vegetation designed to remove sediment and other pollutants and to enhance the infiltration of surface water runoff.	Negligible to slight decrease because of water spreading depending on location of filter strip.	Moderate to slight decrease because of decrease of overbank flow.	Negligible.	Negligible to slight decrease because of erosion reduction.	Slight to significant decrease because of reduced erosion on area vegetated.	Slight to significant decrease because of development of root mass and increased organic material within the field border.	Negligible.	Negligible.	Negligible.
840 - Grass-Lined Channel	A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation for stable conveyance of runoff.	Slight to significant decrease because of managed and guided runoff.	Slight to moderate decrease because of managed and guided runoff.	Not applicable.	Negligible to slight decrease because of managed and guided runoff.	Negligible.	Not applicable.	Negligible.	Negligible.	Negligible.
841 - Impoundment Structure-Full Flow	A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.	Negligible to significant decrease due to stabilization if embankment is constructed in gully.	Negligible to slight decrease due to reduced peak flows downstream from impoundment.	Not applicable.	Negligible.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Negligible.

CONSIDERATIONS:		(3) DEPOSITION							
ASPECTS/ PROBLEMS	PRACTICE		DAMAGE		SAFETY				
			ON-SITE	OFF-SITE	ON-SITE	OFF-SITE			
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION		Vegetation destroyed or structural practices damaged or rendered inoperable due to excessive sediment deposition.	Same as on-site damage.	Deposition on roads and railroads that cause accidents, loss of life, and loss of access for emergency vehicles.	Same as on-site safety.			
PRACTICE CODE AND NAME	OTHER EXPLANATIONS								
825 - Dust Control	Controlling dust blowing and movement on construction sites and roads.		Negligible to slight decrease if volume of water applied is controlled to prevent excess runoff.	Same as on-site damage.	Negligible to slight decrease if volume of water applied is controlled to prevent excess runoff.	Same as on-site safety.			
830 - Erosion Blanket	The application of a preformed protective blanket of straw or other plant residue, or plastic fibers formed into a mat, usually with a plastic mesh on one or both sides.		Moderate to significant decrease due to protection of soil surface from impact of raindrops.	Moderate to significant decrease due to protection of soil surface from impact of raindrops.	Moderate to significant decrease due to protection of soil surface from impact of raindrops.	Moderate to significant decrease due to protection of soil surface from impact of raindrops.			
835 - Filter Strip	A created or preserved area of vegetation designed to remove sediment and other pollutants and to enhance the infiltration of surface water runoff.		Slight to significant decrease because of trapping of sediment in filter.	Slight to significant decrease because of trapping of sediment in filter.	Slight to moderate decrease because of trapping of sediment upslope from roads.	Slight decrease because of trapping of sediment upslope from roads.			
840 - Grass-Lined Channel	A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation for stable conveyance of runoff.		Negligible to slight decrease due to managed runoff and reduced sedimentation.	Same as on-site damage.	Negligible to slight decrease due to managed runoff and reduced sedimentation.	Same as on-site safety.			
841 - Impoundment Structure-Full Flow	A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.		Slight to significant decrease due to sediment deposition in impoundment.	Same as on-site damage.	Slight to significant decrease due to sediment deposition in impoundment.	Same as on-site safety.			

CONSIDERATIONS:		(1) EROSION					(2) CONDITION			
ASPECTS/ PROBLEMS	PRACTICE	CLASSIC GULLY	STREAMBANK	SOIL MASS MOVEMENT	ROADBANK AND CONSTRUCTION SITES	SHEET AND RILL	SOIL COMPACTION	SOIL CONTAMINANTS		
								EXCESS CHEMICAL CONTENT, SALINITY, SELENIUM, BORON, HEAVY METAL	EXCESS FERTILIZER	EXCESS PESTICIDES
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION									
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
842 - Impoundment Structure-Routed	A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.	Negligible to significant decrease due to stabilization if embankment is constructed in gully.	Negligible to slight decrease due to reduced peak flows downstream of impoundment.	Not applicable.	Negligible.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Negligible.
847 - Infiltration Trench	An excavated trench filled with coarse granular material in which stormwater runoff is collected for temporary storage and infiltration.	Slight to significant decrease due to interception of concentrated flow.	Negligible to slight decrease due to reduced peak flow.	Slight to moderate increase if located above a potential soil mass movement site.	Negligible to slight decrease due to reduced peak flows.	Slight to moderate decrease due to reduced overland flow.	Negligible.	Not applicable.	Not applicable.	Not applicable.
850 - Inlet Protection - Block and Gravel	A sediment control barrier formed around a storm drain inlet by the use of standard concrete blocks and gravel.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
855 - Inlet Protection - Excavated Drain	An excavated area in the approach to a storm drain drop inlet or curb inlet.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
860 - Inlet Protection - Fabric Drop	A temporary fabric barrier placed around a drop inlet.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.

CONSIDERATIONS:		(3) DEPOSITION							
ASPECTS/ PROBLEMS	PRACTICE		DAMAGE		SAFETY				
			ON-SITE	OFF-SITE	ON-SITE	OFF-SITE			
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION		Vegetation destroyed or structural practices damaged or rendered inoperable due to excessive sediment deposition.	Same as on-site damage.	Deposition on roads and railroads that cause accidents, loss of life, and loss of access for emergency vehicles.	Same as on-site safety.			
PRACTICE CODE AND NAME	OTHER EXPLANATIONS								
842 - Impoundment Structure-Routed	A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.		Slight to significant decrease due to sediment deposition in impoundment.	Same as on-site damage.	Slight to significant decrease due to sediment deposition in impoundment.	Same as on-site safety.			
847 - Infiltration Trench	An excavated trench filled with coarse granular material in which stormwater runoff is collected for temporary storage and infiltration.		Negligible to slight decrease due to sediment deposition in excavated pit or trench.	Same as on-site damage.	Slight to significant decrease due to trapping of sediment above storm drain inlet.	Same as on-site safety.			
850 - Inlet Protection - Block and Gravel	A sediment control barrier formed around a storm drain inlet by the use of standard concrete blocks and gravel.		Slight to significant decrease due to trapping of sediment above storm drain inlet.	Same as on-site damage.	Slight to significant decrease due to trapping of sediment above storm drain inlet.	Same as on-site safety.			
855 - Inlet Protection - Excavated Drain	An excavated area in the approach to a storm drain drop inlet or curb inlet.		Slight to significant decrease due to trapping of sediment above storm drain inlet.	Same as on-site damage.	Slight to significant decrease due to trapping of sediment above storm drain inlet.	Same as on-site safety.			
860 - Inlet Protection - Fabric Drop	A temporary fabric barrier placed around a drop inlet.		Slight to significant decrease due to trapping of sediment above storm drain inlet.	Same as on-site damage.	Negligible.	Same as on-site safety.			

CONSIDERATIONS:		(1) EROSION					(2) CONDITION			
ASPECTS/ PROBLEMS	PRACTICE	CLASSIC GULLY	STREAMBANK	SOIL MASS MOVEMENT	ROADBANK AND CONSTRUCTION SITES	SHEET AND RILL	SOIL COMPACTION	SOIL CONTAMINANTS		
								EXCESS CHEMICAL CONTENT, SALINITY, SELENIUM, BORON, HEAVY METAL	EXCESS FERTILIZER	EXCESS PESTICIDES
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Gullies are channels that may grow or enlarge from year to year by headcutting and lateral widening. They are too deep to be erased by normal operations.	Sloughing of banks caused by overbank flow, unstable soils, obstructions, unstable channel bottom, or all of these.	Soil slippage, landslides, or slope failure, normally on hillsides, in deep cuts or through unstable soil on sloping land that creates a large volume of soil movement.	The erosion as identified is causing problems and damage, both on-site and off-site.	The movement of soil from water forces, requiring treatment when soil loss tolerance level is exceeded.	Compaction is excess compressing of soil particles and aggregates by machine and natural consolidation, thereby effecting plant-soil-moisture-air relationship.	Excess chemical content, salinity, selenium, boron, heavy metals. Includes the amounts of desirable and undesirable chemical elements and compounds consisting of either organic or inorganic forms and restricts the desired use of soil.	Excess fertilizer occurs if the application of fertilizer or quantity of nutrients restricts the desired use of the soil.	Excess pesticides occur if the application method type or the quantity of the residuals restrict desired use of the soil.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
861 - Inlet Protection - Gravel & Wire Mesh	A temporary sediment control barrier formed around a storm drain inlet by the use of gravel and wire mesh.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
862 - Inlet Protection -Sod Filter	A sediment filter formed around a storm drain drop inlet by the use of sod.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
863 - Inlet Protection - Straw Bale Barrier	A temporary sediment control barrier formed around a storm drain drop inlet consisting of a row of entrenched and anchored straw bales.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
865 - Land Grading	Reshaping the ground surface to planned grades as determined by engineering survey evaluation and layout.	Negligible.	Negligible.	Negligible.	Negligible.	Negligible to slight increase where length of slopes are extended.	Negligible to significant increase due to vehicular traffic.	Slight to significant increase or decrease due to altered soil profile.	Negligible to slight decrease due to increased plant utilization.	Not applicable.
870 - Level Spreader	A device used to disperse concentrated runoff over the ground surface as sheet flow.	Negligible to significant depending on location of level spreader to intercept and spread concentrated runoff.	Negligible.	Negligible to moderate decrease if water is diverted from top or slope and uniformly distributed.	Moderate to significant decrease due to interception of surface flow.	Negligible to significant depending on location on the slope.	Negligible.	Negligible.	Negligible.	Negligible.

CONSIDERATIONS:		(3) DEPOSITION							
ASPECTS/ PROBLEMS	PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	DAMAGE		SAFETY				
			ON-SITE	OFF-SITE	ON-SITE	OFF-SITE			
TYPE OF PRACTICE	PRACTICE CODE AND NAME	OTHER EXPLANATIONS	Vegetation destroyed or structural practices damaged or rendered inoperable due to excessive sediment deposition.	Same as on-site damage.	Deposition on roads and railroads that cause accidents, loss of life, and loss of access for emergency vehicles.	Same as on-site safety.			
861 - Inlet Protection - Gravel & Wire Mesh	A temporary sediment control barrier formed around a storm drain inlet by the use of gravel and wire mesh.		Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
862 - Inlet Protection -Sod Filter	A sediment filter formed around a storm drain drop inlet by the use of sod.		Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
863 - Inlet Protection - Straw Bale Barrier	A temporary sediment control barrier formed around a storm drain drop inlet consisting of a row of entrenched and anchored straw bales.		Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
865 - Land Grading	Reshaping the ground surface to planned grades as determined by engineering survey evaluation and layout.		Negligible.	Negligible.	Negligible.	Negligible.			
870 - Level Spreader	A device used to disperse concentrated runoff over the ground surface as sheet flow.		Slight to significant decrease due to controlled runoff and reduced sedimentation.	Negligible to moderate decrease due to controlled runoff and reduced sedimentation.	Slight to significant decrease due to controlled runoff and reduced sedimentation.	Negligible to moderate decrease due to controlled runoff and reduced sedimentation.			

CONSIDERATIONS:		(1) EROSION					(2) CONDITION			
ASPECTS/ PROBLEMS	PRACTICE	CLASSIC GULLY	STREAMBANK	SOIL MASS MOVEMENT	ROADBANK AND CONSTRUCTION SITES	SHEET AND RILL	SOIL COMPACTION	SOIL CONTAMINANTS		
								EXCESS CHEMICAL CONTENT, SALINITY, SELENIUM, BORON, HEAVY METAL	EXCESS FERTILIZER	EXCESS PESTICIDES
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION									
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
875 - Mulching	The application of plant residues and other suitable materials to the soil surface.	Negligible to slight decrease due to reduced runoff.	Negligible.	Slight to moderate increase due to increased water infiltration.	Moderate to significant decrease due to increased surface cover	Moderate to significant decrease because of increased surface cover.	Slight to moderate decrease due to surface protection, increased infiltration, increased organic material and increased biological activity.	Slight to moderate decrease due to reduced evaporation.	Negligible.	Negligible.
880 - Permanent Vegetation	Establishing permanent vegetative cover to stabilize disturbed or exposed areas.	Slight to significant decrease due to vegetative cover and reduced runoff.	Moderate to slight increase due to vegetative cover and reduced runoff.	Slight to moderate increase due to increased water infiltration.	Significant decrease due to vegetative cover, improved root mass, and reduced runoff.	Moderate to significant decrease because of increased surface cover.	Moderate to significant decrease due to vegetative cover and root mass.	Negligible to slight decrease due to plant uptake and increased water infiltration.	Negligible.	Negligible.
890 - Permeable Pavement	A pavement consisting of materials having regularly interspersed void areas filled with pervious materials, such as vegetated soil, gravel or sand.	Not applicable.	Negligible to slight decrease due to reduced peak flows.	Slight to moderate increase due to increased water infiltration.	Negligible to slight decrease due to reduced peak flows.	Slight to moderate decrease due to reduced overland flow.	Negligible to slight increase depending on extent of vehicular traffic during practice installation.	Negligible.	Not applicable.	Not applicable.
895 - Portable Sediment Tank	A compartmented container through which sediment-laden water is pumped to trap and retain the sediment.	Not applicable.	Not applicable.	Not applicable.	Slight to significant decrease in off-site damage due to retention of sediment in tank.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
900 - Right-of-Way Diversion	A ridge or ridge and channel constructed diagonally across a sloping road or utility right-of-way that is subject to erosion.	Slight to significant decrease due to interception of concentrated flow.	Not applicable to negligible.	Negligible to moderate decrease if water is directed from top of slope.	Moderate to significant due to interception of surface flow.	Negligible to slight decrease if slope length is reduced.	Negligible.	Negligible to slight decrease due to increased infiltration.	Negligible.	Negligible.

CONSIDERATIONS:		(3) DEPOSITION									
ASPECTS/ PROBLEMS	PRACTICE	TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	DAMAGE		SAFETY					
				ON-SITE	OFF-SITE	ON-SITE	OFF-SITE				
PRACTICE CODE AND NAME	OTHER EXPLANATIONS										
875 - Mulching	The application of plant residues and other suitable materials to the soil surface.		Vegetation destroyed or structural practices damaged or rendered inoperable due to excessive sediment deposition.	Moderate to significant decrease due to reduced sediment yield.	Slight to moderate decrease due to reduced sediment yield.	Deposition on roads and railroads that cause accidents, loss of life, and loss of access for emergency vehicles.	Same as on-site safety.				
880 - Permanent Vegetation	Establishing permanent vegetative cover to stabilize disturbed or exposed areas.		Slight to significant decrease due to reduced runoff, vegetative cover and stabilization of critical areas.	Same as on-site damage.	Significant decrease due to reduced runoff and sedimentation.	Moderate to significant decrease due to reduced runoff and sedimentation.					
890 - Permeable Pavement	A pavement consisting of materials having regularly interspersed void areas filled with pervious materials, such as vegetated soil, gravel or sand.		Slight to significant decrease due to protective cover and reduced sediment yield.	Same as on-site damage.	Slight to significant decrease due to protective cover and reduced sediment yield.	Same as on-site safety.					
895 - Portable Sediment Tank	A compartmented container through which sediment-laden water is pumped to trap and retain the sediment.		Slight to significant decrease due to retention of sediment in tank.	Slight to significant decrease due to retention of sediment in tank.	Slight to significant decrease due to retention of sediment in tank.	Slight to significant decrease due to retention of sediment in tank.					
900 - Right-of-Way Diversion	A ridge or ridge and channel constructed diagonally across a sloping road or utility right-of-way that is subject to erosion.		Slight to significant decrease due to reduced runoff and sedimentation.	Negligible to moderate decrease due to reduced runoff and sedimentation.	Slight to significant decrease due to reduced runoff and sedimentation.	Negligible to moderate decrease due to reduced runoff and sedimentation.					

CONSIDERATIONS:		(1) EROSION					(2) CONDITION				
ASPECTS/ PROBLEMS	PRACTICE	CLASSIC GULLY	STREAMBANK	SOIL MASS MOVEMENT	ROADBANK AND CONSTRUCTION SITES	SHEET AND RILL	SOIL COMPACTION	SOIL CONTAMINANTS			
								EXCESS CHEMICAL CONTENT, SALINITY, SELENIUM, BORON, HEAVY METAL	EXCESS FERTILIZER	EXCESS PESTICIDES	
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	OTHER EXPLANATIONS									
			Gullies are channels that may grow or enlarge from year to year by headcutting and lateral widening. They are too deep to be erased by normal operations.	Sloughing of banks caused by overbank flow, unstable soils, obstructions, unstable channel bottom, or all of these.	Soil slippage, landslides, or slope failure, normally on hillsides, in deep cuts or through unstable soil on sloping land that creates a large volume of soil movement.	The erosion as identified is causing problems and damage, both on-site and off-site.	The movement of soil from water forces, requiring treatment when soil loss tolerance level is exceeded.	Compaction is excess compressing of soil particles and aggregates by machine and natural consolidation, thereby effecting plant-soil-moisture-air relationship.	Excess chemical content, salinity, selenium, boron, heavy metals. Includes the amounts of desirable and undesirable chemical elements and compounds consisting of either organic or inorganic forms and restricts the desired use of soil.	Excess fertilizer occurs if the application of fertilizer or quantity of nutrients restricts the desired use of the soil.	Excess pesticides occur if the application method type or the quantity of the residuals restrict desired use of the soil.
			Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
			Significant decrease due to elimination of head cuts.	Negligible to significant decrease due to elimination of head cuts.	Not applicable.	Negligible to moderate decrease due to elimination of head cuts.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
			Not applicable.	Not applicable.	Not applicable.	Slight to significant decrease in off-site damage due to retention of trapped sediment.	Negligible.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
			Slight to significant decrease due to vegetative cover and reduced runoff.	Moderate to slight decrease due to vegetative cover and reduced runoff.	Slight to moderate increase due to increased water infiltration.	Significant decrease due to vegetative cover, improved root mass, and reduced runoff.	Moderate to significant decrease because of increased surface cover.	Moderate to significant decrease due to vegetative cover and root mass.	Negligible to slight decrease due to plant uptake and increased water infiltration.	Negligible.	Negligible.
			Not applicable.	Not applicable.	Not applicable.	Slight to moderate decrease due to protective cover on soil surface.	Negligible.	Negligible.	Not applicable.	Not applicable.	Not applicable.

CONSIDERATIONS:		(3) DEPOSITION							
ASPECTS/ PROBLEMS	PRACTICE		DAMAGE		SAFETY				
			ON-SITE	OFF-SITE	ON-SITE	OFF-SITE			
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION		Vegetation destroyed or structural practices damaged or rendered inoperable due to excessive sediment deposition.	Same as on-site damage.	Deposition on roads and railroads that cause accidents, loss of life, and loss of access for emergency vehicles.	Same as on-site safety.			
PRACTICE CODE AND NAME	OTHER EXPLANATIONS								
905 - Rock Check Dam	A small rock dam constructed across a grassed swale or road ditch.		Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
910 - Rock Outlet Protection	A section of rock protection placed at the outlet end of culverts, conduits, or channels.		Negligible to significant decrease due to controlling of head cutting and associated sediment yield.	Same as on-site damage.	Negligible to significant decrease due to controlling of head cutting and associated sediment yield.	Same as on-site safety.			
920 - Silt Fence	A temporary barrier of entrenched geotextile fabric stretched across and attached to supporting posts used to intercept sediment-laden runoff from small drainage areas of disturbed soil.		Slight to significant decrease due to retention of trapped sediment.	Moderate to significant decrease due to retention of trapped sediment.	Slight to significant decrease due to retention of trapped sediment.	Moderate to significant decrease due to retention of trapped sediment.			
925 - Sodding	Stabilization of fine graded disturbed areas by laying a continuous cover of grass sod.		Slight to significant decrease due to reduced runoff, vegetative cover and stabilization of critical areas.	Same as on-site damage.	Significant decrease due to reduced runoff and sedimentation.	Moderate to significant decrease due to reduced runoff and sedimentation.			
930 - Stabilized Construction Entrance	A stabilized pad of aggregate underlain with filter fabric at any point where traffic enters or leaves a construction site to or from a public right-of-way, street, alley or parking area.		Negligible to slight decrease due to reduced erosion and associated sediment yield.	Moderate to significant decrease due to reduced erosion and associated sediment yield.	Negligible to slight decrease due to reduced erosion and associated sediment yield.	Moderate to significant decrease due to reduced erosion and associated sediment yield.			

CONSIDERATIONS:		(1) EROSION					(2) CONDITION			
ASPECTS/ PROBLEMS	PRACTICE	CLASSIC GULLY	STREAMBANK	SOIL MASS MOVEMENT	ROADBANK AND CONSTRUCTION SITES	SHEET AND RILL	SOIL COMPACTION	SOIL CONTAMINANTS		
								EXCESS CHEMICAL CONTENT, SALINITY, SELENIUM, BORON, HEAVY METAL	EXCESS FERTILIZER	EXCESS PESTICIDES
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Gullies are channels that may grow or enlarge from year to year by headcutting and lateral widening. They are too deep to be erased by normal operations.	Sloughing of banks caused by overbank flow, unstable soils, obstructions, unstable channel bottom, or all of these.	Soil slippage, landslides, or slope failure, normally on hillsides, in deep cuts or through unstable soil on sloping land that creates a large volume of soil movement.	The erosion as identified is causing problems and damage, both on-site and off-site.	The movement of soil from water forces, requiring treatment when soil loss tolerance level is exceeded.	Compaction is excess compressing of soil particles and aggregates by machine and natural consolidation, thereby effecting plant-soil-moisture-air relationship.	Excess chemical content, salinity, selenium, boron, heavy metals. Includes the amounts of desirable and undesirable chemical elements and compounds consisting of either organic or inorganic forms and restricts the desired use of soil.	Excess fertilizer occurs if the application of fertilizer or quantity of nutrients restricts the desired use of the soil.	Excess pesticides occur if the application method type or the quantity of the residuals restrict desired use of the soil.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
935 - Straw Bale Barrier	A temporary barrier of entrenched and anchored straw bales used to intercept sediment-laden runoff from small drainage areas of disturbed soil.	Not applicable.	Not applicable.	Not applicable.	Slight to significant decrease in off-site damage due to retention of trapped sediment.	Negligible.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
940 - Structural Streambank Stabilization	Stabilization of eroding streambanks by use of designed structural measures.	Negligible.	Significant decrease due to stabilizing banks.	Significant decrease along unstable areas due to stabilization of the toe slope that was undermining the mass movement area.	Not applicable.	Negligible.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
945 - Subsurface Drain	A conduit, such as corrugated plastic tubing, tile, or pipe, installed beneath the ground surface to collect and/or convey drainage water.	Slight decrease due to intercepting subsurface water moving laterally into gully.	Slight decrease due to intercepting water exiting to streambank.	Moderate to significant decrease due to removal of subsurface water which contributes to the instability of soil mass.	Moderate to significant decrease due to intercepting water that exits on roadbanks.	Negligible to slight decrease because of increased infiltration.	Slight to moderate decrease because excess water is removed from the soil profile.	Significant decrease in excess chemicals because water is used to leach out salts and sodium.	Significant decrease due to leaching of water soluble contaminants.	Significant decrease due to leaching of water soluble contaminants.
950 - Sump Pit	A temporary pit constructed to trap and filter water for pumping into a suitable discharge area.	Not applicable.	Not applicable.	Negligible to slight decrease due to removal of ponded water at the toe slope of excavations that undermines the mass movement area.	Negligible to slight decrease in off-site damage due to the filtering of sediment-laden water.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
953 - Surface Roughening	A rough soil surface with horizontal grooves running across the slope on the contour, stair stepping, or tracking with construction equipment.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.

CONSIDERATIONS:		(3) DEPOSITION									
ASPECTS/ PROBLEMS	PRACTICE	TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	DAMAGE		SAFETY					
				ON-SITE	OFF-SITE	ON-SITE	OFF-SITE				
PRACTICE CODE AND NAME	OTHER EXPLANATIONS										
935 - Straw Bale Barrier	A temporary barrier of entrenched and anchored straw bales used to intercept sediment-laden runoff from small drainage areas of disturbed soil.		Vegetation destroyed or structural practices damaged or rendered inoperable due to excessive sediment deposition.	Slight to significant decrease due to retention of trapped sediment.	Moderate to significant decrease due to retention of trapped sediment.	Deposition on roads and railroads that cause accidents, loss of life, and loss of access for emergency vehicles.	Same as on-site safety.				
940 - Structural Streambank Stabilization	Stabilization of eroding streambanks by use of designed structural measures.		Negligible to slight decrease due to limited area impacted.	Moderate to significant decrease because erosion provided high sediment delivery directly to stream system and in high water stages deposits on flood plain.	Negligible to slight decrease due to limited area impacted.	Slight to significant decrease due to reduced deposition in water courses that creates safety problem.					
945 - Subsurface Drain	A conduit, such as corrugated plastic tubing, tile, or pipe, installed beneath the ground surface to collect and/or convey drainage water.		Negligible to slight decrease due to managed runoff and reduced sediment.	Same as on-site damage.	Negligible to slight decrease due to managed runoff and reduced sediment.	Same as on-site safety.					
950 - Sump Pit	A temporary pit constructed to trap and filter water for pumping into a suitable discharge area.		Negligible to slight decrease due to the filtering of sediment-laden water.	Slight to moderate decrease due to the filtering of sediment-laden water.	Negligible to slight decrease due to the filtering of sediment-laden water.	Slight to moderate decrease due to the filtering of sediment-laden water.					
953 - Surface Roughening	A rough soil surface with horizontal grooves running across the slope on the contour, stair stepping, or tracking with construction equipment.		Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.					

CONSIDERATIONS:		(1) EROSION					(2) CONDITION			
ASPECTS/ PROBLEMS	PRACTICE	CLASSIC GULLY	STREAMBANK	SOIL MASS MOVEMENT	ROADBANK AND CONSTRUCTION SITES	SHEET AND RILL	SOIL COMPACTION	SOIL CONTAMINANTS		
								EXCESS CHEMICAL CONTENT, SALINITY, SELENIUM, BORON, HEAVY METAL	EXCESS FERTILIZER	EXCESS PESTICIDES
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION									
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
955 - Temporary Diversion	A temporary ridge or excavated channel or combination ridge and channel constructed across sloping land on a predetermined grade.	Slight to significant decrease due to the interception of concentrated flow.	Negligible due to reduction in overbank flow.	Negligible to moderate decrease if water is diverted from top of slope.	Moderate to significant decrease due to interception of surface flow.	Negligible to slight decrease if slope length is reduced.	Negligible.	Negligible to slight decrease due to increased infiltration.	Negligible.	Negligible.
960 - Temporary Sediment Trap	A small temporary ponding basin formed by construction of an embankment or excavated basin.	Slight to significant decrease below basin depending on storage available and area controlled.	Slight to significant decrease below basin depending on storage available and area controlled.	Potential for slight increase because of increased infiltration depending on location of basin.	Slight to significant decrease below the basin because of reduced bedloads and/or reduced flows depending on storage available and area controlled.	Negligible.	Short-term increase in area of construction.	Negligible.	Negligible.	Negligible.
965 - Temporary Seeding	Planting rapid-growing annual grasses or small grains to provide initial, temporary coverage for erosion control on disturbed areas.	Slight decrease because of vegetative cover and reduced runoff.	Moderate to slight decrease because of vegetative cover and reduced runoff.	Negligible.	Significant decrease because of vegetative cover, improved root mass, and reduced runoff.	Slight to significant decrease because of vegetative cover.	Slight to moderate decrease because of vegetative cover.	Negligible to slight decrease because of plant uptake and increased infiltration.	Not applicable.	Not applicable.
970 - Temporary Slope Drain	A flexible tubing or rigid conduit extending temporarily from the top to the bottom of a cut or fill slope.	Negligible.	Negligible.	Negligible to slight decrease due to managed and guided runoff.	Negligible to slight decrease due to managed and guided runoff.	Not applicable.	Negligible.	Not applicable.	Not applicable.	Not applicable.
975 - Temporary Stream Crossing	A bridge, ford, or temporary structure installed across a stream or watercourse for short-term use by construction vehicles or heavy equipment.	Not applicable.	Slight to moderate decrease due to temporary stabilization of streambanks.	Negligible to slight decrease depending on location of crossing in relation to mass movement area.	Slight to moderate decrease due to temporary stabilization of streambanks.	Negligible.	Negligible to slight increase depending on size and type of equipment used to install crossing.	Not applicable.	Not applicable.	Not applicable.

CONSIDERATIONS:		(3) DEPOSITION									
ASPECTS/ PROBLEMS	PRACTICE	TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	DAMAGE		SAFETY					
				ON-SITE	OFF-SITE	ON-SITE	OFF-SITE				
PRACTICE CODE AND NAME	OTHER EXPLANATIONS										
955 - Temporary Diversion	A temporary ridge or excavated channel or combination ridge and channel constructed across sloping land on a predetermined grade.		Vegetation destroyed or structural practices damaged or rendered inoperable due to excessive sediment deposition.	Slight to significant decrease due to reduced runoff and sedimentation.	Negligible to moderate decrease due to reduced runoff and sedimentation.	Deposition on roads and railroads that cause accidents, loss of life, and loss of access for emergency vehicles.	Same as on-site safety.				
960 - Temporary Sediment Trap	A small temporary ponding basin formed by construction of an embankment or excavated basin.		Moderate to significant decrease if located above siting area depending on storage available and area controlled.	Moderate to significant decrease if located above siting area depending on storage available and area controlled.	Moderate to significant decrease if located above siting area depending on storage available and area controlled.	Moderate to significant decrease if located above siting area depending on storage available and area controlled.					
965 - Temporary Seeding	Planting rapid-growing annual grasses or small grains to provide initial, temporary coverage for erosion control on disturbed areas.		Slight to significant decrease because of reduced runoff, vegetative cover and location of critical areas.	Slight to significant decrease because of reduced runoff and vegetative cover at sediment source of location.	Significant decrease because of reduced runoff and sedimentation.	Moderate to significant decrease because of reduced runoff and sedimentation.					
970 - Temporary Slope Drain	A flexible tubing or rigid conduit extending temporarily from the top to the bottom of a cut or fill slope.		Slight to significant decrease due to managed and guided runoff and reduced sediment yield.	Same as on-site damage.	Slight to significant decrease due to managed and guided runoff and reduced sediment yield.	Same as on-site safety.					
975 - Temporary Stream Crossing	A bridge, ford, or temporary structure installed across a stream or watercourse for short-term use by construction vehicles or heavy equipment.		Slight to significant decrease due to streambank protection and control of sediment entering watercourse.	Same as on-site damage.	Negligible.	Negligible.					

CONSIDERATIONS:		(1) EROSION					(2) CONDITION			
ASPECTS/ PROBLEMS	PRACTICE	CLASSIC GULLY	STREAMBANK	SOIL MASS MOVEMENT	ROADBANK AND CONSTRUCTION SITES	SHEET AND RILL	SOIL COMPACTION	SOIL CONTAMINANTS		
								EXCESS CHEMICAL CONTENT, SALINITY, SELENIUM, BORON, HEAVY METAL	EXCESS FERTILIZER	EXCESS PESTICIDES
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Gullies are channels that may grow or enlarge from year to year by headcutting and lateral widening. They are too deep to be erased by normal operations.	Sloughing of banks caused by overbank flow, unstable soils, obstructions, unstable channel bottom, or all of these.	Soil slippage, landslides, or slope failure, normally on hillsides, in deep cuts or through unstable soil on sloping land that creates a large volume of soil movement.	The erosion as identified is causing problems and damage, both on-site and off-site.	The movement of soil from water forces, requiring treatment when soil loss tolerance level is exceeded.	Compaction is excess compressing of soil particles and aggregates by machine and natural consolidation, thereby effecting plant-soil-moisture-air relationship.	Excess chemical content, salinity, selenium, boron, heavy metals. Includes the amounts of desirable and undesirable chemical elements and compounds consisting of either organic or inorganic forms and restricts the desired use of soil.	Excess fertilizer occurs if the application of fertilizer or quantity of nutrients restricts the desired use of the soil.	Excess pesticides occur if the application method type or the quantity of the residuals restrict desired use of the soil.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
980 - Temporary Swale	A temporary excavated drainageaway.	Slight to significant decrease because of managed and guided runoff.	Slight to moderate decrease because of managed and guided runoff.	Not applicable.	Negligible to slight decrease because of managed and guided runoff.	Negligible.	Negligible.	Negligible.	Negligible.	Negligible.
981 - Topsoiling	Methods of preserving and using topsoil to enhance final site stabilization with vegetation.	Negligible.	Negligible.	Negligible.	Negligible.	Negligible to slight decrease where infiltration is improved.	Slight to moderate decrease because of increased vegetation and other site modifications.	Slight to significant decrease because of reclamation.	Not applicable.	Not applicable.
984 - Tree and Forest Ecosystem Preservation	The preservation of contiguous stands of trees from damage during construction operations.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
985 - Tree and Shrub Planting	Planting of selected trees and shrubs.	Slight to moderate decrease because of improved vegetative cover in watershed on long-term.	Slight to moderate decrease because of improved vegetative cover in watershed on long-term.	Negligible to significant decrease after trees become established because of soil binding by root mass and removal of soil moisture by increased transpiration.	Slight to significant decrease because of improved vigor on watershed and significant improvement after trees become established because of soil binding by root mass and removal of soil transpiration.	Slight to significant decrease long term because of vegetative cover.	Slight to significant decrease because of root development, litter accumulation and biological activity over the long term.	Negligible.	Slight to moderate decrease because of increased uptake of nutrients.	Moderate to significant decrease because of land use change and change in pesticide use.
990 - Tree Protection	The protection of individual trees from damage during construction operations.	Not applicable.	Negligible to slight decrease when trees on banks within the riparian strip are preserved.	Slight to significant decrease due to soil binding by root mass of established trees and removal of soil moisture by plant transpiration.	Slight to significant decrease due to soil binding by root mass of established trees.	Not applicable.	Slight decrease because of root development, litter accumulation and biological activity over the long term.	Negligible.	Slight decrease because of increased uptake of nutrients.	Moderate to significant decrease because of land use change and change in pesticide use.

CONSIDERATIONS:		(3) DEPOSITION									
ASPECTS/ PROBLEMS	PRACTICE	TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	DAMAGE		SAFETY					
				ON-SITE	OFF-SITE	ON-SITE	OFF-SITE				
PRACTICE CODE AND NAME	OTHER EXPLANATIONS										
980 - Temporary Swale	A temporary excavated drainage way.			Negligible to slight decrease because of managed runoff and reduced sedimentation.	Negligible to slight decrease because of managed runoff and reduced sedimentation.	Negligible to slight decrease because of managed runoff and reduced sedimentation.	Negligible to slight decrease because of managed runoff and reduced sedimentation.				
981 - Topsoiling	Methods of preserving and using topsoil to enhance final site stabilization with vegetation.			Moderate to significant decrease because of increased vegetative cover, water management, stability, and decreased sediment yield.	Moderate to significant decrease because of increased vegetative cover, water management, stability, and decreased sediment yield.	Moderate to significant decrease because of increased vegetative cover, water management, stability, and decreased sediment yield.	Moderate to significant decrease because of increased vegetative cover, water management, stability, and decreased sediment yield.				
984 - Tree and Forest Ecosystem Preservation	The preservation of contiguous stands of trees from damage during construction operations.			Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.				
985 - Tree and Shrub Planting	Planting of selected trees and shrubs.			Slight decrease because of reduced sediment yield.	Slight decrease because of reduced sediment yield.	Slight decrease because of reduced sediment yield.	Slight to moderate decrease because of reduced sediment yield.				
990 - Tree Protection	The protection of individual trees from damage during construction operations.			Slight decrease because of reduced sediment yield.							

CONSIDERATIONS:		(1) EROSION					(2) CONDITION			
ASPECTS/ PROBLEMS	PRACTICE	CLASSIC GULLY	STREAMBANK	SOIL MASS MOVEMENT	ROADBANK AND CONSTRUCTION SITES	SHEET AND RILL	SOIL COMPACTION	SOIL CONTAMINANTS		
								EXCESS CHEMICAL CONTENT, SALINITY, SELENIUM, BORON, HEAVY METAL	EXCESS FERTILIZER	EXCESS PESTICIDES
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Gullies are channels that may grow or enlarge from year to year by headcutting and lateral widening. They are too deep to be erased by normal operations.	Sloughing of banks caused by overbank flow, unstable soils, obstructions, unstable channel bottom, or all of these.	Soil slippage, landslides, or slope failure, normally on hillsides, in deep cuts or through unstable soil on sloping land that creates a large volume of soil movement.	The erosion as identified is causing problems and damage, both on-site and off-site.	The movement of soil from water forces, requiring treatment when soil loss tolerance level is exceeded.	Compaction is excess compressing of soil particles and aggregates by machine and natural consolidation, thereby effecting plant-soil-moisture-air relationship.	Excess chemical content, salinity, selenium, boron, heavy metals. Includes the amounts of desirable and undesirable chemical elements and compounds consisting of either organic or inorganic forms and restricts the desired use of soil.	Excess fertilizer occurs if the application of fertilizer or quantity of nutrients restricts the desired use of the soil.	Excess pesticides occur if the application method type or the quantity of the residuals restrict desired use of the soil.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
991 - Tree Protection - Augering	Underground construction such as utility work by augering (tunneling) through an individual tree's Critical Root Zone (CRZ).	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
995 - Vegetative Streambank Stabilization	The stabilization and protection of eroding streambanks with selected vegetation.	Negligible.	Significant decrease because of stabilizing banks.	Significant decrease along unstable areas because of stabilization of toe slope that was undermining the mass movement area.	Not applicable.	Negligible.	Not applicable.	Not applicable.	Not applicable.	Not applicable.
996 - Well Decommissioning	The sealing and permanent closure of a water well, boring, or monitoring well.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.

CONSIDERATIONS:		(3) DEPOSITION							
ASPECTS/ PROBLEMS	PRACTICE		DAMAGE		SAFETY				
			ON-SITE	OFF-SITE	ON-SITE	OFF-SITE			
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION		Vegetation destroyed or structural practices damaged or rendered inoperable due to excessive sediment deposition.	Same as on-site damage.	Deposition on roads and railroads that cause accidents, loss of life, and loss of access for emergency vehicles.	Same as on-site safety.			
PRACTICE CODE AND NAME	OTHER EXPLANATIONS								
991 - Tree Protection - Augering	Underground construction such as utility work by augering (tunneling) through an individual tree's Critical Root Zone (CRZ).		Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
995 - Vegetative Streambank Stabilization	The stabilization and protection of eroding streambanks with selected vegetation.		Negligible to slight decrease because of limited area impacted.	Moderate to significant decrease because erosion provided high sediment delivery directly to conveyance system and in high water stage deposits on flood plain.	Negligible to slight decrease because of limited area impacted.	Slight to significant decrease because of reduced deposition in water courses that creates safety problem.			
996 - Well Decommissioning	The sealing and permanent closure of a water well, boring, or monitoring well.		Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			

CONSIDERATIONS:		(1) QUANTITY								
ASPECTS/ PROBLEMS	PRACTICE	EXCESS AMOUNTS				RESTRICTED CAPACITY FROM SEDIMENT DEPOSITION IN SMALL CONVEYANCE		RESTRICTED CAPACITY FOR SEDIMENT DEPOSITION		
		SEEPS	RUNOFF/FLOODING	EXCESS SUBSURFACE WATER		ON-SITE	OFF-SITE	WATER BODIES, STREAMS, LAKES		
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Subsurface water flows onto the surface of the land.	Water accumulates on the surface of the land.	Subsurface water accumulates in the soil profile, which adversely affects plant growth and production operations.		Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that is affected because of the loss of storage capacity as well as the loss of conveyance capacity.		
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
800 - Urban Stormwater Wetlands	A constructed system of shallow pools that create growing conditions for wetland plants to lessen the impacts of stormwater quality and quantity in urban areas.	Significant decrease because of water management if seep is incorporated in constructed wetland. Slight to significant increase if seep develops downstream of constructed wetland or if existing seep is managed as wetland.	Slight to moderate decrease because of increased water storage area relative to runoff quantity.	Negligible to moderate increase because of water management dependent on extent of impoundment creation and management.		Slight to significant decrease because of increased hydrophytic vegetation and impounded water will reduce erosion and sedimentation.	Slight to moderate decrease because of increased hydrophytic vegetation and impounded water will reduce erosion and sedimentation.	Slight to moderate decrease because of increased hydrophytic vegetation and impounded water will reduce erosion and sedimentation.		
806 - Construction Road Stabilization	The stabilization of temporary construction access routes, subdivision roads, on-site vehicle transportation roads, and construction parking areas with stone immediately after grading.	Not determined yet.	Not determined yet.	Not determined yet.		Not determined yet.	Not determined yet.	Not determined yet.		
808 - Culvert Inlet Protection	A temporary sediment filter located at the inlet to storm sewer culverts.	Not determined yet.	Not determined yet.	Not determined yet.		Not determined yet.	Not determined yet.	Not determined yet.		
815 - Diversion	A channel and supporting ridge constructed across the slope to collect and divert runoff.	Slight decrease because of protection of down slope areas.	Significant decrease because of protection of area below diversion.	Negligible.		Slight to significant decrease because of decreased sediment load, and because of proximity and control of ephemeral gullies and other erosion sources.	Negligible to moderate decrease because of decreased sediment load.	Negligible to slight decrease because of decreased sediment load.		
820 - Diversion Dike	A dike or dike and channel constructed along the perimeter of a disturbed construction area.	Negligible to moderate increase because of temporary storage within dike area.	Moderate to significant decrease because of decreased flooding.	Negligible.		Negligible to significant decrease because of flood water management.	Negligible to significant decrease because of flood water management.	Negligible to significant decrease because of flood water management.		

CONSIDERATIONS:		(2) QUALITY								
ASPECTS/ PROBLEMS	PRACTICE	GROUND WATER CONTAMINANTS			SURFACE WATER CONTAMINANTS					
		PESTICIDES	NUTRIENTS AND ORGANICS	HEAVY METALS	PESTICIDES	NUTRIENTS AND ORGANICS	SUSPENDED SEDIMENT AND TURBIDITY	SALINITY	HEAVY METALS	PATHOGENS
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Water pollution problems from natural or human-induced common nutrients of N, P, K, Ca, Na, and Mg.	Water pollution problems from natural and human-induced common metals or metal compounds, such as iron, lead, zinc, copper, and cobalt.	Surface water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Surface water pollution problems that result from the use of all applied plant nutrients with emphasis on phosphorus and total organic carbon.	Water pollution suspended sediment and turbidity. Suspended sediment is sediment held in surrounding fluid. Turbidity is reduced clarity of fluids because of presence of suspended matter.	Water pollution from common salts such as sodium, calcium, boron and selenium.	Water pollution from natural and human-induced common metals and metal compounds, such as iron, lead, zinc, copper, and cobalt.	Water pollution from bacteria, viruses, protozoans, helminths, and fungi. Pathogens can be transported in both fluid and particulate forms.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
800 - Urban Stormwater Wetlands	A constructed system of shallow pools that create growing conditions for wetland plants to lessen the impacts of stormwater quality and quantity in urban areas.	Negligible to moderate decrease because habitat reduces need for use of chemicals and increased vegetation will uptake pesticides.	Negligible to moderate decrease because wetland management reduces need to add nutrients and uptake of nutrients by hydrophytes.	Negligible to slight decrease because of uptake of heavy metals by hydrophytes.	Moderate to significant decrease because permanent habitat reduces need to use chemicals. Hydrophytes will uptake pesticides. Impoundments will reduce runoff and transport of pesticides.	Moderate to significant decrease because permanent habitat reduces need to use chemicals. Hydrophytes will uptake pesticides. Impoundments will reduce runoff and transport of nutrients and organics.	Moderate to significant decrease because impoundments and hydrophytes will trap sediment.	Moderate to significant decrease because hydrophytes will uptake salts and reduce runoff and transport of salinity.	Moderate to significant decrease because hydrophytes will uptake heavy metals and reduce runoff and transport of heavy metals.	Slight to moderate decrease because of increased assimilation of pathogens in wetland and reduced runoff and transport of pathogens.
806 - Construction Road Stabilization	The stabilization of temporary construction access routes, subdivision roads, on-site vehicle transportation roads, and construction parking areas with stone immediately after grading.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
808 - Culvert Inlet Protection	A temporary sediment filter located at the inlet to storm sewer culverts.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
815 - Diversion	A channel and supporting ridge constructed across the slope to collect and divert runoff.	Slight increase because of increased infiltration of soluble pesticides.	Slight increase because of increased infiltration of solubles, such as nitrate nitrogen.	Negligible.	Slight decrease because of decrease in sediment bound pesticides. Slight increase in solubles off-site because of increased concentrated flow.	Slight to moderate decrease because of decrease in sediment bound phosphorus and total organic carbon. Slight increase in off-site solubles because of increased concentrated flow.	Slight decrease because of reduced sediment yield.	Negligible.	Negligible to moderate decrease because of managed runoff. Could be significant decrease if diversion is placed above a contaminant waste source with metals.	Negligible to moderate decrease because of managed runoff. Could be significant decrease if diversion is placed above a contaminant waste source with pathogens.
820 - Diversion Dike	A dike or dike and channel constructed along the perimeter of a disturbed construction area.	Negligible.	Negligible.	Negligible.	Slight to moderate decrease because of flood water management.	Slight to moderate decrease because of flood water management.	Slight to moderate decrease because of flood water management.	Negligible.	Negligible.	Slight to moderate decrease because of flood water management.

CONSIDERATIONS:		(1) QUANTITY								
ASPECTS/ PROBLEMS	PRACTICE	EXCESS AMOUNTS			RESTRICTED CAPACITY FROM SEDIMENT DEPOSITION IN SMALL CONVEYANCE		RESTRICTED CAPACITY FOR SEDIMENT DEPOSITION			
		SEEPS	RUNOFF/FLOODING	EXCESS SUBSURFACE WATER	ON-SITE	OFF-SITE	WATER BODIES, STREAMS, LAKES			
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Subsurface water flows onto the surface of the land.	Water accumulates on the surface of the land.	Subsurface water accumulates in the soil profile, which adversely affects plant growth and production operations.		Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that is affected because of the loss of storage capacity as well as the loss of conveyance capacity.		
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
825 - Dust Control	Controlling dust blowing and movement on construction sites and roads.	Not applicable.	Negligible.	Negligible.		Negligible to slight increase if materials applied enter small conveyance or cause runoff which includes sediment.	Negligible.	Not applicable.		
830 - Erosion Blanket	The application of a preformed protective blanket of straw or other plant residue, or plastic fibers formed into a mat, usually with a plastic mesh on one or both sides.	Negligible to slight increase because of increased infiltration.	Slight to moderate decrease because of increased infiltration.	Negligible to slight increase due to more surface water infiltration.		Negligible to slight decrease due to more surface water infiltration and reduced sediment load in runoff water.	Negligible to slight decrease due to reduced sediment load.	Negligible.		
835 - Filter Strip	A created or preserved area of vegetation designed to remove sediment and other pollutants and to enhance the infiltration of surface water runoff.	Negligible to slight increase because of temporary storage within filter area.	Not applicable.	Negligible.		Slight to significant decrease because of reduced sediment transport.	Slight to moderate decrease because of reduced sediment transport.	Slight to moderate decrease because of reduced sediment transport.		
840 - Grass-Lined Channel	A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation for stable conveyance of runoff.	Negligible.	Moderate to significant decrease because of providing stable outlet.	Negligible.		Slight to moderate decrease because of decreased sediment loads by treating the eroding drainageway.	Moderate to significant decrease because of decreased sediment loads.	Slight to moderate decrease because of decreased sediment loads.		
841 - Impoundment Structure-Full Flow	A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.	Slight to moderate increase because of increased infiltration especially during the dormant season.	Slight to moderate decrease because of reduced runoff and increased infiltration depending on watershed characteristics, such as soils, climate, plant communities, and topography.	Slight increase because of increased infiltration.		Moderate to significant decrease because of decreased sediment load.	Moderate to significant decrease because of decreased sediment load.	Moderate to significant decrease because of decreased sediment load.		

CONSIDERATIONS:		(2) QUALITY								
ASPECTS/ PROBLEMS	PRACTICE	GROUND WATER CONTAMINANTS			SURFACE WATER CONTAMINANTS					
		PESTICIDES	NUTRIENTS AND ORGANICS	HEAVY METALS	PESTICIDES	NUTRIENTS AND ORGANICS	SUSPENDED SEDIMENT AND TURBIDITY	SALINITY	HEAVY METALS	PATHOGENS
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Water pollution problems from natural or human-induced common nutrients of N, P, K, Ca, Na, and Mg.	Water pollution problems from natural and human-induced common metals or metal compounds, such as iron, lead, zinc, copper, and cobalt.	Surface water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Surface water pollution problems that result from the use of all applied plant nutrients with emphasis on phosphorus and total organic carbon.	Water pollution suspended sediment and turbidity. Suspended sediment is sediment held in surrounding fluid. Turbidity is reduced clarity of fluids because of presence of suspended matter.	Water pollution from common salts such as sodium, calcium, boron and selenium.	Water pollution from natural and human-induced common metals and metal compounds, such as iron, lead, zinc, copper, and cobalt.	Water pollution from bacteria, viruses, protozoans, helminths, and fungi. Pathogens can be transported in both fluid and particulate forms.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
825 - Dust Control	Controlling dust blowing and movement on construction sites and roads.	Negligible unless liquid is applied immediately after pesticide application.	Negligible.	Negligible.	Negligible.	Negligible.	Negligible.	Negligible.	Negligible.	Negligible.
830 - Erosion Blanket	The application of a preformed protective blanket of straw or other plant residue, or plastic fibers formed into a mat, usually with a plastic mesh on one or both sides.	Negligible.	Negligible.	Negligible.	Negligible.	Negligible.	Negligible to moderate decrease depending on amount of coverage of the soil surface.	Negligible.	Negligible.	Negligible.
835 - Filter Strip	A created or preserved area of vegetation designed to remove sediment and other pollutants and to enhance the infiltration of surface water runoff.	Negligible to slight increase because of increased downward movement of soluble pesticides, and because of concentration and increased infiltration.	Slight decrease because of increased plant uptake.	Slight decrease because of increased plant uptake.	Negligible to slight decrease in soluble pesticides due to sediment trapping and plant uptake.	Slight decrease because of decrease in sediment bound phosphorus due to plant uptake.	Slight to moderate decrease because of filtering action of sediment trapping.	Slight decrease because of trapped sediment.	Slight to moderate decrease because of trapped sediment.	Negligible.
840 - Grass-Lined Channel	A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation for stable conveyance of runoff.	Negligible to slight increase because of transport of soluble pesticides.	Negligible to slight increase because of transport of soluble nutrients.	Negligible.	Slight to moderate decrease because of decrease in sediment bound pesticides.	Slight to moderate decrease because of decrease in sediment bound phosphorus and total organic carbon. Slight decrease of soluble nutrients because of infiltration and plant uptake.	Slight to moderate decrease because of decreased sediment yield.	Negligible.	Negligible.	Negligible.
841 - Impoundment Structure-Full Flow	A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.	Negligible to slight increase if chemical treatment of a pond is used.	Negligible to slight increase because of wildlife use.	Negligible.	Negligible to moderate increase if chemical treatment of a pond is used.	Negligible to moderate increase because of wildlife use.	Negligible.	Not applicable.	Negligible.	Negligible to moderate increase because of aquatic animal feed and feces and products of vegetative decay.

CONSIDERATIONS:		(1) QUANTITY								
ASPECTS/ PROBLEMS	PRACTICE	EXCESS AMOUNTS				RESTRICTED CAPACITY FROM SEDIMENT DEPOSITION IN SMALL CONVEYANCE		RESTRICTED CAPACITY FOR SEDIMENT DEPOSITION		
		SEEPS	RUNOFF/FLOODING	EXCESS SUBSURFACE WATER		ON-SITE	OFF-SITE			
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Subsurface water flows onto the surface of the land.	Water accumulates on the surface of the land.	Subsurface water accumulates in the soil profile, which adversely affects plant growth and production operations.		Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that is affected because of the loss of storage capacity as well as the loss of conveyance capacity.		
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
842 - Impoundment Structure-Routed	A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.	Slight to moderate increase because of increased infiltration especially during the dormant season.	Slight to moderate decrease because of reduced runoff and increased infiltration depending on watershed characteristics, such as soils, climate, plant communities, and topography.	Slight increase because of increased infiltration.		Moderate to significant decrease because of decreased sediment load.	Moderate to significant decrease because of decreased sediment load.	Moderate to significant decrease because of decreased sediment load.		
847 - Infiltration Trench	An excavated trench filled with coarse granular material in which stormwater runoff is collected for temporary storage and infiltration.	Slight to moderate increase because of increased infiltration.	Slight to significant decrease in flooding due to temporary storage of stormwater runoff.	Slight to moderate increase because of increased infiltration.		Slight decrease due to trapping of sediment in pits or trenches from collection and temporary storage of runoff water.	Slight decrease due to trapping of sediment in pits or trenches from collection and temporary storage of runoff water.	Slight decrease due to trapping of sediment in pits or trenches from collection and temporary storage of runoff water.		
850 - Inlet Protection - Block and Gravel	A sediment control barrier formed around a storm drain inlet by the use of standard concrete blocks and gravel.	Not applicable.	Slight to moderate increase due to ponding around the inlet.	Not applicable.		Slight decrease due to trapping in barrier around storm drain inlet.	Slight decrease due to trapping in barrier around storm drain inlet.	Slight decrease due to trapping in barrier around storm drain inlet.		
855 - Inlet Protection - Excavated Drain	An excavated area in the approach to a storm drain drop inlet or curb inlet.	Not applicable.	Slight to moderate increase due to ponding around the inlet.	Not applicable.		Slight decrease due to trapping of sediments in the excavated area in approach to storm drain.	Slight decrease due to trapping of sediments in the excavated area in approach to storm drain.	Slight decrease due to trapping of sediments in the excavated area in approach to storm drain.		
860 - Inlet Protection - Fabric Drop	A temporary fabric barrier placed around a drop inlet.	Not applicable.	Slight to moderate increase due to ponding around the inlet.	Not applicable.		Slight decrease due to trapping of sediments in barrier around storm drain inlet.	Slight decrease due to trapping of sediments in barrier around storm drain inlet.	Slight decrease due to trapping of sediments in barrier around storm drain inlet.		

CONSIDERATIONS:		(2) QUALITY								
ASPECTS/ PROBLEMS	PRACTICE	GROUND WATER CONTAMINANTS			SURFACE WATER CONTAMINANTS					
		PESTICIDES	NUTRIENTS AND ORGANICS	HEAVY METALS	PESTICIDES	NUTRIENTS AND ORGANICS	SUSPENDED SEDIMENT AND TURBIDITY	SALINITY	HEAVY METALS	PATHOGENS
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Water pollution problems from natural or human-induced common nutrients of N, P, K, Ca, Na, and Mg.	Water pollution problems from natural and human-induced common metals or metal compounds, such as iron, lead, zinc, copper, and cobalt.	Surface water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Surface water pollution problems that result from the use of all applied plant nutrients with emphasis on phosphorus and total organic carbon.	Water pollution suspended sediment and turbidity. Suspended sediment is sediment held in surrounding fluid. Turbidity is reduced clarity of fluids because of presence of suspended matter.	Water pollution from common salts such as sodium, calcium, boron and selenium.	Water pollution from natural and human-induced common metals and metal compounds, such as iron, lead, zinc, copper, and cobalt.	Water pollution from bacteria, viruses, protozoans, helminths, and fungi. Pathogens can be transported in both fluid and particulate forms.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
842 - Impoundment Structure-Routed	A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.	Negligible to slight increase if chemical treatment of a pond is used.	Negligible to slight increase because of wildlife use.	Negligible.	Negligible to moderate increase if chemical treatment of a pond is used.	Negligible to moderate increase because of wildlife use.	Negligible.	Not applicable.	Not applicable.	Negligible to moderate increase because of aquatic animal feed and feces and products of vegetative decay.
847 - Infiltration Trench	An excavated trench filled with coarse granular material in which stormwater runoff is collected for temporary storage and infiltration.	Slight to moderate increase if trapped runoff is laden with pesticides.	Slight to moderate increase if trapped runoff is laden with nutrients.	Slight to moderate increase if trapped runoff is laden with heavy metals.	Slight to moderate decrease because of infiltration and reduced sediment.	Slight to moderate decrease because of infiltration and reduced sediment.	Slight to moderate decrease because of infiltration and reduced sediment.	Slight to moderate decrease because of infiltration and reduced sediment.	Slight to moderate decrease because of infiltration and reduced sediment.	Slight to moderate decrease because of infiltration and reduced sediment.
850 - Inlet Protection - Block and Gravel	A sediment control barrier formed around a storm drain inlet by the use of standard concrete blocks and gravel.	Negligible to slight decrease due to trapping of pesticide-laden sediment.	Negligible to slight decrease due to trapping of nutrient-laden sediment.	Negligible to slight decrease due to trapping of sediment laden with heavy metals.	Slight to moderate decrease due to sediment trapping.	Slight to moderate decrease due to sediment trapping.	Slight to moderate decrease due to sediment trapping.	Negligible.	Slight to moderate decrease due to sediment trapping.	Negligible.
855 - Inlet Protection - Excavated Drain	An excavated area in the approach to a storm drain drop inlet or curb inlet.	Negligible to slight decrease due to trapping of pesticide-laden sediment.	Negligible to slight decrease due to trapping of nutrient-laden sediment.	Negligible to slight decrease due to trapping of sediment laden with heavy metals.	Slight to moderate decrease due to sediment trapping.	Slight to moderate decrease due to sediment trapping.	Slight to moderate decrease due to sediment trapping.	Negligible.	Slight to moderate decrease due to sediment trapping.	Negligible.
860 - Inlet Protection - Fabric Drop	A temporary fabric barrier placed around a drop inlet.	Negligible to slight decrease due to trapping of pesticide-laden sediment.	Negligible to slight decrease due to trapping of nutrient-laden sediment.	Negligible to slight decrease due to trapping of sediment laden with heavy metals.	Slight to moderate decrease due to sediment trapping.	Slight to moderate decrease due to sediment trapping.	Slight to moderate decrease due to sediment trapping.	Negligible.	Slight to moderate decrease due to sediment trapping.	Negligible.

CONSIDERATIONS:		(1) QUANTITY								
ASPECTS/ PROBLEMS	PRACTICE	EXCESS AMOUNTS			RESTRICTED CAPACITY FROM SEDIMENT DEPOSITION IN SMALL CONVEYANCE		RESTRICTED CAPACITY FOR SEDIMENT DEPOSITION			
		SEEPS	RUNOFF/FLOODING	EXCESS SUBSURFACE WATER	ON-SITE	OFF-SITE	WATER BODIES, STREAMS, LAKES			
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Subsurface water flows onto the surface of the land.	Water accumulates on the surface of the land.	Subsurface water accumulates in the soil profile, which adversely affects plant growth and production operations.		Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that is affected because of the loss of storage capacity as well as the loss of conveyance capacity.		
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
861 - Inlet Protection - Gravel & Wire Mesh	A temporary sediment control barrier formed around a storm drain inlet by the use of gravel and wire mesh.	Not determined yet.	Not determined yet.	Not determined yet.		Not determined yet.	Not determined yet.	Not determined yet.		
862 - Inlet Protection -Sod Filter	A sediment filter formed around a storm drain drop inlet by the use of sod.	Not determined yet.	Not determined yet.	Not determined yet.		Not determined yet.	Not determined yet.	Not determined yet.		
863 - Inlet Protection - Straw Bale Barrier	A temporary sediment control barrier formed around a storm drain drop inlet consisting of a row of entrenched and anchored straw bales.	Not determined yet.	Not determined yet.	Not determined yet.		Not determined yet.	Not determined yet.	Not determined yet.		
865 - Land Grading	Reshaping the ground surface to planned grades as determined by engineering survey evaluation and layout.	Negligible to significant decrease because of removal of depressions.	Slight to significant decrease because of removal of depressions.	Negligible to slight decrease because of removal of depressions.		Negligible.	Negligible.	Negligible.		
870 - Level Spreader	A device used to disperse concentrated runoff over the ground surface as sheet flow.	Negligible to slight decrease due to controlled runoff and increased infiltration.	Negligible to slight decrease due to controlled runoff.	Negligible.		Slight decrease due to controlled runoff.	Negligible.	Negligible.		

CONSIDERATIONS:		(2) QUALITY								
ASPECTS/ PROBLEMS	PRACTICE	GROUND WATER CONTAMINANTS			SURFACE WATER CONTAMINANTS					
		PESTICIDES	NUTRIENTS AND ORGANICS	HEAVY METALS	PESTICIDES	NUTRIENTS AND ORGANICS	SUSPENDED SEDIMENT AND TURBIDITY	SALINITY	HEAVY METALS	PATHOGENS
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Water pollution problems from natural or human-induced common nutrients of N, P, K, Ca, Na, and Mg.	Water pollution problems from natural and human-induced common metals or metal compounds, such as iron, lead, zinc, copper, and cobalt.	Surface water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Surface water pollution problems that result from the use of all applied plant nutrients with emphasis on phosphorus and total organic carbon.	Water pollution suspended sediment and turbidity. Suspended sediment is sediment held in surrounding fluid. Turbidity is reduced clarity of fluids because of presence of suspended matter.	Water pollution from common salts such as sodium, calcium, boron and selenium.	Water pollution from natural and human-induced common metals and metal compounds, such as iron, lead, zinc, copper, and cobalt.	Water pollution from bacteria, viruses, protozoans, helminths, and fungi. Pathogens can be transported in both fluid and particulate forms.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
861 - Inlet Protection - Gravel & Wire Mesh	A temporary sediment control barrier formed around a storm drain inlet by the use of gravel and wire mesh.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
862 - Inlet Protection -Sod Filter	A sediment filter formed around a storm drain drop inlet by the use of sod.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
863 - Inlet Protection - Straw Bale Barrier	A temporary sediment control barrier formed around a storm drain drop inlet consisting of a row of entrenched and anchored straw bales.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
865 - Land Grading	Reshaping the ground surface to planned grades as determined by engineering survey evaluation and layout.	Negligible to moderate decrease because of decreased ponding and more uniform infiltration.	Negligible to moderate decrease because of decreased ponding and more uniform infiltration.	Negligible.	Negligible to slight increase where practice enhances surface drainage.	Negligible to slight increase where practice enhances surface drainage.	Negligible.	Negligible.	Negligible.	Negligible.
870 - Level Spreader	A device used to disperse concentrated runoff over the ground surface as sheet flow.	Slight increase due to increased infiltration of soluble pesticides.	Slight increase due to increased infiltration of soluble nutrients.	Negligible.	Slight decrease due to reduced concentrated flow, erosion and sediment bound pesticides.	Slight decrease due to reduced concentrated flow, erosion and sediment bound pesticides.	Slight decrease due to reduced sediment yield.	Negligible.	Negligible to slight decrease due to managed runoff.	Negligible to slight decrease due to managed runoff.

CONSIDERATIONS:		(1) QUANTITY								
ASPECTS/ PROBLEMS	PRACTICE	EXCESS AMOUNTS			RESTRICTED CAPACITY FROM SEDIMENT DEPOSITION IN SMALL CONVEYANCE		RESTRICTED CAPACITY FOR SEDIMENT DEPOSITION			
		SEEPS	RUNOFF/FLOODING	EXCESS SUBSURFACE WATER	ON-SITE	OFF-SITE	WATER BODIES, STREAMS, LAKES			
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Subsurface water flows onto the surface of the land.	Water accumulates on the surface of the land.	Subsurface water accumulates in the soil profile, which adversely affects plant growth and production operations.		Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that is affected because of the loss of storage capacity as well as the loss of conveyance capacity.		
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
875 - Mulching	The application of plant residues and other suitable materials to the soil surface.	Negligible to slight increase because of increased infiltration.	Slight to moderate decrease because of increased infiltration.	Slight to moderate increase because of increased infiltration.		Slight to moderate decrease because of decreased sediment yield.	Slight to moderate decrease because of decreased sediment yield.	Slight to moderate decrease because of decreased sediment yield.		
880 - Permanent Vegetation	Establishing permanent vegetative cover to stabilize disturbed or exposed areas.	Slight to moderate increase because of increased infiltration depending on species selected to site location.	Slight to moderate decrease because of increased infiltration.	Slight to moderate increase because of increased infiltration.		Significant decrease because of vegetative cover, reduced runoff, and sedimentation.	Moderate to significant decrease because of vegetative cover, reduced runoff, and sedimentation.	Slight to significant decrease because of reduced erosion and sediment.		
890 - Permeable Pavement	A pavement consisting of materials having regularly interspersed void areas filled with pervious materials, such as vegetated soil, gravel or sand.	Negligible to slight increase due to increased water infiltration.	Slight to moderate decrease due to increased water infiltration.	Slight to moderate increase due to increased water infiltration.		Significant decrease due to reduced sediment yield and runoff.	Slight to moderate decrease due to reduced sediment yield.	Slight to moderate decrease due to reduced sediment yield.		
895 - Portable Sediment Tank	A compartmented container through which sediment-laden water is pumped to trap and retain the sediment.	Not applicable.	Not applicable.	Not applicable.		Slight to moderate decrease due to trapping of sediment.	Slight decrease due to trapping of sediment.	Slight decrease due to trapping of sediment.		
900 - Right-of-Way Diversion	A ridge or ridge and channel constructed diagonally across a sloping road or utility right-of-way that is subject to erosion.	Negligible.	Negligible.	Negligible.		Slight to moderate decrease because of decreased sediment load, because of proximity and control of ephemeral gullies and other erosion sources.	Negligible.	Negligible.		

CONSIDERATIONS:		(2) QUALITY								
ASPECTS/ PROBLEMS	PRACTICE	GROUND WATER CONTAMINANTS			SURFACE WATER CONTAMINANTS					
		PESTICIDES	NUTRIENTS AND ORGANICS	HEAVY METALS	PESTICIDES	NUTRIENTS AND ORGANICS	SUSPENDED SEDIMENT AND TURBIDITY	SALINITY	HEAVY METALS	PATHOGENS
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Water pollution problems from natural or human-induced common nutrients of N, P, K, Ca, Na, and Mg.	Water pollution problems from natural and human-induced common metals or metal compounds, such as iron, lead, zinc, copper, and cobalt.	Surface water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Surface water pollution problems that result from the use of all applied plant nutrients with emphasis on phosphorus and total organic carbon.	Water pollution suspended sediment and turbidity. Suspended sediment is sediment held in surrounding fluid. Turbidity is reduced clarity of fluids because of presence of suspended matter.	Water pollution from common salts such as sodium, calcium, boron and selenium.	Water pollution from natural and human-induced common metals and metal compounds, such as iron, lead, zinc, copper, and cobalt.	Water pollution from bacteria, viruses, protozoans, helminths, and fungi. Pathogens can be transported in both fluid and particulate forms.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
875 - Mulching	The application of plant residues and other suitable materials to the soil surface.	Negligible to slight increase because of increased infiltration.	Negligible to slight increase because of increased infiltration.	Negligible.	Moderate to significant decrease because of decreased runoff and erosion.	Moderate to significant decrease because of decreased runoff and erosion.	Moderate to significant decrease because of decreased runoff and erosion.	Moderate to significant decrease because of decreased runoff and erosion.	Moderate to significant decrease because of decreased runoff and erosion.	Negligible to slight decrease because of decreased runoff and erosion.
880 - Permanent Vegetation	Establishing permanent vegetative cover to stabilize disturbed or exposed areas.	Negligible to moderate decrease because of change in pesticide use.	Slight to moderate decrease because of plant uptake.	Negligible.	Negligible to moderate decrease because of change in pesticide use and reduced runoff.	Slight to moderate decrease because of plant uptake and reduced runoff.	Moderate to significant decrease because of decreased sediment delivery.	Slight to moderate decrease because of reduced erosion and runoff.	Slight to significant decrease because of reduced erosion and sediment yield.	Negligible.
890 - Permeable Pavement	A pavement consisting of materials having regularly interspersed void areas filled with pervious materials, such as vegetated soil, gravel or sand.	Negligible to slight increase due to increased infiltration of soluble pesticides.	Negligible to slight increase due to increased infiltration of soluble nutrients.	Negligible increase due to increased infiltration.	Moderate to significant decrease due to reduced runoff and erosion.	Moderate to significant decrease due to reduced runoff and erosion.	Moderate to significant decrease due to reduced runoff and erosion.	Moderate to significant decrease due to reduced runoff and erosion.	Moderate to significant decrease due to reduced runoff and erosion.	Negligible.
895 - Portable Sediment Tank	A compartmented container through which sediment-laden water is pumped to trap and retain the sediment.	Slight decrease due to trapping of pesticide-laden sediment.	Slight decrease due to trapping of nutrient-laden sediment.	Negligible.	Negligible.	Negligible.	Slight decrease due to trapping of sediment.	Negligible.	Negligible.	Negligible.
900 - Right-of-Way Diversion	A ridge or ridge and channel constructed diagonally across a sloping road or utility right-of-way that is subject to erosion.	Negligible.	Negligible.	Negligible.	Slight decrease because of decrease in sediment bound pesticides.	Slight decrease because of decrease in sediment bound phosphorus and total organic carbon.	Slight decrease because of reduced sediment yield.	Negligible.	Slight decrease because of managed runoff.	Negligible.

CONSIDERATIONS:		(1) QUANTITY								
ASPECTS/ PROBLEMS	PRACTICE	EXCESS AMOUNTS			RESTRICTED CAPACITY FROM SEDIMENT DEPOSITION IN SMALL CONVEYANCE		RESTRICTED CAPACITY FOR SEDIMENT DEPOSITION			
		SEEPS	RUNOFF/FLOODING	EXCESS SUBSURFACE WATER	ON-SITE	OFF-SITE	WATER BODIES, STREAMS, LAKES			
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Subsurface water flows onto the surface of the land.	Water accumulates on the surface of the land.	Subsurface water accumulates in the soil profile, which adversely affects plant growth and production operations.		Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that is affected because of the loss of storage capacity as well as the loss of conveyance capacity.		
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
905 - Rock Check Dam	A small rock dam constructed across a grassed swale or road ditch.	Not determined yet.	Not determined yet.	Not determined yet.		Not determined yet.	Not determined yet.	Not determined yet.		
910 - Rock Outlet Protection	A section of rock protection placed at the outlet end of culverts, conduits, or channels.	Not applicable.	Not applicable.	Not applicable.		Slight to significant decrease because of reduced erosion.	Slight to moderate decrease because of reduced erosion.	Slight to moderate decrease because of reduced erosion.		
920 - Silt Fence	A temporary barrier of entrenched geotextile fabric stretched across and attached to supporting posts used to intercept sediment-laden runoff from small drainage areas of disturbed soil.	Not applicable.	Negligible.	Negligible.		Slight to moderate decrease due to trapping of sediment.	Slight to moderate decrease due to trapping of sediment.	Slight to moderate decrease due to trapping of sediment.		
925 - Sodding	Stabilization of fine graded disturbed areas by laying a continuous cover of grass sod.	Slight to moderate increase because of increased infiltration depending on species selected to site location.	Slight to moderate decrease because of increased infiltration.	Slight to moderate increase because of increased infiltration.		Significant decrease because of vegetative cover, reduced runoff, and sedimentation.	Moderate to significant decrease because of vegetative cover, reduced runoff, and sedimentation.	Slight to significant decrease because of reduced erosion and sediment.		
930 - Stabilized Construction Entrance	A stabilized pad of aggregate underlain with filter fabric at any point where traffic enters or leaves a construction site to or from a public right-of-way, street, alley or parking area.	Not applicable.	Not applicable.	Not applicable.		Negligible.	Negligible.	Negligible.		

CONSIDERATIONS:		(2) QUALITY								
ASPECTS/ PROBLEMS	PRACTICE	GROUND WATER CONTAMINANTS			SURFACE WATER CONTAMINANTS					
		PESTICIDES	NUTRIENTS AND ORGANICS	HEAVY METALS	PESTICIDES	NUTRIENTS AND ORGANICS	SUSPENDED SEDIMENT AND TURBIDITY	SALINITY	HEAVY METALS	PATHOGENS
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Water pollution problems from natural or human-induced common nutrients of N, P, K, Ca, Na, and Mg.	Water pollution problems from natural and human-induced common metals or metal compounds, such as iron, lead, zinc, copper, and cobalt.	Surface water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Surface water pollution problems that result from the use of all applied plant nutrients with emphasis on phosphorus and total organic carbon.	Water pollution suspended sediment and turbidity. Suspended sediment is held in surrounding fluid. Turbidity is reduced clarity of fluids because of presence of suspended matter.	Water pollution from common salts such as sodium, calcium, boron and selenium.	Water pollution from natural and human-induced common metals and metal compounds, such as iron, lead, zinc, copper, and cobalt.	Water pollution from bacteria, viruses, protozoans, helminths, and fungi. Pathogens can be transported in both fluid and particulate forms.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
905 - Rock Check Dam	A small rock dam constructed across a grassed swale or road ditch.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
910 - Rock Outlet Protection	A section of rock protection placed at the outlet end of culverts, conduits, or channels.	Negligible.	Negligible.	Negligible.	Negligible.	Negligible.	Slight decrease because of reduced erosion.	Negligible.	Negligible.	Negligible.
920 - Silt Fence	A temporary barrier of entrenched geotextile fabric stretched across and attached to supporting posts used to intercept sediment-laden runoff from small drainage areas of disturbed soil.	Negligible.	Negligible.	Negligible.	Slight decrease due to sediment trapping.	Slight decrease due to sediment trapping.	Slight decrease due to sediment trapping.	Negligible.	Slight decrease due to sediment trapping.	Negligible.
925 - Sodding	Stabilization of fine graded disturbed areas by laying a continuous cover of grass sod.	Negligible to moderate decrease because of change in pesticide use.	Slight to moderate decrease because of plant uptake.	Negligible.	Negligible to moderate decrease because of change in pesticide use and reduced runoff.	Slight to moderate decrease because of plant uptake and reduced runoff.	Moderate to significant decrease because of decreased sediment delivery.	Slight to moderate decrease because of reduced erosion and runoff.	Slight to significant decrease because of reduced erosion and sediment yield.	Negligible.
930 - Stabilized Construction Entrance	A stabilized pad of aggregate underlain with filter fabric at any point where traffic enters or leaves a construction site to or from a public right-of-way, street, alley or parking area.	Not applicable.	Not applicable.	Not applicable.	Negligible.	Negligible.	Negligible.	Negligible.	Negligible.	Negligible.

CONSIDERATIONS:		(1) QUANTITY								
ASPECTS/ PROBLEMS	PRACTICE	EXCESS AMOUNTS				RESTRICTED CAPACITY FROM SEDIMENT DEPOSITION IN SMALL CONVEYANCE		RESTRICTED CAPACITY FOR SEDIMENT DEPOSITION		
		SEEPS	RUNOFF/FLOODING	EXCESS SUBSURFACE WATER		ON-SITE	OFF-SITE			
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Subsurface water flows onto the surface of the land.	Water accumulates on the surface of the land.	Subsurface water accumulates in the soil profile, which adversely affects plant growth and production operations.		Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that is affected because of the loss of storage capacity as well as the loss of conveyance capacity.		
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
935 - Straw Bale Barrier	A temporary barrier of entrenched and anchored straw bales used to intercept sediment-laden runoff from small drainage areas of disturbed soil.	Not applicable.	Negligible.	Negligible.		Slight to moderate decrease due to sediment trapping.	Slight to moderate decrease due to sediment trapping.	Slight to moderate decrease due to sediment trapping.		
940 - Structural Streambank Stabilization	Stabilization of eroding streambanks by use of designed structural measures.	Not applicable.	Slight decrease because of decreased potential for deposition that caused out-of-bank flooding.	Not applicable.		Negligible to slight decrease because of limited area impacted.	Slight to significant decrease because of reduced sediment deposition.	Slight to significant decrease because of reduced sediment deposition.		
945 - Subsurface Drain	A conduit, such as corrugated plastic tubing, tile, or pipe, installed beneath the ground surface to collect and/or convey drainage water.	Significant decrease because water is collected and conveyed to an outlet.	Negligible to moderate decrease because of storage available in the soil profile and the removal of water if surface inlets are provided.	Significant decrease because subsurface water is collected and conveyed to an outlet.		Negligible to slight decrease because of reduced sediment load.	Negligible to slight decrease because of reduced sediment load.	Negligible decrease because of reduced sediment load depending on proximity to water body.		
950 - Sump Pit	A temporary pit constructed to trap and filter water for pumping into a suitable discharge area.	Significant decrease if located below seep area.	Slight decrease due to controlled runoff.	Negligible.		Negligible to slight decrease due to sediment trapping.	Negligible to slight decrease due to sediment trapping.	Negligible to slight decrease due to sediment trapping.		
953 - Surface Roughening	A rough soil surface with horizontal grooves running across the slope on the contour, stair stepping, or tracking with construction equipment.	Not determined yet.	Not determined yet.	Not determined yet.		Not determined yet.	Not determined yet.	Not determined yet.		

CONSIDERATIONS:		(2) QUALITY								
ASPECTS/ PROBLEMS	PRACTICE	GROUND WATER CONTAMINANTS			SURFACE WATER CONTAMINANTS					
		PESTICIDES	NUTRIENTS AND ORGANICS	HEAVY METALS	PESTICIDES	NUTRIENTS AND ORGANICS	SUSPENDED SEDIMENT AND TURBIDITY	SALINITY	HEAVY METALS	PATHOGENS
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Water pollution problems from natural or human-induced common nutrients of N, P, K, Ca, Na, and Mg.	Water pollution problems from natural and human-induced common metals or metal compounds, such as iron, lead, zinc, copper, and cobalt.	Surface water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Surface water pollution problems that result from the use of all applied plant nutrients with emphasis on phosphorus and total organic carbon.	Water pollution suspended sediment and turbidity. Suspended sediment is sediment held in surrounding fluid. Turbidity is reduced clarity of fluids because of presence of suspended matter.	Water pollution from common salts such as sodium, calcium, boron and selenium.	Water pollution from natural and human-induced common metals and metal compounds, such as iron, lead, zinc, copper, and cobalt.	Water pollution from bacteria, viruses, protozoans, helminths, and fungi. Pathogens can be transported in both fluid and particulate forms.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
935 - Straw Bale Barrier	A temporary barrier of entrenched and anchored straw bales used to intercept sediment-laden runoff from small drainage areas of disturbed soil.	Negligible.	Negligible.	Negligible.	Slight decrease due to trapping of pesticide-laden sediment.	Slight decrease due to trapping of nutrient-laden sediment.	Slight decrease due to sediment trapping.	Negligible.	Slight decrease due to sediment trapping.	Negligible.
940 - Structural Streambank Stabilization	Stabilization of eroding streambanks by use of designed structural measures.	Not applicable.	Not applicable.	Not applicable.	Negligible.	Slight decrease because of decreased erosion of streambank soil profiles.	Slight to significant decrease especially for fine textured streambanks because of decreased erosion and sediment.	Negligible.	Negligible.	Negligible.
945 - Subsurface Drain	A conduit, such as corrugated plastic tubing, tile, or pipe, installed beneath the ground surface to collect and/or convey drainage water.	Moderate to significant decrease because water is collected and conveyed to an outlet.	Moderate to significant decrease because water is collected and conveyed to an outlet.	Negligible.	Moderate to significant increase of water soluble pesticides.	Moderate to significant increase of water soluble nutrients.	Slight decrease because of decreased sediment yield.	Moderate to significant increase because water is collected and conveyed to an outlet.	Negligible.	Negligible.
950 - Sump Pit	A temporary pit constructed to trap and filter water for pumping into a suitable discharge area.	Moderate to significant decrease because water is collected and conveyed to an outlet.	Moderate to significant decrease because water is collected and conveyed to an outlet.	Negligible.	Moderate to significant increase because water is collected and conveyed to an outlet.	Moderate to significant increase because water is collected and conveyed to an outlet.	Slight decrease because of decreased sediment yield.	Moderate to significant increase because water is collected and conveyed to an outlet.	Negligible.	Negligible.
953 - Surface Roughening	A rough soil surface with horizontal grooves running across the slope on the contour, stair stepping, or tracking with construction equipment.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.

CONSIDERATIONS:		(1) QUANTITY								
ASPECTS/ PROBLEMS	PRACTICE	EXCESS AMOUNTS				RESTRICTED CAPACITY FROM SEDIMENT DEPOSITION IN SMALL CONVEYANCE		RESTRICTED CAPACITY FOR SEDIMENT DEPOSITION		
		SEEPS	RUNOFF/FLOODING	EXCESS SUBSURFACE WATER		ON-SITE	OFF-SITE	WATER BODIES, STREAMS, LAKES		
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Subsurface water flows onto the surface of the land.	Water accumulates on the surface of the land.	Subsurface water accumulates in the soil profile, which adversely affects plant growth and production operations.		Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that is affected because of the loss of storage capacity as well as the loss of conveyance capacity.		
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
955 - Temporary Diversion	A temporary ridge or excavated channel or combination ridge and channel constructed across sloping land on a predetermined grade.	Slight decrease because of protection of down slope areas.	Moderate decrease because of protection of area below diversion.	Negligible.		Slight to significant decrease because of decreased sediment load, because of proximity and control of ephemeral gullies and other erosion sources.	Negligible to moderate decrease because of decreased sediment load.	Negligible to slight decrease because of decreased sediment load.		
960 - Temporary Sediment Trap	A small temporary ponding basin formed by construction of an embankment or excavated basin.	Slight increase because of increased infiltration.	Slight to moderate increase because of increased infiltration.	Slight increase because of increased infiltration.		Moderate to significant decrease because of trapped sediment and debris, depending on storage available, and area controlled.	Moderate to significant decrease because of trapped sediment and debris, depending on storage available, and area controlled.	Moderate to significant decrease because of trapped sediment and debris, depending on storage available, and area controlled.		
965 - Temporary Seeding	Planting rapid-growing annual grasses or small grains to provide initial, temporary coverage for erosion control on disturbed areas.	Slight to moderate increase because of increased infiltration depending on species of selected to site location.	Slight to moderate decrease because of increased infiltration.	Negligible.		Significant decrease because of vegetative cover, reduced runoff, and sedimentation.	Moderate to significant decrease because of vegetative cover, reduced runoff, and sedimentation.	Slight to significant decrease because of reduced erosion and sediment.		
970 - Temporary Slope Drain	A flexible tubing or rigid conduit extending temporarily from the top to the bottom of a cut or fill slope.	Slight to significant temporary decrease due to water being collected and conveyed to an outlet.	Significant temporary decrease due to water being collected and conveyed to an outlet.	Negligible.		Negligible.	Negligible.	Negligible.		
975 - Temporary Stream Crossing	A bridge, ford, or temporary structure installed across a stream or watercourse for short-term use by construction vehicles or heavy equipment.	Not applicable.	Not applicable.	Not applicable.		Slight increase due to altered stream flow at crossing location.	Slight increase due to altered stream flow at crossing location.	Slight increase due to altered stream flow at crossing location.		

CONSIDERATIONS:		(2) QUALITY								
ASPECTS/ PROBLEMS	PRACTICE	GROUND WATER CONTAMINANTS			SURFACE WATER CONTAMINANTS					
		PESTICIDES	NUTRIENTS AND ORGANICS	HEAVY METALS	PESTICIDES	NUTRIENTS AND ORGANICS	SUSPENDED SEDIMENT AND TURBIDITY	SALINITY	HEAVY METALS	PATHOGENS
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Water pollution problems from natural or human-induced common nutrients of N, P, K, Ca, Na, and Mg.	Water pollution problems from natural and human-induced common metals or metal compounds, such as iron, lead, zinc, copper, and cobalt.	Surface water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Surface water pollution problems that result from the use of all applied plant nutrients with emphasis on phosphorus and total organic carbon.	Water pollution suspended sediment and turbidity. Suspended sediment is sediment held in surrounding fluid. Turbidity is reduced clarity of fluids because of presence of suspended matter.	Water pollution from common salts such as sodium, calcium, boron and selenium.	Water pollution from natural and human-induced common metals and metal compounds, such as iron, lead, zinc, copper, and cobalt.	Water pollution from bacteria, viruses, protozoans, helminths, and fungi. Pathogens can be transported in both fluid and particulate forms.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
955 - Temporary Diversion	A temporary ridge or excavated channel or combination ridge and channel constructed across sloping land on a predetermined grade.	Slight increase because of increased infiltration of soluble pesticides.	Slight increase because of increased infiltration of solubles, such as nitrate nitrogen.	Negligible.	Slight decrease because of decrease in sediment bound pesticides.	Slight to moderate decrease because of decrease in sediment bound phosphorus and total organic carbon. Slight increase in off-site solubles because of increased concentrated flow.	Slight decrease because of reduced sediment yield.	Negligible.	Negligible to moderate decrease because of managed runoff. Could be significant decrease if diversion is placed above a contaminant waste source with metals.	Negligible to moderate decrease because of managed runoff. Could be significant decrease if diversion is placed above a contaminant waste source with pathogens.
960 - Temporary Sediment Trap	A small temporary ponding basin formed by construction of an embankment or excavated basin.	Negligible to slight increase because of increased infiltration in the basin.	Negligible to slight increase because of increased infiltration in the basin.	Negligible.	Slight decrease of water soluble pesticides because of retention and slight to significant decrease in soil attached pesticides trapped in a basin.	Slight decrease of water soluble nutrients because of retention. Slight to significant decrease in soil attached nutrients and organics trapped in the basin, depending on particle size, available storage, and area controlled.	Moderate to significant decrease in sediment because of trapping and slight to significant decrease in turbidity because of retention and ponding.	Slight decrease for soil attached materials trapped and negligible for water soluble materials.	Moderate to significant decrease for heavy metals attached to soil particles.	Negligible to slight decrease because of attached material trapped with the sediment.
965 - Temporary Seeding	Planting rapid-growing annual grasses or small grains to provide initial, temporary coverage for erosion control on disturbed areas.	Negligible.	Negligible.	Negligible.	Negligible.	Negligible.	Moderate to significant decrease because of decreased sediment delivery.	Slight decrease because of reduced erosion and runoff.	Slight to moderate decrease because of reduced erosion and sediment yield.	Negligible.
970 - Temporary Slope Drain	A flexible tubing or rigid conduit extending temporarily from the top to the bottom of a cut or fill slope.	Slight to moderate decrease due to runoff being collected and conveyed to an outlet.	Slight to moderate decrease due to runoff being collected and conveyed to an outlet.	Negligible.	Slight to moderate increase due to runoff being collected and conveyed to an outlet.	Slight to moderate increase due to runoff being collected and conveyed to an outlet.	Negligible.	Slight to moderate increase due to runoff being collected and conveyed to an outlet.	Slight increase due to runoff being collected and conveyed to an outlet.	Negligible.
975 - Temporary Stream Crossing	A bridge, ford, or temporary structure installed across a stream or watercourse for short-term use by construction vehicles or heavy equipment.	Not Applicable.	Not Applicable.	Not Applicable.	Negligible.	Negligible.	Slight increase due to equipment entering stream where fords are used.	Negligible.	Negligible.	Negligible.

CONSIDERATIONS:		(1) QUANTITY								
ASPECTS/ PROBLEMS	PRACTICE	EXCESS AMOUNTS				RESTRICTED CAPACITY FROM SEDIMENT DEPOSITION IN SMALL CONVEYANCE		RESTRICTED CAPACITY FOR SEDIMENT DEPOSITION		
		SEEPS	RUNOFF/FLOODING	EXCESS SUBSURFACE WATER		ON-SITE	OFF-SITE	WATER BODIES, STREAMS, LAKES		
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Subsurface water flows onto the surface of the land.	Water accumulates on the surface of the land.	Subsurface water accumulates in the soil profile, which adversely affects plant growth and production operations.		Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that is affected because of the loss of storage capacity as well as the loss of conveyance capacity.		
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
980 - Temporary Swale	A temporary excavated drainageway.	Negligible.	Moderate to significant decrease because of providing stable outlet.	Negligible.		Slight to moderate decrease because of decreased sediment loads by treating the eroding drainage way.	Moderate to significant decrease because of decreased sediment loads.	Slight to moderate decrease because of decreased sediment loads.		
981 - Topsoiling	Methods of preserving and using topsoil to enhance final site stabilization with vegetation.	Slight to moderate increase because of increased infiltration.	Slight to moderate decrease because of increased infiltration.	Slight to moderate increase because of increased infiltration.		Slight to moderate decrease because of decreased sediment yield, water management, and stabilization.	Slight to moderate decrease because of decreased sediment yield, water management, and stabilization.	Slight to moderate decrease because of decreased sediment yield, water management, and stabilization.		
984 - Tree and Forest Ecosystem Preservation	The preservation of contiguous stands of trees from damage during construction operations.	Not determined yet.	Not determined yet.	Not determined yet.		Not determined yet.	Not determined yet.	Not determined yet.		
985 - Tree and Shrub Planting	Planting of selected trees and shrubs.	Moderate to significant decrease depending upon species and proximity to seep due to increased plant uptake and transpiration.	Slight to moderate decrease because of improved land cover and retardance of runoff.	Moderate to significant decrease dependent on species used because of increased plant uptake and transpiration.		Slight to moderate decrease because of increased protective vegetation and reduced runoff.	Slight to moderate decrease because of increased protective vegetation and reduced runoff.	Slight to moderate decrease because of increased protective vegetation and reduced runoff.		
990 - Tree Protection	The protection of individual trees from damage during construction operations.	Moderate to significant decrease depending upon species and proximity to seep due to increased plant uptake and transpiration.	Slight to moderate decrease because of maintaining land cover.	Slight to moderate decrease dependent on species used because of increased plant uptake and transpiration.		Slight increase because of increased protective vegetation and reduced runoff.	Slight to moderate decrease because of increased protective vegetation and reduced runoff.	Slight to moderate decrease because of increased protective vegetation and reduced runoff.		

CONSIDERATIONS:		(2) QUALITY								
ASPECTS/ PROBLEMS	PRACTICE	GROUND WATER CONTAMINANTS			SURFACE WATER CONTAMINANTS					
		PESTICIDES	NUTRIENTS AND ORGANICS	HEAVY METALS	PESTICIDES	NUTRIENTS AND ORGANICS	SUSPENDED SEDIMENT AND TURBIDITY	SALINITY	HEAVY METALS	PATHOGENS
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Water pollution problems from natural or human-induced common nutrients of N, P, K, Ca, Na, and Mg.	Water pollution problems from natural and human-induced common metals or metal compounds, such as iron, lead, zinc, copper, and cobalt.	Surface water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Surface water pollution problems that result from the use of all applied plant nutrients with emphasis on phosphorus and total organic carbon.	Water pollution suspended sediment and turbidity. Suspended sediment is sediment held in surrounding fluid. Turbidity is reduced clarity of fluids because of presence of suspended matter.	Water pollution from common salts such as sodium, calcium, boron and selenium.	Water pollution from natural and human-induced common metals and metal compounds, such as iron, lead, zinc, copper, and cobalt.	Water pollution from bacteria, viruses, protozoans, helminths, and fungi. Pathogens can be transported in both fluid and particulate forms.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
980 - Temporary Swale	A temporary excavated drainageway.	Negligible to slight increase because of transport of soluble pesticides.	Negligible to slight increase because of transport of soluble nutrients.	Negligible.	Slight to moderate decrease because of decrease in sediment bound pesticides.	Slight to moderate decrease because of decrease in sediment bound phosphorus and total organic carbon. Slight decrease of soluble nutrients because of infiltration.	Slight to moderate decrease because of decreased sediment yield.	Negligible.	Negligible.	Negligible.
981 - Topsoiling	Methods of preserving and using topsoil to enhance final site stabilization with vegetation.	Negligible.	Negligible.	Negligible.	Slight decrease because of decreased runoff and erosion.	Slight decrease because of decreased runoff and erosion.	Moderate decrease because of decreased sediment yield, water management, and stabilization.	Slight decrease because of decreased sediment yield, water management, and stabilization.	Slight decrease because of decreased sediment yield, water management, and stabilization.	Negligible.
984 - Tree and Forest Ecosystem Preservation	The preservation of contiguous stands of trees from damage during construction operations.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
985 - Tree and Shrub Planting	Planting of selected trees and shrubs.	Slight decrease because of increased evaporation.	Slight to moderate decrease because of increased uptake of nutrients by trees and reduced runoff.	Negligible decrease because of plant uptake by adapted species.	Slight to moderate decrease because of changes in land use and decrease of runoff because of improved vegetative cover.	Slight to moderate decrease because of improved vegetative cover and decrease of runoff.	Slight to moderate decrease because of increased vegetative cover.	Slight decrease because of uptake by improved vegetative cover and decreased runoff.	Slight decrease because of uptake by improved vegetative cover and decreased runoff.	Slight decrease because of improved vegetative cover and increased soil microbiological activity.
990 - Tree Protection	The protection of individual trees from damage during construction operations.	Negligible.	Negligible.	Negligible decrease because of plant uptake by adapted species.	Negligible.	Negligible.	Negligible.	Negligible.	Negligible.	Negligible.

CONSIDERATIONS:		(1) QUANTITY								
ASPECTS/ PROBLEMS	PRACTICE	EXCESS AMOUNTS			RESTRICTED CAPACITY FROM SEDIMENT DEPOSITION IN SMALL CONVEYANCE		RESTRICTED CAPACITY FOR SEDIMENT DEPOSITION			
		SEEPS	RUNOFF/FLOODING	EXCESS SUBSURFACE WATER	ON-SITE	OFF-SITE	WATER BODIES, STREAMS, LAKES			
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Subsurface water flows onto the surface of the land.	Water accumulates on the surface of the land.	Subsurface water accumulates in the soil profile, which adversely affects plant growth and production operations.		Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that affects drainage ditches, road ditches, culverts, and canals.	Water quantity that is affected because of the loss of storage capacity as well as the loss of conveyance capacity.		
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
991 - Tree Protection - Augering	Underground construction such as utility work by augering (tunneling) through an individual tree's Critical Root Zone (CRZ).	Not determined yet.	Not determined yet.	Not determined yet.		Not determined yet.	Not determined yet.	Not determined yet.		
995 - Vegetative Streambank Stabilization	The stabilization and protection of eroding streambanks with selected vegetation.	Not applicable.	Slight decrease because of decreased potential for deposition that caused out-of-bank flooding.	Not applicable.		Negligible to slight decrease because of limited area impacted.	Slight to significant decrease because of reduced sediment deposition.	Slight to significant decrease because of reduced sediment deposition.		
996 - Well Decommissioning	The sealing and permanent closure of a water well, boring, or monitoring well.	Not determined yet.	Not determined yet.	Not determined yet.		Not determined yet.	Not determined yet.	Not determined yet.		

CONSIDERATIONS:		(2) QUALITY								
ASPECTS/ PROBLEMS	PRACTICE	GROUND WATER CONTAMINANTS			SURFACE WATER CONTAMINANTS					
		PESTICIDES	NUTRIENTS AND ORGANICS	HEAVY METALS	PESTICIDES	NUTRIENTS AND ORGANICS	SUSPENDED SEDIMENT AND TURBIDITY	SALINITY	HEAVY METALS	PATHOGENS
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Water pollution problems from natural or human-induced common nutrients of N, P, K, Ca, Na, and Mg.	Water pollution problems from natural and human-induced common metals or metal compounds, such as iron, lead, zinc, copper, and cobalt.	Surface water pollution problems from pesticides. Pesticide means "all" chemicals used to manage weeds, insects, and diseases.	Surface water pollution problems that result from the use of all applied plant nutrients with emphasis on phosphorus and total organic carbon.	Water pollution suspended sediment and turbidity. Suspended sediment is sediment held in surrounding fluid. Turbidity is reduced clarity of fluids because of presence of suspended matter.	Water pollution from common salts such as sodium, calcium, boron and selenium.	Water pollution from natural and human-induced common metals and metal compounds, such as iron, lead, zinc, copper, and cobalt.	Water pollution from bacteria, viruses, protozoans, helminths, and fungi. Pathogens can be transported in both fluid and particulate forms.
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
991 - Tree Protection - Augering	Underground construction such as utility work by augering (tunneling) through an individual tree's Critical Root Zone (CRZ).	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.
995 - Vegetative Streambank Stabilization	The stabilization and protection of eroding streambanks with selected vegetation.	Not Applicable.	Not Applicable.	Not Applicable.	Negligible.	Slight decrease because of decreased erosion of streambank soil profiles.	Slight to significant decrease especially for fine textured streambanks because of decreased erosion and sediment delivered.	Slight decrease for saline soils because of decreased erosion and sediment delivery.	Negligible.	Negligible.
996 - Well Decommissioning	The sealing and permanent closure of a water well, boring, or monitoring well.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.

CONSIDERATIONS:		(1) QUANTITY		(2) CONDITION						
ASPECTS/ PROBLEMS		AIRBORNE ODORS	FUNGI, MOLDS, POLLEN	AIR TEMPERATURE	AIR MOVEMENT	HUMIDITY				
PRACTICE										
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Objectionable odors from such sources as waste, storage areas, waste lagoons, and other organics.	Production and release of fungi, molds, and pollen by components of a practice.	Improper temperature for development of flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper air movement for flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper level of humidity for flora and fauna health.				
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
800 - Urban Stormwater Wetlands	A constructed system of shallow pools that create growing conditions for wetland plants to lessen the impacts of stormwater quality and quantity in urban areas.	Negligible to significant decrease because of increased vegetative cover. Slight to moderate increase because some wetland odors are objectionable to some people.	Slight increase because of greater variety of plants.	Slight to moderate decrease in summer because of increased evaporation and transpiration.	Slight to moderate decrease because of increased hydrophytic vegetation.	Moderate increase because of increased evaporation and transpiration.				
806 - Construction Road Stabilization	The stabilization of temporary construction access routes, subdivision roads, on-site vehicle transportation roads, and construction parking areas with stone immediately after grading.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.				
808 - Culvert Inlet Protection	A temporary sediment filter located at the inlet to storm sewer culverts.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.				
815 - Diversion	A channel and supporting ridge constructed across the slope to collect and divert runoff.	Not applicable.	Not applicable.	Not applicable.	Negligible.	Not applicable.				
820 - Diversion Dike	A dike or dike and channel constructed along the perimeter of a disturbed construction area.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.				

CONSIDERATIONS:		(1) QUANTITY		(2) CONDITION						
ASPECTS/ PROBLEMS		AIRBORNE ODORS	FUNGI, MOLDS, POLLEN	AIR TEMPERATURE	AIR MOVEMENT	HUMIDITY				
PRACTICE										
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Objectionable odors from such sources as waste, storage areas, waste lagoons, and other organics.	Production and release of fungi, molds, and pollen by components of a practice.	Improper temperature for development of flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper air movement for flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper level of humidity for flora and fauna health.				
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
825 - Dust Control	Controlling dust blowing and movement on construction sites and roads.	Negligible to significant increase depending on the type, extent and frequency of materials applied.	Not applicable.	Not applicable.	Negligible.	Negligible.				
830 - Erosion Blanket	The application of a preformed protective blanket of straw or other plant residue, or plastic fibers formed into a mat, usually with a plastic mesh on one or both sides.	Not applicable.	Not applicable.	Not applicable.	Negligible.	Negligible.				
835 - Filter Strip	A created or preserved area of vegetation designed to remove sediment and other pollutants and to enhance the infiltration of surface water runoff.	Not applicable.	Slight to significant increase in problem depending on species present.	Slight decrease because of the effects of vegetative cover.	Slight decrease because of the effects of vegetative cover.	Slight decrease because of the effects of vegetative cover.				
840 - Grass-Lined Channel	A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation for stable conveyance of runoff.	Not applicable.	Slight increase because of permitting plants to mature.	Not applicable.	Negligible.	Negligible.				
841 - Impoundment Structure-Full Flow	A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.	Negligible.	Negligible.	Not applicable.	Not applicable.	Not applicable.				

CONSIDERATIONS:		(1) QUANTITY		(2) CONDITION						
ASPECTS/ PROBLEMS		AIRBORNE ODORS	FUNGI, MOLDS, POLLEN	AIR TEMPERATURE	AIR MOVEMENT	HUMIDITY				
PRACTICE										
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Objectionable odors from such sources as waste, storage areas, waste lagoons, and other organics.	Production and release of fungi, molds, and pollen by components of a practice.	Improper temperature for development of flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper air movement for flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper level of humidity for flora and fauna health.				
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
842 - Impoundment Structure-Routed	A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.	Negligible.	Negligible.	Not applicable.	Not applicable.	Not applicable.				
847 - Infiltration Trench	An excavated trench filled with coarse granular material in which stormwater runoff is collected for temporary storage and infiltration.	Negligible to slight increase due to temporary ponding of runoff.	Negligible.	Not applicable.	Not applicable.	Not applicable.				
850 - Inlet Protection - Block and Gravel	A sediment control barrier formed around a storm drain inlet by the use of standard concrete blocks and gravel.	Not applicable.	Negligible.	Not applicable.	Not applicable.	Not applicable.				
855 - Inlet Protection - Excavated Drain	An excavated area in the approach to a storm drain drop inlet or curb inlet.	Negligible to slight increase due to temporary ponding of runoff.	Negligible.	Not applicable.	Not applicable.	Not applicable.				
860 - Inlet Protection - Fabric Drop	A temporary fabric barrier placed around a drop inlet.	Negligible to slight increase due to temporary ponding of runoff.	Negligible.	Not applicable.	Not applicable.	Not applicable.				

CONSIDERATIONS:		(1) QUANTITY		(2) CONDITION						
ASPECTS/ PROBLEMS		AIRBORNE ODORS	FUNGI, MOLDS, POLLEN	AIR TEMPERATURE	AIR MOVEMENT	HUMIDITY				
PRACTICE										
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Objectionable odors from such sources as waste, storage areas, waste lagoons, and other organics.	Production and release of fungi, molds, and pollen by components of a practice.	Improper temperature for development of flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper air movement for flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper level of humidity for flora and fauna health.				
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
861 - Inlet Protection - Gravel & Wire Mesh	A temporary sediment control barrier formed around a storm drain inlet by the use of gravel and wire mesh.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.				
862 - Inlet Protection -Sod Filter	A sediment filter formed around a storm drain drop inlet by the use of sod.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.				
863 - Inlet Protection - Straw Bale Barrier	A temporary sediment control barrier formed around a storm drain drop inlet consisting of a row of entrenched and anchored straw bales.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.				
865 - Land Grading	Reshaping the ground surface to planned grades as determined by engineering survey evaluation and layout.	Not applicable.	Negligible to slight decrease due to less ponding to form moist areas for molds.	Not applicable.	Not applicable.	Not applicable.				
870 - Level Spreader	A device used to disperse concentrated runoff over the ground surface as sheet flow.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.				

CONSIDERATIONS:		(1) QUANTITY		(2) CONDITION						
ASPECTS/ PROBLEMS		AIRBORNE ODORS	FUNGI, MOLDS, POLLEN	AIR TEMPERATURE	AIR MOVEMENT	HUMIDITY				
PRACTICE										
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Objectionable odors from such sources as waste, storage areas, waste lagoons, and other organics.	Production and release of fungi, molds, and pollen by components of a practice.	Improper temperature for development of flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper air movement for flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper level of humidity for flora and fauna health.				
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
875 - Mulching	The application of plant residues and other suitable materials to the soil surface.	Negligible.	Negligible to slight increase because of organic mulches.	Slight to moderate decrease because of surface cover.	Negligible.	Negligible.				
880 - Permanent Vegetation	Establishing permanent vegetative cover to stabilize disturbed or exposed areas.	Not applicable.	Negligible.	Slight decrease because of vegetative cover effects on temperature extremes.	Negligible.	Moderate increase at ground level. Slight increase above plants.				
890 - Permeable Pavement	A pavement consisting of materials having regularly interspersed void areas filled with pervious materials, such as vegetated soil, gravel or sand.	Not applicable.	Negligible.	Negligible.	Negligible.	Negligible.				
895 - Portable Sediment Tank	A compartmented container through which sediment-laden water is pumped to trap and retain the sediment.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.				
900 - Right-of-Way Diversion	A ridge or ridge and channel constructed diagonally across a sloping road or utility right-of-way that is subject to erosion.	Not applicable.	Not applicable.	Not applicable.	Negligible.	Not applicable.				

CONSIDERATIONS:		(1) QUANTITY		(2) CONDITION						
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PRACTICE										
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PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
905 - Rock Check Dam	A small rock dam constructed across a grassed swale or road ditch.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.				
910 - Rock Outlet Protection	A section of rock protection placed at the outlet end of culverts, conduits, or channels.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.				
920 - Silt Fence	A temporary barrier of entrenched geotextile fabric stretched across and attached to supporting posts used to intercept sediment-laden runoff from small drainage areas of disturbed soil.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.				
925 - Sodding	Stabilization of fine graded disturbed areas by laying a continuous cover of grass sod.	Not applicable.	Negligible.	Slight decrease because of vegetative cover effects on temperature extremes.	Negligible.	Moderate increase at ground level. Slight increase above plants.				
930 - Stabilized Construction Entrance	A stabilized pad of aggregate underlain with filter fabric at any point where traffic enters or leaves a construction site to or from a public right-of-way, street, alley or parking area.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.				

CONSIDERATIONS:		(1) QUANTITY		(2) CONDITION						
ASPECTS/ PROBLEMS		AIRBORNE ODORS	FUNGI, MOLDS, POLLEN	AIR TEMPERATURE	AIR MOVEMENT	HUMIDITY				
PRACTICE										
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Objectionable odors from such sources as waste, storage areas, waste lagoons, and other organics.	Production and release of fungi, molds, and pollen by components of a practice.	Improper temperature for development of flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper air movement for flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper level of humidity for flora and fauna health.				
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
935 - Straw Bale Barrier	A temporary barrier of entrenched and anchored straw bales used to intercept sediment-laden runoff from small drainage areas of disturbed soil.	Not applicable.	Negligible.	Not applicable.	Not applicable.	Not applicable.				
940 - Structural Streambank Stabilization	Stabilization of eroding streambanks by use of designed structural measures.	Not applicable.	Negligible.	Not applicable.	Not applicable.	Not applicable.				
945 - Subsurface Drain	A conduit, such as corrugated plastic tubing, tile, or pipe, installed beneath the ground surface to collect and/or convey drainage water.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.				
950 - Sump Pit	A temporary pit constructed to trap and filter water for pumping into a suitable discharge area.	Negligible to slight increase due to temporary ponding of runoff.	Negligible to slight increase due to temporary ponding of runoff.	Not applicable.	Not applicable.	Not applicable.				
953 - Surface Roughening	A rough soil surface with horizontal grooves running across the slope on the contour, stair stepping, or tracking with construction equipment.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.				

CONSIDERATIONS:		(1) QUANTITY		(2) CONDITION						
ASPECTS/ PROBLEMS		AIRBORNE ODORS	FUNGI, MOLDS, POLLEN	AIR TEMPERATURE	AIR MOVEMENT	HUMIDITY				
PRACTICE										
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Objectionable odors from such sources as waste, storage areas, waste lagoons, and other organics.	Production and release of fungi, molds, and pollen by components of a practice.	Improper temperature for development of flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper air movement for flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper level of humidity for flora and fauna health.				
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
955 - Temporary Diversion	A temporary ridge or excavated channel or combination ridge and channel constructed across sloping land on a predetermined grade.	Not applicable.	Not applicable.	Not applicable.	Negligible.	Not applicable.				
960 - Temporary Sediment Trap	A small temporary ponding basin formed by construction of an embankment or excavated basin.	Negligible to slight increase depending on amount and kind of debris and other material trapped.	Negligible.	Not applicable.	Not applicable.	Negligible.				
965 - Temporary Seeding	Planting rapid-growing annual grasses or small grains to provide initial, temporary coverage for erosion control on disturbed areas.	Not applicable.	Negligible.	Slight decrease because of vegetative cover effects on temperature extremes.	Negligible.	Moderate increase at ground level. Slight increase above plants.				
970 - Temporary Slope Drain	A flexible tubing or rigid conduit extending temporarily from the top to the bottom of a cut or fill slope.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.				
975 - Temporary Stream Crossing	A bridge, ford, or temporary structure installed across a stream or watercourse for short-term use by construction vehicles or heavy equipment.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.				

CONSIDERATIONS:		(1) QUANTITY		(2) CONDITION						
ASPECTS/ PROBLEMS		AIRBORNE ODORS	FUNGI, MOLDS, POLLEN	AIR TEMPERATURE	AIR MOVEMENT	HUMIDITY				
PRACTICE										
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Objectionable odors from such sources as waste, storage areas, waste lagoons, and other organics.	Production and release of fungi, molds, and pollen by components of a practice.	Improper temperature for development of flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper air movement for flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper level of humidity for flora and fauna health.				
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
980 - Temporary Swale	A temporary excavated drainageway.	Negligible.	Slight increase due to permitting plants to mature.	Not applicable.	Negligible.	Not applicable.				
981 - Topsoiling	Methods of preserving and using topsoil to enhance final site stabilization with vegetation.	Negligible.	Slight to significant decrease because of surface cover.	Negligible.	Negligible.	Negligible.				
984 - Tree and Forest Ecosystem Preservation	The preservation of contiguous stands of trees from damage during construction operations.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.				
985 - Tree and Shrub Planting	Planting of selected trees and shrubs.	Negligible.	Slight increase because of land use.	Slight to moderate decrease because of absorption of solar radiation and increased transpiration.	Moderate decrease because of increased vegetative cover and obstruction of surface wind patterns.	Slight to moderate increase because of increased transpiration.				
990 - Tree Protection	The protection of individual trees from damage during construction operations.	Negligible.	Slight increase because of land use.	Slight to moderate decrease because of absorption of solar radiation and increased transpiration.	Moderate decrease because of increased vegetative cover and obstruction of surface wind patterns.	Slight to moderate increase because of increased transpiration.				

CONSIDERATIONS:		(1) QUANTITY		(2) CONDITION						
ASPECTS/ PROBLEMS		AIRBORNE ODORS	FUNGI, MOLDS, POLLEN	AIR TEMPERATURE	AIR MOVEMENT	HUMIDITY				
PRACTICE										
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Objectionable odors from such sources as waste, storage areas, waste lagoons, and other organics.	Production and release of fungi, molds, and pollen by components of a practice.	Improper temperature for development of flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper air movement for flora and fauna. Zone of influence from ground level to 10 times plant height.	Improper level of humidity for flora and fauna health.				
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
991 - Tree Protection - Augering	Underground construction such as utility work by augering (tunneling) through an individual tree's Critical Root Zone (CRZ).	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.				
995 - Vegetative Streambank Stabilization	The stabilization and protection of eroding streambanks with selected vegetation.	Not applicable.	Negligible.	Not applicable.	Not applicable.	Not applicable.				
996 - Well Decommissioning	The sealing and permanent closure of a water well, boring, or monitoring well.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.				

RESOURCE: PLANTS

Urban Conservation Practice Physical Effects

CONSIDERATIONS:		(1) QUANTITY		(2) CONDITION	(3) MANAGEMENT					
ASPECTS/ PROBLEMS		PLANTS ARE NOT WELL ADAPTED TO SITE	PLANTS ARE UNSUITABLE FOR INTENDED USE	HEALTH AND VIGOR	ESTABLISHMENT, GROWTH, AND HARVEST	NUTRIENT MANAGEMENT	PESTS (BRUSH, WEEDS, INSECTS, DISEASES, AND FUNGI)			
PRACTICE										
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Plants are not adapted to soil and climatic conditions of the area. (Select a better adapted species or modify site conditions.)	Plant of concern does not meet the needs and objectives of the manager, such as by providing quantity and quality of desired food or forage, controlling erosion, improved soil condition, conserving water, adding beauty, providing habitat for animals.	Plants do not manufacture sufficient plant food to continue the growth cycle or to reproduce.	The management scheme or plan does not provide the proper techniques and timing to meet the plant needs of establishment, growth, and harvest.	The correct amount of plant nutrients are not available to meet plant needs.	Pests are not managed to meet the needs of the plants of concern and the manager's objectives and resource management objectives.			
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
800 - Urban Stormwater Wetlands	A constructed system of shallow pools that create growing conditions for wetland plants to lessen the impacts of stormwater quality and quantity in urban areas.	Moderate to significant decrease because of establishment of adapted vegetation, creation of impoundments, and manipulation of water levels.	Moderate to significant decrease because of establishment of desired vegetation.	Moderate to significant decrease because of creation of impoundments and manipulation of water levels.	Moderate to significant decrease because of creation of impoundments and/or manipulation of water levels resulting in increased productivity of wetland plants.	Not applicable.	Moderate to significant decrease because permanent adapted vegetation will result in less pests and active management will control pests.			
806 - Construction Road Stabilization	The stabilization of temporary construction access routes, subdivision roads, on-site vehicle transportation roads, and construction parking areas with stone immediately after grading.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
808 - Culvert Inlet Protection	A temporary sediment filter located at the inlet to storm sewer culverts.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
815 - Diversion	A channel and supporting ridge constructed across the slope to collect and divert runoff.	Slight to significant decrease because of change in available moisture.	Not applicable.	Slight to moderate decrease because of reduced stress from excess water.	Significant decrease because of improvement in area protected by diversion.	Not applicable.	Slight increase because of improved pest habitat on vegetated diversions.			
820 - Diversion Dike	A dike or dike and channel constructed along the perimeter of a disturbed construction area.	Negligible to significant decrease because of site modification from flood water management.	Not applicable.	Slight to significant decrease because of improved soil, water, and plant relationship due to water management.	Slight to significant decrease because of improved soil, water, and plant relationship due to water management.	Not applicable.	Negligible.			

CONSIDERATIONS:		(1) QUANTITY		(2) CONDITION	(3) MANAGEMENT					
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PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
825 - Dust Control	Controlling dust blowing and movement on construction sites and roads.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			
830 - Erosion Blanket	The application of a preformed protective blanket of straw or other plant residue, or plastic fibers formed into a mat, usually with a plastic mesh on one or both sides.	Not applicable.	Not applicable.	Slight decrease due to protection of young plants and moisture conservation provided by erosion blanket.	Slight decrease due to protection of young plants and moisture conservation provided by erosion blanket.	Negligible.	Moderate to significant decrease due to protection of young plants.			
835 - Filter Strip	A created or preserved area of vegetation designed to remove sediment and other pollutants and to enhance the infiltration of surface water runoff.	Significant decrease because of proper plant selection.	Significant decrease because of proper plant selection.	Slight decrease because of erosion control. Slight increase because of deposition within the filter strip.	Not applicable.	Not applicable.	Slight to moderate increase because of improved habitat for pests.			
840 - Grass-Lined Channel	A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation for stable conveyance of runoff.	Significant decrease because of proper plant selection and site modification.	Significant decrease because of proper plant selection.	Slight decrease because of erosion control. Slight increase because of deposition within the waterway.	Slight decrease because of improved farmability.	Not applicable.	Slight increase or decrease because of improved habitat for pests as well as beneficial organisms.			
841 - Impoundment Structure-Full Flow	A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.	Not applicable.	Not applicable.	Moderate to significant decrease when used to facilitate grazing management.	Slight to significant decrease when used to facilitate grazing management.	Not applicable.	Negligible.			

RESOURCE: PLANTS

Urban Conservation Practice Physical Effects

CONSIDERATIONS:		(1) QUANTITY		(2) CONDITION	(3) MANAGEMENT					
ASPECTS/ PROBLEMS		PLANTS ARE NOT WELL ADAPTED TO SITE	PLANTS ARE UNSUITABLE FOR INTENDED USE	HEALTH AND VIGOR	ESTABLISHMENT, GROWTH, AND HARVEST	NUTRIENT MANAGEMENT	PESTS (BRUSH, WEEDS, INSECTS, DISEASES, AND FUNGI)			
PRACTICE										
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PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
842 - Impoundment Structure-Routed	A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.	Not applicable.	Not applicable.	Moderate to significant decrease when used to facilitate grazing management.	Slight to significant decrease when used to facilitate grazing management.	Not applicable.	Negligible.			
847 - Infiltration Trench	An excavated trench filled with coarse granular material in which stormwater runoff is collected for temporary storage and infiltration.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			
850 - Inlet Protection - Block and Gravel	A sediment control barrier formed around a storm drain inlet by the use of standard concrete blocks and gravel.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			
855 - Inlet Protection - Excavated Drain	An excavated area in the approach to a storm drain drop inlet or curb inlet.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			
860 - Inlet Protection - Fabric Drop	A temporary fabric barrier placed around a drop inlet.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			

CONSIDERATIONS:		(1) QUANTITY		(2) CONDITION	(3) MANAGEMENT					
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PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
861 - Inlet Protection - Gravel & Wire Mesh	A temporary sediment control barrier formed around a storm drain inlet by the use of gravel and wire mesh.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
862 - Inlet Protection -Sod Filter	A sediment filter formed around a storm drain drop inlet by the use of sod.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
863 - Inlet Protection - Straw Bale Barrier	A temporary sediment control barrier formed around a storm drain drop inlet consisting of a row of entrenched and anchored straw bales.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
865 - Land Grading	Reshaping the ground surface to planned grades as determined by engineering survey evaluation and layout.	Slight to significant decrease because of improved water, soil, and air relationship.	Slight to significant decrease because of improved water, soil, and air relationship.	Slight to significant decrease because of improved water, soil, and air relationship.	Significant decrease because of improved water management.	Slight decrease because of improved soil, water, and air relationship.	Slight decrease because of uniformity of management.			
870 - Level Spreader	A device used to disperse concentrated runoff over the ground surface as sheet flow.	Slight to significant decrease due to change in soil moisture conditions.	Not applicable.	Slight decrease due to reduced plant damage and stress from uniformly dispersed water.	Negligible.	Not applicable.	Not applicable.			

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PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
875 - Mulching	The application of plant residues and other suitable materials to the soil surface.	Slight to moderate because of improved site conditions.	Not applicable.	Slight to moderate because of improved site conditions.	Slight to moderate because of improved site conditions.	Slight to moderate decrease because of increased infiltration and water use.	Negligible to slight decrease because of return of weed competition. Negligible to slight increase because of improved habitat for other pests.			
880 - Permanent Vegetation	Establishing permanent vegetative cover to stabilize disturbed or exposed areas.	Significant decrease because of proper plant selection and nutrient modification of site.	Significant decrease because of proper plant selection.	Significant decrease because of improved vegetation management and plant selection.	Significant decrease because of proper selection of plants and management.	Moderate to significant decrease because of properly managed plant needs.	Not applicable.			
890 - Permeable Pavement	A pavement consisting of materials having regularly interspersed void areas filled with pervious materials, such as vegetated soil, gravel or sand.	Slight decrease due to proper plant selection where void areas are filled with sod.	Slight decrease due to proper plant selection where void areas are filled with sod.	Slight decrease due to proper plant selection where void areas are filled with sod.	Slight decrease due to proper plant selection where void areas are filled with sod.	Moderate to significant decrease because of properly managed plant needs.	Not applicable.			
895 - Portable Sediment Tank	A compartmented container through which sediment-laden water is pumped to trap and retain the sediment.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			
900 - Right-of-Way Diversion	A ridge or ridge and channel constructed diagonally across a sloping road or utility right-of-way that is subject to erosion.	Slight to significant decrease because of change in available moisture.	Not applicable.	Slight to moderate decrease because of reduced stress from excess water.	Significant decrease because of improvement in area protected by diversion.	Not applicable.	Slight increase because of improved pest habitat on vegetated diversions.			

RESOURCE: PLANTS

Urban Conservation Practice Physical Effects

CONSIDERATIONS:		(1) QUANTITY		(2) CONDITION	(3) MANAGEMENT					
ASPECTS/ PROBLEMS		PLANTS ARE NOT WELL ADAPTED TO SITE	PLANTS ARE UNSUITABLE FOR INTENDED USE	HEALTH AND VIGOR	ESTABLISHMENT, GROWTH, AND HARVEST	NUTRIENT MANAGEMENT	PESTS (BRUSH, WEEDS, INSECTS, DISEASES, AND FUNGI)			
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PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
905 - Rock Check Dam	A small rock dam constructed across a grassed swale or road ditch.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
910 - Rock Outlet Protection	A section of rock protection placed at the outlet end of culverts, conduits, or channels.	Moderate to significant decrease because of site modification by structure and stabilization for vegetative establishment and growth.	Not applicable.	Negligible.	Moderate to significant decrease because of site modification by structure and stabilization for vegetative establishment and growth.	Not applicable.	Not applicable.			
920 - Silt Fence	A temporary barrier of entrenched geotextile fabric stretched across and attached to supporting posts used to intercept sediment-laden runoff from small drainage areas of disturbed soil.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			
925 - Sodding	Stabilization of fine graded disturbed areas by laying a continuous cover of grass sod.	Significant decrease because of proper plant selection and nutrient modification of site.	Significant decrease because of proper plant selection.	Significant decrease because of improved vegetative management and plant selection.	Significant decrease because of proper selection of plants and management.	Moderate to significant decrease because of properly managed plant needs.	Not applicable.			
930 - Stabilized Construction Entrance	A stabilized pad of aggregate underlain with filter fabric at any point where traffic enters or leaves a construction site to or from a public right-of-way, street, alley or parking area.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			

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PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
935 - Straw Bale Barrier	A temporary barrier of entrenched and anchored straw bales used to intercept sediment-laden runoff from small drainage areas of disturbed soil.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			
940 - Structural Streambank Stabilization	Stabilization of eroding streambanks by use of designed structural measures.	Slight to moderate decrease due to stabilized bank creating suitable site conditions for plant growth where vegetative plantings are included with structural measures.	Slight to moderate decrease due to stabilized bank creating suitable site conditions for plant growth where vegetative plantings are included with structural measures.	Slight to moderate decrease due to stabilized bank creating suitable site conditions for plant growth where vegetative plantings are included with structural measures.	Slight to moderate decrease due to stabilized bank creating suitable site conditions for plant growth where vegetative plantings are included with structural measures.	Not applicable.	Not applicable.			
945 - Subsurface Drain	A conduit, such as corrugated plastic tubing, tile, or pipe, installed beneath the ground surface to collect and/or convey drainage water.	Slight to significant increase for non-hydrophytic plants and significant decrease for hydrophytic plants because subsurface water is removed from the soil profile.	Not applicable.	Slight to significant increase for non-hydrophytic plants and significant decrease for hydrophytic plants because subsurface water is removed from the soil profile.	Slight to significant decrease because subsurface water is removed from the soil profile.	Not applicable.	Slight to moderate decrease in aquatic pests and significant increase in terrestrial pests because subsurface water is removed from the soil profile.			
950 - Sump Pit	A temporary pit constructed to trap and filter water for pumping into a suitable discharge area.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			
953 - Surface Roughening	A rough soil surface with horizontal grooves running across the slope on the contour, stair stepping, or tracking with construction equipment.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			

RESOURCE: PLANTS

Urban Conservation Practice Physical Effects

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PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
955 - Temporary Diversion	A temporary ridge or excavated channel or combination ridge and channel constructed across sloping land on a predetermined grade.	Slight to significant decrease because of change in available moisture.	Not applicable.	Slight to moderate decrease because of reduced stress from excess water.	Significant decrease because of improvement in area protected by diversion.	Not applicable.	Slight increase because of improved pest habitat on vegetated diversions.			
960 - Temporary Sediment Trap	A small temporary ponding basin formed by construction of an embankment or excavated basin.	Not applicable.	Not applicable.	Negligible to slight decrease below basin when trapped sediment is kept off field.	Negligible to slight decrease below basin when trapped sediment is kept off field.	Negligible.	Negligible to slight increase or decrease because of trapped seeds and/or weeds growing on the basin.			
965 - Temporary Seeding	Planting rapid-growing annual grasses or small grains to provide initial, temporary coverage for erosion control on disturbed areas.	Significant decrease because of proper plant selection and nutrient modification of site.	Significant decrease because of proper plant selection.	Significant decrease because of improved vegetative management and plant selection.	Significant decrease because of proper selection of plants and management.	Moderate to significant decrease because of properly managed plant needs.	Not applicable.			
970 - Temporary Slope Drain	A flexible tubing or rigid conduit extending temporarily from the top to the bottom of a cut or fill slope.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			
975 - Temporary Stream Crossing	A bridge, ford, or temporary structure installed across a stream or watercourse for short-term use by construction vehicles or heavy equipment.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			

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PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
980 - Temporary Swale	A temporary excavated drainage way.	Significant decrease because of proper plant selection and site modification.	Significant decrease because of proper plant selection.	Slight decrease because of erosion control. Slight increase because of deposition within the waterway.	Slight decrease because of improved farmability.	Not applicable.	Slight increase or decrease because of improved habitat for pests as well as beneficial organisms.			
981 - Topsoiling	Methods of preserving and using topsoil to enhance final site stabilization with vegetation.	Moderate to significant decrease because of selecting proper plants and soil modification.	Significant decrease because of selecting proper plants.	Significant decrease because of selecting proper plants and soil modification.	Moderate to significant decrease because of selecting proper plants and soil modification.	Slight to moderate decrease because of soil modification.	Negligible.			
984 - Tree and Forest Ecosystem Preservation	The preservation of contiguous stands of trees from damage during construction operations.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
985 - Tree and Shrub Planting	Planting of selected trees and shrubs.	Moderate to significant decrease because of proper species selection.	Moderate to significant decrease because of proper species selection.	Not applicable.	Moderate to significant decrease because of proper species selection and planting techniques.	Moderate to significant decrease because of application of needed plant nutrients.	Moderate to significant decrease because of control of pests for establishment of trees.			
990 - Tree Protection	The protection of individual trees from damage during construction operations.	Not applicable.	Not applicable.	Significant decrease due to reduced damage provided by protective measures.	Moderate to significant decrease due to reduced damage provided by protective measures.	Not applicable.	Negligible.			

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ASPECTS/ PROBLEMS		PLANTS ARE NOT WELL ADAPTED TO SITE	PLANTS ARE UNSUITABLE FOR INTENDED USE	HEALTH AND VIGOR	ESTABLISHMENT, GROWTH, AND HARVEST	NUTRIENT MANAGEMENT	PESTS (BRUSH, WEEDS, INSECTS, DISEASES, AND FUNGI)			
PRACTICE										
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Plants are not adapted to soil and climatic conditions of the area. (Select a better adapted species or modify site conditions.)	Plant of concern does not meet the needs and objectives of the manager, such as by providing quantity and quality of desired food or forage, controlling erosion, improved soil condition, conserving water, adding beauty, providing habitat for animals.	Plants do not manufacture sufficient plant food to continue the growth cycle or to reproduce.	The management scheme or plan does not provide the proper techniques and timing to meet the plant needs of establishment, growth, and harvest.	The correct amount of plant nutrients are not available to meet plant needs.	Pests are not managed to meet the needs of the plants of concern and the manager's objectives and resource management objectives.			
PRACTICE CODE AND NAME	OTHER EXPLANATIONS									
991 - Tree Protection - Augering	Underground construction such as utility work by augering (tunneling) through an individual tree's Critical Root Zone (CRZ).	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
995 - Vegetative Streambank Stabilization	The stabilization and protection of eroding streambanks with selected vegetation.	Significant decrease because of selection of adapted species and site modification.	Slight to significant decrease because of potential to introduce new plant type and stabilizes streambank for existing plants.	Negligible to moderate decrease because of improved environment for plant growth.	Negligible.	Negligible.	Negligible.			
996 - Well Decommissioning	The sealing and permanent closure of a water well, boring, or monitoring well.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			

RESOURCE: ANIMALS

Urban Conservation Practice Physical Effects

CONSIDERATIONS:		(1) HABITAT		(2) MANAGEMENT					
ASPECTS/ PROBLEMS		FOOD	COVER OR SHELTER	QUANTITY AND QUALITY OF DRINKING WATER	POPULATION/ RESOURCE BALANCE	ANIMAL HEALTH			
PRACTICE									
TYPE OF PRACTICE	RESOURCE PROBLEM/ CONSIDERATIONS DEFINITION	Quantity and quality of food are not provided to meet the seasonal requirements of the species of concern.	Adequate wildlife cover for the species of concern is not provided.	Adequate quantities of water of required quality are not provided for the species of concern.	Numbers and kinds of wildlife are not in balance with feed, forage, space, and habitat requirements.	Proper attention is not given to the health of the animal of concern. This includes considerations such as diseases, parasites, and insects.			
PRACTICE CODE AND NAME	OTHER EXPLANATIONS								
800 - Urban Stormwater Wetlands	A constructed system of shallow pools that create growing conditions for wetland plants to lessen the impacts of stormwater quality and quantity in urban areas.	Significant decrease because of establishment of adapted hydrophytes or upland food plants and maintenance of water quality.	Significant decrease because of establishment of adapted hydrophytes and nesting cover.	Slight to significant decrease because of creation and maintenance of impoundments.	Slight to significant decrease because of increased plant diversity and increased supply of needed food.	Moderate to significant decrease because of habitat improvement for wildlife. Moderate to significant increase because of insects, parasites, and diseases for domestic wildlife.			
806 - Construction Road Stabilization	The stabilization of temporary construction access routes, subdivision roads, on-site vehicle transportation roads, and construction parking areas with stone immediately after grading.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
808 - Culvert Inlet Protection	A temporary sediment filter located at the inlet to storm sewer culverts.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
815 - Diversion	A channel and supporting ridge constructed across the slope to collect and divert runoff.	Slight decrease because grass provides food source for wildlife on vegetated diversions.	Slight decrease because grass on vegetated diversions provides diversity, cover, and travel lanes.	Significant decrease because of increase in quantity where diversion diverts water to storage facility.	Slight decrease because of improvement in habitat.	Negligible.			
820 - Diversion Dike	A dike or dike and channel constructed along the perimeter of a disturbed construction area.	Negligible to slight decrease or increase because of water management.	Slight to moderate decrease because of vegetation diversity on dike and water management.	Negligible.	Slight to moderate decrease because of vegetation diversity on dike and water management.	Negligible.			

CONSIDERATIONS:		(1) HABITAT		(2) MANAGEMENT					
ASPECTS/ PROBLEMS		FOOD	COVER OR SHELTER	QUANTITY AND QUALITY OF DRINKING WATER	POPULATION/ RESOURCE BALANCE	ANIMAL HEALTH			
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PRACTICE CODE AND NAME	OTHER EXPLANATIONS								
825 - Dust Control	Controlling dust blowing and movement on construction sites and roads.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			
830 - Erosion Blanket	The application of a preformed protective blanket of straw or other plant residue, or plastic fibers formed into a mat, usually with a plastic mesh on one or both sides.	Negligible.	Negligible.	Not applicable.	Not applicable.	Not applicable.			
835 - Filter Strip	A created or preserved area of vegetation designed to remove sediment and other pollutants and to enhance the infiltration of surface water runoff.	Negligible to moderate decrease because of added plant diversity depending on size of area and species seeded.	Negligible to significant decrease because of improvements in cover depending on plant species, size, location and management.	Slight to significant decrease because of reduced sediment and other pollutants.	Negligible to slight decrease because of increased plant diversity and improved habitat quality.	Slight to moderate increase because of potential to add pollutants in food chain if forage from filter strips is consumed by wildlife.			
840 - Grass-Lined Channel	A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation for stable conveyance of runoff.	Negligible to significant decrease because of increase in food depending on size of area and species seeded.	Slight to significant decrease because of increase in vegetation depending on plant species, size, location and management.	Negligible to significant decrease because of reduction in runoff of sediment.	Slight to moderate decrease because of increase in forage availability and habitat quality.	Negligible.			
841 - Impoundment Structure-Full Flow	A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.	Slight to significant decrease because of distribution of wildlife for grazing and foraging on uplands. Provides food for some fish and some wildlife.	Slight to significant decrease because of increase in cover in pond area. Slight to significant increase if pond and surrounding area create concentration of animals.	Moderate to significant decrease because of providing water during critical periods.	Slight to significant decrease because of increase in habitat and forage use.	Slight to significant decrease because of improved water source. Slight to significant increase because of parasite problems caused by animal concentration.			

CONSIDERATIONS:		(1) HABITAT		(2) MANAGEMENT					
ASPECTS/ PROBLEMS		FOOD	COVER OR SHELTER	QUANTITY AND QUALITY OF DRINKING WATER	POPULATION/ RESOURCE BALANCE	ANIMAL HEALTH			
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PRACTICE CODE AND NAME	OTHER EXPLANATIONS								
842 - Impoundment Structure-Routed	A dam or excavation which creates an impoundment to collect and store debris, sediment, or water.	Slight to significant decrease because of distribution of wildlife for grazing and foraging on uplands. Provides food for some fish and some wildlife.	Slight to significant decrease because of increase in cover in pond area. Slight to significant increase if pond and surrounding area create concentration of animals.	Moderate to significant decrease because of providing water during critical periods.	Slight to significant decrease because of increase in habitat and forage use.	Slight to significant decrease because of improved water source. Slight to significant increase because of parasite problems caused by animal concentration.			
847 - Infiltration Trench	An excavated trench filled with coarse granular material in which stormwater runoff is collected for temporary storage and infiltration.	Slight to moderate decrease if area adjacent to pit or trench is established to permanent cover of mast producing plant species.	Slight to moderate decrease if area adjacent to pit or trench is established to permanent cover of mast producing plant species.	Slight decrease due to temporary water storage.	Slight to moderate decrease if area adjacent to pit or trench is established to permanent cover of mast producing plant species.	Negligible.			
850 - Inlet Protection - Block and Gravel	A sediment control barrier formed around a storm drain inlet by the use of standard concrete blocks and gravel.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			
855 - Inlet Protection - Excavated Drain	An excavated area in the approach to a storm drain drop inlet or curb inlet.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			
860 - Inlet Protection - Fabric Drop	A temporary fabric barrier placed around a drop inlet.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			

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PRACTICE CODE AND NAME	OTHER EXPLANATIONS								
861 - Inlet Protection - Gravel & Wire Mesh	A temporary sediment control barrier formed around a storm drain inlet by the use of gravel and wire mesh.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
862 - Inlet Protection -Sod Filter	A sediment filter formed around a storm drain drop inlet by the use of sod.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
863 - Inlet Protection - Straw Bale Barrier	A temporary sediment control barrier formed around a storm drain drop inlet consisting of a row of entrenched and anchored straw bales.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
865 - Land Grading	Reshaping the ground surface to planned grades as determined by engineering survey evaluation and layout.	Slight to significant increase because of changes in water regime and decreased diversity.	Slight to significant increase because of changes in water regime and decreased diversity.	Negligible to slight increase because of less water standing in field.	Slight to significant increase or decrease depending upon target species because of changes in water regime.	Negligible.			
870 - Level Spreader	A device used to disperse concentrated runoff over the ground surface as sheet flow.	Slight decrease if established to seed or forage producing plant species.	Slight to moderate decrease if established to plant species and managed to provide wildlife habitat.	Negligible.	Slight decrease if established to seed or forage producing plant species.	Negligible.			

RESOURCE: ANIMALS

Urban Conservation Practice Physical Effects

CONSIDERATIONS:		(1) HABITAT		(2) MANAGEMENT					
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PRACTICE CODE AND NAME	OTHER EXPLANATIONS								
875 - Mulching	The application of plant residues and other suitable materials to the soil surface.	Negligible.	Negligible.	Negligible to moderate decrease because of reduced sediment yield.	Not applicable.	Not applicable.			
880 - Permanent Vegetation	Establishing permanent vegetative cover to stabilize disturbed or exposed areas.	Slight to significant decrease because of revegetating depending on size of area and plant species selected.	Slight to moderate decrease because of increased vegetation.	Significant decrease because of reduced erosion and infiltration.	Slight to significant decrease because of increased habitat quality.	Slight decrease because of improved habitat and food supply.			
890 - Permeable Pavement	A pavement consisting of materials having regularly interspersed void areas filled with pervious materials, such as vegetated soil, gravel or sand.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			
895 - Portable Sediment Tank	A compartmented container through which sediment-laden water is pumped to trap and retain the sediment.	Not applicable.	Not applicable.	Slight to moderate decrease due to sediment trapping and removal.	Not applicable.	Not applicable.			
900 - Right-of-Way Diversion	A ridge or ridge and channel constructed diagonally across a sloping road or utility right-of-way that is subject to erosion.	Slight decrease because grass provides food source for wildlife on vegetated diversions.	Slight decrease because grass on vegetated diversions provides diversity, cover, and travel lanes.	Significant decrease because of increase in quantity where diversion diverts water to storage facility.	Slight decrease because of improvement in habitat.	Negligible.			

CONSIDERATIONS:		(1) HABITAT		(2) MANAGEMENT					
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PRACTICE CODE AND NAME	OTHER EXPLANATIONS								
905 - Rock Check Dam	A small rock dam constructed across a grassed swale or road ditch.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
910 - Rock Outlet Protection	A section of rock protection placed at the outlet end of culverts, conduits, or channels.	Negligible to moderate decrease because of stabilization.	Slight decrease because grass on vegetated diversions provides diversity, cover, and travel lanes.	Negligible to moderate decrease because of reduced sediment yield from channel source.	Slight decrease because of improvement in habitat.	Negligible.			
920 - Silt Fence	A temporary barrier of entrenched geotextile fabric stretched across and attached to supporting posts used to intercept sediment-laden runoff from small drainage areas of disturbed soil.	Not applicable.	Negligible to moderate decrease because of stabilization.	Slight to moderate decrease due to sediment trapping and removal.	Negligible.	Not applicable.			
925 - Sodding	Stabilization of fine graded disturbed areas by laying a continuous cover of grass sod.	Slight to significant decrease because of revegetating depending on size of area and plant species selected.	Slight to moderate decrease because of increased vegetation.	Significant decrease because of reduced erosion and infiltration.	Slight to significant decrease because of increased habitat quality.	Slight decrease because of improved habitat and food supply.			
930 - Stabilized Construction Entrance	A stabilized pad of aggregate underlain with filter fabric at any point where traffic enters or leaves a construction site to or from a public right-of-way, street, alley or parking area.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			

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PRACTICE CODE AND NAME	OTHER EXPLANATIONS								
935 - Straw Bale Barrier	A temporary barrier of entrenched and anchored straw bales used to intercept sediment-laden runoff from small drainage areas of disturbed soil.	Not applicable.	Not applicable.	Slight to moderate decrease due to sediment trapping and removal.	Not applicable.	Not applicable.			
940 - Structural Streambank Stabilization	Stabilization of eroding streambanks by use of designed structural measures.	Slight to significant decrease in food depending on whether vegetation treatment is used and species planted.	Slight to significant increase especially for vegetative streambank treatment or potential for vegetative treatment into or over structural treatment (riprap).	Negligible.	Negligible.	Negligible.			
945 - Subsurface Drain	A conduit, such as corrugated plastic tubing, tile, or pipe, installed beneath the ground surface to collect and/or convey drainage water.	Negligible to significant increase or decrease depending upon target species.	Negligible to significant increase or decrease because of change in vegetation.	Slight to significant increase because of removal of water. Slight to moderate decrease because of improved collection of ground water for conveyance to storage facility.	Negligible to significant increase or decrease because of changes in plant communities.	Negligible to significant decrease because of impact on pest habitat.			
950 - Sump Pit	A temporary pit constructed to trap and filter water for pumping into a suitable discharge area.	Not applicable.	Not applicable.	Slight to moderate decrease due to sediment trapping and removal and temporary water storage.	Not applicable.	Not applicable.			
953 - Surface Roughening	A rough soil surface with horizontal grooves running across the slope on the contour, stair stepping, or tracking with construction equipment.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			

RESOURCE: ANIMALS

Urban Conservation Practice Physical Effects

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PRACTICE CODE AND NAME	OTHER EXPLANATIONS								
955 - Temporary Diversion	A temporary ridge or excavated channel or combination ridge and channel constructed across sloping land on a predetermined grade.	Slight decrease because grass provides food source for wildlife on vegetated diversions.	Slight decrease because grass on vegetated diversions provides diversity, cover, and travel lanes.	Significant decrease because of increase in quantity where diversion diverts water to storage facility.	Slight decrease because of improvement in habitat.	Negligible.			
960 - Temporary Sediment Trap	A small temporary ponding basin formed by construction of an embankment or excavated basin.	Slight to moderate decrease when embankment is seeded to permanent cover.	Slight to moderate decrease when embankment is seeded to permanent cover.	Slight decrease if basin holds water and water is suited for use.	Not applicable.	Negligible to moderate increase because of concentration of pollutants.			
965 - Temporary Seeding	Planting rapid-growing annual grasses or small grains to provide initial, temporary coverage for erosion control on disturbed areas.	Slight to significant decrease because revegetating depending on size of area and plant species selected.	Slight to moderate decrease because of increased vegetation.	Significant decrease because of reduced erosion and infiltration.	Slight to significant decrease because of increased habitat quality.	Slight decrease because of improved habitat and food supply.			
970 - Temporary Slope Drain	A flexible tubing or rigid conduit extending temporarily from the top to the bottom of a cut or fill slope.	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Not applicable.			
975 - Temporary Stream Crossing	A bridge, ford, or temporary structure installed across a stream or watercourse for short-term use by construction vehicles or heavy equipment.	Not applicable.	Not applicable.	Slight decrease due to reduced sediment load delivery by vehicles and heavy equipment.	Not applicable.	Not applicable.			

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PRACTICE CODE AND NAME	OTHER EXPLANATIONS								
980 - Temporary Swale	A temporary excavated drainage way.	Negligible to significant decrease because of increase in food depending on size of area and species seeded.	Slight to significant decrease because of increase in vegetation depending on plant species, size, location, and management.	Negligible to significant decrease because of reduction of runoff of sediment and agricultural chemicals.	Slight to moderate decrease because of increase in forage availability and habitat quality.	Negligible.			
981 - Topsoiling	Methods of preserving and using topsoil to enhance final site stabilization with vegetation.	Moderate to significant decrease because of increased vegetation.	Moderate to significant decrease because of increased vegetation.	Slight to significant decrease because of reduced sediment yield, water management, and stabilization.	Slight to significant decrease because of vegetative cover.	Slight to significant decrease because of vegetative cover.			
984 - Tree and Forest Ecosystem Preservation	The preservation of contiguous stands of trees from damage during construction operations.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
985 - Tree and Shrub Planting	Planting of selected trees and shrubs.	Moderate to significant increase or decrease because of changes in vegetative types dependent on tree species planted, spacing of plantings, and animal species of concern.	Moderate to significant increase or decrease because of changes in vegetation types depend on tree species planted and animal species of concern.	Slight to significant increase or decrease because of effect on watershed hydrology dependent on number and location of trees planted.	Moderate to significant increase or decrease because of changes in vegetative types, dependent on tree species planted, spacing of plantings, and animal species of concern.	Moderate to significant increase or decrease because of changes in vegetative types, dependent on tree species planted, spacing of plantings, and animal species of concern.			
990 - Tree Protection	The protection of individual trees from damage during construction operations.	Slight to moderate decrease depending on species protected.	Slight to moderate decrease depending on species protected.	Slight to moderate increase or decrease due to effect on watershed hydrology depending on number of trees protected.	Slight to significant increase or decrease depending on tree species protected and animal species of concern.	Negligible.			

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PRACTICE CODE AND NAME	OTHER EXPLANATIONS								
991 - Tree Protection - Augering	Underground construction such as utility work by augering (tunneling) through an individual tree's Critical Root Zone (CRZ).	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			
995 - Vegetative Streambank Stabilization	The stabilization and protection of eroding streambanks with selected vegetation.	Slight to significant decrease in food depending on vegetation treatment used and species planted.	Slight to significant increase especially for vegetative streambank treatment.	Negligible.	Negligible.	Negligible.			
996 - Well Decommissioning	The sealing and permanent closure of a water well, boring, or monitoring well.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.	Not determined yet.			

SECTION 9 - REFERENCES

INTRODUCTION

This section contains selected references in the fields of stormwater management, floodplain management, soil erosion and sediment control, and wetland and stream protection. Several of the references were used in the preparation of previous editions of this manual. The references that were chosen to be included are representative of materials that could be reviewed if a unit of government, consultant, or private citizen was interested in learning more about these subjects, or wanted to develop guidance or a regulatory mechanism (e.g., ordinance) to address these issues.

As new conservation practice standards are added to the manual, specific references used to prepare the standards will be included within the standard itself.

This section was revised in October 2001.

NRCS IL October 2001

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SECTION 9 - REFERENCES

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SECTION 10 - GLOSSARY

There are many terms used today in erosion and sediment control, work in environmental quality, resource planning, and air and water quality programs that many people do not fully understand. This glossary contains some terms not used in this publication. An attempt has been made to assemble a list of terms used in the field of Natural Resource Conservation in addition to those found in this guide book to aid the users to have a better understanding of the subject. Many of the definitions were taken from Resource Conservation Glossary, 3rd edition, Soil Conservation Society of America, 1982.

Acid Soil - Soil with pH value of less than 7.0. The term generally is applied to the surface layers or root zone unless otherwise specified.

Acre-Foot - The volume of water that will cover one acre to a depth of one foot. One acre-foot contains 325,851 gallons.

Aerial Photograph - A photograph of the earth's surface taken from airborne equipment, sometimes called aerial photo or air photograph.

Aggradation - The process of building up a surface or channel by deposition; the opposite of degradation. The process is sometimes referred to as siltation.

Agricultural Land - Land in farms regularly used for agricultural production. The term includes all land devoted to crop or livestock enterprises, for example, the farmstead lands, drainage and irrigation ditches, water supply, cropland, and grazing land of every kind in farms.

Agronomic Practices - The soil and crop activities employed in the production of farm crops, such as selecting seed, seedbed preparation, fertilizing, liming, manuring, seeding, cultivation, harvesting, curing, crop sequence, crop rotations, cover crops, strip cropping, pasture development, etc.

Alluvial - Pertaining to material that is transported and deposited by running water.

Angle of Repose - The angle between the horizontal and the maximum slope that a soil assumes through natural processes.

Annual Flood - The highest peak discharge in a water year.

Anti-seep Collar - A device constructed around a pipe or other conduit placed through a dam, dike, or levee for the purpose of reducing seepage losses and piping failures.

Anti-vortex Device - A facility placed at the entrance to a pipe conduit structure such as a drop inlet spillway or hood inlet spillway to prevent air from entering the structure when the pipe is flowing full.

Apron - A floor or lining to protect a surface from erosion. For example, the pavement below chutes, spillways, or at the toes of dams.

Aquifer - A geologic formation or structure that transmits water in sufficient quantity to supply the needs for a water development. The term water-bearing is sometimes used synonymously with aquifer when a stratum furnishes water for a specific use. Aquifers are usually saturated sands, gravel, fractures, cavernous and vesicular rock.

Auxiliary Spillway - A dam spillway built to carry runoff in excess of that carried by the principal spillway.

Available Water-holding Capacity (soils) - The capacity to store water available for use by plants, usually expressed in linear depths of water per unit depth of soil. Commonly defined as the difference between the percentage of soil water at field capacity and the percentage at wilting point. This difference multiplied by the bulk density and divided by 100 gives a value in surface inches of water per inch depth of soil. See field capacity; wilting point.

Base Flow - The stream discharge from ground water runoff.

Bedding - The process of laying a drain or other conduit in its trench and tamping earth around the conduit to form its bed. The manner of bedding may be specified to conform to the earth load and conduit strength.

Bedload - The sediment that moves by sliding, rolling, or bounding on or very near the streambed; sediment moved mainly by tractive or gravitational forces or both but at velocities less than the surrounding flow.

Bedrock - The more or less solid rock in place either on or beneath the surface of the earth. It may be soft or hard and have a smooth or irregular surface.

Berm - A ledge or shelf that breaks the continuity of a slope, as a ledge across the face of a dam or the shoulder along a paved road.

Blind Drain - A type of drain consisting of an excavated trench refilled with previous materials, such as coarse sand, gravel or crushed stones, through whose voids water percolates and flows toward an outlet. Often referred to as a French drain because of its initial development and widespread use in France.

Borrow Area - A source of earth fill materials used in the construction of embankments or other earth fill structures.

Bottomlands - A term often used to define lowlands adjacent to streams (flood plains in rural areas).

Broadcast Seeding - Any method of planting seed that scatters the seed in a random pattern on the surface of the soil.

Cantilever Outlet - A discharge pipe extending beyond its support.

Cascades - Section of stream without pools consisting primarily of bedrock, rubble, gravel, or other such material. Current is usually more swift than in riffles.

Channel - A natural or artificial stream that conveys water. Channels are often further classified by their size and purpose. For example, there are primary and secondary channels based on size, but diversions, waterways, and chutes are also channels.

Channel Improvement - The improvement of the flow characteristics of a channel by clearing, excavating, realigning, lining, or other means in order to increase its capacity. The term is sometimes used to connote channel stabilization.

Channel Stabilization - Erosion prevention and stabilization of velocity distribution in a channel using jetties, drops, revetments, vegetation, and other measures.

Check Dam - Small dam constructed in a gully or other small water- course to decrease the streamflow velocity, minimize channel scour, and promote deposition of sediment.

Chiseling - 1. Performing tillage that breaks or loosens the soil without inverting it. 2. Tilling the soil with a chisel implement. The depth of chiseling is arbitrarily limited to 16 inches or less; beyond 16 inches, the tillage becomes subsoiling.

Chute - A high velocity, open channel for conveying water to a lower level without erosion.

Clay - 1. A soil textural class including particles less than 0.002 millimeters in diameter. 2. A fine-grained soil with a high plasticity index in relation to the liquid limits. 3. Soils with a high clay content which are difficult to excavate or till; sometimes called heavy soils.

Clearcutting (forestry) - A method of cutting that removes the entire timber stand on the area cut. Contrast with selective cutting.

Climate - The sum total of all atmospheric or meteorological influences, principally temperature, moisture, wind, pressure, and evaporation, which combine to characterize a region and give it individuality by influencing the nature of its land forms, soils, vegetation, and land use. Contrast with weather.

Climax Vegetation - Relatively stable vegetation in equilibrium with its environment and with good reproduction of the dominant plants.

Closed Drain - An underground pipe for intercepting and conveying water.

Compost - Organic residues, or a mixture of organic residues and soil, that have been piled and allowed to undergo biological decomposition.

Conduit - Any structure intended for the conveyance of water, whether open or closed.

Conservation - The protection, improvement, and wise use of natural resources according to nature's principles that will assure their highest environmental, economic and social benefits.

Conservation District - A public organization created under state enabling law or a special-purpose district to develop and carry out a program of soil, water, and related resource conservation, use, and development within its boundaries; usually a subdivision of state government with a local governing body and always with limited authorities. Often it is called a soil conservation district or a soil and water conservation district.

Contour - An imaginary line on the surface of the earth connecting points of the same elevation or a line drawn on a map connecting points of the same elevation. This term may include allowable deviations from the true contour.

Core Wall - A wall of masonry, sheet piling, or compacted earth placed near the center of a dam or embankment to reduce seepage.

Cradle - A device, usually concrete, used to support a pipe conduit.

Crest - 1. The top of a dam, dike, spillway or weir, frequently restricted to overflow portion. 2. The summit of a wave or peak of a flood.

Cubic Foot Per Second - The rate of fluid flow at which 1 cubic foot of fluid passes a measuring point in one second. Abbreviated as cfs. Syn. with second-foot and CUSEC.

Cut - 1. A portion of land surface or area from which earth has been removed or will be removed by excavation. 2. The depth below original ground surface to excavated surface.

Cut-and-Fill - The process of earth moving by excavating part of an area and using the excavated material for adjacent embankments or fill areas.

Cutoff - 1. A wall, collar, narrow excavation, or other structure, such as a trench, constructed along the centerline of a dam, dike, levee, or embankment, and filled with relatively impervious material intended to reduce seepage of water through porous strata. 2. In river hydraulics, the new and shorter channel formed either naturally or artificially when a stream cuts through the neck of a bend.

Dam - A barrier to confine, divert, or raise water for storage; to create a hydraulic head; to prevent gully erosion; or to retain sediment, rock, and other debris.

Debris - 1. A term applied to the loose material arising from the disintegration of rocks and vegetative material; transportable by streams, ice, or floods. 2. Stones, scrap material; stumps, limbs, and other undesirable vegetative material; waste and trash on a site.

Debris Basin - A basin constructed in a waterway or at other suitable locations to trap sediment and debris.

Degradation - To wear down through erosion, especially through stream action.

Demography - The statistical study of human vital statistics and population dynamics.

Design Highwater - The elevation of the water surface as determined by the flow conditions of the design floods.

Design Life - The period of time for which a facility is expected to perform its intended function.

Dike - An embankment constructed of earth or other suitable materials to protect land against overflow from streams, lakes, or tidal influences or to protect flat land areas from diffused surface water.

Discharge (hydraulics) - 1. Rate of flow, specifically fluid flow. 2. A volume of fluid passing a point per unit of time, commonly expressed as cubic feet per second, million gallons per day, gallons per minute, or cubic meters per second.

Diversion - A channel with a supporting ridge on the lower side constructed across a slope for the purpose of intercepting and diverting water.

Drain - 1. A buried pipe or other conduit (closed drain). 2. A ditch (open drain) for carrying off surplus surface water or ground water.

Drainage - 1. The removal of excess surface or ground water from land by means of surface or subsurface drains. 2. Soil characteristics that affect natural drainage.

Drainage Area - The land area from which water drains to a given point.

Drawdown - Lowering of the water surface (in open channel flow), water table, or piezometric surface (in groundwater flow) resulting from a withdrawal of water.

Drill (seeding) - A method of planting seed with an implement that places the seed in closely spaced rows on or slightly below the surface of the soil

Drop Inlet Spillway - An overfall structure in which the water drops through a vertical riser connected to a discharge conduit.

Drop Spillway - An overfall structure in which the water drops over a vertical wall onto an apron at a lower elevation.

Drop Structure - A structure for dropping water to a lower level and dissipating its surplus energy.

Dry Well - A pit or hole in the ground walled up with unmortared stone, concrete blocks, etc. so as to permit drainage into the ground. Normally dry.

Ecosystem - Energy-driven complex of a community of organisms and its controlling environment.

Effluent - 1. The discharge or outflow of water from ground or subsurface storage. 2. The fluids discharged from domestic, industrial, and municipal waste collection systems or treatment facilities.

Embankment - A man-made deposit of soil, rock, or other materials used to form an impoundment.

Emergency Spillway - A spillway used to carry runoff exceeding a given design flood.

Energy Dissipator - A device used to reduce the energy of flowing water.

Environment - The sum total of all the external conditions that may act on an organism or community to influence its development or existence.

Ephemeral Stream - A stream or portion of a stream that flows only in direct response to precipitation. It receives little or no water from springs and no long continued supply from snow or other sources. Its channel is at all times above the water table.

Erosion - 1. The wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep. 2. Detachment and movement of soil or rock fragments by water, wind, ice, or gravity. The following terms are used to describe different types of water erosion:

Accelerated Erosion - Erosion much more rapid than normal, natural, or geologic erosion, primarily as a result of the influence of the activities of man or, in some cases, of other animals or natural catastrophes that expose base surfaces, for example, fires.

Geological Erosion - The normal or natural erosion caused by geological processes acting over long geologic periods and resulting in the wearing away of mountains, the building up of floodplains, coastal plains, etc. Syn. natural erosion.

Gully Erosion - The erosion process whereby water accumulates in narrow channels and, over short periods, removes the soil from this narrow area to considerable depths, ranging from 1 to 2 feet to as much as 75 to 100 feet.

Natural Erosion - Wearing away of the earth's surface by water, ice, or other natural agents under natural environmental conditions of climate, vegetation, etc., undisturbed by man. Syn. geologic erosion.

Normal Erosion - The gradual erosion of land used by man that does not greatly exceed natural erosion. See natural erosion.

Rill Erosion - An erosion process in which numerous small channels only several inches deep are formed; occurs mainly on recently cultivated soils. See rill.

Sheet Erosion - The removal of a fairly uniform layer of soil from the land surface by runoff water.

Splash Erosion - The spattering of small soil particles caused by the impact of raindrops on wet soils. The loosened and spattered particles may or may not be subsequently removed by surface runoff.

Fauna - The animal life of a region.

Fertilizer - Any organic or inorganic material of natural or synthetic origin that is added to a soil to supply elements essential to plant growth.

Fertilizer Analysis - The percentage composition of a fertilizer expressed in terms of elemental nitrogen, phosphoric acid (P₂O₅) and potash (K₂O) or as elemental phosphorous (P) and potassium (K). Examples are 5-10-10, 10-10-10, 0-14-14, and 16-20-0. Minor elements are sometimes included also.

Filter Blanket - A layer of sand and /or gravel designed to prevent the movement of fine-grained soils.

Filter Strip - A long, narrow vegetative planting used to retard or collect sediment for the protection of diversions, drainage basins, or other structures.

Firm Soil - 1. A characteristic of soil between friable and hard 2. Soil that has been somewhat compressed by tillage operations when preparing a seedbed.

Flat - Section of stream with current too slow to be classed as a riffle and too shallow to be classed as a pool. Stream bottom usually composed of sand or finer materials, with coarse rubble, boulders, or bedrock occasionally evident.

Flood - An overflow or inundation that comes from a river or other body of water and causes or threatens damage.

Flood Control - Methods or facilities for reducing flood flows.

Flood Plain - The relatively flat area adjoining the channel of a natural stream that has been or may be hereafter, covered by floodwater.

Flood Routing - Determining the changes in the rise and fall of floodwater as it proceeds downstream through a valley or a reservoir.

Freeboard - The vertical distance between the maximum design water surface elevation and the top of a retaining bank or structure.

Frequency Curve - A graphical representation of the frequency of occurrence of specific events, such as flood peaks, precipitation amounts, annual or seasonal runoff, etc.

Friable Soil - Soil which is easily crumbled or tilled; a desirable characteristic of a soil often associated with good tilth but not necessarily with fertility.

Gabion - A galvanized wire basket filled with stone used for structural purposes. When fastened together used as retaining walls, revetments, slope protection and similar structures.

Gradation (geology) - The bringing of a surface or a streambed to grade, by running water. As used in connection with sedimentation and fragmental products for engineering evaluation, the term gradation refers to the frequency distribution of the various sized grains that constitute a sediment, soil, or other material.

Grade - 1. The slope of a road, channel, or natural ground. 2. Any surface prepared for the support of construction such as that for paving or laying a conduit.

Grade Stabilization Structure - A structure to stabilize the grade or to control head-cutting in natural or artificial channels.

Gradient - 1. Change of elevation, velocity, pressure, or other characteristics per unit length. 2. Slope or grade.

Grading - Any stripping, cutting, filling, stockpiling, or combination thereof which modifies the land surface.

Grass - Any member of the botanical family *Gramineae*; herbaceous plants with blade like leaves arranged in two ranks on a round to flattened stem. Common examples are fescue, bermudagrass, and bahiagrass. A term sometimes used to indicate a combination of grass and legumes grown for forage or turf purposes.

Grass Lined Channel - A natural or constructed waterway, usually broad and shallow, covered with erosion-resistant grasses, used to conduct surface water.

Ground Cover - Any vegetation producing mat on or just above the soil surface. In forestry, includes low-growing shrubs, vines, and herbaceous plants under the trees.

Gully - A channel or miniature valley cut by concentrated runoff but through which water commonly flows only during and immediately after heavy rains or during the melting of snow. A gully is a form of water erosion and is distinguished from a rill by the fact that it cannot be obliterated by normal farm tillage operations, whereas a rill can be eliminated by such tillage.

Gully Control Plantings - The planting of forage, legume, or woody plant seeds, seedlings, cuttings, or transplants in gullies to establish or re-establish a vegetative cover adequate to control runoff and erosion and incidentally produce useful products.

Habitat - The environment in which the life needs of a plant or animal are supplied.

Hard Seed - Live seed that is capable of growth but which is slow to germinate or start growth when growing conditions are optimum. This is due to the fact that the seeds do not readily absorb water or oxygen. Hard seed is especially common in the legume family.

Heavy Soil - A term often applied to soils which have a high silt or clay content and which are difficult to pulverize when tilled or excavated.

Heel-in - To store young trees and other plants in a temporary trench, covering the roots with soil, to keep them from drying out before they are permanently planted.

Helminths - A parasitic intestinal nematode.

Highway Erosion Control - The prevention and control of erosion in ditches, at cross drains, and on fills and road banks within a highway right-of-way. Includes vegetative practices and structural practices

Hood Inlet - A pipe entrance wherein the top edge of the pipe is extended 3/4 of the diameter beyond the bottom invert cut on an angle.

Hulled Seed - Seed from which the hull or other outer covering has been removed. Example: Hulled common Bermuda grass seed. Hulling usually reduces the amount of seed required to plant an area and encourages quick germination.

Hydraulic Radius - The cross-sectional area of a stream divided by its wetted perimeter. The "r" in Manning's formula.

Hydrograph - A graph showing for a given point on a stream or drainage system, the discharge, stage, velocity, or other property of water with respect to time.

Hydroseeding - A method of broadcasting seed and sometimes lime, fertilizer, and mulch together in a mixture of water.

Impact Basin - A device used to dissipate the energy of flowing water. Generally constructed of concrete in the form of a depressed and partially submerged vessel and may utilize baffles to dissipate velocities.

Inlet (hydraulics) - 1. A surface connection to a closed drain. 2. A structure at the diversion end of a conduit. 3. The upstream end of any structure through which water may flow.

Inoculant - A special culture of nitrogen-fixing bacteria used to treat legume seeds and thus ensure their nitrogen-fixing ability.

Intermittent Stream - A stream or portion of a stream that flows only in direct response to precipitation. It receives little or no water from springs and no long-continued supply

from melting snow or other sources. It is dry for a large part of the year, ordinarily more than 3 months.

Interseeding - Seeding into an established vegetation.

Invader Plant Species - Plant species that were absent in undisturbed portions of the original vegetation and will invade under disturbance or continued overuse. Commonly termed invaders.

Land - Any ground, soil, or earth including marshes, swamps, drainageways, and areas not permanently covered by water.

Land Capability - The suitability of land for use without permanent damage. Land capability, as ordinarily used in the United States, is an expression of the effect of physical land conditions, including climate, on the total suitability for use without damage for crops that require regular tillage, for grazing, for woodland, and for wildlife. Land capability involves consideration of (1) the risks of land damage from erosion and other causes and (2) the difficulties in land use owing to physical land characteristics, including climate.

Land Capability Class - One of the eight classes of land in the land capability classification of the Soil Conservation Service. These eight land capability classes, distinguished according to the risk of land damage or the difficulty of land use, are:

Land suitable for cultivation and other uses.

- I. Soils in class I have few limitations that restrict their use.
- II. Soils in class II have some limitations that reduce the choice of plants or require moderate conservation practices.
- III. Soils in class III have severe limitations that reduce the choice of plants or require special conservation practices, or both.
- IV. Soils in class IV have very severe limitations that restrict the choice of plants, require very careful management, or both.

Land generally not suitable for cultivation (without major treatment).

- V. Soils in class V have little or no erosion hazard but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover.

- VI. Soils in class VI have severe limitations that make them generally unsuited for cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.
- VII. Soils in class VII have very severe limitations that make them unsuited to cultivation and that restricts their use largely to grazing, woodland, or wildlife.
- VIII. Soils and landforms in class VIII have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, water supply, or aesthetic purposes.

Land Resource Area - An area of land reasonably alike in its relationship to agriculture with emphasis on combinations and/or intensities of problems in soil and water conservation, ordinarily larger than a land resource unit and smaller than a land resource region.

Landscape - All the natural features, such as fields, hills, forests, water, etc., that distinguish one part of the earth's surface from another part, usually that portion of land or territory which the eye can comprehend in a single view, including all of its natural characteristics.

Land Use Plan - A community plan outlining proposed future land uses and their distribution.

Land Use Planning - The process by which decisions are made on future land uses over extended time periods that are deemed to best serve the general welfare. These decisions are best made by considering the resource capability of the land to support the type of use planned. Decision-making authorities on land uses are usually vested in state and local governmental units, but citizen participation in the planning process is essential for proper understanding and implementation.

Legume - A member of the botanical family *Leguminosae*. Some well known legumes are peas, beans, clovers, and sericea. Most legumes have the ability to take nitrogen from the air for use by plants, and many are important food, forage, and low-maintenance ground cover plants.

Level Spreaders - A shallow channel excavation at the outlet end of a diversion with a level section for the purpose of diffusing the diversion outflow.

Lime (agricultural) - Usually ground limestone applied as a soil amendment to correct the acidity of soil and provide calcium for plant growth. Dolomitic lime also provides magnesium. Other materials used for lime include basic slag, marl, and ground shells.

Liming - The application of lime to land, primarily to reduce soil acidity and supply calcium for plant growth. Dolomitic limestone supplies both calcium and magnesium.

May also improve soil structure, organic matter content, and nitrogen content of the soil by encouraging the growth of legumes and soil microorganisms. Liming an acid soil to a pH value of about 6.5 is desirable for maintaining a high degree of availability of most of the nutrient elements required by plants.

Liquid Limit - The moisture content at which the soil passes from a plastic to a liquid state. In engineering, a high liquid limit indicated that the soil has a high content of clay and a low capacity for supporting loads.

Loam - Technically, a soil textural class; but also a term used to designate topsoil, fertile and friable soils, and soils which are easily tilled.

Manning's Formula (hydraulics) - A formula used to predict the velocity of water flow in an open channel or pipeline:

$$V = \frac{1.486 r^{2/3} s^{1/2}}{n}$$

Where **V** is the main velocity of flow in feet per second, **r** is the hydraulic radius; **s** is the slope of the channel in feet per foot, and **n** is the roughness coefficient or retardance factor of the channel lining.

Marking Trees - Selection and indication, usually by blaze or paint spot, of trees to be cut or retained in a cutting operation.

Marsh - Periodically wet or continually flooded area with the surface not deeply submerged. Covered dominantly with sedges, cattails, rushes, or other hydrophytic plants. Subclasses include freshwater and saltwater marshes. See swamp; miscellaneous land type.

Meadow - An area of natural or planted vegetation dominated by grasses and grass-like plants used primarily for hay production.

Mine Dumps - Areas covered with overburden and other waste materials from ore and coal mines, quarries, and smelters, usually with little or no vegetative cover. A miscellaneous land type.

Mineral Soil - A soil consisting predominantly of, and having its properties determined predominantly by, mineral matter, usually containing less than 20 percent organic matter but sometimes containing an organic surface layer up to 30 centimeters thick. See organic soil.

Mulch or Mulching - Plant residues, natural, artificial, or other materials spread on the soil to reduce erosion, promote plant growth, conserve moisture, and to minimize temperature fluctuation.

Native Species - A species that is a part of an area's original fauna or flora.

Natural Area - 1. An area set aside indefinitely to preserve a representative unit of a major forest, range, or wetland type primarily for the purposes of science, research, or education. 2. A site or area in its natural state undisturbed by man's activities.

Natural Grassland - An area in which the natural potential plant community is dominated by grasses and grass-like plants. Associated species include forbs and woody plants.

Natural Revegetation - Natural re-establishment of plants; propagation of new-plants over an area by natural processes.

Neutral Soil - A soil that is neither acid nor alkaline; specifically, a soil with a pH of 7.0, but often those with a pH ranging between 6.6 and 7.3.

Nurse Crop - A fast-growing crop grown with a slow-growing crop to provide quick or temporary cover. An example is fast-growing rye planted with a slow-growing bahiagrass. Nurse crops are competitive and must be used with discretion.

Outfall - The point where water flows from a conduit, stream, or drain.

Outlet - The point of water disposal from a stream, river, lake, tidewater, or artificial drain.

Overfall - 1. An abrupt change in stream channel elevation. 2. The part of a dam or weir over which water flows.

Peak Discharge - The maximum instantaneous flow from a given storm condition at a specific location.

Periphyton - Plants growing on other plants, twigs, and stones in water.

Permissible Velocity (hydraulics) - The highest velocity at which water may be carried safely in a channel or other conduit.

pH - A numerical measure of the hydrogen ion concentration in the soil; a term used to indicate the acidity (pH below 7.0) or alkalinity (pH above 7.0) of soil. See acid soil.

Pipe Drop - A circular conduit used to convey water down steep grades.

Plant Material Center - A place where plants are assembled and their value and use in a conservation program is determined. This includes both domestic collections and plant introductions. Plants are assembled; their performance is evaluated; selections are made and increased for field testing; varieties are named and released; and foundation-quality seed and/or stock is produced and distributed to cooperative seed growers and nurseries for commercial production and use.

Plant Succession - The process of vegetation development whereby an area becomes successively occupied by different plant communities of higher ecological order.

Plasticity Index - The moisture content at which a soil changes from a semi-solid to a plastic state.

Playa - A shallow central basin of a plain where water gathers after a rain and is evaporated.

Plunge Pool - A device used to dissipate the energy of flowing water that may be constructed or made by the action of flowing. These facilities may be protected by various lining materials.

Pool - Section of stream deeper and usually wider than normal with appreciably slower current than immediate upstream or downstream areas, and possessing adequate cover (sheer depth or physical condition) for protection of fish. The stream bottom is usually a mixture of silt and coarse sand.

Principal Spillway - Generally constructed of permanent material and designed to regulate the normal water level, provide flood protection and reduce the frequency of operation of the emergency spillway.

Pure Live Seed - The product of the percentage of germination plus the hard seed and the percentage of pure seed, divided by 100.

Rainfall Intensity - The rate at which rain is falling at any given instant, usually expressed in inches per hour.

Recreation Area Planting - Establishing grasses, legumes, vines, shrubs, trees, or other plants on recreation areas.

Recreation Area Stabilization - Stabilizing recreation areas subject to heavy use by surfacing with suitable materials or by installing needed structures.

Recreation Land - Land and water used or usable primarily as sites for outdoor recreation facilities and activities.

Recreation Land Grading and Shaping - Altering the surface of land to meet the requirements of recreation facilities.

Recreation Trail and Walkway - A pathway prepared especially for pedestrian, equestrian, and cycle travel.

Renewable Natural Resources - Can be restored and improved to produce the things man needs.

Revetment - Facing of stone or other material, either permanent or temporary, placed along the edge of a stream to stabilize the bank and to protect it from the erosive action of the stream.

Ridge - The bank or dike constructed on the downslope side of a diversion.

Riffle - Section of stream containing gravel or rubble, in which surface water is at least slightly turbulent and current, is swift enough that the surface of the gravel and rubble is kept fairly free from sand and silt.

Rill - Small, intermittent water course with steep sides, usually only a few inches deep and, hence, no obstacle to tillage operations.

Riparian Rights - The rights of an owner whose land abuts water. They differ from state to state and often depend on whether the water is a river, lake, or ocean. See water rights.

Riprap - Broken rock, cobbles, or boulders placed on earth surfaces, such as the face of a dam or the bank of a stream, for protection against the action of water.

Riser - The inlet portion of a drop inlet spillway that extends vertically from the pipe conduit and controls the water surface elevation.

River Basin Plan - A plan for development of water and related land resources to make the best use of such resources to meet the basin needs and make the greatest long-term contribution to the economic growth and social well being of the people of the basin and the nation.

Root Zone - The part of the soil that is penetrated or can be penetrated by plant roots.

Roughness Coefficient (hydraulics) - A factor in velocity and discharge formulas representing the effect of channel roughness on energy losses in flowing water. Manning's "n" is a commonly used roughness coefficient.

Runoff - That portion of the precipitation that makes its way toward stream channels, lakes, or oceans as surface or subsurface flow. When the term "runoff" is used alone, surface runoff usually is implied.

Rural Beautification - Creating, enhancing, and preserving natural beauty in the countryside.

Sand - 1. A soil textural class including soil particles between 0.05 and 2.0 millimeters in diameter. 2. A term sometimes used to indicate sediment.

Scalping - Removal of sod or other vegetation in spots or strips.

Scarified Seed - Seed that has had the hard outer coat scuffed or otherwise treated to improve absorption of moisture and thus facilitate germination. Example: scarified sericea lespedeza seed. Scarified seed require lower seeding rates than unscarified seed, but must be planted closer to optimum seeding dates.

Scarify - To abrade, scratch, or modify the surface. For example, to scratch the impervious seed coat of hard seed or to break the surface of the soil with a narrow-bladed implement.

Scour - To abrade and wear away. Used to describe the wearing away of terrace or diversion channels or streambeds.

Sediment - Solid soil material, both mineral and organic, that is being moved or has been moved from its original site by wind, gravity, flowing water or ice. Also, sometimes referred to as silt or sand.

Sediment Basin - A depression formed by the construction of a barrier or dam built at suitable locations to retain rock, sand, gravel, silt or other material.

Sediment Discharge - The quantity of sediment, measured in dry weight or by volume, transported through a stream cross-section in a given time. It consists of both suspended load and bed-load.

Seedbed - Soil prepared to receive seed and promote the growth of seedlings. The term may apply also to prepared soil in which plants are to be planted by sprigging, sodding, or other means.

Seed Purity - The percentage of the desired species in relation to the total quantity, including other species, weed seed, and foreign matter.

Sheet Flow - Water, usually storm runoff, flowing in a thin layer over the ground surface. Syn. overland flow.

Shrub - A woody perennial plant differing from a perennial herb by its more woody stems and from a tree by its low stature and habit of branching from the base. There is no definite line between herbs and shrubs or between shrubs and trees; all possible intergradations occur.

Side Slopes - The slopes of the sides of a canal, dam, or embankment.

Silt - 1. A soil textural class including soil particles between 0.05 and 0.002 millimeters in diameter. 2. A term often used to indicate sediment.

Sink - Depression in the land surface; a negative potential area, as in a source and a sink.

Site (ecology) - 1. An area considered for its ecological factors with reference to capacity to produce vegetation; the combination of biotic, climatic, and soil conditions of an area. 2. An area sufficiently uniform in soil, climate, and natural biotic conditions to produce a particular climax vegetation.

Sod - 1. Established grass, turf, or sward. 2. Thin rectangles, strips or pieces of earth and matted grass roots and stems that are transplanted to establish grass cover.

Sod Grasses - Stoloniferous or rhizomatous grasses that form a sod or turf.

Soil - The unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.

Soil Horizon - A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes.

Soil Profile - A vertical cross-section of soil layers constitutes the soil profile, which is composed of three major layers designated, A, B, and C horizons. The A and B horizons are layers that have been modified by weathering, while the C horizon is unaltered by soil-forming processes.

A horizon: The original top layer of soil having the same color and texture throughout its depth. It is usually 10 to 12 inches thick but may range from 2 inches to 2 feet. The A horizon is also referred to as the topsoil or surface soil when erosion has not taken place.

B horizon: The soil layer just below the A horizon that has about the same color and texture throughout its depth. It is usually 10 to 12 inches thick but may range from 4 inches to 8 feet. The B horizon is also referred to as the subsoil.

C horizon: The soil layer just below the B horizon having about the same color and texture throughout its depth. It is quite different from the B horizon. It may be of indefinite thickness. At the beginning of the soil profile development, the C horizon constituted the entire depth, but time, weather, and soil-forming processes have changed the top layers into the A and B horizons described above.

Spillway - An open or closed conduit used to convey water from a reservoir.

Spillway (emergency) - A spillway used to carry runoff exceeding a given design flood; commonly, a channel around the end of a dam built to carry off excess floodwaters.

Spillway (primary) - A spillway used to convey the runoff of a given designed flood; commonly, a metal pipe or concrete riser connected to a closed conduit under a dam which discharges runoff from a given flood.

Sprig - Portions of stems and roots of grasses that are planted to provide rapid ground cover or assure trueness to type.

Sprigging - The planting of a portion of the stem and root of grass.

Sprinkler Systems - All sprinkler lines, main lines, submains, pumping plant, operation control equipment, and other accessories required for applying water to a field by the sprinkler method.

Stabilized Center Section - An area in the bottom of a grassed waterway protected by stone, asphalt, concrete, or other materials to prevent erosion.

Stilling Basin - An open structure or excavation at the foot of an overfall, chute, drop, or spillway to reduce the energy of the descending stream.

Stone Center - A stabilized center section made of stone.

Storm Frequency - An expression or measure of how often a hydrologic event of given size or magnitude should on an average be equaled or exceeded. The average should be based on a reasonable example.

Streambanks - The usual boundaries (not the flood boundaries) of a stream channel. Right and left banks are indicated when facing downstream.

Subsoil - The layers of soil beneath the topsoil. A term sometimes used to indicate soil of low quality for vegetative purposes.

Succession - The progressive development of vegetation toward its highest ecological expression, the climax; replacement of one plant community by another.

Suitable Outlet - An outlet, either natural or artificial, that will dispose of water at non-erosive velocities and without flooding.

Temporary Protection - Stabilization of erosive or sediment-producing areas.

Tidal Marsh - A low, flat area traversed by interlacing channels and tidal sloughs and periodically inundated by high tides. Vegetation usually consists of salt-tolerant plants.

Toe Drain - A drainage system constructed in the downstream portion of an earth dam or levee to prevent excessive hydrostatic pressures.

Topsoil - 1. A vague term applied to the upper layer of soil. 2. The "plow layer" or upper 6 to 8 inches of soil. 3. The "A" horizons of a soil. 4. A term used to indicate friable, fertile soil applied over other soil to improve conditions for plant growth.

Toxic Salt Reduction - Decreasing harmful concentrations of toxic salts in soils, usually by leaching and with, or without, the addition of soil amendments.

Trash Rack - A structural device used to prevent debris from entering a spillway or other hydraulic structure.

Tributary - Secondary branch of a stream, drain, or other channel that contributes flow to the primary or main channel.

Unhulled Seed - Seed from which the hull or outer covering has not been removed. Example: Unhulled Bermudagrass seed. Unhulled seed can sometimes be used to an

advantage but is slower to germinate and requires a higher seeding rate than hulled seed.

Unified Soil Classification System - A classification system based on the identification of soils according to their particle size, gradation, plasticity index, and liquid limit.

Universal Soil Loss Equation - An equation used for the design of water erosion control systems: $A = RKLSPC$ wherein **A** = average annual soil loss in tons per acre per year; **R** = rainfall factor; **K** = soil erodibility factor; **L** = length of slope; **S** = percent of slope; **P** = conservation practice factor; and **C** = cropping and management factor. (**T** = soil loss tolerance value that has been assigned each soil, expressed T/A/Year.)

Unscarified Seed - Seed that has not had the hard outer coat scuffed or otherwise treated to improve germination. Example: unscarified sericea lespedeza. Unscarified seed will germinate but exposure to winter temperatures or special treatment is necessary to break its dormancy. This is an advantage when an area must be seeded "off season."

Uplift Forces - Vertical pressures acting upward on a structure, usually caused by a buoyant condition.

Vegetative Cover - All plants of all sizes and species found on an area, irrespective of whether they have forage or other value. Syn. plant cover.

Vegetative Protection - Stabilization of erosive or sediment producing areas by covering the soil with:

- a. Permanent seeding, producing long-term vegetative cover.
- b. Short-term seeding, producing temporary vegetative cover.
- c. Sodding, producing areas covered with a turf of perennial sod-forming grass.

Velocity - The rate of flow measured in feet per second.

Watercourse - A natural or constructed channel for the flow of water.

Water Disposal System - A complete system for safely removing excess water from land. On sloping lands, a system may include diversions, grassed waterways, grade stabilization structures, and other practices. Systems on flat lands may consist of surface or subsurface drains, land leveling, and other measures.

Water Rights - The legal rights to the use of water. They consist of riparian rights and those acquired by appropriation and prescription. Riparian rights are those rights to use and control water by virtue of ownership of the bank or banks. Appropriated rights are those acquired by an individual to the exclusive use of water, based strictly on priority of appropriation and application of the water to beneficial use and without limitation of the place of use to riparian land. Prescribed rights are those to which legal title is acquired by long possession and use without protest of other parties.

Watershed - See Drainage Area.

Watershed Area - All land and water within the confines of a drainage divide or a water problem area consisting in whole or in part of land needing drainage or irrigation.

Watershed Management - The use, regulation, and treatment of water and land resources of a watershed to accomplish stated objectives.

Water Table - The upper surface of ground water or the level below which the soil is saturated with water.

Waterway - A natural or constructed channel for the safe disposal of excess water from a field or diversion. Waterways are usually located on sloping ground and must be established in grass to prevent erosion.

Weep-holes (engineering) - Openings left in retaining walls, aprons, linings, or foundations to permit drainage and reduce pressure.

Wetted Perimeter - The length of the wetted contact between a liquid and its containing conduit, measured along a plane at right angles to the direction of flow.

Windbreak - 1. A living barrier of trees or combination of trees and shrubs located adjacent to farm or ranch headquarters and designed to protect the area from cold or hot winds and drifting snow. Also headquarters and livestock windbreaks. 2. A narrow barrier of living trees or combination of trees and shrubs, usually from one to five rows, established within or around a field for the protection of land and crops. May also consist of narrow strips of annual crops, such as corn or sorghum.

Wind Erosion - The detachment and transportation of soil by wind.

Wind Erosion Equation - An equation used for the design of wind erosion control systems. $E = f(IKCLV)$ wherein **E** = average annual soil loss, expressed in tons per acre per year; **f** = a function of; **I** = soil erodibility; **K** = soil ridge roughness; **C** = climatic factor; **L** = unsheltered distance across the field along the wind erosion direction; and **V** = vegetative cover.

Woodland - Any land used primarily for growing trees and shrubs. Woodland includes, in addition to what is ordinarily termed "forest" or "forest plantations," shelterbelts, windbreaks, wide hedgerows containing woodland species for wildlife food or cover, stream and other banks with woodland cover, etc. It also includes farmland and other lands on which woody vegetation is to be established and maintained.

Zoning (rural) - A means by which governmental authority is used to promote the proper use of land under certain circumstances. This power traditionally resides in the state, and the power to regulate land use by zoning is usually delegated to minor units of government, such as town, municipalities, and counties, through an enabling act that specifies powers granted and the conditions under which these are to be exercised.

Zoning Ordinance – An ordinance based on the police power of government to protect the public health, safety, and general welfare. It may regulate the type of use and intensity of development of land and structures to the extent necessary for a public purpose. Requirements may vary among various geographically defined areas called zones. Regulations generally cover such items as height and bulk of buildings, density of dwelling units, off-street parking, control of signs, and use of land for residential, commercial, industrial, or agricultural purposes. It may also contains provisions to protect natural resources, such as soil erosion and sediment control, and protection of steep slopes, trees, and wetlands. A zoning ordinance is one of the major methods for implementation of the comprehensive plan.

APPENDIX A - NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMITS FOR CONSTRUCTION SITE STORM WATER DISCHARGES

INTRODUCTION

This appendix contains information on the National Pollutant Discharge Elimination System (NPDES) permits for construction site storm water discharges in the state of Illinois. It contains a general overview of the program, the NPDES Permit No. ILR10 Construction Site Activities, the Notice of Intent (NOI) form, the Incidence of Non-Compliance (ION) form, and the Notice of Termination (NOT) form. The NOI, ION, and NOT forms are in a read-only pdf file format, but word fillable forms are available on the CD in the IEPA Fillable Forms folder.

These materials have been provided by the Illinois Environmental Protection Agency (EPA) who is responsible for administering the program in Illinois. Questions about the program should be directed to the Illinois EPA-Division of Water Pollution Control - Permit Section #15, Bureau of Water, 1021 North Grand Avenue East, P.O. Box 19276, Springfield, IL 62794-9276, phone 217-782-0610, fax 217-782-9891.

The Permit Section website contains information on when a permit is needed, forms, and a list of contacts at Illinois EPA: <http://www.epa.state.il.us/water/permits/waste-water/index.html>

The NPDES Permit No. ILR10, and the NOI, ION, and NOT forms are in a read-only format.

This section was updated in April 2000.

NRCS IL April 2000

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NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMITS FOR CONSTRUCTION SITE STORM WATER DISCHARGES

General

Under the provisions of the Clean Water Act Amendments of 1987 and the federal regulations at 40 CFR Part 122.26(b)(14)(x), operators of construction sites are required to have NPDES permits for the discharge of storm water except "...operations that result in the disturbance of less than five acres of total land area which are not part of a larger common plan of development or sale." The following are the definitions that the United States Environmental Protection Agency (USEPA) uses for "operators" and "part of a larger common plan of development or sale".

- The operator is determined by who has day to day supervision and control of the activities occurring at a site. In some cases, the operator may be the owner or the developer; at other sites the operator may be the general contractor. The operator is responsible for applying for the permit. In the case of construction, the owner may submit an application for a construction activity if the operators have not yet been identified. However, once the operators have been identified, they must become either sole permittees or co-permittees with the owner.
- A "larger common plan of development or sale" is a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one plan. For example, if a developer buys a 20 acre lot and builds roads, installs pipes, and runs electricity with the intention of constructing homes or other structures sometime in the near future, this would be considered a common plan of development or sale. If the land is parceled off or sold, and construction occurs on plots that are less than five acres by separate, independent builders, this activity still would be subject to storm water permitting requirements because USEPA considers it to be part of a larger plan of development (please note that the homes must have been included on the original site plan in order to trigger permit application requirements).

The Illinois General Permit for Construction Site Storm Water Discharges

The Illinois Environmental Protection Agency has issued an NPDES general permit for discharges from construction site activities. The major features of the Illinois permit are the following:

- The permit can authorize all discharges of storm water from construction sites anywhere in Illinois regardless of the size of the site.
- Part II of the permit contains detailed instructions on how to apply for coverage under the permit.
- The permit requires each construction site to have a storm water pollution prevention plan prior to the start of construction. Part IV of the permit contains information on how to develop a plan, what elements must be included in the plan, and what the periodic inspection requirements are.

- A copy of the storm water pollution prevention plan must be retained at the construction site from the date of project initiation to the date of final stabilization.
- The permittee is required to have qualified personnel inspect the disturbed areas of the construction site that have not been finally stabilized, structural control measures, and locations where vehicles enter or exit the site at least once every seven calendar days and within 24 hours of the end of a storm that is 0.5 inches of rain or greater or an equivalent snowfall.
- The permittee is required to submit within 5 days an "Incidence of Noncompliance" (ION) report for any violation of the storm water pollution prevention plan observed during an inspection conducted, including those not required by the Plan. The submission is required to be on an ION form and must include specific information on the cause of noncompliance, actions which were taken to prevent any further incidents of noncompliance, and a statement detailing any environmental impact which may have resulted from the noncompliance
- The storm water pollution prevention plan, inspection records and other information must be retained for a period of at least three years from the date that the site is finally stabilized.
- The permit expires on May 31, 2003, but site operators covered by the permit do not have to apply for coverage under the reissued permit since discharges covered under the expiring permit are automatically covered under the reissued permit.

The Phase II Storm Water Program

On December 8, 1999 USEPA published final regulations for Phase II of the NPDES storm water program. The new regulations reduce the size of sites that are required to have permits from five acres or more to one acre or more. The larger common plan of development or sale requirement remains unchanged, so a construction project that is less than one acre would need a permit if it was part of a larger common plan of development or sale that would ultimately result in the disturbance of one acre or more. The one acre requirement is effective as of March 10, 2003, and operators of construction sites that result in a total land disturbance of one acre or more must apply for permit coverage on or before March 10, 2003.

How to Obtain Coverage Under the Permit

To obtain coverage under the permit the operator must complete the one-page Notice of Intent (NOI) form, sign it, and send the original signed copy to the Illinois EPA. Unless notified by the Agency to the contrary, coverage under the permit is automatic, and operators are authorized to discharge storm water from construction sites under the terms and conditions of the permit either:

- 48 hours after the date the NOI is postmarked, if the project had established compliance with Illinois law regarding historic preservation and endangered species prior to submittal of the NOI;

or

- 30 days after the date the NOI is postmarked, if the project had not established compliance with Illinois historic preservation and endangered species requirements prior to submittal of the NOI.

The Agency will confirm the permit coverage and the project's permit number by letter approximately one week after the automatic coverage takes effect.

Termination of Coverage Under the Permit

After the land disturbing activities are complete and the site has been finally stabilized the operator should terminate his coverage under the permit by completing a Notice of Termination form and submitting it to the Agency. USEPA considers that a site has been finally stabilized when all land disturbing activities are complete and a uniform perennial vegetative cover with a density of 70 percent of the cover for unpaved areas and areas not covered by permanent structures has been established or equivalent permanent stabilization measures have been used.

NPDES Permit No. ILR10

Pollution Prevention Plan
Illinois Environmental Protection Agency
Division of Water Pollution Control
1021 North Grand East
Post Office Box 19276
Springfield, Illinois 62794-9276

CONSTRUCTION SITE ACTIVITIES

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) Storm Water Permit

Expiration Date: May 31, 2003

Issue Date: May 14, 1998

Effective Date: June 1, 1998

In compliance with the provisions of the Illinois Environmental Protection Act, the Illinois Pollution Control Board Rules and Regulations (35 Ill. Adm. Code, Subtitle C, Chapter I), and the Clean Water Act, and the regulations thereunder the following discharges are authorized by this permit, in accordance with the conditions and attachments herein:

Thomas G. McSwiggin, P.E.
Manager, Permit Section
Division of Water Pollution Control

Part I. COVERAGE UNDER THIS PERMIT

A. **Permit Area.** The permit covers all areas of the State of Illinois with discharges to any waters of the State.

B. **Eligibility.**

1. This permit shall authorize all discharges of storm water associated with industrial activity from construction sites, (those sites or common plans of development or sale that will result in the disturbance of five or more acres total land area), (heretofore referred to as storm water discharges from construction activities) occurring after the effective date of this permit (including discharges occurring after the effective date of this permit where the construction activity was initiated before the effective date of this permit), except for discharges identified under paragraph I.B.3 (Limitations on Coverage).
2. This permit may only authorize a storm water discharge associated with industrial activity from a construction site that is mixed with a storm water discharge from an industrial source other than construction, where:
 - a. the industrial source other than construction is located on the same site as the construction activity;
 - b. storm water discharges associated with industrial activity from the areas of the site where construction activities are occurring are in compliance with the terms of this permit; and
 - c. storm water discharges associated with industrial activity from the areas of the site where industrial activity other than construction are occurring (including storm water discharges from dedicated asphalt plants and dedicated concrete plants) are covered by a different NPDES general permit or individual permit authorizing such discharges.
3. **Limitations on Coverage.** The following storm water discharges from construction sites are not authorized by this permit:
 - a. storm water discharges associated with industrial activity that originate from the site after construction activities have been completed and the site has undergone final stabilization.
 - b. discharges that are mixed with sources of non-storm water other than discharges identified in Part III.A (Prohibition on Non-Storm Water Discharges) of this permit and in compliance with paragraph IV.D.5 (Non-Storm Water Discharges) of this permit.
 - c. storm water discharges associated with industrial activity that are subject to an existing NPDES individual or general permit or which are issued a permit in accordance with Part VI.N (Requiring an Individual Permit or an Alternative General Permit) of this permit. Such discharges may be authorized under this permit after an existing permit expires provided the existing permit did not establish numeric limitations for such discharges; and
 - d. storm water discharges from construction sites that the Agency has determined to be or may reasonably be expected to be contributing to a violation of a water quality standard.

- e. Storm water discharges that the Agency, at its discretion, determines are not appropriately authorized or controlled by this general permit.

C. Authorization.

1. In order for storm water discharges from construction sites to be authorized to discharge under this general permit a discharger must submit a Notice of Intent (NOI) in accordance with the requirements of Part II below, using an NOI from provided by the Agency, or be covered by a valid Illinois General NPDES Construction Site Activities Permit.
2. Where a new operator (contractor) is selected after the submittal of an NOI under Part II below, a new Notice of Intent (NOI) must be submitted by the owner in accordance with Part II.
3. For projects that have complied with State law on historic preservation and endangered species prior to submittal of the NOI, through coordination with the Illinois Historic Preservation Agency and the Illinois Department of Natural Resources or through fulfillment of the terms of interagency agreements with those agencies, the NOI shall indicate that such compliance has occurred.

Unless notified by the Agency to the contrary, dischargers who submit an NOI in accordance with the requirements of this permit are authorized to discharge storm water from construction sites under the terms and conditions of this permit either:

- a. 48 hours after the date the NOI is postmarked, if the project had established compliance with Illinois law regarding historic preservation and endangered species prior to submittal of the NOI;
or
- b. 30 days after the date the NOI is postmarked, if the project had not established compliance with Illinois historic preservation and endangered species requirements prior to submittal of the NOI.

The Agency may deny coverage under this permit and require submittal of an application for an individual NPDES permit based on a review of the NOI or other information.

Part II. NOTICE OF INTENT REQUIREMENTS

A. Deadlines for Notification.

1. To receive authorization under this general permit, a discharge must either be covered by a valid Illinois General NPDES Construction Site Permit, or a Notice of Intent (NOI) in accordance with the requirements of this part must be submitted prior to the commencement of construction. For projects that have established compliance with Illinois law regarding historic preservation and endangered species prior to submittal of the NOI, the NOI must be submitted at least 48 hours prior to the commencement of construction. For all other projects, the NOI must be submitted at least 30 days prior to the commencement of construction.
2. Discharges that are covered by a valid Illinois General NPDES Construction Site Activities Permit are automatically covered by this permit.
3. A discharger may submit an NOI in accordance with the requirements of this part after the start of construction. In such instances, the Agency may bring an enforcement action for any discharges of storm water associated with industrial activity from a construction site that have occurred on or after the start of construction.

B. Failure to Notify. Dischargers who fail to notify the Agency of their intent to be covered, and discharge storm water associated with construction site activity to Waters of the State without an NPDES permit, are in violation of the Environmental Protection Act and Clean Water Act.

C. Contents of Notice of Intent. The Notice of Intent shall be signed in accordance with Part VI.G (Signatory Requirements) of this permit by all of the entities identified in paragraph 2 below and shall include the following information:

1. The mailing address, and location of the construction site for which the notification is submitted. Where a mailing address for the site is not available, the location can be described in terms of the latitude and longitude of the approximate center of the facility to the nearest 15 seconds, or the nearest quarter section (if the section, township and range is provided) that the construction site is located in;
2. The owner's name, address, telephone number, and status as Federal, State, private, public or other entity.
3. The name, address and telephone number of the general contractor(s) that have been identified at the time of the NOI submittal;
4. The name of the receiving water(s), or if the discharge is through a municipal separate storm sewer, the name of the municipal operator of the storm sewer and the ultimate receiving water(s);
5. The number of any NPDES permit for any discharge (including non-storm water discharges) from the site that is currently authorized by an NPDES permit.
6. A yes or no indication of whether the owner or operator has existing quantitative data which describes the concentration of pollutants in storm water discharges (existing data should not be included as part of the NOI); and
7. A brief description of the project, estimated timetable for major activities, estimates of the number of acres of the site on which soil will be disturbed, and a certification that a storm water pollution prevention plan has been prepared for the facility in accordance with Part IV of this permit, and such plan provides compliance with local sediment and erosion plans or permits and/or storm water management plans or permits in accordance with paragraph VI.G.1 (Signatory Requirements) of this permit. **(A copy of the plans or permits should not be included with the NOI submission).**

D. Where to Submit

1. Facilities which discharge storm water associated with construction site activity must use a NOI form provided by the Agency. NOIs must be signed in accordance with Part VI.G (Signatory Requirements) of this permit. NOIs are to be submitted certified mail to the Agency at the following address:

Illinois Environmental Protection Agency
 Division of Water Pollution Control
 Attention: Permit Section
 1021 North Grand East
 Post Office Box 19276
 Springfield, Illinois 62794-9276

2. A copy of the letter of notification of coverage or other indication that storm water discharges from the site are covered under an NPDES permit shall be posted at the site in a prominent place for public viewing (such as alongside a building permit).

E. Additional Notification. Facilities which are operating under approved local sediment and erosion plans, grading plans, or storm water management plans, in addition to filing copies of the Notice of Intent in accordance with Part D above, shall also submit signed copies of the Notice of Intent to the local agency approving such plans in accordance with the deadlines in Part A above. See Part IV.D.2.d (Approved State or Local Plans).

F. Notice of Termination. Where a site has been finally stabilized and all storm water discharges from construction sites that are authorized by this permit are eliminated, the permittee of the facility may submit a Notice of Termination that is signed in accordance with Part VI.G (Signatory Requirements) of this permit.

1. The Notice of Termination shall include the following information:

- a. The mailing address, and location of the construction site for which the notification is submitted. Where a mailing address for the site is not available, the location can be described in terms of the latitude and longitude of the approximate center of the facility to the nearest 15 seconds, or the nearest quarter section (if the section, township and range is provided) that the construction site is located in;
- b. The owner's name, address, telephone number, and status as Federal, State, private, public or other entity.
- c. The name, address and telephone number of the general contractor(s);
- d. The following certification signed in accordance with Part VI.G (Signatory Requirements) of this permit:

"I certify under penalty of law that all storm water discharges associated with construction site activity from the identified facility that are authorized by NPDES general permit ILR100000 have otherwise been eliminated. I understand that by submitting this notice of termination, that I am no longer authorized to discharge storm water associated with construction site activity by the general permit, and that discharging pollutants in storm water associated with construction site activity to Waters of the State is unlawful under the Environmental Protection Act and Clean Water Act where the discharge is not authorized by a NPDES permit. I also understand that the submittal of this notice of termination does not release an operator from liability for any violations of this permit or the Clean Water Act."

For the purposes of this certification, elimination of storm water discharges associated with industrial activity means that all disturbed soils at the identified facility have been finally stabilized and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time, or that all storm water discharges associated with construction activities from the identified site that are authorized by a NPDES general permit have otherwise been eliminated.

2. All Notices of Termination are to be sent, using the form provided by the Agency to the address in paragraph II.D.1.

Part III. SPECIAL CONDITIONS, MANAGEMENT PRACTICES, AND OTHER NON-NUMERIC LIMITATIONS

A. Prohibition on Non-Storm Water Discharges.

1. Except as provided in paragraph I.B.2 and 2 below, all discharges covered by this permit shall be composed entirely of storm water.
2.
 - a. Except as provided in paragraph b below, discharges of materials other than storm water must be in compliance with a NPDES permit (other than this permit) issued for the discharge.
 - b. The following non-storm water discharges may be authorized by this permit provided the non-storm water component of the discharges is in compliance with paragraph IV.D.5 (Non-Storm Water Discharges): discharges from fire fighting activities; fire hydrant flushings; waters used to wash vehicles or control dust; potable water sources including waterline flushings; irrigation drainages; routine external building washdown which does not use detergents; pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; springs; uncontaminated ground water; and foundation or footing drains where flows are not contaminated with process materials such as solvents.

Part IV. STORM WATER POLLUTION PREVENTION PLANS

A storm water pollution prevention plan shall be developed for each construction site covered by this permit. Storm water pollution prevention plans shall be prepared in accordance with good engineering practices. The plan shall identify potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges associated with construction site activity from the facility. In addition, the plan shall describe and ensure the implementation of practices which will be used to reduce the pollutants in storm water discharges associated with construction site activity and to assure compliance with the terms and conditions of this permit. Facilities must implement the provisions of the storm water pollution prevention plan required under this part as a condition of this permit.

A. Deadlines for Plan Preparation and Compliance.

The plan shall:

1. Be completed prior to the start of the construction to be covered under this permit and updated as appropriate;
2. Provide for compliance with the terms and schedule of the plan beginning with the initiation of construction activities.

B. Signature and Plan Review.

1. The plan shall be signed in accordance with Part VI.G (Signatory Requirements), and be retained on-site at the facility which generates the storm water discharge in accordance with Part VI.E (Duty to Provide Information) of this permit.
2. The permittee shall make plans available upon request from this Agency or a local agency approving sediment and erosion plans, grading plans, or storm water management plans; or in the case of a storm water discharge associated with industrial activity which discharges through a municipal separate storm sewer system with an NPDES permit, to the municipal operator of the system.
3. The Agency may notify the permittee at any time that the plan does not meet one or more of the minimum requirements of this Part. Such notification shall identify those provisions of the permit which are not being met by the plan, and identify which provisions of the plan requires modifications in order to meet the minimum requirements of this part. Within 7 days from receipt of notification from the Agency, the permittee shall make the required changes to the plan and shall submit to the Agency a written certification that the requested changes have been made. Failure to comply shall terminate authorization under this permit.
4. All storm water pollution prevention plans required under this permit are considered reports that shall be available to the public under Section 308(b) of the CWA. The permittee shall make plans available to members of the public upon request by the public. However, the permittee may claim any portion of a storm water pollution prevention plan as confidential in accordance with 40 CFR Part 2.

C. Keeping Plans Current. The permittee shall amend the plan whenever there is a change in design, construction, operation, or maintenance, which has a significant effect on the potential for the discharge of pollutants to the Waters of the State and which has not otherwise been addressed in the plan or if the storm water pollution prevention plan proves to be ineffective in eliminating or significantly minimizing pollutants from sources identified under paragraph D.2 below, or in otherwise achieving the general objectives of controlling pollutants in storm water discharges associated with construction site activity. In addition, the plan shall be amended to identify any new contractor and/or subcontractor that will implement a measure of the storm water pollution prevention plan. Amendments to the plan may be reviewed by the Agency in the same manner as Part IV.B above.

D. Contents of Plan. The storm water pollution prevention plan shall include the following items:

1. **Site Description.** Each plan shall, provide a description of the following:
 - a. A description of the nature of the construction activity;
 - b. A description of the intended sequence of major activities which disturb soils for major portions of the site (e.g. grubbing, excavation, grading);
 - c. Estimates of the total area of the site and the total area of the site that is expected to be disturbed by excavation, grading, or other activities;
 - d. An estimate of the runoff coefficient of the site after construction activities are completed and existing data describing the soil or the quality of any discharge from the site;
 - e. A site map indicating drainage patterns and approximate slopes anticipated before and after major grading activities, locations where vehicles enter or exit the site and controls to prevent offsite sediment tracking, areas of soil disturbance, the location of major structural and nonstructural controls identified in the plan, the location of areas where stabilization practices are expected to occur, surface waters (including wetlands), and locations where storm water is discharged to a surface water; and
 - f. The name of the receiving water(s) and the ultimate receiving water(s), and areal extent of wetland acreage at the site.
2. **Controls.** Each plan shall include a description of appropriate controls that will be implemented at the construction site. The plan will clearly describe for each major activity identified in paragraph D.1 above, appropriate controls and the timing during the construction process that the controls will be implemented. (For example, perimeter controls for one portion of the site will be installed after the clearing and grubbing necessary for installation of the measure, but before the clearing and grubbing for the remaining portions of the site. Perimeter controls will be actively maintained until final stabilization of those portions of the site upward of the perimeter control. Temporary perimeter controls will be removed after final stabilization). The description of controls shall address as appropriate the following minimum components:

a. **Erosion and Sediment Controls.**

(i). **Stabilization Practices.** A description of interim and permanent stabilization practices, including site-specific scheduling of the implementation of the practices. Site plans should ensure that existing vegetation is preserved where attainable and that disturbed portions of the site are stabilized. Stabilization practices may include: temporary seeding, permanent seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, preservation of mature vegetation, and other appropriate measures. A record of the dates when major grading activities occur, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization measures are initiated shall be included in the plan. Except as provided in paragraphs (A) and (B) below, stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.

(A). Where the initiation of stabilization measures by the 14th day after construction activity temporary or permanently cease is precluded by snow cover, stabilization measures shall be initiated as soon as practicable.

(B). Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g. the total time period that construction activity is temporarily ceased is less than 21 days) then stabilization measures do not have to be initiated on that portion of site by the 14th day after construction activity temporarily ceased.

(ii). **Structural Practices.** A description of structural practices to the degree attainable, to divert flows from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Such practices may include silt fences, earth dikes, drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins. Structural practices should be placed on upland soils to the degree attainable. The installation of these devices may be subject to Section 404 of the CWA.

b. **Storm Water Management.** A description of measures that will be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed. Structural measures should be placed on upland soils to the degree attainable. The installation of these devices may be subject to Section 404 of the CWA. This permit only addresses the installation of storm water management measures, and not the ultimate operation and maintenance of such structures after the construction activities have been completed and the site has undergone final stabilization. Permittees are responsible for only the installation and maintenance of storm water management measures prior to final stabilization of the site, and are not responsible for maintenance after storm water discharges associated with industrial activity have been eliminated from the site.

(i). Such practices may include: storm water detention structures (including wet ponds); storm water retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff onsite; and sequential systems (which combine several practices). The pollution prevention plan shall include an explanation of the technical basis used to select the practices to control pollution where flows exceed predevelopment levels.

(ii). Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel as necessary to provide a non-erosive velocity flow from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g. maintenance of hydrologic conditions, such as the hydroperiod and hydrodynamics present prior to the initiation of construction activities).

c. **Other Controls.**

(i). **Waste Disposal.** No solid materials, including building materials, shall be discharged to Waters of the State, except as authorized by a Section 404 permit.

(ii). The plan shall ensure and demonstrate compliance with applicable State and/or local waste disposal, sanitary sewer or septic system regulations.

d. **Approved State or Local Plans.**

(i). The management practices, controls and other provisions contained in the storm water pollution prevention plan must be at least as protective as the requirements contained in Illinois Environmental Protection Agency's Illinois Urban Manual, 1995. Facilities which discharge storm water associated with construction site activities must include in their storm water pollution prevention plan procedures and requirements specified in applicable sediment and erosion site plans or storm water management plans approved by local officials. Requirements specified in sediment and erosion site plans or site permits or storm water management site plans or site permits approved by local officials that are applicable to protecting surface water resources are, upon submittal of an NOI to be authorized to discharge under this permit, incorporated by reference and are enforceable under this permit even if they are not specifically included in a storm water pollution prevention plan required under this permit. This provision does not apply to provisions of master plans, comprehensive plans, non-enforceable guidelines or technical guidance documents that are not identified in a specific plan or permit that is issued for the construction site.

(ii) Dischargers seeking alternative permit requirements are not authorized by this permit and shall submit an individual permit application in accordance with 40 CFR 122.26 at the address indicated in Part II.D (Where to Submit) of this permit, along with a description of why requirements in approved local plans or permits should not be applicable as a condition of an NPDES permit.

3. **Maintenance.** A description of procedures to maintain in good and effective operating conditions vegetation, erosion and sediment control measures and other protective measures identified in the site plan.

4. **Inspections.** Qualified personnel (provided by the permittee) shall inspect disturbed areas of the construction site that have not been finally stabilized, structural control measures, and locations where vehicles enter or exit the site at least once every seven calendar days and within 24 hours of the end of a storm that is 0.5 inches or greater or equivalent snowfall.
 - a. Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the plan shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles enter or exit the site shall be inspected for evidence of offsite sediment tracking.
 - b. Based on the results of the inspection, the description of potential pollutant sources identified in the plan in accordance with paragraph IV.D.1 (Site Description) of this permit and pollution prevention measures identified in the plan in accordance with paragraph IV.D.2 (Controls) of this permit shall be revised as appropriate as soon as practicable after such inspection. Such modifications shall provide for timely implementation of any changes to the plan within 7 calendar days following the inspection.
 - c. A report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the storm water pollution prevention plan, and actions taken in accordance with paragraph b above shall be made and retained as part of the storm water pollution prevention plan for at least three years after the date of inspection. The report shall be signed in accordance with Part VI.G (Signatory Requirements) of this permit.
 - d. The permittee shall complete and submit within 5 days an "Incidence of Noncompliance" (ION) report for any violation of the storm water pollution prevention plan observed during an inspection conducted, including those not required by the Plan. Submission shall be on forms provided by the Agency and include specific information on the cause of noncompliance, actions which were taken to prevent any further causes of noncompliance, and a statement detailing any environmental impact which may have resulted from the noncompliance.
 - e. All reports of noncompliance shall be signed by a responsible authority as defined in Part VI.G (Signatory Requirements).
 - f. All reports of noncompliance shall be mailed to the Agency at the following address:

Illinois Environmental Protection Agency
Division of Water Pollution Control
Compliance Assurance Section
1021 North Grand East
Post Office Box 19276
Springfield, Illinois 62794-9276

5. **Non-Storm Water Discharges** - Except for flows from fire fighting activities, sources of non-storm water listed in paragraph III.A.2 of this permit that are combined with storm water discharges associated with industrial activity must be identified in the plan. The plan shall identify and insure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

E. Additional requirements for storm water discharge from industrial activities other than construction, including dedicated asphalt plants, and dedicated concrete plants. - This permit may only authorize a storm water discharge associated with industrial activity from a construction site that is mixed with a storm water discharge from an industrial source other than construction, where:

1. the industrial source other than construction is located on the same site as the construction activity;
2. storm water discharges associated with industrial activity from the areas of the site where construction activities are occurring are in compliance with the terms of this permit; and
3. storm water discharges associated with industrial activity from the areas of the site where industrial activity other than construction are occurring (including storm water discharges from dedicated asphalt plants (other than asphalt emulsion facilities) and dedicated concrete plants) are in compliance with the terms, including applicable NOI or application requirements, of a different NPDES general permit or individual permit authorizing such discharges.

F. Contractors.

1. The storm water pollution prevention plan must clearly identify for each measure identified in the plan, the contractor(s) or subcontractor(s) that will implement the measure. All contractors and subcontractors identified in the plan must sign a copy of the certification statement in paragraph 2 below in accordance with Part VI.G (Signatory Requirements) of this permit. All certifications must be included in the storm water pollution prevention plan except for owners that are acting as contractor.
2. **Certification Statement.** All contractors and subcontractors identified in a storm water pollution prevention plan in accordance with paragraph 1 above shall sign a copy of the following certification statement before conducting any professional service at the site identified in the storm water pollution prevention plan:

"I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit (ILR100000) that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification."

The certification must include the name and title of the person providing the signature in accordance with Part VI.G of this permit; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification is made.

Part V. RETENTION OF RECORDS

- A. The permittee shall retain copies of storm water pollution prevention plans and all reports and notices required by this permit, and records of all data used to complete the Notice of Intent to be covered by this permit, for a period of at least three years from the date that the site is finally stabilized. This period may be extended by request of the Agency at any time.
- B. The permittee shall retain a copy of the storm water pollution prevention plan required by this permit at the construction site from the date of project initiation to the date of final stabilization.

Part VI. STANDARD PERMIT CONDITIONS**A. Duty to Comply.**

1. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of Illinois Environmental Protection Act and the CWA and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

2. Penalties for Violations of Permit Conditions.**a. Criminal**

- (1). **Negligent Violations** The CWA provides that any person who negligently violates permit conditions implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to a fine of not less than \$2,500 nor more than \$25,000 per day of violation, or by imprisonment for not more than 1 years, or both. The Environmental Protection Act provides that any person who negligently violates subsection (f) of Section 12 of the Act, any provision of any regulation, standard, or filing requirement under subsection (b) of Section 39 of the Act, or any NPDES permit issued under the Act is subject to a fine not to exceed \$10,000 for each day of violation.
- (2). **Knowing Violations** The CWA provides that any person who knowingly violates permit conditions implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to a fine of not less than \$5,000 nor more than \$50,000 per day of violation, or by imprisonment for not more than 3 year, or both. The Environmental Protection Act provides that any person who knowingly violates subsection (f) of Section 12 of the Act, any provision of any regulation, standard, or filing requirement under subsection (b) of Section 39 of the Act, or any NPDES permit issued under the Act commits a Class 4 felony, and in addition to any other penalty prescribed by law is subject to a fine not to exceed \$25,000 for each day of violation.
- (3). **Knowing Endangerment** The CWA provides that any person who knowingly violates permit conditions implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act and who knows at that time that he is placing another person in imminent danger of death or serious bodily injury is subject to a fine of not more than \$250,000, or by imprisonment for not more than 15 years, or both.
- (4). **False Statement** The CWA provides that any person who knowingly makes any false material statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under the Act or who knowingly falsifies, tampers with, or renders inaccurate, any monitoring device or method required to be maintained under the Act, shall upon conviction, be punished by a fine of not more than \$10,000 or by imprisonment for not more than 2 years, or by both. If a conviction of a permittee is for a violation committed after a first conviction of such person under this paragraph, punishment shall be by a fine of not more than \$20,000 per day of violation, or by imprisonment of not more than 4 years, or by both. (See Section 309.c.4 of the Clean Water Act). The Environmental Protection Act provides that any person who knowingly makes any false statement, representation, or certification in an application form, or form pertaining to a NPDES permit or who knowingly renders inaccurate any monitoring device or record required in connection with any such permit or with any discharge which is subject to the provisions of subsection (f) of Section 12 of the Act commits a Class A misdemeanor, and in addition to any other penalties provided by law is subject to a fine not to exceed \$10,000 for each day of violation.

- b. **Civil Penalties**- The CWA provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to a civil penalty not to exceed \$25,000 per day for each violation. The Environmental Protection Act provides that any person who violates subsection (f) of Section 12 of the Act, any provision of any regulation, standard, or filing requirement under subsection (b) of Section 39 of the Act, or any NPDES permit issued under the Act is subject to a civil penalty not to exceed \$50,000 for each violation and an additional civil penalty of not to exceed \$10,000 for each day during which the violation continues.

- c. **Administrative Penalties** - The CWA provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to an administrative penalty, as follows:

- (1). **Class I penalty** Not to exceed \$10,000 per violation nor shall the maximum amount exceed \$25,000.
- (2). **Class II penalty** Not to exceed \$10,000 per day for each day during which the violation continues nor shall the maximum amount exceed \$125,000.

- B. **Continuation of the Expired General Permit** This permit expires five years from the date of issuance. An expired general permit continues in force and effect until a new general permit or an individual permit is issued. Only those facilities authorized to discharge under the expiring general permit are covered by the continued permit.

- C. **Need to halt or reduce activity not a defense.** It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

- D. **Duty to Mitigate.** The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.
- E. **Duty to Provide Information.** The permittee shall furnish within a reasonable time to the Agency or local agency approving sediment and erosion plans, grading plans, or storm water management plans; or in the case of a storm water discharge associated with industrial activity which discharges through a municipal separate storm sewer system with an NPDES permit, to the municipal operator of the system, any information which is requested to determine compliance with this permit. Upon request, the permittee shall also furnish to the Agency or local agency approving sediment and erosion plans, grading plans, or storm water management plans; or in the case of a storm water discharge associated with industrial activity which discharges through a municipal separate storm sewer system with an NPDES permit, to the municipal operator of the system, copies of records required to be kept by this permit.
- F. **Other Information.** When the permittee becomes aware that he or she failed to submit any relevant facts or submitted incorrect information in the Notice of Intent or in any other report to the Agency, he or she shall promptly submit such facts or information.
- G. **Signatory Requirements.** All Notices of Intent, storm water pollution prevention plans, reports, certifications or information either submitted to the Agency or the operator of a large or medium municipal separate storm sewer system, or that this permit requires be maintained by the permittee, shall be signed.
1. All Notices of Intent shall be signed as follows:
 - a. For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: (1) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or (2) the manager of one or more manufacturing, production or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding \$25,000,000 (in second-quarter 1980 dollars) if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;
 - b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or
 - c. For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes (1) the chief executive officer of the agency, or (2) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.
 2. All reports required by the permit and other information requested by the Agency shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
 - a. The authorization is made in writing by a person described above and submitted to the Agency.
 - b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of manager, operator, superintendent, or position of equivalent responsibility or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position).
 - c. **Changes to authorization.** If an authorization under paragraph I.C (Authorization) is no longer accurate because a different individual or position has responsibility for the overall operation of the construction site, a new authorization satisfying the requirements of paragraph I.C must be submitted to the Agency prior to or together with any reports, information, or applications to be signed by an authorized representative.
 - d. **Certification.** Any person signing documents under this Part shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."
- H. **Penalties for Falsification of Reports.** Section 309(c)(4) of the Clean Water Act provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than \$10,000, or by imprisonment for not more than 2 years, or by both. Section 44(j)(4) and (5) of the Environmental Protection Act provides that any person who knowingly makes any false statement, representation, or certification in an application form, or form pertaining to a NPDES permit commits a Class A misdemeanor, and in addition to any other penalties provided by law is subject to a fine not to exceed \$10,000 for each day of violation.
- I. **Penalties for Falsification of Monitoring Systems.** The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by fines and imprisonment described in Section 309 of the CWA. The Environmental Protection Act provides that any person who knowingly renders inaccurate any monitoring device or record required in connection with any NPDES permit or with any discharge which is subject to the provisions of subsection (f) of Section 12 of the Act commits a Class A misdemeanor, and in addition to any other penalties provided by law is subject to a fine not to exceed \$10,000 for each day of violation.
- J. **Oil and Hazardous Substance Liability.** Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under section 311 of the CWA.
- K. **Property Rights.** The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

- L. **Severability.** The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.
- M. **Transfers.** This permit is not transferable to any person except after notice to the Agency. The Agency may require the discharger to apply for and obtain an individual NPDES permit as stated in Part I.C (Authorization).
- N. **Requiring an Individual Permit or an Alternative General Permit.**
1. The Agency may require any person authorized by this permit to apply for and/or obtain either an individual NPDES permit or an alternative NPDES general permit. Any interested person may petition the Agency to take action under this paragraph. Where the Agency requires a discharger authorized to discharge under this permit to apply for an individual NPDES permit, the Agency shall notify the discharger in writing that a permit application is required. This notification shall include a brief statement of the reasons for this decision, an application form, a statement setting a deadline for the discharger to file the application, and a statement that on the effective date of the individual NPDES permit or the alternative general permit as it applies to the individual permittee, coverage under this general permit shall automatically terminate. Applications shall be submitted to the Agency indicated in Part II.D (Where to Submit) of this permit. The Agency may grant additional time to submit the application upon request of the applicant. If a discharger fails to submit in a timely manner an individual NPDES permit application as required by the Agency under this paragraph, then the applicability of this permit to the individual NPDES permittee is automatically terminated at the end of the day specified by the Agency for application submittal.
 2. Any discharger authorized by this permit may request to be excluded from the coverage of this permit by applying for an individual permit. In such cases, the permittee shall submit an individual application in accordance with the requirements of 40 CFR 122.26(c)(1)(ii), with reasons supporting the request, to the Agency at the address indicated in Part II.D (Where to Submit) of this permit. The request may be granted by issuance of any individual permit or an alternative general permit if the reasons cited by the permittee are adequate to support the request.
 3. When an individual NPDES permit is issued to a discharger otherwise subject to this permit, or the discharger is authorized to discharge under an alternative NPDES general permit, the applicability of this permit to the individual NPDES permittee is automatically terminated on the effective date of the individual permit or the date of authorization of coverage under the alternative general permit, whichever the case may be. When an individual NPDES permit is denied to a discharger otherwise subject to this permit, or the discharger is denied for coverage under an alternative NPDES general permit, the applicability of this permit to the individual NPDES permittee remains in effect, unless otherwise specified by the Agency.
- O. **State/Environmental Laws.** No condition of this permit shall release the permittee from any responsibility or requirements under other environmental statutes or regulations.
- P. **Proper Operation and Maintenance.** The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of storm water pollution prevention plans. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance requires the operation of backup or auxiliary facilities or similar systems, installed by a permittee only when necessary to achieve compliance with the conditions of the permit.
- Q. **Inspection and Entry.** The permittee shall allow the Agency or, in the case of a construction site which discharges through a municipal separate storm sewer, an authorized representative of the municipal operator or the separate storm sewer receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:
1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;
 2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and
 3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment).
- R. **Permit Actions.** This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

Part VII. REOPENER CLAUSE

- A. If there is evidence indicating potential or realized impacts on water quality due to any storm water discharge associated with industrial activity covered by this permit, the discharger may be required to obtain individual permit or an alternative general permit in accordance with Part I.C (Authorization) of this permit or the permit may be modified to include different limitations and/or requirements.
- B. Permit modification or revocation will be conducted according to provisions of 35 Ill. Adm. Code, Subtitle C, Chapter I and the provisions of 40 CFR 122.62, 122.63, 122.64 and 124.5.

Part VIII. DEFINITIONS

"Agency" means the Illinois Environmental Protection Agency.

"Best Management Practices" ("BMPs") means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

"Commencement of Construction" - The initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.

"CWA" means Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub.L. 92-500, as amended Pub. L. 95-217, Pub. L. 95-576, Pub. L. (96-483 and Pub. L. 97-117, 33 U.S.C. 1251 et.seq.)

"Dedicated portable asphalt plant" - A portable asphalt plant that is located on or contiguous to a construction site and that provides asphalt only to the construction site that the plant is located on or adjacent to. The term dedicated portable asphalt plant does not include facilities that are subject to the asphalt emulsion effluent limitation guideline at 40 CFR 443.

"Dedicated portable concrete plant" - A portable concrete plant that is located on or contiguous to a construction site and that provides concrete only to the construction site that the plant is located on or adjacent to.

"Dedicated sand or gravel operation" - An operation that produces sand and/or gravel for a single construction project.

"Director" means the Director of the Illinois Environmental Protection Agency or an authorized representative.

"Final Stabilization" means that all soil disturbing activities at the site have been completed, and that a uniform perennial vegetative cover with a density of 70% the cover for unpaved areas and areas not covered by permanent structures has been established or equivalent stabilization measures (such as the use of riprap, gabions or geotextiles) have been employed.

"Large and Medium municipal separate storm sewer system" means all municipal separate storm sewers that are either:

- (i) located in an incorporated place (city) with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census (these cities are listed in Appendices F and G of 40 CFR Part 122); or
- (ii) located in the counties with unincorporated urbanized populations of 100,000 or more, except municipal separate storm sewers that are located in the incorporated places, townships or towns within such counties (these counties are listed in Appendices H and I of 40 CFR Part 122); or
- (iii) owned or operated by a municipality other than those described in paragraph (i) or (ii) and that are designated by the Director as part of the large or medium municipal separate storm sewer system.

"NOI" means notice of intent to be covered by this permit (see Part II of this permit.)

"Point Source" means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharges. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.

"Runoff coefficient" means the fraction of total rainfall that will appear at the conveyance as runoff.

"Storm Water" means storm water runoff, snow melt runoff, and surface runoff and drainage.

"Storm Water Associated with Industrial Activity" means the discharge from any conveyance which is used for collecting and conveying storm water and which is directly related to manufacturing, processing or raw materials storage areas at an industrial plant. The term does not include discharges from facilities or activities excluded from the NPDES program. For the categories of industries identified in subparagraphs (i) through (x) of this subsection, the term includes, but is not limited to, storm water discharges from industrial plant yards; immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility; material handling sites; refuse sites; sites used for the application or disposal of process waste waters (as defined at 40 CFR 401); sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas (including tank farms) for raw materials, and intermediate and finished products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to storm water. For the categories of industries identified in subparagraph (xi), the term includes only storm water discharges from all areas listed in the previous sentence (except access roads) where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, or industrial machinery are exposed to storm water. For the purposes of this paragraph, material handling activities include the: storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, finished product, by-product or waste product. The term excludes areas located on plant lands separate from the plant's industrial activities, such as office buildings and accompanying parking lots as long as the drainage from the excluded areas is not mixed with storm water drained from the above described areas. Industrial facilities (including industrial facilities that are Federally or municipally owned or operated that meet the description of the facilities listed in this paragraph (i)- (xi)) include those facilities designated under 40 CFR 122.26(a)(1)(v). The following categories of facilities are considered to be engaging in "industrial activity" for purposes of this subsection:

- (i) Facilities subject to storm water effluent limitations guidelines, new source performance standards, or toxic pollutant effluent standards under 40 CFR Subchapter N (except facilities with toxic pollutant effluent standards which are exempted under category (xi) of this paragraph);
- (ii) Facilities classified as Standard Industrial Classifications 24 (except 2434), 26 (except 265 and 267), 28, 29, 311, 32, 33, 3441, 373;
- (iii) Facilities classified as Standard Industrial Classifications 10 through 14 (mineral industry) including active or inactive mining operations (except for areas of coal mining operations meeting the definition of a reclamation area under 40 CFR 434.11(l)) and oil and gas exploration, production, processing, or treatment operations, or transmission facilities that discharge storm water contaminated by contact with or that has come into contact with, any overburden, raw material, intermediate products, finished products, byproducts or waste products located on the site of such operations; inactive mining operations are mining sites that are not being actively mined, but which have an identifiable owner/operator;
- (iv) Hazardous waste treatment, storage, or disposal facilities, including those that are operating under interim status or a permit under Subtitle C of

RCRA;

- (v) Landfills, land application sites, and open dumps that have received any industrial wastes (waste that is received from any of the facilities described under this subsection) including those that are subject to regulation under Subtitle D of RCRA;
- (vi) Facilities involved in the recycling of materials, including metal scrapyards, battery reclaimers, salvage yards, and automobile junkyards, including but limited to those classified as Standard Industrial Classification 5015 and 5093;
- (vii) Steam electric power generating facilities, including coal handling sites;
- (viii) Transportation facilities classified as Standard Industrial Classifications 40, 41, 42, 44, and 45 which have vehicle maintenance shops, equipment cleaning operations, or airport deicing operations. Only those portions of the facility that are either involved in vehicle maintenance (including vehicle rehabilitation, mechanical repairs, painting, fueling, and lubrication), equipment cleaning operations, airport deicing operations, or which are otherwise identified under subparagraphs (i)-(vii) or (ix)-(xi) of this subsection are associated with industrial activity;
- (ix) Treatment works treating domestic sewage or any other sewage sludge or wastewater treatment device or system, used in the storage treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated to the disposal of sewage sludge that are located within the confines of the facility, with a design flow of 1.0 mgd or more, or required to have an approved pretreatment program under 40 CFR 403. Not included are farm lands, domestic gardens or lands used for sludge management where sludge is beneficially reused and which are not physically located in the confines of the facility, or areas that are in compliance with 40 CFR 503;
- (x) Construction activity including clearing, grading and excavation activities except: operations that result in the disturbance of less than five acres of total land area which are not part of a larger common plan of development or sale;
- (xi) Facilities under Standard Industrial Classifications 20, 21, 22, 23, 2434, 25, 265, 267, 27, 283, 31 (except 311), 34 (except 3441), 35, 36, 37 (except 373), 38, 39, 4221-25, (and which are not otherwise included within categories (i)-(x)).

"Waters" mean all accumulations of water, surface and underground, natural, and artificial, public and private, or parts thereof, which are wholly or partially within, flow through, or border upon the State of Illinois, except that sewers and treatment works are not included except as specially mentioned; provided, that nothing herein contained shall authorize the use of natural or otherwise protected waters as sewers or treatment works except that in-stream aeration under Agency permit is allowable.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
NOTICE OF INTENT (NOI)
GENERAL PERMIT TO DISCHARGE STORM WATER
CONSTRUCTION SITE ACTIVITIES

OWNER INFORMATION

NAME:	LAST	FIRST	MIDDLE INITIAL	OWNER TYPE: (SELECT ONE)
MILING ADDRESS:				<input type="checkbox"/> PRIVATE <input type="checkbox"/> COUNTY <input type="checkbox"/> CITY <input type="checkbox"/> SPECIAL DISTRICT <input type="checkbox"/> FEDERAL <input type="checkbox"/> STATE
CITY:			STATE:	ZIP:
CONTACT PERSON:			TELEPHONE NUMBER:	AREA CODE NUMBER

CONTRACTOR INFORMATION

NAME:		TELEPHONE NUMBER:	AREA CODE	NUMBER
MILING ADDRESS:	CITY:	STATE:	ZIP:	

CONSTRUCTION SITE INFORMATION

SELECT ONE:	<input type="checkbox"/> EXISTING SITE <input type="checkbox"/> NEW SITE <input type="checkbox"/> CHANGE OF INFORMATION	GENERAL NPDES PERMIT NUMBER:	ILR10 _____									
FACILITY NAME:	OTHER NPDES PERMIT NUMBERS:											
FACILITY LOCATION:	(Not necessarily the mailing address)		TELEPHONE NUMBER: AREA CODE NUMBER									
CITY:	STATE:	IL	ZIP:	LATITUDE:	DEG.	MIN.	SEC.	LONGITUDE:	DEG.	MIN.	SEC.	
COUNTY:	SECTION:		TOWNSHIP:	RANGE:								
CONSTRUCTION START DATE:	CONSTRUCTION END DATE:		TOTAL SIZE OF CONSTRUCTION SITE IN ACRES:									

TYPE OF CONSTRUCTION (SELECT ALL THAT APPLY)

RESIDENTIAL COMMERCIAL INDUSTRIAL RECONSTRUCTION TRANSPORTATION OTHER

HISTORIC PRESERVATION AND ENDANGERED SPECIES COMPLIANCE

HAS THIS PROJECT SATISFIED APPLICABLE REQUIREMENTS FOR COMPLIANCE WITH ILLINOIS LAW ON:			
HISTORIC PRESERVATION	<input type="checkbox"/> YES	<input type="checkbox"/> NO	
ENDANGERED SPECIES	<input type="checkbox"/> YES	<input type="checkbox"/> NO	

I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage this system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. In addition, I certify that the provisions of the permit, including the development and implementation of a storm water pollution prevention plan and a monitoring program plan, will be complied with.

OWNER SIGNATURE: _____ DATE: _____

MAIL COMPLETED FORM TO:
 (DO NOT SUBMIT ADDITIONAL DOCUMENTATION UNLESS REQUESTED)

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
 DIVISION OF WATER POLLUTION CONTROL
 ATTN: PERMIT SECTION
 POST OFFICE BOX 19276
 SPRINGFIELD, ILLINOIS 62794-9276

FOR OFFICE USE ONLY
LOG:
PERMIT NO. ILR10 _____
DATE:

Information required by this form must be provided to comply with 415 ILCS 5/39 (1996). Failure to do so may prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center.

GUIDELINES FOR COMPLETION OF NOTICE OF INTENT (NOI) FORM

Please adhere to the following guidelines:

Submit original, photocopy or facsimile copies. Facsimile and/or photo copies should be followed-up with an original signature copy as soon as possible. Please write "copy" under the "For Office Use Only" box in the lower right hand corner.

< Submit completed forms to:

Illinois Environmental Protection Agency
Division of Water Pollution Control
Permit Section
Post Office Box 19276
Springfield, Illinois 62794-9276
or call (217)782-0610

< Reports must be typed or printed legibly and signed.

< If this is a change in your facility information, renewal, etc., please fill in your permit number on the appropriate line.

< **NOTE: FACILITY LOCATION IS NOT NECESSARILY THE FACILITY MAILING ADDRESS, BUT SHOULD DESCRIBE WHERE THE FACILITY IS LOCATED.**

< Use the formats given in the following examples for correct form completion.

	<u>Example</u>	<u>Format</u>
SECTION	12	1 or 2 numerical digits
TOWNSHIP	12N	1 or 2 numerical digits followed by "N" or "S"
RANGE	12W	1 or 2 numerical digits followed by "E" or "W"

**ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
CONSTRUCTION SITE STORM WATER DISCHARGE
INCIDENCE OF NON-COMPLIANCE (ION)**

PERMITTEE NAME:	LAST		FIRST		MIDDLE INITIAL		AREA CODE + PHONE NUMBER:									
STREET:				CITY:			ST:			ZIP:						
CONSTRUCTION SITE NAME:																
COUNTY:				SECTION:			TOWNSHIP:			RANGE:						
NPDES PERMIT NUMBER:	I	L	R	1	0				LATITUDE:	DEG.	MIN.	SEC.	LONGITUDE:	DEG.	MIN.	SEC.

CAUSE OF NON-COMPLIANCE:

ACTIONS TAKEN TO PREVENT ANY FURTHER NON-COMPLIANCE:

ENVIRONMENTAL IMPACT RESULTING FROM THE NON-COMPLIANCE:

ACTIONS TAKEN TO REDUCE THE ENVIRONMENTAL IMPACT RESULTING FROM THE NON-COMPLIANCE:

SIGNATURE: _____ TITLE: _____ DATE: _____

FOR OFFICE USE ONLY

MAIL COMPLETED FORM TO:
(DO NOT SUBMIT ADDITIONAL DOCUMENTATION UNLESS REQUESTED)

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL
COMPLIANCE ASSURANCE SECTION #19
POST OFFICE BOX 19276
SPRINGFIELD, ILLINOIS 62794-9276

LOG:
PERMIT NO. ILR10____
DATE:

Information required by this form must be provided to comply with 415 ILCS 5/39(1996). Failure to do so may prevent this form from being processed and could result in your application being denied. This form has been approved by the Forms Management Center.

**GUIDELINES FOR COMPLETION OF INCIDENCE OF NON-COMPLIANCE (ION)
FORM**

Complete and submit this form for any violation of the Storm Water Pollution Prevention Plan observed during any inspection conducted, including those not required by the Plan. Please adhere to the following guidelines.

< **Submit original, photocopy or facsimile copies. Facsimile and/or photo copies should be followed-up with an original signature copy as soon as possible. Please write "copy" under the "For Office Use Only" box in the lower right hand corner.**

< **Submit completed forms to:**

**Illinois Environmental Protection Agency
Division of Water Pollution Control
Permit Section
Post Office Box 19276
Springfield, Illinois 62794-9276**

< **Reports must be typed or printed legibly and signed.**

< **Use the formats given in the following examples for correct form completion.**

<u>Example</u>		<u>Format</u>
SECTION	12	1 or 2 numerical digits
TOWNSHIP	12N	1 or 2 numerical digits followed by "N" or "S"
RANGE	12W	1 or 2 numerical digits followed by "E" or "W"

**ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
NOTICE OF TERMINATION (NOT)
OF COVERAGE UNDER THE GENERAL PERMIT
FOR STORM WATER DISCHARGES
ASSOCIATED WITH CONSTRUCTION SITE ACTIVITY**

OWNER INFORMATION

NAME:	LAST	FIRST	MIDDLE INITIAL	OWNER TYPE: (SELECT ONE)		
MAILING ADDRESS:				<input type="checkbox"/> PRIVATE	<input type="checkbox"/> COUNTY	
				<input type="checkbox"/> CITY	<input type="checkbox"/> SPECIAL DISTRICT	
				<input type="checkbox"/> FEDERAL	<input type="checkbox"/> STATE	
CITY:		STATE:		ZIP:		
CONTACT PERSON:			TELEPHONE NUMBER:	AREA CODE	NUMBER	

CONTRACTOR INFORMATION

NAME:				TELEPHONE NUMBER:	AREA CODE	NUMBER
MAILING ADDRESS:		CITY:		STATE:		ZIP:

CONSTRUCTION SITE INFORMATION

FACILITY NAME:					NPDES STORM WATER GENERAL PERMIT NUMBER:	I	L	R	1	0				
FACILITY LOCATION:	(Not necessarily the mailing address)													
CITY:		STATE:	IL	ZIP:		LATITUDE	DEG.	MIN.	SEC.	LONGITUDE:	DEG.	MIN.	SEC.	
COUNTY:				SECTION:		TOWNSHIP:				RANGE:				

I certify under penalty of law that disturbed soils at the identified facility have been finally stabilized or that all storm water discharges associated with industrial activity from the identified facility that are authorized by an NPDES general permit have otherwise been eliminated. I understand that by submitting this notice of termination, that I am no longer authorized to discharge storm water associated with industrial activity by the general permit, and that discharging pollutants in storm water associated with industrial activity to Waters of the State is unlawful under the Environmental Protection Act and the Clean Water Act where the discharge is not authorized by an NPDES permit.

OWNER SIGNATURE: _____

DATE: _____

MAIL COMPLETED FORM TO:

(DO NOT SUBMIT ADDITIONAL DOCUMENTATION UNLESS REQUESTED)

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL
ATTN: PERMIT SECTION
POST OFFICE BOX 19276
SPRINGFIELD, ILLINOIS 62794-9276

FOR OFFICE USE ONLY

LOG:
PERMIT NO. ILR10 _____
DATE:

GUIDELINES FOR COMPLETION OF NOTICE OF TERMINATION (NOT) FORM

Please adhere to the following guidelines:

Submit original, photocopy or facsimile copies. Facsimile and/or photo copies should be followed-up with an original signature copy as soon as possible. Please write "copy" under the "For Office Use Only" box in the lower right hand corner.

< Submit completed forms to:

Illinois Environmental Protection Agency
Division of Water Pollution Control
Permit Section
Post Office Box 19276
Springfield, Illinois 62794-9276
217/782-0610

< Reports must be typed or printed legibly and signed.

< **NOTE: FACILITY LOCATION IS NOT NECESSARILY THE FACILITY MAILING ADDRESS, BUT SHOULD DESCRIBE WHERE THE FACILITY IS LOCATED.**

< Use the formats given in the following examples for correct form completion.

	<u>Example</u>	<u>Format</u>
SECTION	12	1 or 2 numerical digits
TOWNSHIP	12N	1 or 2 numerical digits followed by "N" or "S"
RANGE	12W	1 or 2 numerical digits followed by "E" or "W"

APPENDIX B - SOIL QUALITY - URBAN TECHNICAL NOTES

INTRODUCTION

These technical notes provide information about soil quality-related resource issues tailored for the urban environment. They are intended for use by government employees, homeowners, builders, consultants, developers, and others interested in natural resource conservation.

Urban Technical Note No. #1 provides background information on erosion sedimentation on construction sites. It describes impacts on the soil's ability to perform important functions and suggests management practices for preventing or mitigating soil quality degradation in the urban environment.

Urban Technical Note No. #2 provides background information on urban soil compaction, describes impact of soil compaction on the soil's ability to perform important functions, and suggests management practices for preventing or mitigating soil quality degradation in the urban environment.

Urban Technical Note No. #3 provides background information on heavy metal contamination in soils, along with management practices for preventing or mitigating soil quality degradation in the urban environment.

This section was revised in October 2001.

NRCS IL October 2001

urbapp_B.doc

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Erosion and Sedimentation on Construction Sites



United States
Department of
Agriculture

Natural
Resources
Conservation
Service

Soil Quality Institute
411 S. Donahue Dr.
Auburn, AL 36832
334-844-4741
X-177
Urban Technical
Note No. 1

March, 2000

This is the first note in a series of Soil Quality-Urban technical notes on the effects of land management on soil quality.



Introduction

Soil is a crucial component of rural and urban environments, and in both places land management is the key to soil quality. This series of technical notes examines the urban activities causing soil degradation and sedimentation, and the management practices that protect the functions that urban societies demand from soil. This technical note will focus on soil erosion and sedimentation from construction sites.

Off site damage from sediment is the most critical problem facing construction sites. Erosion, which produces this sediment, is accelerated when soil is disturbed, left bare, and exposed to the abrasive action of wind and water. Unless adequate measures are taken to prevent this abnormal, highly accelerated soil removal, it becomes the most visible and damaging factor in the deterioration of soil quality and the environmental quality of urban areas.

Construction Erosion

Although erosion on construction sites often affects only a relatively small acreage of land in a watershed, it is a major source of sediment because the potential for erosion on highly disturbed land is commonly 100 times greater than on agricultural land (Brady and Weil, 1999). Erosion and sediment damages occur both on and off the construction site, and all of society pays for the destructive impacts.

Erosion Impacts

Construction activities, such as grading and filling, drastically reduce soil quality on construction sites. Left unprotected, sites will be further degraded by erosion and begin to adversely affect the surrounding environment. The goal of soil quality management on construction sites is to revegetate for protection against off-site damage and increase soil organic matter levels to remedy the on-site damage caused by site preparation.

On-site impacts: The loss of topsoil, either by actual removal with heavy equipment or erosion by wind and water, is the worst on-site damage in urban areas. This layer of soil has the highest biological activity, organic matter, and plant nutrients—all key components of healthy soil. The on-site loss of this upper layer of soil nearly eliminates the soil's natural ability to provide nutrients, regulate water flow, and combat pests and disease.

- Loss of nutrients and nutrient holding capacity, results in a less fertile environment for lawns and landscape plants. The organic matter and finer soil particles are responsible for soil fertility and are washed away first, leaving larger, less reactive particles such as sand and gravel.
- As organic matter is lost, soil density increases and compaction occurs. Compaction lowers the infiltration rate of water and reduces the available water holding capacity. This results in poorer growth of lawns, gardens, flowerbeds, shrubs, and trees, as well as making the site more susceptible to drought and requiring more frequent watering. Additionally, soil amendments such as fertilizer and pesticides cannot move into the soil and, instead, run off into nearby lakes and streams. Lower organic matter levels are also associated with weaker soil aggregates and therefore greater risk of further erosion and soil crusting.
- The surface organic matter is also the food source and habitat for beneficial microorganisms and insects. The loss of this material drastically reduces the soils natural ability to control disease and pest outbreaks, increasing the need for pesticides. These microorganisms are also key to removing or buffering toxic elements or contaminants.

Off-site impacts: Erosion from construction sites has off-site environmental and economic impacts. Erosion creates two major water quality problems in surface waters and drainage ways: excess nutrients and excess sediment. These problems adversely impact the health and biological diversity of water bodies. More specifically:

- Excess nutrients impact water quality through eutrophication, a process whereby excess nitrogen and phosphorus causes unwanted biological growth.
- Sediment reduces water quality by making the water turbid (cloudy). Turbidity prevents sunlight from penetrating the water and thus reduces photosynthesis and underwater vegetation. Oxygen levels are reduced in turbid waters, further degrading habitat for fish and other aquatic organisms.
- Sediment can build up in stream channels, lowering flow capacity. The problem of low stream capacity is compounded as runoff increases from newly built-up or paved areas and causes stream channels to receive larger amounts of water in shorter periods of time. This leads to more frequent flooding in areas that never or only rarely flooded in the past. In flood-prone areas, levees may need to be built or enlarged to better protect public safety.
- A financial burden results from clean up of sediment-damaged areas. Taxpayers often bear the cost of removing sediment from public roads, road ditches, culverts or streams; not to mention damage to homes and the safety hazards associated with flooding. Other costs of erosion that are borne by the public are degraded soils, a polluted environment, more runoff, greater need for irrigation, and aesthetically displeasing sites.

Many local governments enforce regulations to control or prevent erosion from construction sites. State and local laws and the Clean Water Act of 1992 can require contractors to develop detailed erosion and sediment control plans before beginning construction projects over approximately 2.5 acres.

Tool for Estimating Erosion on Construction Sites

Soil loss from sheet and rill erosion on construction sites, mined lands, reclaimed lands, and other highly disturbed areas can be estimated using the Revised Universal Soil Loss Equation (RUSLE) version 1.06. A handbook is available to help the user estimate factor values and apply the computer model (Toy and Foster, 1998).

The person in each NRCS State or Basin Area Office with responsibility for RUSLE (typically the state agronomist) should be contacted for assistance with estimating soil loss on construction sites using RUSLE.

Evaluating Management Practices and Developing Alternative Systems

Erosion control practices and management systems can be evaluated and planned using the RUSLE model. The erosion control

benefits of cover and management practices such as adding mulch, seeding, and sod can be estimated with the RUSLE conservation management (C) factor. Structural and vegetative practices such as straw bales, silt fences, gravel bags, narrow grass strips or buffers, vegetative barriers, terraces and diversions can be evaluated with the RUSLE conservation practice (P) factor.

Alternative management systems, consisting of combinations of cover and structural practices, can be developed with the RUSLE program. Ideally, these management systems will reduce or control erosion and sedimentation and improve soil quality. Each site and management system must be evaluated individually, since erosion estimates will vary depending on climate, soils, topography, and cover conditions.

The RUSLE model also estimates the amount of sediment delivered to the base of a slope (sediment yield) using the RUSLE P factor. Some temporary practices used on construction sites such as a silt fence placed at the base of the slope will not reduce erosion on the slope but will trap some of the sediment leaving that slope. The RUSLE model estimates this sediment yield, as displayed in Table 1.

Table 1. Effects of management practices on controlling erosion on a road bank. Estimated sheet and rill erosion and sediment yield using RUSLE during a construction year in Nashville, TN¹.

Site Conditions ²		Soil Loss from Road Bank (t/a/y)	Sediment Yield at Base of Slope (t/a/y)
-1 st 6 mo	2 nd 6 mo		
Bare	Bare	400	400
Bare	Bare, Silt Fence	400	250
Bare	Mulch, Seeded	140	140
Bare	Sod, Diversion	40	5

¹Effects of management will vary under other climatic conditions. For example, soil loss and sediment yield will be 35 % and 80 % less in Chicago and Denver, respectively, than values shown in table.

²Roadside cutbank, 100 ft. long at 30% gradient. Site disturbed from March – June. Soil loss and sediment yield during a single construction season. Soil is a silt loam. Silt fence placed at base of slope. Diversion placed in middle of slope.

Principles of Construction Erosion Control

Prevention of urban erosion is best. Here are some basic principles of erosion control on construction sites (adapted from Brady and Weil, 1999):

1. Divide the project into smaller phases clearing smaller areas of vegetation.
2. Schedule excavation during low-rainfall periods, when possible.
3. Fit development to the terrain.
4. Excavate immediately before construction instead of leaving soils exposed for months or years.
5. Cover disturbed soils as soon as possible with vegetation or other materials (mulch) to reduce erosion potential.
6. Divert water from disturbed areas.
7. Control concentrated flow and runoff to reduce the volume and velocity of water from work sites to prevent formation of rills and gullies.
8. Minimize length and steepness of slopes (e.g. use bench terraces).
9. Prevent sediment movement off-site.
10. Inspect and maintain any structural control measures.
11. Where wind erosion is a concern, plan and install windbreaks.
12. Avoid soil compaction by restricting the use of trucks and heavy equipment to limited areas.
13. Soils compacted by grading need to be broken up or tilled prior to vegetating or placing sod.

It is inevitable that soil will be exposed during construction. However, it is essential that the exposed land is minimized, and cover is established as quickly as possible. Conservation practices that provide immediate permanent cover (sod) or provide intermittent cover (mulches and permanent seeding) drastically reduce soil losses and runoff (Table 2). Other supporting practices such as diversions or terraces change slope

lengths, thus reducing runoff and erosion. These supporting practices provide temporary protection for vegetation or sod until they become established and provide permanent protection for the site. There are other conservation practices available for construction and urban erosion (NRCS Watershed Science Institute, 2000).

Table 2. Effectiveness of various groundcovers in reducing runoff and soil erosion for a single simulated rain event (3.78 in/h) at University of Maryland’s turf grass research facility¹ (adapted from Brady and Weil, 1999).

Material	Soil loss ² (tons/acre)	% of Rainfall Runoff	% Ground Cover Established ³
Bare soil with partial cover	2.97	83	50
Woven mesh	0.18	68	61
Wood shavens in non-woven polyester netting	0.36	74	69
Coconut fiber mat	0.48	76	58
Straw (2 t/a)	0.26	60	76
Grass sod	0.04	28	NA

¹Effectiveness will vary at other locations because of differences in climate, soils and topography.

²Soil from Sassafras loamy sand with a 8 % slope and a Matapeake sandy clay loam with a 15% slope.

³Percent vegetation cover established one year after Kentucky 31 fescue grass was seeded and covered by various material.

Conclusion

Soil is important but is often an overlooked component of our urban infrastructure. It is especially important in regulating runoff of storm water and in supporting trees, shrubs, lawns, and gardens. Soil erosion during construction is often a serious problem. Many erosion control practices are available in local soil and water conservation district offices. However, the effects of erosion on construction sites continue to menace society both from on-site and off-site damages. Preventing soil-related problems before they occur is easier and more cost effective than correcting them later. Communities need to work with developers, contractors, and local governments to limit compaction and soil loss during construction operations. The result is a soil functioning properly in the urban landscape.

References

- Brady, N.C., and R.R. Weil. 1999. *The Nature and Properties of Soils*. 12th ed. Prentice Hall. Upper Saddle River, NJ.
- NRCS Watershed Science Institute. 2000. Water related best management practices in the landscape. <ftp://ftp.ftw.nrcs.usda.gov/pub/wssi/UrbanBMPs/index.html>
- Toy, T.J. and G.R. Foster, co-editors. 1998. Guidelines for the use of the Revised Universal Soil Loss Equation (RUSLE) version 1.06 on Mined Lands, Construction Sites, and Reclaimed Lands. USDI-Office of Surface Mining. Denver, CO.

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Urban Soil Compaction



United States
Department of
Agriculture

Natural
Resources
Conservation
Service

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334-844-4741
X-177
Urban Technical
Note No. 2

March, 2000

This is the second note
in a series of Soil
Quality-Urban technical
notes on the effects of
land management on
soil quality.



Introduction

Soil is a crucial component of rural and urban environments, and in both places land management is the key to soil quality. This series of technical notes examines the urban activities that cause soil degradation, and the management practices that protect the functions urban societies demand from soil. This technical note will focus on urban soil compaction.

Healthy soil includes not only the physical particles making up the soil, but also adequate pore space between the particles for the movement and storage of air and water. This is necessary for plant growth, and for a favorable environment for soil organisms to live. Compaction occurs when soil particles are pressed together, thereby reducing the amount of pore space. Examples of compaction in urban settings are traffic pans resulting from repeated trips across lots with trucks and machinery and excessive trampling by people, bicycles, etc. Soils are particularly susceptible to compaction if these activities occur when the soil is wet. The primary impacts of soil compaction are changes in the soil's physical properties (Schuler et al., 2000):

- Strength increases with compaction. Soil strength is the ability to resist penetration by an applied force and is desirable under roads and buildings.

- Bulk density increases with compaction. Bulk density is the weight of soil per volume. It is commonly reported as grams of oven dry soil per cubic centimeter.
- Porosity decreases with compaction. Porosity is the ratio of the volume of pores to the bulk volume of the soil.
- With compaction, the distribution of pores shifts toward smaller pore sizes. Pore size distribution is the array of pores, from very small to large, making up the soil's overall porosity.

These changes influence the movement of air and water in the soil, ease of root growth, and the biological diversity and activity in the soil. For proper plant growth, void space must be available for air and water movement.

Typically a medium textured soil has about 50 % solids and 50 % pore or void space. Compaction increases bulk density and reduces the number of large pores in the soil. (Schuler et al., 2000).

Compared to agricultural land, compaction in urban areas can be more permanent because of the difficulty in bringing in equipment to loosen the soil, due to the presence of utilities and the prevalence of perennial vegetation.

Causes of Soil Compaction in Urban Areas

Causes of compaction in urban areas are generally of two types:

1. Deliberate compaction during construction activities.
 - Compacting of entire areas in order to increase strength for paving and housing foundations without consideration for leaving non-constructed areas (landscaping areas and lawns) in a more natural state.
 - Use of heavy equipment for reshaping and sloping banks along roads and hillsides.
 - Grading lots and placing sod on hard soil or soil denuded of topsoil.
2. Unintentional compaction of the soil after construction is completed.
 - Allowing uncontrolled traffic (both vehicles and foot traffic)
 - Allowing vehicles on lawn areas around homes or businesses, especially when the soil is wet.

Impacts of Soil Compaction

For individual homeowners and businesses, soil compaction makes it difficult to establish and maintain lawns and landscaping due to:

- Restricted root growth.
- Reduced plant uptake of water and nutrients.
- Reduced available water capacity.

- Reduced soil biological activity.

For communities, excessive levels of soil compaction lead to environmental problems due to:

- Increased storm water runoff as a result of low infiltration rates of compacted soils.
- Increased flooding due to runoff.
- Increased erosion from construction sites.
- Increased water pollution potential, especially nitrates and phosphorus, in local rivers, streams, lakes, and ponds.

Detection of Soil Compaction

Generally compaction is a problem within the top 12 inches of the soil surface.

Detection of compaction can be by:

- Observing discolored or poor plant growth.
- Probing with a firm wire (survey flag) or welding rod (18" in length) into the compacted area.
- Digging down to plant roots and finding lateral root growth with little if any penetration of compacted layers.
- Taking bulk density samples (Table 2).
- Using commercially available cone penetrometers that indicate force required to penetrate the soil in terms of pressure (pounds per square inch). Roots are unable to penetrate soil compacted to 300 psi or more. This varies with soil type and moisture content of the soil when tested (Schuler et al., 2000).

Table 2. General relationship of soil bulk density to root growth based on soil texture (NRCS Soil Quality Institute, 1999).

Soil texture	Ideal bulk densities (g/cm ³)	Bulk densities that may affect root growth (g/cm ³)	Bulk densities that restrict root growth (g/cm ³)
Sands, loamy sands	<1.60	1.69	>1.80
Sandy loams, loams	<1.40	1.63	>1.80
Sandy clay loams, loams, clay loams	<1.40	1.60	>1.75
Silts, silt loams	<1.30	1.60	>1.75
Silt loams, silty clay loams	<1.10	1.55	>1.65
Sandy clays, silty clays, some clay loams (35-45% clay)	<1.10	1.49	>1.58
Clays (>45% clay)	<1.10	1.39	>1.47

Prevention of Urban Soil Compaction

Compaction problems during urban development can be avoided by proper planning. Working with local governments may help prevent total compaction in development areas. Divide large areas into sections to be consciously compacted for roads and foundations, and sections for lawns and landscaping. Disturb only areas needed for construction. Also, only manipulate soil when dry (less than field capacity).

Soil that will support lawns can be protected by subsoiling, and by stockpiling topsoil that will be returned to the site after construction. These two measures can restore water flow functions to near natural conditions. Establishing sod or seeding a lawn is much more successful on a loose soil with topsoil than on a compacted soil without adequate topsoil.

In parks and recreation areas, specific areas can be designated for heavy traffic (paved areas or trails). The remaining vegetated areas will benefit from less compaction because of controlled traffic. During special events, lay down metal or wood mats for better distribution of weight for vehicular

traffic or involving high volume of people in concentrated areas. Mesh elements have been used for sporting fields (Beard and Sifers, 1990).

These measures may take a little more time initially, but will pay dividends in the long run. The benefits of planning and wise urban development are:

- Satisfied buyers of homes with soils that function well
- Soils that have good infiltration rates (less frequent irrigation)
- Reduced run-off (less chemical and fertilizer loss to water bodies)
- Lower mortality rates of perennial vegetation (lawns and trees)
- Better plant growth and quality for shrubs, flowers, trees, gardens, and lawns.

Management Practices for Compacted Urban Soil

Although prevention is more effective, the detrimental effects of compaction can be lessened after soils are compacted. Management practices to reduce the effects of urban compaction are:

- Subsoiling to alleviate compacted soils. Always have underground utilities and other underground plumbing or wires located and marked.
- Partial or total soil replacement. Replace dense soil with loose soil or haul in topsoil.
- Increasing organic matter. In gardens, go to residue management/no-till systems and/or cover crops.
- Use of mulch, compost, manures, and amendments.
- Annual aeration of turf grasses to improve infiltration.
- Aeration of soil using a metal tube and air compressor. This is usually used around tree roots. (Personal communication with John Lesenger. Used at the Alabama Shakespeare Festival.)
- Irrigation management. Frequent, low rates of water are necessary because compacted soil holds little water. Over-irrigation wastes water and may lead to environmental pollution from lawn chemicals, nutrients, and sediment.
- Cutting grass at higher heights, which reduces evapotranspiration losses (see local turf grass recommendations—Extension Service).

Summary

Compaction changes important physical properties of the soil. Soils with higher strength, higher bulk densities, and decreased pore space have lower infiltration rates, reduced water holding capacity, and more runoff. This degradation of soil quality results in the need for more irrigation, less

healthy plants, higher plant mortality rates, and higher pollution potential from storm water runoff. Urban soil compaction is more complicated than in an agricultural setting. It is less convenient to alleviate urban compaction because soil cannot be disturbed easily around perennial vegetation, underground utilities, buildings, drive ways, etc. Planning will prevent many problems with compaction in developments and subdivisions. Preventive practices, including limiting the extent of disturbed areas, manipulating soil only when dry and restricting traffic, are more effective and less expensive than practices to alleviate compaction after it occurs. Preventing and managing compaction results in soils that function well and that benefit all of society.

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Heavy Metal Soil Contamination



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Urban Technical
Note No. 3

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This is the third note in a series of Soil Quality-Urban technical notes on the effects of land management on soil quality.



Introduction

Soil is a crucial component of rural and urban environments, and in both places land management is the key to soil quality. This series of technical notes examines the urban activities that cause soil degradation, and the management practices that protect the functions urban societies demand from soil. This technical note focuses on heavy metal soil contamination.

Metals in Soil

Mining, manufacturing, and the use of synthetic products (e.g. pesticides, paints, batteries, industrial waste, and land application of industrial or domestic sludge) can result in heavy metal contamination of urban and agricultural soils. Heavy metals also occur naturally, but rarely at toxic levels. Potentially contaminated soils may occur at old landfill sites (particularly those that accepted industrial wastes), old orchards that used insecticides containing arsenic as an active ingredient, fields that had past applications of waste water or municipal sludge, areas in or around mining waste piles and tailings, industrial areas where chemicals may have been dumped on the ground, or in areas downwind from industrial sites.

Excess heavy metal accumulation in soils is toxic to humans and other animals. Exposure to heavy metals is normally chronic (exposure over a longer period of time), due to food chain transfer. Acute (immediate) poisoning from heavy metals is rare through ingestion or dermal contact, but is possible. Chronic problems associated with long-term heavy metal exposures are:

- Lead – mental lapse.
- Cadmium – affects kidney, liver, and GI tract.
- Arsenic – skin poisoning, affects kidneys and central nervous system.

The most common problem causing *cationic* metals (metallic elements whose forms in soil are positively charged cations e.g., Pb^{2+}) are mercury, cadmium, lead, nickel, copper, zinc, chromium, and manganese. The most common anionic compounds (elements whose forms in soil are combined with oxygen and are negatively charged e.g., MoO_4^{2-}) are arsenic, molybdenum, selenium, and boron.

Prevention of Heavy Metal Contamination

Preventing heavy metal pollution is critical because cleaning contaminated soils is extremely expensive and difficult. Applicators of industrial waste or sludge must abide by the regulatory limits set by the U.S. Environmental Protection Agency (EPA) in Table 1.

Table 1. Regulatory limits on heavy metals applied to soils (Adapted from U.S. EPA, 1993).

Heavy metal	Maximum concentration in sludge (mg/kg or ppm)	Annual pollutant loading rates		Cumulative pollutant loading rates	
		(kg/ha/yr)	(lb/A/yr)	(kg/ha)	(lb/A)
Arsenic	75	2	1.8	41	36.6
Cadmium	85	1.9	1.7	39	34.8
Chromium	3000	150	134	3000	2,679
Copper	4300	75	67	1500	1,340
Lead	420	21	14	420	375
Mercury	840	15	13.4	300	268
Molybdenum	57	0.85	0.80	17	15
Nickel	75	0.90	0.80	18	16
Selenium	100	5	4	100	89
Zinc	7500	140	125	2800	2500

Prevention is the best method to protect the environment from contamination by heavy metals. With the above table, a simple equation is used to show the maximum amount of sludge that can be applied. For example, suppose city officials want to apply the maximum amount of sludge (kg/ha) on some agricultural land. The annual pollutant-loading rate for zinc is 140 kg/ha/yr (from Table 1). The lab analysis of the sludge shows a zinc concentration of 7500 mg/kg (mg/kg is the same as parts per million). How much can the applicator apply (tons/A) without exceeding the 140 kg/ha/yr?

Solution:

(1) Convert mg to kg (1,000,000 mg = 1kg) so all units are the same:

$$7500 \text{ mg} \times (1 \text{ kg}/1,000,000 \text{ mg}) = 0.0075 \text{ kg}$$

(2) Divide the amount of zinc that can be applied by the concentration of zinc in the sludge:

$$(140 \text{ kg Zn/ha}) / (0.0075 \text{ kg Zn/kg sludge}) = 18,667 \text{ kg sludge/ha}$$

(3) Convert to lb/A: $18,667 \text{ kg/ha} \times 0.893 = 16,669 \text{ lbs/A}$

$$\text{Convert lbs to tons: } 16,669 \text{ lb/A} / 2,000 \text{ lb/T} = 8.3 \text{ T sludge per acre}$$

Traditional Remediation of Contaminated Soil

Once metals are introduced and contaminate the environment, they will remain. Metals do not degrade like carbon-based (organic) molecules. The only exceptions are mercury and selenium, which can be transformed and volatilized by microorganisms. However, in general it is very difficult to eliminate metals from the environment.

Traditional treatments for metal contamination in soils are expensive and cost prohibitive when large areas of soil are contaminated. Treatments can be done *in situ* (on-site), or *ex situ* (removed and treated off-site). Both are extremely expensive. Some treatments that are available include:

1. High temperature treatments (produce a vitrified, granular, non-leachable material).
2. Solidifying agents (produce cement-like material).
3. Washing process (leaches out contaminants).

Management of Contaminated Soil

Soil and crop management methods can help prevent uptake of pollutants by plants, leaving them in the soil. The soil becomes the sink, breaking the soil-plant-animal or human cycle through which the toxin exerts its toxic effects (Brady and Weil, 1999).

The following management practices will not remove the heavy metal contaminants, but will help to immobilize them in the soil and reduce the potential for adverse effects from the metals – Note that the kind of metal (cation or anion) must be considered:

1. Increasing the soil pH to 6.5 or higher.

Cationic metals are more soluble at lower pH levels, so increasing the pH makes them less available to plants and therefore less likely to be incorporated in their tissues and ingested by humans. Raising pH has the opposite effect on anionic elements.

2. Draining wet soils.

Drainage improves soil aeration and will allow metals to oxidize, making them less soluble. Therefore when aerated, these metals are less available. The opposite is true for chromium, which is more available in oxidized forms. Active organic matter is effective in reducing the availability of chromium.

3. Applying phosphate.

Heavy phosphate applications reduce the availability of cationic metals, but have the opposite effect on anionic compounds like arsenic. Care should be taken with phosphorus applications because high levels of phosphorus in the soil can result in water pollution.

4. Carefully selecting plants for use on metal-contaminated soils

Plants translocate larger quantities of metals to their leaves than to their fruits or seeds. The greatest risk of food chain contamination is in leafy vegetables like lettuce or spinach. Another hazard is forage eaten by livestock.

Plants for Environmental Cleanup

Research has demonstrated that plants are effective in cleaning up contaminated soil (Wenzel et al., 1999). Phytoremediation is a general term for using plants to remove, degrade, or contain soil pollutants such as heavy metals, pesticides, solvents, crude oil, polyaromatic hydrocarbons, and landfill leachates. For example, prairie grasses can stimulate breakdown of petroleum products. Wildflowers were recently used to degrade hydrocarbons from an oil spill in Kuwait. Hybrid poplars can remove ammunition compounds such as TNT as well as high nitrates and pesticides (Brady and Weil, 1999).

Plants for Treating Metal Contaminated Soils

Plants have been used to stabilize or remove metals from soil and water. The three mechanisms used are *phytoextraction*, *rhizofiltration*, and *phytostabilization*. This technical note will define rhizofiltration and phytostabilization but will focus on phytoextraction.

Rhizofiltration is the adsorption onto plant roots or absorption into plant roots of contaminants that are in solution surrounding the root zone (rhizosphere). Rhizofiltration is used to decontaminate groundwater. Plants are grown in greenhouses in water instead of soil. Contaminated water from the site is used to acclimate the plants to the environment. The plants are then planted on the site of contaminated ground water where the roots take up the water and contaminants. Once the roots are saturated with the contaminant, the plants are harvested including the roots. In Chernobyl, Ukraine, sunflowers were used in this way to remove radioactive contaminants from groundwater (EPA, 1998).

Phytostabilization is the use of perennial, non-harvested plants to stabilize or immobilize contaminants in the soil and groundwater. Metals are absorbed and accumulated by roots, adsorbed onto roots, or precipitated within the rhizosphere. Metal-tolerant plants can be used to restore vegetation where natural vegetation is lacking, thus reducing the risk of water and wind erosion and leaching. Phytostabilization reduces the mobility of the contaminant and prevents further movement of the contaminant into groundwater or the air and reduces the bioavailability for entry into the food chain.

Phytoextraction

Phytoextraction is the process of growing plants in metal contaminated soil. Plant roots then translocate the metals into aboveground portions of the plant. After plants have grown for some time, they are harvested and incinerated or composted to recycle the metals. Several crop growth cycles may be needed to decrease

contaminant levels to allowable limits. If the plants are incinerated, the ash must be disposed of in a hazardous waste landfill, but the volume of the ash is much smaller than the volume of contaminated soil if dug out and removed for treatment. (See box.)

Example of Disposal

Excavating and landfilling a 10-acre contaminated site to a depth of 1 foot requires handling roughly 20,000 tons of soil. Phytoextraction of the same site would result in the need to handle about 500 tons of biomass, which is about 1/40 of the mass of the contaminated soil. In this example, if we assume the soil was contaminated with a lead concentration of 400 ppm, six to eight crops would be needed, growing four crops per season (Phytotech, 2000).

Phytoextraction is done with plants called hyperaccumulators, which absorb unusually large amounts of metals in comparison to other plants.

Hyperaccumulators contain more than 1,000 milligrams per kilogram of cobalt, copper, chromium, lead, or nickel; or 10,000 milligrams per kilogram (1 %) of manganese or zinc in dry matter (Baker and Brooks, 1989). One or more of these plant types are planted at a particular site based on the kinds of metals present and site conditions. Tables 2 and 3 demonstrate the importance of using hyperaccumulators.

Table 2. Percentage decrease in water-extractable zinc and cadmium in three soils after growth of Alpine pennycress (*Thlaspi caerulescens*) (McGrath, 1998).

Site Sampled	Zn	Cd
Farm	28	10
Garden	17	22
Mountain	64	70

Table 3. Removal of zinc in a hypothetical 4.5 T/A (dry matter) crop growing in soil contaminated with 1000 (ppm) zinc with a target of 50 ppm, showing the importance of hyperaccumulation (>10,000 ppm zinc) (McGrath, 1998).

ppm Zn in plant	Lbs. of Zn removed	% of soil total in one crop	years to target
100	0.9	0.04	2470.0
1000	9	0.38	247.0
10,000	90	3.85	24.7
20,000	179	7.69	12.4
30,000	268	11.54	8.2

Phytoextraction is easiest with metals such as nickel, zinc, and copper because these metals are preferred by a majority of the 400 hyperaccumulator plants. Several plants in the genus *Thlaspi* (pennycress) have been known to take up more than 30,000 ppm (3%) of zinc in their tissues. These plants can be used as ore because of the high metal concentration (Brady and Weil, 1999).

Of all the metals, lead is the most common soil contaminant (EPA, 1993). Unfortunately, plants do not accumulate lead under natural conditions. A chelator such as EDTA (ethylenediaminetetraacetic acid) has to be added to the soil as an amendment. The EDTA makes the lead available to the plant. The most common plant used for lead extraction is Indian mustard (*Brassica juncea*). Phytotech (a private research company) has reported that they have cleaned up lead-contaminated sites in New Jersey to below the industrial standards in 1 to 2 summers using Indian mustard (Watanabe, 1997).

Plants are available to remove zinc, cadmium, lead, selenium, and nickel from soils at rates that are medium to long-term, but rapid enough to be useful. Many of the plants that hyperaccumulate metals produce low biomass, and need to be bred for much higher biomass production.

Current genetic engineering efforts at USDA in Beltsville, MD, are aimed toward developing pennycress (*Thlaspi*) that is extremely zinc tolerant. These taller-than-normal plants would have more biomass, thereby taking up larger quantities of contaminating metals (Watanabe, 1997).

Traditional cleanup *in situ* may cost between \$10.00 and \$100.00 per cubic meter (m^3), whereas removal of contaminated material (*ex situ*) may cost as high \$30.00 to \$300/ m^3 . In comparison, phytoremediation may only cost \$0.05/ m^3 (Watanabe, 1997).

Future Prospects

Phytoremediation has been studied extensively in research and small-scale demonstrations, but in only a few full-scale applications. Phytoremediation is moving into the realm of commercialization (Watanabe, 1997). It is predicted that the phytoremediation market will reach \$214 to \$370 million by the year 2005 (Environmental Science & Technology, 1998).

Given the current effectiveness, phytoremediation is best suited for cleanup over a wide area in which contaminants are present at low to medium concentrations. Before phytoremediation is fully commercialized, further research is needed to assure that tissues of plants used for phytoremediation do not have adverse environmental effects if eaten by wildlife or used by humans for things such as mulch or firewood (EPA, 1998). Research is also needed to find more efficient bioaccumulators, hyperaccumulators that produce more biomass, and to further monitor current field trials to ensure a thorough understanding. There is the need for a commercialized smelting method to extract the metals from plant biomass so they can be recycled.

Phytoremediation is slower than traditional methods of removing heavy metals from soil but much less costly. Prevention of soil contamination is far less expensive than any kind of remediation and much better for the environment.

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APPENDIX C – METHODS FOR ESTIMATING RECEIVING WATER QUALITY IMPACTS OF URBAN AND SUBURBAN DEVELOPMENT

This summary was developed by USEPA Region 5 - Chicago.

I. INTRODUCTION

This chapter provides an overview of practical methods for estimating short-term and long-term surface water quality impacts related to urban and suburban development sites. These methods may be used by the urban planner or developer to estimate the impacts on receiving waters from development which may result based on various planning conditions and assumptions. Using the approaches presented here, mitigation of water quality impacts may be tested based upon incorporation of various types of management practices.

II. IMPACTS OF URBAN AND SUBURBAN DEVELOPMENT

There are two principal types of water quality impacts typically associated with urban and suburban development. The first includes the impacts related to the construction phase of development as soils which are destabilized due to clearing grading and excavation are subject to increased erosion by wind and water. Eroded soils associated with construction activity can be carried offsite and deposited in receiving waters such as lakes, rivers and wetlands. Adverse impacts related to these sediments include increased turbidity and habitat modification, including smothering of spawning beds. While the construction phase itself may be relatively short-lived, the impacts to receiving waters from poorly managed construction activities may be extremely severe and long-lasting, particularly to sensitive areas such as wetlands and inland lakes.

Once the construction phase is over, other receiving water quality impacts may become more pronounced due to potentially dramatic changes to the area's hydrology (reduced baseflow and exaggerated peak flow volumes), and the change in land use compared to predevelopment conditions. The increase in impervious areas causes a resultant increase in runoff rates and volumes. This can result in increased streambank erosion and associated water quality problems.

The increased runoff also accelerates the transport of land-borne pollutants into receiving waters. Typical pollutants which may be found in urban storm water at significant levels include heavy metals, oil and grease, pesticides, fertilizers and other nutrients, and toxic organic contaminants. Runoff from roadways and parking lots may cause significant elevations in receiving water temperatures during summer months. Winter road deicing activities can contribute high levels of chlorides or sediment.

In order to properly manage and maintain urban water resources, the impacts associated with new development must be carefully evaluated. Post-development impacts may be evaluated in terms of short-term (acute) impacts, and long-term (chronic) impacts. Short term impacts include the changes to a receiving water's

chemistry, hydrology, temperature, etc, caused by individual runoff events, and are typically on a timescale of hours to days. Long-term impacts are those which are manifested in the weeks-to-years timescale, and include changes to the dry and wet weather hydrology, streambank morphology, and water chemistry of the receiving water. Long-term chemical impacts are most critical for receiving waters with longer residence times such as lakes and wetlands, and for slower moving stream segments.

In terms of the changes to a receiving water's chemistry due to urban runoff, pollutant concentrations are best used to evaluate short-term effects, while pollutant loadings are appropriate for assessing long-term impacts. Land use planners and developers need to understand these impacts and carefully plan in order to mitigate the negative water quality impacts of development. Part of the analysis should be to evaluate changes in both the annual mass of pollutants exported from a developing area (pollutant loading), and instream pollutant concentration related to runoff from new development or redevelopment.

Loading estimates may focus on nutrients such as phosphorus and nitrogen which contribute to algal blooms in lakes and ponds when the assimilative capacity is exceeded. Estimated loadings can be compared with any existing load allocation limitations for a given receiving water. Even when load allocations do not currently exist, loading estimates are very useful for predicting gross changes in the export of various parameters (sediment, oxygen demanding substances, toxic metals and organics, nutrients), and allow for the analysis of various best management practice (BMP) alternatives to modulate any increased loading of pollutants.

Concentration estimates can be compared with applicable State water quality standards to provide an indication of the likelihood that those standards will be exceeded as a result of storm water discharges. This analysis will help in the planning of BMPs to reduce short term impacts such as acute aquatic toxicity, biochemical oxygen demand and bacteria.

III. METHODS

The following is a summary of three methods which may be used to estimate water quality impacts of new development with respect to increased pollutant loading and pollutant concentration.

1. SIMPLE METHOD AND LOADING FUNCTIONS

Pollutant export estimates for a wide variety of pollutants under various planning assumptions can be estimated using the Simple Method (Schueler, 1987). The method is very easy to use as it requires only information which is readily available and does not involve the use of computer models to calculate load estimates. It is recommended that the method be limited in application to sites less than 1 square mile in area.

The annual mass export of a given pollutant in urban runoff may be estimated by the following basic form of the Simple Method:

(EQ 1) $L = (P)(P_j)(R_v)(C)(A)(0.227)$ - (where concentration is in mg/l), or

(EQ 1a) $L = (P)(P_j)(R_v)(C)(A)(0.000227)$ - (where concentration is in ug/l)

where:

- L = annual mass of pollutant export (lbs/yr)
- P = annual precipitation (inches)
- P_j = correction factor for smaller storms which do not produce runoff (dimensionless)
- R_v = runoff coefficient (dimensionless)
- C = average concentration of pollutant
- A = site area (acres)

Annual precipitation Where site specific values for **P** are not available these can be estimated from Figure 1 and Table 1. In Illinois, reasonable estimates fall between 30 inches per year in the northern and central parts of the State to 42 inches per year in the extreme southern section.

FIGURE 1 Rain Zones for the United States (EPA, 1989)

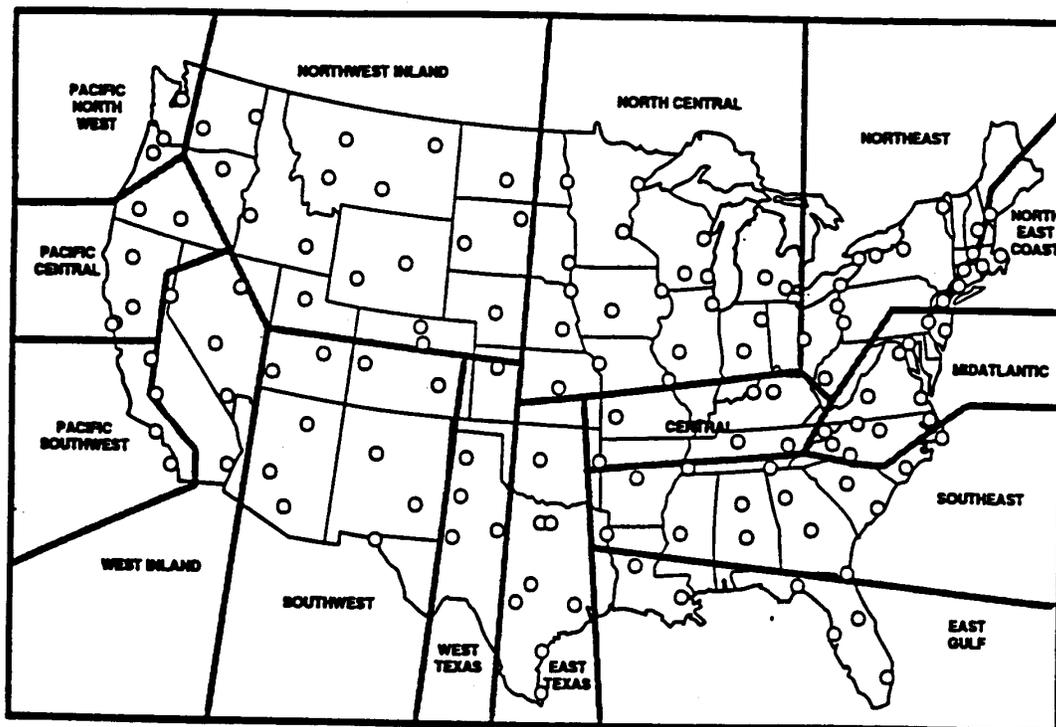


TABLE 1 *Typical Values for Annual Precipitation
in Rain Zones of the United States (EPA, 1989)*

<i>RAIN ZONE</i>	<i>NUMBER OF STORMS</i>	<i>COV</i>	<i>PRECIP (IN)</i>	<i>COV</i>
<i>Northeast</i>	<i>70</i>	<i>0.13</i>	<i>34.6</i>	<i>0.18</i>
<i>Northeast-Coastal</i>	<i>62</i>	<i>0.12</i>	<i>41.4</i>	<i>0.21</i>
<i>Mid-Atlantic</i>	<i>62</i>	<i>0.13</i>	<i>39.5</i>	<i>0.18</i>
<i>Central</i>	<i>68</i>	<i>0.14</i>	<i>41.9</i>	<i>0.19</i>
<i>North Central</i>	<i>55</i>	<i>0.16</i>	<i>29.8</i>	<i>0.22</i>
<i>Southeast</i>	<i>65</i>	<i>0.15</i>	<i>49.0</i>	<i>0.20</i>
<i>East Gulf</i>	<i>68</i>	<i>0.17</i>	<i>53.7</i>	<i>0.23</i>
<i>East Texas</i>	<i>41</i>	<i>0.22</i>	<i>31.2</i>	<i>0.29</i>
<i>West Texas</i>	<i>30</i>	<i>0.27</i>	<i>17.3</i>	<i>0.33</i>
<i>Southwest</i>	<i>20</i>	<i>0.30</i>	<i>7.4</i>	<i>0.37</i>
<i>West Inland</i>	<i>14</i>	<i>0.38</i>	<i>4.9</i>	<i>0.43</i>
<i>Pacific South</i>	<i>19</i>	<i>0.36</i>	<i>10.2</i>	<i>0.42</i>
<i>Northwest Inland</i>	<i>31</i>	<i>0.23</i>	<i>11.5</i>	<i>0.29</i>
<i>Pacific Central</i>	<i>32</i>	<i>0.26</i>	<i>18.4</i>	<i>0.33</i>
<i>Pacific Northwest</i>	<i>71</i>	<i>0.15</i>	<i>35.7</i>	<i>0.19</i>

COV = Coefficient of Variation = Standard Deviation/Mean

Correction Factor This factor is used to account for smaller storms which produce no runoff. The value of P_j may be estimated to be 0.9 where more precise data are unavailable.

Runoff Coefficient R_v represents that fraction of precipitation which appears as runoff. This may be estimated from the following:

$$(EQ 2) \quad R_v = 0.05 + 0.009(I) \quad (\text{Schueler, 1987})$$

where I is the impervious area for the site expressed as percent. I may be estimated by summing the area of impervious surfaces dividing by the total area.

Alternatively, I may be estimated for residential areas by:

$$(EQ 3) \quad I = 9(PD)^{1/2} \quad (\text{Shelly, 1988})$$

where PD is the population density in persons/acre.

Pollutant Concentration The concentration of pollutant C , may be determined from flow-weighted composite samples representative of annual average values in urban runoff from a given area. Where such data are not available, estimates may be based on data from the NURP database or other reliable sources. A table of C values compiled from NURP data is provided in Table 2. Other data on pollutant concentrations (Schueler, 1987), are presented in Tables 3 and 4.

TABLE 2 **Water Quality Characteristics of
Urban Runoff from NURP (U.S. EPA, 1983)**

<i>Pollutant</i>	<i>For Media Urban Site</i>	<i>For 90th Percentile Urban Site</i>	<i>Coefficient of Variation</i>
<i>TSS (mg/l)</i>	100	300	1-2
<i>BOD (mg/l)</i>	9	15	0.5-1.0
<i>COD (mg/l)</i>	65	140	0.5-1.0
<i>Tot. P (mg/l)</i>	0.33	0.70	0.5-1.0
<i>Sol. P (mg/l)</i>	0.12	0.21	0.5-1.0
<i>TKN (mg/l)</i>	1.5	3.3	0.5-1.0
<i>NO₂₊₃ -N (mg/l)</i>	0.68	1.75	0.5-1.0
<i>Copper (ug/l)</i>	34	93	0.5-1.0
<i>Lead (ug/l)</i>	144	350	0.5-1.0
<i>Zinc (ug/l)</i>	160	500	0.5-1.0

TABLE 3 Concentration (C) Values for Use with Simple Method

Pollutant	Residential		Mixed		Commercial		Open/ Nonurban	
	Med	COV	Med	COV	Med	COV	Med	COV
BOD mg/l	10.0	0.41	7.8	0.52	9.3	0.31	--	--
COD mg/l	73	0.55	65	0.58	57	0.39	40	0.78
TSS mg/l	101	0.96	67	1.14	69	0.85	70	2.92
Total P	383	0.69	263	0.75	201	0.67	121	1.66
Soluble P	143	0.46	56	0.75	80	0.71	26	2.11
TKN	1900	0.73	1288	0.50	1179	0.43	965	1.00
Nit. NO ₂ +NO ₃	736	0.83	558	0.67	572	0.48	543	0.91
Copper ug/l	144	0.75	114	1.35	104	0.68	30	1.52
Lead ug/l	33	0.99	27	1.32	29	0.81	--	--
Zinc ug/l	135	0.84	154	0.78	226	1.07	195	0.66

Source: NURP (EPA 1983)

TABLE 4 Concentration Values for Hardwood Forest (OWML, 1983)

Pollutant	Concentration
COD (mg/l)	>40
Tot. P (mg/l)	0.15
Sol. P (mg/l)	0.04
TKN (mg/l)	0.61
NO ₂ -N (mg/l)	0.17

EXAMPLE 1

A proposed 25 acre development in Northeastern Illinois would convert a woodland area ($I = 2\%$) to single family homes and townhouses. The total imperviousness would be 40%. Estimate the post-development increases in phosphorus and total Kjeldahl nitrogen (TKN) loadings.

Discussion

The annual precipitation is assumed to be 30 inches/year (Table 1). The runoff coefficient is calculated from EQ 2.

Prior to development, $I = 2\%$:

$$R_v = 0.05 + 0.009(2) = 0.068$$

After development:

$$R_v = 0.05 + 0.009(40) = 0.41$$

The concentration values C , are taken from Tables 3 and 4. (Mean NURP concentration values are assumed)

<u>Parameter</u>	<u>Pre-development</u>	<u>Post-development</u>
P	30 inches/year	30 inches/year
P_j	0.9	0.9
R_v	0.068	0.41
C (TKN)	0.61 mg/l	1.5 mg/l
C (total P)	0.15 mg/l	0.33 mg/l
A	25 acres	25 acres

Annual loadings are computed from EQ. 1:

Pre-development:

$$TKN = [(30 \text{ in/yr})(0.9)(0.068)(0.61 \text{ mg/l})(25 \text{ acres})(0.227)] = \underline{6.4 \text{ lbs/yr}}$$

$$P\text{-total} = [(30 \text{ in/yr})(0.9)(0.068)(0.15 \text{ mg/l})(25 \text{ acres})(0.227)] = \underline{1.6 \text{ lbs/yr}}$$

Post-development:

$$TKN = [(30 \text{ in/yr})(0.9)(0.41)(1.5 \text{ mg/l})(25 \text{ acres})(0.227)] = \underline{94.2 \text{ lbs/yr}}$$

$$P\text{-total} = [(30 \text{ in/yr})(0.9)(0.41)(0.33 \text{ mg/l})(25 \text{ acres})(0.227)] = \underline{20.7 \text{ lbs/yr}}$$

Results:

<u>Parameter</u>	<u>Pre-devel.</u>	<u>Post-devel.</u>	<u>Increase</u>
TKN	6.4 lbs/yr	94.2 lbs/yr	1472%
P-total	1.6 lbs/yr	20.7 lbs/yr	1294%

EXAMPLE 2

For the above example, what would be the post development nutrient increase if the total imperviousness were limited to 25%?

Discussion

From Equation 2, $R_v = 0.28$. From Equation 1, the post development increase would be:

<u>Parameter</u>	<u>Pre-devel.</u>	<u>Post-devel.</u>	<u>% Increase</u>
TKN	6.4 lbs/yr	64.3 lbs/yr	1000
P-total	1.6 lbs/yr	14.1 lbs/yr	884

EXAMPLE 3

Suggest a BMP or group of BMPs which could potentially limit the export of total phosphorus to within 50 % of pre-development levels.

Discussion

Table 15 provides a summary of pollutant removal efficiencies for various storm water runoff control practices. Wet ponds or multiple pond systems are the most reliable practices for controlling nutrients in runoff, and are also generally effective in removing other pollutants of concern.

Loading Functions The simple method may be used to convert typical concentration values to estimates of annual mass loadings. Also known as loading functions, these estimates can be based upon unit area for various land use types and per cent site imperviousness, or other similar constants. Loading functions allow for a direct estimation of pollutant loading for various land use types. Table 4 presents calculated loading functions from various land use types.

TABLE 4 Calculated Pollutant Mass Loadings for Various Land Uses

(Pounds/Acre/Year)

Land Use	I	Total Phos.	TKN	BOD 5-day	Zinc	Lead
Rural Residential	0	0.10	0.45	2.70	0.05	0.04
	5	0.19	0.86	5.16	0.09	0.08
	10	0.28	1.27	7.62	0.14	0.12
Large Lot Single Family	10	0.28	1.27	7.62	0.04	0.12
	15	0.38	1.73	10.4	0.18	0.17
	20	0.46	2.09	12.5	0.22	0.20
Medium Density Single Family	20	0.46	2.09	12.5	0.22	0.20
	25	0.55	2.50	15.0	0.27	0.24
	30	0.64	2.92	17.5	0.31	0.28
	35	0.74	3.36	20.2	0.36	0.32
Town-house	35	0.74	3.36	20.2	0.36	0.32
	40	0.83	3.77	22.6	0.40	0.36
	45	0.92	4.18	25.1	0.45	0.40
	50	1.01	4.59	27.5	0.49	0.44
Garden Apartment	50	1.01	4.59	27.5	0.49	0.44
	55	1.10	5.00	30.0	0.53	0.48
	60	1.19	5.41	32.5	0.58	0.52
High Rise, Light Commercial/ Industrial	60	1.19	5.41	32.5	0.58	0.52
	65	1.28	5.82	34.9	0.62	0.56
	70	1.37	6.23	37.4	0.66	0.60
	75	1.46	6.64	39.8	0.70	0.64
	80	1.55	7.05	42.3	0.75	0.68
Heavy Commercial, Shopping Center	80	1.55	7.05	42.3	0.75	0.68
	85	1.64	7.45	44.7	0.80	0.72
	90	1.72	7.82	46.9	0.83	0.75
	95	1.82	8.27	49.6	0.88	0.79
	100	1.91	8.68	52.1	0.93	0.83

¹ $P=30$ inches, $P_f=0.9$, $R_v=0.05+0.009(I)$, $A= 1$ acre,

$C=$ mean NURP values from Table 2

Similar loading functions can be made using the data in Table 3 or other appropriate data.

Total annual loads are estimated by multiplying the area associated with each given land use type by the loading function for that land use:

$$(EQ. 4) \quad L = \text{SUM}(L_x)(A_x)$$

where:

- L = total loading (lbs/yr)
- L_x = loading function for land use x (lbs/acre/yr)
- A_x = area of land use x (acre)

In another variation of the Simple Method, Heaney (Mills et al, 1985) has developed a loading function based on population density and street cleaning frequency:

$$(EQ.5) \quad L_x = (a_x)(F_x)(Y_x)(P)$$

where:

- L_x = loading function for land use x (lbs/acre)
- a_x = pollutant concentration factor (lbs/acre/in)
- F_x = population density function
- Y_x = street cleaning factor
- P = annual precipitation (inches)

Total loading is calculated using EQ. 5. Typical a_x values are given in Table 5.

**TABLE 5 Pollutant Concentration Factors (a_x)
For use in EQ 5**

Land Use	BOD	TSS	PO ₄	Nit.
Residential	0.78	16	0.033	0.13
Commercial	3.13	22	0.073	0.29
Industrial	1.18	29	0.069	0.27
Other Developed	0.11	2.7	0.009	0.06

The population density function, F_x is a dimensionless parameter. Typical empirical values for F_x adapted from Heaney et al. are:

1.0 for commercial and industrial development, and

$$(EQ. 6) \quad 0.142 + 0.134 [0.405(PD)]^{0.54} \text{ for residential}$$

where:

PD = population density (persons/acre)

The street cleaning factor is based upon the street sweeping interval in days (**N_s**):

Y_x = **N_s/20** for **N_s < 20** days

Y_x = **1.0** for **N_s > 20** days

EXAMPLE 4

Referring to Example 1, assume that the population density is 25 persons/acre and that street sweeping is performed 1/month, what is the annual nitrogen and phosphorus loading from the development as predicted from EQ. 4 ? How does this compare with the prediction from Example 1 ?

ANSWER

From TABLE 4, **a_x** is 0.033 (lbs/acre/in).

From EQ. 6, the population density function, **F_x** = 0.87

Y_x is set to 1.0, since street sweeping frequency is less than 1/20 days.

P = 30 in/yr.

From EQ 5, the phosphorus loading function is:

L_x = (0.033 lbs/acre-inch)(0.87)(1.0)(30 in/yr) = 0.86 lbs/acre-yr

The total annual load from EQ 3 is:

L = (25 acres)(0.86 lbs/acre-yr) = 22 lbs/yr (Using the simple method in Example 1 predicted 20.7 lbs/yr)

2. PHOSPHORUS LOAD ALLOCATIONS - THE MAINE DEP METHOD

The Maine Department of Environmental Protection has developed a detailed application of the loading functions method for determining changes in phosphorus loadings which may be expected as a result of different urban and suburban development scenarios (Dennis et al. 1989). Estimated phosphorus loadings can be compared with specified phosphorus loading allocations for Maine lakes. In addition, the procedure allows for the estimation of phosphorus loading mitigation, based on the use of various combinations of BMPS. By use of simple desk-top calculations, planners

and developers are able to estimate in advance whether proposed development areas will comply with the State's phosphorus loading allocations.

The acceptable increase in phosphorus export is determined by:

$$(EQ. 7) \quad L_p = (FC)/D$$

where:

L_p = acceptable increase in the phosphorus loading function (lbs/acre/yr)

1F = phosphorus coefficient for the lake watershed (lbs/ppb/yr)

C = acceptable increase in lake phosphorus concentration (ppb)

D = future area to be developed over next 50 years in the watershed (acres)

¹ ***F factors have been determined for specific lakes in Maine. Similar targets may be established for waterbodies in other areas. In the absence of specific loading limitations, the process may be used to estimate the increase in phosphorus loading resulting from a proposed development.***

C , the acceptable increase in phosphorus concentration, is a function of existing water quality and the level of desired protection. C values are given in Table 6.

TABLE 6 C Values - Acceptable Increase in Lake Phosphorus Concentration (Maine DEP, 1989)

Water Quality Category	Lake Protection Level		
	High	Medium	Low
Outstanding	0.5	1.0	1.0
Good	1.0	1.5	2.0
Moderate/Stable	1.0	1.25	1.5
Moderate/Sensitive	0.75	1.0	1.25
Poor/Restorable	0.1	0.5	NA
Poor/Low Priority	2.0	4.0	6.0

D is determined as the total area minus already developed and undevelopable land (steep slopes, wetlands, parks, etc.) and multiplying by a development factor which

estimates the portion of undeveloped land which is likely to be developed. In Maine these development factors are:

0.20 - 0.35 for lake areas near growth centers

0.15 - 0.25 for lake areas subject to seasonal development

0.10 - 0.20 for lakes for which development is shoreline dependent

0.10 - 0.15 for lake areas not subject to development pressure

It is recommended that conservative upper estimates be used for development factors.

The permitted phosphorus export (PPE) for a site is simply:

$$(EQ. 8) \quad PPE = (L_p)(A)$$

where:

PPE = permitted phosphorus export for proposed development (lbs/acre)

A = the proposed area of the site (acres)

The proposed area of the development (A) should include all areas except those which are undevelopable such as wetlands > 1 acre, and steep slopes.

The total predicted phosphorus export (TE) for a development site is the summation of export values from roadways, individual houselots, multi-unit housing, commercial and industrial development. Credit is given for phosphorus control measures which are employed. The general equation for Phosphorus export is:

$$(EQ. 9) \quad (TE) = \text{summation } (RE) + (HE) + (CE)$$

where:

(TE) = total predicted phosphorus export

(RE) = phosphorus export from roadways

(HE) = phosphorus export from individual house lots

(CE) = phosphorus export from multi-unit housing, commercial, and industrial development,

Phosphorus Export from Residential Area Roadways (RE)

Road surface phosphorus export is determined as follows:

$$(EQ. 9) \quad (RE) = [(FT)(LBS)(TF_b)(TF_{wp})(TF_i)(TF_o)]/100$$

where:

(FT) = length of roadway being evaluated (feet)

(LBS) = annual export of phosphorus from 100 feet of roadway, before treatment

(TF_b) = treatment factor for buffer strips

(TF_{wp}) = treatment factor for wet ponds

(TF_i) = treatment factor for infiltration practice

(TF_o) = treatment factor for other treatment factor

The annual export per 100 feet of roadway is calculated as:

$$(EQ. 10) \quad (LBS) = (\text{road surface width})(0.012) + (\text{road ditch width})(0.004)$$

Treatment factors (TF) for all the above calculations and those that follow must be numbers between 0 and 1.0 which reflect the long term phosphorus removal efficiency of the treatment practice or practices employed. Tables in Appendix C-1 present some recommended values. Note that lower numbers reflect higher removal efficiencies. It is also evident that the calculation gives greater credit where redundant treatment practices are employed.

Phosphorus export from individual house lots (HE)

The annual phosphorus export from an individual houselot is calculated as:

$$(EQ. 11) \quad (HE) = (BP)(TF_b)(TF_{wp})(TF_i)(TF_o)$$

where:

(BP) = phosphorus export before treatment

(TF_b) = treatment factor for buffer strips

(TF_{wp}) = treatment factor for wet ponds

(TF_i) = treatment factor for infiltration practice

(TF_o) = treatment factor for other treatment factor

Table 11 presents (BP) values for different hydrologic groups

TABLE 11 Phosphorus Export (BP Values) From Lots Before Treatment - Residential

Hydrologic Group	Area Cleared per Lot		
	<10,000 ft	>10,000 ft	>15,000 ft
A	.27 (.2)	.30 (.30)	.35 (.35)
B	.32 (.40)	.39 (.46)	.49 (.54)
C	.34 (.48)	.44 (.56)	.58 (.67)
D	.36 (.62)	.47 (.62)	.62 (.74)

Note: Values in parentheses are appropriate for sites where more than 40% of timber volume has been harvested within the last 5 years.

Phosphorus Export from Multi-unit Housing, Commercial, and Industrial Development (CE)

Phosphorus Export from multi-unit housing, commercial, and industrial development is calculated as:

$$(EQ. 12) \quad (CE_x) = (L_x)((BL_x)(TF_b)(TF_{wp})(TF_i)(TF_o))$$

where:

(L_x) = altered land surface area (acres)

(BL_x) = additional phosphorus export per acre of altered land surface (lbs/acre)

(TF_b) = treatment factor for buffer strips

(TF_{wp}) = treatment factor for wet ponds

(TF_i) = treatment factor for infiltration practice

(TF_o) = treatment factor for other treatment factor

Values for additional phosphorus export associated with altered land uses are found in Table 12.

TABLE 12 Phosphorus Export from Altered Land Uses

<i>Land Use Category</i>	<i>Phosphorus Export Before Treatment</i>
<i>Lawn A</i>	<i>.30 lbs/acre</i>
<i>Lawn B</i>	<i>.65 lbs/acre</i>
<i>Lawn C</i>	<i>.97 lbs/acre</i>
<i>Lawn D</i>	<i>1.1 lbs/acre</i>
<i>Road Ditch</i>	<i>1.8 lbs/acre</i>
<i>Road Surface</i>	<i>5.3 lbs/acre</i>
<i>Impervious Surfaces</i>	<i>3.5 lbs/acre</i>

The total loading from multi-unit housing, commercial and industrial areas is the summation of all areas for various land use categories.

EXAMPLE 5

Referring to the proposed development in Example 1, consists of 40 single family units with an average lot size of 0.31 acres, and 29 townhouses with an average of 0.43 acres. The resident soil is Type C. All the runoff will be treated by a wet detention basin. Runoff from the townhouses and roads will also be treated by a 150 foot buffer strip with a slope of 12%. The wet detention basin will be designed with a length to width ratio of 3:1, and mean depth of 5 ft.

The total road length to be added as part of the subdivision is 1,100 feet. The road width is 38 feet with 4 foot shoulders. The main access road which is included in the total road length is 700 feet and has 5 foot ditches on each roadside.

Calculate the additional phosphorus export associated with the proposed development. Also calculate without treatment and compare with Examples 1 and 4.

Discussion

Referring to Appendix C-1, assume a treatment factor of 0.7 for buffer strips 0.5 for the wet detention pond. The analysis must consider the runoff from the houses and townhouses separately. Assuming that < 10,000 ft² cleared, phosphorus loading from the single-family dwellings is:

$$(HE) = (40 \text{ lots})(0.48\text{lbs/lot/yr})(0.5) = 9.6 \text{ lbs/yr}$$

From the townhouses:

$$(CE) = (29 \text{ lots})(0.43 \text{ acres/lot})(0.97 \text{ lbs/acre/yr})(0.5)(0.7) = 4.2 \text{ lbs/yr}$$

For the roadways, use EQ. 9:

$$(LBS) = [(38 + 4 + 4)(0.012)] + [(5 + 5)(0.004)] = 0.59 \text{ lbs/100 ft}$$

$$(RE) = (11)(0.59)(0.7)(0.5) = 2.3 \text{ lbs/yr}$$

The total additional phosphorus export is then:

$$HE + CE + RE = \underline{16.1 \text{ lbs/yr}}$$

Without treatment:

$$(HE) = (40 \text{ lots})(0.48 \text{ lbs/lot/yr}) = 19.2 \text{ lbs/yr}$$

From the townhouses:

$$(CE) = (29 \text{ lots})(0.43 \text{ acres/lot})(0.97 \text{ lbs/acre/yr}) = 12.1 \text{ lbs/yr}$$

For the roadways, use EQ. 9:

$$(LBS) = [(38 + 4 + 4)(0.012)] + [(5 + 5)(0.004)] = 0.59 \text{ lbs/100 ft}$$

$$(RE) = (11)(0.59) = 6.5 \text{ lbs/yr}$$

The total additional phosphorus export is then:

$$HE + CE + RE = \underline{37.8 \text{ lbs/yr}}$$

This is somewhat higher than the solutions to Examples 1 and 4 (20.7 lbs/year and 22 lbs/year, respectively).

EXAMPLE 6

A 7.4 acre office complex in an area with type B soils is proposed. The site includes 4.9 acres of lawn area. Rooftop accounts for 0.9 acres and 1.1 acre for parking, and 0.3 acres for road surface, and 0.2 acres for road ditch. Calculate the additional phosphorus export.

All flows are to be treated by a 100 ft buffer strip with 10% slope and a wet detention pond with a 4:1 length to width ratio and a mean depth of 4 feet.

Discussion

From Appendix C - 1, TABLES C - 1.1 and C - 1.2, the Treatment factors are 0.6 for the buffer strip and 0.48 for the wet pond. Phosphorus loadings from the various areas are from Table 12 and EQ 9. The total loading is:

$$(CE) = [(4.9)(0.65) + (0.9)(3.5) + (1.1)(3.5) + (0.3)(5.3) + (0.2)(3.5)] \times [(0.6)(0.48)] = \underline{2.77 \text{ lbs phosphorus/yr}}$$

Other pollutants

While the Maine procedure was conceived for use in loading estimates of a particular pollutant (phosphorus), and is specific to the State of Maine, the basic concept can be expanded for use with other pollutants of concern in any type of receiving water anywhere in the country. In order to adapt this procedure, the following types of information are necessary:

- Data on annual average loading per unit area for given types of land uses.
- Data on the treatment efficiency of various best management practices in reducing the loading of pollutants of concern.

Where available, these may be compared with target loading ceilings for pollutants of concern.

Table 13 summarizes data on concentrations of various pollutants in runoff from to urban catchments in Wisconsin (Bannerman et al, 1992). In Table 14 these are converted to annual pollutant load per acre, based on 30 inches of precipitation annually. These can be converted to lbs per square foot by dividing by 43,560.

TABLE 13 Pollutant Concentrations from Various Source Areas in Two Urban Catchments in Wisconsin

Source ¹	Mean Pollutant Concentration ²						
	TSS mg/l	Total Phos mg/l	Cd ug/l	Cr ug/l	Cu ug/l	Pb ug/l	Zn ug/l
IndustRoof 1	54	.13	.3	--	7	8	1348
Arterial ST 1	875	1.01	2.8	26	85	85	629
Arterial ST 2	241	.53	2.6	18	50	55	554
Feeder ST 1	969	1.57	3.7	17	97	107	574
Feeder ST 2	1085	1.77	.8	7	25	38	245
Parking Lot 1	475	.48	1.2	16	47	62	361
Parking Lot 2	91	.26	.08	7	21	30	249
Outfall 1	174	.38	1.1	7	31	26	295
Outfall 2	374	.86	.6	5	20	40	254
ResiDriveway 2	193	1.5	.5	2	20	20	113
FlatRoof 2	19	.24	.4	--	10	10	363
Collector ST 2	386	1.22	1.7	13	61	62	357
ResiLawn 2	457	3.47	--	--	13	--	60
ResiRoof 2	36	.19	.2	--	5	10	153

Source: Bannerman et al, 1992

¹Study area 1 described as mainly industrial; Study area 2 described as medium density residential

²Area = 1 acre P = 30 inches/yr

TABLE 14 Pollutant Loadings per Acre From Various Sources, Based on Wisconsin Data

Source ¹	Pollutant Loading (lbs/acre/year) ²						
	TSS	Total Phos	Cd	Cr	Cu	Pb	Zn
IndustRoof 1	367	.88	.002	--	.05	.05	9.2
Arterial ST 1	5950	6.9	0.2	.18	.58	.58	4.3
Arterial ST 2	1639	3.6	.018	.12	.34	.37	3.8
Feeder ST 1	6589	10.7	.025	.12	.66	.73	3.9
Feeder ST 2	7378	12.0	.005	.05	.17	.26	1.67
Parking Lot 1	3230	3.26	.008	.11	.32	.42	2.45
Parking Lot 2	619	1.77	.0005	.05	.14	.20	1.69
Outfall 1	1183	2.58	.007	.05	.21	.18	2.01
Outfall 2	2543	5.84	.004	.03	.136	.27	1.73
ResiDriveway 2	1312	10.2	.003	.014	.136	.136	.768
FlatRoof 2	129	1.63	.003	--	.068	.068	2.47
Collector ST 2	2625	8.30	.012	.088	.415	.422	2.43
ResiLawn 2	3108	23.6	--	--	.088	--	0
ResiRoof 2	245	1.29	.0014	--	.034	.068	1.04

Source: Bannerman et al, 1992

¹Study area 1 described as mainly industrial; Study area 2 described as medium density residential

²Area = 1 acre P = 30 inches/year

Schueler has provided an assessment of effectiveness of various control practices in removing pollutants (Schueler, 1992). A summary is provided in Table 15.

TABLE 15 Pollutant Removal Efficiencies For Various Control Practices

Storm Water Management Practice	Pollutant Removal Efficiency			
	TSS	Nutrients	Organic	Metals
Extended Detention	30-70%	low to neg. for soluble nutrients	15-40% for COD	
Wet Ponds	50-90%	30-90% for total P 40-80% for sol. nutr.	mod-high removal	mod-high removal
Stormwater Wetlands	slightly higher than wet ponds	somewhat lower than wet ponds		
Multiple Pond System	Varies with design, but typically enhanced over individual ponds			
Infiltration Trenches	+90%	60%		+90%
Infiltration Basins				
Porous Pavement	up to 80%	up to 60% for Phos up to 80% for Nit	High	High
Sand Filters	85%	40% for dissolved Phosphorus 35% for Nit		50-70%
Peat Sand Filters	85%	70% for Phosphorus 50% for Nit	90% for BOD	
Grassed Swales	up to 70%	30% for Phos 25% for Nit		50-90%
Filter Strip	28%			

Source: Schueler et al, 1992

EXAMPLE 7

Returning to Example 1 and Example 5. Assume that the single family units have roofs which are 2,400 square feet (0.055 acre), and the townhouse roofs are 3,000 square feet (0.069 acre). Residential driveways are assumed to average 610 square feet (0.014 acres). Parking for the townhouses consists of 11 lots at an average of 6,500 square feet (0.15 acres) each.

Calculate the zinc loading for the 25 acre single family/townhouse development, using the Tables 14 and 15, and alternatively, EQ 1, before treatment. How do the results compare?

Discussion

The total roof area is:

$$(40)(0.055) + (29)(0.069) = 4.2 \text{ acres rooftops}$$

Total driveway area is:

$$(40)(0.014 \text{ acres}) = 0.56 \text{ acres driveway}$$

Total parking lot area is:

$$(11)(0.15 \text{ acres}) = 1.65 \text{ acres parking lot.}$$

The area associated with the roadways (feeder street) is:

$$(38 + 4 + 4)(1,100) = 50,600 \text{ square feet or } 1.2 \text{ acres}$$

The remaining area is considered to be residential lawn:

$$25 - [4.2 + 0.56 + 1.65 + 1.2] = 17.4 \text{ acres residential lawn}$$

Loading estimates:

Referring to Table 14, the estimated loading rate from rooftops is assumed to be 1.04 lbs zinc/yr, and 0.68 lbs lead/yr. Total loading for the development is:

$$\text{Zinc} - (4.2 \text{ acres})(1.04 \text{ lbs/acre/yr}) = 4.24 \text{ lbs/yr}$$

$$\text{Lead} - (4.2 \text{ acres})(0.68 \text{ lbs/acre/yr}) = 2.86 \text{ lbs/yr}$$

The estimated loading rate from residential driveways is assumed to be 0.768 lbs zinc/acre/yr, and 0.136 lbs lead/acre/yr. Total loading from residential driveways is:

$$\text{Zinc} - (0.56 \text{ acres})(0.768 \text{ lbs/acre/yr}) = 0.43 \text{ lbs/yr}$$

$$\text{Lead} - (0.56 \text{ acres})(0.136 \text{ lbs/acre/yr}) = 0.076 \text{ lbs/yr}$$

The estimated loading rate from parking lots is 1.69 lbs zinc/acre/yr and 0.20 lbs lead/acre/yr (assume study area 2 - medium density residential). Total loading from parking lots is:

$$\text{Zinc} - (1.65 \text{ acres})(1.69 \text{ lbs/acre/yr}) = 2.60 \text{ lbs/yr}$$

$$\text{Lead} - (1.65 \text{ acres})(0.20 \text{ lbs/acre/yr}) = 0.33 \text{ lbs/yr}$$

The estimated loading rate from the feeder streets is 1.67 lbs zinc/acre/yr, and 0.26 lbs lead/acre/yr. Total loading is:

$$\text{Zinc} - (1.2 \text{ acres})(1.67 \text{ lbs/acre/yr}) = 2.00 \text{ lbs/yr}$$

$$\text{Lead} - (1.2 \text{ acres})(0.26 \text{ lbs/acre/yr}) = 0.31 \text{ lbs/yr}$$

The estimated loading rate from residential lawns is 0 for zinc and unknown for lead. Therefore, assume no significant increase in metals loading from these areas.

Summing the above the total loading from all areas is gives:

$$\underline{\text{Zinc}} - 4.24 + 0.43 + 2.60 + 2.00 = \underline{\mathbf{9.3 \text{ lbs/yr}}}$$

$$\underline{\text{Lead}} - 2.86 + 0.076 + 0.33 + 0.31 = \underline{\mathbf{3.6 \text{ lbs/yr}}}$$

Using EQ 1a, and referring back to Table 2 and Example 1:

$$\underline{\text{Zinc}} = (30 \text{ in/yr})(0.9)(0.068)(0.160 \text{ mg/l})(25 \text{ acres}) = \underline{\mathbf{7.3 \text{ lbs/yr}}}$$

$$\underline{\text{Lead}} = (30 \text{ in/yr})(0.9)(0.068)(0.144 \text{ mg/l})(25 \text{ acres}) = \underline{\mathbf{6.6 \text{ lbs/yr}}}$$

The methods provide reasonable agreement for the proposed development.

3. ESTIMATING ACUTE CONCENTRATIONS

The approaches outlined above offer tools for predicting changes in long-term loading rates of pollutants to surface waters as an aid to planning activities. These methods do not provide for estimating short term impacts of urban runoff. Such impacts are more properly viewed as the result of instream pollutant concentrations rather than average loading rates. Predicted instream concentrations can be compared with state water quality standards as a means of predicting water quality standards violations due to urban runoff.

Typically much more complex computer models are employed to predict short term wet weather impacts to receiving waters brought about by urbanization. These models integrate hydrological and instream chemical processes in order to estimate instream pollutant concentrations. Models such as STORM and SWMM require significant data input and site specific verification.

Analysis of data collected as part of the National Urban Runoff Program (NURP) indicates that event mean pollutant concentrations may adequately be specified as a lognormal distribution (EPA, 1986). Because of this, the expected concentration for a given probability for a given pollutant in urban runoff can be determined for a particular data set if the central tendency (median or mean value) and the variability (coefficient of variation or standard deviation) are known. This concentration can be compared to some reference concentration such as a water quality standard to indicate the likelihood that an acute water quality impact will occur in the receiving water. Alternatively, the probability that a given concentration level (such as a water quality standard) will be exceeded can be estimated.

The expected runoff concentration for pollutant x is:

$$(EQ. 13) \quad C_x = C_m (\exp [Z (\ln\{1+COV\})^2]^{1/2})$$

where:

* C_x = expected concentration of pollutant x

* Z = standard normal probability (for specified probability of occurrence)

* C_m = median pollutant concentration

* COV = coefficient of variation

* **For log-transformed data**

The probability that a specified concentration will be exceeded can be determined by substituting the concentration level of interest for C_x in EQ. 13, solving the equation for Z , and locating the associated probability for the calculated Z value:

(EQ. 14) $Z = (\ln[C_x/C_m]) / [(\ln(1+COV^2))^{1/2}]$

Z values for various probabilities of occurrence is presented in Table 16.

Median event mean concentrations and coefficients of variation for NURP data for all land use types are presented in Table 3. If sufficient local data are available these may also be used provided they are transformed into logrhythmic form. Illinois Water quality standards for various pollutants is presented in Table 17. For certain metals these are based on hardness.

TABLE 16 Z Values for Various Probabilities

Z Value	Probability of Exceedance
3.090	0.1%
2.326	1%
2.054	2%
1.881	3%
1.751	4%
1.645	5%
1.476	7%
1.282	10%
1.036	15%
0.842	20%
0.674	25%
0.524	30%
0.385	35%
0.253	40%
0.000	50%
-0.253	60%
-0.524	70%
-0.842	80%
-1.282	90%

TABLE 17 Illinois Water Quality Standards

Pollutant	Acute Standard	Chronic Standard
Arsenic (ug/l)	360	
Cadmium (ug/l)	$\exp[A + B \ln(H)]$ but not > 50ug/l A=-2.98, B=1.128	$\exp[A + B \ln(H)]$ A=-3.49, B=0.785
Hexavalent Chromium (ug/l)	16	11
Trivalent Chromium (ug/l)	$\exp[A + B \ln(H)]$ A=3.688, B=0.819	$\exp[A + B \ln(H)]$ A=1.561, B=0.819
Copper (ug/l)	$\exp[A + B \ln(H)]$ A=-1.46, B=0.942	$\exp[A + B \ln(H)]$ A=-1.47, B=0.855
Cyanide (ug/l)	22	5.2
Lead (ug/l)	$\exp[A + B \ln(H)]$ but not >100ug/l A=-1.46, B=1.273	NA
Mercury (ug/l)	0.5	NA
Barium (mg/l)	5.0	NA
Boron (mg/l)	1.0	NA
Chloride (mg/l)	500	NA
Fluoride (mg/l)	1.4	NA
Iron Mg/l)	1.0	NA
Manganese (mg/l)	1.0	NA
Nickel (mg/l)	1.0	NA
Phenols (mg/l)	0.1	NA
Selenium (mg/l)	1.0	NA
Silver (ug/l)	5.0	NA
Sulfate (mg/l)	500	NA
Total Dissolved Solids (mg/l)	1000	NA
Zinc (mg/l)	1.0	NA

H = Hardness

EXAMPLE 8

For the development described in Example 1, what is the probability that water quality standards will be violated for zinc and lead, assuming no treatment.

Answer

From Table 15, the acute water quality standard for lead is:

$$WQS_{acute} = \exp[-1.46 + 1.273(\ln(H))]$$

Assuming the Hardness = 100 mg/l, then:

$$WQS_{acute} = 82 \text{ ug/l lead}$$

From Table 15, the acute water quality standard for zinc is:

$$WQS_{acute} = 1.0 \text{ mg/l zinc}$$

From Table 3, the median concentrations and Coefficients of variation for lead and zinc are

$$\text{Lead: } C_m = 33 \text{ ug/l, } \text{COV} = 0.99$$

$$\text{Zinc: } C_m = 135 \text{ ug/l, } \text{COV} = 0.84$$

Applying EQ 14, the probability that lead and zinc water quality standards would be exceeded for any given storm (assuming no treatment or dilution) would be estimated to be:

$$\text{Lead: } Z = (\ln[82/33])/[(\ln(1+0.99)^2)]^{1/2}$$

$$Z = 0.77, \text{ which corresponds to an exceedance probability of 20 - 25\%}$$

$$\text{Zinc: } Z = (\ln[1000/135])/[(\ln(1+0.84)^2)]^{1/2}$$

$$Z = 1.81, \text{ which corresponds to an exceedance probability of less than 5\%}$$

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APPENDIX C-1 -- TREATMENT FACTORS FOR USE IN MAINE DEP PROCEDURE

TABLE C-1.1 Treatment Factors (TF) for Buffer Strips

Hydrologic Group A Soils

<i>Treatment Factor- Wooded (Non-Wooded)</i>					
<i>Slope</i>	<i>25 ft</i>	<i>50 ft</i>	<i>100 ft</i>	<i>150 ft</i>	<i>200 ft</i>
<i>0-10%</i>	<i>.75 (.95)</i>	<i>.4 (.6)</i>	<i>.2 (.4)</i>	<i>.1 (.3)</i>	<i>0 (.2)</i>
<i>11-15%</i>	<i>.8 (1.0)</i>	<i>.5 (.7)</i>	<i>.25 (.45)</i>	<i>.1 (.3)</i>	<i>0 (.2)</i>
<i>16-20%</i>	<i>.8 (1.0)</i>	<i>.7 (.9)</i>	<i>.5 (.7)</i>	<i>.25 (.45)</i>	<i>.1 (.3)</i>
<i>21-30%</i>	<i>.8 (1.0)</i>	<i>.75 (.95)</i>	<i>.7 (.9)</i>	<i>.6 (.8)</i>	<i>.3 (.6)</i>

Hydrologic Group B Soils

<i>Treatment Factor- Wooded (Non-Wooded)</i>					
<i>Slope</i>	<i>25 ft</i>	<i>50 ft</i>	<i>100 ft</i>	<i>150 ft</i>	<i>200 ft</i>
<i>0-10%</i>	<i>.75 (.95)</i>	<i>.6 (.8)</i>	<i>.4 (.6)</i>	<i>.2 (.4)</i>	<i>.1 (.2)</i>
<i>11-15%</i>	<i>.8 (1.0)</i>	<i>.75 (.95)</i>	<i>.5 (.7)</i>	<i>.2 (.4)</i>	<i>.1 (.2)</i>
<i>16-20%</i>	<i>.8 (1.0)</i>	<i>.8 (1.0)</i>	<i>.65 (.85)</i>	<i>.4 (.6)</i>	<i>.2 (.4)</i>
<i>21-30%</i>	<i>.8 (1.0)</i>	<i>.8 (1.0)</i>	<i>.7 (.9)</i>	<i>.5 (.7)</i>	<i>.3 (.6)</i>

Hydrologic Group C Soils

<i>Treatment Factor- Wooded (Non-Wooded)</i>					
<i>Slope</i>	<i>25 ft</i>	<i>50 ft</i>	<i>100 ft</i>	<i>150 ft</i>	<i>200 ft</i>
<i>0-10%</i>	<i>.8 (1.0)</i>	<i>.7 (.9)</i>	<i>.55 (.75)</i>	<i>.45 (.65)</i>	<i>.35 (.55)</i>
<i>11-15%</i>	<i>.8 (1.0)</i>	<i>.75 (.95)</i>	<i>.6 (.8)</i>	<i>.5 (.7)</i>	<i>.4 (.65)</i>
<i>16-20%</i>	<i>.8 (1.0)</i>	<i>.8 (1.0)</i>	<i>.7 (.9)</i>	<i>.6 (.8)</i>	<i>.5 (.65)</i>
<i>21-30%</i>	<i>.8 (1.0)</i>	<i>.8 (1.0)</i>	<i>.75 (.95)</i>	<i>.65 (.85)</i>	<i>.5 (.75)</i>

Hydrologic Group D Soils

<i>Treatment Factor- Wooded (Non-Wooded)</i>					
<i>Slope</i>	<i>25 ft</i>	<i>50 ft</i>	<i>100 ft</i>	<i>150 ft</i>	<i>200 ft</i>
<i>0-10%</i>	<i>.9 (1.0)</i>	<i>.8 (.65)</i>	<i>.75 (.8)</i>	<i>.7 (.8)</i>	<i>.6 (.75)</i>
<i>11-15%</i>	<i>.9 (1.0)</i>	<i>.85 (1.0)</i>	<i>.8 (.9)</i>	<i>.75 (.9)</i>	<i>.65 (.8)</i>
<i>16-20%</i>	<i>.9 (1.0)</i>	<i>.9 (1.0)</i>	<i>.85 (1.0)</i>	<i>.8 (1.0)</i>	<i>.7 (.85)</i>
<i>21-30%</i>	<i>.9 (1.0)</i>	<i>.9 (1.0)</i>	<i>.9 (1.0)</i>	<i>.8 (1.0)</i>	<i>.75 (.9)</i>

Source: Maine DEP, 1989

TABLE C-1.2 Treatment Factors (TF) for Wet Ponds

Volume Treated in One Wet Pond

>4:1 length:width (100% plug flow)

		Number of Storm Volumes			
		1/2 V	1V	2V	3V
MEAN DEPTH	3 ft	.50	.4	.33	.31
	5 ft	.47	.34	.27	.24
	7 ft	.44	.32	.24	.20

4:1-2:1 length:width (50% plug flow)

		Number of Storm Volumes			
		1/2 V	1V	2V	3V
MEAN DEPTH	3 ft	.56	.48	.42	.40
	5 ft	.52	.43	.36	.33
	7 ft	.51	.41	.33	.29

<2:1 length:width (100% mixed)

		Number of Storm Volumes			
		1/2 V	1V	2V	3V
MEAN DEPTH	3 ft	.61	.55	.51	.49
	5 ft	.59	.51	.45	.43
	7 ft	.58	.49	.42	.39

Volume Distributed Between Two Wet Ponds

>4:1 length:width (100% plug flow)

<i>Number of Storm Volumes</i>					
		<i>1/2 V</i>	<i>1V</i>	<i>2V</i>	<i>3V</i>
<i>MEAN DEPTH</i>	<i>3 ft</i>	<i>.46</i>	<i>.34</i>	<i>.26</i>	<i>.23</i>
	<i>5 ft</i>	<i>.43</i>	<i>.31</i>	<i>.22</i>	<i>.18</i>
	<i>7 ft</i>	<i>.43</i>	<i>.30</i>	<i>.19</i>	<i>.16</i>

4:1-2:1 length:width (50% plug flow)

<i>Number of Storm Volumes</i>					
		<i>1/2 V</i>	<i>1V</i>	<i>2V</i>	<i>3V</i>
<i>MEAN DEPTH</i>	<i>3 ft</i>	<i>.50</i>	<i>.39</i>	<i>.31</i>	<i>.28</i>
	<i>5 ft</i>	<i>.48</i>	<i>.35</i>	<i>.26</i>	<i>.23</i>
	<i>7 ft</i>	<i>.47</i>	<i>.34</i>	<i>.24</i>	<i>.22</i>

<2:1 length:width (100% mixed)

<i>Number of Storm Volumes</i>					
		<i>1/2 V</i>	<i>1V</i>	<i>2V</i>	<i>3V</i>
<i>MEAN DEPTH</i>	<i>3 ft</i>	<i>.53</i>	<i>.43</i>	<i>.36</i>	<i>.34</i>
	<i>5 ft</i>	<i>.52</i>	<i>.41</i>	<i>.33</i>	<i>.30</i>
	<i>7 ft</i>	<i>.51</i>	<i>.40</i>	<i>.31</i>	<i>.26</i>

Volume Distributed Between Three Wet Ponds

>4:1 length:width (100% plug flow)

<i>Number of Storm Volumes</i>					
		<i>1/2 V</i>	<i>1V</i>	<i>2V</i>	<i>3V</i>
<i>MEAN DEPTH</i>	<i>3 ft</i>	<i>.44</i>	<i>.33</i>	<i>.23</i>	<i>.19</i>
	<i>5 ft</i>	<i>.43</i>	<i>.30</i>	<i>.19</i>	<i>.16</i>
	<i>7 ft</i>	<i>.42</i>	<i>.27</i>	<i>.18</i>	<i>.15</i>

4:1-2:1 length:width (50% plug flow)

<i>Number of Storm Volumes</i>					
		<i>1/2 V</i>	<i>1V</i>	<i>2V</i>	<i>3V</i>
<i>MEAN DEPTH</i>	<i>3 ft</i>	<i>.47</i>	<i>.35</i>	<i>.26</i>	<i>.23</i>
	<i>5 ft</i>	<i>.46</i>	<i>.33</i>	<i>.23</i>	<i>.19</i>
	<i>7 ft</i>	<i>.46</i>	<i>.32</i>	<i>.22</i>	<i>.18</i>

<2:1 length:width (100% mixed)

<i>Number of Storm Volumes</i>					
		<i>1/2 V</i>	<i>1V</i>	<i>2V</i>	<i>3V</i>
<i>MEAN DEPTH</i>	<i>3 ft</i>	<i>.50</i>	<i>.39</i>	<i>.31</i>	<i>.27</i>
	<i>5 ft</i>	<i>.49</i>	<i>.36</i>	<i>.27</i>	<i>.24</i>
	<i>7 ft</i>	<i>.48</i>	<i>.35</i>	<i>.26</i>	<i>.22</i>

APPENDIX D - NPDES PHASE II STORM WATER PERMIT PROGRAM FOR SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS (MS4s)

INTRODUCTION

This appendix contains information on the National Pollutant Discharge Elimination System (NPDES) Phase II storm water permit program for small municipal separate storm sewer systems (MS4s). It contains the Storm Water Phase II Compliance Assistance Guide and a series of fact sheets developed by US Environmental Protection Agency (EPA) that give an overview of the Storm Water Phase II Final Rule and Small MS4 program and discuss the six required minimum control measures. Additional information from USEPA is available at www.epa.gov/npdes/stormwater. A copy of the Storm Water Phase II Final Rule (64 *FR* 68722) that appeared in the Federal Register is available at www.epa.gov/npdes/regulations/phase2.pdf.

This appendix also contains the General NPDES Permit No. ILR40 for Discharges from Small Municipal Separate Storm Sewer Systems and the Notice of Intent (NOI) for General Permit for Discharges from Small Municipal Separate Storm Sewer Systems. The ILR40 Permit and NOI have been provided by the Illinois Environmental Protection Agency (EPA) who is responsible for administering the program in Illinois. The NOI pdf file is in a read-only format, but a word fillable form is available on the CD in the IEPA Fillable Forms folder.

Questions about the program should be directed to the Illinois EPA-Division of Water Pollution Control - Permit Section #15, Bureau of Water, 1021 North Grand Avenue East, P.O. Box 19276, Springfield, IL 62794-9276, phone 217-782-0610, fax 217-782-9891.

The Permit Section website contains information on when a permit is needed, forms, and a list of contacts at Illinois EPA: www.epa.state.il.us/water/permits/waste-water/index.html

This section was updated in November 2002.

NRCS IL November 2002

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General NPDES Permit No. ILR40

Illinois Environmental Protection Agency
Division of Water Pollution Control
1021 North Grand East
P.O. Box 19276
Springfield, Illinois 62794-9276

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

General NPDES Permit For Discharges from Small Municipal Separate Storm Sewer Systems

Expiration Date:	February 29, 2008	Issue Date:	December 20, 2002
		Effective Date:	March 1, 2003

Discharges authorized by this General Permit: In compliance with the provisions of the Illinois Environmental Protection Act, the Illinois Pollution Control Board Rules and Regulations (35 Ill. Adm. Code, Subtitle C, Chapter 1) and the Clean Water Act, the following discharges may be authorized by this permit in accordance with the conditions herein:

Discharges of storm water from small municipal separate storm sewer systems, as defined and limited herein. Storm water means storm water runoff, snow melt runoff, and surface runoff and drainage.

This general permit regulates only storm water discharges. Other discharges such as process wastewater or cooling water shall be regulated by other NPDES permits.

Receiving waters: Discharges may be authorized to any surface water of the State.

To receive authorization to discharge under this general permit, a facility operator must submit an application as described in the permit conditions to the Illinois Environmental Protection Agency. Authorization, if granted, will be by letter and include a copy of this permit.

Thomas G. McSwiggin, P.E.
Manager, Permit Section
Division of Water Pollution Control

CONTENTS OF THIS GENERAL PERMIT

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PART I. COVERAGE UNDER THIS PERMIT

A. Permit Area

This permit covers all areas of the State of Illinois.

B. Eligibility

1. This permit authorizes discharges of storm water from small municipal separate storm sewer systems (MS4s) as defined in 40 CFR 122.26(b)(16) as designated for permit authorization pursuant to 40 CFR 122.32.
2. This permit authorizes the following non-storm water discharges provided they have been determined not to be substantial contributors of pollutants to a particular small MS4 applying for coverage under this permit:
 - water line and fire hydrant flushing,
 - landscape irrigation water,
 - rising ground waters,
 - ground water infiltration,
 - pumped ground water,
 - discharges from potable water sources,
 - foundation drains,
 - air conditioning condensate,
 - irrigation water, (except for wastewater irrigation),
 - springs,
 - water from crawl space pumps,
 - footing drains,
 - storm sewer cleaning water,
 - water from individual residential car washing,
 - routine external building washdown which does not use detergents,
 - flows from riparian habitats and wetlands,
 - dechlorinated pH neutral swimming pool discharges,
 - residual street wash water,
 - discharges or flows from fire fighting activities
 - dechlorinated water reservoir discharges, and
 - pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed).
3. Any municipality covered by this general permit is also granted automatic coverage under Permit No. ILR10 for the discharge of storm water associated with construction site activities for municipal construction projects disturbing one acre or more. The permittee shall comply with all the requirements of Permit ILR10 for all such construction projects.

C. Limitations on Coverage

The following discharges are not authorized by this permit:

1. Storm water discharges that are mixed with non-storm water or storm water associated with industrial activity unless such discharges are:
 - a. in compliance with a separate NPDES permit, or
 - b. identified by and in compliance with Part I.B.2 of this permit.

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2. Storm water discharges that the Agency determines are not appropriately covered by this general permit.

D. Obtaining Authorization

In order for storm water discharges from small municipal separate storm sewer systems to be authorized to discharge under this general permit, a discharger must:

1. Submit a Notice of Intent (NOI) in accordance with the requirements of Part II using an NOI form provided by the Agency (or a photocopy thereof) or the appropriate U.S. EPA NOI form.
2. Where the operator changes, or where a new operator is added after the submittal of an NOI under Part II, a new NOI must be submitted in accordance with Part II within 30 days of the change.
3. Unless notified by the Agency to the contrary, dischargers who submit an NOI in accordance with the requirements of this permit are authorized to discharge storm water from small municipal separate storm sewer systems under the terms and conditions of this permit 30 days after the date that the NOI is received. The Agency may deny coverage under this permit and require submittal of an application for an individual NPDES permit based on a review of the NOI or other information.

PART II. NOTICE OF INTENT REQUIREMENTS**A. Deadlines for Notification**

1. If you are an operator of a regulated small municipal separate storm sewer system designated under § 122.32(a)(1), you must apply for coverage under an NPDES permit, or apply for a modification of an existing NPDES permit by March 10, 2003.
2. If you are an operator of a regulated small municipal separate storm sewer system designated under § 122.32(a)(2), you must apply for coverage under an NPDES permit, or apply for a modification of an existing NPDES permit within 180 days of notice, from the Agency or by a later date as specified by the Agency.
3. Submitting a late NOI. You are not prohibited from submitting an NOI after the dates provided in Part II.A.1 and II.A.2. If a late NOI is submitted, your authorization is only for discharges that occur after permit coverage is granted. The Agency reserves the right to take appropriate enforcement actions for any unpermitted discharges.

B. Contents of Notice of Intent

Dischargers seeking coverage under this permit shall submit either the Illinois MS4 NOI form or the U.S. EPA MS4 NOI form. The Notice(s) of Intent shall be signed in accordance with Standard Condition 11 of this permit and shall include the following information:

1. The street address, county, and the latitude and longitude of the municipal office for which the notification is submitted;
2. The name, address, and telephone number of the operator(s) filing the NOI for permit coverage;
3. The name of the receiving water(s); and
4. The following shall be provided as an attachment to the NOI:
 - a. the best management practices (BMPs) to be implemented and the measurable goals for each of the storm water minimum control measures in paragraph IV. B. of this permit designed to reduce the discharge of pollutants to the maximum extent practicable;
 - b. the month and year in which you will start and fully implement each of the minimum control measures or indicate the frequency of the action;
 - c. the person or persons responsible for implementing or coordinating your storm water management program; and
 - d. identification of a local qualifying program if any.

C. The required information shall be submitted to the following address:

Illinois Environmental Protection Agency
Division of Water Pollution Control
Permit Section
Post Office Box 19276
Springfield, Illinois 62794-9276

D. Shared Responsibilities

You may partner with other MS4s to develop and implement your storm water management program. You may also jointly submit an NOI with one or more MS4s. Each MS4 must fill out the NOI form. The description of your storm water management program must clearly describe which permittees are responsible for implementing each of the control measures.

PART III. SPECIAL CONDITIONS

- A. Your discharges, alone or in combination with other sources, shall not cause or contribute to a violation of any applicable water quality standard outlined in 35 Ill. Adm. Code 302.
- B. If there is evidence indicating that the storm water discharges authorized by this permit cause, or have the reasonable potential to cause or contribute to a violation of water quality standard, you may be required to obtain an individual permit or an alternative general permit or the permit may be modified to include different limitations and/or requirements.
- C. If a total maximum daily load (TMDL) allocation or watershed management plan is approved for any waterbody into which you discharge, you must review your storm water management program to determine whether the TMDL or watershed management plan includes requirements for control of storm water discharges. If you are not meeting the TMDL allocations, you must modify your storm water management program to implement the TMDL or watershed management plan within eighteen months of notification by the Agency of the TMDL's approval. Where a TMDL or watershed management plan is approved, you must:
1. Determine whether the approved TMDL is for a pollutant likely to be found in storm water discharges from your MS4.
 2. Determine whether the TMDL includes a pollutant wasteload allocation (WLA) or other performance requirements specifically for storm water discharge from your MS4.
 3. Determine whether the TMDL addresses a flow regime likely to occur during periods of storm water discharge.
 4. After the determinations above have been made and if it is found that your MS4 must implement specific WLA provisions of the TMDL, assess whether the WLAs are being met through implementation of existing storm water control measures or if additional control measures are necessary.
 5. Document all control measures currently being implemented or planned to be implemented. Also include a schedule of implementation for all planned controls. Document the calculations or other evidence that shows that the WLA will be met.
 6. Describe and implement a monitoring program to determine whether the storm water controls are adequate to meet the WLA.
 7. If the evaluation shows that additional or modified controls are necessary, describe the type and schedule for the control additions/revisions. Continue Paragraphs 4 above through 7 until two continuous monitoring cycles show that the WLAs are being met or that WQ standards are being met.
- D. If this permit is not reissued or replaced prior to the expiration date, it will be administratively continued in accordance with the Administrative Procedures Act and remain in force and effect. Any permittee who was granted permit coverage prior to the expiration date will automatically remain covered by the continued permit until the earlier of:
1. Reissuance or replacement of this permit, at which time you must comply with the Notice of Intent conditions of the new permit to maintain authorization to discharge; or
 2. Your submittal of a Notice of Termination; or
 3. Issuance of an individual permit for your discharges; or
 4. A formal permit decision by the Agency not to reissue this general permit at which time you must seek coverage under an alternative general permit or an individual permit.
- E. The Agency may require any person authorized to discharge by this permit to apply for and obtain either an individual NPDES permit or an alternative NPDES general permit. Any interested person may petition the Agency to take action under this paragraph. The Agency may require any owner or operator authorized to discharge under this permit to apply for an individual NPDES permit only if the owner or operator has been notified in writing that a permit application is required. This notice shall include a brief statement of the reasons for this decision, an application form, a statement setting a deadline for the owner or operator to file the application, and a statement that on the effective date of the individual NPDES permit or the alternative general permit as it applies to the individual permittee, coverage under this general permit shall automatically terminate. The Agency may grant additional time to submit the application upon request of the applicant. If an owner or operator fails to submit in a timely manner an individual NPDES permit application required by the Agency under this paragraph, then the applicability of this permit to the individual NPDES permittee is automatically terminated at the end of the day specified for application submittal.

- F. Any owner or operator authorized by this permit may request to be excluded from the coverage of this permit by applying for an individual permit. The owner or operator shall submit an individual application with reasons supporting the request, in accordance with the requirements of 40 CFR 122.28, to the Agency. The request will be granted by issuing an individual permit or an alternative general permit if the reasons cited by the owner or operator are adequate to support the request.
- G. When an individual NPDES permit is issued to an owner or operator otherwise subject to this permit, or the owner or operator is approved for coverage under an alternative NPDES general permit, the applicability of this permit to the individual NPDES permittee is automatically terminated on the issue date of the individual permit or the date of approval for coverage under the alternative general permit, whichever the case may be.
- H. When an individual NPDES permit is denied to an owner or operator otherwise subject to this permit, or the owner or operator is denied coverage under an alternative NPDES general permit the applicability of this permit to the individual NPDES permitted is automatically terminated on the date of such denial, unless otherwise specified by the Agency.

PART IV. STORM WATER MANAGEMENT PROGRAMS

A. Requirements

You must develop, implement, and enforce a storm water management program designed to reduce the discharge of pollutants from your small municipal separate storm sewer system to the maximum extent practicable (MEP), to protect water quality, and to satisfy the appropriate water quality requirements of the Illinois Pollution Control Board Rules and Regulations (35 Ill. Adm. Code, Subtitle C, Chapter 1) and the Clean Water Act. Your storm water management program must include the minimum control measures described in section B of this Part. You must develop and implement your program by five years from your coverage date under this permit.

B. Minimum Control Measures

The 6 minimum control measures to be included in your storm water management program are:

1. Public education and outreach on storm water impacts

You must:

- a. implement a public education program to distribute educational materials to the community or conduct equivalent outreach activities about the impacts of storm water discharges on water bodies and the steps that the public can take to reduce pollutants in storm water runoff; and
- b. define appropriate BMPs for this minimum control measure and measurable goals for each BMP. These measurable goals must ensure the reduction of all of the pollutants of concern in your storm water discharges to the maximum extent practicable.

2. Public Involvement/Participation

You must:

- a. at a minimum, comply with State and local public notice requirements when implementing a public involvement/participation program; and
- b. define appropriate BMPs for this minimum control measure and measurable goals for each BMP, which must ensure the reduction of all of the pollutants of concern in your storm water discharges to the maximum extent practicable.

3. Illicit discharge detection and elimination

You must:

- a. develop, implement and enforce a program to detect and eliminate illicit discharges into your small MS4;
- b. develop, if not already completed, a storm sewer system map, showing the location of all outfalls and the names and location of all waters that receive discharges from those outfalls;
- c. to the extent allowable under state or local law, effectively prohibit, through ordinance, or other regulatory mechanism, non-storm water discharges into your storm sewer system and implement appropriate enforcement procedures and actions;
- d. develop, implement, and adequately fund a plan to detect and address non-storm water discharges, including illegal dumping, to your system;
- e. inform public employees, businesses, and the general public of hazards associated with illegal discharges and improper disposal of waste;

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- f. address the categories of non-storm water discharges listed in Section I.B.2 only if you identify them as significant contributor of pollutants to your small MS4 (discharges or flows from the fire fighting activities are excluded from the effective prohibition against non-storm water and need only be addressed where they are identified as significant sources of pollutants to waters of the United States); and
- g. define appropriate BMPs for this minimum control measure and measurable goals for each BMP. These measurable goals must ensure the reduction of all of the pollutants of concern in your storm water discharges to the maximum extent practicable.

4. Construction site storm water runoff control

You must:

- a. develop, implement, and enforce a program to reduce pollutants in any storm water runoff to your small MS4 from construction activities that result in a land disturbance of greater than or equal to one acre. Reduction of storm water discharges from construction activity disturbing less than one acre must be included in your program if that construction activity is part of a larger common plan of development or sale that would disturb one acre or more or has been designated by the permitting authority.

Your program must include the development and implementation of, at a minimum:

- i. an ordinance or other regulatory mechanism to require erosion and sediment controls, as well as sanctions to ensure compliance, to the extent allowable under state or local law;
- ii. requirements for construction site operators to implement appropriate erosion and sediment control best management practices;
- iii. requirements for construction site operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality;
- iv. require all regulated construction sites to have a storm water pollution prevention plan that meets the requirements of Part IV of NPDES permit No. ILR10 including management practices, controls, and other provisions at least as protective as the requirements contained in the Illinois Urban Manual, 2002;
- v. procedures for site plan review which incorporate consideration of potential water quality impacts and review of individual pre-construction site plans to ensure consistency with local sediment and erosion control requirements;
- vi. procedures for receipt and consideration of information submitted by the public; and
- vii. procedures for site inspections and enforcement of control measures.

- b. define appropriate BMPs for this minimum control measure and measurable goals for each BMP. These measurable goals must ensure the reduction of all of the pollutants of concern in your storm water discharges to the maximum extent practicable.

5. Post-construction storm water management in new development and redevelopment

You must:

- a. develop, implement, and enforce a program to address storm water runoff from new development and redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale or that have been designated to protect water quality, that discharge into your small MS4. Your program must ensure that controls are in place that would protect water quality and reduce the discharge of pollutants to the maximum extent practicable;
- b. develop and implement strategies which include a combination of structural and/or non-structural BMPs appropriate for your community that will reduce the discharge of pollutants to the maximum extent practicable;
- c. use an ordinance or other regulatory mechanism to address post-construction runoff from new development and redevelopment projects to the extent allowable under state or local law;
- d. require all regulated construction sites to have post-construction management that meets or exceeds the requirements of Section IV (D)(2)(b) of NPDES permit No. ILR10 including management practices, controls, and other provisions at least as protective as the requirements contained in the Illinois Urban Manual, 2002;
- e. ensure adequate long-term operation and maintenance of BMPs; and

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- f. define appropriate BMPs for this minimum control measure and measurable goals for each BMP. These measurable goals must ensure the reduction of all of the pollutants of concern in your storm water discharges to the maximum extent practicable.

6. Pollution prevention/good housekeeping for municipal operations

You must:

- a. develop and implement an operation and maintenance program that includes a training component and is designed to prevent and reduce the discharge of pollutants to the maximum extent practicable;
- b. using training materials that are available from EPA, the state of Illinois, or other organizations, your program must include employee training to prevent and reduce storm water pollution from activities such as park and open space maintenance, fleet and building maintenance, operation of storage yards, snow disposal, new construction and land disturbances, and storm water system maintenance procedures for proper disposal of street cleaning debris and catch basin material, address ways that flood management projects impact water quality, nonpoint source pollution control, and aquatic habitat; and
- c. define appropriate BMPs for this minimum control measure and measurable goals for each BMP. These measurable goals must ensure the reduction of all of the pollutants of concern in your storm water discharges to the maximum extent practicable.

C. Qualifying State, County, or Local Program

If an existing qualifying local program requires you to implement one or more of the minimum control measures of B. above, you may follow that qualifying program's requirements rather than the requirements of B. above. A qualifying local program is a local, county or state municipal storm water management program that imposes, at a minimum, the relevant requirements of Section B. Any qualifying local programs that you intend to follow shall be specified in your storm water management plan.

D. Sharing Responsibility

1. Implementation of one or more of the minimum measures may be shared with another entity, or the entity may fully take over the measure. You may rely on another entity only if:
 - a. The other entity, in fact, implements the control measure;
 - b. The particular control measure, or component of that measure is at least as stringent as the corresponding permit requirement.
 - c. The other entity agrees to implement the control measure on your behalf. Written acceptance of this obligation is expected. This obligation must be maintained as part of the description of your storm water management program. If the other entity agrees to report on the minimum measure, you must supply the other entity with the reporting requirements contained in Section V (C) of this permit. If the other entity fails to implement the control measure on your behalf, then you remain liable for any discharges due to that failure to implement.

E. Reviewing and Updating Storm Water Management Programs

1. Storm Water Management Program Review: You must do an annual review of your Storm Water Management Program in conjunction with preparation of the annual report required under Part V.(C).
2. Storm Water Management Program Update: You may change your Storm Water Management Program during the life of the permit in accordance with the following procedures:
 - a. Changes adding (but not subtracting or replacing) components, controls, or requirements to the Storm Water Management Program may be made at any time upon written notification to the Agency; and
 - b. Changes replacing an ineffective or unfeasible BMP specifically identified in the Storm Water Management Program with an alternate BMP may be requested at any time. Unless denied by the Agency, changes proposed in accordance with the criteria below shall be deemed approved and may be implemented 60 days from submittal of the request. If request is denied, the Agency will send you a written response giving a reason for the decision. Your modification requests must include the following:
 1. An analysis of why the BMP is ineffective or infeasible (including cost prohibitive);
 2. Expectations on the effectiveness of the replacement BMP; and
 3. An analysis of why the replacement BMP is expected to achieve the goals of the BMP to be replaced.
 - c. Change requests or notifications must be made in writing and signed in accordance with Standard Condition II of Attachment H.

3. Storm Water Management Program Updates Required by the Agency. The Agency may require changes to the Storm Water Management Program as needed to:
 - a. Address impacts on receiving water quality caused, or contributed to, by discharges from the municipal separate storm sewer system;
 - b. Include more stringent requirements necessary to comply with new federal statutory or regulatory requirements; or
 - c. Include such other conditions deemed necessary by the Agency to comply with the goals and requirements of the Clean Water Act.
 - d. Changes requested by the Agency must be made in writing, set forth the time schedule for you to develop the changes, and offer you the opportunity to propose alternative program changes to meet the objective of the requested modification. All changes required by the Permitting Authority will be made in accordance with 40 CFR 124.5, 40 CFR 122.62, or as appropriate 40 CFR 122.63.

PART V. MONITORING, RECORDKEEPING AND REPORTING

A. Monitoring

You must evaluate program compliance, the appropriateness of your identified best management practices, and progress towards achieving your identified measurable goals, which must include reducing the discharge of pollutants to the maximum extent practicable (MEP).

B. Recordkeeping

You must keep records required by this permit for at least 3 years. All records shall be kept onsite or locally available and shall be made accessible to the Agency for review at the time of an on-site inspection. You must submit your records to the Agency only when specifically asked to do so. You must make your records, including your notice of intent (NOI) and your storm water management plan, available to the public at reasonable times during regular business hours within 10 working days of its approval by the permitting authority. (You may assess a reasonable charge for copying. You may require a member of the public to provide advance notice, not to exceed seven working days.) Storm sewer maps may be withheld for security reasons.

C. Reporting

You must submit annual reports to the Agency by the first day of June for each year that this permit is in effect. The first report is due June 1, 2004. Each report shall cover the period from March of the previous year through March of the current year. Your report must include:

1. The status of compliance with permit conditions, an assessment of the appropriateness of your identified best management practices and progress towards achieving the statutory goal of reducing the discharge of pollutants to the MEP, and your identified measurable goals for each of the minimum control measures;
2. Results of information collected and analyzed, including monitoring data, if any, during the reporting period;
3. A summary of the storm water activities you plan to undertake during the next reporting cycle (including an implementation schedule);
4. A change in any identified best management practices or measurable goals that apply to the program elements; and
5. Notice that you are relying on another government entity to satisfy some of your permit obligations (if applicable).
6. Municipal storm water inspection reports shall be submitted to the following address:

Illinois Environmental Protection Agency
Division of Water Pollution Control
Compliance Assurance Section
Municipal Annual Inspection Report
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

PART VI. DEFINITIONS AND ACRONYMS (SEE ALSO SPECIAL CONDITIONS)

All definitions contained in Section 502 of the Clean Water Act, 40 CFR 122, and 35 Ill. Adm. Code 309 shall apply to this permit and are incorporated herein by reference. For convenience, simplified explanations of some regulatory/statutory definitions have been provided, but in the event of a conflict, the definition found in the statute or regulation takes precedence.

Best Management Practices (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the state. BMPs also include treatment requirements, operating procedures, and practices to control runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

BMP is an acronym for "Best Management Practices."

CFR is an acronym for "Code of Federal Regulations."

Control Measure as used in this permit, refers to any Best Management Practice or other method used to prevent or reduce the discharge of pollutants to waters of the United States.

CWA or The Act means the Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483 and Pub. L. 97-117, 33 U.S.C. 1251 et. seq.

Discharge, when used without a qualifier, refers to discharge of a pollutant as defined at 40 CFR 122.2.

Illicit Connection means any man-made conveyance connecting an illicit discharge directly to a municipal separate storm sewer.

Illicit Discharge is defined at 40 CFR 122.26(b)(2) and refers to any discharge to a municipal separate storm sewer that is not composed entirely of storm water, except discharges authorized under an NPDES permit (other than the NPDES permit for discharges from the MS4) and discharges resulting from fire fighting activities.

MEP is an acronym for "Maximum Extent Practicable," the technology-based discharge standard for Municipal Separate Storm Sewer Systems to reduce pollutants in storm water discharges that was established by CWA ? Section 402(p). A discussion of MEP as it applies to small MS4s is found at 40 CFR 122.34.

MS4 is an acronym for "Municipal Separate Storm Sewer System" and is used to refer to either a Large, Medium, or Small Municipal Separate Storm Sewer System (e.g. "the Dallas MS4"). The term is used to refer to either the system operated by a single entity or a group of systems within an area that are operated by multiple entities (e.g., the Houston MS4 includes MS4s operated by the city of Houston, the Texas Department of Transportation, the Harris County Flood Control District, Harris County, and others).

Municipal Separate Storm Sewer is defined at 40 CFR 122.26(b)(8) and means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under Section 208 of the CWA that discharges to waters of the United States; (ii) Designed or used for collecting or conveying storm water; (iii) Which is not a combined sewer; and (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

NOI is an acronym for "Notice of Intent" to be covered by this permit and is the mechanism used to "register" for coverage under a general permit.

NPDES is an acronym for "National Pollutant Discharge Elimination System."

Outfall is defined at 40 CFR 122.26(b)(9) and means a point source as defined by 40 CFR 122.2 at the point where a municipal separate storm sewer discharges to waters of the United States and does not include open conveyances connecting two municipal storm sewers, or pipes, tunnels or other conveyances which connect segments of the same stream or other waters of the United States and are used to convey waters of the United States.

Owner or Operator is defined at 40 CFR 122.2 and means the owner or operator of any "facility or activity" subject to regulation under the NPDES program.

Permitting Authority means the Illinois EPA.

Point Source is defined at 40 CFR 122.2 and means any discernable, confined and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.

Qualifying Local Program is defined at 40 CFR 122.34(c) and means a local, state, or Tribal municipal storm water management program that imposes, at a minimum, the relevant requirements of paragraph (b) of Section 122.34.

Small Municipal Separate Storm Sewer System is defined at 40 CFR 122.26(b)(16) and refers to all separate storm sewers that are owned or operated by the United States, a State [sic], city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State [sic] law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under Section 208 of the CWA that discharges to waters of the United States, but is not defined as "large" or "medium" municipal separate storm sewer system. This term includes systems similar to separate storm sewer systems in municipalities, such as systems at military bases, large hospital or prison complexes, and highways and other thoroughfares. The term does not include separate storm sewers in very discrete areas, such as individual buildings.

Storm Water is defined at 40 CFR 122.26(b)(13) and means storm water runoff, snowmelt runoff, and surface runoff and drainage.

Storm Water Management Program (SWMP) refers to a comprehensive program to manage the quality of storm water discharged from the municipal separate storm sewer system.

SWMP is an acronym for "Storm Water Management Program."

TMDL is an acronym for "Total Maximum Daily Load."

Waters (also referred to as waters of the state or receiving water) is defined at Section 301.440 of Title 35: Subtitle C: Chapter I of the Illinois Pollution Control Board Regulations and means all accumulations of water, surface and underground, natural, and artificial, public and private, or parts thereof, which are wholly or partially within, flow through, or border upon the State of Illinois, except that sewers and treatment works are not included except as specially mentioned; provided, that nothing herein contained shall authorize the use of natural or otherwise protected waters as sewers or treatment works except that in-stream aeration under Agency permit is allowable.

"You" and "Your" as used in this permit is intended to refer to the permittee, the operator, or the discharger as the context indicates and that party's responsibilities (e.g., the city, the country, the flood control district, the U.S. Air Force, etc.).

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Attachment H
Standard Conditions
Definitions

Act means the Illinois Environmental Protection Act, 415 ILCS 5 as Amended.

Agency means the Illinois Environmental Protection Agency.

Board means the Illinois Pollution Control Board.

Clean Water Act (formerly referred to as the Federal Water Pollution Control Act) means Pub. L 92-500, as amended. 33 U.S.C. 1251 et seq.

NPDES (National Pollutant Discharge Elimination System) means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 402, 318 and 405 of the Clean Water Act.

USEPA means the United States Environmental Protection Agency.

Daily Discharge means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the Adaily discharge@ is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurements, the Adaily discharge@ is calculated as the average measurement of the pollutant over the day.

Maximum Daily Discharge Limitation (daily maximum) means the highest allowable daily discharge.

Average Monthly Discharge Limitation (30 day average) means the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

Average Weekly Discharge Limitation (7 day average) means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.

Best Management Practices (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Aliquot means a sample of specified volume used to make up a total composite sample.

Grab Sample means an individual sample of at least 100 milliliters collected at a randomly-selected time over a period not exceeding 15 minutes.

24 Hour Composite Sample means a combination of at least 8 sample aliquots of at least 100 milliliters, collected at periodic intervals during the operating hours of a facility over a 24-hour period.

8 Hour Composite Sample means a combination of at least 3 sample aliquots of at least 100 milliliters, collected at periodic intervals during the operating hours of a facility over an 8-hour period.

Flow Proportional Composite Sample means a combination of sample aliquots of at least 100 milliliters collected at periodic intervals such that either the time interval between each aliquot or the volume of each aliquot is proportional to either the stream flow at the time of sampling or the total stream flow since the collection of the previous aliquot.

- (1) Duty to comply. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action, permit termination, revocation and reissuance, modification, or for denial of a permit renewal application. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.
- (2) Duty to reapply. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. If the permittee submits a proper application as required by the Agency no later than 180 days prior to the expiration date, this permit shall continue in full force and effect until the final Agency decision on the application has been made.
- (3) Need to halt or reduce activity not a defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
- (4) Duty to mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.
- (5) Proper operation and maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up, or auxiliary facilities, or similar systems only when necessary to achieve compliance with the conditions

of the permit

- (6) Permit actions. This permit may be modified, revoked and reissued, or terminated for cause by the Agency pursuant to 40 CFR 122.62. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.
- (7) Property rights. This permit does not convey any property rights of any sort, or any exclusive privilege.
- (8) Duty to provide information. The permittee shall furnish to the Agency within a reasonable time, any information which the Agency may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with the permit. The permittee shall also furnish to the Agency, upon request, copies of records required to be kept by this permit.
- (9) Inspection and entry. The permittee shall allow an authorized representative of the Agency, upon the presentation of credentials and other documents as may be required by law, to:
 - (a) Enter upon the permittee=s premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
 - (b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
 - (c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
 - (d) Sample or monitor at reasonable times, for the purpose of assuring permit compliance, or as otherwise authorized by the Act, any substances or parameters at any location.
- (10) Monitoring and records.
 - (a) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
 - (b) The permittee shall retain records of all monitoring information, including all calibration and maintenance records, and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of this permit, measurement, report or application. This period may be extended by request of the Agency at any time.
 - (c) Records of monitoring information shall include:
 - (1) The date, exact place, and time of sampling or measurements;
 - (2) The individual(s) who performed the sampling or measurements;
 - (3) The date(s) analyses were performed;
 - (4) The individual(s) who performed the analyses;
 - (5) The analytical techniques or methods used; and
 - (6) The results of such analyses.
 - (d) Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit. Where no test procedure under 40 CFR Part 136 has been approved, the permittee must submit to the Agency a test method for approval. The permittee shall calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals to ensure accuracy of measurements.
- (11) Signatory requirement. All applications, reports or information submitted to the Agency shall be signed and certified.
 - (a) Application. All permit applications shall be signed as follows:
 - (1) For a corporation: by a principal executive officer of at least the level of vice president or a person or position having overall responsibility for environmental matters for the corporation;
 - (2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or
 - (3) For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.
 - (b) Reports. All reports required by permits, or other information requested by the Agency shall be signed by a person described in paragraph (a) or by a duly authorized representative of that person. A person is a duly authorized representative only if:
 - (1) The authorization is made in writing by a person described in paragraph (a); and

General NPDES Permit No. ILR40

- (2) The authorization specifies either an individual or a position responsible for the overall operation of the facility, from which the discharge originates, such as a plant manager, superintendent or person of equivalent responsibility; and
- (3) The written authorization is submitted to the Agency.
- (c) Changes of Authorization. If an authorization under (b) is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of (b) must be submitted to the Agency prior to or together with any reports, information, or applications to be signed by an authorized representative.
- (12) Reporting requirements.
- (a) Planned changes. The permittee shall give notice to the Agency as soon as possible of any planned physical alterations or additions to the permitted facility.
- (b) Anticipated noncompliance. The permittee shall give advance notice to the Agency of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.
- (c) Compliance schedules. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.
- (d) Monitoring reports. Monitoring results shall be reported at the intervals specified elsewhere in this permit.
- (1) Monitoring results must be reported on a Discharge Monitoring Report (DMR).
- (2) If the permittee monitors any pollutant more frequently than required by the permit, using test procedures approved under 40 CFR 136 or as specified in the permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR.
- (3) Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Agency in the permit.
- (e) Twenty-four hour reporting. The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and time; and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. The following shall be included as information which must be reported within 24 hours:
- (1) Any unanticipated bypass which exceeds any effluent limitation in the permit;
- (2) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Agency in the permit to be reported within 24 hours.
- The Agency may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.
- (f) Other noncompliance. The permittee shall report all instances of noncompliance not reported under paragraphs (12)(c), (d), or (e), at the time monitoring reports are submitted. The reports shall contain the information listed in paragraph (12)(e).
- (g) Other information. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to the Agency, it shall promptly submit such facts or information.
- (13) Transfer of permits. A permit may be automatically transferred to a new permittee if:
- (a) The current permittee notifies the Agency at least 30 days in advance of the proposed transfer date;
- (b) The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage and liability between the current and new permittees; and
- (c) The Agency does not notify the existing permittee and the proposed new permittee of its intent to modify or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement.
- (14) All manufacturing, commercial, mining, and silvicultural dischargers must notify the Agency as soon as they know or have reason to believe:
- (a) That any activity has occurred or will occur which would result in the discharge of any toxic pollutant identified under Section 307 of the Clean Water Act which is not limited in the permit, if that discharge will exceed the highest of the following notification levels:
- (1) One hundred micrograms per liter (100 ug/l):
- (2) Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2,4-dinitrophenol and for 2-methyl-4,6 dinitrophenol; and one milligram per liter (1 mg/l) for antimony.
- (3) Five (5) times the maximum concentration value reported for that pollutant in the NPDES permit application; or
- (4) The level established by the Agency in this permit.
- (b) That they have begun or expect to begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant which was not reported in the NPDES permit application.
- (15) All Publicly Owned Treatment Works (POTWs) must provide adequate notice to the Agency of the following:
- (a) Any new introduction of pollutants into that POTW from an indirect discharge which would be subject to Sections 301 or 306 of the Clean Water Act if it were directly discharging those pollutants; and
- (b) Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
- (c) For purposes of this paragraph, adequate notice shall include information on (i) the quality and quantity of effluent introduced into the POTW, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.
- (16) If the permit is issued to a publicly owned or publicly regulated treatment works, the permittees shall require any industrial user of such treatment works to comply with federal requirements concerning:
- (a) User charges pursuant to Section 204(b) of the Clean Water Act, and applicable regulations appearing in 40 CFR 35;
- (b) Toxic pollutant effluent standards and pretreatment standards pursuant to Section 307 of the Clean Water Act; and
- (c) Inspection, monitoring and entry pursuant to Section 308 of the Clean Water Act.
- (17) If an applicable standard or limitation is promulgated under Section 301(b)(2)(C) and (D), 304(b)(2), or 307(a)(2) and that effluent standard or limitation is more stringent than any effluent limitation in the permit, or controls a pollutant not limited in the permit, the permit shall be promptly modified or revoked, and reissued to conform to that effluent standard or limitation.
- (18) Any authorization to construct issued to the permittee pursuant to 35 Ill. Adm. Code 309.154 is hereby incorporated by reference as a condition of this permit.
- (19) The permittee shall not make any false statement, representation or certification in any application, record, report, plan or other document submitted to the Agency or the USEPA, or required to be maintained under this permit.
- (20) The Clean Water Act provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Clean Water Act is subject to a civil penalty not to exceed \$10,000 per day of such violation. Any person who willfully or negligently violates permit conditions implementing Sections 301, 302, 306, 307, or 308 of the Clean Water Act is subject to a fine of not less than \$2,500 nor more than \$25,000 per day of violation, or by imprisonment for not more than one year, or both.
- (21) The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under permit shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.
- (22) The Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit shall, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.
- (23) Collected screening, slurries, sludges, and other solids shall be disposed of in such a manner as to prevent entry of those wastes (or runoff from the wastes) into waters of the State. The proper authorization for such disposal shall be obtained from the Agency and is incorporated as part hereof by reference.
- (24) In case of conflict between these standard conditions and any other condition(s) included in this permit, the other condition(s) shall govern.
- (25) The permittee shall comply with, in addition to the requirements of the permit, all applicable provisions of 35 Ill. Adm. Code, Subtitle C, Subtitle D, Subtitle E, and all applicable orders of the Board.
- (26) The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit is held invalid, the remaining provisions of this permit shall continue in full force and effect.
- (Rev. 3-13-98)

**ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
 NOTICE OF INTENT
 FOR GENERAL PERMIT FOR DISCHARGES FROM
 SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS
 (MS4s)**

Input forms in Word format are available
 by via email.
marilyn.davenport@epa.state.il.us
 or by calling the Permit Section at
 217/782-0610
 See address for mailing on page 4

For Office Use Only – Permit No. ILR40_____

Part I. General Information

1. MS4 Operator Name:

2. MS4 Operator Mailing Address:

Street- _____ City- _____
 State- Illinois Zip Code- _____

3. Operator Type: City

4. Operator Status: State

5. Name(s) of Governmental Entity(ies) in which MS4 is located:

6. Area of land that drains to your MS4 (in square miles):

5. Latitude/Longitude at approximate geographical center of MS4 for which you are requesting authorization to discharge:

Latitude: _____ Longitude: _____
DEG. MIN. SEC. DEG. MIN. SEC.

8. Name(s) of known receiving waters: *Attach additional sheets (Attachment 1) as necessary:*

- | | |
|----------|-----------|
| 1. _____ | 2. _____ |
| 3. _____ | 4. _____ |
| 5. _____ | 6. _____ |
| 7. _____ | 8. _____ |
| 9. _____ | 10. _____ |

9. Persons Responsible for Implementation/Coordination of Storm Water Management Program:

<u>Name</u>	<u>Title</u>	<u>Telephone No.</u>	<u>Area of Responsibility</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Information required by this form must be provided to comply with 415 ILCS 5/39 (2000). Failure to do so may prevent this form from being processed and could result in your application being denied.

Part II. Best Management Practices (include shared responsibilities) Proposed to be Implemented in the MS4 Area

(Details of BMP implementation for each checked BMP number, e.g., A.1, E.2, is required in Part IV of this NOI.)

A. Public Education and Outreach

- A.1 Distributed Paper Material
- A.2 Speaking Engagement
- A.3 Public Service Announcement
- A.4 Community Event
- A.5 Classroom Education Material
- A.6 Other Public Education

B. Public Participation/Involvement

- B.1 Public Panel
- B.2 Educational Volunteer
- B.3 Stakeholder Meeting
- B.4 Public Hearing
- B.5 Volunteer Monitoring
- B.6 Program Coordination
- B.7 Other Public Involvement

C. Illicit Discharge Detection and Elimination

- C.1 Storm Sewer Map Preparation
- C.2 Regulatory Control Program
- C.3 Detection/Elimination Prioritization Plan
- C.4 Illicit Discharge Tracing Procedures
- C.5 Illicit Source Removal Procedures
- C.6 Program Evaluation and Assessment
- C.7 Visual Dry Weather Screening
- C.8 Pollutant Field Testing
- C.9 Public Notification
- C.10 Other Illicit Discharge Controls

D. Construction Site Runoff Control

- D.1 Regulatory Control Program
- D.2 Erosion and Sediment Control BMPs
- D.3 Other Waste Control Program
- D.4 Site Plan Review Procedures
- D.5 Public Information Handling Procedures
- D.6 Site Inspection/Enforcement Procedures
- D.7 Other Construction Site Runoff Controls

E. Post-Construction Runoff Control

- E.1 Community Control Strategy
- E.2 Regulatory Control Program
- E.3 Long Term O&M Procedures
- E.4 Pre-Const Review of BMP Designs
- E.5 Site Inspections During Construction
- E.6 Post-Construction Inspections
- E.7 Other Post-Const Runoff Controls

F. Pollution Prevention/Good Housekeeping

- F.1 Employee Training Program
- F.2 Inspection and Maintenance Program
- F.3 Muni Operations Storm Water Control
- F.4 Municipal Operations Waste Disposal
- F.5 Flood Management/Assess Guidelines
- F.6 Other Municipal Operations Controls

Part III. Qualifying Local Programs

Attach additional sheets (Attachment 2) as necessary:

(Describe any qualifying local programs that you will implement in lieu of new permitting requirements.)

1. Public Education and Outreach:

2. Public Participation/Involvement:

3. Illicit Discharge Detection and Elimination:

4. Construction Site Runoff Control:

5. Post-Construction Runoff Control:

6. Pollution Prevention/Good Housekeeping:

Part IV. Measurable Goals (include shared responsibilities) Proposed to be Implemented by the MS4

Attach additional sheets (Attachment 3) as necessary

(BMP No. should match that checked in Part II of this NOI. The applicant may repeat the same BMP No. where more than one BMP of similar type is to be implemented. Where necessary, attach additional sheets to provide more detail on each specific BMP.)

BMP No.

Brief Description of BMP:

Measurable Goal(s), including frequencies:

Milestones: Year 1:
Year 2:
Year 3:
Year 4:
Year 5:

BMP No.

Brief Description of BMP:

Measurable Goal(s), including frequencies:

Milestones: Year 1:
Year 2:
Year 3:
Year 4:
Year 5:

BMP No.

Brief Description of BMP:

Measurable Goal(s), including frequencies:

Milestones: Year 1:
Year 2:
Year 3:
Year 4:
Year 5:

BMP No.

Brief Description of BMP:

Measurable Goal(s), including frequencies:

Milestones: Year 1:
Year 2:
Year 3:
Year 4:
Year 5:

Part V. Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Authorized Representative Name and Title

Signature

Date

Mail completed form to:

**ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL
ATTN: PERMIT SECTION
POST OFFICE BOX 19276
SPRINGFIELD, ILLINOIS 62794-9276**

Copy and complete this page if additional pages are necessary:

**Attachment 1
Receiving Streams (Continued)**

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Copy and complete this page if additional pages are necessary:

Attachment 2

Part III (Continued) Qualifying Local Programs

(Describe any qualifying local programs that you will implement in lieu of new permitting requirements.)

1a. Public Education and Outreach:

2a. Public Participation/Involvement:

3a. Illicit Discharge Detection and Elimination:

4a. Construction Site Runoff Control:

5a. Post-Construction Runoff Control:

6a. Pollution Prevention/Good Housekeeping:

Attachment 3

Part IV. (Continued) Measurable Goals (include shared responsibilities) Proposed to be Implemented by the MS4

BMP No.

Brief Description of BMP:

Measurable Goal(s), including frequencies:

Milestones: Year 1:
Year 2:
Year 3:
Year 4:
Year 5:

BMP No.

Brief Description of BMP:

Measurable Goal(s), including frequencies:

Milestones: Year 1:
Year 2:
Year 3:
Year 4:
Year 5:

BMP No.

Brief Description of BMP:

Measurable Goal(s), including frequencies:

Milestones: Year 1:
Year 2:
Year 3:
Year 4:
Year 5:

BMP No.

Brief Description of BMP:

Measurable Goal(s), including frequencies:

Milestones: Year 1:
Year 2:
Year 3:
Year 4:
Year 5:



United States
Environmental Protection
Agency

Office of Water
(4204)

EPA 833-R-00-002
March 2000

Storm Water Phase II Compliance Assistance Guide



Compliance Guide Notice

The statements in this document are intended solely as guidance to aid regulated entities in complying with the Storm Water Phase II final rule. The guidance is not a substitute for reading the regulation and understanding all its requirements as it applies to your facility. This guidance does not constitute rulemaking by the EPA and may not be relied on to create a substantive or procedural right or benefit enforceable, at law or in equity, by any person. EPA may decide to update this guide without public notice to reflect changes in EPA's approach to implementing Storm Water Phase II or to clarify and update text. To determine whether EPA has revised this document and/or to obtain copies, go to EPA's web site at www.epa.gov/owm/sw/phase2.

1.0 INTRODUCTION

After reading this introduction, you should know whether you need to use this guide, what the guide covers, and where to get the latest information on the regulation.

The U.S. Environmental Protection Agency (EPA) published the regulation entitled “National Pollutant Discharge Elimination System - Regulations for Revision of the Water Pollution Control Program Addressing Storm Water Discharges” (*Federal Register*, Volume 64, Number 235, pages 68722-68852) on December 8, 1999 as required by Section 402(p) of the Clean Water Act (CWA). This guide explains how to tell if you are subject to the regulation and what to do if you are required to comply.

1.1 Who should use this guide?

This new rule regulates storm water discharges from two categories:

First, the rule covers storm water discharges to certain ***municipal separate storm sewer systems*** (MS4s). Public entities which operate these MS4s, such as cities, counties, States, and the Federal government, could be regulated under this rule. MS4 operators should read section 4 for more information.

Second, the rule also covers storm water discharges from ***construction activity*** generally disturbing between 1 and 5 acres. A construction operator could include the site owner, developer, contractor, or subcontractor. Construction site operators should read section 5 for more information.

The storm water Phase II final rule also provide regulatory relief for certain ***industrial facilities*** (currently permitted under EPA’s storm water regulations) where storm water runoff is not exposed to industrial activities. Operators of industrial facilities interested in the no exposure exclusion should read section 6.

1.2 What Does this Guide Cover?

The purpose of this guide is to help the regulated community comply with the Storm Water Phase II Rule. This guide answers the following basic questions:

- Why is the Storm Water Phase II Rule important?
- Am I subject to the Storm Water Phase II Rule?
- What must I do to comply with the Storm Water Phase II Rule?

1.3 How Do I Use this Guide?

This guide is organized into seven major sections plus three appendices.

- | | |
|-------------|--|
| Section 1.0 | Introduces you to this guide and the Storm Water Phase II Rule. Describes basic types of entities regulated so you can determine if you are affected by the rule. |
| Section 2.0 | Provides background on why the Storm Water Phase II Rule is needed. Topics such as the environmental impacts of storm water and why storm water should be controlled are discussed. The history of the NPDES Storm Water program is briefly described. |
| Section 3.0 | Delivers an overview of the Storm Water Phase II requirements. The basic components of the program are described and schedules and timelines are highlighted. |
| Section 4.0 | Gives step-by-step procedures for operators of small MS4s to determine if they are subject to the regulation and provides information on how to demonstrate compliance. |
| Section 5.0 | Gives step-by-step procedures for operators of small construction activities to determine if they are subject to the regulation and provides information on how to demonstrate compliance. |
| Section 6.0 | Provides a discussion of how the Rule affects industrial facilities, including which industrial facilities are covered, and an explanation of the No Exposure exclusion and how to determine if you qualify. |
| Section 7.0 | Documents the Compliance Assurance Process - Discusses how EPA will determine compliance, what happens if you or EPA discovers noncompliance, and the legal status of the guide. |
| Appendices | Provides additional references and where to go for more information on storm water. |

1.4 Where Can I Get More Information on the Storm Water Phase II Rule?

Additional information on the NPDES storm water Phase II rule, including a series of fact sheets and a full copy of the final rule, can be found on EPA's web pages at <http://www.epa.gov/owm/sw/phase2>.

Compliance assistance will be covered in Section 7 of the guide. One source for compliance assistance and information on the rule is the Local Government Environmental Assistance Network (LGEAN). LGEAN is one of EPA's compliance

assistance centers and can be found on the web at www.lgean.org or contacted by phone at 1-877-TO-LGEAN.

2.0 BACKGROUND

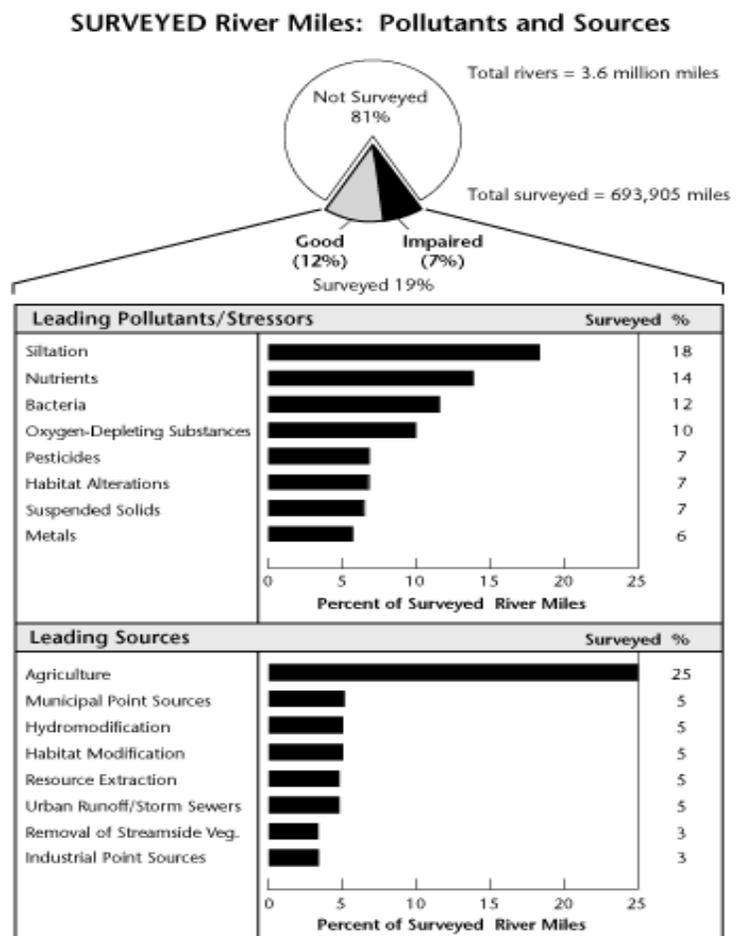
After reading section 2, you should understand the environmental impacts of storm water and the history of the storm water program, including existing regulations to control storm water (Phase I).

2.1 What are the Environmental Impacts from Storm Water Discharges?

Storm water runoff from lands modified by human activities can harm surface water and, in turn, cause or contribute to an exceedance of water quality standards by changing natural hydrologic patterns, accelerating natural stream flows, destroying aquatic habitat, and elevating pollutant concentrations and loadings. Such runoff may contain high levels of contaminants, such as sediment, suspended solids, nutrients (phosphorus and nitrogen), heavy metals, pathogens, toxins, oxygen-demanding substances (organic material), and floatables (U.S. EPA. 1992.

Environmental Impacts of Storm Water Discharges: A National Profile. EPA 841-R-92-001. Office of Water. Washington, DC). After a rain, storm water runoff carries these pollutants into nearby streams, rivers, lakes, estuaries, wetlands, and oceans. Individually and combined, these pollutants impair water quality, threatening designated beneficial uses and causing habitat alteration and destruction.

The 1996 305(b) Report (U.S. EPA. 1998. The National Water Quality Inventory, 1996 Report to Congress. EPA 841-R-97-008. Office of Water. Washington, DC), provides a national assessment of water quality based on biennial reports submitted by the States as required under CWA section 305(b) of the CWA. In the CWA 305(b) reports, States, Tribes, and Territories assess their individual water quality control programs by examining the attainment or



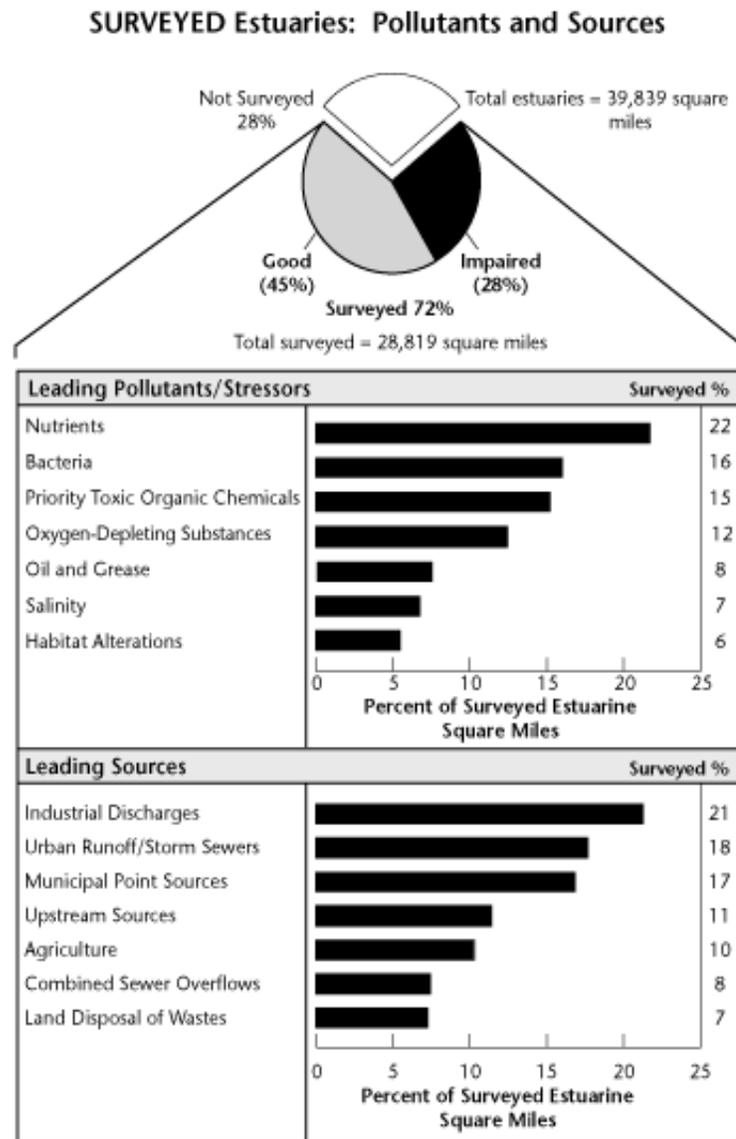
NOTE: Percentages do not add up to 100% because more than one pollutant or source may impair a river segment.

Figure 2-1. Pollutants and Sources in Surveyed River Miles (EPA, 1998)

nonattainment of the designated uses assigned to their rivers, lakes, estuaries, wetlands, and ocean shores. The 1996 Inventory indicated that approximately 40 percent of the Nation's assessed rivers, lakes, and estuaries are impaired.

The 1996 Inventory also found urban runoff/discharges from storm sewers to be a major source of water quality impairment nationwide. Urban runoff/storm sewers were found to be a source of pollution in 13 percent of impaired rivers; 21 percent of impaired lakes, ponds, and reservoirs; and 45 percent of impaired estuaries (second only to industrial discharges). See Figures 2-1 and 2-2 for an illustration of the pollutants and sources of pollution for both rivers and estuaries. In addition to these waterbodies, urban runoff was found to be the leading cause of ocean impairment for those ocean miles surveyed.

Urbanization alters the natural infiltration capability of the land and generates a host of pollutants that are associated with the activities of dense populations, thus causing an increase in storm water runoff volumes and pollutant loadings in storm water discharged to receiving waterbodies (U.S. EPA, 1992). Urban development increases the amount of impervious surface in a watershed as farmland, forests, and meadowlands are converted into buildings with rooftops, driveways, sidewalks, roads, and parking lots with virtually no ability to absorb storm water. Storm water and snow-melt runoff wash over these impervious areas, picking up pollutants along the way while gaining speed and volume because of their inability to disperse and filter into the ground (see Figure 2-3 which illustrates the increased runoff resulting from increased impervious area). The resulting storm water flows are higher in volume, pollutants, and temperature than the flows in less impervious areas, which have more natural vegetation and soil to filter the runoff (U.S. EPA, 1997. *Urbanization and Streams: Studies of Hydrologic Impacts*).



NOTE: Percentages do not add up to 100% because more than one pollutant or source may impair an estuary.

Figure 2-2. Pollutants and Sources in surveyed Estuaries (EPA, 1998)

EPA 841-R-97-009. Office of Water. Washington, DC).

In addition to the pollutants picked up by storm water runoff before it enters a storm drain, studies have shown that discharges from a storm drain system often include wastes and wastewater from non-storm water sources, referred to as illicit discharges. These discharges are 'illicit' because municipal storm sewer systems are not designed to accept, process, or discharge such wastes. Sources of illicit discharges can include sanitary wastewater illegally connected to the storm drain system; effluent from septic tanks; car wash, laundry, and other industrial wastewaters; improper disposal of auto and household toxics, such as used motor oil and pesticides; and spills from roadways.

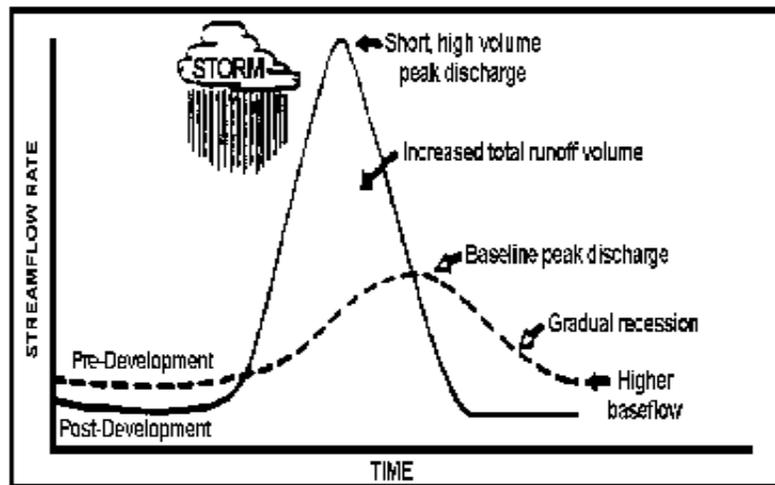


Figure 1. Impacts of urbanization on stream flow (Schueler, 1987).

Illicit discharges enter the system through either direct connections (e.g., wastewater piping either mistakenly or deliberately connected to the storm drains) or indirect connections (e.g., infiltration into the MS4 from cracked sanitary systems, spills collected by drain outlets, and paint or used oil dumped directly into a drain). The result is untreated discharges that contribute high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses and bacteria into receiving waterbodies.

2.2 Summary of EPA's Storm Water Program

In 1972, Congress amended the Federal Water Pollution Control Act (commonly referred to as the Clean Water Act (CWA)) to prohibit the discharge of any pollutant to waters of the United States from a point source unless the discharge is authorized by an NPDES permit. The NPDES program is designed to track point sources and require the implementation of the controls necessary to minimize the discharge of pollutants. Initial efforts to improve water quality under the NPDES program primarily focused on reducing pollutants in industrial process wastewater and municipal sewage. These discharge sources were easily identified as responsible for poor water quality.

As pollution control measures for industrial process wastewater and municipal sewage were implemented and refined, it became increasingly evident that more diffuse sources of water pollution were also significant causes of water quality impairment. Specifically, storm water runoff was found to be a major cause of water quality impairment.

In 1987, Congress amended the CWA to require implementation, in two phases, of a comprehensive national program for addressing storm water discharges. The first phase of the program, commonly referred to as “Phase I,” was promulgated on November 16, 1990 (55 FR 47990). Phase I requires NPDES permits for storm water discharge from a large number of priority sources including medium and large municipal separate storm sewer systems (“MS4s”) generally serving populations of 100,000 or more and several categories of industrial activity, including construction activity that disturbs five or more acres of land.

The Phase I permits for municipal separate storm sewer systems mostly cover larger cities, and require them to develop a storm water management program, track and oversee industrial facilities regulated under the NPDES storm water program, conduct some monitoring, and submit periodic reports.

The operators of construction activities disturbing greater than 5 acres have been required to obtain NPDES permit coverage since 1992. General permits for large construction activity require construction operators to develop and implement a storm water pollution prevention plan to control erosion, sediment and other wastes on the site.

The Phase I industrial storm water program also regulates the following industrial sectors:

- facilities subject to EPA storm water effluent guidelines, new source performance standards, or toxic pollutant effluent standards
- heavy manufacturing facilities
- mining/oil and gas
- hazardous waste facilities
- landfills
- recycling facilities
- steam electric power
- transportation facilities
- sewage treatment plants
- construction activity (described above), and
- light manufacturing facilities.

The second phase of the storm water program, which this guide addresses, requires permits for storm water discharges from certain small municipal separate storm sewer systems and construction activity generally disturbing between 1 and 5 acres. See Figure 2-4 for a summary of the federal storm water permit requirements under Phases I and II.

Figure 2-4. Summary of Federal Permit Requirements Under the NPDES Storm Water Program

	Municipal Separate Storm Sewer Systems (MS4s)	Construction Activity	Industrial Activity
Requirements in Effect Now (Phase I)	<p>Medium and Large MS4s (§ 122.26(d))</p> <ul style="list-style-type: none"> Storm Water Management Program: <ul style="list-style-type: none"> - Public education and outreach - Public participation efforts - Illicit discharge detection and elimination program - Construction and post-construction runoff control program for all construction activity (no size threshold) - BMPs to reduce pollutants from industrial, commercial, and residential areas Track/oversee industrial facilities regulated under the NPDES storm water program Conduct analytical and visual monitoring of MS4 discharges Submit periodic program assessment reports 	<p>Category (x) Construction Activity (5+ Acres)*</p> <p><u>CGP:</u></p> <ul style="list-style-type: none"> Storm Water Pollution Prevention Plan (SWPPP) <ul style="list-style-type: none"> - Site description - Description of BMPs for erosion and sediment, post-construction storm water management, and other controls - Self-evaluation and reporting <p><i>*Category (x) is one of the categories of "storm water discharges associated with industrial activity." Temporarily excluded from permitting: Category (x) construction activity operated by a municipality of <100,000 (ISTEA moratorium).</i></p>	<p>Ten Categories of Industrial Activity (Categories (i)-(ix),(xi))*</p> <p><u>MSGP:</u></p> <ul style="list-style-type: none"> SWPPP <ul style="list-style-type: none"> - Site evaluation - Description of appropriate storm water management BMPs - Self-evaluation, monitoring, and reporting If discharging into a medium or large MS4, notify the MS4 operator <p><i>*Temporarily excluded from permitting: Industrial activity operated by a municipality of <100,000, except for power plants, airports, and uncontrolled sanitary landfills (ISTEA moratorium).</i></p>
Requirements that Will Be in Effect by 2003 (Phase II)	<p>Regulated Small MS4s (§ 122.34 outlined here, but may choose permit coverage under § 122.26(d) instead)</p> <ul style="list-style-type: none"> Storm Water Management Program: <ul style="list-style-type: none"> - Public education and outreach - Public participation efforts - Illicit discharge detection and elimination program - Construction runoff control program for construction activity disturbing 1 acre or greater - Post-construction runoff control program for construction activity disturbing 1 acre or greater - Good housekeeping/pollution prevention for municipal operations Conduct assessment of identified BMPs and measurable goals for each minimum control measure Submit annual program assessment reports 	<p>Small Construction Activity (≤1 and <5 Acres)</p> <ul style="list-style-type: none"> Expected to be similar to Category (x) Construction Activity requirements above <hr/> <p>Category (x) Construction Activity Operated by a Municipality of < 100,000</p> <ul style="list-style-type: none"> Same requirements as for Category (x) Construction Activity above 	<p>Industrial Activity Operated by a Municipality of <100,000*</p> <ul style="list-style-type: none"> Same requirements as for Ten Categories of Industrial Activity above <p><i>*Does not include: Power plants, airports, and uncontrolled sanitary landfills</i></p>

3.0 REGULATION REQUIREMENTS

After reading section 3.0, you should understand the basic components and requirements of the Storm Water Phase II Rule and the rule's compliance schedule/timeline. This information is meant to serve as a basis for understanding the details of the Rule as discussed in further sections of this guidance.

3.1 What Does The Storm Water Phase II Rule Require?

This regulation can be divided into three main components, each with distinct requirements, affecting three types of entities. These components and the requirements for each are summarized below.

Regulated Small MS4s (see section 4.0)

A certain subset of operators of small MS4s (primarily those located in urbanized areas) are required to implement programs and practices to control polluted storm water runoff from the jurisdiction serviced by the MS4. The operator must design its storm water management program to satisfy applicable CWA water quality requirements and technology standards. The program must include the development and implementation of best management practices (BMPs) and measurable goals for the following six minimum measures, and include evaluation and reporting efforts:

- Public education and outreach,
- Public participation/involvement,
- Illicit discharge detection and elimination,
- Construction site runoff control,
- Post-construction runoff control, and
- Pollution prevention/good housekeeping for municipal operations.

Two waivers from coverage are available for small MS4s brought into the program by the Phase II regulation.

Small Construction Activity (see section 5.0)

All construction operators disturbing more than 1 acre and less than 5 acres are required to apply for an NPDES storm water permit for small construction activity. EPA already regulates construction activity disturbing more than 5 acres. A construction operator is usually the developer or landowner, but can also be the contractor or another party responsible for the operational control of erosion and sediment control practices on site.

Unlike the requirements for regulated small MS4s, the requirements for small construction activity (primarily activity disturbing between 1 and 5 acres of land) are not detailed in the Phase II regulation. Rather, the requirements are left to the discretion of the NPDES permitting authority when it develops the small construction activity permit. EPA expects the permit for small construction activity to be similar to the existing storm water general permits for large construction activity regulated under the Phase I program. EPA's existing Construction General Permit includes requirements to:

- Submit a Notice of Intent (NOI);
- Develop and implement a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP includes erosion and sediment controls, controls on waste at the site, self-inspection/monitoring, and reporting efforts; and
- Submit a Notice of Termination (NOT) when permit coverage is no longer necessary.

Two waivers from coverage are available for small construction activity.

Industrial Activity (see section 6.0)

Eleven categories of industrial activity are regulated under Phase I of the NPDES Storm Water Program. Under the Phase II Rule, no new categories of industrial activity are designated into the storm water program. The Rule does, however, include a revised no exposure exclusion that is available to all regulated categories of industrial activity (except category (x) - large construction activity) if the facility operator can certify that storm water runoff is not exposed to industrial activities.

Also, this regulation further extends the deadline to obtain permit coverage for those industrial activities operated by municipalities with populations of less than 100,000 that were temporarily exempted from permitting under the Intermodal Surface Transportation Enforcement Act (ISTEA) of 1991.

3.2 What Is the Phase II Rule's Compliance Schedule/Timeline?

The Phase II Final Rule was published in the *Federal Register* on December 8, 1999 (64 *FR* 68722). The following table lists milestones for EPA, the NPDES permitting authorities, and the regulated community under this program.

Storm Water Phase II Program Compliance Timeline

ACTIVITY	DEADLINE
Conditional No Exposure Exclusion option available in States where EPA is the NPDES permitting authority	February 7, 2000
Submission of No Exposure Certification	Every 5 years
EPA issues a menu of BMPs for small MS4 programs	October 2000
EPA issues a model general permit for small MS4s	October 2000
EPA issues guidance on measurable goals for small MS4 programs	October 2001
NPDES permitting authority determines designation of small MS4s located outside of an urbanized area that serve a jurisdiction with a population of 10,000 and population density of 1,000	By December 9, 2002; or by December 8, 2004 if apply designation criteria on a watershed basis under a comprehensive watershed plan
NPDES permitting authority determines waivers for regulated small MS4s in urbanized areas	By December 9, 2002
NPDES permitting authority issues general permits for regulated small MS4s and small construction activity	By December 9, 2002
Operators of regulated small MS4s and small construction activity designated by the rule must obtain permit coverage	By March 10, 2003
Operators of regulated small MS4s and small construction activity designated by NPDES permitting authority must obtain permit coverage	Within 180 days of notice
Temporarily exempted municipal operators of industrial activity must obtain permit coverage (ISTEA moratorium)	By March 10, 2003
The NPDES permitting authority may phase in coverage for small MS4s serving jurisdictions with a populations less than 10,000 on a schedule consistent with a State watershed permitting approach	Completion of phase-in by March 8, 2007
The regulated small MS4s must fully implement their storm water management programs	By the end of the first permit term – typically a 5-year period
Re-evaluation of the Phase II small MS4 regulations by EPA	By December 2012
NPDES permitting authority determination on a petition for designation of a non-regulated storm water discharger	Within 180 days of receipt

4.0 REGULATED SMALL MS4S

After reading section 4.0, you should understand what an MS4 is, which operators of MS4s are subject to the Phase II small MS4 regulations (including who may be waived from coverage), the small MS4 permit options, and the permit requirements for a small MS4 storm water management program. The discussion of these elements concludes with a step-by-step review of the process for compliance with the small MS4 program and possible funding options. Special concerns regarding Federal and State-operated small MS4s are also addressed.

4.1 MS4 DEFINITIONS

EPA's National Pollutant Discharge Elimination System (NPDES) storm water permitting program labels municipal separate storm sewer systems (MS4s) as either "small," "medium," or "large" for the purposes of regulation. The definitions of each are included herein. The Phase I storm water program covers medium and large MS4s. The Phase II storm water regulation covers a certain subset of small MS4s, known as "regulated small" MS4s. Regulated small MS4 coverage under the rule is discussed in section 4.2.

4.1.1 What is an "MS4"?

What constitutes a municipal separate storm sewer system (MS4) is often misinterpreted and misunderstood. The term MS4 does not solely refer to municipally-owned storm sewer systems, but rather is a term of art with a much broader application that can include, in addition to local jurisdictions, State departments of transportation, universities, local sewer districts, hospitals, military bases, and prisons. An MS4 also is not always just a system of underground pipes – it can include roads with drainage systems, gutters, and ditches. The regulatory definition of an MS4 is provided in the text box below.

According to 40 CFR 122.26(b)(8), “*municipal separate storm sewer* means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

- (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law)...including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges into waters of the United States.
- (ii) Designed or used for collecting or conveying storm water;
- (iii) Which is not a combined sewer; and
- (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2."

4.1.2 What is a "large" MS4?

A **large MS4** is any MS4 located in an incorporated place or county with a population of 250,000 or greater as of the 1990 Census. The Phase II Final Rule revised the original large MS4 definition (found in the 1990 Phase I regulations) by freezing it as of the 1990 Census so that no new large MS4s could be automatically designated based on the 2000 Census, or any subsequent Census. Listings of incorporated places and counties with populations of 250,000 or greater as of the 1990 Census are included in the revised Appendices F and H to Part 122, found in the Phase II Final Rule.

4.1.3 What is a "medium" MS4?

A **medium MS4** is any MS4 located in an incorporated place or county with a population between 100,000 - 249,999 as of the 1990 Census. The Phase II Final Rule revised the original medium MS4 definition (found in the 1990 Phase I regulations) by freezing it as of the 1990 Census so that no new medium MS4s could be automatically designated based on the 2000 Census, or any subsequent Census. Listings of incorporated places and counties with populations between 100,000 - 249,999 as of the 1990 Census are included in the revised Appendices G and I to Part 122, found in the Phase II Final Rule.

Important Note: Many MS4s in areas below 100,000 in population have been individually brought into the Phase I program by NPDES permitting authorities. Such already regulated MS4s are considered Phase I MS4s and are not required to develop a Phase II program.

4.1.4 What is a "small" MS4?

A **small MS4** is any MS4 that is not already regulated under the Phase I storm water program. Unlike the definitions of medium and large MS4s, the definition of a small MS4: 1) is not dependant on a population threshold, and 2) includes Federally-owned systems, such as military bases and veterans hospitals.

4.2 COVERAGE: Who Is Subject to the Phase II Final Rule?

4.2.1 Are All Small MS4s Covered by the Phase II Final Rule?

No. The universe of small MS4s is quite large since it includes every MS4 except for the approximately 900 medium and large MS4s already regulated under the Phase I storm water program. Only a select sub-set of small MS4s, referred to as **regulated small MS4s**, are covered by the Phase II Final Rule, either through automatic nationwide designation by the rule or designation on a case-by-case basis by the NPDES permitting authority.

4.2.2 How Is A Small MS4 Designated as a Regulated Small MS4 under Phase II?

A *small MS4* can be designated as a *regulated small MS4*, and thereby be subject to the Phase II rule, in any one of the three ways explained in the following subsections.

4.2.2.1 Automatic Nationwide Designation by the Rule

The Phase II Final Rule requires "automatic" nationwide coverage of all operators of small MS4s that are located within the boundaries of a Bureau of the Census-delineated "urbanized area" (UA) based on the latest decennial Census. This doesn't just include municipal operators of small MS4s, but also universities, highway departments, and any other operator of a storm sewer system that is located fully or partially within the UA. **Refer to section 4.3 for more information on how to determine if a particular small MS4 is located within a UA.**

Important Note: Only the portion of the small MS4 that is located within the UA boundaries is regulated under Phase II. For example, if a county operates a small MS4 that serves the whole county but only half of the MS4 falls within the UA boundary, then the county must obtain permit coverage (and implement a storm water management program) only for the half of the MS4 in the UA.

Once a small MS4 is designated into the program based on the UA boundaries, it cannot be waived from the program if in a subsequent UA calculation the small MS4 is no longer within the UA boundaries. An automatically designated small MS4 remains regulated unless, or until, it meets the criteria for a waiver. See section 4.4 for more information on waivers from coverage for regulated small MS4s in urbanized areas.

An operator of a small MS4 located outside of a UA boundary may be designated as a regulated small MS4 if the NPDES permitting authority determines that the small MS4's discharges cause, or have the potential to cause, an adverse impact on water quality. See sections 4.2.2.2 and 4.2.2.3 below for more information on designations by the permitting authority.

Preamble of the Phase II Final Rule: Appendix 6

A listing of governmental entities that are located either fully or partially within a UA according to the 1990 Census can be found in Appendix 6 to the Preamble of the Phase II Final Rule. The list is a general geographic reference intended to help operators of small MS4s determine whether or not they are located in a UA and, consequently, required to comply with the regulation; it is not a list of all Phase II regulated MS4s and it may contain errors. For example, the list does not include small MS4 operators such as colleges and universities, Federal prison complexes, and State highway departments located within a UA.

4.2.2.2 Potential Designation by the NPDES Permitting Authority — Required Evaluation of 10,000/1,000 Areas

The Phase II Final Rule requires the NPDES permitting authority to develop a set of designation criteria and apply them, *at a minimum*, to all small MS4s located outside of a UA that serve a jurisdiction with a population of at least 10,000 and a population density of at least 1,000 people/square mile. The permitting authority is required to *evaluate* such small MS4s but is not required to *designate* them into the program unless they meet the designation criteria.

Recommended Designation Criteria

EPA recommends in the Phase II regulations that the NPDES permitting authority use a balanced consideration of the following designation criteria on a watershed or other local basis:

- ✓ Discharge to sensitive waters;
- ✓ High population density;
- ✓ High growth or growth potential;
- ✓ Contiguity to a UA;
- ✓ Significant contributor of pollutants to waters of the United States; and
- ✓ Ineffective protection of water quality concerns by other programs.

Preamble of the Phase II Final Rule: Appendix 7

A listing of governmental entities located outside of a UA that have a population of at least 10,000 and a population density of at least 1,000 people per square mile, can be found in Appendix 7 to the Preamble of the Phase II Final Rule. Similar to Appendix 6, the list is a geographic reference only – it is not a list of regulated entities and it may contain errors. Operators of small MS4s located within a listed area could be examined by their NPDES permitting authority for potential designation into the Phase II

program. Furthermore, the NPDES permitting authority reserves the right to designate for regulation any small MS4 that is contributing pollutants to waters of the United States, whether or not its jurisdiction is found in Appendix 7.

Deadline for Designation

The NPDES permitting authority is required to designate small MS4s meeting the designation criteria by December 9, 2002, or by December 8, 2004 if a comprehensive State watershed plan is in place and the criteria are being applied on a watershed basis.

4.2.2.3 Potential Designation by the NPDES Permitting Authority — Physically Interconnected

The Phase II Final Rule requires the NPDES permitting authority to designate any small MS4 located outside of a UA that contributes substantially to the pollutant loadings of a *physically interconnected* MS4 that is permitted by the NPDES storm water program. This means the other MS4 could be a large, medium, or regulated small MS4.

Small MS4s located right outside the boundary of an urbanized area are the ones most likely to meet this criterion for designation and, therefore, should make an effort to become aware of whether they discharge pollutants directly into a regulated MS4. The sooner a small MS4 operator is prepared for potential designation and implementation of the Phase II program, the better.

Physically interconnected means that one MS4 is connected to a second MS4 in such a way that it allows for *direct* discharges into the second system.

Deadline for Designation

The final rule does not set a deadline for designation of small MS4s meeting this criterion.

4.3 URBANIZED AREAS: What Are They and How Does a Small MS4 Operator Determine If It Is Located in One?

As discussed in section 4.2, the Phase II Final Rule covers all small municipal separate storm sewer systems (MS4s) located within an “urbanized area” (UA). Based on the 1990 Census, there are 405 UAs in the United States that cover 2 percent of total U.S. land area and contain approximately 63 percent of the Nation’s population. These numbers include Puerto Rico — the only U.S. Territory with UAs.

UAs constitute the largest and most dense areas of settlement. UA calculations delineate boundaries around these dense areas of settlement and, in doing so, identify the areas of concentrated development. UA designations are used for several

purposes in both the public and private sectors. For example, the Federal Government has used UAs to calculate allocations for transportation funding, and some planning agencies and development firms use UA boundaries to help ascertain current, and predict future, growth areas.

4.3.1. What Is the Definition of an Urbanized Area (UA)?

The Bureau of the Census determines UAs by applying a detailed set of published UA criteria (see 55 *FR* 42592, October 22, 1990) to the latest decennial census data. Although the full UA definition is complex, the Bureau of the Census' general definition of a UA, based on population and population density, is provided below.

An *urbanized area (UA)* is a land area comprising one or more places – central place(s) – and the adjacent densely settled surrounding area – urban fringe – that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile. It is a calculation used by the Bureau of the Census to determine the geographic boundaries of the most heavily developed and dense urban areas.

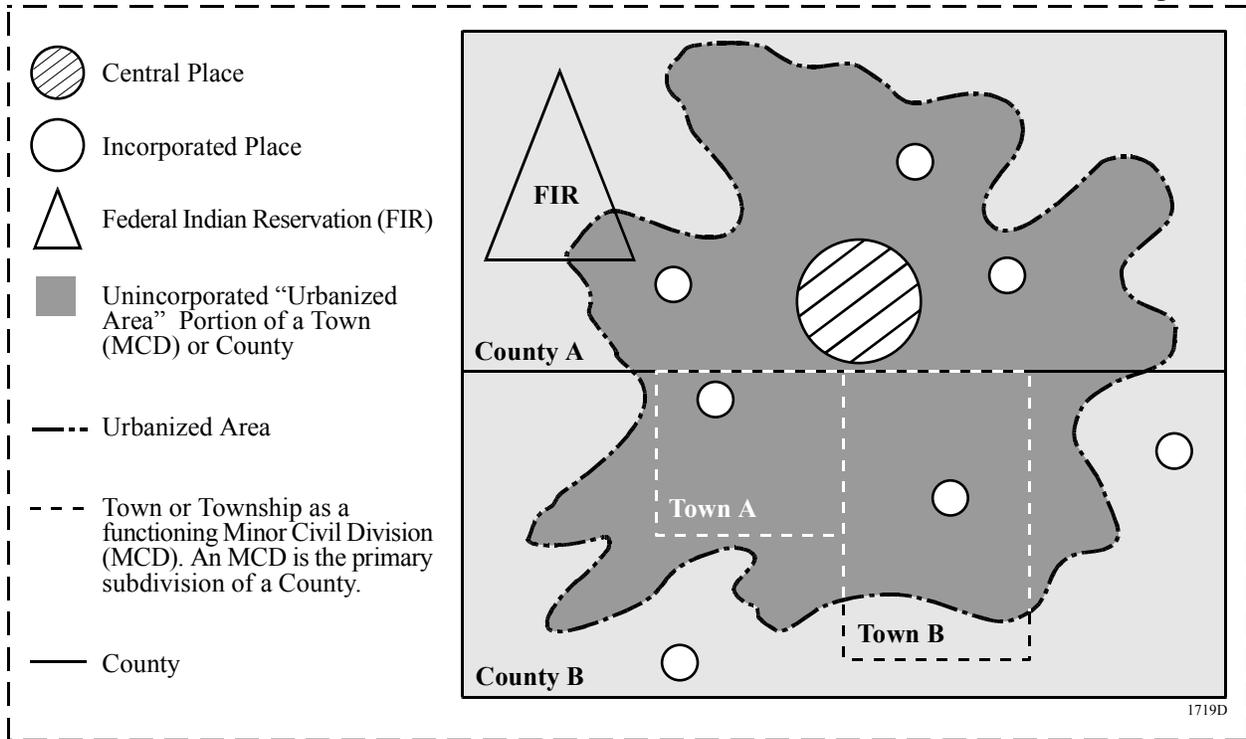
UA Facts:

- The basic unit for delineating the UA boundary is the census block. Census blocks are based on visible physical boundaries, such as the city block, when possible, or on invisible political boundaries, when not. An urbanized area can comprise places, counties, Federal Indian Reservations, and minor civil divisions (MCDs - towns and townships).
- A UA can include governmental entities of every population size: 200; 7,000; 15,000; 30,000, 200,000; or 3 million! Entities with small populations are commonly found in the urban fringe of the UA.
- Before the time of permit issuance (by December 9, 2002), new UA calculations based on the 2000 Census should be published. The regulated small MS4 universe then will be based on these new calculations.

4.3.2. What Does A UA Look Like?

The drawing below (see Figure 4-1) is a simplified UA illustration that demonstrates the concept of UAs in relation to the Phase II Final Rule. This “urbanized area” includes within its boundaries incorporated places, a portion of a Federal Indian reservation, an entire MCD, a portion of another MCD, and portions of two counties. Any and all operators of small MS4s located within the boundaries of the UA are covered under the Phase II Final Rule, regardless of political boundaries. Operators of small MS4s located outside of the UA are subject to potential designation into the Phase II MS4 program by the NPDES permitting authority, as explained in section 4.2.

Figure 4-1



4.3.3 How Can An Operator of a Regulated Small MS4 Determine If It Is Located Within a UA?

Operators of small MS4s can determine if they are located within a UA, and therefore covered under the Phase II storm water program, through the following two steps:

— STEP 1 —

Refer to a listing of incorporated places, MCDs, and counties that are located entirely or partially within a UA. Such a listing, based on the 1990 Census and including only those entities not regulated under Phase I, can be found in Appendix 6 to the Preamble of the Phase II Final Rule. If a small MS4 is located in a listed incorporated place, MCD, or county, then the operator of the small MS4 should follow step (2) below. It is important to note that Appendix 6 is general guidance only and may contain errors. For this reason, even if a particular small MS4 isn't located in a listed area, EPA recommends that the small MS4 operator follow Step 2.

— STEP 2 —

Some operators of small MS4s may find that they are located within an

entity listed in Appendix 6 but not know if their systems are within the urbanized portion of the listed entity, or they are not on the list but want to confirm their status as recommended above. In such cases, they should contact one or more of the following institutions for more detailed information on the location of UA boundaries:

❑ **The State or NPDES Permitting Authority**

Storm Water Coordinators: The NPDES permitting authority may be the State or the U.S. EPA Region. The Storm Water Coordinators for each U.S. EPA Region are listed in Section 8. These regional contacts can assist with UA information and provide the names of State storm water contacts.

State Data Centers: Each State's Data Center receives listings of all entities that are located in UAs, as well as detailed maps and electronic files of UA boundaries. The Bureau of the Census web site includes a list of contact names and phone numbers for the Data Center in each State at www.census.gov/sdc/www.

State Planning/Economic/Transportation Agencies: These agencies typically use UAs to assess current development and forecast future growth trends and, therefore, should have detailed UA information readily available to help determine the UA boundaries in any given area.

❑ **County or Regional Planning Commissions/ Boards**

As with State agencies, these entities are likely to have detailed UA data and maps to help determine UA boundaries.

❑ **The Bureau of the Census**

Urbanized Areas Staff: 301 457-1099

Web Site: www.census.gov

The site provides information on purchasing UA maps and electronic files for use with computerized mapping systems. Obtain free UA cartographic boundary files (Arc/Info export format) for Geographical Information System (GIS) use at: www.census.gov:80/geo/www/cob/ua.html.

UA Maps: Detailed UA maps are available for purchase with a \$25 minimum order (\$5 per map sheet). Each map sheet measures 36 by 42 inches. For prices and a listing of UAs, visit www.census.gov/mp/www/geo/msgeo12.html. Order from the Department of Commerce, Bureau of the Census (MS 1921), P.O. Box 277943, Atlanta, GA 30384-7943 (Phone: 301 457-4100; Toll-free fax: 1-888-249-7295).

❑ **U.S. EPA**

EPA is currently modifying a web-based geographic program called *Enviromapper* for use in determining UA boundaries. This program will allow users to enter a location (by name, zip code, or street address) and see a map that will show if the location is within a UA boundary. EPA is committed to using *Enviromapper* to create a tool that, someday, will be the only tool necessary to determine the location of UA boundaries. Information about *Enviromapper* will be available at www.epa.gov/owm/phase2.

4.3.4 How Will the Year 2000 Census Affect the Determination of Status as a Regulated Small MS4?

The listing of incorporated places, MCDs, and counties located within UAs in the United States and Puerto Rico, found in Appendix 6, is based on the 1990 Census. New listings for UAs based on the 2000 Census are scheduled to be available by August of 2001. Once the official 2000 Census listings are published by the Bureau of the Census, operators of small MS4s located within the revised boundaries of former 1990 UAs, or in any newly defined 2000 UAs, become regulated small MS4s and must develop a storm water management program.

Any additional automatic designations of small MS4s based on subsequent census years is governed by the Bureau of the Census' definition of a UA in effect for that year and the UA boundaries determined as a result of the definition.

Once a small MS4 is designated into the Phase II storm water program based on the UA boundaries, it can not be waived from the program if in a subsequent UA calculation the small MS4 is no longer within the UA boundaries. An automatically designated small MS4 will remain regulated unless, or until, it meets the criteria for a waiver.

4.4 WAIVERS: Which Regulated Small MS4s May Obtain a Waiver From Coverage?

Two waiver options are available to operators of regulated small MS4s in urbanized areas if the NPDES permitting authority determines that their discharges do not cause, or have the potential to cause, water quality impairment.

Important Note: The waivers are granted by the NPDES permitting authority, the operator of the regulated small MS4 can not determine for itself that it meets the waiver criteria. If the permitting authority is not proactive in assessing small MS4s for potential waivers, an operator may petition for a waiver assessment.

If a permitting authority decides to grant waivers, it is required to do so by December 9, 2002 to coincide with the expected date of the small MS4 permit issuance. The

permitting authority is also required to periodically review any waivers granted to small MS4 operators to determine whether any information required for granting the waiver has changed. Minimally, such a review needs to be conducted once every five years. The waiver options are described in the following two subsections.

Deadline for Waivers

The NPDES permitting authorities are required to make their waiver determinations by March 9, 2002 to coincide with the expected issuance of their small MS4 general permit. If the permit authority chooses to phase in permit coverage based on a comprehensive watershed plan (see section 4.5.2.2), then regulated small MS4s may be waived on the same schedule. The phase-in of permit coverage and waivers is to be completed no later than March 8, 2007.

4.4.1 Option 1: Less than 1,000 Population in a UA

The first waiver option applies where:

- (1) the jurisdiction served by the system is less than 1,000 people;
- (2) the system is not contributing substantially to the pollutant loadings of a physically interconnected regulated MS4; and
- (3) if the small MS4 discharges any pollutants identified as a cause of impairment of any water body to which it discharges, storm water controls are not needed based on wasteload allocations that are part of an EPA approved or established "total maximum daily load" (TMDL) that addresses the pollutant(s) of concern.

TMDLs are water quality assessments that determine the source or sources of pollutants of concern for a particular waterbody, consider the maximum amount of pollutants the waterbody can assimilate, and then allocate to each source a set level of pollutants that it is allowed to discharge (i.e., a "wasteload allocation"). Small MS4s that are not given a wasteload allocation would meet the third criterion above.

The third criterion of this waiver option need only be met if the small MS4 is discharging into a impaired water body and the discharge contains a pollutant or pollutants that are the cause of the impairment (i.e., the "pollutants of concern").

4.4.2 Option 2: Less than 10,000 Population in a UA

The second waiver option applies where:

- (1) the jurisdiction served by the system is less than 10,000 people;

- (2) an evaluation of all waters of the U.S. that receive a discharge from the system shows that storm water controls are not needed based on wasteload allocations that are part of an EPA approved or established TMDL that addresses the pollutant(s) of concern or an equivalent analysis; and
- (3) it is determined that future discharges from the small MS4 do not have the potential to result in exceedances of water quality standards.

Pollutants of Concern include biochemical oxygen demand (BOD), sediment or a parameter that addresses sediment (such as total suspended solids, turbidity or siltation), pathogens, oil and grease, and any pollutant that has been identified as a cause of impairment in any water body to which the MS4 discharges.

This waiver option differs from the first option in that: 1) it applies to a larger jurisdiction size (up to 10,000 rather than 1,000), 2) it requires a determination that the discharges are not affecting the receiving water body, whether the water body is impaired or not (in the first option an assessment is only necessary if the water body is impaired and the MS4 is discharging a pollutant of concern), 3) the determination must be based on a TMDL or an equivalent analysis (the first option does not allow for an equivalent analysis), and 4) an assessment of the impacts of future discharges must be performed (no such assessment is necessary under the first option).

4.5 PERMITTING OPTIONS: What Permitting Choices are Available?

The Storm Water Phase II Final Rule requires operators of a particular subset of small MS4s in urbanized areas to obtain National Pollutant Discharge Elimination System (NPDES) permit coverage because their storm water discharges are considered “point sources” of pollution. All point source discharges, unlike nonpoint sources such as agricultural runoff, are required under the Clean Water Act (CWA) to be covered by federally enforceable NPDES permits. Those MS4s already permitted under the NPDES Phase I storm water program, even MS4s serving less than 100,000 people, are not required to be permitted under the Phase II storm water program.

NPDES storm water permits are issued by an NPDES permitting authority, which may be an NPDES-authorized State or a U.S. EPA Region in non-authorized States. Once a permit application is submitted by the operator of a regulated small MS4 and a permit is obtained, the conditions of the permit must be satisfied (i.e., development and implementation of a storm water management program) and periodic reports must be submitted on the status and effectiveness of the program. This section addresses the flexible permit options the Phase II regulations allow for the regulated small MS4 operator, as well as for the permitting authority. The permit requirements are discussed in section 4.6.

4.5.1 For Regulated Small MS4 Operators**4.5.1.1 The Types of Permit Coverage Available**

Unlike the Phase I program that requires individual permits for medium and large MS4s, the Phase II approach allows operators of regulated small MS4s to choose from as many as three permitting options as listed below. Each NPDES permitting authority reserves the authority to determine, however, which options are available to the regulated small MS4s in their jurisdiction.

1) General Permits

- # General permits are strongly encouraged by EPA. The Phase II program has been designed specifically to accommodate a general permit approach.
- # General permits prescribe one set of requirements for all applicable permittees. General permits are drafted by the NPDES permitting authority, then published for public comment before being finalized and issued.
- # A Notice of Intent (NOI) serves as the application for the general permit. The regulated small MS4 operator complies with the permit application requirements by submitting an NOI to the NPDES permitting authority that describes the storm water management plan, including best management practices (BMPs) and measurable goals. The operator has the flexibility to develop an individualized storm water program that addresses the particular characteristics and needs of its system, provided the requirements of the general permit are satisfied.
- # For general permit coverage, the regulated small MS4 operator must follow the Phase II permit application requirements (see section 4.6.2).

2) Individual Permits

- # Individual permits are required for Phase I medium and large MS4s, but not recommended by EPA for Phase II program implementation.
- # Individual permits prescribe a particular set of requirements for a particular permittee or a group of co-permittees. Individual permits require the submission of a more comprehensive permit application than an NOI that is submitted under a general permit. Once the permit application is received, an individual permit is drafted by the NPDES permitting authority, then published for public comment before being finalized and issued.
- # The Phase II rule allows a regulated small MS4 to submit an individual application for coverage under either the:

- Phase II MS4 regulation (see § 122.34 of the Phase II rule), or
- Phase I MS4 regulation (see 40 CFR §122.26(d)).

3) Modification of an Existing Phase I Individual Permit – A Co-Permittee Option with Medium and Large MS4s

The operator of a regulated small MS4 could participate as a limited co-permittee in a neighboring Phase I MS4's storm water management program by seeking a modification of the existing Phase I individual permit. As a limited co-permittee the small MS4 operator would be responsible for compliance with the permit's conditions applicable to its jurisdiction.

Note: A list of Phase I medium and large MS4s can be obtained from the EPA Office of Wastewater Management (OWM) or downloaded from the OWM web site.

The permittee must comply with the applicable terms of the modified Phase I individual permit rather than the minimum control measures in the Phase II Final Rule.

4.5.1.2 Co-permittee with Another Operator of a Regulated Small MS4

Section 4.5.1.1 explained the permitting option of a modification of an existing Phase I individual permit in order to be a co-permittee with a medium or large MS4. Regulated small MS4 operators may also choose to share responsibilities for meeting the Phase II program requirements with another regulated small MS4 operator under a general or individual permit. Those operators choosing to do so may submit jointly an NOI or individual permit application that identifies who will implement which minimum measures within the area served by the MS4s.

4.5.1.3 Relying on Another Entity to Satisfy One or More of the Minimum Control Measures

Under either a general or individual permit, the Phase II small MS4 permittee has the option of relying on other entities that are already performing one or more of the minimum control measures to implement the measure(s) on the permittee's behalf. This is only allowable where the existing control measure, or component thereof, is at least as stringent as the Phase II rule requirements (under § 122.34(b)) and the other entity has agreed to the arrangement.

For example, a county may already have an illicit discharge detection and elimination program in place and may allow an operator of a regulated small MS4 within the county's jurisdiction to rely on the county program instead of formulating and implementing a new program. In such a case, the permittee would not need to

implement the particular measure, but would still be ultimately responsible for its effective implementation. For this reason, EPA recommends that the permittee enter into a legally binding agreement with the other entity. If the permittee chooses to rely on another entity, they must note this in their permit application and subsequent reports.

Note: Also, the other entity does not necessarily need to be a governmental entity. For example, a permittee could rely on a non-profit organization that is performing public education efforts on environmental issues to satisfy the public education and outreach minimum measure.

A Phase II permittee also has the option to rely on another entity to satisfy all of the permittee's small MS4 permit obligations – but only if the other entity is a governmental entity permitted under the NPDES storm water program. Should this option be chosen, the permittee must note this in its NOI, but does not need to file the otherwise required periodic reports on the status of the program. Again, it is important to note that the permittee would remain ultimately liable under the small MS4 permit. This option is particularly beneficial for operators that serve a low population, have limited resources or legal authority, or are surrounded by an NPDES regulated municipality. For example, let's assume a college campus or a veteran's hospital are operators of small MS4s and they are located in the middle of a Phase II regulated city. Negotiating with the city to implement the storm water management program for them in their jurisdictions could be a cost-effective and less burdensome option than for each to implement their own programs.

4.5.2 For the NPDES Permitting Authority

4.5.2.1 Alternative Options for Writing Permit Requirements

Two permitting options tailored to minimize duplication of effort by the regulated small MS4 permittee can be incorporated into the general or individual permit by the NPDES permitting authority:

1) Recognizing Another Governmental Entity's Program

The permitting authority can recognize in a small MS4 permit that another governmental entity is responsible under an NPDES permit for implementing any or all of the minimum control measures. In such a case, responsibility for implementation of the measure(s) would rest with the other governmental entity, thereby relieving the small MS4 permittee of its responsibility to implement that particular measure(s). See Table 4-1 for examples of both this option and the following option.

4.0 Regulated Small MS4s

STORM WATER PHASE II RULE SMALL MS4 FLEXIBLE PERMITTING OPTIONS

	Referencing a QUALIFYING LOCAL PROGRAM (QLP)	RECOGNIZING an NPDES-Regulated Entity	RELYING on Another Entity	CO-PERMITTEE with an NPDES-Regulated Entity
NPDES PERMITTING AUTHORITY Responsibilities	<ul style="list-style-type: none"> • PA assesses local, State, and Tribal NPDES and non-NPDES programs to determine if their requirements are equivalent to one or more Phase II minimum measures for regulated small MS4s • PA chooses whether to reference a QLP in small MS4 permit. Requires permittee to follow requirements of QLP rather than new permit requirements. • PA does not need to notify the administrator of the QLP or obtain permission since referencing the QLP has no bearing/no affect on the administrator. 	<ul style="list-style-type: none"> • PA assesses entities that are, or will be, performing the equivalent of 1 or more of the small MS4 minimum measures under an NPDES permit. • PA chooses whether to recognize such an entity in a small MS4 permit. 	N/A	N/A
SMALL MS4 OPERATOR Responsibilities	<ul style="list-style-type: none"> • The operator should already be complying with any QLP referenced in the permit. • Compliance with the QLP is considered compliance with the NPDES permit; therefore operator <u>held liable</u> if doesn't comply with the QLP. 	<ul style="list-style-type: none"> • Operator has <u>no responsibility</u> to perform the measure(s) that is being done by the recognized entity. • <u>Not held liable</u> if the other entity fails to perform the measure effectively; however, PA may then require the operator to implement the measure itself. 	<ul style="list-style-type: none"> • Operator <u>chooses</u>, under its own permit, whether to rely on another entity to implement 1 or more minimum measure on its behalf – can be a non-NPDES regulated entity. • Operator notes in NOI or indiv. permit application that it is relying on another entity to implement a measure. • Remain liable if other entity fails to perform the measure effectively. 	<ul style="list-style-type: none"> • Operator <u>chooses</u> whether to be a co-permittee with another regulated MS4 and submits a single NOI or individual permit application • The operators determine who will do what and include this information in the permit application
EXAMPLES	<p>The QLP in the small MS4 permit could be a State program that requires MS4 operators to detect & eliminate illicit discharges into their systems.</p>	<p>A county doing educational outreach for the whole county under a Phase I NPDES permit could be recognized, thereby relieving all small MS4s in the county from having to have their own educational outreach programs.</p>	<ol style="list-style-type: none"> 1. An environmental group is doing educational outreach on the impacts of storm water runoff. 2. A county is already implementing a construction runoff control program under a Phase I NPDES permit. 	

2) Referencing a Qualifying Local Program

The NPDES permitting authority can include conditions in a small MS4 permit that direct a permittee to follow the requirements of an existing qualifying local program rather than the requirements of particular minimum control measure(s). A qualifying local program is defined as a local, State or Tribal municipal storm water program that imposes requirements that are equivalent to those of the Phase II MS4 minimum measures (as found in § 122.34(b) of the rule). Unlike in Option 1 above, under this option the permittee remains responsible for the implementation of the minimum measure through its compliance with the qualifying local program.

4.5.2.2. Alternative Option for Permit Coverage: Phase-in Coverage for Regulated Small MS4s with Populations under 10,000

Permitting authorities may phase-in permit coverage for regulated small MS4s serving jurisdictions with a population under 10,000 on a schedule consistent with a State watershed permitting approach. Under this alternative option, the permitting authority must develop and implement a schedule to phase-in permit coverage for approximately 20 percent annually of all regulated small MS4s that qualify, completing the phase-in schedule in no more than five years. In such a case, the regulated small MS4 operators would be notified by the permitting authority concerning the operator's deadlines for permit coverage.

Deadlines for Phase-In

- Permitting authorities are required to have their phase-in schedule approved by the USEPA Regional Administrator no later than December 10, 2001.
- Under the phase-in option, all regulated small MS4s are required to have coverage under an NPDES permit no later than March 8, 2007.

4.6 REQUIREMENTS: What Requirements Are Regulated Small MS4s Subject To?

A regulated small MS4 operator is required to submit a permit application and obtain coverage under a NPDES storm water permit. Under the permit, the operator will be required to develop and implement a storm water management program that includes six minimum control measures, evaluation/assessment and reporting efforts, and recordkeeping, as described herein. This section begins by highlighting the standards an operator must meet to ensure compliance with the Phase II regulations.

4.6.1 Applicable Standards

A Phase II small MS4 operator must design a storm water management program so that it:

- Reduces the discharge of pollutants to the “maximum extent practicable”

(MEP);

- Protects water quality; and
- Satisfies the appropriate water quality requirements of the Clean Water Act.

The standard of MEP is the same standard applied to Phase I medium and large MS4 programs. There is no regulatory definition of MEP in order to allow the permitting authority and regulated MS4s maximum flexibility in their interpretation of it as appropriate.

Compliance with the technical standard of MEP requires the successful implementation of approved BMPs. The Phase II Final Rule considers narrative effluent limitations that require the implementation of BMPs and the achievement of measurable goals as the most appropriate form of effluent limitations to achieve the protection of water quality, rather than requiring that storm water discharges meet numeric effluent limitations.

EPA intends to issue Phase II NPDES permits consistent with its August 1, 1996, Interim Permitting Approach policy, which calls for BMPs in first-round storm water permits and expanded or better tailored BMPs in subsequent permits, where necessary, to provide for the attainment of water quality standards. In cases where information exists to develop more specific conditions or limitations to meet water quality standards, these conditions or limitations should be incorporated into the storm water permit. Monitoring is not required under the Phase II Rule, but the NPDES permitting authority has the discretion to require monitoring if deemed necessary.

4.6.2 Permit Application Requirements

The permit application requirements differ depending on the type of permit chosen. The following subsections describe the applicable requirements for each type of permit option allowable under the Phase II regulation.

Deadline for Submission of Permit Application

The deadline for submission of each type of permit application is the same – it must be done no later than March 10, 2003 unless the NPDES permitting authority chooses to phase-in permit coverage on a watershed basis and establishes other deadlines (see section 4.5.2.2).

4.6.2.1 General Permit Under Phase II Regulations

Operators of regulated small MS4s are required to submit in their NOI the following information:

- Best management practices (BMPs) for each of the six minimum control measures:
 - ❶ Public education and outreach on storm water impacts
 - ❷ Public participation/involvement
 - ❸ Illicit discharge detection and elimination
 - ❹ Construction site storm water runoff control
Post-construction storm water management in new development/
redevelopment
 - ❺ Pollution prevention/good housekeeping for municipal operations
- Measurable goals for each minimum control measure (i.e, narrative or numeric standards used to gauge program effectiveness);
- Estimated months and years in which actions to implement each measure will be undertaken, including interim milestones and frequency; and
- The person or persons responsible for implementing or coordinating the storm water program.

The operator of a regulated small MS4 has the flexibility to determine the BMPs and measurable goals, for each minimum control measure, that are most appropriate for the system. The chosen BMPs and measurable goals, submitted in the permit application, become the required storm water management program; however, the NPDES permitting authority can require changes in the mix of chosen BMPs and measurable goals if all or some of them are found to be inconsistent with the provisions of the Phase II Final Rule. Likewise, the permittee can change its mix of BMPs if it determines that the program is not as effective as it could be. Section 4.6.2 fully describes the minimum control measures, including sample BMPs and measurable goals for each, while section 4.6.3 describes the permit requirements concerning evaluation/assessment and recordkeeping activities.

4.6.2.2 Individual Permit Under the Phase II Regulation

For individual permit coverage under Phase II, the regulated small MS4 operator must follow the requirements of 40 CFR § 122.21(f) and the Phase II permit application requirements as described in section 4.6.2.1 above. The operator must also provide an estimate of the square mileage served by the system and any additional information requested by the NPDES permitting authority. A storm sewer map that satisfies the requirements of § 122.34(b)(3)(i) of the Phase II rule will satisfy the map requirements of § 122.21(f)(7).

4.6.2.3 Individual Permit Under the Phase I Regulation

For individual permit coverage under Phase I, the regulated small MS4 operator must follow the permit application requirements detailed at 40 CFR § 122.26(d). The operator must submit both Part 1 and Part 2 of the application requirements in §§ 122.26(d)(1) and (2) by March 10, 2003. The operator would not need to submit the information required by §§ 122.26(d)(1)(ii) and (d)(2) regarding legal authority unless it wanted the permitting authority to take that information into account when developing the individual permit.

4.6.2.4 Modification of an Existing Phase I Individual Permit

Under this permit option, the operator of a regulated small MS4 must follow Phase I permit application requirements in § 122.26(d), with some exclusions, rather than Phase II permit application requirements. The operator would not need to follow the application requirements of §§ 122.26(d)(1)(iii) and (iv) and (d)(2)(iii) – *discharge characterization*. The operator may satisfy the requirements in §§ 122.26(d)(1)(v) and (d)(2)(iv) – *identification of a management program* – by referring to the Phase I MS4's storm water management program.

EPA Recommendations

In referencing a Phase I's MS4's storm water management program, the operator should briefly describe how the existing plan will address discharges from the small MS4 or would need to be supplemented in order to adequately address the small MS4 discharges. The small MS4 operator should explain their role in coordinating storm water pollutant control activities in their MS4 service area and detail the resources available to accomplish the plan.

If a small MS4 is considering this option, it should find out when the Phase I MS4's permit is scheduled for renewal and become thoroughly familiar with the Phase I MS4's permit conditions. This co-permitting approach will be most successful if both MS4s have had thorough discussions of their storm water programs and if the small MS4 submits its application at the time that the Phase I MS4 is submitting its reapplication.

4.6.2 Program Requirements: The Six Minimum Control Measures

If coverage is obtained under a general permit or an individual permit under the Phase II regulations, the operator of a regulated small MS4 is required to implement a storm water management program that includes, at a minimum, the six minimum control measures described in the following subsections. As you read these subsections, keep in mind that the operator has a great deal of flexibility in determining the best management practices they will use to accomplish each measure. The rule allows the operators to choose the BMPs and measurable goals for each measure as appropriate for their particular MS4 service area – as long as the chosen BMPs and measurable goals result in effective control of pollutants in storm water runoff. Otherwise, the permitting authority may require changes in the chosen mix of BMPs and measurable goals to result in a more effective program.

4.6.2.1 Public Education and Outreach on Storm Water Impacts

Why Is Public Education and Outreach Necessary?

An informed and knowledgeable community is crucial to the success of a storm water management program since it helps to ensure the following:

Greater support for the program as the public gains a greater understanding of the reasons why it is necessary and important. Public support is particularly beneficial when operators of small MS4s attempt to institute new funding initiatives for the program or seek volunteers to help implement the program; and

Greater compliance with the program as the public becomes aware of the personal responsibilities expected of them and others in the community, including the individual actions they can take to protect or improve the quality of area waters.

What Is Required?

To satisfy this minimum control measure, the operator of a regulated small MS4 must:

- Implement a public education program to distribute educational materials to the community, or conduct equivalent outreach activities about the impacts of storm water discharges on local waterbodies and the steps that can be taken to reduce storm water pollution; and
- Determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure. Some program implementation approaches, BMPs (i.e., the program actions/activities), and measurable goals are suggested below.

What Are Some Guidelines for Developing and Implementing This Measure?

Three main action areas are important for successful implementation of a public education and outreach program:

① ***Forming Partnerships***

Operators of regulated small MS4s are encouraged to enter into partnerships with other governmental entities to fulfill this minimum control measure's requirements. It is generally more cost-effective to use an existing program, or to develop a new regional or state-wide education program, than to have numerous operators developing their own local programs. Operators also are encouraged to seek assistance from non-governmental organizations (e.g., environmental, civic, and industrial organizations), since many already have educational materials and perform outreach activities.

② Using Educational Materials and Strategies

Operators of regulated small MS4s may use storm water educational information provided by their State, Tribe, EPA Region, or environmental, public interest, or trade organizations instead of developing their own materials. Operators should strive to make their materials and activities relevant to local situations and issues, and incorporate a variety of strategies to ensure maximum coverage. Some examples include:

Brochures or fact sheets for general public and specific audiences;

Recreational guides to educate groups such as golfers, hikers, paddlers, climbers, fishermen, and campers;

Alternative information sources, such as web sites, bumper stickers, refrigerator magnets, posters for bus and subway stops, and restaurant placemats;

A library of educational materials for community and school groups;

Volunteer citizen educators to staff a **public education task force**;

Event participation with educational displays at home shows and community festivals;

Educational programs for school-age children;

Storm drain stenciling of storm drains with messages such as “Do Not Dump - Drains Directly to Lake;”

Storm water hotlines for information and for citizen reporting of polluters;

Economic incentives to citizens and businesses (e.g., rebates to homeowners purchasing mulching lawnmowers or biodegradable lawn products);and

Tributary signage to increase public awareness of local water resources.

③ Reaching Diverse Audiences

The public education program should use a mix of appropriate local strategies to address the viewpoints and concerns of a variety of audiences and communities, including minority and disadvantaged communities, as well as children. Printing posters and brochures in more than one language or posting large warning signs (e.g., cautioning against fishing or swimming) near storm sewer outfalls are methods that can be used to reach audiences less likely to read standard materials. Directing materials or outreach programs toward specific groups of commercial, industrial, and institutional entities likely to have significant storm water impacts is also recommended. For example, information could be provided to restaurants on the effects of grease clogging storm drains and to auto garages on the effects of dumping used oil into storm drains.

What Are Appropriate Measurable Goals?

Measurable goals, which are required for each minimum control measure, are intended to gauge permit compliance and program effectiveness. The measurable goals, as well as the BMPs, should reflect the needs and characteristics of the operator and the area served by its small MS4. Furthermore, they should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure. An integrated approach for this minimum measure could include the following measurable goals:

<u>Target Date</u>	<u>Activity</u>
1 year.....	Brochures developed (bilingual, if appropriate) and distributed in water utility bills; a storm water hotline in place; volunteer educators trained.
2 years.....	A web site created school curricula developed; storm drains stenciled.
3 years.....	A certain percentage of restaurants no longer dumping grease and other pollutants down storm sewer drains.
4 years.....	A certain percentage reduction in litter or animal waste detected in discharges.

4.6.2.2 Public Participation/Involvement

Why Is Public Participation and Involvement Necessary?

EPA believes that the public can provide valuable input and assistance to a regulated small MS4's municipal storm water management program and, therefore, suggests that the public be given opportunities to play an active role in both the development and implementation of the program. An active and involved community is crucial to the success of a storm water management program because it allows for:

Broader public support since citizens who participate in the development and decision making process are partially responsible for the program and, therefore, may be less likely to raise legal challenges to the program and more likely to take an active role in its implementation;

Shorter implementation schedules due to fewer obstacles in the form of public and legal challenges and increased sources in the form of citizen volunteers;

A broader base of expertise and economic benefits since the community can be a valuable, and free, intellectual resource; and

A conduit to other programs as citizens involved in the storm water program development process provide important cross-connections and relationships with other community and government programs. This benefit is particularly valuable when trying to implement a storm water program on a watershed basis, as encouraged by EPA.

What Is Required?

To satisfy this minimum control measure, the operator of a regulated small MS4 must:

- ❑ Comply with applicable State, Tribal, and local public notice requirements; and
- ❑ Determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure. Possible implementation approaches, BMPs (i.e., the program actions and activities), and measurable goals are described below.

What Are Some Guidelines for Developing and Implementing This Measure?

Operators of regulated small MS4s should include the public in developing, implementing, and reviewing their storm water management programs. The public participation process should make every effort to reach out and engage all economic and ethnic groups. EPA recognizes that there are challenges associated with public involvement. Nevertheless, EPA strongly believes that these challenges can be addressed through an aggressive and inclusive program. Challenges and example practices that can help ensure successful participation are discussed below.

Implementation Challenges

The best way to handle common notification and recruitment challenges is to know the audience and think creatively about how to gain its attention and interest. Traditional methods of soliciting public input are not always successful in generating interest, and subsequent involvement, in all sectors of the community. For example, municipalities often rely solely on advertising in local newspapers to announce public meetings and other opportunities for public involvement. Since there may be large sectors of the population who do not read the local press, the audience reached may be limited. Therefore, alternative advertising methods should be used whenever possible, including radio or television spots, postings at bus or subway stops, announcements in neighborhood newsletters, announcements at civic organization meetings, distribution of flyers, mass mailings, door-to-door visits, telephone notifications, and multilingual announcements. These efforts, of course, are tied closely to the efforts for the public education and outreach minimum control measure.

In addition, advertising and soliciting for help could and should be targeted at specific population sectors, including ethnic, minority, and low-income communities; academia and educational institutions; neighborhood and community groups; outdoor recreation groups; and business and industry. The goal is to involve a diverse cross-section of people who could offer a multitude of concerns, ideas, and connections during the program development process.

Possible Practices (BMPs)

There are a variety of practices that could be incorporated into a public participation and involvement program, such as:

Public meetings/citizen panels allow citizens to discuss various viewpoints and provide input concerning appropriate storm water management policies and BMPs;

Volunteer water quality monitoring gives citizens first-hand knowledge of the quality of local water bodies and provides a cost-effective means of collecting water quality data;

Volunteer educators/speakers who can conduct workshops, encourage public participation, and staff special events;

Storm drain stenciling is an important and simple activity that concerned citizens, especially students, can do;

Community clean-ups along local waterways, beaches, and around storm drains;

Citizen watch groups can aid local enforcement authorities in the identification of polluters; and

“Adopt A Storm Drain” programs encourage individuals or groups to keep storm drains free of debris and to monitor what is entering local waterways through storm drains.

What Are Appropriate Measurable Goals?

Measurable goals, which are required for each minimum control measure, are intended to gauge permit compliance and program effectiveness. The measurable goals, as well as the BMPs, would greatly depend on the needs and characteristics of the operator and the area served by its small MS4. Furthermore, they should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure. An integrated approach for this minimum measure could include the following measurable goals:

Target Date	Activity
1 year.....	Notice of a public meeting in several different print media and bilingual flyers; citizen panel established; volunteers organized to locate outfalls/illicit discharges and stencil drains.
2 years.....	Final recommendations of the citizen panel; radio spots promoting program and participation.
3 years.....	A certain percentage of the community participating in community clean-ups.
4 years.....	Citizen watch groups established in a certain percentage of neighborhoods; outreach to every different population sector completed.

4.6.2.3 Illicit Discharge Detection and Elimination

What Is An “Illicit Discharge”?

Federal regulations define an illicit discharge as “...any discharge to an MS4 that is not composed entirely of storm water...” with some exceptions. These exceptions include discharges from NPDES-permitted industrial sources and discharges from fire-fighting activities. Illicit discharges (see Table 4-2) are considered “illicit” because MS4s are not designed to accept, process, or discharge such non-storm water wastes. It is important to note that “illicit” does not mean “illegal.” Not every illicit discharge is necessarily a prohibited illegal discharge.

Why Are Illicit Discharge Detection and Elimination Efforts Necessary?

Discharges from MS4s often include wastes and wastewater from non-storm water sources. A study conducted in 1987 in Sacramento, California, found that almost one-half of the water discharged from a local MS4 was not directly attributable to precipitation runoff. A significant portion of these dry weather flows were from illicit and/or inappropriate discharges and connections to the MS4.

Illicit discharges enter the system through either direct connections (e.g., wastewater piping either mistakenly or deliberately connected to the storm drains) or indirect connections (e.g., infiltration into the MS4 from cracked sanitary systems, spills collected by drain outlets, or paint or used oil dumped directly into a drain). The result is untreated discharges that contribute high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria to receiving waterbodies. Pollutant levels from these illicit discharges have been shown in EPA studies to be high enough to significantly degrade receiving water quality and threaten aquatic, wildlife, and human health.

Table 4-2

Sources of Illicit Discharges
Sanitary wastewater
Effluent from septic tanks
Car wash wastewaters
Improper oil disposal
Radiator flushing disposal
Laundry wastewaters
Spills from roadway accidents
Improper disposal of auto and household toxics

What Is Required?

Recognizing the adverse effects illicit discharges can have on receiving waters, the final rule requires an operator of a regulated small MS4 to develop and implement an illicit discharge detection and elimination program. This program must include the following:

- ❑ A storm sewer system map, showing the location of all outfalls and the names and location of all waters of the United States that receive discharges from those outfalls;

- Through an ordinance, or other regulatory mechanism, a prohibition (to the extent allowable under State, Tribal, or local law) on non-storm water discharges into the MS4, and appropriate enforcement procedures and actions;
- A plan to detect and address non-storm water discharges, including illegal dumping, into the MS4;
- The education of public employees, businesses, and the general public about the hazards associated with illegal discharges and improper disposal of waste; and
- The determination of appropriate best management practices (BMPs) and measurable goals for this minimum control measure. Some program implementation approaches, BMPs (i.e., the program actions/activities), and measurable goals are suggested below.

Does This Measure Need to Address All Illicit Discharges?

No. The illicit discharge detection and elimination program does not need to address the following categories of non-storm water discharges or flows unless the operator of the regulated small MS4 identifies them as significant contributors of pollutants to its MS4:

- | | |
|---|--|
| <input type="checkbox"/> Water line flushing | <input type="checkbox"/> Irrigation water |
| <input type="checkbox"/> Landscape irrigation | <input type="checkbox"/> Springs |
| <input type="checkbox"/> Diverted stream flows | <input type="checkbox"/> Water from crawl space pumps |
| <input type="checkbox"/> Rising ground waters | <input type="checkbox"/> Footing drains |
| <input type="checkbox"/> Uncontaminated ground water infiltration | <input type="checkbox"/> Lawn watering |
| <input type="checkbox"/> Uncontaminated pumped ground water | <input type="checkbox"/> Individual residential car washing |
| <input type="checkbox"/> Discharges from potable water sources | <input type="checkbox"/> Flows from riparian habitats and wetlands |
| <input type="checkbox"/> Foundation drains | <input type="checkbox"/> Dechlorinated swimming pool discharges |
| <input type="checkbox"/> Air conditioning condensation | <input type="checkbox"/> Street wash water. |

What Are Some Guidelines for Developing and Implementing This Measure?

The objective of the illicit discharge detection and elimination minimum control measure is to have regulated small MS4 operators gain a thorough awareness of their systems. This awareness allows them to determine the types and sources of illicit discharges entering their system, and establish the legal, technical, and educational means needed to eliminate these discharges. Permittees could meet these objectives

in a variety of ways depending on their individual needs and abilities, but some general guidance for each requirement is provided below.

The Map

The storm sewer system map is meant to demonstrate a basic awareness of the intake and discharge areas of the system. It is needed to help determine the extent of discharged dry weather flows, the possible sources of the dry weather flows, and the particular waterbodies these flows may be affecting. An existing map, such as a topographical map, on which the location of major pipes and outfalls can be clearly presented would demonstrate such an awareness.

EPA recommends collecting all existing information on outfall locations (e.g., review city records, drainage maps, storm drain maps), and then conducting field surveys to verify locations. It probably will be necessary to walk (i.e., wade through small receiving waters or use a boat for larger waters) the streambanks and shorelines for visual observation. More than one trip may be needed to locate all outfalls.

Legal Prohibition and Enforcement

EPA recognizes that some permittees may have limited authority under State, Tribal or local law to establish and enforce an ordinance, or other regulatory mechanism, prohibiting illicit discharges. In such a case, the permittee is encouraged to obtain the necessary authority, if at all possible. Otherwise, the NPDES permitting authority assumes responsibility for implementation of this component of the minimum measure, yet the permittee would remain ultimately responsible for the quality of its MS4 discharge. Model ordinances, including examples of amendments to local codes or existing ordinances, will be provided in the Phase II storm water guidance for regulated small MS4s, which is part of EPA's planned implementation "tool box" for the rule.

The Plan

The plan to detect and address illicit discharges is the central component of this minimum control measure. The plan is dependant upon several factors, including the permittee's available resources, size of staff, and degree and character of its illicit discharges. EPA envisions a plan similar to the one recommended for use in meeting Michigan's general storm water NPDES permit for small MS4s. As guidance only, the four steps of a recommended plan are outlined below:

① Locate Problem Areas

EPA recommends that priority areas be identified for detailed screening of the system based on the likelihood of illicit connections (e.g., areas with older sanitary sewer lines). Some methods that could be used to locate problem areas include: public complaints; visual screening; water sampling from manholes and outfalls during dry weather; and use of infrared and thermal photography.

② Find the Source

Once a problem area or discharge is found, additional efforts usually would be

necessary to determine the source of the problem. Some methods that could be used to find the source of the illicit discharge include: dye-testing buildings in problem areas; dye- or smoke-testing buildings at the time of sale; tracing the discharge upstream in the storm sewer; employing a certification program that shows that buildings have been checked for illicit connections; implementing an inspection program of existing septic systems; and using video to inspect the storm sewers.

④ **Remove/Correct Illicit Connections**

Once the source is identified, the offending discharger should be notified and directed to correct the problem. Education efforts and working with the discharger can be effective in resolving the problem before taking legal action.

④ **Document Actions Taken**

As a final step, all actions taken under the plan should be documented. Doing so would illustrate that progress is being made to eliminate illicit connections and discharges. Documented actions should be included in the required annual reports and include information such as: the number of outfalls screened; any complaints received and corrected; the number of discharges and quantities of flow eliminated; and the number of dye or smoke tests conducted.

Educational Outreach

Outreach to public employees, businesses, property owners, the general community, and elected officials regarding ways to detect and eliminate illicit discharges is an integral part of this minimum measure that will help gain support for the permittee's storm water program. Suggested educational outreach efforts include:

- Developing ***informative brochures, and guidances*** for specific audiences (e.g., carpet cleaning businesses) and school curricula;
- Designing a program to ***publicize and facilitate public reporting*** of illicit discharges;
- ***Coordinating volunteers*** for locating, and visually inspecting, outfalls or to stencil storm drains; and
- Initiating ***recycling programs*** for commonly dumped wastes, such as motor oil, antifreeze, and pesticides.

What Are Appropriate Measurable Goals?

Measurable goals, which are required for each minimum control measure, are intended to gauge permit compliance and program effectiveness. The measurable goals, as well as the BMPs, should reflect the needs and characteristics of the operator and the area served by its small MS4. Furthermore, they should be chosen using an integrated approach that would fully address the requirements and intent of the minimum control measure. An integrated approach for this minimum measure could

include the following measurable goals:

Target Date	Activity
1 year.....	Sewer system map completed; recycling program for household hazardous waste in place.
2 years.....	Ordinance in place; training for public employees completed; a certain percentage of sources of illicit discharges determined.
3 years.....	A certain percentage of: illicit discharges detected; illicit discharges eliminated; and households participating in quarterly household hazardous waste special collection days.
4 years.....	Most illicit discharge sources detected and eliminated.

The educational outreach measurable goals for this minimum control measure could be combined with the measurable goals for the Public Education and Outreach minimum control measure.

4.6.2.4 Construction Site Storm Water Runoff Control

Why Is The Control of Construction Site Runoff Necessary?

Polluted storm water runoff from construction sites often flows to MS4s and ultimately is discharged into local rivers and streams. Of the pollutants listed in Table 4-3, sediment is usually the main pollutant of concern. Sediment runoff rates from construction sites are typically 10 to 20 times greater than those of agricultural lands, and 1,000 to 2,000 times greater than those of forest lands. During a short period of time, construction sites can contribute more sediment to streams than can be deposited naturally during several decades. The resulting siltation, and the contribution of other pollutants from construction sites, can cause physical, chemical, and biological harm to our nation’s waters. For example, excess sediment can quickly fill rivers and lakes, requiring dredging and destroying aquatic habitats.

Table 4-3

Pollutants Commonly Discharged From Construction Sites
Sediment
Solid and sanitary wastes
Phosphorous (fertilizer)
Nitrogen (fertilizer)
Pesticides
Oil and grease
Concrete truck washout
Construction chemicals
Construction debris

What Is Required?

The Phase II Final Rule requires an operator of a regulated small MS4 to develop, implement, and enforce a program to reduce pollutants in storm water runoff to their MS4 from construction activities that result in a land disturbance of greater than or equal to one acre. The small MS4 operator is required to:

- Have an ordinance or other regulatory mechanism requiring the implementation of proper erosion and sediment controls, and controls for other wastes, on applicable construction sites;

- Have procedures for site plan review of construction plans that consider potential water quality impacts;
- Have procedures for site inspection and enforcement of control measures;
- Have sanctions to ensure compliance (established in the ordinance or other regulatory mechanism);
- Establish procedures for the receipt and consideration of information submitted by the public; and
- Determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure. Suggested BMPs (i.e., the program actions/activities) and measurable goals are presented below.

What Are Some Guidelines for Developing and Implementing This Measure?

Further explanation and guidance for each component of a regulated small MS4's construction program is provided below.

Regulatory Mechanism

Through the development of an ordinance or other regulatory mechanism, the small MS4 operator needs to establish a construction program that requires controls for polluted runoff from construction sites with a land disturbance of greater than or equal to one acre. Because there may be limitations on regulatory legal authority, the small MS4 operator is required to satisfy this minimum control measure only to the maximum extent practicable and allowable under State, Tribal, or local law. If an operator is unable to establish an enforceable construction program due to a lack of legal authority, and is unsuccessful in trying to obtain the necessary authority, the NPDES permitting authority would then assume responsibility.

EPA intends to develop a model ordinance that a small MS4 operator could use as a basis for its construction program. Alternatively, amendments to existing erosion and sediment control programs, or other ordinances, can also provide the basis for the program.

Site Plan Review

The small MS4 operator is required to include in its construction program requirements for the implementation of appropriate BMPs on construction sites to control erosion and sediment, as well as waste at the site. To determine if a construction site is in compliance with such provisions, the small MS4 operator should review the site plans submitted by the construction site operator before ground is broken.

Site plan review aids in compliance and enforcement efforts since it alerts the small MS4 operator early in the process to the planned use or non-use of proper BMPs and provides a way to track new construction activities. The tracking of sites is useful not only for the small MS4 operator's recordkeeping and reporting purposes, which will be required activities under their NPDES storm water permit (see Fact Sheet 2.9), but also for members of the public interested in ensuring that the sites are in compliance.

Inspections and Penalties

Once construction commences, the BMPs should be in place and the small MS4 operator's enforcement activities should begin. To ensure that the BMPs are properly installed, the small MS4 operator is required to develop procedures for site inspection and enforcement of control measures to deter infractions. Procedures could include steps to identify priority sites for inspection and enforcement based on the nature and extent of the construction activity, topography, and the characteristics of soils and receiving water quality. Inspections give the MS4 operator an opportunity to provide additional guidance and education, issue warnings, or assess penalties. To conserve staff resources, one possible option for small MS4 operators could be to have these inspections performed by the same inspector that visits the sites to check compliance with health and safety building codes.

Information Submitted by the Public

A final requirement of the small MS4 program for construction activity is the development of procedures for the receipt and consideration of public inquiries, concerns, and information submitted regarding local construction activities. This provision is intended to further reinforce the public participation component of the regulated small MS4 storm water program and to recognize the crucial role that the public can play in identifying instances of noncompliance.

The small MS4 operator is required only to *consider* the information submitted, and may not need to follow-up and respond to every complaint or concern. Although some form of enforcement action or reply is not required, the small MS4 operator is required to demonstrate acknowledgment and consideration of the information submitted. A simple tracking process in which submitted public information, both written and verbal, is recorded and then given to the construction site inspector for possible follow-up would suffice.

What Are Appropriate Measurable Goals?

Measurable goals, which are required for each minimum control measure, are intended to gauge permit compliance and program effectiveness. The measurable goals, as well as the BMPs, should reflect the needs and characteristics of the operator and the area served by its small MS4. Furthermore, they should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure. An integrated approach for this minimum measure could include the following measurable goals:

Target Date	Activity
1 year.....	Ordinance or other regulatory mechanism in place; procedures for information submitted by the public in place.
2 years.....	Procedures for site inspections implemented; a certain percentage rate of compliance achieved by construction operators.
3 years.....	Maximum compliance with ordinance; improved clarity and reduced sedimentation of local waterbodies.
4 years.....	Increased numbers of sensitive aquatic organisms in local waterbodies.

Am I Correct in Thinking that Construction Sites Are Already Covered Under the NPDES Storm Water Program?

Yes. EPA’s Phase I NPDES storm water program requires operators of construction activities that disturb five or more acres to obtain a NPDES construction storm water permit. General permit requirements include the submission of a Notice of Intent and the development of a storm water pollution prevention plan (SWPPP). The SWPPP must include a site description and measures and controls to prevent or minimize pollutants in storm water discharges. The Phase II Final Rule similarly regulates discharges from smaller construction sites disturbing equal to or greater than one acre and less than five acres.

Even though all construction sites that disturb more than one acre are covered nationally by an NPDES storm water permit, the construction site runoff control minimum measure for the small MS4 program is needed to induce more localized site regulation and enforcement efforts, and to enable operators of regulated small MS4s to more effectively control construction site discharges into their MS4s.

To aid operators of regulated construction sites in their efforts to comply with both local requirements and their NPDES permit, the Phase II Final Rule includes a provision that allows the NPDES permitting authority to reference a “qualifying State, Tribal or local program” in the NPDES general permit for construction. This means that if a construction site is located in an area covered by a qualifying local program, then the construction site operator’s compliance with the local program would constitute compliance with their NPDES permit. A regulated small MS4’s storm water program for construction could be a “qualifying program” if the MS4 operator requires a SWPPP, in addition to the requirements summarized in this fact sheet.

The ability to reference other programs in the NPDES permit is intended to reduce confusion between overlapping and similar requirements, while still providing for both local and national regulatory coverage of the construction site. The provision allowing NPDES permitting authorities to reference other programs has no impact on, or direct relation to, the small MS4 operator’s responsibilities under the construction site runoff control minimum measure profiled in this fact sheet.

Is a Small MS4 Operator Required to Regulate Construction Sites that the Permitting Authority has Waived from the NPDES Construction Program?

No. If the NPDES permitting authority waives requirements for storm water discharges associated with small construction activity (see § 122.26(b)(15) of the Phase II rule), the small MS4 operator is not required to develop, implement, and/or enforce a program to reduce pollutant discharges from such sites.

4.6.2.5 Post-construction Storm Water Management in New Development/Redevelopment**Why Is The Control of Post-Construction Runoff Necessary?**

Post-construction storm water management in areas undergoing new development or redevelopment is necessary because runoff from these areas has been shown to significantly effect receiving waterbodies. Many studies indicate that prior planning and design for the minimization of pollutants in post-construction storm water discharges is the most cost-effective approach to storm water quality management.

There are generally two forms of substantial impacts of post-construction runoff. The first is caused by an increase in the type and quantity of pollutants in storm water runoff. As runoff flows over areas altered by development, it picks up harmful sediment and chemicals such as oil and grease, pesticides, heavy metals, and nutrients (e.g., nitrogen and phosphorus). These pollutants often become suspended in runoff and are carried to receiving waters, such as lakes, ponds, and streams. Once deposited, these pollutants can enter the food chain through small aquatic life, eventually entering the tissues of fish and humans. The second kind of post-construction runoff impact occurs by increasing the quantity of water delivered to the waterbody during storms. Increased impervious surfaces interrupt the natural cycle of gradual percolation of water through vegetation and soil. Instead, water is collected from surfaces such as asphalt and concrete and routed to drainage systems where large volumes of runoff quickly flow to the nearest receiving water. The effects of this process include streambank scouring and downstream flooding, which often lead to a loss of aquatic life and damage to property.

What Is Required?

The Phase II Final Rule requires an operator of a regulated small MS4 to develop, implement, and enforce a program to reduce pollutants in post-construction runoff to their MS4 from new development and redevelopment projects that result in the land disturbance of greater than or equal to 1 acre. The small MS4 operator is required to:

- Develop and implement strategies which include a combination of structural and/or non-structural best management practices (BMPs);

- ❑ Have an ordinance or other regulatory mechanism requiring the implementation of post-construction runoff controls to the extent allowable under State, Tribal or local law;
- ❑ Ensure adequate long-term operation and maintenance of controls;
- ❑ Determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure.

What Is Considered a “Redevelopment” Project?

The term “redevelopment” refers to alterations of a property that change the “footprint” of a site or building in such a way that the disturbance of equal to or greater than 1 acre of land results. The term does not include such activities as exterior remodeling. Because redevelopment projects may have site constraints not found on new development sites, the rule provides flexibility for implementing post-construction controls on redevelopment sites that consider these constraints.

What Are Some Guidelines for Developing and Implementing This Measure?

This section includes some sample non-structural and structural BMPs that could be used to satisfy the requirements of the post-construction runoff control minimum measure. It is important to recognize that many BMPs are climate-specific, and not all BMPs are appropriate in every geographic area. Because the requirements of this measure are closely tied to the requirements of the construction site runoff control minimum measure (see Fact Sheet 2.6), EPA recommends that small MS4 operators develop and implement these two measures in tandem. Sample BMPs follow.

❑ Non-Structural BMPs

- **Planning and Procedures.** Runoff problems can be addressed efficiently with sound planning procedures. Master Plans, Comprehensive Plans, and zoning ordinances can promote improved water quality by guiding the growth of a community away from sensitive areas and by restricting certain types of growth (industrial, for example) to areas that can support it without compromising water quality.
- **Site-Based Local Controls.** These controls can include buffer strip and riparian zone preservation, minimization of disturbance and imperviousness, and maximization of open space.

❑ Structural BMPs

- **Storage Practices.** Storage or detention BMPs control storm water by gathering runoff in wet ponds, dry basins, or multichamber catch basins and slowly

releasing it to receiving waters or drainage systems. These practices both control storm water volume and settle out particulates for pollutant removal.

- **Infiltration Practices.** Infiltration BMPs are designed to facilitate the percolation of runoff through the soil to ground water, and, thereby, result in reduced storm water quantity and reduced mobilization of pollutants. Examples include infiltration basins/trenches, dry wells, and porous pavement.
- **Vegetative Practices.** Vegetative BMPs are landscaping features that, with optimal design and good soil conditions, enhance pollutant removal, maintain/improve natural site hydrology, promote healthier habitats, and increase aesthetic appeal. Examples include grassy swales, filter strips, artificial wetlands, and rain gardens.

What Are Appropriate Measurable Goals?

Measurable goals, which are required for each minimum control measure, are intended to gauge permit compliance and program effectiveness. The measurable goals, as well as the BMPs, should reflect needs and characteristics of the operator and the area served by its small MS4. Furthermore, the measurable goals should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure. An integrated approach for this minimum measure could include the following goals:

Target Date	Activity
1 year.....	Strategies developed that include structural and/or non-structural BMPs.
2 years.....	Strategies codified by use of ordinance or other regulatory mechanism.
3 years.....	Reduced percent of new impervious surfaces associated with new development projects.
4 years.....	Improved clarity and reduced sedimentation of local waterbodies.

4.6.2.6 Pollution Prevention/Good Housekeeping for Municipal Operations

Why Is Pollution Prevention/Good Housekeeping Necessary?

The Pollution Prevention/Good Housekeeping for municipal operations minimum control measure is a key element of the small MS4 storm water management program. This measure requires the small MS4 operator to examine and subsequently alter own actions to help ensure a reduction in the amount and type of pollution that (1) collects on streets, parking lots, open spaces, and storage and vehicle maintenance areas and is discharged into local waterways; and (2) results from actions such as environmentally damaging land development and flood management practices or poor maintenance of storm sewer systems.

While this measure is meant primarily to accomplish the goal of improving or protecting the quality of receiving waters by altering the performance of municipal or facility operations, it also can result in a cost savings for the small MS4 operator, since proper and timely maintenance of storm sewer systems can help avoid repair costs from damage caused by age and neglect.

What Is Required?

Recognizing the benefits of pollution prevention practices, the rule requires an operator of a regulated small MS4 to:

- ❑ Develop and implement an operation and maintenance program with the ultimate goal of preventing or reducing pollutant runoff from municipal operations into the storm sewer system;
- ❑ Include employee training on how to incorporate pollution prevention/good housekeeping techniques into municipal operations such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and storm water system maintenance. To minimize duplication of effort and conserve resources, the MS4 operator could use training materials that are available from EPA, their State or Tribe, or relevant organizations;
- ❑ Determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure. Some program implementation approaches, BMPs (i.e., the program actions/activities), and measurable goals are suggested below.

What Are Some Guidelines for Developing and Implementing This Measure?

The intent of this control measure is to ensure that existing municipal, State or Federal operations are performed in ways that will minimize contamination of storm water discharges. EPA encourages the small MS4 operator to consider the following components when developing their program for this measure:

Maintenance activities, maintenance schedules, and long-term inspection procedures for structural and non-structural controls to reduce floatables and other pollutants discharged from the separate storm sewers;

Controls for reducing or eliminating the discharge of pollutants from areas such as roads and parking lots, maintenance and storage yards (including salt/sand storage and snow disposal areas), and waste transfer stations. These controls could include programs that promote recycling (to reduce litter), minimize pesticide use, and ensure the proper disposal of animal waste;

Procedures for the proper disposal of waste removed from the separate

storm sewer systems and the areas listed in the bullet above, including dredge spoil, accumulated sediments, floatables, and other debris; and

Ways to ensure that new flood management projects assess the impacts on water quality and examine existing projects for incorporation of additional water quality protection devices or practices. EPA encourages coordination with flood control managers for the purpose of identifying and addressing environmental impacts from such projects.

The effective performance of this control measure hinges on the proper maintenance of the BMPs used, particularly for the first two bullets above. For example, structural controls, such as grates on outfalls to capture floatables, typically need regular cleaning, while non-structural controls, such as training materials and recycling programs, need periodic updating.

What Are Appropriate Measurable Goals?

Measurable goals, which are required for each minimum control measure, are meant to gauge permit compliance and program effectiveness. The measurable goals, as well as the BMPs, should consider the needs and characteristics of the operator and the area served by its small MS4. The measurable goals should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure. An integrated approach for this minimum measure could include the following measurable goals:

<u>Target Date</u>	<u>Activity</u>
1 year.....	Pollution prevention plan (the new BMPs and revised procedures) completed; employee training materials gathered or developed; procedures in place for catch basin cleaning after each storm and regular street sweeping.
2 years.....	Training for appropriate employees completed; recycling program fully implemented.
3 years.....	Some pollution prevention BMPs incorporated into master plan; a certain percentage reduction in pesticide and sand/salt use; maintenance schedule for BMPs established.
4 years.....	A certain percentage reduction in floatables discharged; a certain compliance rate with maintenance schedules for BMPs; controls in place for all areas of concern.

4.6.3 Program Requirements: Evaluation/Assessment & Reporting

If coverage is obtained under a general permit or an individual permit under the Phase II regulations, the operator of a regulated small MS4 is required to comply with the evaluation/assessment and reporting requirements summarized in this section.

Frequency of Reports

Reports must be submitted annually during the first permit term – permit terms are typically a 5-year period. For subsequent permit terms, reports must be submitted in years 2 and 4 only, unless the NPDES permitting authority requests more frequent reports. Reports do not need to be submitted if the operator of the regulated small MS4 is relying on another entity to satisfy all permit obligations (see section 4.5.1.3)

Required Report Content

The reports must include the following:

- The status of compliance with permit conditions, including an assessment of the appropriateness of the selected BMPs and progress toward achieving the selected measurable goals for each minimum measure;
- Results of any information collected and analyzed, including monitoring data, if any;
- A summary of the storm water activities planned for the next reporting cycle;
- A change in any identified best management practices or measurable goals for any minimum measure; and
- Notice of relying on another governmental entity to satisfy some of the permit obligations (if applicable – see section 4.5.1.3).

A Change in Selected BMPs

If, upon evaluation of the program, improved controls are identified as necessary, permittees should revise their mix of BMPs to provide for a more effective program. Such a change, and an explanation of the change, must be noted in a report to the NPDES permitting authority.

Recordkeeping Requirements

Records required by the NPDES permitting authority must be kept for at least 3 years and made accessible to the public at reasonable times during regular business hours. Records need not be submitted to the NPDES permitting authority unless the permittee is requested to do so.

4.7 SMALL MS4 PROGRAM COMPLIANCE PROCESS: What Do I Need to Do To Comply?

Sections 4.1 through 4.6 of this guidance have provided a details on who's covered and what's required under the Phase II regulations for regulated small MS4s. Now that you are familiar with the Phase II program, this section walks you through the process, from beginning to end, that an operator of a regulated small should take to comply with the regulation. This step-by-step "walk-through" references the appropriate sections of the

guidance along the way as a means for understanding how the information in sections 4.1 through 4.6 fits together.

The last page of this section includes a permitting decision tree to help operators of MS4s determine if they need an NPDES storm water permit. By starting in the upper left hand corner, an operator can follow the decision tree to determine if they fall under Phase I or Phase II, and if they are eligible for a waiver.

- Step 1:** Determine if you are an operator of an MS4 (see section 4.1.1).
- Step 2:** As an operator of an MS4, determine if you are an operator of a small MS4 (see section 4.1.4).
- Step 3:** As an operator of a small MS4, determine if you are an operator of a regulated small MS4 (see section 4.2). You need to find out if you are:
- A. Automatically designated by the rule**
- First, determine if your system is located partially or fully within an urbanized area (See section 4.3),
 - Second, determine if you may qualify for a waiver (waivers are at the discretion of the permitting authority). If you qualify for a waiver, stop here. (See section 4.4)
- B. Potentially designated by the NPDES permitting authority**
- Determine if your system, located outside of a UA, may fit the criteria for potential designation. Since designations are at the discretion of the permitting authority, a final determination is made by the permitting authority and not the small MS4 operator. If designated, continue with Step 4.
- Step 4:** Read Phase II Rule and guidance materials to get a sense of the permitting options (see section 4.5) and program requirements (see section 4.6).
- Step 5:** Determine which neighbors are regulated as Phase I MS4s (refer to list on the EPA web site) or Phase II MS4s (refer to Appendix 6 and maps of your UA). This information will be used to base your decision as to whether to:
- Be a co-permittee with another regulated MS4. (See section 4.5.1.2)
 - Rely on another regulated MS4 for partial or full implementation of the minimum measures on your behalf. (See section 4.5.1.3)
- Step 6:** Determine if programs similar to one or more of the minimum measures is already being performed by another entity. This information will be used to decide whether you wish to rely on another entity for partial implementation of the minimum measures on your behalf. (See section 4.5.1.3)

- Step 7:** Determine which permit option to choose (depends on which are made available by the your NPDES permitting authority) (See section 4.5.1)
- General permit under the Phase II regulation
 - Individual permit under the Phase I or Phase II regulation
 - Modification of a Phase I individual permit (Co-permittee with a large or medium MS4)

In determine which option to choose, think about...

- If you wish to be a co-permittee and share responsibilities based on information from Step 5
- If, instead of the co-permittee option, you wish to have own permit but rely on another entity for implementing a measure or measures based on information from Steps 5 & 6.

- Step 8:** Begin planning and development of your storm water management program

- Use menu of BMPs as a guide (provided by EPA or the permitting authority). The EPA web site will also have references and links to helpful guidance on every facet of a storm water management program for MS4s.
- Meet with staff who will be responsible for implementing the storm water management program (may be a multi-departmental team). Task them with:
 - Assessing the storm water management characteristics and needs of the area served by the regulated small MS4.
 - Determining appropriate BMPs and measurable goals
 - Determining who will be responsible for what under the program
- Form a citizen advisory panel to help develop the program and give them similar tasks as those given to the staff.
- Meet with local Phase I and Phase II MS4 operators to discuss co-permittee status or sharing of resources, such as: hiring one enforcement inspector for multiple areas, co-sponsoring household hazardous waste collection events, or sharing a street sweeper, recycling truck, illicit discharge detection cameras, or any other equipment. (Note: Nothing listed here is required by the Phase II rule -- they are only examples)
- Meet with other entities that you may rely on to implement one or more of the minimum measures to discuss the arrangement and any legal agreements.

- Step 9:** **A. Under a General Permit:**

- 1) Once a general permit is issued, read it carefully. You may not be

required to implement every minimum measure due to the permitting authority recognizing or referencing other similar programs (see section 4.5.2.1). For this reason, before the permit is issued (which is expected to be no later than December 9, 2002) follow Step 8 but only do a preliminary storm water management program until the final permit requirements are known. Once the permit is issued, if you have chosen this option you will need to make final decisions on the following issues and complete the development of your storm water management plan:

- Do you want to be a co-permittee with another regulated small MS4?
- Do you want to rely on another entity for some or all of the permit requirements?
- Which BMPs and measurable goals will you use for each minimum measure you will be implementing?

2) Fill out an NOI in accordance with the Phase II regulation. (See section 4.6.2.1)

B. Under an Individual Permit (new or modified):

If you have chosen one of the individual permit options (i.e., under Phase II, under Phase I, or modified existing Phase I), you will need to continue efforts in Step 8, as applicable, and complete development of your permit application in accordance with the Phase II regulation. (See sections 4.6.2.2 through 4.6.2.4)

- Step 10:** Submit your NOI under a general permit or your individual permit application to the NPDES permitting authority by March 10, 2003; unless your NPDES permitting authority phases-in permit coverage and establishes alternative deadlines (see section 4.5.2.2).
- Step 11:** Implement your storm water management program in accordance with applicable standards (see section 4.6.1). The Phase II rule allows you up to five years to fully implement your program, although the exact timeframe is at the discretion of the your NPDES permitting authority.
- Step 12:** Write annual reports in your first permit term assessing the effectiveness of BMPs and if measurable goals were met, and submit the reports to your NPDES permitting authority. You may change the mix of BMPs originally selected if you find that such a change is necessary to ensure a more effective program. This step, as required in the Phase II regulations at § 122.34(g) and described in section 4.6.3, is not applicable if you sought coverage under an individual permit under the Phase I regulations or under a modification of an existing Phase I MS4 permit.

Step 13: Be aware that you may need to take over implementation of a minimum control measure if you are relying on another entity for its implementation and the other entity fails to perform it effectively. This is why EPA encourages a legally-binding agreement when choosing to rely on another entity. Also, the permitting authority may choose to change your mix of BMPs and measurable goals as submitted in your permit application if it determines that your program is not effectively controlling pollutant discharges.

4.8 FEDERAL AND STATE-OPERATED REGULATED SMALL MS4S: Unique Program Implementation Issues

In addition to local government jurisdictions, small MS4s include certain Federal and State-operated MS4s. Federal facilities were not designated for regulation by the NPDES Phase I storm water program for MS4s. The Phase II Final Rule, however, includes the “United States” in the definition of a small MS4, thereby including Federal MS4 operators in the NPDES Phase II storm water program. Federal and State-operated small MS4s can include universities, prisons, hospitals, roads (i.e., departments of transportation), military bases (e.g., State Army National Guard barracks), parks, and office buildings/complexes.

The small MS4 program, largely designed with municipally-operated small MS4s in mind, raises a number of implementation issues for Federal and State operators of regulated small MS4s who must obtain an NPDES permit that requires the development and implementation of a storm water management program that includes the six minimum control measures. This section highlights potential implementation issues related to the minimum control measures, and then discusses the implementation options included in the rule that may help resolve these issues.

4.8.1 What Are Some Implementation Concerns?

This section profiles the three most common implementation issues raised in the public comments submitted regarding Federal/State implementation of the small MS4 program.

How Does the Final Rule Account for Unique Characteristics?

Federal and State small MS4s possess a number of characteristics that set them apart from their municipal counterparts. For example, whereas municipally-operated MS4s largely serve resident populations, many Federal or State-operated MS4s, such as medical clinics and departments of transportation (DOTs), do not. Other types of Federal and State MS4s, such as military bases, prisons, and State universities, serve populations that are different from a typical municipal population. Their unique characteristics might lead Federal or State MS4 operators to question either the need to implement the entire suite of minimum control measures or their ability to comply fully with their Phase II storm water permit. The flexibility within the minimum measures allows Federal and State MS4s to develop a storm water program that comprises the

minimum measures in a way that makes sense for their circumstances.

What If the Operator Lacks Legal Authority?

Three of the minimum control measures (illicit discharge detection and elimination, and the two construction-related measures) require enforceable controls on third party activities to ensure successful implementation of the measure. Some Federal and State operators, however, may not have the necessary legal regulatory authority to adopt these enforceable controls in the same manner as do local governments.

For example, a State DOT that is responsible for the portions of its roads running through urbanized areas may not have the legal authority to impose restrictions on, and penalties against, illicit (i.e., non-storm water) discharges into its MS4 if the source of the discharge is outside the DOT's right-of-way or jurisdiction. As in the case of local governments that lack such authority, State and Federal MS4s are expected to utilize the authority they do possess and to seek cooperative arrangements.

How Can the Program Be Implemented in Areas Where There Are Multiple Regulated Entities?

Since the final rule provides automatic coverage of all small MS4s within an urbanized area, regardless of political boundaries, coverage of multiple governments and agencies in a single area is likely. For example, a city government that operates a small MS4 within an urbanized area must obtain permit coverage alongside the county, State, and Federal DOTs if they all operate a portion of the roads (i.e., MS4s) in the city. All four entities are responsible for developing a storm water management program for their MS4s (or portions thereof) within the urbanized area. EPA encourages State and Federal small MS4 operators to establish cooperative agreements with cities and counties in implementing their storm water programs.

4.8.2 Are There Implementation Strategies that Help Facilitate Program Implementation?

This section offers two hypothetical strategies for resolving the implementation issues raised above. The best solution may include a creative combination of strategies.

STRATEGY #1 *A Focus on Choosing Appropriate BMPs*

The final rule requires the permittee to choose *appropriate* best management practices (BMPs) for each minimum control measure. In other words, EPA expects Phase II permittees to tailor their storm water management plans and their BMPs to fit the particular characteristics and needs of the permittee and the area served by its MS4. Therefore, the Federal or State operator of a regulated storm sewer system can take advantage of the flexibility provided by the rule to utilize the most suitable minimum control measures for its MS4. Below is an example of tailored activities and BMPs that

Federal or State operators can implement for each measure:

- ❑ **Public Education and Outreach.** Distribute brochures and post fliers to educate employees of a Federal hospital about the problems associated with storm water runoff and the steps they can take to reduce pollutants in storm water discharges. For example, employees could be advised against carelessly discarding trash on the ground or allowing their cars to leak oil/fluids in the parking lot.
- ❑ **Public Participation/Involvement.** Provide notice of storm water management plan development and hold meetings at which employees of a Federal office complex are encouraged to voice their ideas and opinions about the effort. Request volunteers to help develop the plan.
- ❑ **Illicit Discharge Detection and Elimination.** Develop a map of the storm sewer system on a military base. Perform visual dry weather monitoring of any outfalls to determine whether the storm sewer system is receiving any non-storm water discharges from the base. If a dry weather flow is found, trace it back to the source and stop the discharge. Should a Federal military base identify an illicit discharge, the source of which is traced to the boundary of its system, the Federal operator should refer the discharge to the adjoining regulated MS4 for further action.
- ❑ **Construction Site Runoff Control.** Require the implementation of erosion and sediment controls, and control of waste, for any Federal or State DOT road construction. The DOT would review site plans for proper controls, perform inspections, and establish penalties in the construction contract if controls are not implemented. If construction is done directly by the regulated DOT instead of a private contractor, the DOT could be penalized by the NPDES permitting authority for non-compliance with its small MS4 permit in the event that controls are not properly implemented.
- ❑ **Post-Construction Runoff Control.** Require the implementation of post-construction storm water controls for any new construction on the grounds of a prison. This can be required as part of a construction contract, instituted as internal policy, and considered during site plan review.
- ❑ **Pollution Prevention/Good Housekeeping for Municipal Operations.** Train maintenance staff at a State university to employ pollution prevention techniques whenever possible. For example, routinely pick up trash/litter from the university grounds, use less salt on the parking lots and access roads in the winter, perform any maintenance of university vehicles under shelter only, limit pesticide use to the minimum needed, use vegetative buffer strips in the parking lots to filter runoff, and keep dumpster lids closed.

STRATEGY #2

Working with Other Entities

There may be instances when the Federal or State permittee has limited capabilities to satisfy one or more of the minimum control measures. As discussed above, the permittee may lack the proper legal authority to enforce controls (although it should try to obtain the necessary legal authority if at all possible).

In the case of limited capabilities, the permittee can work with neighboring operators of regulated small MS4s, preferably on a watershed basis, to form a shared storm water management program in which each permittee is responsible for activities that are within individual legal authorities and abilities. The final rule allows the permittee to rely on other entities, with their permission, to implement those minimum measures that the permittee is otherwise unable to implement. Three examples are:

- ❑ A State DOT with limited regulatory legal authority can reference a local sewer district's illicit detection and elimination program in its permit application, provided the program sufficiently addresses illicit discharges into the DOT's storm sewer system.
- ❑ The permittee or NPDES permitting authority can reference such programs as coastal nonpoint pollution control programs, State or local watershed programs, State or local construction programs, and environmental education efforts by public or private entities.
- ❑ The permittee can become a co-permittee with a neighboring Phase I MS4 through a modification of the Phase I MS4's individual permit. This may be the most logical and preferable option for those Federal and State entities located in close proximity to Phase I MS4s.

Choosing to work with other governmental entities as a co-permittee, or referencing parts of each other's plans, can help resolve issues that may arise where multiple regulated jurisdictions exist in the same area. Permittees can avoid duplicative efforts, as well as territorial or regulatory disputes, by working together to implement the storm water program.

Suggested Steps for Working with Other Entities

- (1) Identify the boundaries of the urbanized area.
- (2) Identify the operators of storm sewer systems or portions of the systems within the urbanized area such as local, State, Tribal or Federal governments or other entities.
- (3) In seeking permit coverage:

Identify where another entity's program may satisfy one or more minimum control measure. If a program has requirements that are equivalent to a minimum control measure's required elements, the operator of the regulated small MS4 may reference the program in its permit application, provided the other entity gives it permission to do so. While such an arrangement relieves the operator from performing the minimum measure itself, the operator remains ultimately responsible for the measure's effective implementation.

OR

Team with an operator of a Phase I MS4 and become a co-permittee on its existing Phase I individual permit.

4.9 FUNDING OPTIONS

Possibly the biggest challenge for an operator of a regulated small MS4 in implementing a storm water management program is finding funding for the program. Funding is needed to maintain the staff, equipment and materials necessary to develop and implement an effective program. Adequate funding is critical to the success of the program but attaining it can be difficult as many other important programs compete for the same limited revenues from a general fund. Therefore, the operator of a regulated small MS4 will need to consider alternative funding options. This section provides brief introductions to some of the various funding options currently in use across the country. The following information on funding options was written by the American Public Works Association (AWPA) as part of their Storm Water Phase II workshops:

Debt Financing: Typically used for capital-intensive projects, local governments can issue debt to finance storm water management programs and facilities. Revenue bonds - or bonds that rely on ongoing source of revenue may be used. Alternatively, a general obligation bond can be issued which are backed by the full faith and credit of your municipality (based on your ability to generate revenues through taxes and other fees).

Grants and Loans: Federal, State, or Regional grant or loan funds may be available for some elements of the storm water program, depending on the BMP's selected and the location. Grants and loans are usually applicable to specific projects and not on-going activities, such as operation and maintenance.

Users /Utility Fees: Utility services charges are rates billed to customers for providing storm water management services. The service charges may be flat rates, or variable rates based on classes of

customers. Utility service charges may represent a dedicated source of funding and an ongoing method of funding some or all storm water management programs.

Special Assessment: Properties can be assessed annually to fund storm water management programs. Often, special assessments are used to fund a special district or authority that can implement all or portions of a region's storm water management program.

Local Improvement Under this type of funding system, individual properties benefitted by storm water projects are assessed to fund the project. Some states require special enabling legislation to establish this type of special benefits district.

General Fund: General fund monies are used for many storm water programs. If storm water programs are funded from your General Fund, the programs are at risk in each budget cycle. In addition, in order to increase funding levels for your program, other local government services may be affected or a general tax increase may be required.

Inspection Fees: Plan review and inspection fees allows the community to recover some or all of the direct cost associated with performing design reviews for pre and post construction BMP's.

Developer Fees: The developers construct needed facilities as a condition of development and bear associated costs.

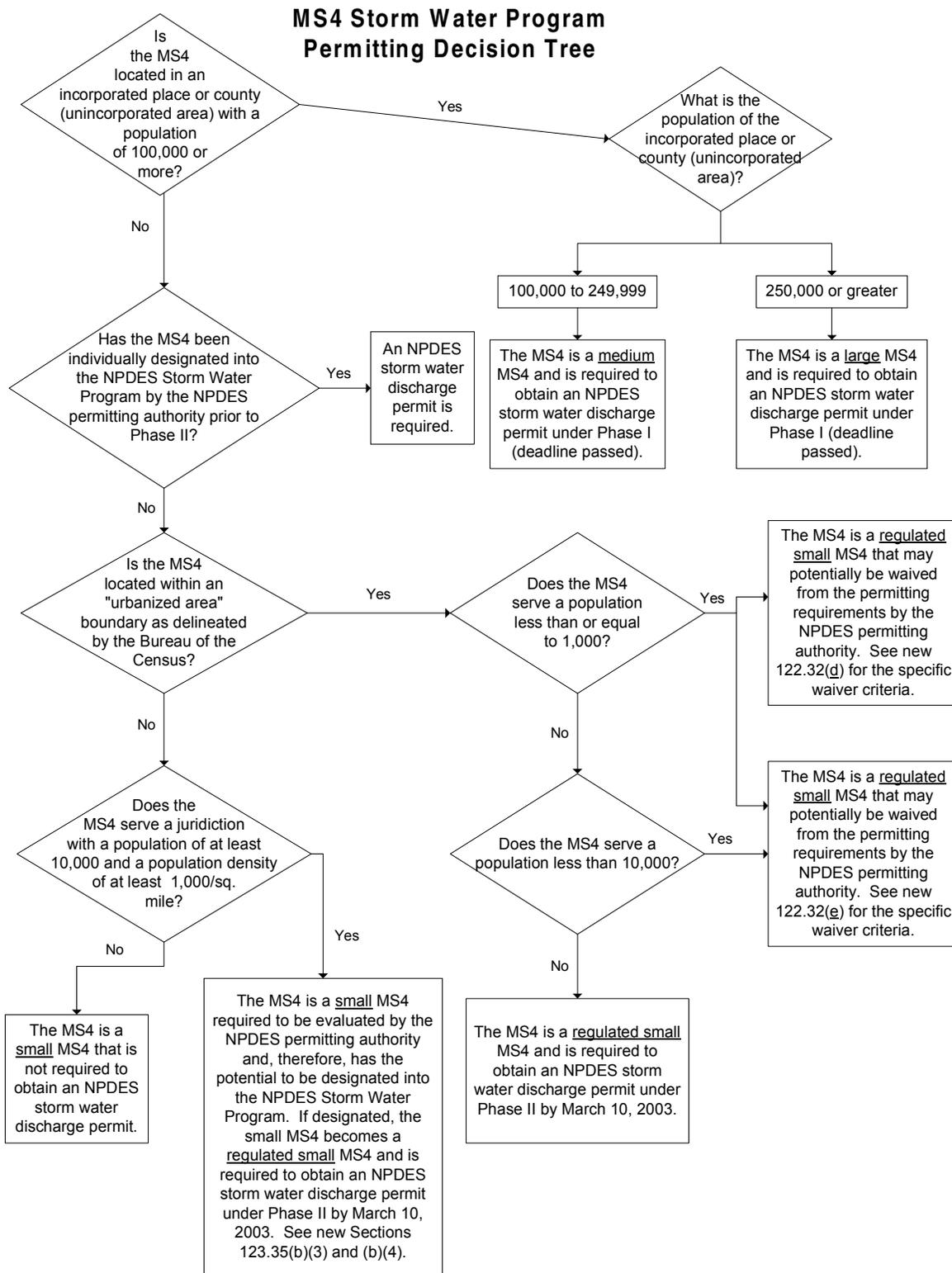
Alternative Fees: Instead of constructing on-site facilities to meet development requirements, developers may be given the option of paying a comparable fee to be used by the local government to build regional facilities that are designed to meet the same objectives as the developer-constructed on-site mitigation.

Connection Fees: A one time charge assessed at the time of development to recover a proportionate share of the cost of existing facilities and planned future facilities. The applicability depends upon legislation in each state.

Additional Resources

- Storm Water Utilities: Innovative Financing for Storm Water Management. 1992. U.S. EPA, Office of Policy, Planning, and Evaluation. Washington, D.C.
- State and Local Funding of Nonpoint Source Control Programs. 1992. U.S. EPA, Office of Water, Assessment and Watershed Protection Division. Washington, D.C.
- Storm Water Management Utility Implementation Manual. South Carolina Land Resources Commission, Columbia, S.C.

- Storm Water Maintenance and Financing Options (draft). 1987. State of Maryland, Maryland Department of Natural Resources.



1. See Appendices F, G, H, and I to Part 122 (as revised by the Phase II Final Rule) for the list of incorporated places and counties (unincorporated areas) with a population of 100,000 or greater. If the MS4 is located in a listed entity, then the answer to this question is "Yes" and the MS4 is covered under the Phase I MS4 program as a medium or large MS4.

5.0 SMALL CONSTRUCTION ACTIVITY

After reading Section 5.0, you should understand what type of construction activity is subject to the Phase II small construction activity regulations (including who may be waived from coverage), who is considered an operator of small construction activity, the permit options and requirements for small construction activity, and the interaction of the NPDES storm water program for construction with the NPDES storm water program for regulated MS4s. The discussion of these elements concludes with a step-by-step review of the process for compliance with the Phase II regulations for small construction activity.

5.1 COVERAGE: Who Is Subject to the Phase II Rule?

The NPDES Storm Water Program defines construction activities as "small" and "large" for the purposes of regulation. The Phase I storm water program covers large construction activity. The Phase II storm water regulation covers small construction activity. To understand who is covered under the Phase II Rule, it is necessary to understand who is already covered under the Phase I Rule. Toward this end, this section provides a definition of the type of construction activity covered by Phase I and Phase II, as well as other definitions essential to understanding the construction component of the NPDES Storm Water Program.

5.1.1 What Type of Construction Activity Is Covered Under the Phase I Regulations?

The Phase I Rule identifies eleven categories of industrial activity in the definition of "storm water discharge associated with industrial activity" that must obtain an NPDES storm water discharge permit (see section 6.1). Category (x) of this definition includes construction activity (including clearing, grading and excavation) that results in **a total land disturbance of 5 acres or greater**. Disturbances of less than 5 acres are also regulated under category (x) if they are part of a "larger common plan of development or sale" with a planned land disturbance of 5 acres or greater. Phase I construction activity is commonly referred to as "large"

Construction activities can include road building, construction of residential houses, office buildings, industrial sites, or demolition.

Land Disturbance means exposed soil due to clearing, grading, or excavation activities.

Larger common plan of development or sale describes a situation in which multiple construction activities are occurring, or will occur, on a contiguous area.

An operator is the person or persons that has either operational control of construction project plans and specifications, or day-to-day operational control of activities necessary to ensure compliance with storm water permit conditions.

construction activity. The Phase I rule requires all operators of large construction activity to obtain an NPDES storm water discharge permit before discharging storm water runoff to a municipal separate storm sewer system or waters of the United States.

5.1.2 What Type of Construction Activity Is Covered Under the Phase II Regulations?

In 1992, the Ninth Circuit court remanded for further proceedings the portion of EPA's Phase I storm water regulation related to category (x) construction activity (NRDC v. EPA, 966 F.2d at 1292). EPA responded to the court's decision by designating under Phase II storm water discharges from construction site activities that ultimately will result in a **land disturbance of equal to or greater than 1 and less than 5 acres** as "storm water discharges associated with *small construction* activity" (see § 122.26(b)(15)). The Phase II rule requires all operators of small construction activity to obtain an NPDES storm water discharge permit before discharging storm water runoff to a municipal separate storm sewer system or waters of the United States.

Construction activities disturbing less than 1 acre are also included in Phase II of the NPDES storm water program if they are part of a larger common plan of development or sale with a planned disturbance of equal to or greater than 1 acre and less than 5 acres, or if they are designated by the NPDES permitting authority. The NPDES permitting authority or EPA Region may designate construction activities disturbing less than 1 acre based on the potential for contribution to a violation of a water quality standard or for significant contribution of pollutants to waters of the United States.

The definition of small construction activity does not apply where the construction operator can certify to one of two waivers – see section 5.2 for more information on waiver options.

5.1.3 What is meant by the terms "land disturbance," "larger common plan of development or sale," and "operator" of a construction site?

The definitions of "land disturbance," "larger common plan of development or sale," and "operator" of a construction site are key in understanding coverage under the NPDES Storm Water Program for construction activity. These definitions originate from the NPDES storm water general permit for large construction activity.

- **Land disturbance** refers to exposed soil resulting from activities such as clearing, grading and excavating.
- **Larger common plan of development or sale** is a contiguous area where multiple separate and distinct construction activities are occurring under one plan (e.g., the operator is building on three half-acre lots in a 6-acre development). The "plan" in a common plan of development or sale is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, sales pitch,

advertisement, drawing, permit application, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that construction activities may occur on a specific plot.

- **An operator** of a construction site is the person (or persons) responsible for obtaining coverage under an NPDES storm water permit for construction activity, and complying with the permit requirements. An operator is the person or persons that meet either of the following criteria:
 - ❑ Has operational control of construction project plans and specifications, including the ability to make modifications to those plans and specifications; or
 - ❑ Has day-to-day operational control of those activities at a project which are necessary to ensure compliance with a storm water pollution prevention plan (SWPPP) for the site or other permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions).

There may be more than one party at a site responsible for “operational control.” Depending on the project and the distinction between the parties’ (e.g., owner’s vs. developer’s) responsibilities, there can either be a single party acting as a site operator needing permit coverage or there can be two (or more) operators who may share permit responsibilities. In cases where there are two or more operators, both parties will need permit coverage if they choose to keep the responsibilities as described in the above bullets separate, or they choose to separately maintain operational control for different portions of the site, etc. In such cases both operators should obtain permit coverage as co-permittees by co-submitting separate Notice of Intent forms, and should share in meeting permit conditions (e.g., generating the storm water pollution prevention plan, performing inspections, etc.). The option to have one sole operator who is willing to assume complete responsibility / liability for all permit requirements still exists and, in many cases, may be the less overall burdensome way to comply with storm water requirements.

There are other instances where parties conduct earth disturbing activities at a site but do not need their own permit coverage. Examples for whom this may apply include a subcontractor who is under the supervision of the operator, or an entity that is neither a subcontractor nor has operational control (e.g., a utility line installer).

Additional information on the responsibilities of operators can be found in Part III.E of EPA's NPDES Construction General Permit, published on February 17, 1998 (63 FR 7858). Part II of the fact sheet contained in the NPDES Construction General Permit also provides answers to common questions regarding roles and responsibilities of different parties involved on a construction site.

Important note: NPDES-authorized States may use a different definition of "operator" than the one provided above.

5.2 WAIVERS: Which Small Construction Activity Sites May Obtain a Waiver From Coverage?

Under the Phase II Rule, NPDES permitting authorities have the option of providing a waiver from Phase II coverage and requirements to operators of small construction activity who certify to one of two conditions:

- ① Low predicted rainfall potential (i.e., activity occurs during a negligible rainfall period), where the rainfall erosivity factor ("R" in the Revised Universal Soil Loss Equation [RUSLE]) would be less than 5 during the period of construction activity.
- ② A determination that storm water controls are not necessary based on either:
 - (A) A "total maximum daily load" (TMDL) that address the pollutant(s) of concern for construction activities; **OR**
 - (B) For nonimpaired waters that don't require TMDLs, an equivalent analysis that determines allocations for small construction sites for the pollutants of concern or determines that such allocations are not needed to protect water quality based on consideration of instream concentrations, expected growth in pollutant concentrations from all sources, and a margin of safety.

Pollutants of concern include sediment or a parameter that addresses sediment (such as total suspended solids, turbidity, or siltation) and any other pollutant that has been identified as a cause of impairment of a receiving waterbody.

The intent of these waiver provisions (see §§ 122.26(b)(15)(A) and(B)) is to waive only those sites that are highly unlikely to have a negative effect on water quality. Therefore, before applying for a waiver, operators of small construction activity are encouraged to consider the potential water quality impacts that may result from their project and to carefully examine such factors as proximity to water resources and sensitivity of receiving waters. Small construction activities disturbing less than 1 acre that are designated by the permitting authority are not eligible for these waivers.

5.2.1 Waiver 1: The Rainfall Erosivity Factor Waiver

The Rainfall Erosivity Factor waiver is based on the potential for a construction activity to occur in an area, or during a certain period of time, where there is low

predicted rainfall potential and, therefore, less likelihood of causing impacts. This waiver is time-sensitive and is dependent on when during the year a construction activity takes place, how long it lasts, and the expected rainfall and intensity during that time. It creates an incentive for construction site operators to build during the dry part of the year.

How would an operator qualify for, and certify to, this waiver?

To qualify for this waiver, the construction site operator must determine the value of the rainfall erosivity factor (R factor) in the Revised Universal Soil Loss Equation (RUSLE) and then certify to the permitting authority that the value of the factor is less than 5 during the period of construction. The RUSLE is a refinement of the Universal Soil Loss Equation (USLE), which is a method developed by the U.S. Department of Agriculture to measure soil loss from agricultural lands at various times of the year on a regional basis. The R factor varies based on location and time period during the year.

A construction site operator will need site-specific data to calculate the values for rainfall erosivity using the RUSLE. The rainfall erosivity factor is determined in accordance with Chapter 2 of *Agriculture Handbook Number 703, Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*. This handbook is no longer in print but Chapter 2 can be obtained from EPA's web site or by contacting EPA's Water Resource Center.

5.2.1 Waiver 2: The Water Quality Waiver

The Water Quality waiver consists of: 1) a component for small construction sites that will discharge to an impaired waterbody where total maximum daily load (TMDL) assessments have been performed, and 2) a component for small construction sites that will discharge to non-impaired waters where an analysis equivalent to the TMDL assessments have been performed.

For impaired waters where technology-based controls required by NPDES permits are not achieving State water quality standards, the CWA requires implementation of the TMDL process.

The **TMDL process** establishes the maximum amount of pollutants a waterbody can assimilate before water quality is impaired, then requires that this maximum level not be exceeded. A TMDL assessment determines the source or sources of a pollutant of concern, considers the maximum allowable level of that pollutant for the waterbody, then allocates to each source or category of sources a set level of the pollutant that it is allowed to discharge into the waterbody. Allocations to point sources are called wasteload allocations.

A TMDL is developed for each pollutant that is found to be contributing to the impairment of a waterbody or a segment of a waterbody. To allow a waiver for construction activities, a TMDL would need to address sediment, or a parameter that addresses sediment such as total suspended solids, turbidity, or siltation. Additional TMDLs addressing common pollutants from construction sites such as nitrogen, phosphorus, and oil and grease also may be necessary to ensure water quality protection and allow a waiver from the NPDES storm water program. More information on TMDLs can be found at <http://www.epa.gov/owow/tmdl/>.

Non-impaired waterbodies do not require TMDL assessments. However, construction site operators that discharge to non-impaired waterbodies are still eligible for this waiver. A construction site operator is eligible for a waiver if an analysis equivalent to a TMDL assessment is conducted for the pollutants of concern and it is determined through this analysis that small construction sites would not have to control their contribution of pollutants of concern to the waterbody to protect water quality. The analysis may also determine that allocations are not needed to protect water quality based on consideration of variables including existing in-stream concentrations; expected growth in pollutant contributions from all sources; and a margin of safety. In this situation, the construction site operator also qualifies for a waiver.

How would an operator qualify for, and certify to, this waiver?

EPA expects that when TMDLs, or equivalent analyses are completed, there may be a determination that certain classes of sources, such as small construction sites, would not have to control their contribution of pollutants of concern to the waterbody in order for the waterbody to be in attainment with water quality standards (i.e., these sources were not assigned wasteload allocations). In such a case, to qualify for the Water Quality waiver, the operator of the construction site would need to certify that its construction activity will take place, and the storm water discharges will occur, within the area covered either by the TMDLs or equivalent analysis. A certification form would likely be provided by the NPDES permitting authority.

5.3 PERMIT OPTIONS

The Storm Water Phase II Rule requires operators of small construction activities to obtain National Pollutant Discharge Elimination System (NPDES) permit coverage because their storm water discharges are considered “point sources” of pollution. Point source pollutant discharges, unlike nonpoint sources such as agricultural runoff, are required under the Clean Water Act (CWA) to be covered by federally enforceable NPDES permits.

NPDES storm water permits are issued by an NPDES permitting authority, which may be an NPDES-authorized State or a U.S. EPA Region in non-authorized States (see *Appendix A* for a list of U.S. EPA Regions). Once a permit application is submitted by the operator of a small construction activity, the conditions of the permit must be

satisfied (i.e., implementation of a storm water pollution prevention plan). This section addresses the permit options under the Phase II regulations for operators of small construction activity, as well as for the permitting authority. The permit requirements are discussed in Section 5.4.

5.3.1 For Operators of Small Construction Activity: What Types of Permit Coverage Are Available?

Similar to the Phase I program for large construction activity, the Phase II approach allows operators of small construction activities to choose between two permitting options. Each NPDES permitting authority has the discretion, however, to determine which options are available to operators of small construction activities in their jurisdiction.

1) General Permits

- # General permits are strongly encouraged by EPA for small construction activity. EPA anticipates that the existing general permit for large construction activity will serve as a model for small construction activity general permits.
- # General permits prescribe one set of requirements for all applicable permittees. General permits are drafted by the NPDES permitting authority, then published for public comment before being finalized and issued.
- # A Notice of Intent (NOI) serves as the application for the general permit. Under the Phase II Rule, NPDES permitting authorities have the discretion to not require submittal of an NOI under a general permit for small construction activity.
- # Small construction operators must submit an NOI and obtain coverage under a general permit by March 10, 2003 or an earlier date set by the permitting authority (if this option is available).

2) Individual Permits

- # NPDES permitting authorities may deny coverage under general permits and require operators to submit an individual NPDES permit application based on information such as water quality data.
- # In the event that an NPDES permitting authority decides to issue an individual construction permit for small construction activity, operators are subject to the individual application requirements found at 40 CFR §122.26(c)(1)(ii).
- # For any discharges of storm water associated with small construction activity identified in §122.26(b)(15) that are not authorized by a general permit, an individual permit application must be submitted to the permitting authority by

March 10, 2003.

5.3.2 For the NPDES Permitting Authority

5.3.2.1 Alternative Option for Writing Permit Requirements: Referencing a Qualifying State, Tribal or Local Erosion and Sediment Control Program

Under §122.44(s) of the Phase II Rule, permitting authorities have the flexibility to develop permit conditions that incorporate by reference qualifying State, Tribal, or local erosion and sediment control programs into permits for large and small construction activity.

To be considered a qualifying State, Tribal, or local program, the program must require construction site operators to:

- Implement appropriate erosion and sediment control BMPs;
- Control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the site that may cause adverse impacts to water quality;
- Submit a site plan for review that incorporates consideration of potential water quality impacts; and
- Develop and implement a storm water pollution prevention plan (SWPPP) containing elements similar to those required by other NPDES construction storm water permits.

In addition to these elements, a qualifying program for large construction activities must also include any additional requirements necessary to achieve the applicable technology-based standards of “Best Available Technology” (BAT) and “Best Conventional Technology” (BCT) based on the best professional judgment of the permit writer.

Important Note: Not all the construction programs administered by NPDES-permitted MS4s would qualify. A primary reason for this is because NPDES-permitted MS4s are not obligated under their permit to require construction operators to develop a SWPPP.

Should a State, Tribal, or local program include one or more, but not all, of the elements listed above, the NPDES permitting authority can reference the program in the permit, provided it also lists the missing element(s) as a condition in the permit.

5.3.2.2 Permit Application: Optional Use of NOIs

Under the Phase II Rule, EPA is providing NPDES permitting authorities with the

discretion to not require NOIs under a general permit for discharges from small construction activity, if desired. EPA does, however, recommend the use of NOIs for tracking permit coverage and prioritizing inspections and enforcement. This alternative option does not apply to general permits for large construction activity.

5.4 PERMIT REQUIREMENTS

The Phase II Rule requires operators of small construction sites, nationally, to obtain an NPDES permit and implement practices to minimize pollutant runoff. The Phase II Rule directs permitting authorities to develop and issue permits for small construction activity no later than December 9, 2002. Operators of small construction activity will be required to obtain permit coverage by March 10, 2003, or an earlier date set by the permitting authority. However, operators may have to comply with local, State, or Tribal construction runoff control programs (see section 4.6.2.4 for information on the Phase II small MS4's construction program).

For the Phase II small construction program, EPA has taken an approach similar to Phase I where the program requirements are not fully defined in the rule but rather in the NPDES permit by the NPDES permitting authority. EPA recommends that the NPDES permitting authorities use their existing Phase I NPDES construction general permits as a guide to developing their Phase II construction permits. In doing so, the Phase II requirements would be similar to the Phase I requirements described in subsection 5.4.2, although the applicable standards for small construction activity are different as outlined in subsection 5.4.1.

5.4.1 Applicable Water Quality Standards

Unlike the technology-based standards of BAT and BCT that are applicable to large construction activity, an operator of small construction activity is required to design its pollutant control plan so that it:

- Protects water quality (under CWA section 402(p)(6)); and
- Satisfies the appropriate water quality requirements of the CWA.

The water quality standards for large and small construction activity are different because they were designated into the NPDES storm water program under two separate sections of the CWA with differing standards. Practically, though, the standard for small construction activity would be substantively the same as the standard for large construction activity.

5.4.2 Potential Small Construction Activity Permit Requirements

EPA currently has only one type of permit available for construction activity operators, the NPDES Construction General Permit. This permit provides coverage to

large construction activities only. EPA expects any general permit for small construction activity to be very similar to the CGP. To gain familiarity with the CGP, the three main elements of the CGP are included below.

Important note: This section on the CGP requirements is included for informational purposes only in order to provide a sense of what the permit requirements for small construction activity may be – these are not the requirements for small construction activity.

5.4.2.1 Notice of Intent

A complete and accurate NOI must be submitted to the NPDES permitting authority. An NOI includes general information and a certification that the activity will not impact endangered or threatened species. This certification is unique to EPA's NOI and is not a requirement of most NPDES-delegated State's NOIs.

An NOI must be postmarked at least two days prior to commencement of any work on site (if the operator has control over plans and specifications) or two days prior to commencement of the operator's portion of the work (if the operator has only day-to-day operational control).

5.4.2.2 Storm Water Pollution Prevention Plan (SWPPP)

The most important requirement of the CGP is the construction storm water pollution prevention plan (SWPPP) that includes the appropriate BMPs to minimize the discharge of pollutants from the site. The CGP requires at least one SWPPP for each construction project or site.

The construction site operator, or operators, must develop the SWPPP prior to submitting the NOI to obtain permit coverage. Unlike the NOI and other reporting forms, the operator(s) does not submit the SWPPP to the permitting authority. Instead, the SWPPP remains onsite and made accessible according to the requirements described in the CGP.

The SWPPP comprises several elements:

- **Site description.** This will contain a description of potential pollutant sources and other information.
- **Controls (BMPs).** This part of the SWPPP must clearly describe not only the controls, but also the timing and responsible permittee for implementing the controls in the following categories:

- ✓ Erosion and Sediment Controls
- ✓ Storm Water Management Controls

✓ Other Controls

- **Inspections.** Another critical element of the SWPPP is regular inspections of disturbed areas of the site that has not been stabilized; exposed materials storage areas; structural controls; and vehicle entrances and exits.
- **Maintenance.** The SWPPP also requires that operators perform maintenance on the controls (BMPs) to ensure they are in effective operating condition.
- **Signatures.** The SWPPP must be signed by at least one of the persons responsible for submitting an NOI for the project.
- **Accessibility.** The CGP requires the operator(s) to retain a copy of the SWPPP at the construction site or other local location accessible to the permitting authority.

More information on the construction SWPPP requirements can be found in the CGP, published on February 17, 1998 (63 *FR* 7858, p. 7906). EPA has also issued a construction general permit for Regions IV and VI. Contact your EPA Regional office or State environmental agency for information on construction permits in your State. In addition, EPA published a construction SWPPP guidance in a document entitled *Storm Water Management for Construction Activities: Developing Storm Water Pollution Prevention Plans and Best Management Practices* (EPA 832-R-92-005, September 1992).

5.4.2.3 Notice of Termination (NOT)

A completed Notice of Termination (NOT) must be submitted to the NPDES permitting authority within 30 days after one or more of the following conditions have been met:

- Final stabilization has been achieved on all portions of the site for which the permittee is responsible;
- Another operator/permittee has assumed control over all areas of the site that have not been finally stabilized; or
- For residential construction only: temporary stabilization of a lot has been completed prior to transference of ownership to the homeowner, with the homeowner being made aware of the need to perform final stabilization.

5.5 INTEGRATION OF NPDES PROGRAM FOR CONSTRUCTION WITH NPDES PROGRAM FOR MS4S

There is often confusion about the interaction between the NPDES Storm Water Program for construction activity, which has been the topic of discussion in this section, and the construction runoff control program implemented by NPDES-regulated MS4s, which was the topic of discussion in section 4.6.2.4.

- These are two separate and distinct construction programs.
- A construction operator is subject to requirements under BOTH programs if it is located in an NPDES-regulated MS4's jurisdiction.

The NPDES Storm Water Program for Construction is administered by the NPDES permitting authority, either the State or an EPA Regional Office.

- This program requires the construction site operator to seek coverage under an NPDES storm water discharge permit for construction. The current permit, the Construction General Permit, requires the operator to submit an NOI, develop a SWPPP, and comply with other applicable NPDES storm water discharge permit requirements.
- The Construction General Permit (CGP) currently only applies to large construction activity disturbing greater than 5 acres. Permits for small construction activity will be issued by each NPDES permitting authority by December 9, 2002.

The NPDES Storm Water Program for MS4s: MS4 Construction Runoff Control Programs are administered by the MS4 operator. The MS4 operator's NPDES storm water discharge permit requires it to establish requirements to control storm water discharges from construction activity and new development and redevelopment.

- Regulated small MS4s must control 1 acre and above.
- Medium and large MS4s have no particular size thresholds that they must control – differs among MS4s
- The specific requirements of the construction programs will vary among MS4s. An MS4 permit typically does not specify that the MS4 operator must require a SWPPP or that a permit application be submitted.

5.6 SMALL CONSTRUCTION ACTIVITY COMPLIANCE PROCESS: What Do I Need To Do To Comply?

Sections 5.1 through 5.5 of this guidance have provided details on who's covered, who may be waived, and what may be required under the Phase II regulations for small construction activity. Now that you are familiar with the Phase II program, this section

walks you through the process, from beginning to end, that an operator of a small construction activity should take to comply with the regulation. This step-by-step "walk-through" assumes the issuance of a general permit for small construction activity that is similar to the CGP. Remember, the general permit for small construction activity may have different requirements, timeframes, and deadlines than what is noted here. Repeat the steps for each individual construction site.

The last page of this section includes a permitting decision tree to help operators of construction activity determine if they need an NPDES storm water permit. By starting in the upper left hand corner, an operator can follow the decision tree to determine if they fall under Phase I, Phase II, or are eligible for a waiver.

Step 1: Determine if your construction site will discharge storm water runoff into a MS4 (see section 4.1.1 for definition) or to waters of the United States. If so, proceed to Step 2. If not, stop here.

Waters of the United States include interstate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce. (Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA are not waters of the United States.) A complete definition can be found at 40 CFR 122.2.

Step 2: Determine if your construction site's storm water discharge will meet the definition of a "storm water discharge associated with small construction activity." If so, proceed to Step 3. If not, stop here. (See section 5.1.2)

Step 3: If your site meets the definition of small construction activity, determine if it qualifies for a waiver from the permit requirements. If so, stop here. If not, proceed to Step 4. (See section 5.2)

Step 4: Obtain and read the applicable storm water discharge permit for small construction activity (or the CGP until the small construction permit has been issued to get a sense of the upcoming permit requirements). The small construction permit should be issued by the NPDES permitting authority by December 9, 2002. (See section 5.4.2 for potential requirements)

Step 5: Determine which parties are considered *operators* and, therefore, are responsible for complying with the requirements described in the storm water permit for small construction activity (See section 5.1.3)

Step 6: Develop a SWPPP. (See section 5.4.2.2)

- SWPPPs must be developed prior to submitting the NOI.
- You do not need to submit the SWPPP to your NPDES permitting authority, however, it should be accessible to the public.

Step 7: Complete and submit an NOI. (See section 5.4.2.1)

- Your NPDES permitting authority may or may not require a NOI. If so, the Phase II regulation requires that you submit your NOI no later than March 10, 2003 (or 90 days after the NPDES permitting authority issues the permit, whichever comes first).
- Submit a completed NOI to your NPDES permitting authority two days prior to beginning work at the construction site.

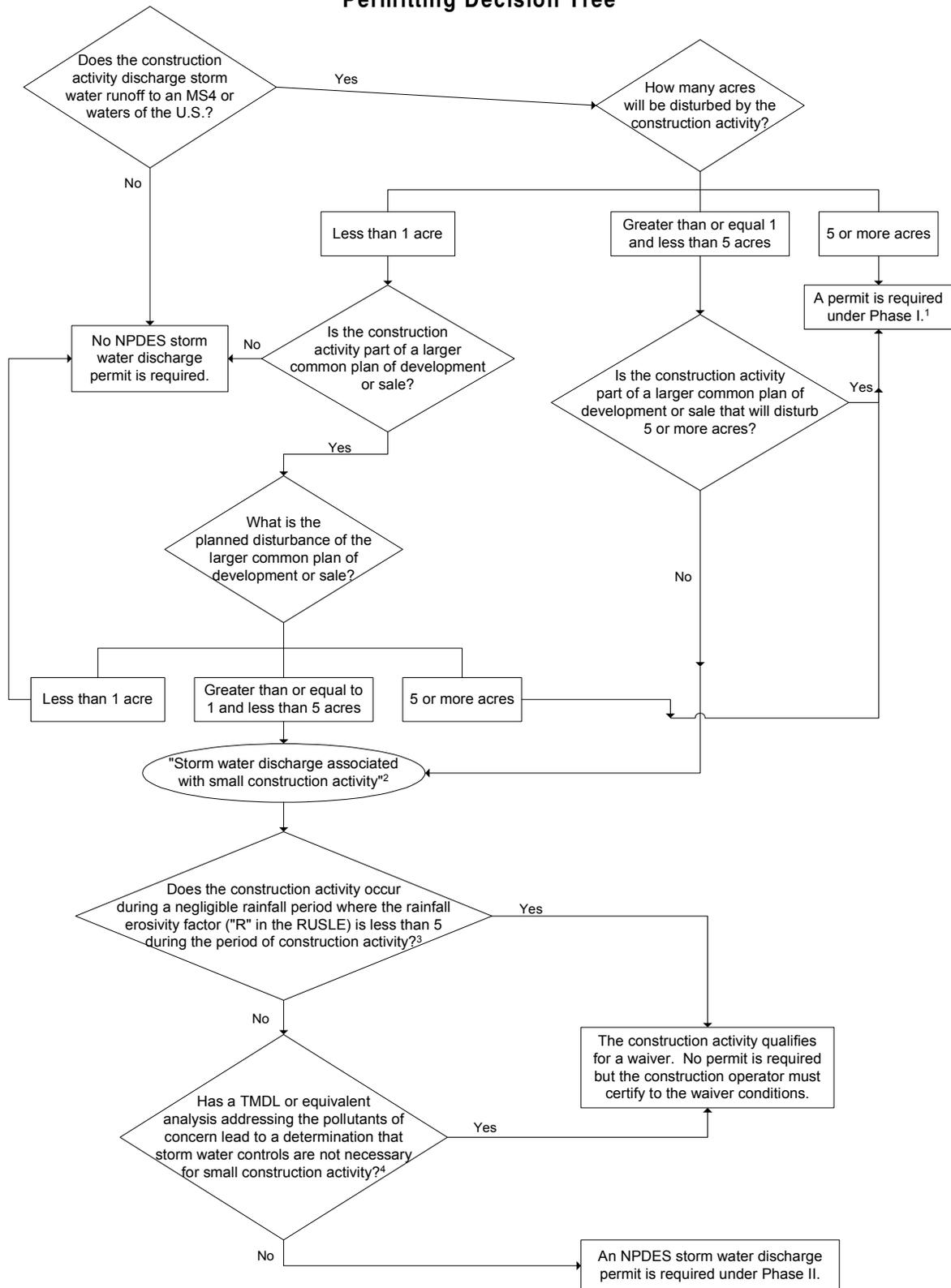
Step 8: Implement the SWPPP.

- Includes generation of inspection reports that are to be kept on-site.

Step 9: Complete and submit an NOT. (See section 5.4.2.3)

- Submit a completed NOT to your NPDES permitting authority within 30 days after one or more of the appropriate conditions have been met.

**Construction Activities Storm Water Program
Permitting Decision Tree**



1. Construction activity disturbing, or part of a planned disturbance of, five or more acres is a "storm water discharge associated with industrial activity" under category (x). See 40 CFR 122.26(b)(14)(x).
 2. See new 122.26(b)(15) for the definition of "storm water discharge associated with small construction activity."
 3. See new 122.26(b)(15)(i)(A) for more details.
 4. See new 122.26(b)(15)(i)(B) for more details.

6.0 INDUSTRIAL ACTIVITY

After reading section 6.0, you should understand the basic components and requirements of the Phase II regulations as they affect the categories of industrial activity covered by the Phase I regulations. Phase II revises the original Phase I industrial no exposure exemption and also sets a new deadline for permit coverage for the municipally-owned industrial activity that had been temporarily exempted from storm water permit coverage.

6.1 PHASE I INDUSTRIAL ACTIVITY: What Industrial Activities are Covered by Phase I of EPA's Storm Water Program?

The 1990 storm water regulations for Phase I of the federal storm water program identify eleven categories of industrial activities under the definition of a "storm water discharge associated with industrial activity" that must obtain a National Pollutant Discharge Elimination System (NPDES) permit. The categories contain industries listed either by reference to an industry's Standard Industrial Classification (SIC) code, or by a short narrative description of the activity found at the industrial site (see text box at right for more detailed descriptions). For facilities that match the SIC codes or description in one of the categories, only those that have a storm water discharge to a *municipal separate storm sewer system (MS4)* or *waters of the United States* are required to seek permit coverage. The NPDES permit requirements vary between individual and general permits, but in general involve the development of a storm water pollution prevention plan based upon site assessments, monitoring and reporting data on storm water discharges, and mitigating any possible effects of discharges on endangered species and national historic properties (for EPA issued permits).

Storm Water Discharge Associated with Industrial Activity (40 CFR 122.26(b)(14)(i) - (xi))

- Facilities subject to storm water effluent limitation guidelines; new source performance standards, or toxic pollutant effluent standards under 40 CFR Subchapter N.
- "Heavy" industrial facilities with SIC codes listed in 40 CFR 122.26(b)(14)(ii), (iii), and (vi)
- "Light" industrial facilities with SIC codes listed in 40 CFR 122.26(b)(14)(xi), which conduct the activities specified in that sections.
- Hazardous waste treatment, storage, or disposal facilities.
- Landfills, land application sites, and open dumps that receive or have received industrial waste.
- Steam electric power generating facilities.
- Sewage treatment works.
- Construction activity (including clearing, grading, and excavation) disturbing five or more acres of land, or less than five acres of land if it is part of a larger common plan of development or sale of five acre or greater.

Under the Phase I regulations, operators of facilities within category eleven (xi), commonly referred to as “light industry,” were exempted from the definition of “storm water discharge associated with industrial activity,” and the subsequent requirement to obtain an NPDES permit, provided their industrial materials or activities were not “exposed” to storm water. This Phase I no exposure exemption from permitting was limited to those facilities identified in category (xi), and did not require category (xi) facility operators to submit any information supporting their no exposure claim.

In 1992, the Ninth Circuit court remanded to EPA for further rulemaking the no exposure exemption for light industry after making a determination that the limited exemption was arbitrary and capricious. The result was a revised no exposure exemption (now an "exclusion") as part of the Phase II regulation.

6.2 PHASE II NO EXPOSURE EXCLUSION: What is the Conditional No Exposure Exclusion for Industrial Activity as Revised by this Regulation?

The intent of the no exposure provision is to provide a simplified method for complying with the Clean Water Act to all industrial facilities that are entirely indoors. This includes facilities that are located within a large office building, or at which the only items permanently exposed to precipitation are roofs, parking lots, vegetated areas, and other non-industrial areas or activities.

As revised in the Phase II regulation, if a condition of No Exposure exists at a Phase I industrial facility, then permits will not be required for storm water discharges from these facilities. All industrial facilities that have no exposure of materials to storm water, including the "light industrial" facilities, must submit a certification to the permitting authority. The facility must certify that a condition of No Exposure exists at its facility and either maintain a condition of no exposure or obtain a permit. The following subsections discuss who is eligible for the revised no exposure exclusion, the definition of no exposure, and the requirement to submit a written certification of no exposure in place of a permit application.

6.2.1 Who is Eligible to Qualify for the No Exposure Exclusion?

The Phase II Conditional No Exposure Exclusion represents a significant expansion in the scope of the original no exposure provision in terms of eligibility. Now, all Phase I industrial categories with a condition of no exposure, except for construction activity, are eligible for the no exposure exclusion. The exclusion from permitting is available on a facility-wide basis only, not for individual outfalls

6.2.2 What is the Definition of No Exposure?

The Phase II regulatory definition of no exposure is as follows:

No exposure means all industrial materials and activities are protected

by a storm resistant shelter to prevent exposure to rain, snow, snowmelt, and/or runoff. Industrial materials or activities include, but are not limited to, material handling equipment or activities, industrial machinery, raw materials, intermediate products, by-products, final products, or waste products.

A storm resistant shelter is not required for the following industrial materials and activities:

- Drums, barrels, tanks, and similar containers that are tightly sealed, provided those containers are not deteriorated and do not leak. “Sealed” means banded or otherwise secured and without operational taps or valves;
- Adequately maintained vehicles used in materials handling;
- Final products, other than products that would be mobilized in storm water discharges (e.g., rock salt).

The term “storm-resistant shelter,” as used in the no exposure definition, includes completely roofed and walled buildings or structures, as well as structures with only a top cover but no side coverings, provided material under the structure is not otherwise subject to any run-on and subsequent runoff of storm water.

While the intent of the no exposure provision is to promote a condition of permanent no exposure, certain machinery, such as trucks, may become temporarily exposed to rain and snow while passing between buildings. Adequately maintained mobile equipment (e.g., trucks, automobiles, forklifts, trailers, or other such general purpose vehicles found at the industrial site that are not industrial machinery, and that are not leaking contaminants or are not otherwise a source of industrial pollutants) also can be exposed to precipitation or runoff. Such activities alone would not prevent a facility from certifying to no exposure. Similarly, trucks or other vehicles awaiting maintenance at vehicle maintenance facilities that are not leaking contaminants or are not otherwise a source of industrial pollutants, would not be considered exposed.

EPA recognizes that there are circumstances where permanent no exposure of industrial activities or materials is not possible and, therefore, under such conditions, materials and activities could be sheltered with temporary covers (e.g., tarps) between periods of permanent enclosure. The No Exposure provision does not specify every such situation, but NPDES permitting authorities can address this issue on a case-by-case basis.

The Phase II regulation also addresses particulate matter emissions from roof stacks/vents. If regulated by, and in compliance with, other environmental protection programs (i.e., air quality control programs) and not causing storm water contamination, they are considered not exposed. Particulate matter or visible deposits of residuals from roof stacks and/or vents not otherwise regulated (i.e., under an air quality control program) and evident in storm water outflow are considered “exposed.” Likewise,

visible “track out” (i.e., pollutants carried on the tires of vehicles) or windblown raw materials are considered “exposed.” Leaking pipes containing contaminants exposed to storm water are deemed “exposed,” as are past sources of storm water contamination that remain onsite. General refuse and trash, not of an industrial nature, is not considered exposed as long as the container is completely covered and nothing can drain out holes in the bottom, or is lost in loading onto a garbage truck. Industrial refuse and trash that is left uncovered, however, is considered “exposed.”

6.2.3 What Do I Need To Know About Certifying to a Condition of No Exposure?

In order to obtain the Conditional No Exposure exclusion, you will have to submit written certification that your facility meets the definition of “no exposure,” even if you are a category (xi) facility operator. The Phase II Rule included as an appendix to the preamble a four-page No Exposure Certification form to be used for this purpose in areas where EPA is the NPDES permitting authority. EPA's certification form uses a series of yes/no questions which you must answer regarding the your industrial activity. You may certify to no exposure if you can answer "no" to all of the questions.

Important note: EPA's No Exposure Certification form applies only in areas where EPA is the NPDES permitting authority. Where a State is the NPDES permitting authority, the State will issue its own form. Since most aspects of EPA's form are also regulatory requirements as to what must be included within a written certification of no exposure, you may expect the State forms to be very similar to EPA's.

The Certification form serves two purposes: 1) as an aid to help you in determining whether you have a condition of No Exposure at your facility or site, and 2) as the necessary written certification of No Exposure, provided you are able to answer all the questions in the negative.

- If, after you have completed the form, you find that you answered "yes" to one or more of the questions about possible exposure, you must make the appropriate changes at the facility if you still wish to apply for the conditional exclusion. These changes must remove the particular material, process, or activity at the facility or site from exposure to storm water.
- If, after completing the form, you find that you were able to check "no" to every question, you qualify for the no exposure exclusion and must sign and submit the form to your NPDES permitting authority.

Certification Facts:

- The certification must be completed and submitted to your permitting authority once every 5 years, and can only be done so if the condition of no exposure continues to exist at the facility.
- The Certification must be provided for each facility qualifying for the no exposure

exclusion.

- The form is non-transferable. If a new operator takes over your facility, they must complete, sign, and submit a new form to claim the no exposure exclusion when they assume control over the operations of the facility.

6.2.4 Are There Any Concerns Related to Water Quality Standards?

Yes. An operator certifying that its facility qualifies for the conditional no exposure exclusion may, nonetheless, be required by the permitting authority to obtain permit authorization. Such a requirement would follow the permitting authority's determination that the facility's discharge is likely to have an adverse impact on water quality.

Many efforts to achieve no exposure can employ simple good housekeeping and contaminant cleanup activities such as moving materials and activities indoors into existing buildings or structures. In limited cases, however, industrial operators may make major changes at a site to achieve no exposure. These efforts may include constructing a new building or cover to eliminate exposure or constructing structures to prevent run-on and storm water contact with industrial materials and activities. Major changes undertaken to achieve no exposure, however, can increase the impervious area of the site, such as when a building is placed in a formerly vegetated area. Increased impervious area can lead to an increase in the volume and velocity of storm water runoff, which, in turn, can result in a higher concentration of pollutants in the discharge, since fewer pollutants are naturally filtered out.

The concern of increased impervious area is addressed in one of the last questions on the Certification form, which asks, "Have you paved or roofed over a formerly exposed, pervious area in order to qualify for the no exposure exclusion? If yes, please indicate approximately how much area was paved or roofed over." This question is intended to aid the NPDES permitting authority in assessing the likelihood of such actions interfering with water quality standards. Where this is a concern, the facility operator and its NPDES permitting authority should take appropriate actions to ensure that water quality standards can be achieved.

6.2.5 Industrial Program Compliance Process: What Do I Need To Do To Obtain the No Exposure Exclusion and Comply with Applicable Requirements?

Sections 6.1 through 6.2.4. of this guidance have provided information necessary to understand the conditional no exposure exclusion. Now that you are familiar with the no exposure exclusion, this section walks you through the process, from beginning to end, that an operator of industrial activity will need to take to comply with the Phase II regulation. This step-by-step "walk-through" assumes the issuance of a no exposure certification form that is similar to EPA's form. Remember, a State's certification form may have different requirements and deadlines than what is noted here. Repeat the steps for each individual facility or site.

Step 1: Determine if your industrial activity meets the definition of a "discharge associated with industrial activity." If so, proceed to Step 2. If not, stop here. (See section 6.1)

- If you are a regulated industrial operator, you need to **either** apply for a storm water permit, **or** submit a no exposure certification, in order to be in compliance with the NPDES storm water regulations. Any storm water permit you may currently hold becomes null and void once a completed conditional no exposure certification form is submitted

Step 2: Obtain the no exposure certification form from your NPDES permitting authority. Determine if your regulated industrial activity meets the definition of "no exposure" and qualifies for the exclusion from permitting. If it does, proceed to Step 3. If not, stop here and obtain industrial storm water permit coverage (probably through the multi-sector general permit or similar permit).

- The conditional no exposure exclusion option is currently available only for facilities in areas where EPA is the NPDES permitting authority. In all other areas, where the State is the NPDES permitting authority, the facility operators will need to wait until the State makes the option available.

Step 3: Submit the certification form to your NPDES permitting authority -- a new form must be submitted once every 5 years.

- Be aware that even when you certify to no exposure, your NPDES permitting authority still retains the authority to require you to apply for an individual or general permit if it has determined that your discharge is contributing to the violation of, or interfering with the attainment or maintenance of, water quality standards, including designated uses.

Step 4: Submit a copy, upon request, of the certification form to the municipality in which the facility is located.

Step 5: Allow your NPDES permitting authority or, if discharging into a municipal separate storm sewer system, the operator of the system, to (1) inspect the facility and (2) make such inspection reports publicly available upon request.

Step 6: Maintain a condition of no exposure.

- The no exposure exclusion is conditional and not an outright exemption. Therefore, if there is a change in circumstances that causes exposure of industrial activities or materials to storm water, the you are required to comply immediately with all the requirements of the NPDES Storm Water Program, including applying for and obtaining a storm water discharge permit.

- Failure to maintain the condition of no exposure or obtain coverage under an NPDES permit can lead to the unauthorized discharge of pollutants to waters of the United States, resulting in penalties under the CWA.

6.3 ISTEAMORATORIUM: How Has this Regulation Affected the Municipally-Operated Industrial Activity Subject to the Intermodal Surface Transportation Enforcement Act (ISTEA) Moratorium?

Provisions within ISTEAM temporarily delayed the deadline for Phase I industrial activities operated by municipalities with populations of less than 100,000 people to obtain an NPDES storm water discharge permit. Congress delayed the permitting deadline to allow small municipalities additional time to comply with NPDES requirements. This moratorium on permitting did not apply to power plants, airports, and uncontrolled sanitary landfills operated by small municipalities.

The Phase II Rule slightly extended this temporary exemption from permitting and set a deadline of no later than March 10, 2003 for all ISTEAM-exempted municipally-operated industrial activities to obtain NPDES permit coverage. Of course, like any other regulated industrial activity, these municipally-operated industrial activities are eligible to qualify for the no exposure exclusion from permitting if a condition of no exposure exists. Municipal-operators must follow the same procedures outlined in Section 6.2.4 in order to obtain an exclusion from permitting.

Many of the small municipalities that will now have to obtain permit coverage for their industrial activity will also have to obtain permit coverage for their small MS4 (see section 4.0) and small construction activity (see section 5.0). The Phase II regulation deadlines for industrial, small MS4, and small construction permit coverage are all the same – no later than March 10, 2003 – to allow the NPDES permitting authority to issue one individual permit that covers all three components if it chooses to do so.

7.0 THE COMPLIANCE ASSURANCE PROCESS

After reading section 7, you should understand how EPA will determine compliance, what happens if you or the EPA discovers noncompliance, and where to go for compliance assistance information.

7.1 How Will EPA Determine Compliance?

EPA employs several approaches to monitor compliance with its environmental regulations, including both EPA-initiated and facility-initiated methods.

1. **Inspections** – EPA may conduct periodic inspections at facilities subject to this regulation. Inspections may be initiated by disclosures to EPA, randomly selecting facilities, or a variety of targeting methods. Inspections may be used, for instance, to monitor recordkeeping requirements, visit sites where storm water controls should be in place, and/or verify that facilities have permits.
2. **Permits, Records, and Reports** – Permits are not required for small construction sites and regulated small MS4s for up to three years and 90 days from the effective date of the final rule. After general permits are issued, the NPDES permitting authorities intend to use the data in storm water permit applications, construction waiver certifications, storm water pollution prevention plans (SWPPPs), no exposure certifications, records, and reports (as required by the Phase II regulation) to set appropriate permit conditions and track discharges covered by a storm water permit. Compliance and enforcement authorities will use the information to assess the regulated entity's level of compliance.
3. **Review of No Exposure Certifications** – Operators of industrial facilities that are eligible for a no exposure exclusion from the NPDES permitting requirements may prepare, and submit for review, a no exposure certification. NPDES authorities will use the information contained in the certification in determining compliance with the no exposure provisions. This information will particularly assist in determining compliance with the no exposure certification in conjunction with complaints from the public.
4. **Self-audit and Self Disclosure** – Facilities have the primary responsibility for ensuring that they are in continuous compliance. EPA encourages the facility to take advantage of EPA's Audit Policy, Small Business Policy, or Small Community Policy (these will be discussed in more detail in section 7.2).

In addition to this document, to aid in determining whether it is in compliance, the facility might use a document currently being developed by EPA entitled "Protocol for Conducting Environmental Compliance Audits under the Storm

Water Program.” This protocol, which is a part of a set containing other statute-specific audit protocols, is a tool to assist and encourage businesses and organizations to perform environmental audits and disclose violations in accordance with EPA’s Audit Policy. The protocol provides guidance on key requirements, defines regulatory terms, gives an overview of the federal laws affecting a particular environmental management area, and includes a checklist for review of the facility. EPA anticipates making the document available for public use in summer 2000. To see a sample of protocols that have been completed under other statutes (RCRA, EPCRA, CERCLA), visit the Internet site: <http://es.epa.gov/oeca/ccsmd/profile.html>.

7.2 If I Discover a Violation, How Can I Work With The Agency to Correct It?

EPA promotes environmental compliance by providing incentives. By participating in compliance assistance programs or voluntarily disclosing violations and promptly correcting violations, businesses may get penalty waivers or reductions. EPA has three policies that potentially apply to entities regulated by the Storm Water Phase II Rule. These policies do not apply if an enforcement action has already been initiated.

Audit Policy. The first of these policies is *“Incentives for Self-Policing: Discovery, Disclosure, Correction and Prevention of Violations”* (60 FR 66706), known as the “Audit Policy”. EPA initiated this policy to provide entities of all sizes with incentives to voluntarily discover and promptly disclose and correct violations of environmental regulations. For a more detailed description of the Audit Policy, visit the Internet site at: www.epa.gov/oeca/polguid/polyguid1.html.

Small Business Policy. EPA’s *“Policy on Compliance Incentives for Small Business”* was developed to help small businesses with 100 or fewer employees achieve environmental compliance by creating benefits for businesses that make a good faith effort to comply with environmental regulations before a government agency discovers a violation or otherwise takes an enforcement action. The Policy currently provides incentives, such as penalty waivers or penalty reduction, for businesses that participate in on-site compliance assistance programs or conduct environmental audits to discover, disclose, and correct violations. The Policy is presently being modified to broaden when and how a small business can take advantage of the Policy. Revisions are expected in spring of 2000. Please see www.epa.gov/oeca/polguid or contact Ginger Gotliffe (202-564-7072) for more information.

Small Community Policy. The *“Policy on Flexible State Enforcement Responses to Small Community Violations”* (November, 1995) promotes alternative strategies for communities to achieve environmental and economic goals. States are encouraged to use multimedia compliance assistance and prioritize compliance issues to address specific needs of their small communities. As long as states work within the parameters of the Policy, EPA will generally defer to their decision to waive part or all of the penalty for a small community’s environmental violations. This approach allows small

communities to apply their limited resources to fixing their environmental problems, rather than to paying penalties. The policy applies to communities generally comprised of fewer than 2,500 residents. In the context of the Storm Water Phase II Rule, small MS4s that are not eligible for waivers from their regulatory requirements would be most likely to take advantage of this policy. For a more detailed description of the Small Communities Policy, visit the Internet sites: www.epa.gov/oeca/scpolicy.html or www.epa.gov/oeca/ccsmd/mun.html.

7.3 Where Can I Go for Compliance Assistance on the Storm Water Phase II Rule?

The permitting authority is the leading source for information on the Storm Water Phase II Rule. EPA is also developing a "tool box" to assist States, Tribes, municipalities, and other parties involved in the Phase II program. This tool box will facilitate implementation of the storm water program in an effective and cost-efficient manner. The tool box is available on EPA's web page at <http://www.epa.gov/owm/sw/phase2> and consists of the following eight major components:

- Fact Sheets
- Guidance Documents
- Menu of BMPs
- Training and Outreach Efforts
- Information Clearinghouse
- Technical Research
- Support for Demonstration Projects
- Compliance Monitoring/Assistance Tools

In addition, EPA provides widely available compliance assistance through the establishment of national compliance assistance centers, in partnership with industry, academic institutions, and other federal and state agencies. Centers have been established that provide services for several industries that contain many small businesses. Compliance assistance centers offer a range of communications services, including Web sites, e-mail groups, fax-back systems, and telephone assistance lines. Each Center is targeted to a specific sector and explains relevant federal environmental regulations. For instance, local governments can use the services of the Local Government Environmental Assistance Network (LGEAN). LGEAN is a "first-stop shop" providing environmental management, planning, and regulatory information for local government elected and appointed officials, managers, and staff. It provides 24-hour access to regulatory and pollution prevention information, message boards, regulatory updates, grants and information, and more. It is a good source for compliance assistance information on the Storm Water Phase II Rule.

For more information on EPA's compliance assistance centers, please contact Tracy Back (202-564-7076). You can access all the centers through www.epa.gov/oeca/mcfac.html or individually at:

EPA's Compliance Assistance Centers

Center	Phone	Web Address
Local Government Environmental Assistance Network (LGEAN)	1-877-TO-LGEAN	www.lgean.org
National Metal Finishing Resource Center	1-800-AT-NMFRC	www.nmfrc.org
Printers' National Environmental Assistance Center	1-888-USPNEAC	www.pneac.org
CCAR-Greenlink (the Automotive Compliance Information Assistance Center)	1-888-GRN-LINK	www.ccar-greenlink.org
National Agriculture Compliance Assistance Center	1-888-663-2155	www.epa.gov/oeca/ag
Printed Wiring Board Resource Center	1-734-995-4911	www.pwbrc.org
ChemAlliance	1-800-672-6048	www.chemalliance.org
Transportation Environmental Resource Center	1-888-459-0656	www.transource.org
Paints and Coatings Resource Center	1-800-286-6372	www.paintcenter.org



7.4 If the Agency Discovers a Violation, What Might Be Its Response?

To maximize compliance, EPA implements a balanced program of compliance assistance, compliance incentives, and traditional law enforcement. EPA knows that small businesses which must comply with complicated new statutes or rules often want to do the right thing, but may lack the requisite knowledge, resources, or skills. Compliance assistance information and technical advice helps small businesses to understand and meet their environmental obligations. Compliance incentives, such as our Small Business Policy, encourage persons to voluntarily discover, disclose, and correct violations before they are identified by the government. EPA's strong law enforcement program protects all of us by targeting persons who neither comply nor cooperate to address their problems.



EPA uses a variety of methods to determine whether regulated entities are complying, including inspecting facilities, reviewing records and reports, and responding to citizen complaints. If we learn an entity is violating the law, EPA (or a State, if the program is delegated) may file an enforcement action seeking penalties of up to \$27,500, per violation, per day. While the statutory maximum penalty is currently \$27,500, it may be increased periodically based on inflation in accordance with the Debt Collection Improvement Act of 1996. The proposed penalty in a given case will depend on many factors, including the number, length, and severity of the violations, the economic benefit obtained by the violator, and its ability to pay. EPA has policies in place to ensure penalties are calculated fairly. These policies are available to the public. In addition, any company charged with a violation has the right to contest EPA's allegations and proposed penalty before an impartial judge or jury.

EPA recognizes that we can achieve the greatest possible protection by encouraging businesses and organizations to work with us to discover, disclose, and correct violations. That is why we have issued Audit, Small Business, and Small Community policies to eliminate or reduce penalties for small and large entities which cooperate with EPA to address compliance problems. To help the regulated community in understanding their requirements for compliance with the rule, EPA provides compliance assistance through its regional offices, Office of Enforcement and Compliance Assurance at Headquarters, and national compliance assistance centers partners.

ABBREVIATIONS:

BAT	Best Available Technology Economically Achievable (applies to non-conventional and toxic pollutants)
BCT	Best Conventional Pollutant Control Technology (applies to conventional pollutants)
BMP	Best Management Practice
BPJ	Best Professional Judgment
BPT	Best Practicable Control Technology Currently Available (generally applies to conventional pollutants and some metals)
CFR	Code of Federal Regulations
CGP	Construction General Permit
COD	Chemical Oxygen Demand
CSO	Combined Sewer Overflow
CWA	Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972)
CZARA	Coastal Zone Act Reauthorization Amendments
D.O.	Dissolved Oxygen
DMR	Discharge Monitoring Report
ELG	Effluent Limitations Guidelines
EPA	Environmental Protection Agency
FR	Federal Register
MEP	Maximum Extent Practicable
MS4	Municipal Separate Storm Sewer System
MSGP	Multi Sector General Permit
NOI	Notice of Intent
NOT	Notice of Termination
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NPS	Non-point Source
O&M	Operation and Maintenance
OW	Office of Water
OWM	Office of Wastewater Management
PA	Permitting Authority
POTW	Publicly Owned Treatment Works
SIC	Standard Industrial Classification
SWPPP	Storm Water Pollution Prevention Plan
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
UA	Urbanized Area

DEFINITIONS:

Best Available Treatment(BAT)/Best Control Technology (BCT): A level of technology based on the very best (state of the art) control and treatment measures that have been developed or are capable of being developed and that are economically achievable within the appropriate industrial category.

Best Management Practices (BMPs): Activities or structural improvements that help reduce the quantity and improve the quality of storm water runoff. BMPs include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Category (xi) facilities: Specific facilities classified as light industry with equipment or materials exposed to storm water.

Clean Water Act (Water Quality Act): (formerly the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972). Public law 92-500; 33 U.S.C. 1251 et seq.; legislation which provides statutory authority for the NPDES program. Also know as the Federal Water Pollution Control Act.

Conveyance: The process of water moving from one place to another.

Discharge: The volume of water (and suspended sediment if surface water) that passes a given location within a given period of time.

Erosion: When land is diminished or worn away due to wind, water, or glacial ice. Often the eroded debris (silt or sediment) becomes a pollutant via storm water runoff. Erosion occurs naturally but can be intensified by land clearing activities such as farming, development, road-building, and timber harvesting.

Excavation: The process of removing earth, stone, or other materials from land.

General Permit: A permit issued under the NPDES program to cover a certain class or category of storm water discharges. These permits reduce the administrative burden of permitting storm water discharges.

Grading: The cutting and/or filling of the land surface to a desired slope or elevation.

Illicit Connection: Any discharge to a municipal separate storm sewer that is not composed entirely of storm water and is not authorized by an NPDES permit, with some exceptions (e.g., discharges due to fire fighting activities).

Industrial Activity: Any activity which is directly related to manufacturing, processing or raw materials storage areas at an industrial plant.

Large Municipal Separate Storm Sewer System (MS4): An MS4 located in an incorporated place or county with a population of 250,000 or more, as determined by

the latest U.S. Census

Light Manufacturing Facilities: Described under Category (xi) of the definition of "storm water discharges associated with industrial activity." [40 CFR 122.26(b)(14)(xi)] Under the Phase I NPDES Storm Water Program, these facilities were eligible for exemption from storm water permitting requirements if certain areas and activities were not exposed to storm water. As a result of the Phase II Final Rule, these facilities must now certify to a condition of no exposure.

Maximum Extent Practicable (MEP): A standard for water quality that applies to all MS4 operators regulated under the NPDES Storm Water Program. Since no precise definition of MEP exists, it allows for maximum flexibility on the part of MS4 operators as they develop and implement their programs.

Medium Municipal Separate Storm Sewer System (MS4): MS4 located in an incorporated place or county with a population of 100,000 or more but less than 250,000, as determined by the latest U.S. Census.

Municipal Separate Storm Sewer System (MS4): A publically-owned conveyance or system of conveyances that discharges to waters of the U.S. and is designed or used for collecting or conveying storm water, is not a combined sewer, and is not part of a publicly-owned treatment works (POTW).

Multi-Sector General Permit (MSGP): An NPDES permit that regulates storm water discharges from eleven categories of industrial activities.

No exposure: All industrial materials or activities are protected by a storm resistant shelter to prevent exposure to rain, snow, snowmelt, and/or runoff. Industrial materials or activities include, but are not limited to, material handling equipment or activities, industrial machinery, raw materials, intermediate products, by-products, final products, or waste products. Material handling activities include the storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, final product or waste product.

Non-authorized States: any State that does not have the authority to regulate the NPDES Storm Water Program.

Non-point Source (NPS) Pollutants: Pollutants from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water.

Notice of Intent (NOI): An application to notify the permitting authority of a facility's intention to be covered by a general permit; exempts a facility from having to submit an individual or group application.

NPDES: "National Pollutant Discharge Elimination System" the name of the surface water quality program authorized by Congress as part of the 1987 Clean Water Act. This is EPA's program to control the discharge of pollutants to waters of the United States (see 40 CFR 122.2).

O&M Expenditures: The operating and maintenance costs associated with the continual workings of a project.

Outfall: The point where wastewater or drainage discharges from a sewer pipe, ditch, or other conveyance to a receiving body of water.

Permitting Authority (PA): The NPDES-authorized state agency or EPA regional office that administers the NPDES Storm Water Program. PAs issue permits, provide compliance assistance, and inspect and enforce the program.

Physically interconnected MS4: This means that one MS4 is connected to a second MS4 in such a way that it allows for direct discharges into the second system.

Point Source Pollutant: Pollutants from a single, identifiable source such as a factory or refinery.

Pollutant Loading: The total quantity of pollutants in storm water runoff.

Qualifying local program: A local, State or Tribal municipal storm water management program that imposes, at a minimum, the relevant requirements of one or more of the minimum control measures included in 122.34(b).

Regulated MS4: Any MS4 covered by the NPDES Storm Water Program (regulated small, medium, or large MS4s).

Retrofit: The modification of storm water management systems through the construction and/or enhancement of wet ponds, wetland plantings, or other BMPs designed to improve water quality

Runoff: Drainage or flood discharge that leaves an area as surface flow or as pipeline flow. Has reached a channel or pipeline by either surface or sub-surface routes.

Sanitary Sewer: A system of underground pipes that carries sanitary waste or process wastewater to a treatment plant.

Sediment: Soil, sand, and minerals washed from land into water, usually after rain. Sediment can destroy fish-nesting areas, clog animal habitats, and cloud waters so that sunlight does not reach aquatic plants.

Sheet flow: The portion of precipitation that moves initially as overland flow in very shallow depths before eventually reaching a stream channel.

Site Plan: A graphical representation of a layout of buildings and facilities on a parcel of land.

Site Runoff: Any drainage or flood discharge that is released from a specified area.

Small Municipal Separate Storm Sewer System (MS4): Any MS4 that is not regulated under Phase I of the NPDES Storm Water Program and Federally-owned MS4s.

Stakeholder: An entity that holds a special interest in an issue or program -- such as the storm water program -- since it is or may be affected by it.

Standard Industrial Classification (SIC) Code: A four digit number which is used to identify various types of industries.

Storm Drain: A slotted opening leading to an underground pipe or an open ditch for carrying surface runoff.

Storm Water: Precipitation that accumulates in natural and/or constructed storage and storm water systems during and immediately following a storm event.

Storm Water Management: Functions associated with planning, designing, constructing, maintaining, financing, and regulating the facilities (both constructed and natural) that collect, store, control, and/or convey storm water.

Storm Water Pollution Prevention Plan (SWPPP): A plan to describe a process whereby a facility thoroughly evaluates potential pollutant sources at a site and selects and implements appropriate measures designed to prevent or control the discharge of pollutants in storm water runoff.

Surface Water: Water that remains on the surface of the ground, including rivers, lakes, reservoirs, streams, wetlands, impoundments, seas, estuaries, etc.

Total Maximum Daily Load (TMDL): The maximum amount of pollutants which can be released into a water body without adversely affecting the water quality.

Tool Box: A term to describe the activities and materials that EPA plans to perform/produce to facilitate implementation of the storm water program in an effective and cost-efficient manner. The eight components include: 1) fact sheets; 2) guidance documents; 3) menu of BMPs; 4) compliance assistance; 5) information clearing house; 6) training and outreach efforts; 7) technical research; and 8) support for demonstration projects.

Urbanized Area (UA): A Bureau of the Census determination of a central place (or places) and the adjacent densely settled surrounding territory that together have a minimum residential population of 50,000 people and a minimum average density of 1,000 people/square mile. This is a simplified definition of a UA, the full definition is very complex.

Urban Runoff: Storm water from urban areas, which tends to contain heavy concentrations of pollutants from urban activities.

Watershed: That geographical area which drains to a specified point on a water course, usually a confluence of streams or rivers (also known as drainage area, catchment, or river basin).

Wet Weather Flows: Water entering storm drains during rainstorms/wet weather events.

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Region 10 (AK, ID, OR, WA)

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1200 Sixth Avenue
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References

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<http://www.epa.gov/owm/sw/phase2>

Storm Water Phase II Final Rule Fact Sheet Series, January 2000

A series of 15 fact sheets breaking the final rule into separate parts.

<http://www.epa.gov/owm/sw/phase2>

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Storm Water Phase II Final Rule

An Overview

Storm Water Phase II Final Rule Fact Sheet Series

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Why Is the Phase II Storm Water Program Necessary?

Since the passage of the Clean Water Act (CWA), the quality of our Nation's waters has improved dramatically. Despite this progress, however, degraded waterbodies still exist. According to the 1996 National Water Quality Inventory (Inventory), a biennial summary of State surveys of water quality, approximately 40 percent of surveyed U.S. waterbodies are still impaired by pollution and do not meet water quality standards. A leading source of this impairment is polluted runoff. In fact, according to the Inventory, 13 percent of impaired rivers, 21 percent of impaired lake acres and 45 percent of impaired estuaries are affected by urban/suburban storm water runoff and 6 percent of impaired rivers, 11 percent of impaired lake acres and 11 percent of impaired estuaries are affected by construction site discharges.

Phase I of the U.S. Environmental Protection Agency's (EPA) storm water program was promulgated in 1990 under the CWA. Phase I relies on National Pollutant Discharge Elimination System (NPDES) permit coverage to address storm water runoff from: (1) “medium” and “large” municipal separate storm sewer systems (MS4s) generally serving populations of 100,000 or greater, (2) construction activity disturbing 5 acres of land or greater, and (3) ten categories of industrial activity.

The Storm Water Phase II Final Rule is the next step in EPA's effort to preserve, protect, and improve the Nation's water resources from polluted storm water runoff. The Phase II program expands the Phase I program by requiring additional operators of MS4s in urbanized areas and operators of small construction sites, through the use of NPDES permits, to implement programs and practices to control polluted storm water runoff. See Fact Sheets 2.0 and 3.0 for overviews of the Phase II programs for MS4s and construction activity.

Phase II is intended to further reduce adverse impacts to water quality and aquatic habitat by instituting the use of controls on the unregulated sources of storm water discharges that have the greatest likelihood of causing continued environmental degradation. The environmental problems associated with discharges from MS4s in urbanized areas and discharges resulting from construction activity are outlined below.

MS4s in Urbanized Areas

Storm water discharges from MS4s in urbanized areas are a concern because of the high concentration of pollutants found in these discharges. Concentrated development in urbanized areas substantially increases impervious surfaces, such as city streets, driveways, parking lots, and sidewalks, on which pollutants from concentrated human activities settle and remain until a storm event washes them into nearby storm drains. Common pollutants include pesticides, fertilizers, oils, salt, litter and other debris, and sediment. Another concern is the possible illicit connections of sanitary sewers, which can result in fecal coliform bacteria entering the storm sewer system. Storm water runoff picks up and transports these and other harmful pollutants then discharges them – untreated – to waterways via storm sewer systems. When left uncontrolled, these discharges can result in fish kills, the destruction of spawning and wildlife habitats, a loss in aesthetic value, and contamination of drinking water supplies and recreational waterways that can threaten public health.

Construction Activity

Uncontrolled runoff from construction sites is a water quality concern because of the devastating effects that sedimentation can have on local waterbodies, particularly small streams. Numerous studies have shown that the amount of sediment transported by storm water runoff from construction sites with no controls is significantly greater than from sites with controls. In addition to sediment, construction activities yield pollutants such as pesticides, petroleum products, construction chemicals, solvents, asphalts, and acids that can contaminate storm water runoff. During storms, construction sites may be the source of sediment-laden runoff, which can overwhelm a small stream channel's capacity, resulting in streambed scour, streambank erosion, and destruction of near-stream vegetative cover. Where left uncontrolled, sediment-laden runoff has been shown to result in the loss of in-stream habitats for fish and other aquatic species, an increased difficulty in filtering drinking water, the loss of drinking water reservoir storage capacity, and negative impacts on the navigational capacity of waterways.

Are Municipally Operated Sources Exempted by the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 Affected by the Final Rule?

Provisions within ISTEA temporarily delayed the deadline for Phase I industrial activities (with the exception of power plants, airports, and uncontrolled sanitary landfills) operated by municipalities with populations of less than 100,000 people to obtain an NPDES storm water discharge permit. Congress delayed the permitting deadline for these facilities to allow small municipalities additional time to comply with NPDES requirements. The Phase II Final Rule ended this temporary exemption from permitting and set a deadline of no later than March 10, 2003 for all ISTEA-exempted municipally operated industrial activities to obtain permit coverage.

How Was the Phase II Final Rule Developed?

EPA developed the Phase II Final Rule during extensive consultations with a cross-section of interested stakeholders brought together on a subcommittee chartered under the Federal Advisory Committee Act, and with representatives of small entities participating in an advisory process mandated under the Small Business Regulatory Enforcement Fairness Act. In addition, EPA considered comments submitted by over 500 individuals and organizations during a 90-day public comment period on the proposed rule.

Why Does Part of the Phase II Final Rule Use a Question and Answer Format?

The provisions pertaining to operators of small MS4s are written in a “readable regulation” form that uses the “plain language” method. Questions and answers are used to create more reader-friendly and understandable regulations. The plain language method uses “must” instead of “shall” to indicate a requirement and words like “should,” “could,” or “encourage” to indicate a recommendation or guidance.

Who Is Covered by the Phase II Final Rule?

The final rule “automatically” covers two classes of storm water dischargers on a nationwide basis:

- (1) Operators of small MS4s located in “urbanized areas” as delineated by the Bureau of the Census. A “small” MS4 is any MS4 not already covered by Phase I of the NPDES storm water program. See Fact Sheets 2.1 and 2.2 for more information on small MS4 coverage.
- (2) Operators of small construction activities that disturb equal to or greater than 1 (one) and less than 5 (five) acres of land. See Fact Sheet 3.0 for more information on small construction activity coverage.

Waivers

Permitting authorities may waive “automatically designated” Phase II dischargers if the dischargers meet the necessary criteria. See Fact Sheets 2.1 (small MS4 waivers overview), 3.0 (construction waivers overview) and 3.1 (construction rainfall erosivity waiver) for details.

Phased-in Permit Coverage

Permitting authorities may phase-in permit coverage for small MS4s serving jurisdictions with a population under 10,000 on a schedule consistent with a State watershed permitting approach.

Additional Designations by the Permitting Authority

Small MS4s located outside of urbanized areas, construction activity disturbing less than 1 acre, and any other storm water discharges can be designated for coverage if the NPDES permitting authority or EPA determines that storm water controls are necessary. See Fact Sheet 2.1 for more information on the designation of small MS4s located outside of urbanized areas.

What Does the Phase II Final Rule Require?

Operators of Phase II-designated small MS4s and small construction activity are required to apply for NPDES permit coverage, most likely under a general rather than individual permit, and to implement storm water discharge management controls (known as “best management practices” (BMPs)). Specific requirements for each type of discharge are listed below.

Small MS4s

- A regulated small MS4 operator must develop, implement, and enforce a storm water management program designed to reduce the discharge of pollutants from their MS4 to the “maximum extent practicable,” to protect water quality, and to satisfy the appropriate water quality requirements of the CWA. The rule assumes the use of narrative, rather than numeric, effluent limitations requiring implementation of BMPs.
- The small MS4 storm water management program must include the following six minimum control measures: public education and outreach; public participation/involvement; illicit discharge detection and elimination; construction site runoff control; post-construction runoff control; and pollution prevention/good housekeeping. See Fact Sheets 2.3 through 2.8 for more information on each measure, including BMPs and measurable goals.
- A regulated small MS4 operator must identify its selection of BMPs and measurable goals for each minimum measure in the permit application. The evaluation and assessment of those chosen BMPs and measurable goals must be included in periodic reports to the NPDES permitting authority. See Fact Sheet 2.9 for more information on permitting and reporting.

Small Construction Activity

- The specific requirements for storm water controls on small construction activity will be defined by the NPDES permitting authority on a State-by-State basis.
- EPA expects that the NPDES permitting authorities will use their existing Phase I general permits for large construction activity as a guide for their Phase II permits for small construction activity. If

this occurs, a storm water pollution prevention plan will likely be required for small construction activity. See Fact Sheet 3.0 for more information on potential program requirements and appropriate BMPs for small construction activity.

What Is the Phase II Program Approach?

The Phase II program, based on the use of federally enforceable NPDES permits:

- Encourages the use of general permits;
- Provides flexibility for regulated operators to determine the most appropriate storm water controls;
- Allows for the recognition and inclusion of existing NPDES and non-NPDES storm water programs in Phase II permits;
- Includes public education and participation efforts as primary elements of the small MS4 program;
- Attempts to facilitate and promote watershed planning and to implement the storm water program on a watershed basis; and
- Works toward a unified and comprehensive NPDES storm water program with Phase I of the program.

How Does the Phase II Final Rule Address the Phase I Industrial “No Exposure” Provision?

In addition to establishing a deadline for ISTEAs and designating two new classes of dischargers, the Phase II Final Rule revises the “no exposure” provision originally included in the 1990 regulations for Phase I of the NPDES storm water program. The provision was remanded to EPA for further rulemaking and, subsequently, included in its revised form in the Phase II rule.

Under the Phase II Final Rule, a conditional no exposure exclusion is available to operators of *all* categories of Phase I regulated industrial activity (except category (x) construction activity) who can certify that all industrial materials and activities are protected by a storm resistant shelter to prevent exposure to rain, snow, snowmelt, and/or runoff. To obtain the no exposure exclusion, written certification must be submitted to the NPDES permitting authority. The final rule includes a *No Exposure Certification* form for use only by operators of industrial activity in areas where EPA is the NPDES permitting authority. See Fact Sheet 4.0 for more information on the conditional no exposure exclusion for industrial activity.

What Is the Phase II Program Implementation “Tool Box?”

EPA is committed to providing tools to facilitate implementation of the final Phase II storm water program in an effective and cost-efficient manner. The “tool box” will include the following components:

- ⇒ Fact Sheets;
- ⇒ Guidance Documents;
- ⇒ Menu of BMPs;
- ⇒ Information Clearinghouse/Web Site;
- ⇒ Training and Outreach Efforts;
- ⇒ Technical Research;
- ⇒ Support for Demonstration Projects; and
- ⇒ Compliance Monitoring/Assistance Tools.

A preliminary working toolbox is available on EPA’s web site at www.epa.gov/owm/sw/toolbox. Three years after publication of the final rule, when the general permits are issued, a fully operational tool box is scheduled to be available.

What Is the Schedule for the Phase II Rule?

- The Phase II Final Rule was published in the *Federal Register* on December 8, 1999 (64 *FR* 68722).
- The Conditional No Exposure Exclusion option is available February 7, 2000, in States where EPA is the permitting authority.
- The NPDES permitting authority will issue general permits for Phase II-designated small MS4s and small construction activity by December 9, 2002.
- Operators of Phase II “automatically” designated regulated small MS4s and small construction activity must obtain permit coverage within 90 days of permit issuance.
- The NPDES permitting authority may phase-in coverage for small MS4s serving jurisdictions with a population under 10,000 on a schedule consistent with a State watershed permitting approach.
- Operators of regulated small MS4s must fully implement their storm water management programs by the end of the first permit term, typically a 5-year period.

For Additional Information

Contacts

- ☞ U.S. EPA Office of Wastewater Management
 - Internet: www.epa.gov/npdes/stormwater
 - Phone: 202-564-9545
- ☞ Your NPDES Permitting Authority. A list of names and telephone numbers for each EPA Region and State is located at: www.epa.gov/npdes/stormwater, then click on "Contacts."

Reference Documents

- ☞ Storm Water Phase II Final Rule Fact Sheet Series
 - Internet: cfpub.epa.gov/npdes/stormwater/swfinal.cfm
- ☞ Storm Water Phase II Final Rule (64 *FR* 68722)
 - Internet: www.epa.gov/npdes/regulations/phase2.pdf



Storm Water Phase II Final Rule

Small MS4 Storm Water Program Overview

Storm Water Phase II Final Rule Fact Sheet Series

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Industrial "No Exposure"

4.0 – Conditional No Exposure Exclusion for Industrial Activity

Polluted storm water runoff is often transported to municipal separate storm sewer systems (MS4s) and ultimately discharged into local rivers and streams without treatment. EPA's Storm Water Phase II Rule establishes an MS4 storm water management program that is intended to improve the Nation's waterways by reducing the quantity of pollutants that storm water picks up and carries into storm sewer systems during storm events. Common pollutants include oil and grease from roadways, pesticides from lawns, sediment from construction sites, and carelessly discarded trash, such as cigarette butts, paper wrappers, and plastic bottles. When deposited into nearby waterways through MS4 discharges, these pollutants can impair the waterways, thereby discouraging recreational use of the resource, contaminating drinking water supplies, and interfering with the habitat for fish, other aquatic organisms, and wildlife.

In 1990, EPA promulgated rules establishing Phase I of the National Pollutant Discharge Elimination System (NPDES) storm water program. The Phase I program for MS4s requires operators of "medium" and "large" MS4s, that is, those that generally serve populations of 100,000 or greater, to implement a storm water management program as a means to control polluted discharges from these MS4s. The Storm Water Phase II Rule extends coverage of the NPDES storm water program to certain "small" MS4s but takes a slightly different approach to how the storm water management program is developed and implemented.

What Is a Phase II Small MS4?

A small MS4 is any MS4 not already covered by the Phase I program as a medium or large MS4. The Phase II Rule automatically covers on a nationwide basis all small MS4s located in "urbanized areas" (UAs) as defined by the Bureau of the Census (unless waived by the NPDES permitting authority), and on a case-by-case basis those small MS4s located outside of UAs that the NPDES permitting authority designates. For more information on Phase II small MS4 coverage, see Fact Sheets 2.1 and 2.2.

What Are the Phase II Small MS4 Program Requirements?

Operators of regulated small MS4s are required to design their programs to:

- Reduce the discharge of pollutants to the "maximum extent practicable" (MEP);
- Protect water quality; and
- Satisfy the appropriate water quality requirements of the Clean Water Act.

Implementation of the MEP standard will typically require the development and implementation of BMPs and the achievement of measurable goals to satisfy each of the six minimum control measures.

The Phase II Rule defines a small MS4 storm water management program as a program comprising six elements that, when implemented in concert, are expected to result in significant reductions of pollutants discharged into receiving waterbodies.

The six MS4 program elements, termed “minimum control measures,” are outlined below. For more information on each of these required control measures, see Fact Sheets 2.3 – 2.8.

- ① **Public Education and Outreach**
Distributing educational materials and performing outreach to inform citizens about the impacts polluted storm water runoff discharges can have on water quality.
- ② **Public Participation/Involvement**
Providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives on a storm water management panel.
- ③ **Illicit Discharge Detection and Elimination**
Developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system (includes developing a system map and informing the community about hazards associated with illegal discharges and improper disposal of waste).
- ④ **Construction Site Runoff Control**
Developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb 1 or more acres of land (controls could include silt fences and temporary storm water detention ponds).
- ⑤ **Post-Construction Runoff Control**
Developing, implementing, and enforcing a program to address discharges of post-construction storm water runoff from new development and redevelopment areas. Applicable controls could include preventative actions such as protecting sensitive areas (e.g., wetlands) or the use of structural BMPs such as grassed swales or porous pavement.
- ⑥ **Pollution Prevention/Good Housekeeping**
Developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations. The program must include municipal staff training on pollution prevention measures and techniques (e.g., regular street sweeping, reduction in the use of pesticides or street salt, or frequent catch-basin cleaning).

What Information Must the NPDES Permit Application Include?

The Phase II program for MS4s is designed to accommodate a general permit approach using a Notice of Intent (NOI) as the permit application. The operator of a regulated small MS4 must include in its permit application,

or NOI, its chosen BMPs and measurable goals for each minimum control measure. To help permittees identify the most appropriate BMPs for their programs, EPA will issue a “menu,” of BMPs to serve as guidance. NPDES permitting authorities can modify the EPA menu or develop their own list. For more information on application requirements, see Fact Sheet 2.9.

What Are the Implementation Options?

The rule identifies a number of implementation options for regulated small MS4 operators. These include sharing responsibility for program development with a nearby regulated small MS4, taking advantage of existing local or State programs, or participating in the implementation of an existing Phase I MS4's storm water program as a co-permittee. These options are intended to promote a regional approach to storm water management coordinated on a watershed basis.

What Kind of Program Evaluation/Assessment Is Required?

Permittees need to evaluate the effectiveness of their chosen BMPs to determine whether the BMPs are reducing the discharge of pollutants from their systems to the “maximum extent practicable” and to determine if the BMP mix is satisfying the water quality requirements of the Clean Water Act. Permittees also are required to assess their progress in achieving their program’s measurable goals. While monitoring is not required under the rule, the NPDES permitting authority has the discretion to require monitoring if deemed necessary. If there is an indication of a need for improved controls, permittees can revise their mix of BMPs to create a more effective program. For more information on program evaluation/assessment, see Fact Sheet 2.9.

For Additional Information

Contact

- ☞ U.S. EPA Office of Wastewater Management
 - Internet: www.epa.gov/npdes/stormwater
 - Phone: 202-564-9545

Reference Documents

- ☞ Storm Water Phase II Final Rule Fact Sheet Series
 - Internet: cfpub.epa.gov/npdes/stormwater/swfinal.cfm
- ☞ Storm Water Phase II Final Rule (64 FR 68722)
 - Internet: www.epa.gov/npdes/regulations/phase2.pdf



Storm Water Phase II Final Rule

Who's Covered? Designation and Waivers of Regulated Small MS4s

Storm Water Phase II Final Rule Fact Sheet Series

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Who Is Affected by the Phase II Small MS4 Program?

The Storm Water Phase II Final Rule applies to operators of *regulated small* municipal separate storm sewer systems (MS4s), which are designated based on the criteria discussed in this fact sheet. In this fact sheet, the definition of an MS4 and the distinction between small, medium, and large MS4s is reviewed. Conditions under which a small MS4 may be designated as a *regulated small MS4*, as well as the conditions for a waiver from the Phase II program requirements, are outlined. This fact sheet also attempts to clarify possible implementation issues related to determining one's status as an operator of a regulated small MS4.

What Is a Municipal Separate Storm Sewer System (MS4)?

What constitutes an MS4 is often misinterpreted and misunderstood. The term MS4 does not solely refer to municipally-owned storm sewer systems, but rather is a term of art with a much broader application that can include, in addition to local jurisdictions, State departments of transportation, universities, local sewer districts, hospitals, military bases, and prisons. An MS4 also is not always just a system of underground pipes – it can include roads with drainage systems, gutters, and ditches. The regulatory definition of an MS4 is provided below.

According to 40 CFR 122.26(b)(8), "*municipal separate storm sewer* means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

- (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law)...including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges into waters of the United States.
- (ii) Designed or used for collecting or conveying storm water;
- (iii) Which is not a combined sewer; and
- (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2."

What Is a Small, Medium, or Large MS4?

- ❑ EPA’s NPDES (National Pollutant Discharge Elimination System) storm water permitting program labels MS4s as either “small,” “medium,” or “large” for the purposes of regulation.
- ❑ A **small MS4** is any MS4 that is not already covered by the Phase I storm water program. Small MS4s include Federally-owned systems, such as military bases.
- ❑ The Phase I storm water program covers *medium* and *large* MS4s. Phase I MS4s were automatically designated nationwide as **medium MS4s** if they were located in an incorporated place or county with a population between 100,000 - 249,999 or as **large MS4s** if located in an incorporated place or county with a population of 250,000 or greater. Many MS4s in areas below 100,000 in population, however, have been individually brought into the Phase I program by NPDES permitting authorities. Such already regulated MS4s do not have to develop a Phase II program.

Are All Small MS4s Covered by the Phase II Final Rule?

No. The universe of small MS4s is quite large since it includes every MS4 except for the approximately 900 medium and large MS4s already regulated under the Phase I storm water program. Only a select sub-set of small MS4s, referred to as **regulated small MS4s**, is covered by the Phase II Final Rule, either through automatic nationwide designation or designation on a case-by-case basis by the NPDES permitting authority.

How Is A Small MS4 Designated as a Regulated Small MS4?

A small MS4 can be designated by the permitting authority as a **regulated** small MS4 in one of three ways:

① Automatic Nationwide Designation

The Phase II Final Rule requires nationwide coverage of all operators of small MS4s that are located within the boundaries of a Bureau of the Census-defined “urbanized area” (UA) based on the latest decennial Census. Once a small MS4 is designated into the program based on the UA boundaries, it cannot be waived from the program if in a subsequent UA calculation the small MS4 is no longer within the UA boundaries. An automatically designated small MS4 remains regulated unless, or until, it meets the criteria for a waiver.

❑ **Urbanized Areas**

An **urbanized area (UA)** is a land area comprising one or more places – central place(s) – and the adjacent densely settled surrounding area – urban fringe – that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile. It is a calculation used by the Bureau of the Census to determine the geographic boundaries of the most heavily developed and dense urban areas.

Before the time of permit issuance (which must be by December 9, 2002), UA calculations based on the 2000 Census should be published. The regulated universe then will be based on these new calculations. For more information on UAs, see Fact Sheet 2.2.

❑ **Preamble of the Phase II Final Rule: Appendix 6**

A listing of governmental entities that are located either fully or partially within a UA according to the 1990 Census can be found in Appendix 6 to the Preamble. The list is a general geographic reference intended to help operators of small MS4s determine whether or not they are located in a UA and, consequently, required to comply with the regulation; it is not a list of all Phase II regulated MS4s. For example, the list does not include small MS4 operators such as colleges and universities, Federal prison complexes, and State highway departments located within a UA. See Fact Sheet 2.2 for more information on how to determine potential coverage under the Phase II program. Appendix 6 can be obtained from the EPA Office of Wastewater Management (OWM) or downloaded from the OWM web site.

② Potential Designation by the NPDES Permitting Authority – Required Evaluation

An operator of small MS4 located outside of a UA may be designated as a regulated small MS4 if the NPDES permitting authority determines that its discharges cause, or have the potential to cause, an adverse impact on water quality. The Phase II Final Rule requires the NPDES permitting authority to develop a set of designation criteria and apply them, *at a minimum*, to all small MS4s located outside of a UA serving a jurisdiction with a population of at least 10,000 and a population density of at least 1,000 people/square mile.

❑ **Designation Criteria**

EPA recommends that the NPDES permitting authority use a balanced consideration of the following designation criteria on a watershed or other local basis:

- ✓ Discharge to sensitive waters;
- ✓ High population density;
- ✓ High growth or growth potential;
- ✓ Contiguity to a UA;
- ✓ Significant contributor of pollutants to waters of the United States; and
- ✓ Ineffective protection of water quality concerns by other programs.

❑ **Preamble of the Phase II Final Rule: Appendix 7**

A listing of governmental entities located outside of a UA, that have a population of at least 10,000 and a population density of at least 1,000 people per square mile can be found in Appendix 7 to the Preamble of the Phase II Final Rule. Similar to Appendix 6, the list is a geographic reference only – it is not a list of regulated entities. Operators of small MS4s located within a listed area could be examined by their NPDES permitting authority for potential designation into the Phase II program. Furthermore, the NPDES permitting authority reserves the right to designate for regulation any small MS4 that is contributing pollutants to waters of the United States, whether or not its jurisdiction is found in Appendix 7. Appendix 7 can be obtained from the EPA Office of Wastewater Management or downloaded from the OWM web site.

❑ **Deadline for Designation**

The NPDES permitting authority is required to designate small MS4s meeting the designation criteria by December 9, 2002 or by December 8, 2004 if a watershed plan is in place.

③ **Potential Designation by the NPDES Permitting Authority – Physically Interconnected**

Under the final rule, the NPDES permitting authority is required to designate any small MS4 located outside of a UA that contributes substantially to the pollutant loadings of a *physically interconnected* MS4 regulated by the NPDES storm water program. The final rule does not set a deadline for designation of small MS4s meeting this criterion.

Physically interconnected means that one MS4 is connected to a second MS4 in such a way that it allows for *direct* discharges into the second system.

Are Waivers from the Phase II Permit/Program Requirements Possible?

Yes, two waiver options are available to operators of automatically designated small MS4s if discharges do not cause, or have the potential to cause, water quality impairment.

The first applies where:

- (1) the jurisdiction served by the system is less than 1,000 people;
- (2) the system is not contributing substantially to the pollutant loadings of a physically interconnected regulated MS4; and
- (3) if the small MS4 discharges any pollutants identified as a cause of impairment of any water body to which it discharges, storm water controls are not needed based on wasteload allocations that are part of an EPA approved or established “total maximum daily load” (TMDL) that addresses the pollutant(s) of concern.

TMDLs are water quality assessments that determine the source or sources of pollutants of concern for a particular waterbody, consider the maximum amount of pollutants the waterbody can assimilate, and then allocate to each source a set level of pollutants that it is allowed to discharge (i.e., a “wasteload allocation”). Small MS4s that are not given a wasteload allocation would meet the third criterion above.

Pollutants of Concern include biochemical oxygen demand (BOD), sediment or a parameter that addresses sediment (such as total suspended solids, turbidity or siltation), pathogens, oil and grease, and any pollutant that has been identified as a cause of impairment in any water body to which the MS4 discharges.

The second applies where:

- (1) the jurisdiction served by the system is less than 10,000 people;
- (2) an evaluation of all waters of the U.S. that receive a discharge from the system shows that storm water controls are not needed based on wasteload allocations that are part of an EPA approved or established TMDL that addresses the pollutant(s) of concern or an equivalent analysis; and
- (3) it is determined that future discharges from the small MS4 do not have the potential to result in exceedances of water quality standards.

The NPDES permitting authority is required to periodically review any waivers granted to MS4 operators to determine whether any information required for granting the waiver has changed. Minimally, such a review needs to be conducted once every five years.

Are There Allowances for Phasing-in Permit Coverage?

Yes. Small MS4s serving a jurisdiction with a population under 10,000 can be phased-in for permit coverage, following establishment of a State watershed permitting approach. NPDES permitting authorities that choose this option must establish a schedule to phase-in permit coverage annually for approximately 20 percent of all small MS4s that qualify for such phased-in coverage. Where this option is followed, all regulated small MS4s are required to have permit coverage no later than March 8, 2007.

Can More than One MS4 in the Same Political Jurisdiction Be Automatically Designated?

Yes. Since the final rule provides automatic coverage of all small MS4s within a UA, the result would likely be coverage of several governments and agencies with multiple, perhaps overlapping, jurisdictions. For example, a city that is located within a UA and operates its own small MS4 could be designated alongside the State’s department of transportation (DOT) and the county’s DOT if the State and county operate roads that are within the borders of the city. All three entities would be responsible for developing a storm water management program for the portion of their respective MS4s within the city limits. In such a case, the permittees are strongly encouraged to work together to form a unified storm water management program.

Who Is Responsible if the Small MS4 Operator Lacks the Necessary Legal Authority?

Some regulated small MS4s may lack the necessary legal authority to implement one or more of the required minimum control measures that comprise the Phase II storm water management program. For example, a local government that is a small MS4 operator may be in a State that does not have an enabling statute that allows local regulatory control of construction site runoff into the sewer system. Another example is a State DOT that may not have the legal authority to require and enforce controls on illicit discharges into its system. In these situations the small MS4 is encouraged to work with the neighboring regulated small MS4s. As co-permittees, they could form a shared storm water management program in which each permittee is responsible for activities that are within their individual legal authorities and abilities.

For Additional Information

Contact

- ☞ U.S. EPA Office of Wastewater Management
 - Phone: 202 260-5816
 - E-mail: SW2@epa.gov
 - Internet: www.epa.gov/owm/sw/phase2

Reference Documents

- ☞ Storm Water Phase II Final Rule Fact Sheet Series
 - Internet: www.epa.gov/owm/sw/phase2
- ☞ Storm Water Phase II Final Rule (64 FR 68722)
 - Internet: www.epa.gov/owm/sw/phase2
 - Contact the U.S. EPA Water Resource Center
 - Phone: 202 260-7786
 - E-mail: center.water-resource@epa.gov



Storm Water Phase II Final Rule

Federal and State-Operated MS4s: Program Implementation

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Industrial "No Exposure"

4.0 – Conditional No Exposure Exclusion for Industrial Activity

The program for small municipal separate storm sewer systems (MS4s) under the Storm Water Phase II Final Rule includes, in addition to local government jurisdictions, certain Federal and State-operated small MS4s. Federal facilities were not designated for regulation by the NPDES Phase I storm water program for MS4s. The Phase II Final Rule, however, includes the "United States" in the definition of a small MS4, thereby including Federal MS4 operators in the NPDES Phase II storm water program. Federal and State-operated small MS4s can include universities, prisons, hospitals, roads (i.e., departments of transportation), military bases (e.g., State Army National Guard barracks), parks, and office buildings/complexes.

The small MS4 program, largely designed with municipally-operated small MS4s in mind, raises a number of implementation issues for Federal and State operators of regulated small MS4s who must obtain an NPDES permit that requires the development and implementation of a storm water management program that includes the following six minimum control measures: public education and outreach, public participation/involvement, illicit discharge detection and elimination, construction site runoff control, post-construction runoff control, and good housekeeping/pollution prevention for municipal operations (for more information on each measure, see Fact Sheets 2.3 through 2.8). This fact sheet highlights potential implementation issues related to the minimum control measures, then discusses the implementation options included in the rule that may resolve these issues.

What Are Some Implementation Concerns?

This section profiles the three most common implementation issues raised in the public comments submitted regarding Federal/State implementation of the small MS4 program.

How Does the Final Rule Account for Unique Characteristics?

Federal and State small MS4s possess a number of characteristics that set them apart from their municipal counterparts. For example, whereas municipally-operated MS4s largely serve resident populations, many Federal or State-operated MS4s, such as medical clinics and departments of transportation (DOTs), do not. Other types of Federal and State MS4s, such as military bases, prisons, and State universities, serve populations that are different from a typical municipal population. Their unique characteristics might lead Federal or State MS4 operators to question either the need to implement the entire suite of minimum control measures or their ability to comply fully with their Phase II storm water permit. Responsibility for developing a storm water program that comprises the minimum measures lies with the operator of the Federal or State MS4.

What If the Operator Lacks Legal Authority?

Three of the minimum control measures (illicit discharge detection and elimination, and the two construction-related measures) require enforceable controls on third party activities to ensure successful implementation of the measure. Some Federal and State operators, however, may not have the necessary legal regulatory authority to adopt these enforceable controls in the same manner as do local governments.

For example, a State DOT that is responsible for the portions of its roads running through urbanized areas may not have the legal authority to impose restrictions on, and penalties against, illicit (i.e., non-storm water) discharges into its MS4 if the source of the discharge is outside the DOT's right-of-way or jurisdiction. As in the case of local governments that lack such authority, State and Federal MS4s are expected to utilize the authority they do possess and to seek cooperative arrangements.

How Can the Program Be Implemented in Areas Where There Are Multiple Regulated Entities?

Since the final rule provides automatic coverage of all small MS4s within an urbanized area, regardless of political boundaries, coverage of multiple governments and agencies in a single area is likely. For example, a city government that operates a small MS4 within an urbanized area must obtain permit coverage alongside the county, State, and Federal DOTs if they all operate a portion of the roads (i.e., MS4s) in the city. All four entities are responsible for developing a storm water management program for their MS4s (or portions thereof) within the urbanized area. EPA encourages State and Federal small MS4 operators to establish cooperative agreements with cities and counties in implementing their storm water programs.

Are There Implementation Strategies that Help Facilitate Program Implementation?

This section offers two hypothetical strategies for resolving the implementation issues raised above. The best solution may include a creative combination of strategies.

STRATEGY #1

A Focus on Choosing Appropriate BMPs

The final rule requires the permittee to choose *appropriate* best management practices (BMPs) for each minimum control measure. In other words, EPA expects Phase II permittees to tailor their storm water management plans and their BMPs to fit the particular characteristics and needs of the permittee and the area served by its MS4. Therefore, the Federal or State operator of a regulated storm sewer system can take advantage of the flexibility provided by the rule to utilize the most suitable minimum control measures for its MS4. Below is an example of tailored activities and BMPs that Federal or State operators can implement for each measure:

- ❑ **Public Education and Outreach.** Distribute brochures and post fliers to educate employees of a Federal hospital about the problems associated with storm water runoff and the steps they can take to

reduce pollutants in storm water discharges. For example, employees could be advised against carelessly discarding trash on the ground or allowing their cars to leak oil/fluids in the parking lot.

- ❑ **Public Participation/Involvement.** Provide notice of storm water management plan development and hold meetings at which employees of a Federal office complex are encouraged to voice their ideas and opinions about the effort. Request volunteers to help develop the plan.
- ❑ **Illicit Discharge Detection and Elimination.** Develop a map of the storm sewer system on a military base. Perform visual dry weather monitoring of any outfalls to determine whether the storm sewer system is receiving any non-storm water discharges from the base. If a dry weather flow is found, trace it back to the source and stop the discharge. Should a Federal military base identify an illicit discharge, the source of which is traced to the boundary of its system, the Federal operator should refer the discharge to the adjoining regulated MS4 for further action.
- ❑ **Construction Site Runoff Control.** Require the implementation of erosion and sediment controls, and control of waste, for any Federal or State DOT road construction. The DOT would review site plans for proper controls, perform inspections, and establish penalties in the construction contract if controls are not implemented. If construction is done directly by the regulated DOT instead of a private contractor, the DOT could be penalized by the NPDES permitting authority for non-compliance with its small MS4 permit in the event that controls are not properly implemented.
- ❑ **Post-Construction Runoff Control.** Require the implementation of post-construction storm water controls for any new construction on the grounds of a prison. This can be required as part of a construction contract, instituted as internal policy, and considered during site plan review.
- ❑ **Pollution Prevention/Good Housekeeping for Municipal Operations.** Train maintenance staff at a State university to employ pollution prevention techniques whenever possible. For example, routinely pick up trash/litter from the university grounds, use less salt on the parking lots and access roads in the winter, perform any maintenance of university vehicles under shelter only, limit pesticide use to the minimum needed, use vegetative buffer strips in the parking lots to filter runoff, and keep dumpster lids closed.

STRATEGY #2

Working with Other Entities

There may be instances when the Federal or State permittee has limited capabilities to satisfy one or more of the minimum control measures. As discussed above, the permittee may lack the proper legal authority to enforce controls (although it should try to obtain the necessary legal authority if at all possible).

In the case of limited capabilities, the permittee can work with neighboring operators of regulated small MS4s, preferably on a watershed basis, to form a shared storm water management program in which each permittee is responsible for activities that are within individual legal authorities and abilities. The final rule allows the permittee to rely on other entities, with their permission, to implement those minimum measures that the permittee is otherwise unable to implement. Three examples are:

- ❑ A State DOT with limited regulatory legal authority can reference a local sewer district's illicit detection and elimination program in its permit application, provided the program sufficiently addresses illicit discharges into the DOT's storm sewer system.
- ❑ The permittee or NPDES permitting authority can reference such programs as coastal nonpoint pollution control programs, State or local watershed programs, State or local construction programs, and environmental education efforts by public or private entities.
- ❑ The permittee can become a co-permittee with a neighboring Phase I MS4 through a modification of the Phase I MS4's individual permit. This may be the most logical and preferable option for those Federal and State entities located in close proximity to Phase I MS4s.

Choosing to work with other governmental entities as a co-permittee, or referencing parts of each other's plans, can help resolve issues that may arise where multiple regulated jurisdictions exist in the same area. Permittees can avoid duplicative efforts, as well as territorial or regulatory disputes, by working together to implement the storm water program. See Fact Sheet 2.9 for more information on permitting options for regulated small MS4s.

Suggested Steps for Working with Other Entities

- (1) Identify the boundaries of the urbanized area (see Fact Sheet 2.2 for more information on urbanized areas)
- (2) Identify the operators of storm sewer systems or portions of the systems within the urbanized area such as local, State, Tribal or Federal governments or other entities.
- (3) In seeking permit coverage:
 - (A) Identify where another entity's program may satisfy one or more minimum control measure. If a program has requirements that are equivalent to a minimum control measure's required elements, the operator of the regulated small MS4 may reference the program in its permit application, provided the other entity gives it permission to do so. While such an arrangement relieves the operator from performing the minimum measure itself, the operator remains ultimately responsible for the measure's effective implementation (see Fact Sheet 2.9 for more information on this option)

OR

- (B) Team with an operator of a Phase I MS4 and become a co-permittee on its existing Phase I individual permit (see Fact Sheet 2.9 for more information on this option)

For Additional Information

Contact

- ☞ U.S. EPA Office of Wastewater Management
 - Phone: 202 260-5816
 - E-mail: SW2@epa.gov
 - Internet: www.epa.gov/owm/sw/phase2

Reference Documents

- ☞ Storm Water Phase II Final Rule Fact Sheet Series
 - Internet: www.epa.gov/owm/sw/phase2
- ☞ Storm Water Phase II Final Rule (64 FR 68722)
 - Internet: www.epa.gov/owm/sw/phase2
 - Contact the U.S. EPA Water Resource Center
 - Phone: 202 260-7786
 - E-mail: center.water-resource@epa.gov



Storm Water Phase II Final Rule

Urbanized Areas: Definition and Description

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3.0 – Construction Program Overview

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Industrial "No Exposure"

4.0 – Conditional No Exposure Exclusion for Industrial Activity

As discussed in Fact Sheet 2.1, *Who's Covered? Designation and Waivers of Regulated Small MS4s*, the Phase II Final Rule covers all small municipal separate storm sewer systems (MS4s) located within an "urbanized area" (UA). Based on the 1990 Census, there are 405 UAs in the United States that cover 2 percent of total U.S. land area and contain approximately 63 percent of the Nation's population. These numbers include Puerto Rico — the only U.S. Territory with UAs.

UAs constitute the largest and most dense areas of settlement. UA calculations delineate boundaries around these dense areas of settlement and, in doing so, identify the areas of concentrated development. UA designations are used for several purposes in both the public and private sectors. For example, the Federal Government has used UAs to calculate allocations for transportation funding, and some planning agencies and development firms use UA boundaries to help ascertain current, and predict future, growth areas.

What Is an Urbanized Area (UA)?

The Bureau of the Census determines UAs by applying a detailed set of published UA criteria (see 55 *FR* 42592, October 22, 1990) to the latest decennial census data. Although the full UA definition is complex, the Bureau of the Census' general definition of a UA, based on population and population density, is provided below.

An *urbanized area* is a land area comprising one or more places — central place(s) — and the adjacent densely settled surrounding area — urban fringe — that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile.

The basic unit for delineating the UA boundary is the census block. Census blocks are based on visible physical boundaries, such as the city block, when possible, or on invisible political boundaries, when not. An urbanized area can comprise places, counties, Federal Indian Reservations, and minor civil divisions (MCDs - towns and townships).

How Can Status as a Regulated Small MS4 Be Determined?

The drawing below (see Figure 1) is a simplified UA illustration that demonstrates the concept of UAs in relation to the Phase II Final Rule. The "urbanized area" includes within its boundaries incorporated places, a portion of a Federal Indian reservation, an entire MCD, a portion of another MCD, and portions of two counties. Any and all operators of small MS4s located within the boundaries of the UA are covered under the Phase II Final Rule, regardless of political boundaries. Operators of small MS4s located outside of the UA are subject to potential designation into the Phase II MS4 program by the NPDES permitting authority.

Operators of small MS4s can determine if they are located within a UA, and therefore covered by the Phase II storm water program, through the following two steps:

— **STEP 1** —

Refer to a listing of incorporated places, MCDs, and counties that are located entirely or partially within a UA. Such a listing, based on the 1990 Census, can be found in Appendix 6 to the Preamble of the Phase II Final Rule; it does not include governmental entities already permitted under Phase I. If a small MS4 is located in a listed incorporated place, MCD, or county, then the operator of the small MS4 should follow step (2) below. (Note: Appendix 6 can be obtained from the EPA Office of Wastewater Management (OWM) or downloaded from the OWM web site.)

— **STEP 2** —

Some operators of small MS4s may find that they are located within an entity listed in Appendix 6 but not know if their systems are within the urbanized portion of the listed entity. In such a case, they should contact one or more of the following institutions for more detailed information on the location of the UA boundary:

- ❑ **The State or NPDES Permitting Authority (may be the State or the U.S. EPA Region)**

Storm Water Coordinators: The NPDES permitting authority may be the State or the U.S. EPA Region. The Storm Water Coordinators for each U.S. EPA Region are listed in the *For Additional Information* section in Fact Sheet 2.9. These regional contacts can assist with UA information and provide the names of State storm water contacts. Regional and State contact information can also be obtained from OWM.

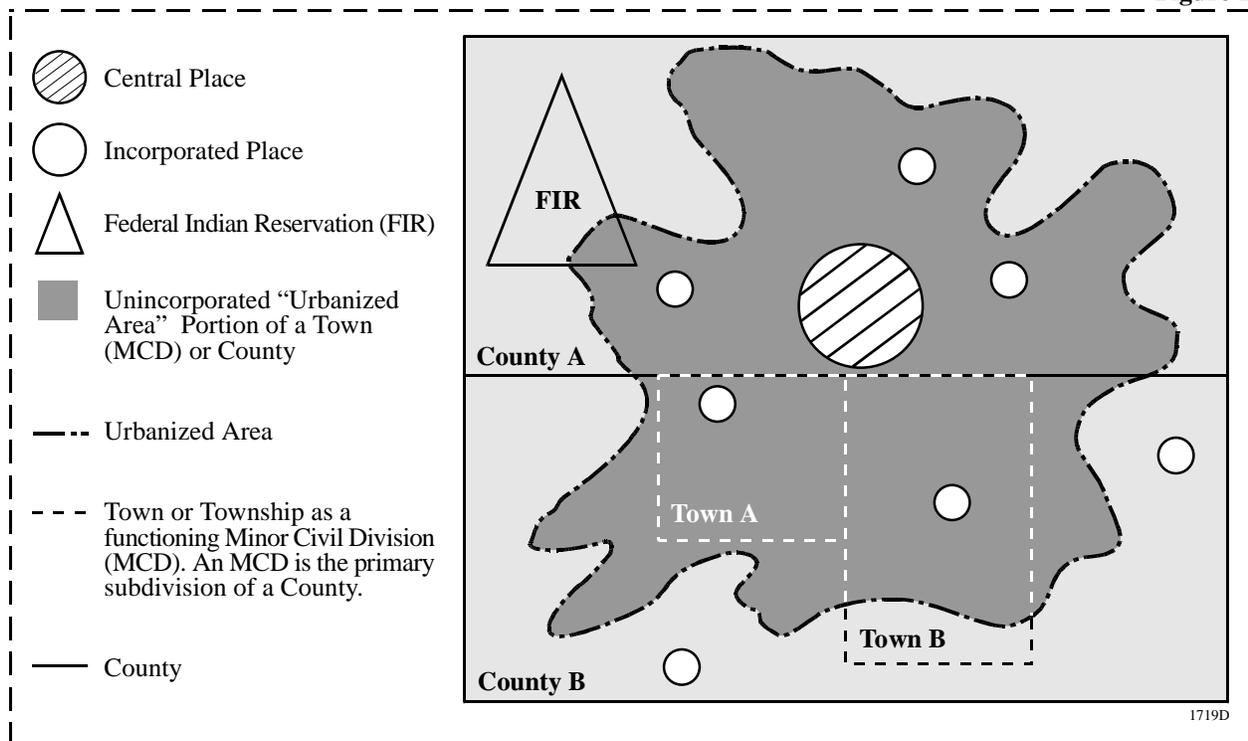
State Data Centers: Each State’s Data Center receives listings of all entities that are located in UAs, as well as detailed maps and electronic files of UA boundaries. The Bureau of the Census web site includes a list of contact names and phone numbers for the data in each State at www.census.gov/sdc/www.

State Planning/Economic/Transportation Agencies: These agencies typically use UAs to assess current development and forecast future growth trends and, therefore, should have detailed UA information readily available to help determine the UA boundaries in any given area.

- ❑ **County or Regional Planning Commissions/Boards**

As with State agencies, these entities are likely to have detailed UA data and maps to help determine UA boundaries.

Figure 1



1719D

□ The Bureau of the Census

Urbanized Areas Staff: 301 457-1099

Web Site: www.census.gov

The site provides information on purchasing UA maps and electronic files for use with computerized mapping systems. Obtain free UA cartographic boundary files (Arc/Info export format) for Geographical Information System (GIS) use at: www.census.gov:80/geo/www/cob/ua.html.

UA Maps: Detailed UA maps are available for purchase with a \$25 minimum order (\$5 per map sheet). Each map sheet measures 36 by 42 inches. For prices and a listing of UAs, visit www.census.gov/mp/www/geo/msgeo12.html. Order from the Department of Commerce, Bureau of the Census (MS 1921), P.O. Box 277943, Atlanta, GA 30384-7943 (Phone: 301 457-4100; Toll-free fax: 1-888-249-7295).

□ U.S. EPA

EPA is modifying a web-based geographic program called *Enviromapper*. This will allow MS4 operators to enter a location and see a detailed map of the UA boundary. Information about *Enviromapper* will be available at www.epa.gov/owm/phase2.

How Will the Year 2000 Census Affect the Determination of Status as a Regulated Small MS4?

The listing of incorporated places, MCDs, and counties located within UAs in the United States and Puerto Rico, found in Appendix 6, is based on the 1990 Census. New listings for UAs based on the 2000 Census are scheduled to be available by July or August of 2001. Once the official 2000 Census listings are published by the Bureau of the Census, operators of small MS4s located within the revised boundaries of former 1990 UAs, or in any newly defined 2000 UAs, become regulated small MS4s and must develop a storm water management program.

Any additional automatic designations of small MS4s based on subsequent census years is governed by the Bureau of the Census' definition of a UA in effect for that year and the UA boundaries determined as a result of the definition.

Once a small MS4 is designated into the Phase II storm water program based on the UA boundaries, it can not be waived from the program if in a subsequent UA calculation the small MS4 is no longer within the UA boundaries. An automatically designated small MS4 will remain regulated unless, or until, it meets the criteria for a waiver (see Fact Sheet 2.1 for more information on the regulated small MS4 waiver option).

For Additional Information

Contact

- ☛ U.S. EPA Office of Wastewater Management
 - Phone: 202 260-5816
 - E-mail: SW2@epa.gov
 - Internet: www.epa.gov/owm/sw/phase2

Reference Documents

- ☛ Storm Water Phase II Final Rule Fact Sheet Series
 - Internet: www.epa.gov/owm/sw/phase2
- ☛ Storm Water Phase II Final Rule (64 FR 68722)
 - Internet: www.epa.gov/owm/sw/phase2
 - Contact the U.S. EPA Water Resource Center
 - Phone: 202 260-7786
 - E-mail: center.water-resource@epa.gov



Storm Water Phase II Final Rule

Public Education and Outreach Minimum Control Measure

Storm Water Phase II Final Rule Fact Sheet Series

Overview

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Small MS4 Program

2.0 – Small MS4 Storm Water Program Overview

2.1 – Who's Covered? Designation and Waivers of Regulated Small MS4s

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2.7 – Post-Construction Runoff Control

2.8 – Pollution Prevention/Good Housekeeping

2.9 – Permitting and Reporting: The Process and Requirements

2.10 – Federal and State-Operated MS4s: Program Implementation

Construction Program

3.0 – Construction Program Overview

3.1 – Construction Rainfall Erosivity Waiver

Industrial "No Exposure"

4.0 – Conditional No Exposure Exclusion for Industrial Activity

This fact sheet profiles the Public Education and Outreach minimum control measure, one of six measures an operator of a Phase II-regulated small municipal separate storm sewer system (MS4) is required to include in its storm water management program to meet the conditions of its National Pollutant Discharge Elimination System (NPDES) storm water permit. This fact sheet outlines the Phase II Final Rule requirements and offers some general guidance on how to satisfy them. It is important to keep in mind that the regulated small MS4 operator has a great deal of flexibility in choosing exactly how to satisfy the minimum control measure requirements.

Why Is Public Education and Outreach Necessary?

An informed and knowledgeable community is crucial to the success of a storm water management program since it helps to ensure the following:

- **Greater support** for the program as the public gains a greater understanding of the reasons why it is necessary and important. Public support is particularly beneficial when operators of small MS4s attempt to institute new funding initiatives for the program or seek volunteers to help implement the program; and
- **Greater compliance** with the program as the public becomes aware of the personal responsibilities expected of them and others in the community, including the individual actions they can take to protect or improve the quality of area waters.

What Is Required?

To satisfy this minimum control measure, the operator of a regulated small MS4 needs to:

- Implement a public education program to distribute educational materials to the community, or conduct equivalent outreach activities about the impacts of storm water discharges on local waterbodies and the steps that can be taken to reduce storm water pollution; and
- Determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure. Some program implementation approaches, BMPs (i.e., the program actions/activities), and measurable goals are suggested below.

What Are Some Guidelines for Developing and Implementing This Measure?

Three main action areas are important for successful implementation of a public education and outreach program:

1 Forming Partnerships

Operators of regulated small MS4s are encouraged to enter into partnerships with other governmental entities to fulfill this minimum control measure’s requirements. It is generally more cost-effective to use an existing program, or to develop a new regional or state-wide education program, than to have numerous operators developing their own local programs. Operators also are encouraged to seek assistance from non-governmental organizations (e.g., environmental, civic, and industrial organizations), since many already have educational materials and perform outreach activities.

2 Using Educational Materials and Strategies

Operators of regulated small MS4s may use storm water educational information provided by their State, Tribe, EPA Region, or environmental, public interest, or trade organizations instead of developing their own materials. Operators should strive to make their materials and activities relevant to local situations and issues, and incorporate a variety of strategies to ensure maximum coverage. Some examples include:

- **Brochures or fact sheets** for general public and specific audiences;
- **Recreational guides** to educate groups such as golfers, hikers, paddlers, climbers, fishermen, and campers;
- **Alternative information sources**, such as web sites, bumper stickers, refrigerator magnets, posters for bus and subway stops, and restaurant placemats;
- **A library of educational materials** for community and school groups;
- **Volunteer citizen educators** to staff a **public education task force**;
- **Event participation** with educational displays at home shows and community festivals;
- **Educational programs** for school-age children;
- **Storm drain stenciling** of storm drains with messages such as “Do Not Dump - Drains Directly to Lake;”
- **Storm water hotlines** for information and for citizen reporting of polluters;
- **Economic incentives** to citizens and businesses (e.g., rebates to homeowners purchasing mulching lawnmowers or biodegradable lawn products);and
- **Tributary signage** to increase public awareness of local water resources.

3 Reaching Diverse Audiences

The public education program should use a mix of appropriate local strategies to address the viewpoints and concerns of a variety of audiences and communities, including minority and disadvantaged communities, as well as children. Printing posters and brochures in more than one language or posting

large warning signs (e.g., cautioning against fishing or swimming) near storm sewer outfalls are methods that can be used to reach audiences less likely to read standard materials. Directing materials or outreach programs toward specific groups of commercial, industrial, and institutional entities likely to have significant storm water impacts is also recommended. For example, information could be provided to restaurants on the effects of grease clogging storm drains and to auto garages on the effects of dumping used oil into storm drains.

What Are Appropriate Measurable Goals?

Measurable goals, which are required for each minimum control measure, are intended to gauge permit compliance and program effectiveness. The measurable goals, as well as the BMPs, should reflect the needs and characteristics of the operator and the area served by its small MS4. Furthermore, they should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure. An integrated approach for this minimum measure could include the following measurable goals:

<u>Target Date</u>	<u>Activity</u>
1 year.....	Brochures developed (bilingual, if appropriate) and distributed in water utility bills; a storm water hotline in place; volunteer educators trained.
2 years.....	A web site created; school curricula developed; storm drains stenciled.
3 years.....	A certain percentage of restaurants no longer dumping grease and other pollutants down storm sewer drains.
4 years.....	A certain percentage reduction in litter or animal waste detected in discharges.

For Additional Information

Contact

- ☞ U.S. EPA Office of Wastewater Management
 - Internet: www.epa.gov/npdes/stormwater
 - Phone: 202-564-9545

Reference Documents

- ☞ Storm Water Phase II Final Rule Fact Sheet Series
 - Internet: cfpub.epa.gov/npdes/stormwater/swfinal.cfm
- ☞ Storm Water Phase II Final Rule (64 FR 68722)
 - Internet: www.epa.gov/npdes/regulations/phase2.pdf



Storm Water Phase II Final Rule

Public Participation/Involvement Minimum Control Measure

Storm Water Phase II Final Rule Fact Sheet Series

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2.0 – Small MS4 Storm Water Program Overview

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2.2 – Urbanized Areas: Definition and Description

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2.7 – Post-Construction Runoff Control Minimum Control Measure

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Construction Program

3.0 – Construction Program Overview

3.1 – Construction Rainfall Erosivity Waiver

Industrial "No Exposure"

4.0 – Conditional No Exposure Exclusion for Industrial Activity

This fact sheet profiles the Public Participation/Involvement minimum control measure, one of six measures the operator of a Phase II regulated small municipal separate storm sewer system (MS4) is required to include in its storm water management program to meet the conditions of its National Pollutant Discharge Elimination System (NPDES) permit. This fact sheet outlines the Phase II Final Rule requirements and offers some general guidance on how to satisfy them. It is important to keep in mind that the small MS4 operator has a great deal of flexibility in determining how to satisfy the minimum control measure requirements.

Why Is Public Participation and Involvement Necessary?

EPA believes that the public can provide valuable input and assistance to a regulated small MS4's municipal storm water management program and, therefore, suggests that the public be given opportunities to play an active role in both the development and implementation of the program. An active and involved community is crucial to the success of a storm water management program because it allows for:

- **Broader public support** since citizens who participate in the development and decision making process are partially responsible for the program and, therefore, may be less likely to raise legal challenges to the program and more likely to take an active role in its implementation;
- **Shorter implementation schedules** due to fewer obstacles in the form of public and legal challenges and increased sources in the form of citizen volunteers;
- **A broader base of expertise and economic benefits** since the community can be a valuable, and free, intellectual resource; and
- **A conduit to other programs** as citizens involved in the storm water program development process provide important cross-connections and relationships with other community and government programs. This benefit is particularly valuable when trying to implement a storm water program on a watershed basis, as encouraged by EPA.

What Is Required?

To satisfy this minimum control measure, the operator of a regulated small MS4 must:

- Comply with applicable State, Tribal, and local public notice requirements; and
- Determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure. Possible implementation approaches, BMPs (i.e., the program actions and activities), and measurable goals are described below.

What Are Some Guidelines for Developing and Implementing This Measure?

Operators of regulated small MS4s should include the public in developing, implementing, and reviewing their storm water management programs. The public participation process should make every effort to reach out and engage all economic and ethnic groups. EPA recognizes that there are challenges associated with public involvement. Nevertheless, EPA strongly believes that these challenges can be addressed through an aggressive and inclusive program. Challenges and example practices that can help ensure successful participation are discussed below.

Implementation Challenges

The best way to handle common notification and recruitment challenges is to know the audience and think creatively about how to gain its attention and interest. Traditional methods of soliciting public input are not always successful in generating interest, and subsequent involvement, in all sectors of the community. For example, municipalities often rely solely on advertising in local newspapers to announce public meetings and other opportunities for public involvement. Since there may be large sectors of the population who do not read the local press, the audience reached may be limited. Therefore, alternative advertising methods should be used whenever possible, including radio or television spots, postings at bus or subway stops, announcements in neighborhood newsletters, announcements at civic organization meetings, distribution of flyers, mass mailings, door-to-door visits, telephone notifications, and multilingual announcements. These efforts, of course, are tied closely to the efforts for the public education and outreach minimum control measure (see Fact Sheet 2.3).

In addition, advertising and soliciting for help should be targeted at specific population sectors, including ethnic, minority, and low-income communities; academia and educational institutions; neighborhood and community groups; outdoor recreation groups; and business and industry. The goal is to involve a diverse cross-section of people who can offer a multitude of concerns, ideas, and connections during the program development process.

Possible Practices (BMPs)

There are a variety of practices that could be incorporated into a public participation and involvement program, such as:

- **Public meetings/citizen panels** allow citizens to discuss various viewpoints and provide input concerning appropriate storm water management policies and BMPs;
- **Volunteer water quality monitoring** gives citizens first-hand knowledge of the quality of local water bodies and provides a cost-effective means of collecting water quality data;
- **Volunteer educators/speakers** who can conduct workshops, encourage public participation, and staff special events;

- **Storm drain stenciling** is an important and simple activity that concerned citizens, especially students, can do;
- **Community clean-ups** along local waterways, beaches, and around storm drains;
- **Citizen watch groups** can aid local enforcement authorities in the identification of polluters; and
- **“Adopt A Storm Drain” programs** encourage individuals or groups to keep storm drains free of debris and to monitor what is entering local waterways through storm drains.

What Are Appropriate Measurable Goals?

Measurable goals, which are required for each minimum control measure, are intended to gauge permit compliance and program effectiveness. The measurable goals, as well as the BMPs, greatly depend on the needs and characteristics of the operator and the area served by the small MS4. Furthermore, they should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure. An integrated approach for this minimum measure could include the following measurable goals:

<u>Target Date</u>	<u>Activity</u>
1 year.....	Notice of a public meeting in several different print media and bilingual flyers; citizen panel established; volunteers organized to locate outfalls/illicit discharges and stencil drains.
2 years.....	Final recommendations of the citizen panel; radio spots promoting program and participation.
3 years.....	A certain percentage of the community participating in community clean-ups.
4 years.....	Citizen watch groups established in a certain percentage of neighborhoods; outreach to every different population sector completed.

For Additional Information

Contact

- ☞ U.S. EPA Office of Wastewater Management
 - Phone: 202 260-5816
 - E-mail: SW2@epa.gov
 - Internet: www.epa.gov/owm/sw/phase2

Reference Documents

- ☞ Storm Water Phase II Final Rule Fact Sheet Series
 - Internet: www.epa.gov/owm/sw/phase2
- ☞ Storm Water Phase II Final Rule (64 FR 68722)
 - Internet: www.epa.gov/owm/sw/phase2
 - Contact the U.S. EPA Water Resource Center
 - Phone: 202 260-7786
 - E-mail: center.water-resource@epa.gov



Storm Water Phase II Final Rule

Illicit Discharge Detection and Elimination Minimum Control Measure

Storm Water Phase II Final Rule Fact Sheet Series

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Construction Program

3.0 – Construction Program Overview

3.1 – Construction Rainfall Erosivity Waiver

Industrial "No Exposure"

4.0 – Conditional No Exposure Exclusion for Industrial Activity

This fact sheet profiles the Illicit Discharge Detection and Elimination minimum control measure, one of six measures the operator of a Phase II regulated small municipal separate storm sewer system (MS4) is required to include in its storm water management program to meet the conditions of its National Pollutant Discharge Elimination System (NPDES) permit. This fact sheet outlines the Phase II Final Rule requirements and offers some general guidance on how to satisfy them. It is important to keep in mind that the small MS4 operator has a great deal of flexibility in choosing exactly how to satisfy the minimum control measure requirements.

What Is An "Illicit Discharge"?

Federal regulations define an illicit discharge as "...any discharge to an MS4 that is not composed entirely of storm water..." with some exceptions. These exceptions include discharges from NPDES-permitted industrial sources and discharges from fire-fighting activities. Illicit discharges (see Table 1) are considered "illicit" because MS4s are not designed to accept, process, or discharge such non-storm water wastes.

Why Are Illicit Discharge Detection and Elimination Efforts Necessary?

Discharges from MS4s often include wastes and wastewater from non-storm water sources. A study conducted in 1987 in Sacramento, California, found that almost one-half of the water discharged from a local MS4 was not directly attributable to precipitation runoff. A significant portion of these dry weather flows were from illicit and/or inappropriate discharges and connections to the MS4.

Illicit discharges enter the system through either direct connections (e.g., wastewater piping either mistakenly or deliberately connected to the storm drains) or indirect connections (e.g., infiltration into the MS4 from cracked sanitary systems, spills collected by drain outlets, or paint or used oil dumped directly into a drain). The result is untreated discharges that contribute high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria to receiving waterbodies. Pollutant levels from these illicit discharges have been shown in EPA studies to be high enough to significantly degrade receiving water quality and threaten aquatic, wildlife, and human health.

Table 1

Sources of Illicit Discharges
Sanitary wastewater
Effluent from septic tanks
Car wash wastewaters
Improper oil disposal
Radiator flushing disposal
Laundry wastewaters
Spills from roadway accidents
Improper disposal of auto and household toxics

What Is Required?

Recognizing the adverse effects illicit discharges can have on receiving waters, the final rule requires an operator of a regulated small MS4 to develop, implement and enforce an illicit discharge detection and elimination program. This program must include the following:

- ❑ A storm sewer system map, showing the location of all outfalls and the names and location of all waters of the United States that receive discharges from those outfalls;
- ❑ Through an ordinance, or other regulatory mechanism, a prohibition (to the extent allowable under State, Tribal, or local law) on non-storm water discharges into the MS4, and appropriate enforcement procedures and actions;
- ❑ A plan to detect and address non-storm water discharges, including illegal dumping, into the MS4;
- ❑ The education of public employees, businesses, and the general public about the hazards associated with illegal discharges and improper disposal of waste; and
- ❑ The determination of appropriate best management practices (BMPs) and measurable goals for this minimum control measure. Some program implementation approaches, BMPs (i.e., the program actions/activities), and measurable goals are suggested below.

Does This Measure Need to Address All Illicit Discharges?

No. The illicit discharge detection and elimination program does not need to address the following categories of non-storm water discharges or flows unless the operator of the regulated small MS4 identifies them as significant contributors of pollutants to its MS4:

- Water line flushing;
- Landscape irrigation;
- Diverted stream flows;
- Rising ground waters;
- Uncontaminated ground water infiltration;
- Uncontaminated pumped ground water;
- Discharges from potable water sources;
- Foundation drains;
- Air conditioning condensation;
- Irrigation water;
- Springs;
- Water from crawl space pumps;

- Footing drains;
- Lawn watering;
- Individual residential car washing;
- Flows from riparian habitats and wetlands;
- Dechlorinated swimming pool discharges; and
- Street wash water.

What Are Some Guidelines for Developing and Implementing This Measure?

The objective of the illicit discharge detection and elimination minimum control measure is to have regulated small MS4 operators gain a thorough awareness of their systems. This awareness allows them to determine the types and sources of illicit discharges entering their system; and establish the legal, technical, and educational means needed to eliminate these discharges. Permittees could meet these objectives in a variety of ways depending on their individual needs and abilities, but some general guidance for each requirement is provided below.

The Map

The storm sewer system map is meant to demonstrate a basic awareness of the intake and discharge areas of the system. It is needed to help determine the extent of discharged dry weather flows, the possible sources of the dry weather flows, and the particular waterbodies these flows may be affecting. An existing map, such as a topographical map, on which the location of major pipes and outfalls can be clearly presented demonstrates such awareness.

EPA recommends collecting all existing information on outfall locations (e.g., review city records, drainage maps, storm drain maps), and then conducting field surveys to verify locations. It probably will be necessary to walk (i.e., wade through small receiving waters or use a boat for larger waters) the streambanks and shorelines for visual observation. More than one trip may be needed to locate all outfalls.

Legal Prohibition and Enforcement

EPA recognizes that some permittees may have limited authority under State, Tribal or local law to establish and enforce an ordinance or other regulatory mechanism prohibiting illicit discharges. In such a case, the permittee is encouraged to obtain the necessary authority, if possible.

The Plan

The plan to detect and address illicit discharges is the central component of this minimum control measure. The plan is dependant upon several factors, including the permittee's available resources, size of staff, and degree and character of its illicit discharges. EPA envisions a plan similar to the one Michigan recommends for use in meeting their NPDES storm

water general permit for small MS4s. As guidance only, the four steps of a recommended plan are outlined below:

1 Locate Problem Areas

EPA recommends that priority areas be identified for detailed screening of the system based on the likelihood of illicit connections (e.g., areas with older sanitary sewer lines). Methods that can locate problem areas include: public complaints; visual screening; water sampling from manholes and outfalls during dry weather; and use of infrared and thermal photography.

2 Find the Source

Once a problem area or discharge is found, additional efforts usually are necessary to determine the source of the problem. Methods that can find the source of the illicit discharge include: dye-testing buildings in problem areas; dye- or smoke-testing buildings at the time of sale; tracing the discharge upstream in the storm sewer; employing a certification program that shows that buildings have been checked for illicit connections; implementing an inspection program of existing septic systems; and using video to inspect the storm sewers.

3 Remove/Correct Illicit Connections

Once the source is identified, the offending discharger should be notified and directed to correct the problem. Education efforts and working with the discharger can be effective in resolving the problem before taking legal action.

4 Document Actions Taken

As a final step, all actions taken under the plan should be documented. This illustrates that progress is being made to eliminate illicit connections and discharges. Documented actions should be included in annual reports and include information such as: the number of outfalls screened; any complaints received and corrected; the number of discharges and quantities of flow eliminated; and the number of dye or smoke tests conducted.

Educational Outreach

Outreach to public employees, businesses, property owners, the general community, and elected officials regarding ways to detect and eliminate illicit discharges is an integral part of this minimum measure that will help gain support for the

permittee’s storm water program. Suggested educational outreach efforts include:

- Developing *informative brochures, and guidances* for specific audiences (e.g., carpet cleaning businesses) and school curricula;
- Designing a program to *publicize and facilitate public reporting* of illicit discharges;
- *Coordinating volunteers* for locating, and visually inspecting, outfalls or to stencil storm drains; and
- Initiating *recycling programs* for commonly dumped wastes, such as motor oil, antifreeze, and pesticides.

What Are Appropriate Measurable Goals?

Measurable goals, which are required for each minimum control measure, are intended to gauge permit compliance and program effectiveness. The measurable goals, as well as the BMPs, should reflect the needs and characteristics of the operator and the area served by its small MS4. Furthermore, they should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure. An integrated approach for this minimum measure could include the following measurable goals:

<u>Target Date</u>	<u>Activity</u>
1 year.....	Sewer system map completed; recycling program for household hazardous waste in place.
2 years.....	Ordinance in place; training for public employees completed; a certain percentage of sources of illicit discharges determined.
3 years.....	A certain percentage of illicit discharges detected; illicit discharges eliminated; and households participating in quarterly household hazardous waste special collection days.
4 years.....	Most illicit discharge sources detected and eliminated.

The educational outreach measurable goals for this minimum control measure could be combined with the measurable goals for the Public Education and Outreach minimum control measure (see Fact Sheet 2.3).

For Additional Information

Contact

- ☞ U.S. EPA Office of Wastewater Management
 - Phone: 202 260-5816
 - E-mail: SW2@epa.gov
 - Internet: www.epa.gov/owm/sw/phase2

Reference Documents

- ☞ Storm Water Phase II Final Rule Fact Sheet Series
 - Internet: www.epa.gov/owm/sw/phase2
- ☞ Storm Water Phase II Final Rule (64 FR 68722)
 - Internet: www.epa.gov/owm/sw/phase2
 - Contact the U.S. EPA Water Resource Center
 - Phone: 202 260-7786
 - E-mail: center.water-resource@epa.gov

Sources

Maryland Department of the Environment, Water Management Administration. 1997. *Dry Weather Flow and Illicit Discharges in Maryland Storm Drain Systems*. Baltimore, Maryland.

U.S. EPA Office of Water. 1993. *Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems: A User's Guide*. EPA/600/R-92/238. Washington, D.C.

Wayne County Rouge River National Wet Weather Demonstration Project. 1997. *Guidance for Preparing a Program for the Elimination of Illicit Discharges*. Wayne County, Michigan.



Storm Water Phase II Final Rule

Construction Site Runoff Control Minimum Control Measure

Storm Water Phase II Final Rule Fact Sheet Series

Overview

1.0 – Storm Water Phase II Final Rule: An Overview

Small MS4 Program

2.0 – Small MS4 Storm Water Program Overview

2.1 – Who's Covered? Designation and Waivers of Regulated Small MS4s

2.2 – Urbanized Areas: Definition and Description

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2.10 – Federal and State-Operated MS4s: Program Implementation

Construction Program

3.0 – Construction Program Overview

3.1 – Construction Rainfall Erosivity Waiver

Industrial "No Exposure"

4.0 – Conditional No Exposure Exclusion for Industrial Activity

This fact sheet profiles the Construction Site Runoff Control minimum control measure, one of six measures that the operator of a Phase II regulated small municipal separate storm sewer system (MS4) is required to include in its storm water management program to meet the conditions of its National Pollutant Discharge Elimination System (NPDES) permit. This fact sheet outlines the Phase II Final Rule requirements and offers some general guidance on how to satisfy them. It is important to keep in mind that the small MS4 operator has a great deal of flexibility in choosing exactly how to satisfy the minimum control measure requirements.

Why Is The Control of Construction Site Runoff Necessary?

Polluted storm water runoff from construction sites often flows to MS4s and ultimately is discharged into local rivers and streams. Of the pollutants listed in Table 1, sediment is usually the main pollutant of concern. Sediment runoff rates from construction sites are typically 10 to 20 times greater than those of agricultural lands, and 1,000 to 2,000 times greater than those of forest lands. During a short period of time, construction sites can contribute more sediment to streams than can be deposited naturally during several decades. The resulting siltation, and the contribution of other pollutants from construction sites, can cause physical, chemical, and biological harm to our nation's waters. For example, excess sediment can quickly fill rivers and lakes, requiring dredging and destroying aquatic habitats.

Table 1

Pollutants Commonly Discharged From Construction Sites
Sediment
Solid and sanitary wastes
Phosphorous (fertilizer)
Nitrogen (fertilizer)
Pesticides
Oil and grease
Concrete truck washout
Construction chemicals
Construction debris

What Is Required?

The Phase II Final Rule requires an operator of a regulated small MS4 to develop, implement, and enforce a program to reduce pollutants in storm water runoff to their MS4 from construction activities that result in a land disturbance of greater than or equal to one acre. The small MS4 operator is required to:

- Have an ordinance or other regulatory mechanism requiring the implementation of proper erosion and sediment controls, and controls for other wastes, on applicable construction sites;
- Have procedures for site plan review of construction plans that consider potential water quality impacts;
- Have procedures for site inspection and enforcement of control measures;
- Have sanctions to ensure compliance (established in the ordinance or other regulatory mechanism);

- ❑ Establish procedures for the receipt and consideration of information submitted by the public; and
- ❑ Determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure. Suggested BMPs (i.e., the program actions/activities) and measurable goals are presented below.

What Are Some Guidelines for Developing and Implementing This Measure?

Further explanation and guidance for each component of a regulated small MS4’s construction program is provided below.

Regulatory Mechanism

Through the development of an ordinance or other regulatory mechanism, the small MS4 operator must establish a construction program that controls polluted runoff from construction sites with a land disturbance of greater than or equal to one acre. Because there may be limitations on regulatory legal authority, the small MS4 operator is required to satisfy this minimum control measure only to the maximum extent practicable and allowable under State, Tribal, or local law.

Site Plan Review

The small MS4 operator must include in its construction program requirements for the implementation of appropriate BMPs on construction sites to control erosion and sediment and other waste at the site. To determine if a construction site is in compliance with such provisions, the small MS4 operator should review the site plans submitted by the construction site operator before ground is broken.

Site plan review aids in compliance and enforcement efforts since it alerts the small MS4 operator early in the process to the planned use or non-use of proper BMPs and provides a way to track new construction activities. The tracking of sites is useful not only for the small MS4 operator’s recordkeeping and reporting purposes, which are required under their NPDES storm water permit (see Fact Sheet 2.9), but also for members of the public interested in ensuring that the sites are in compliance.

Inspections and Penalties

Once construction commences, BMPs should be in place and the small MS4 operator’s enforcement activities should begin. To ensure that the BMPs are properly installed, the small MS4 operator is required to develop procedures for site inspection and enforcement of control measures to deter infractions. Procedures could include steps to identify priority sites for inspection and enforcement based on the nature and extent of

the construction activity, topography, and the characteristics of soils and receiving water quality. Inspections give the MS4 operator an opportunity to provide additional guidance and education, issue warnings, or assess penalties. To conserve staff resources, one possible option for small MS4 operators is to have these inspections performed by the same inspector that visits the sites to check compliance with health and safety building codes.

Information Submitted by the Public

A final requirement of the small MS4 program for construction activity is the development of procedures for the receipt and consideration of public inquiries, concerns, and information submitted regarding local construction activities. This provision is intended to further reinforce the public participation component of the regulated small MS4 storm water program (see Fact Sheet 2.4) and to recognize the crucial role that the public can play in identifying instances of noncompliance.

The small MS4 operator is required only to *consider* the information submitted, and may not need to follow-up and respond to every complaint or concern. Although some form of enforcement action or reply is not required, the small MS4 operator is required to demonstrate acknowledgment and consideration of the information submitted. A simple tracking process in which submitted public information, both written and verbal, is recorded and then given to the construction site inspector for possible follow-up will suffice.

What Are Appropriate Measurable Goals?

Measurable goals, which are required for each minimum control measure, are intended to gauge permit compliance and program effectiveness. The measurable goals, as well as the BMPs, should reflect the needs and characteristics of the operator and the area served by its small MS4. Furthermore, they should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure. An integrated approach for this minimum measure could include the following measurable goals:

<u>Target Date</u>	<u>Activity</u>
1 year.....	Ordinance or other regulatory mechanism in place; procedures for information submitted by the public in place.
2 years.....	Procedures for site inspections implemented; a certain percentage rate of compliance achieved by construction operators.
3 years.....	Maximum compliance with ordinance; improved clarity and reduced sedimentation of local waterbodies.
4 years.....	Increased numbers of sensitive aquatic organisms in local waterbodies.

Are Construction Sites Already Covered Under the NPDES Storm Water Program?

Yes. EPA's Phase I NPDES storm water program requires operators of construction activities that disturb five or more acres to obtain a NPDES construction storm water permit. General permit requirements include the submission of a Notice of Intent and the development of a storm water pollution prevention plan (SWPPP). The SWPPP must include a site description and measures and controls to prevent or minimize pollutants in storm water discharges. The Phase II Final Rule similarly regulates discharges from smaller construction sites disturbing equal to or greater than one acre and less than five acres (see Fact Sheet 3.0 for information on the Phase II construction program).

Even though all construction sites that disturb more than one acre are covered nationally by an NPDES storm water permit, the construction site runoff control minimum measure for the small MS4 program is needed to induce more localized site regulation and enforcement efforts, and to enable operators of regulated small MS4s to more effectively control construction site discharges into their MS4s.

To aid operators of regulated construction sites in their efforts to comply with both local requirements and their NPDES permit, the Phase II Final Rule includes a provision that allows the NPDES permitting authority to reference a "qualifying State, Tribal or local program" in the NPDES general permit for construction. This means that if a construction site is located in an area covered by a qualifying local program, then the construction site operator's compliance with the local program constitutes compliance with their NPDES permit. A regulated small MS4's storm water program for construction could be a "qualifying program" if the MS4 operator requires a SWPPP, in addition to the requirements summarized in this fact sheet.

The ability to reference other programs in the NPDES permit is intended to reduce confusion between overlapping and similar requirements, while still providing for both local and

national regulatory coverage of the construction site. The provision allowing NPDES permitting authorities to reference other programs has no impact on, or direct relation to, the small MS4 operator's responsibilities under the construction site runoff control minimum measure profiled here.

Is a Small MS4 Required to Regulate Construction Sites that the Permitting Authority has Waived from the NPDES Construction Program?

No. If the NPDES permitting authority waives requirements for storm water discharges associated with small construction activity (see 122.26(b)(15)(i)), the small MS4 operator is not required to develop, implement, and/or enforce a program to reduce pollutant discharges from such construction sites.

For Additional Information

Contact

- ☞ U.S. EPA Office of Wastewater Management
 - Phone: 202 260-5816
 - E-mail: SW2@epa.gov
 - Internet: www.epa.gov/owm/sw/phase2

Reference Documents

- ☞ Storm Water Phase II Final Rule Fact Sheet Series
 - Internet: www.epa.gov/owm/sw/phase2
- ☞ Storm Water Phase II Final Rule (64 FR 68722)
 - Internet: www.epa.gov/owm/sw/phase2
 - Contact the U.S. EPA Water Resource Center
 - Phone: 202 260-7786
 - E-mail: center.water-resource@epa.gov



Storm Water Phase II Final Rule

Post-Construction Runoff Control Minimum Control Measure

Storm Water Phase II Final Rule Fact Sheet Series

Overview

1.0 – Storm Water Phase II Final Rule: An Overview

Small MS4 Program

2.0 – Small MS4 Storm Water Program Overview

2.1 – Who's Covered? Designation and Waivers of Regulated Small MS4s

2.2 – Urbanized Areas: Definition and Description

Minimum Control Measures

2.3 – Public Education and Outreach

2.4 – Public Participation/Involvement

2.5 – Illicit Discharge Detection and Elimination

2.6 – Construction Site Runoff Control

2.7 – Post-Construction Runoff Control

2.8 – Pollution Prevention/Good Housekeeping

2.9 – Permitting and Reporting: The Process and Requirements

2.10 – Federal and State-Operated MS4s: Program Implementation

Construction Program

3.0 – Construction Program Overview

3.1 – Construction Rainfall Erosivity Waiver

Industrial "No Exposure"

4.0 – Conditional No Exposure Exclusion for Industrial Activity

This fact sheet profiles the Post-Construction Runoff Control minimum control measure, one of six measures that the operator of a Phase II regulated small municipal separate storm sewer system (MS4) is required to include in its storm water management program in order to meet the conditions of its National Pollutant Discharge Elimination System (NPDES) permit. This fact sheet outlines the Phase II Final Rule requirements for post-construction runoff control and offers some general guidance on how to satisfy those requirements. It is important to keep in mind that the small MS4 operator has a great deal of flexibility in choosing exactly how to satisfy the minimum control measure requirements.

Why Is The Control of Post-Construction Runoff Necessary?

Post-construction storm water management in areas undergoing new development or redevelopment is necessary because runoff from these areas has been shown to significantly effect receiving waterbodies. Many studies indicate that prior planning and design for the minimization of pollutants in post-construction storm water discharges is the most cost-effective approach to storm water quality management.

There are generally two forms of substantial impacts of post-construction runoff. The first is caused by an increase in the type and quantity of pollutants in storm water runoff. As runoff flows over areas altered by development, it picks up harmful sediment and chemicals such as oil and grease, pesticides, heavy metals, and nutrients (e.g., nitrogen and phosphorus). These pollutants often become suspended in runoff and are carried to receiving waters, such as lakes, ponds, and streams. Once deposited, these pollutants can enter the food chain through small aquatic life, eventually entering the tissues of fish and humans. The second kind of post-construction runoff impact occurs by increasing the quantity of water delivered to the waterbody during storms. Increased impervious surfaces interrupt the natural cycle of gradual percolation of water through vegetation and soil. Instead, water is collected from surfaces such as asphalt and concrete and routed to drainage systems where large volumes of runoff quickly flow to the nearest receiving water. The effects of this process include streambank scouring and downstream flooding, which often lead to a loss of aquatic life and damage to property.

What Is Required?

The Phase II Final Rule requires an operator of a regulated small MS4 to develop, implement, and enforce a program to reduce pollutants in post-construction runoff to their MS4 from new development and redevelopment projects that result in the land disturbance of greater than or equal to 1 acre. The small MS4 operator is required to:

- Develop and implement strategies which include a combination of structural and/or non-structural best management practices (BMPs);
- Have an ordinance or other regulatory mechanism requiring the implementation of post-construction runoff controls to the extent allowable under State, Tribal or local law,

- ❑ Ensure adequate long-term operation and maintenance of controls;
- ❑ Determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure.

What Is Considered a “Redevelopment” Project?

The term “redevelopment” refers to alterations of a property that change the “footprint” of a site or building in such a way that there is a disturbance of equal to or greater than 1 acre of land. The term does not include such activities as exterior remodeling. Because redevelopment projects may have site constraints not found on new development sites, the rule provides flexibility for implementing post-construction controls on redevelopment sites that consider these constraints.

What Are Some Guidelines for Developing and Implementing This Measure?

This section includes some sample non-structural and structural BMPs that could be used to satisfy the requirements of the post-construction runoff control minimum measure. It is important to recognize that many BMPs are climate-specific, and not all BMPs are appropriate in every geographic area. Because the requirements of this measure are closely tied to the requirements of the construction site runoff control minimum measure (see Fact Sheet 2.6), EPA recommends that small MS4 operators develop and implement these two measures in tandem. Sample BMPs follow.

❑ Non-Structural BMPs

- **Planning and Procedures.** Runoff problems can be addressed efficiently with sound planning procedures. Master Plans, Comprehensive Plans, and zoning ordinances can promote improved water quality by guiding the growth of a community away from sensitive areas and by restricting certain types of growth (industrial, for example) to areas that can support it without compromising water quality.
- **Site-Based Local Controls.** These controls can include buffer strip and riparian zone preservation, minimization of disturbance and imperviousness, and maximization of open space.

❑ Structural BMPs

- **Storage Practices.** Storage or detention BMPs control storm water by gathering runoff in wet ponds, dry basins, or multichamber catch basins and slowly releasing it to receiving waters or drainage systems. These practices both control storm water volume and settle out particulates for pollutant removal.

- **Infiltration Practices.** Infiltration BMPs are designed to facilitate the percolation of runoff through the soil to ground water, and, thereby, result in reduced storm water quantity and reduced mobilization of pollutants. Examples include infiltration basins/trenches, dry wells, and porous pavement.
- **Vegetative Practices.** Vegetative BMPs are landscaping features that, with optimal design and good soil conditions, enhance pollutant removal, maintain/improve natural site hydrology, promote healthier habitats, and increase aesthetic appeal. Examples include grassy swales, filter strips, artificial wetlands, and rain gardens.

What Are Appropriate Measurable Goals?

Measurable goals, which are required for each minimum control measure, are intended to gauge permit compliance and program effectiveness. The measurable goals, as well as the BMPs, should reflect needs and characteristics of the operator and the area served by its small MS4. Furthermore, the measurable goals should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure. An integrated approach for this minimum measure could include the following goals:

<u>Target Date</u>	<u>Activity</u>
1 year.....	Strategies developed that include structural and/or non-structural BMPs.
2 years.....	Strategies codified by use of ordinance or other regulatory mechanism.
3 years.....	Reduced percent of new impervious surfaces associated with new development projects.
4 years.....	Improved clarity and reduced sedimentation of local waterbodies.

For Additional Information

Contact

- ☎ U.S. EPA Office of Wastewater Management
 - Phone: 202 260-5816
 - E-mail: SW2@epa.gov
 - Internet: www.epa.gov/owm/sw/phase2

Reference Documents

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 - Contact the U.S. EPA Water Resource Center
 - Phone: 202 260-7786
 - E-mail: center.water-resource@epa.gov



Storm Water Phase II Final Rule

Pollution Prevention/Good Housekeeping Minimum Control Measure

Storm Water Phase II Final Rule Fact Sheet Series

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Small MS4 Program

2.0 – Small MS4 Storm Water Program Overview

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2.8 – Pollution Prevention/Good Housekeeping

2.9 – Permitting and Reporting: The Process and Requirements

2.10 – Federal and State-Operated MS4s: Program Implementation

Construction Program

3.0 – Construction Program Overview

3.1 – Construction Rainfall Erosivity Waiver

Industrial "No Exposure"

4.0 – Conditional No Exposure Exclusion for Industrial Activity

This fact sheet profiles the Pollution Prevention/Good Housekeeping for Municipal Operations minimum control measure, one of six measures the operator of a Phase II regulated small municipal separate storm sewer system (MS4) is required to include in its storm water management program to meet the conditions of its National Pollutant Discharge Elimination System (NPDES) permit. This fact sheet outlines the Phase II Final Rule requirements and offers some general guidance on how to satisfy them. It is important to keep in mind that the small MS4 operator has a great deal of flexibility in choosing exactly how to satisfy the minimum control measure requirements.

Why Is Pollution Prevention/Good Housekeeping Necessary?

The Pollution Prevention/Good Housekeeping for municipal operations minimum control measure is a key element of the small MS4 storm water management program. This measure requires the small MS4 operator to examine and subsequently alter their own actions to help ensure a reduction in the amount and type of pollution that: (1) collects on streets, parking lots, open spaces, and storage and vehicle maintenance areas and is discharged into local waterways; and (2) results from actions such as environmentally damaging land development and flood management practices or poor maintenance of storm sewer systems.

While this measure is meant primarily to improve or protect receiving water quality by altering municipal or facility operations, it also can result in a cost savings for the small MS4 operator, since proper and timely maintenance of storm sewer systems can help avoid repair costs from damage caused by age and neglect.

What Is Required?

Recognizing the benefits of pollution prevention practices, the rule requires an operator of a regulated small MS4 to:

- Develop and implement an operation and maintenance program with the ultimate goal of preventing or reducing pollutant runoff from municipal operations into the storm sewer system;
- Include employee training on how to incorporate pollution prevention/good housekeeping techniques into municipal operations such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and storm water system maintenance. To minimize duplication of effort and conserve resources, the MS4 operator can use training materials that are available from EPA, their State or Tribe, or relevant organizations;
- Determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure. Some program implementation approaches, BMPs (i.e., the program actions/activities), and measurable goals are suggested below.

What Are Some Guidelines for Developing and Implementing This Measure?

The intent of this control measure is to ensure that existing municipal, State or Federal operations are performed in ways that will minimize contamination of storm water discharges. EPA encourages the small MS4 operator to consider the following components when developing their program for this measure:

- **Maintenance activities, maintenance schedules, and long-term inspection procedures** for structural and non-structural controls to reduce floatables and other pollutants discharged from the separate storm sewers;
- **Controls for reducing or eliminating the discharge of pollutants** from areas such as roads and parking lots, maintenance and storage yards (including salt/sand storage and snow disposal areas), and waste transfer stations. These controls could include programs that promote recycling (to reduce litter), minimize pesticide use, and ensure the proper disposal of animal waste;
- **Procedures for the proper disposal of waste** removed from separate storm sewer systems and areas listed in the bullet above, including dredge spoil, accumulated sediments, floatables, and other debris; and
- **Ways to ensure that new flood management projects assess the impacts on water quality** and examine existing projects for incorporation of additional water quality protection devices or practices. EPA encourages coordination with flood control managers for the purpose of identifying and addressing environmental impacts from such projects.

The effective performance of this control measure hinges on the proper maintenance of the BMPs used, particularly for the first two bullets above. For example, structural controls, such as grates on outfalls to capture floatables, typically need regular cleaning, while non-structural controls, such as training materials and recycling programs, need periodic updating.

What Are Appropriate Measurable Goals?

Measurable goals, which are required for each minimum control measure, are meant to gauge permit compliance and program effectiveness. The measurable goals, as well as the BMPs, should consider the needs and characteristics of the operator and the area served by its small MS4. The measurable goals should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure. An integrated approach for this minimum measure could include the following measurable goals:

<u>Target Date</u>	<u>Activity</u>
1 year.....	Pollution prevention plan (the new BMPs and revised procedures) completed; employee training materials gathered or developed; procedures in place for catch basin cleaning after each storm and regular street sweeping.
2 years.....	Training for appropriate employees completed; recycling program fully implemented.
3 years.....	Some pollution prevention BMPs incorporated into master plan; a certain percentage reduction in pesticide and sand/salt use; maintenance schedule for BMPs established.
4 years.....	A certain percentage reduction in floatables discharged; a certain compliance rate with maintenance schedules for BMPs; controls in place for all areas of concern.

For Additional Information

Contact

- ☞ U.S. EPA Office of Wastewater Management
 - Phone: 202 260-5816
 - E-mail: SW2@epa.gov
 - Internet: www.epa.gov/owm/sw/phase2

Reference Documents

- ☞ Storm Water Phase II Final Rule Fact Sheet Series
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Storm Water Phase II Final Rule

Permitting and Reporting: The Process and Requirements

Storm Water Phase II Final Rule Fact Sheet Series

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2.10 – Federal and State-Operated MS4s: Program Implementation

Construction Program

3.0 – Construction Program Overview

3.1 – Construction Rainfall Erosivity Waiver

Industrial "No Exposure"

4.0 – Conditional No Exposure Exclusion for Industrial Activity

The Storm Water Phase II Final Rule requires operators of certain small municipal separate storm sewer systems (MS4s) to obtain National Pollutant Discharge Elimination System (NPDES) permit coverage because their storm water discharges are considered "point sources" of pollution. All point source discharges, unlike nonpoint sources such as agricultural runoff, are required under the Clean Water Act (CWA) to be covered by federally enforceable NPDES permits. Those systems already permitted under the NPDES Phase I storm water program, even systems serving less than 100,000 people, are not required to be permitted under the Phase II storm water program.

NPDES storm water permits are issued by an NPDES permitting authority, which may be a NPDES-authorized State or a U.S. EPA Region in non-authorized States (see the *For Additional Information* section for a list of U.S. EPA regional contacts). Once a permit application is submitted by the operator of a regulated small MS4 and a permit is obtained, the conditions of the permit must be satisfied (i.e., development and implementation of a storm water management program) and periodic reports must be submitted on the status and effectiveness of the program.

This fact sheet explains the various permit options that are available for operators of regulated small MS4s and details the permit application and reporting requirements. Important compliance deadlines also are highlighted. Program coverage and requirements for regulated small MS4s are explained in Fact Sheets 2.0 through 2.8.

What Permitting Options Are Available to Operators of Regulated Small MS4s?

Unlike the Phase I program that primarily utilizes individual permits for medium and large MS4s, the Phase II approach allows operators of regulated small MS4s to choose from as many as three permitting options as listed below. The NPDES permitting authority reserves the authority to determine, however, which options are available to the regulated small MS4s.

□ General Permits

- General permits are strongly encouraged by EPA. The Phase II program has been designed specifically to accommodate a general permit approach.
- General permits prescribe one set of requirements for all applicable permittees. General permits are drafted by the NPDES permitting authority, then published for public comment before being finalized and issued.
- A Notice of Intent (NOI) serves as the application for the general permit. The permittee complies with the permit requirements by submitting an NOI to the NPDES permitting authority that describes the storm water management plan, including best management practices (BMPs) and measurable goals. A Phase II permittee has the flexibility to develop an individualized storm water program that addresses the particular characteristics and needs of its system, provided the basic requirements of the general permit are satisfied.

- Permittees also can choose to share responsibilities for meeting the Phase II program requirements. Those entities choosing to do so may submit jointly with the other municipalities or governmental entities an NOI that identifies who will implement which minimum measures within the area served by the MS4.
- The permittee then follows the Phase II permit application requirements (see discussion in next question below).

Minimize Duplication of Effort

Two permitting options tailored to minimize duplication of effort can be incorporated into the general permit by the NPDES permitting authority. First, the permitting authority can recognize in the permit that another governmental entity is responsible under an NPDES permit for implementing any or all minimum measures. Responsibility for implementation of the measure(s) would rest with the other governmental entity, thereby relieving the permittee of its responsibility to implement that particular measure(s). For example, the NPDES permitting authority could recognize a county erosion and sediment control program for construction sites that was developed to comply with a Phase I permit. As long as the Phase II MS4s in the county comply with the county's construction program, they would not need to develop and implement their own construction programs because such activity would already be addressed by the county.

Second, the NPDES permitting authority can include conditions in a general permit that direct a permittee to follow the requirements of an existing qualifying local program rather than the requirements of a minimum measure. A qualifying local program is defined as a local, State or Tribal municipal storm water program that imposes requirements that are equivalent to those of the Phase II MS4 minimum measures. The permittee remains responsible for the implementation of the minimum measure through compliance with the qualifying local program.

☐ Individual Permits

- Individual permits are required for Phase I “medium” and “large” MS4s, but not recommended by EPA for Phase II program implementation.
- The permittee can either submit an individual application for coverage by the Phase II MS4 program (see §122.34) or the Phase I MS4 program (see §122.26(d)).
- For individual coverage under Phase II, the permittee must follow Phase II permit application requirements and provide an estimate of square mileage served by the system and any additional information requested by the NPDES permitting authority. A permittee electing to apply for coverage under the Phase I

program must follow the permit application requirements detailed at §122.26(d).

- The NPDES permitting authority may allow more than one regulated entity to jointly apply for an individual permit.
- The NPDES permitting authority could incorporate in the individual permit either of the two permitting options explained above in the *Minimize Duplication of Effort* section.

☐ Modification of a Phase I Individual Permit – A Co-Permittee Option

- The operator of a regulated small MS4 could participate as a limited co-permittee in a neighboring Phase I MS4's storm water management program by seeking a modification of the existing Phase I individual permit. A list of Phase I medium and large MS4s can be obtained from the EPA Office of Wastewater Management (OWM) or downloaded from the OWM web site.
- The permittee must follow Phase I permit application requirements (with some exclusions).
- The permittee must comply with the applicable terms of the Phase I individual permit rather than the minimum control measures in the Phase II Final Rule.

What Does the Permit Application Require?

Operators of regulated small MS4s are required to submit in their NOI or individual permit application the following information:

- ☐ Best management practices (BMPs) are required for each of the six minimum control measures:
 - ① Public education and outreach on storm water impacts
 - ② Public participation/involvement
 - ③ Illicit discharge detection and elimination
 - ④ Construction site storm water runoff control
 - ⑤ Post-construction storm water management in new development/redevelopment
 - ⑥ Pollution prevention/good housekeeping for municipal operations

(See Fact Sheets 2.3 through 2.8 for full descriptions of each measure, including examples of BMPs and measurable goals)

- ☐ Measurable goals for each minimum control measure (i.e., narrative or numeric standards used to gauge program effectiveness);

- Estimated months and years in which actions to implement each measure will be undertaken, including interim milestones and frequency; and
- The person or persons responsible for implementing or coordinating the storm water program.

Relying on Another Entity

The Phase II permittee has the option of relying on other entities already performing one or more of the minimum control measures, provided that the existing control measure, or component thereof, is at least as stringent as the Phase II rule requirements. For example, a county already may have an illicit discharge detection and elimination program in place and may allow an operator of a regulated small MS4 within the county's jurisdiction to rely on the county program instead of formulating and implementing a new program. In such a case, the permittee would not need to implement the particular measure, but would still be ultimately responsible for its effective implementation. For this reason, EPA recommends that the permittee enter into a legally binding agreement with the other entity. If the permittee chooses to rely on another entity, they must note this in their permit application and subsequent reports. A Phase II permittee may even rely on another governmental entity regulated under the NPDES storm water program to satisfy all of the permittee's permit obligations. Should this option be chosen, the permittee must note this in its NOI, but does not need to file periodic reports.

What Does the Permit Require?

The operator of a regulated small MS4 has the flexibility to determine the BMPs and measurable goals, for each minimum control measure, that are most appropriate for the system. The chosen BMPs and measurable goals, submitted in the permit application, become the required storm water management program; however, the NPDES permitting authority can require changes in the mix of chosen BMPs and measurable goals if all or some of them are found to be inconsistent with the provisions of the Phase II Final Rule. Likewise, the permittee can change its mix of BMPs if it determines that the program is not as effective as it could be. Fact Sheets 2.3 through 2.8 further describe each of the minimum control measures, while the permit requirements for evaluation/assessment and recordkeeping activities are described in separate sections below.

Menu of BMPs

The BMPs for minimum measures 3 through 6 (as listed in the permit application requirements section, above) are not enforceable until the NPDES permitting authority provides a list, or "menu," of BMPs to assist permittees in the design and

implementation of their storm water management programs. The NPDES permitting authority is required to provide this menu as an aid for those operators that are unsure of the most appropriate and effective BMPs to use. Since the menu is intended to serve as guidance only, the operators can either select from the menu or identify other BMPs to meet the permit requirements. EPA is scheduled to develop a menu of BMPs by October 27, 2000.

What Standards Apply?

A Phase II small MS4 operator is required to design its program so that it:

- Reduces the discharge of pollutants to the "maximum extent practicable" (MEP);
- Protects water quality; and
- Satisfies the appropriate water quality requirements of the Clean Water Act.

Compliance with the technical standard of MEP requires the successful implementation of approved BMPs. The Phase II Final Rule considers narrative effluent limitations that require the implementation of BMPs and the achievement of measurable goals as the most appropriate form of effluent limitations to achieve the protection of water quality, rather than requiring that storm water discharges meet numeric effluent limitations.

EPA intends to issue Phase II NPDES permits consistent with its August 1, 1996, Interim Permitting Approach policy, which calls for BMPs in first-round storm water permits and expanded or better tailored BMPs in subsequent permits, where necessary, to provide for the attainment of water quality standards. In cases where information exists to develop more specific conditions or limitations to meet water quality standards, these conditions or limitations should be incorporated into the storm water permit. Monitoring is not required under the Phase II Rule, but the NPDES permitting authority has the discretion to require monitoring if deemed necessary.

What Evaluation/Reporting Efforts Are Required?

Frequency of Reports

Reports must be submitted annually during the first permit term. For subsequent permit terms, reports must be submitted in years 2 and 4 only, unless the NPDES permitting authority requests more frequent reports.

Required Report Content

The reports must include the following:

- ❑ The status of compliance with permit conditions, including an assessment of the appropriateness of the selected BMPs and progress toward achieving the selected measurable goals for each minimum measure;
- ❑ Results of any information collected and analyzed, including monitoring data, if any;
- ❑ A summary of the storm water activities planned for the next reporting cycle;
- ❑ A change in any identified best management practices or measurable goals for any minimum measure; and
- ❑ Notice of relying on another governmental entity to satisfy some of the permit obligations (if applicable).

A Change in Selected BMPs

If, upon evaluation of the program, improved controls are identified as necessary, permittees should revise their mix of BMPs to provide for a more effective program. Such a change, and an explanation of the change, must be noted in a report to the NPDES permitting authority.

What are the Recordkeeping Requirements?

Records required by the NPDES permitting authority must be kept for at least 3 years and made accessible to the public at reasonable times during regular business hours. Records need not be submitted to the NPDES permitting authority unless the permittee is requested to do so.

What Are the Deadlines for Compliance?

- ❑ The NPDES permitting authority issues general permits for regulated small MS4s by December 9, 2002.
- ❑ Operators of “automatically designated” regulated small MS4s in urbanized areas submit their permit applications within 90 days of permit issuance, no later than March 10, 2003.
- ❑ Operators of regulated small MS4s designated by the permitting authority submit their permit applications within 180 days of notice.
- ❑ Regulated small MS4 storm water management programs fully developed and implemented by the end of the first permit term, typically a 5-year period

What are the Penalties for Noncompliance?

The NPDES permit that the operator of a regulated small MS4 is required to obtain is federally enforceable, thus subjecting the permittee to potential enforcement actions and penalties by the NPDES permitting authority if the permittee does not fully comply with application or permit requirements. This federal enforceability also includes the right for interested parties to sue under the citizen suit provision (section 405) of the CWA.

For Additional Information**Contacts****☛ U.S. EPA Regional Storm Water Coordinators¹**

Region 1 {ME ² , NH ² , VT, MA ² , RI, CT}:	Thelma Murphy	617 918-1615
Region 2 {NY, NJ, PR ² , VI}:	Karen O'Brien	212 637-3717
Region 3 {PA, DE, DC ² , MD, VA, WV}:	Mary Letzkus	215 814-2087
Region 4 {KY, TN, NC, SC, MS, AL, GA, FL}:	Michael Mitchell	404 562-9303
Region 5 {MN, WI, IL, MI, IN, OH}:	Peter Swenson	312 886-0236
Region 6 {NM ² , TX, OK, AR, LA}:	Brent Larsen	214 665-7523
Region 7 {NE, KS, IA, MO}:	Ralph Summers	913 551-7416
Region 8 {MT, ND, WY, SD, UT, CO}:	Vernon Berry	303 312-6234
Region 9 {CA, NV, AZ ² , HI}:	Eugene Bromley	415 744-1906
Region 10 {WA, OR, ID ² , AK ² }:	Bob Robichaud	206 553-1448

¹ The U.S. EPA is the NPDES permitting authority for all federally recognized Indian Country Lands, and for Federal facilities in AK, American Samoa, AZ, CO, DE, DC, FL, Guam, ID, Johnston Atoll, ME, MA, Midway & Wake Islands, NH, NM, PR, VT, VI, and WA.

² Denotes a non-authorized State for the NPDES storm water program. For these States only, the U.S. EPA Region is the NPDES permitting authority. All other States serve as NPDES permitting authorities for the storm water program.

☛ U.S. EPA Office of Wastewater Management

- Phone: 202 260-5816
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Industrial "No Exposure"

4.0 – Conditional No Exposure
Exclusion for Industrial Activity

The 1972 amendments to the Federal Water Pollution Control Act, later referred to as the Clean Water Act (CWA), prohibit the discharge of any pollutant to navigable waters of the United States from a point source unless the discharge is authorized by a National Pollutant Discharge Elimination System (NPDES) permit. Efforts to improve water quality under the NPDES program traditionally have focused on reducing pollutants in industrial process wastewater and municipal sewage treatment plant discharges. Over time, it has become evident that more diffuse sources of water pollution, such as storm water runoff from construction sites, are also significant contributors to water quality problems.

Sediment runoff rates from construction sites are typically 10 to 20 times greater than those from agricultural lands, and 1,000 to 2,000 times greater than those of forest lands. During a short period of time, construction activity can contribute more sediment to streams than can be deposited over several decades, causing physical and biological harm to our Nation's waters.

In 1990, EPA promulgated rules establishing Phase I of the NPDES storm water program. Phase I addresses, among other discharges, discharges from large construction activities disturbing 5 acres or more of land. Phase II of the NPDES storm water program covers small construction activities disturbing between 1 and 5 acres. Phase II became final on December 8, 1999 with small construction permit applications due by March 10, 2003 (specific compliance dates will be set by the NPDES permitting authority in each State). This fact sheet outlines the construction activities covered by Phase I and Phase II, including possible waiver options from Phase II coverage, and the Phase II construction program requirements.

Who Is Covered Under the Phase I Rule?

Sites Five Acres and Greater

The Phase I NPDES storm water rule identifies eleven categories of industrial activity in the definition of "storm water discharges associated with industrial activity" that must obtain an NPDES permit. Category (x) of this definition is construction activity, commonly referred to as "large" construction activity. Under category (x), the Phase I rule requires all *operators* of construction activity *disturbing 5 acres or greater of land* to apply for an NPDES storm water permit. Operators of sites disturbing less than 5 acres are also required to obtain a permit if their activity is part of a "larger common plan of development or sale" with a planned disturbance of 5 acres or greater. "Disturbance" refers to exposed soil resulting from activities such as clearing, grading, and excavating. Construction activities can include road building, construction of residential houses, office buildings, industrial sites, or demolition.

What Is Meant by a "Larger Common Plan of Development or Sale"?

As defined in EPA's NPDES storm water general permit for large construction activity, a "larger common plan of development or sale" means a contiguous area where multiple separate and distinct construction activities are occurring under one plan (e.g., the operator is building on three half-acre lots in a 6-acre development). The "plan" in a common plan of development or sale is broadly defined as any announcement or piece of documentation

(including a sign, public notice or hearing, sales pitch, advertisement, drawing, permit application, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that construction activities may occur on a specific plot.

What Is the Definition of an “Operator” of a Construction Site?

As defined in EPA’s storm water general permit for large construction activity, an “operator” is the party or parties that has:

- ❑ Operational control of construction project plans and specifications, including the ability to make modifications to those plans and specifications; *or*
- ❑ Day-to-day operational control of those activities that are necessary to ensure compliance with a storm water pollution prevention plan (SWPPP) for the site or other permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions).

There may be more than one party at a site performing the tasks related to “operational control” as defined above. Depending on the site and the relationship between the parties (e.g., owner, developer, contractor), there can either be a single party acting as site operator and consequently be responsible for obtaining permit coverage, or there can be two or more operators, all obligated to seek permit coverage. It is important to note that NPDES-authorized States may use a different definition of “operator” than the one above.

How Is the Phase II Construction Rule Related to the Phase I Construction Rule?

In 1992, the Ninth Circuit court remanded for further proceedings portions of EPA’s existing Phase I storm water regulation related to the category (x) discharges from large construction activity (NRDC v. EPA, 966 F.2d at 1292). EPA responded to the court’s decision by designating under Phase II storm water discharges from construction activity disturbing less than 5 acres as sources that should be regulated to protect water quality. The Phase II Rule designates these sources as “storm water discharges associated with *small construction* activity,” rather than as another category under “storm water associated with *industrial* activity.”

Who Is Covered Under the Phase II Construction Rule?

Sites Between One and Five Acres

The Storm Water Phase II Rule automatically designates, as small construction activity under the NPDES storm water permitting program, all operators of construction site activities that result in a *land disturbance of equal to or greater than 1 and less than 5 acres*.

Sites Less Than One Acre

Site activities disturbing less than 1 acre are also regulated as small construction activity if they are part of a larger common plan of development or sale with a planned disturbance of equal to or greater than 1 acre and less than 5 acres, or if they are designated by the NPDES permitting authority. The NPDES permitting authority or EPA Region may designate construction activities disturbing less than 1 acre based on the potential for contribution to a violation of a water quality standard or for significant contribution of pollutants to waters of the United States.

Are Waivers Available for Operators of Regulated Construction Activity?

Yes, but only for small, not large, construction activity. Under the Phase II Rule, NPDES permitting authorities have the option of providing a waiver from the requirements to operators of small construction activity who certify to either one of two conditions:

- ① Low predicted rainfall potential (i.e., activity occurs during a negligible rainfall period), where the rainfall erosivity factor (“R” in the Revised Universal Soil Loss Equation [RUSLE]) is less than 5 during the period of construction activity; *or*
- ② A determination that storm water controls are not necessary based on either:
 - (A) A “total maximum daily load” (TMDL) that address the pollutant(s) of concern for construction activities; **OR**
 - (B) An equivalent analysis that determines allocations are not needed to protect water quality based on consideration of instream concentrations, expected growth in pollutant concentrations from all sources, and a margin of safety.

Pollutants of concern include sediment or a parameter that addresses sediment (such as total suspended solids, turbidity, or siltation) and any other pollutant that has been identified as a cause of

The intent of the waiver provision is to waive only those sites that are highly unlikely to have a negative effect on water quality. Therefore, before applying for a waiver, operators of small construction activity are encouraged to consider the potential water quality impacts that may result from their project and to carefully examine such factors as proximity to water resources and sensitivity of receiving waters.

a. What is the Rainfall Erosivity Factor in Waiver ❶?

Waiver ❶ uses the Rainfall Erosivity Factor to determine whether the potential for polluted discharge is low enough to justify a waiver from the requirements. It is one of six variables used by the Revised Universal Soil Loss Equation (RUSLE)—a predictive tool originally used to measure soil loss from agricultural lands at various times of the year on a regional basis—to predict soil loss from construction sites. The Rainfall Erosivity Factor waiver is time-sensitive and is dependent on when during the year a construction activity takes place, how long it lasts, and the expected rainfall and intensity during that time. For information about the rainfall erosivity waiver, see Fact Sheet 3.1. Charts detailing the value of the Rainfall Erosivity Factor by particular regions can be found in Chapter 2 of the RUSLE user’s guide, which can be downloaded at: <http://www.epa.gov/owm/sw/phase2>.

b. What is a “TMDL” in Waiver ❷?

For impaired waters where technology-based controls required by NPDES permits are not achieving State water quality standards, the CWA requires implementation of the TMDL process. The TMDL process establishes the maximum amount of pollutants a waterbody can assimilate before water quality is impaired, then requires that this maximum level not be exceeded.

A TMDL is done for each pollutant that is found to be contributing to the impairment of a waterbody or a segment of a waterbody. To allow a waiver for construction activities, a TMDL would need to address sediment, or a parameter that addresses sediment such as total suspended solids, turbidity, or siltation. Additional TMDLs addressing common pollutants from construction sites such as nitrogen, phosphorus, and oil and grease also may be necessary to ensure water quality protection and allow a waiver from the NPDES storm water program.

A TMDL assessment determines the source or sources of a pollutant of concern, considers the maximum allowable level of that pollutant for the waterbody, then allocates to each source or category of sources a set level of the pollutant that it is allowed to discharge into the waterbody. Allocations to point sources are called wasteload allocations.

How Would an Operator Qualify for, and Certify to, Waiver ❷?

EPA expects that when TMDLs, or equivalent analyses are completed, there may be a determination that certain classes of sources, such as small construction activity, would not have to control their contribution of pollutants of concern to the waterbody in order for the waterbody to be in attainment with water quality standards (i.e., these sources were not assigned wasteload allocations). In such a case, to qualify for waiver ❷, the operator of the construction site would need to certify that its construction activity will take place, and the storm water discharges will occur, within the area covered either by the TMDLs or equivalent analysis. A certification form would likely be provided by the NPDES permitting authority for this purpose.

What Does the Phase II Construction Program Require?

The Phase II Final Rule requires operators of Phase II small construction sites, nationally, to obtain an NPDES permit and implement practices to minimize pollutant runoff. It is important to note that, locally, these same sites also may be covered by State, Tribal, or local construction runoff control programs (see Fact Sheets 2.6 and 2.7 for information on the Phase II small MS4’s construction program). For the Phase II small construction program, EPA has taken an approach similar to Phase I where the program requirements are not fully defined in the rule but rather in the NPDES permit issued by the NPDES permitting authority.

EPA recommends that the NPDES permitting authorities use their existing Phase I large construction general permits as a guide to developing their Phase II small construction permits. In doing so, the Phase II requirements would be similar to the three general Phase I requirements summarized below.

- ❑ Submission of a *Notice of Intent* (NOI) that includes general information and a certification that the activity will not impact endangered or threatened species. This certification is unique to EPA’s NOI and is not a requirement of most NPDES-delegated State’s NOIs;
- ❑ The development and implementation of a *Storm Water Pollution Prevention Plan* (SWPPP) with appropriate BMPs to minimize the discharge of pollutants from the site; and

- ❑ Submission of a *Notice of Termination* (NOT) when final stabilization of the site has been achieved as defined in the permit or when another operator has assumed control of the site.

Can the Permitting Authority Reference a Qualifying Erosion and Sediment Control Program in NPDES Construction Permits?

Yes. The Phase II Rule allows the NPDES permitting authority to include in its NPDES permits for large and for small construction activity conditions that incorporate by reference qualifying State, Tribal, or local erosion and sediment control program requirements. A qualifying program must include the following requirements:

- ❑ Requirements for construction site operators to implement appropriate erosion and sediment control best management practices;
- ❑ Requirements for construction site operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste that may cause adverse impacts to water quality;
- ❑ Requirements for construction site operators to develop and implement a storm water pollution prevention plan; and
- ❑ Requirements to submit a site plan for review that incorporates consideration of potential water quality impacts.

In addition to the four elements above, a qualifying program for large construction activities must also include any additional requirements necessary to achieve the applicable technology-based standards of “Best Available Technology” (BAT) and “Best Conventional Technology” (BCT) based on the best professional judgment of the permit writer.

Should a State, Tribal, or local program include one or more, but not all, of the elements listed above, the permitting authority can reference the program in the permit, provided it also lists the missing element(s) as a condition in the permit.

What are Some Recommended BMPs for Small Construction Sites?

The approach and BMPs used for controlling pollutants in storm water discharges from small construction sites may vary from those used for large sites since their characteristics can differ in many ways. For example, operators of small sites may have more limited access to qualified design personnel and technical information. Also, small sites may have less space for installing and maintaining certain BMPs.

As is the case with all construction sites, erosion and sediment control at small construction sites is best accomplished with proper planning, installation, and maintenance of controls. The following practices have shown to be efficient, cost effective, and versatile for small construction site operators to implement. The practices are divided into two categories: non-structural and structural.

❑ Non-Structural BMPs

- Minimizing Disturbance
- Preserving Natural Vegetation
- Good Housekeeping

❑ Structural BMPs

Erosion Controls

- Mulch
- Grass
- Stockpile Covers

Sediment Controls

- Silt Fence
- Inlet Protection
- Check Dams
- Stabilized Construction Entrances
- Sediment Traps

Most erosion and sediment controls require regular maintenance to operate correctly. Accumulated sediments should be removed frequently and materials should be checked periodically for wear. Regular inspections by qualified personnel, which can allow problem areas to be addressed, should be performed after major rain events.

For Additional Information

Contact

- ☞ U.S. EPA Office of Wastewater Management
 - Internet: www.epa.gov/npdes/stormwater
 - Phone: 202-564-9545

- ☞ Your local soil conservation district office. They can provide assistance with RUSLE and other conservation related issues.
 - A list of conservation district contacts is available at: www.nacdnet.org/resources/cdsonweb.html

Reference Documents

- ☞ Storm Water Phase II Final Rule Fact Sheet Series
 - Internet: cfpub.epa.gov/npdes/stormwater/swfinal.cfm

- ☞ Storm Water Phase II Final Rule (64 FR 68722)
 - Internet: www.epa.gov/npdes/regulations/phase2.pdf

- ☞ *Agricultural Handbook Number 703, Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, Chapter 2, pp. 21-64, January 1997.
 - Internet: www.epa.gov/npdes/pubs/ruslech2.pdf

- ☞ *Guidance for Water Quality Based Decisions: The TMDL Process*. April 1991. U.S. EPA Office of Water. EPA 440/4-91-001.
 - Internet: www.epa.gov/OWOW/tmdl

- ☞ *NPDES General Permit for Storm Water Discharges from Construction Activities* (63 FR 7857).
 - Internet: www.epa.gov/npdes/pubs/cgp-nat.pdf
www.epa.gov/npdes/pubs/cgp-nat2.pdf
www.epa.gov/npdes/pubs/cgp-nat3.pdf
www.epa.gov/npdes/pubs/cgp-nat4.pdf



Storm Water Phase II Final Rule

Construction Rainfall Erosivity Waiver

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Industrial "No Exposure"

4.0 – Conditional No Exposure
Exclusion for Industrial Activity

The 1972 amendments to the Federal Water Pollution Control Act, later referred to as the Clean Water Act (CWA), prohibit the discharge of any pollutant to navigable waters of the United States unless the discharge is authorized by a National Pollutant Discharge Elimination System (NPDES) permit. Because construction site storm water runoff can contribute significantly to water quality problems, the Phase I Storm Water Rule imposed a requirement that all construction sites with a planned land disturbance of 5 acres or more obtain an NPDES permit and implement storm water runoff control plans. Phase II extends the requirements of the storm water program to sites of between 1 and 5 acres. The Rainfall erosivity waiver, along with the water quality waiver, allows permitting authorities to waive those sites that do not have adverse water quality impacts.

What is Erosivity?

Erosivity is the term used to describe the potential for soil to wash off disturbed, devegetated earth into waterways during storms. The potential for erosion is in part determined by the soil type and geology of the site. For instance, dense, clay-like soils on a glacial plain will erode less readily when it rains than will sandy soils on the side of a hill. Another important factor is the amount and force of precipitation expected during the time the earth will be exposed. While it is impossible to predict the weather several months in advance of construction, for many areas of the country, there are definite optimal periods, such as a dry season when rain tends to fall less frequently and with less force. When feasible, this is the time to disturb the earth, so that the site is stabilized by the time the seasonal wet weather returns. There are many other important factors to consider in determining erosivity, such as freeze/thaw cycles and snow pack.

How Is Site Erosivity Determined?

The method for determining if a site qualifies for the erosivity waiver is based on the Universal Soil Loss Equation (USLE) developed by the U.S. Department of Agriculture (USDA) in the 1950s to help farmers conserve their valuable topsoil. The USLE has been updated to the Revised USLE (RUSLE). Using a computer model supported by decades worth of soil and rainfall data, USDA established estimates of annual erosivity values (R) for sites throughout the country. These R factors are used as surrogate measures of the impact that rainfall had on erosion from a particular site. They have been mapped using iseroindent contours, as shown in Figures 2 through 5.

USDA developed the Erosivity Index Table (EI Table, provided here in Table 1), to show how the annual erosivity factor is distributed throughout the year in two-week increments. Table 1 is based on 120 rainfall distribution zones for the continental U.S. Detailed instructions for calculating a project R Factor are provided later in this fact sheet.

The Storm Water Phase II rule allows permitting authorities to waive NPDES requirements for small construction sites if the value of the rainfall erosivity factor is less than 5 during the period of construction activity (see § 122.26(b)(15)(i)(A)). Note that the permitting authority has the option to not allow waivers for small construction activity. If the permitting authority in a State chooses to use the rainfall erosivity waiver, it will not become effective until permits are required from small construction activity.

If the R Factor for the period of construction calculates to 5 or lower, and the permitting authority allows the use of the waiver, the site owner may apply for a waiver under the low rainfall erosivity provision of the applicable NPDES Construction General Permit. When applying, owners are encouraged to consider other site-specific factors, such as proximity to water resources and the sensitivity of receiving waters to sedimentation impacts. The small construction operator must certify to the permitting authority that the construction activity will take place during a period when the rainfall erosivity factor is less than 5.

The start and end dates used for the construction activity will be the initial date of disturbance and the anticipated date when the site will have achieved final stabilization as defined by the permit. If the construction continues beyond this period, the operator will need to recalculate the EI for the site based on this new ending date (but keeping the old start date) and either resubmit the certification form or apply for NPDES permit coverage.

What Other Factors Can Affect Waiver Availability and Eligibility?

EPA has established the R Factor of 5 or lower as the criteria for determining waiver eligibility. However, since the intent is to waive only those construction activities that will not adversely impact water quality, State and Tribal permitting authorities have considerable discretion in determining where, when, and how to offer it. They can establish an R Factor threshold lower than 5, or they can suspend the waiver within an area where watersheds are known to be heavily impacted by, or sensitive to, sedimentation. They can also suspend the waiver during certain periods of the year. They may opt not to offer the waiver at all. NOTE: This waiver is not available to sites that will disturb more than 5 acres of land (large construction).

What if My Site Is Not Eligible?

If your site is not eligible for a waiver, you must submit a Notice of Intent under the NPDES General Permit, and comply with its requirements. These requirements are described in more detail in Storm Water Phase II Fact Sheet 3.0.

How Do I Compute the R Factor for My Project?

1. Estimate the construction start date. This is the day you expect to begin disturbing soils, including grubbing, stockpiling, excavating, and grading activities. Pick the 15-day period for your start date (e.g., June 1-15.)
2. Estimate the day you expect to have a permanent vegetative cover of at least 70%, or as defined by your permitting authority, over all previous disturbed areas. Round to the nearest 15-day period.

3. Refer to Figure 1 to find your Erosivity Index (EI) Zone based on your geographic location.
4. Refer to Table 1, the Erosivity Index (EI) Table. Find the number of your EI Zone in the left column. Locate the EI values for the 15-day periods that correspond to the project start and end periods you identified in Steps 1 and 2. Subtract the start value from the end value to find the % EI for your site. The maximum annual EI value for a project is 100%.
5. Refer to the appropriate Isoerodent Map (Figures 2 through 5). Interpolate the annual isoerodent value for your area. This is the annual R Factor for your site.
6. Multiply the percent value obtained in Step 4 by the annual isoerodent value obtained in Step 5. This is the R Factor for your scheduled project.

Examples

1. Construction started and completed in one calendar year.

Find the R value of a construction site in Denver, Colorado. Assume the site will be disturbed from March 1 to May 15.

The EI distribution zone is 84 (Figure 1). Referring to Table 1, the project period will span from March 1 to May 15. The difference in values between these two periods is 4.7 % ($4.9 - 0.2 = 4.7$). Since the annual erosion index for this location is about 45 (interpolated from Figure 2), the R Factor for the scheduled construction project is 4.7% of 45, or 2.1.

Because 2.1 is less than 5, the operator of this site would be able to seek a waiver under the low rainfall erosivity provision.

2. Construction spanning two calendar years.

Find the R value for a construction site in Pittsburgh, Pennsylvania. Assume the site will be disturbed from August 1 to April 15.

The EI distribution zone is 111 (Figure 1). Referring to Table 1, the project will span from August 1 to April 15. The difference in values between August 1 and December 30 is 35% ($100 - 65.0 = 35.0$). The difference between January 1 and April 15 is 8%. The total percentage EI for this project is 43% ($35 + 8$). Since the annual erosion index for this location is 112 (interpolated from Figure 2), the R Factor for the scheduled construction is 43% of 112, or 48.

Since 48 is greater than 5, the operator of this site would not be able to seek a waiver under the low rainfall erosivity provision.

Can I Use A Personal Computer to Calculate the R Factor?

The computer program used by USDA to develop the current R Factor maps and table is called the Revised Universal Soil Loss Equation, or RUSLE. The current version of RUSLE (v. 1.60) will calculate the R factor for the entire year for a limited number of cities in the U.S., but does not allow the R factor to be easily adjusted based on a shorter period of construction. If you are interested in using RUSLE; Version 1.06 for Mined Lands, Construction Sites, and Reclaimed Lands, is downloadable free of charge from the Internet at <http://www.sedlab.olemiss.edu/rusle>.

Where Can I Get Help?

- " A copy of "Chapter 2, Rainfall-Runoff Erosivity Factor (R)" from the *USDA Handbook 703 - Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, January 1997, is available on EPA's web site at <http://www.epa.gov/owm/sw/>.
- " Your local soil conservation district office can provide assistance with R Factors and other conservation-related issues. To find the office nearest you, look in the government section of the phone book under soil conservation district, conservation district, natural resource conservation district, etc.

For Additional Information

Reference Documents

- L Storm Water Phase II Final Rule Fact Sheet Series
 - Internet: www.epa.gov/owm/sw/phase2
- L Storm Water Phase II Final Rule(64 FR 68722)
 - Internet: www.epa.gov/owm/sw/phase2
 - Contact the U.S. EPA Water Resource Center
Phone: 202 260-7786
E-mail: center.water-resource@epa.gov
- L *Agricultural Handbook Number 703, Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)*, Chapter 2, pp. 21-64, January 1997.
 - Internet: www.epa.gov/owm/sw/phase2

Figure 1. Erosivity Index Zone Map

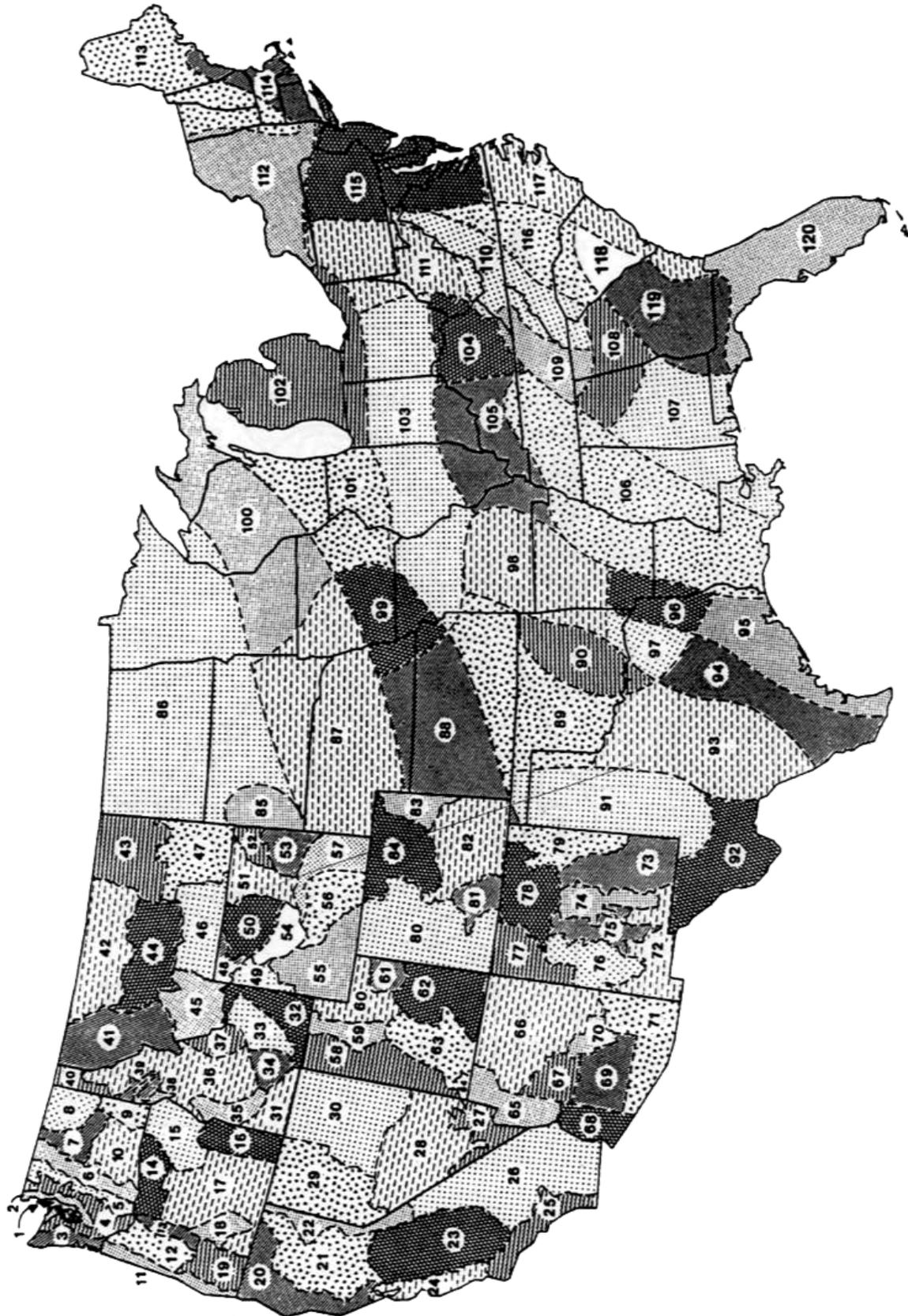
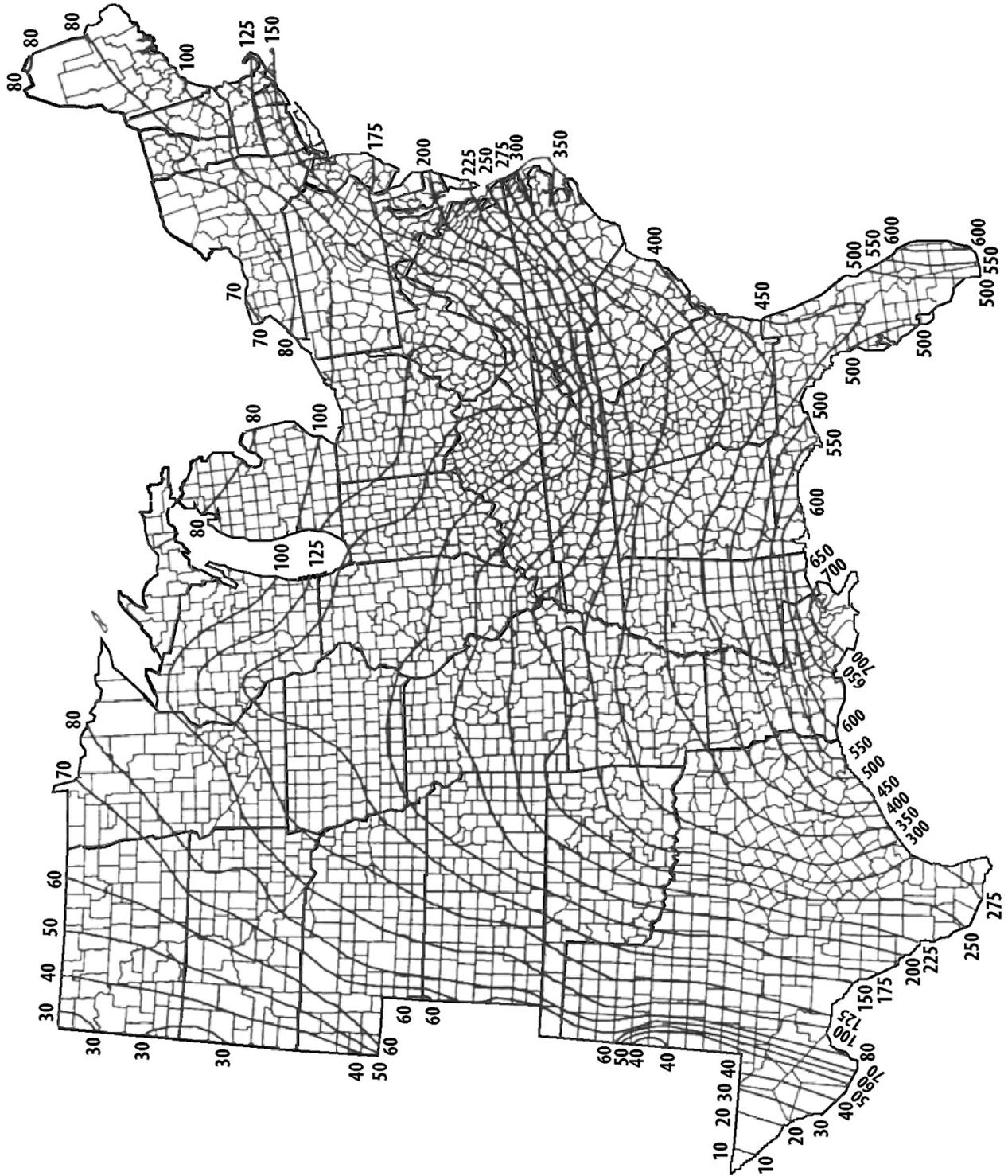
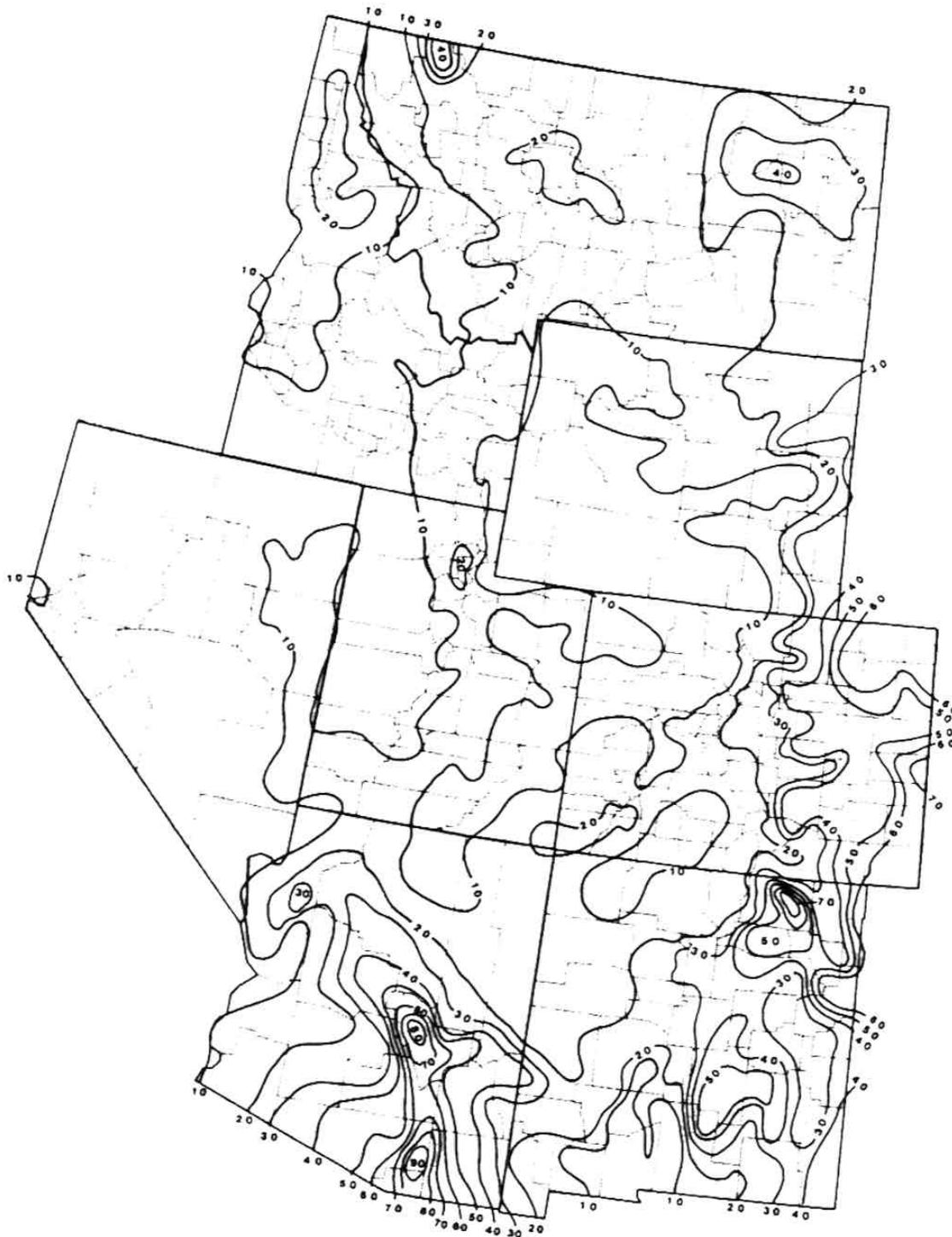


Figure 2. Isoerodent Map of the Eastern U.S.



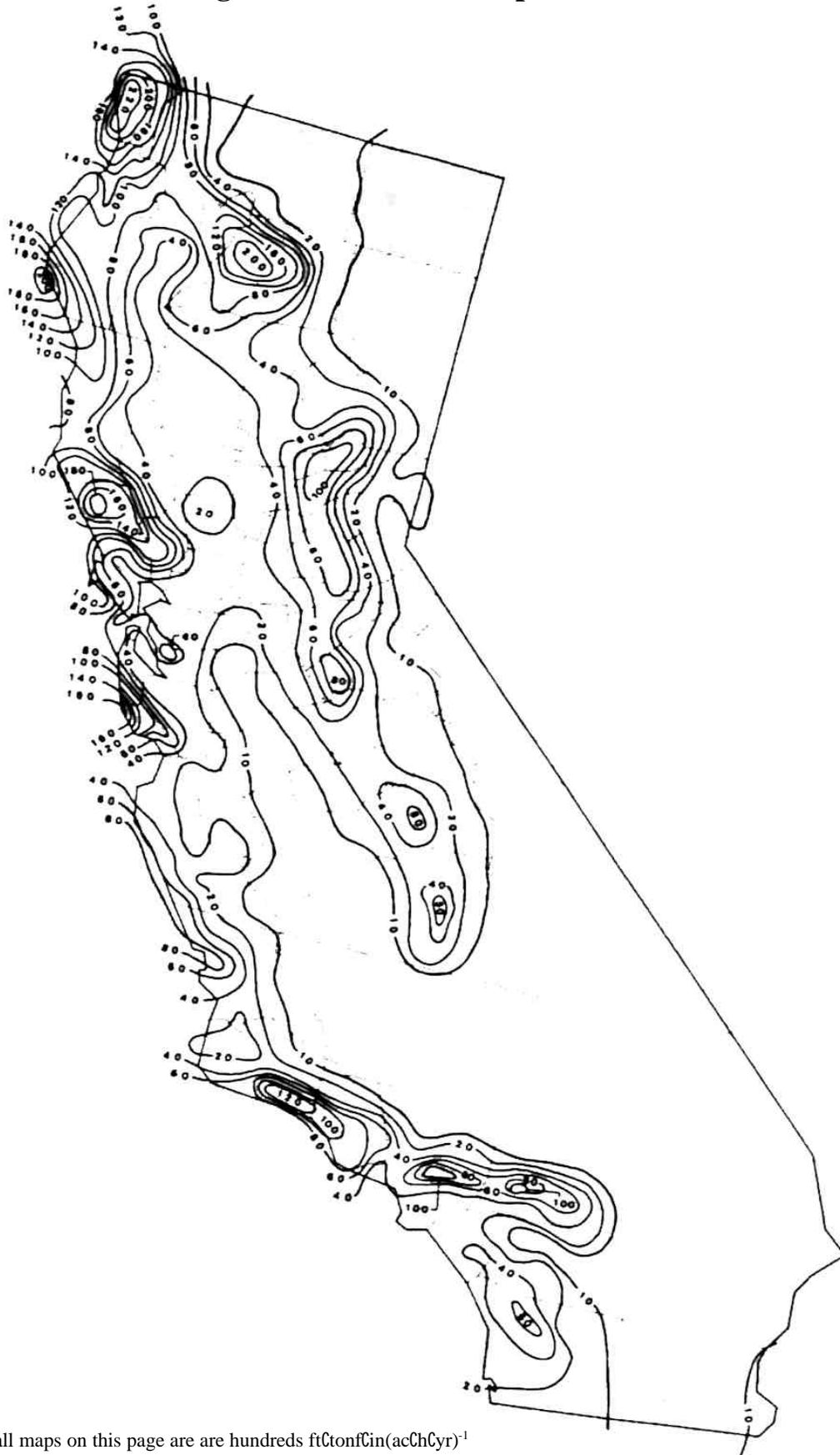
Note: Units for all maps on this page are are hundreds $\text{ft}^3/\text{acre} \cdot \text{yr}$

Figure 3. Isoerodent Map of the Western U.S.



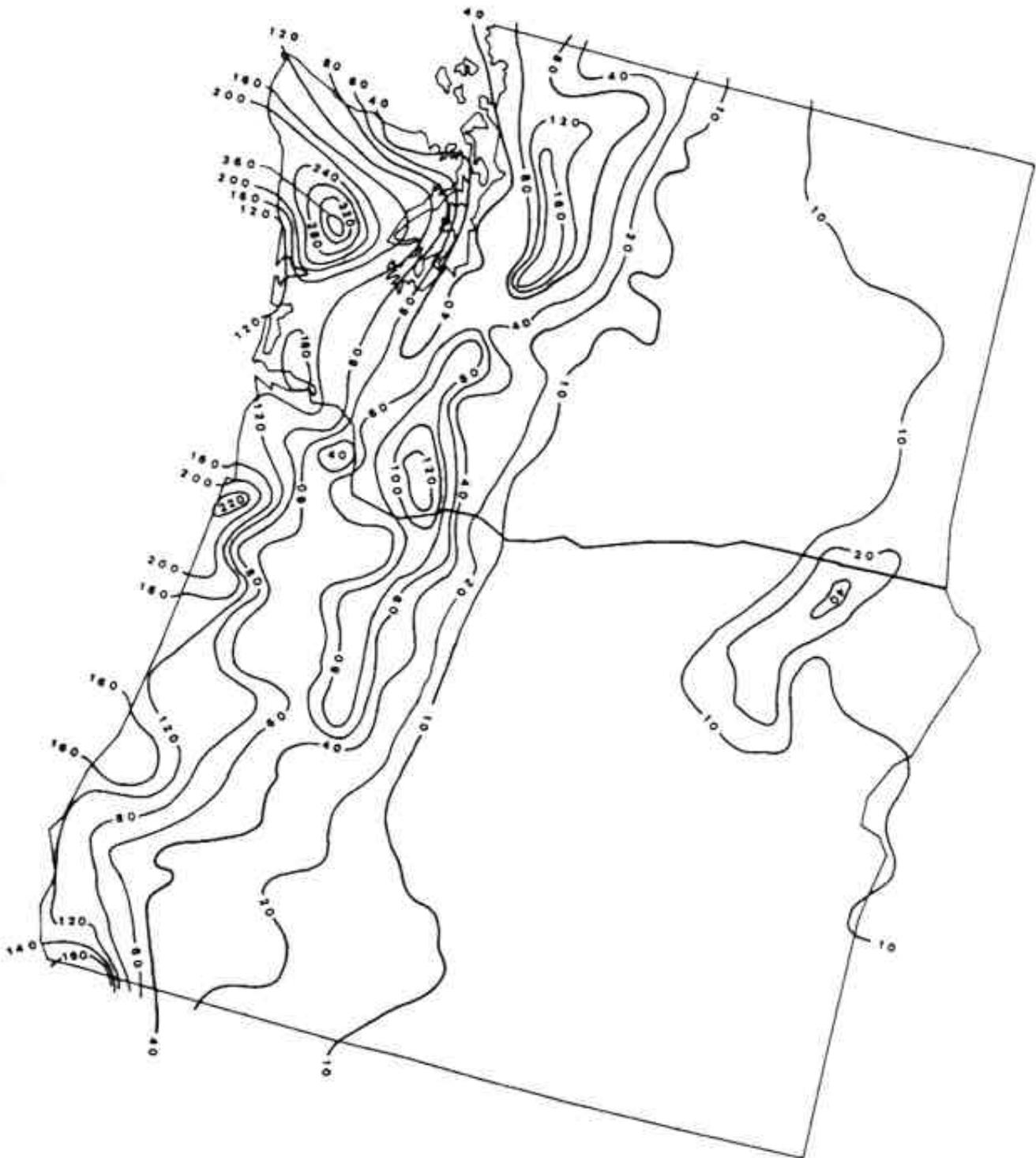
Note: Units for all maps on this page are are hundreds $\text{ft}^2 \text{ ton} \cdot \text{hr} \cdot \text{in} \cdot (\text{ac} \cdot \text{hr} \cdot \text{Cyr})^{-1}$

Figure 4. Isoerodent Map of California



Note: Units for all maps on this page are are hundreds ft/ton/fin(acChCyr)⁻¹

Figure 5. Isoerodent Map of Oregon and Washington



Note: Units for all maps on this page are are hundreds $\text{ft}^2 \text{ ton} \text{ in} \text{ (acChCyr)}^{-1}$

Table 1. Erosivity Index Table

EI as a percentage of Average Annual R Value Computed for Geographic Areas Shown in Figure 1

EI#	Jan	Jan	Feb	Feb	Mar	Mar	Apr	Apr	May	May	Jun	Jun	Jul	Jul	Aug	Aug	Sep	Sep	Oct	Oct	Nov	Nov	Dec	Dec
	1-15	16-31	1-15	16-29	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	16-31	1-15	16-31	1-15	16-31	1-15	16-31
1	0.0	4.3	8.3	12.8	17.3	21.6	25.1	28.0	30.9	34.9	39.1	42.6	45.4	48.2	50.8	53.0	56.0	60.8	66.8	71.0	75.7	82.0	89.1	95.2
2	0.0	4.3	8.3	12.8	17.3	21.6	25.1	28.0	30.9	34.9	39.1	42.6	45.4	48.2	50.8	53.0	56.0	60.8	66.8	71.0	75.7	82.0	89.1	95.2
3	0.0	7.4	13.8	20.9	26.5	31.8	35.3	38.5	40.2	41.6	42.5	43.6	44.5	45.1	45.7	46.4	47.7	49.4	52.8	57.0	64.5	73.1	83.3	92.3
4	0.0	3.9	7.9	12.6	17.4	21.6	25.2	28.7	31.9	35.1	38.2	42.0	44.9	46.7	48.2	50.1	53.1	56.6	62.2	67.9	75.2	83.5	90.5	96.0
5	0.0	2.3	3.6	4.7	6.0	7.7	10.7	13.9	17.8	21.2	24.5	28.1	31.1	33.1	35.3	38.2	43.2	48.7	57.3	67.8	77.9	86.0	91.3	96.9
6	0.0	0.0	0.0	0.5	2.0	4.1	8.1	12.6	17.6	21.6	25.5	29.6	34.5	40.0	45.7	50.7	55.6	60.2	66.5	75.5	85.6	95.9	99.5	99.9
7	0.0	0.0	0.0	0.0	0.0	1.2	4.9	8.5	13.9	19.0	26.1	35.4	43.9	48.8	53.9	64.5	73.4	77.5	80.4	84.8	89.9	96.6	99.2	99.7
8	0.0	0.0	0.0	0.0	0.0	0.9	3.6	7.8	15.0	20.2	27.4	38.1	49.8	57.9	65.0	75.6	82.7	86.8	89.4	93.4	96.3	99.1	100.0	100.0
9	0.0	0.8	3.1	4.7	7.4	11.7	17.8	22.5	27.0	31.4	36.0	41.6	46.4	50.1	53.4	57.4	61.7	64.9	69.7	79.0	89.6	97.4	100.0	100.0
10	0.0	0.3	0.5	0.9	2.0	4.3	9.2	13.1	18.0	22.7	29.2	39.5	46.3	48.8	51.1	57.2	64.4	67.7	71.1	77.2	85.1	92.5	96.5	99.0
11	0.0	5.4	11.3	18.8	26.3	33.2	37.4	40.7	42.5	44.3	45.4	46.5	47.1	47.4	47.8	48.3	49.4	50.7	53.6	57.5	65.5	76.2	87.4	94.8
12	0.0	3.5	7.8	14.0	21.1	27.4	31.5	35.0	37.3	39.8	41.9	44.3	45.6	46.3	46.8	47.9	50.0	52.9	57.9	62.3	69.3	81.3	91.5	96.7
13	0.0	0.0	0.0	1.8	7.2	11.9	16.7	19.7	24.0	31.2	42.4	55.0	60.0	60.8	61.2	62.6	65.3	67.6	71.6	76.1	83.1	93.3	98.2	99.6
14	0.0	0.7	1.8	3.3	6.9	16.5	26.6	29.9	32.0	35.4	40.2	45.1	51.9	61.1	67.5	70.7	72.8	75.4	78.6	81.9	86.4	93.6	97.7	99.3
15	0.0	0.0	0.0	0.5	2.0	4.4	8.7	12.0	16.6	21.4	29.7	44.5	56.0	60.8	63.9	69.1	74.5	79.1	83.1	87.0	90.9	96.6	99.1	99.8
16	0.0	0.0	0.0	0.5	2.0	5.5	12.3	16.2	20.9	26.4	35.2	48.1	58.1	63.1	66.5	71.9	77.0	81.6	85.1	88.4	91.5	96.3	98.7	99.6
17	0.0	0.0	0.0	0.7	2.8	6.1	10.7	12.9	16.1	21.9	32.8	45.9	55.5	60.3	64.0	71.2	77.2	80.3	83.1	87.7	92.6	97.2	99.1	99.8
18	0.0	0.0	0.0	0.6	2.5	6.2	12.4	16.4	20.2	23.9	29.3	37.7	45.6	49.8	53.3	58.4	64.3	69.0	75.0	86.6	93.9	96.6	98.0	100.0
19	0.0	1.0	2.6	7.4	16.4	23.5	28.0	31.0	33.5	37.0	41.7	48.1	51.1	52.0	52.5	53.6	55.7	57.6	61.1	65.8	74.7	88.0	95.8	98.7
20	0.0	9.8	18.5	25.4	30.2	35.6	38.9	41.5	42.9	44.0	45.2	48.2	50.8	51.7	52.5	54.6	57.4	58.5	60.1	63.2	69.6	76.7	85.4	92.4
21	0.0	7.5	13.6	18.1	21.1	24.4	27.0	29.4	31.7	34.6	37.3	39.6	41.6	43.4	45.4	48.1	51.3	53.3	56.6	62.4	72.4	81.3	88.9	94.7
22	0.0	1.2	1.6	1.6	1.6	1.6	1.6	2.2	3.9	4.6	6.4	14.2	32.8	47.2	58.8	69.1	76.0	82.0	87.1	96.7	99.9	99.9	99.9	99.9
23	0.0	7.9	15.0	20.9	25.7	31.1	35.7	40.2	43.2	46.2	47.7	48.8	49.4	49.9	50.7	51.8	54.1	57.7	62.8	65.9	70.1	77.3	86.8	93.5
24	0.0	12.2	23.6	33.0	39.7	47.1	51.7	55.9	57.7	58.6	58.9	59.1	59.1	59.2	59.2	59.3	59.5	60.0	61.4	63.0	66.5	71.8	81.3	89.6
25	0.0	9.8	20.8	30.2	37.6	45.8	50.6	54.4	56.0	56.8	57.1	57.1	57.2	57.6	58.5	59.8	62.2	65.3	67.5	68.2	69.4	74.8	86.6	93.0
26	0.0	2.0	5.4	9.8	15.6	21.5	24.7	26.6	27.4	28.0	28.7	29.8	32.5	36.6	44.9	55.4	65.7	72.6	77.8	84.4	89.5	93.9	96.5	98.4
27	0.0	0.0	0.0	1.0	4.0	5.9	8.0	11.1	13.0	14.0	14.6	15.3	17.0	23.2	39.1	60.0	76.3	86.1	89.7	90.4	90.9	93.1	96.6	99.1
28	0.0	0.0	0.0	0.0	0.2	0.5	1.5	3.3	7.2	11.9	17.7	21.4	27.0	37.1	51.4	62.3	70.6	78.8	84.6	90.6	94.4	97.9	99.3	100.0
29	0.0	0.6	0.7	0.7	0.7	1.5	3.9	6.0	10.5	17.9	28.8	36.6	43.8	51.5	59.3	68.0	74.8	80.3	84.3	88.8	92.7	98.0	99.8	99.9
30	0.0	0.0	0.0	0.0	0.0	0.2	0.8	2.8	7.9	14.2	24.7	35.6	45.4	52.2	58.7	68.5	77.6	84.5	88.9	93.7	96.2	97.6	98.3	99.6

Table 1. Erosivity Index Table (cont.)

El#	Jan 1-15	Jan 16-31	Feb 1-15	Feb 16-29	Mar 1-15	Mar 16-31	Apr 1-15	Apr 16-30	May 1-15	May 16-31	Jun 1-15	Jun 16-30	Jul 1-15	Jul 16-31	Aug 1-15	Aug 16-31	Sep 1-15	Sep 16-31	Oct 1-15	Oct 16-31	Nov 1-15	Nov 16-31	Dec 1-15	Dec 16-31
31	0	0	0	0	0	0.2	1	3.5	9.9	15.7	26.4	47.2	61.4	65.9	69	77.2	86	91.6	94.8	98.7	100	100	100	100
32	0	0.1	0.1	0.1	0.1	0.6	2.2	4.3	9	14.2	23.3	34.6	46.3	54.2	61.7	72.9	82.5	89.6	93.7	98.2	99.7	99.9	99.9	99.9
33	0	0	0	0	0	0.6	2.3	4.2	8.8	16.1	30	46.9	57.9	62.8	66.2	72.1	79.1	85.9	91.1	97	98.9	98.9	98.9	98.9
34	0	0	0	0	0	1.8	7.3	10.7	15.5	22	29.9	35.9	42	48.5	56.9	67	76.9	85.8	91.2	95.7	97.8	99.6	100	100
35	0	0	0	0	0	2.5	10.2	15.9	22.2	27.9	34.7	43.9	51.9	56.9	61.3	67.3	73.9	80.1	85.1	89.6	93.2	98.2	99.8	99.8
36	0	0	0	0	0	0.9	3.4	6.7	12.7	18.5	26.6	36.3	46	53.5	60.2	68.3	75.8	82.6	88.3	96.3	99.3	99.9	100	100
37	0	0	0	0	0	0	0	1	3.9	9.1	19.1	26.7	36.3	47.9	61.4	75.1	84.5	92.3	96	99.1	100	100	100	100
38	0	0	0	1.1	4.3	7.2	11	13.9	17.9	22.3	30.3	43.1	55.1	61.3	65.7	72.1	77.9	82.6	86.3	90.3	93.8	98.4	100	100
39	0	0	0	0	0	1.6	6.5	11	17.8	24.7	33.1	42.8	50.3	54.9	59.7	68.9	78.1	83.6	87.5	93	96.5	99.2	100	100
40	0	0	0	0	0	1.5	6.2	10.1	16.3	23.3	32.5	42.2	50.1	55.6	60.5	67.5	74.3	79.4	84.1	91.1	95.8	99.1	100	100
41	0	0.1	0.2	0.2	0.2	0.2	0.2	0.4	1.1	6.8	22.9	40.1	54.9	63.8	70.7	81.5	89.8	96.3	98.7	99.2	99.3	99.4	99.4	99.7
42	0	0	0	0	0	0	0	0.2	0.9	5.2	17.3	33.8	53.2	66.5	75.9	87.6	93.7	97.5	99	99.7	100	100	100	100
43	0	0	0	0	0	0	0	0.1	0.4	2.7	9.5	21.9	42.7	58.6	71.1	84.6	91.9	97.1	99	99.8	100	100	100	100
44	0	1.7	2.3	2.4	2.4	2.4	2.4	2.7	3.5	7.6	18.5	34.3	52.5	64	72.3	83.3	90	95.1	97.3	98.5	98.9	98.9	98.9	99.2
45	0	0.2	0.2	0.3	0.3	0.4	0.6	0.8	1.4	3.7	10.2	22.6	41.8	54	64.5	78.7	88.4	96	98.7	99.4	99.7	99.7	99.8	99.9
46	0	0	0	0	0	0	0	0.6	2.6	7.5	19.6	32.9	48.9	63	73.5	83.3	89.5	95.6	98.3	99.6	100	100	100	100
47	0	0	0	0	0	0	0	0.4	1.6	5.8	17	33	52.5	66.4	75.7	85.5	91.3	96.5	98.8	100	100	100	100	100
48	0	0	0	0	0	0	0	0	0	2	8.1	15.4	27.8	40.7	52.6	61.1	69.3	82.6	92	98	100	100	100	100
49	0	0	0	0	0	0	0	0.7	2.7	8.3	20	27.5	35.6	44.6	56	70.2	81.3	89.2	93.6	98.5	100	100	100	100
50	0	0	0	0	0	0.1	0.4	2.4	8.2	13.7	23.8	38.8	55.1	66.1	73.6	81.8	87.7	93.8	97	99.4	100	100	100	100
51	0	0	0	0	0	0.3	1	3.1	8.7	18.8	35.8	49.6	60.4	70.2	77	84	88.8	93.8	96.6	99.1	100	100	100	100
52	0	0	0	0	0	0	0	0.6	2.5	6.8	17.5	29.8	46.1	60.5	72.7	86	92.8	96.8	98.4	99.7	100	100	100	100
53	0	0	0	0	0	0	0	0.8	3	9.5	24.2	35.3	48	63.1	76.1	87.7	93.5	97.2	98.6	99.5	99.8	99.9	100	100
54	0	0	0	0	0	0.2	0.7	2.4	7.2	14.7	27.2	37.2	47.3	58.8	67.6	74	79.2	86.7	92.6	97.9	99.8	99.9	100	100
55	0	0	0	0	0	0	0	1.3	5.4	13.3	25.5	31.6	38.8	52.5	66.8	75.5	81.2	87.9	92.8	98.3	100	100	100	100
56	0	0	0	0	0	0	0	1.3	5.1	11.4	22.3	29.5	38.5	51.1	65.2	77.8	85.6	91.7	95	98.7	100	100	100	100
57	0	0	0	0	0	0	0.1	1	3.5	9.2	21.5	31	43.5	60.4	75.1	86.1	91.6	96.2	98.1	99.4	99.9	99.9	100	100
58	0	0	0	0	0	0.2	0.9	2.9	8	13.2	21	29.1	38	45.9	54.5	65.4	74.8	82.1	87.5	95.4	98.8	99.7	100	100
59	0	0	0	0	0	0	0	2.2	8.9	15.6	24.2	31.1	38.3	46	54.9	64.2	73.2	81.9	88.5	95.7	98.6	99.4	99.7	99.7
60	0	0	0	0	0	0	0	0.4	1.5	4	9.5	13.3	20.5	33.6	52.8	66.5	76.7	88.1	94.2	98.6	100	100	100	100

Table 1. Erosivity Index Table (cont.)

El#	Jan 1-15	Jan 16-31	Feb 1-15	Feb 16-29	Mar 1-15	Mar 16-31	Apr 1-15	Apr 16-30	May 1-15	May 16-31	Jun 1-15	Jun 16-30	Jul 1-15	Jul 16-31	Aug 1-15	Aug 16-31	Sep 1-15	Sep 16-31	Oct 1-15	Oct 16-31	Nov 1-15	Nov 16-31	Dec 1-15	Dec 16-31
61	0	0	0	0	0	0	0	1.3	5	8.5	15.5	29.8	41.8	46	49.2	56	65.1	71.6	78.6	91.1	97.3	99.3	100	100
62	0	0	0	0.1	0.3	0.8	2.1	3.6	6.5	9.7	13.7	16.5	20.8	27.3	40.1	56.9	72.6	83.4	89.4	95.5	98.1	99.6	100	100
63	0	0	0	0	0	0	0	0.9	3.7	7.8	13.3	15.8	19.9	29	46.8	64.7	78.3	88.8	93.9	98.5	100	100	100	100
64	0	0	0	0.7	2.8	7.4	12.4	14.4	15.6	17.3	19.4	21	24.4	32.3	48	61.4	72.1	81.9	87	90.1	92.4	98.1	100	100
65	0	3.6	7	9.6	11.4	13	14.4	16.3	17.7	18.4	19.3	20.5	23.6	32	50	66.2	77.2	85.4	88.8	90.4	91.3	92.7	94.8	97
66	0	0	0	0	0	0.1	0.5	1.1	2.2	3.6	6	7.6	11.1	19.8	38.9	59.7	74.4	83.2	88.1	94.6	97.7	99.4	100	100
67	0	0	0	0	0	0.1	0.4	0.9	1.6	1.9	2.4	5	12.1	24.8	48.3	73.6	86.5	92	94.3	96.6	97.9	99.5	100	100
68	0	2.3	4.5	7.8	10.4	12	13.3	16.3	17.7	18.1	18.2	18.3	18.4	19.9	24.5	35	54.4	69.4	78.6	85.7	89.2	91.9	93.9	97
69	0	2	3.7	5.7	7.8	10.5	12.4	13.7	14.3	14.7	15.1	15.7	17.1	22.7	36.7	50.4	63.6	75	81.8	87.8	90.8	93.2	94.9	97.5
70	0	0.5	0.7	1	1.3	1.7	2.2	2.8	3.4	3.9	4.7	5.4	7.4	15.7	36.5	55.8	70.3	80.9	86.4	90.9	93.4	96.4	98.1	99.4
71	0	0.7	1.2	1.6	2.1	2.8	3.3	3.6	4	4.5	5.6	6.5	9.1	18.5	40.6	59.7	74	86.3	91.7	94.7	96	96.7	97.3	98.8
72	0	0	0	0	0	0	0.1	0.2	0.7	0.8	1.3	3.5	9.9	24.7	51.4	71.5	83.6	93.8	97.7	99.2	99.8	99.9	99.9	100
73	0	0	0.1	0.1	0.2	0.2	0.3	0.6	1.3	4.1	11.5	18.1	28.3	40.2	54.1	67	77.2	87.7	93.3	97.5	99.1	99.6	99.8	100
74	0	0	0	0	0	0.1	0.2	0.5	1.2	2.7	6.4	10.2	18.4	31	50.7	68.7	81.2	91.6	96.1	98.4	99.2	99.8	100	100
75	0	0.1	0.1	0.1	0.2	0.5	1.3	1.9	3	4.1	6.6	10	17.6	28.3	44.7	59.4	71.6	83.9	90.3	94.7	96.7	98.8	99.6	99.9
76	0	0	0	0	0	0.1	0.2	0.6	1.3	2	3.5	4.9	8.4	17.4	37.3	57.5	72.9	83.7	89.5	95.8	98.4	99.6	100	100
77	0	0.2	0.3	0.3	0.4	0.8	1.5	2	2.8	3.9	5.9	7.2	10.3	21.5	46.5	66.3	78.3	86.5	90.8	96	98.2	99.1	99.5	99.8
78	0	0	0	0	0	0	0.2	0.5	1.6	3.8	8.9	13.2	21.8	35.8	56.6	75.4	86	92.9	95.9	98.2	99.2	99.8	100	100
79	0	0	0	0	0	0.2	0.7	1.3	2.7	5.8	12.7	18.8	28.8	41.6	58.4	75.7	86.5	94.2	97.3	98.9	99.5	99.9	100	100
80	0	0.6	1.2	1.6	2.1	2.5	3.3	4.5	6.9	10.1	15.5	19.7	26.6	36.4	51.7	67.5	79.4	88.8	93.2	96.1	97.3	98.2	98.7	99.3
81	0	0.1	0.1	0.2	0.4	0.5	0.8	0.9	1.5	3.9	9.9	12.8	18.2	30.7	54.1	77.1	89	94.9	97.2	98.7	99.3	99.6	99.7	99.9
82	0	0	0.1	0.1	0.2	0.2	0.5	1.2	3.1	6.7	14.4	20.1	29.8	44.5	64.2	83.1	92.2	96.4	98.1	99.3	99.7	99.8	99.8	99.9
83	0	0	0.1	0.1	0.1	0.3	0.9	1.6	3.5	8.3	19.4	30	44	59.2	72.4	84.6	91.2	96.5	98.6	99.5	99.8	99.9	100	100
84	0	0	0.1	0.1	0.2	0.3	0.6	1.7	4.9	9.9	19.5	27.2	38.3	52.8	68.8	83.9	91.6	96.4	98.2	99.2	99.6	99.8	99.8	99.9
85	0	0	0	0	0	0	1	2	3	6	11	23	36	49	63	77	90	95	98	99	100	100	100	100
86	0	0	0	0	0	0	1	2	3	6	11	23	36	49	63	77	90	95	98	99	100	100	100	100
87	0	0	0	0	1	1	2	3	6	10	17	29	43	55	67	77	85	91	96	98	99	100	100	100
88	0	0	0	0	1	1	2	3	6	13	23	37	51	61	69	78	85	91	94	96	98	99	99	100
89	0	0	1	1	2	3	4	7	12	18	27	38	48	55	62	69	76	83	90	94	97	98	99	100
90	0	1	2	3	4	6	8	13	21	29	37	46	54	60	65	69	74	81	87	92	95	97	98	99

Table 1. Erosivity Index Table (cont.)

EI#	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
	1-15	16-31	1-15	16-29	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	16-31	1-15	16-31	1-15	16-31	1-15	16-31
91	0	0	0	0	1	1	1	2	6	16	29	39	46	53	60	67	74	81	88	95	99	99	100	100
92	0	0	0	0	1	1	1	2	6	16	29	39	46	53	60	67	74	81	88	95	99	99	100	100
93	0	1	1	2	3	4	6	8	13	25	40	49	56	62	67	72	76	80	85	91	97	98	99	99
94	0	1	2	4	6	8	10	15	21	29	38	47	53	57	61	65	70	76	83	88	91	94	96	98
95	0	1	3	5	7	9	11	14	18	27	35	41	46	51	57	62	68	73	79	84	89	93	96	98
96	0	2	4	6	9	12	17	23	30	37	43	49	54	58	62	66	70	74	78	82	86	90	94	97
97	0	1	3	5	7	10	14	20	28	37	48	56	61	64	68	72	77	81	86	89	92	95	98	99
98	0	1	2	4	6	8	10	13	19	26	34	42	50	58	63	68	74	79	84	89	93	95	97	99
99	0	0	0	1	1	2	3	5	7	12	19	33	48	57	65	72	82	88	93	96	98	99	100	100
100	0	0	0	0	1	1	2	3	5	9	15	27	38	50	62	74	84	91	95	97	98	99	99	100
101	0	0	0	1	2	3	4	6	9	14	20	28	39	52	63	72	80	87	91	94	97	98	99	100
102	0	0	1	2	3	4	6	8	11	15	22	31	40	49	59	69	78	85	91	94	96	98	99	100
103	0	1	2	3	4	6	8	10	14	18	25	34	45	56	64	72	79	84	89	92	95	97	98	99
104	0	2	3	5	7	10	13	16	19	23	27	34	44	54	63	72	80	85	89	91	93	95	96	98
105	0	1	3	6	9	12	16	21	26	31	37	43	50	57	64	71	77	81	85	88	91	93	95	97
106	0	3	6	9	13	17	21	27	33	38	44	49	55	61	67	71	75	78	81	84	86	90	94	97
107	0	3	5	7	10	14	18	23	27	31	35	39	45	53	60	67	74	80	84	86	88	90	93	95
108	0	3	6	9	12	16	20	24	28	33	38	43	50	59	69	75	80	84	87	90	92	94	96	98
109	0	3	6	10	13	16	19	23	26	29	33	39	47	58	68	75	80	83	86	88	90	92	95	97
110	0	1	3	5	7	9	12	15	18	21	25	29	36	45	56	68	77	83	88	91	93	95	97	99
111	0	1	2	3	4	5	6	8	11	15	20	28	41	54	65	74	82	87	92	94	96	97	98	99
112	0	0	0	1	2	3	4	5	7	12	17	24	33	42	55	67	76	83	89	92	94	96	98	99
113	0	1	2	3	4	5	6	8	10	12	17	22	31	42	52	60	68	75	80	85	89	92	96	98
114	0	1	2	4	6	8	11	13	11	13	21	26	32	38	46	55	64	71	77	81	85	89	93	97
115	0	1	2	3	4	5	6	8	10	14	19	26	34	45	56	66	76	82	86	90	93	95	97	99
116	0	1	3	5	7	9	12	15	18	21	25	29	36	45	56	68	77	83	88	91	93	95	97	99
117	0	1	2	3	4	5	7	9	11	14	17	22	31	42	54	65	74	83	89	92	95	97	98	99
118	0	2	4	6	8	12	16	20	25	30	35	41	47	56	67	75	81	85	87	89	91	93	95	97
119	0	1	2	4	6	7	9	12	15	18	23	31	40	48	57	63	72	78	88	92	96	97	98	99
120	0	8	16	25	33	41	46	50	53	54	55	56	56.5	57	57.75	58	58.75	60	61	63	66.5	72	80	90

Table 1. Erosivity Index Table (cont.)

0	Jan	Jan	Feb	Feb	Mar	Mar	Apr	Apr	May	May	Jun	Jun	Jul	Jul	Aug	Aug	Sep	Sep	Oct	Oct	Nov	Nov	Dec	Dec
El#	1-15	16-31	1-15	16-29	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	16-31	1-15	16-31	1-15	16-31	1-15	16-31
121	0	7	14	20	25.5	33.5	38	43	46	50	52.5	54.5	56	58	59	60	61.5	63	65	68	72	79	86	93
122	0	4	8	12	17	23	29	34	38	44	49	53	56	59	62	65	69	72	75	79	83	88	93	96
123	0	4	9	15	23	29	34	40	44	48	50	51	52	53	55	57	60	62	64	67	72	80	88	95
124	0	7	12	17	24	30	39	45	50	53	55	56	57	58	59	61	62	63	64	66	70	77	84	92
125	0	9	16	23	30	37	43	47	50	52	54	55	56	57	58	59	60	62	64	67	71	77	86	93
126	0	8	15	22	28	33	38	42	46	50	52	53	53	53	53	54	55	57	59	63	68	75	83	92
127	0	8	15	22	29	34	40	45	48	51	54	57	59	62	63	64	65	66	67	69	72	76	83	91
128	0	9	16	22	27	32	37	41	45	48	51	53	55	56	57	57	58	59	61	64	68	73	79	89
129	0	10	20	28	35	41	46	49	51	53	55	56	56	57	58	59	60	61	62	65	69	74	81	90
130	0	8	15	22	28	33	38	41	44	47	49	51	53	55	56	58	59	60	63	65	69	75	84	92
131	0	10	18	25	29	33	36	39	41	42	44	45	46	47	48	49	51	53	56	59	64	70	80	90
132	0	8	16	24	32	40	46	51	54	56	57	58	58	59	59	60	60	61	62	64	68	74	83	91
133	0	12	22	31	39	45	49	52	54	55	56	56	56	56	57	57	57	57	58	59	62	68	77	88
134	0	7	15	22	30	37	43	49	53	55	57	58	59	60	61	62	63	65	67	70	74	79	85	92
135	0	11	21	29	37	44	50	55	57	59	60	60	60	60	61	61	61	62	63	64	67	71	78	89
136	0	10	18	25	30	39	46	51	54	57	58	59	59	60	60	60	61	62	63	64	67	72	80	90
137	0	11	22	31	39	46	52	56	58	59	60	61	61	61	61	62	62	62	63	64	66	71	78	89
138	0	8	14	20	25	32	37	42	47	50	53	55	56	58	59	61	63	64	66	68	71	76	85	93
139	0	10.6	21.2	28.6	36	41.4	46.8	49.3	51.8	52.5	53.2	53.5	53.7	53.9	54	54.3	54.7	55.7	56.8	61.6	65.3	73.9	82.5	91.2
140	0	0.2	0.3	0.3	0.3	0.3	0.3	0.8	1.3	5.3	9.3	30.1	50.8	56.8	62.9	67.5	72.2	75.8	79.4	85.6	91.7	95.9	100	100
141	0	10.7	21.4	28.7	36	41.7	47.3	50.3	53.2	54.5	55.7	56.2	56.7	56.9	57	57.4	57.8	59	60.2	64.1	67.9	76.1	84.2	92.1
142	0	2.7	5.5	5.7	5.9	7.1	8.4	10	11.7	15.3	19	22.6	26.1	29	31.9	36.6	41.2	46	50.7	62.3	73.9	83.5	93.1	96.6
143	0	8.7	17.5	25.2	33	39.9	46.7	50.8	54.8	56.2	57.6	58	58.4	58.9	59.4	60.8	62.3	64.1	65.9	68.8	71.7	78.6	85.5	92.7
144	0	4.3	8.6	9.3	10.1	11.1	12	15.3	18.6	22.7	26.7	28.7	30.7	31.3	32	34	36	44.4	52.9	60.1	67.3	78.2	89.2	94.6
145	0	11.7	23.3	33.5	43.7	50.7	57.6	60.3	63	63.5	64.1	64.2	64.2	64.5	64.8	66.1	67.3	68.6	69.8	70.7	71.6	79.2	86.7	93.4
146	0	4.8	9.6	13.1	16.5	22.6	28.7	30.8	32.8	33.3	33.8	34	34.2	36.4	38.6	43	47.5	56	64.5	66.2	67.9	77.9	88	94
147	0	0	4.7	9.4	10.8	12.2	13.2	14.3	14.9	15.5	24.2	32.8	45.5	58.2	67.9	77.6	86.3	95.1	95.6	96.1	98	100	100	100
148	0	5.5	11	19.2	27.5	36.6	45.7	47.8	50	50.9	51.7	52.1	52.5	54.2	55.9	60.1	64.4	70.5	76.7	81.2	85.7	90.4	101	97.6
149	0	2.4	4.9	7.4	9.9	11.7	13.6	14.6	15.6	16.2	16.8	17.2	17.7	24.7	31.7	46.9	62.1	67	72	80.7	89.3	92.3	95.3	97.7



Storm Water Phase II Final Rule

Conditional No Exposure Exclusion for Industrial Activity

Storm Water Phase II Final Rule Fact Sheet Series

Overview

1.0 – Storm Water Phase II Final Rule: An Overview

Small MS4 Program

2.0 – Small MS4 Storm Water Program Overview

2.1 – Who's Covered? Designation and Waivers of Regulated Small MS4s

2.2 – Urbanized Areas: Definition and Description

Minimum Control Measures

2.3 – Public Education and Outreach

2.4 – Public Participation/Involvement

2.5 – Illicit Discharge Detection and Elimination

2.6 – Construction Site Runoff Control

2.7 – Post-Construction Runoff Control

2.8 – Pollution Prevention/Good Housekeeping

2.9 – Permitting and Reporting: The Process and Requirements

2.10 – Federal and State-Operated MS4s: Program Implementation

Construction Program

3.0 – Construction Program Overview

3.1 – Construction Rainfall Erosivity Waiver

Industrial "No Exposure"

4.0 – Conditional No Exposure Exclusion for Industrial Activity

Why Is the Phase I No Exposure Exclusion Addressed in the Phase II Final Rule?

The 1990 storm water regulations for Phase I of the federal storm water program identify eleven categories of industrial activities that must obtain a National Pollutant Discharge Elimination System (NPDES) permit. Operators of certain facilities within category eleven (xi), commonly referred to as "light industry," were exempted from the definition of "storm water discharge associated with industrial activity," and the subsequent requirement to obtain an NPDES permit, provided their industrial materials or activities were not "exposed" to storm water. This Phase I exemption from permitting was limited to those facilities identified in category (xi), and did not require category (xi) facility operators to submit any information supporting their no exposure claim.

In 1992, the Ninth Circuit court remanded to EPA for further rulemaking the no exposure exemption for light industry after making a determination that the exemption was arbitrary and capricious for two reasons. First, the court found that EPA had not established a record to support its assumption that light industrial activity that is not exposed to storm water (as opposed to all other regulated industrial activity not exposed) is not a "storm water discharge associated with industrial activity." Second, the court concluded that the exemption impermissibly relied on the unsubstantiated judgment of the light industrial facility operator to determine the applicability of the exemption. This fact sheet describes the revised conditional no exposure exclusion as presented in the Phase II Final Rule.

Who is Eligible to Claim No Exposure?

As revised in the Phase II Final Rule, the conditional no exposure exclusion applies to ALL industrial categories listed in the 1990 storm water regulations, except for construction activities disturbing 5 or more acres (category (x)).

What Is The Regulatory Definition of "No Exposure"?

The intent of the no exposure provision is to provide facilities with industrial materials and activities that are entirely sheltered from storm water a simplified way of complying with the storm water permitting provisions of the Clean Water Act (CWA). This includes facilities that are located within a larger office building, or facilities at which the only items permanently exposed to precipitation are roofs, parking lots, vegetated areas, and other non-industrial areas or activities. The Phase II regulatory definition of "no exposure" follows.

No exposure means all industrial materials and activities are protected by a storm resistant shelter to prevent exposure to rain, snow, snowmelt, and/or runoff. Industrial materials or activities include, but are not limited to, material handling equipment or activities, industrial machinery, raw materials, intermediate products, by-products, final products, or waste products.

A storm resistant shelter is not required for the following industrial materials and activities:

- Drums, barrels, tanks, and similar containers that are tightly sealed, provided those containers are not deteriorated and do not leak. “Sealed” means banded or otherwise secured and without operational taps or valves;
- Adequately maintained vehicles used in materials handling; and
- Final products, other than products that would be mobilized in storm water discharges (e.g., rock salt).

The term “storm-resistant shelter,” as used in the no exposure definition, includes completely roofed and walled buildings or structures, as well as structures with only a top cover but no side coverings, provided material under the structure is not otherwise subject to any run-on and subsequent runoff of storm water. While the intent of the no exposure provision is to promote a condition of permanent no exposure, EPA understands certain vehicles could become temporarily exposed to rain and snow while passing between buildings. Adequately maintained mobile equipment (e.g., trucks, automobiles, forklifts, trailers, or other such general purpose vehicles found at the industrial site that are not industrial machinery, and that are not leaking contaminants or are not otherwise a source of industrial pollutants) can be exposed to precipitation or runoff. Such activities alone would not prevent a facility from certifying to no exposure. Similarly, trucks or other vehicles awaiting maintenance at vehicle maintenance facilities that are not leaking contaminants or are not otherwise a source of industrial pollutants, are not considered “exposed.”

In addition, EPA recognizes that there are circumstances where permanent no exposure of industrial activities or materials is not possible and, therefore, under such conditions, materials and activities can be sheltered with temporary covers (e.g., tarps) between periods of permanent enclosure. The no exposure provision does not specify every such situation, but NPDES permitting authorities can address this issue on a case-by-case basis.

The Phase II Final Rule also addresses particulate matter emissions from roof stacks/vents that are regulated by, and in compliance with, other environmental protection programs (i.e., air quality control programs) and that do not cause storm water contamination are considered not exposed. Particulate matter or visible deposits of residuals from roof stacks and/or vents not otherwise regulated (i.e., under an air quality control program) and evident in storm water outflow are considered exposed. Likewise, visible “track out” (i.e., pollutants carried on the tires of vehicles) or windblown raw materials is considered exposed. Leaking pipes containing contaminants exposed to storm water are deemed exposed, as are past sources of storm water contamination that remain

onsite. General refuse and trash, not of an industrial nature, is not considered exposed as long as the container is completely covered and nothing can drain out holes in the bottom, or is lost in loading onto a garbage truck. Industrial refuse and trash that is left uncovered, however, is considered exposed.

What is Required Under the No Exposure Provision?

The Phase II Final Rule represents a significant expansion in the scope of the original no exposure provision in terms of eligibility (as noted above) and responsibilities for facilities claiming the exclusion. Under the original no exposure provision, a light industry operator was expected to make an independent determination of whether there was “exposure” of industrial materials and activities to storm water and, if not, simply not submit a permit application. An operator seeking to qualify for the revised conditional no exposure exclusion, including light industry operators (i.e., category (xi) facilities), must:

- Submit written certification that the facility meets the definition of “no exposure” to the NPDES permitting authority once every 5 years.
 - The Phase II Final Rule includes a four-page *No Exposure Certification* form that uses a series of yes/no questions to aid facility operators in determining whether they have a condition of no exposure. It also serves as the necessary certification of no exposure provided the operator is able to answer all the questions in the negative. EPA’s *Certification* is for use only by operators of industrial activity located in areas where EPA is the NPDES permitting authority.
 - A copy of the *Certification* can be obtained from the U.S. EPA Office of Wastewater Management (OWM) web site, the Storm Water Phase II Final Rule published in the *Federal Register* (Appendix 4), or by contacting OWM.
- Submit a copy, upon request, of the *Certification* to the municipality in which the facility is located.
- Allow the NPDES permitting authority or, if discharging into a municipal separate storm sewer system, the operator of the system, to: (1) inspect the facility; and (2) make such inspection reports publicly available upon request.

Regulated industrial operators need to either apply for a permit or submit a no exposure certification form in order to be in compliance with the NPDES storm water regulations. Any permit held becomes null and void once a certification form is submitted.

Even when an industrial operator certifies to no exposure, the NPDES permitting authority still retains the authority to require the operator to apply for an individual or general permit if the NPDES permitting authority has determined that the discharge is contributing to the violation of, or interfering with the attainment or maintenance of, water quality standards, including designated uses.

Are There Any Concerns Related to Water Quality Standards?

Yes. An operator certifying that its facility qualifies for the conditional no exposure exclusion may, nonetheless, be required by the NPDES permitting authority to obtain permit authorization. Such a requirement would follow the permitting authority's determination that the discharge causes, has a reasonable potential to cause, or contributes to a violation of an applicable water quality standard, including designated uses. Designated uses can include use as a drinking water supply or for recreational purposes.

Many efforts to achieve no exposure can employ simple good housekeeping and contaminant cleanup activities such as moving materials and activities indoors into existing buildings or structures. In limited cases, however, industrial operators may make major changes at a site to achieve no exposure. These efforts may include constructing a new building or cover to eliminate exposure or constructing structures to prevent run-on and storm water contact with industrial materials and activities. Major changes undertaken to achieve no exposure, however, can increase the impervious area of the site, such as when a building with a smooth roof is placed in a formerly vegetated area. Increased impervious area can lead to an increase in the volume and velocity of storm water runoff, which, in turn, can result in a higher concentration of pollutants in the discharge, since fewer pollutants are naturally filtered out.

The concern of increased impervious area is addressed in one of the questions on the *Certification* form, which asks, "Have you paved or roofed over a formerly exposed, pervious area in order to qualify for the no exposure exclusion? If yes, please indicate approximately how much area was paved or roofed over." This question has no affect on an operator's eligibility for the exclusion. It is intended only to aid the NPDES permitting authority in assessing the likelihood of such actions interfering with water quality standards. Where this is a concern, the facility operator and its NPDES permitting authority should take appropriate actions to ensure that water quality standards can be achieved.

What Happens if the Condition of No Exposure Is Not Maintained?

Under the Phase II Final Rule, the no exposure exclusion is conditional and not an outright exemption. Therefore, if there is a change in circumstances that causes exposure of industrial activities or materials to storm water, the operator is required to comply immediately with all the requirements of the NPDES Storm Water Program, including applying for and obtaining a permit.

Failure to maintain the condition of no exposure or obtain coverage under an NPDES storm water permit can lead to the unauthorized discharge of pollutants to waters of the United States, resulting in penalties under the CWA. Where a facility operator determines that exposure is likely to occur in the future due to some anticipated change at the facility, the operator should submit an application and acquire storm water permit coverage prior to the exposed discharge to avoid such penalties.

For Additional Information

Contact

- ☞ U.S. EPA Office of Wastewater Management
 - Phone: (202) 564-9537
 - E-mail: SW2@epa.gov
 - Internet: www.epa.gov/npdes/stormwater
- ☞ Your NPDES Permitting Authority. (A list of names and phone numbers for each U.S. EPA Region is included in Fact Sheet 2.9. Additional contact names, addresses, and numbers for each State can be obtained from the U.S. EPA Office of Wastewater Management)

Reference Documents

- ☞ Storm Water Phase II Final Rule Fact Sheet Series
 - Internet: www.epa.gov/npdes/stormwater then click on "Phase II"
- ☞ Storm Water Phase II Final Rule (64 FR 68722)
 - Internet: www.epa.gov/npdes/stormwater then click on "Phase II"
 - Contact the U.S. EPA Water Resource Center
 - Phone: 202 260-7786
 - E-mail: center.water-resource@epa.gov

APPENDIX E – SAMPLE NATURAL RESOURCE PROTECTION ORDINANCES

INTRODUCTION

This appendix contains sample natural resource protection ordinances from various regional, county and municipal units of government in Illinois. The ordinances included represent examples and are not meant to be inclusive. Other regional, county, and municipal natural resource protection ordinances have been adopted elsewhere in Illinois and the nation that also may provide useful guidance.

With the advent of NPDES Phase II storm water permit program for small municipal separate storm sewer systems (MS4s), regulated operators of MS4s will be required to develop an ordinance or other regulatory mechanism for the Illicit Discharge Detection and Elimination, Construction Site Runoff Control, and Post-Construction Runoff Control minimum control measures.

The ordinances included in this appendix may be used to provide guidance for developing ordinances for the Construction Site Runoff Control and Post-Construction Runoff Control minimum control measures. In most cases, these ordinances were developed prior to the NPDES Phase II MS4 rules and permit being finalized. As a result, they should be reviewed and adapted to fit local conditions, current regulatory requirements and technology. The ordinances are in portable document file (pdf) format. Contact information is provided for anyone wanting to receive copies in other formats, such as MS Word for Windows or Word Perfect, which will allow for editing.

Additional information and examples of ordinances from other parts of the country can be obtained from the US Environmental Protection Agency “Model Ordinances to Protect Local Resources” website at www.epa.gov/owow/nps/ordinance/index.htm or from the Center for Watershed Protection’s website at www.stormwatercenter.net.

This section was updated in November 2002.

NRCS IL November 2002

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SAMPLE NATURAL RESOURCE PROTECTION ORDINANCES

REGIONAL MODELS

- 1) The Northeastern Illinois Planning Commission (NIPC) is the official comprehensive planning agency for the six-county Chicago metropolitan area. The natural resource ordinances listed were developed with input from numerous agencies and special interest groups and have served as models for ordinances throughout the state of Illinois. NIPC is currently considering updating their model ordinances. Additional information may be obtained by contacting NIPC's Natural Resources Department at 222 South Riverside Plaza, Suite 1800 Chicago, IL 60606, phone 312-454-0400 or at www.nipc.coq.il.us.
 - [Model Floodplain Ordinance for Communities Within Northeastern Illinois \(July 1996\)](#)
 - [Model Soil Erosion and Sediment Control Ordinance \(September 1991\)](#)
 - [Model Stormwater Drainage and Detention Ordinance \(June 2000\)](#)
 - [Model Stream and Wetland Protection Ordinance \(October 1988\)](#)

- 2) The South Suburban Mayor's and Managers Association (SSMMA) is an intergovernmental agency providing technical assistance and joint services to 43 municipalities in Cook and Will Counties. Their model ordinance was prepared for use in SSMMA's South Suburban Stormwater Strategy. Additional information may be obtained by contacting SSMMA at 1904 West 174th Street, East Hazel Crest, IL 60429, phone 708-206-1155 or at www.ssmma.org.
 - [Model Ordinance for Stormwater and Floodplain Ordinance \(August 2000\)](#)

- 3) The Southwestern Illinois Metropolitan and Regional Planning Commission (SWIMRPC) is the official planning agency for Madison, St. Clair, Monroe, Randolph, Bond, Clinton and Washington Counties. Additional information may be obtained by contacting SWIMRPC at 203 West Main Street, Collinsville, IL 62234, phone 618-344-4250.
 - [Model Ordinance Providing for the Control of Stormwater Drainage and Detention, Soil Erosion and Sediment Control \(June 1997\), as modified for the Village of Caseyville.](#)

- 4) The Tri-County Regional Planning Commission (TCRPC) is the official planning agency for Peoria, Tazewell and Woodford Counties. TCRPC assisted in coordinating a multi-county effort to produce a model Erosion, Sediment, and Storm Water Control Ordinance for each county and their municipalities. There are slight differences between the county ordinances. Individual county ordinances are listed below. Intergovernmental agreements have been executed between the counties and the local NRCS/SWCD office to assist in plan review and site inspections. Additional information may be obtained by contacting TCRPC's Environmental Services Planner at 411 Hamilton Boulevard, Suite 2001, Peoria, IL 61602, phone 309-673-9330, or at www.tricountyrpc.org.

- [Summary of Significant Differences Between the Peoria, Tazewell and Woodford County Erosion, Sediment, and Storm Water Control Ordinances](#)

COUNTY

- 1) Kane County's Stormwater Management Ordinance was prepared in accordance with the Kane County Comprehensive Countywide Stormwater Management Plan, as authorized in 55 ILCS 5/5-1062. This ordinance provides county-wide minimum standards and applies to all areas within the county, including municipalities. The ordinance was amended to provide protection of isolated wetlands that are no longer offered protection by the U.S. Army Corps of Engineers. A companion Technical Reference Manual (TRM) has been prepared to provide guidance in the implementation of the ordinance. Additional information may be obtained by contacting Kane County Environmental Management Department, 719 S. Batavia Avenue Bldg. A, Geneva, IL 60134, phone 630-208-5118 or at www.co.kane.il.us/Environment.
 - [Kane County Stormwater Management Ordinance \(October 2001\)](#)
 - [Amendment \(December 2001\)](#)
- 2) Kendall County's Stormwater Management Ordinance was prepared in accordance with police powers granted to the County by the Illinois Compiled Statutes and the Kendall County Land Resource Management Plan. It applies only to unincorporated areas within the county. Additional information may be obtained by contacting Strand Associates, Inc., 2400 Glenwood Avenue, Suite 226, Joliet, IL 60435, phone 815-744-4200.
 - [Kendall County Stormwater Management Ordinance \(October 2002\)](#)
- 3) Lake County's Watershed Development Ordinance (WDO) was prepared in accordance with the Lake County Comprehensive Stormwater Management Plan, as authorized in 55 ILCS 5/5-1062. The WDO provides county-wide minimum standards and applies to all areas within the county, including municipalities. The ordinance has been amended several times since initially adopted in 1992, most recently to provide protection of isolated wetlands that are no longer offered protection by the U.S. Army Corps of Engineers. A companion Technical Reference Manual (TRM) has been prepared to provide guidance in the implementation of the WDO. Additional information may be obtained by contacting Lake County Stormwater Management Commission (SMC), 333 Peterson Road, Libertyville, IL 60048, phone 847-918-5260 or at www.co.lake.il.us/smc.
 - [Lake County's Watershed Development Ordinance \(Amended August 2001\)](#)
- 4) Peoria County's Erosion, Sediment, and Storm Water Control ordinance was modeled after the Tri-County Regional Planning Commission's model ordinance. It applies only to unincorporated areas within the county. An intergovernmental agreement has been executed between the county and the local NRCS/SWCD

office to assist in plan review and site inspections. Additional information may be obtained by contacting Peoria County Erosion Control Administrator, Peoria County Courthouse, 324 Main Street, Peoria, IL 61602, phone 309-672-6915, or at www.co.peoria.il.us/zoning/pcpzhome.htm or the Peoria County SWCD, 5715 N. Smith Rd., Edwards, IL 61528, phone 309-671-7040 ext.3.

- [Peoria County Erosion, Sediment, and Storm Water Control Ordinance \(April 1996\) Appendix A – Standards for Stormwater Design Analysis and Appendix B – Erosion and Sediment Control Criteria and Specifications are not included.](#)
- 5) The St. Clair County Soil and Water Conservation District (SWCD) Ordinance for Stormwater Management and Erosion Control represents an updating of the Southwestern Illinois Metropolitan and Regional Planning Commission’s model ordinance. It has not been adopted yet. Additional information may be obtained by contacting St. Clair County SWCD, 2031 Mascoutah Avenue, Belleville, IL 62220, phone 618-235-2500 ext.3.
- [St. Clair County Soil and Water Conservation District Ordinance for Stormwater Management and Erosion Control \(Developed March 2002--Not Yet Adopted\)](#)
- 6) Tazewell County’s Erosion, Sediment, and Stormwater Control ordinance was modeled after the Tri-County Regional Planning Commission’s model ordinance. It applies only to unincorporated areas within the county. An intergovernmental agreement has been executed between the county and the local NRCS/SWCD office to assist in plan review and site inspections. Additional information may be obtained by contacting Tazewell County Erosion Control Administrator, McKenzie Building, 11 South Fourth Street, Room 400 Pekin, IL 61554, phone 309-477-2235 or the Tazewell County SWCD, 2934 Court St., Pekin, IL 61554, phone 309-346-4462 ext.3.
- [Tazewell County Erosion, Sediment, and Storm Water Control Ordinance \(April 1996\). Appendix A – Standards for Stormwater Design Analysis and Appendix B – Erosion and Sediment Control Criteria and Specifications are not included.](#)
- 7) Woodford County’s Erosion, Sediment, and Storm Water Control Ordinance was modeled after the Tri-County Regional Planning Commission’s model ordinance. It applies only to unincorporated areas within the county. An intergovernmental agreement has been executed between the county and the local NRCS/SWCD office to assist in plan review and site inspections. Additional information may be obtained by contacting Woodford County Erosion Control Administrator, Woodford County Courthouse, Eureka, IL 61530, phone 309-467-3023 or the Woodford County SWCD, 937 W. Center St., Eureka, IL 61530, phone 309-467-2387 ext.3.

- [Woodford County Erosion, Sediment, and Storm Water Control Ordinance \(April 1996\). Appendix A – Standards for Stormwater Design Analysis and Appendix B – Erosion and Sediment Control Criteria and Specifications are not included.](#)

MUNICIPAL

- 1) The City of Belvidere incorporates soil erosion and sediment control in their subdivision ordinance. Additional information may be obtained by contacting the City of Belvidere's Public Works Department, 119 S. State St., Belvidere, IL 61008, phone 815-544-9256 or the Boone County SWCD, 211 North Appleton Road, P.O. Box 218, Belvidere, IL 61008-0218, phone 815-544-2677 ext.3.
 - [City of Belvidere Erosion and Sediment Control \(Amended August 1997\)](#)
- 2) The Village of Carbon Cliff has a stand-alone ordinance covering stormwater drainage and detention and soil erosion and sediment control. Additional information may be obtained by contacting the Village of Carbon Cliff, 106 1st Avenue, Carbon Cliff, IL 61239, phone 309-792-8235 or the Rock Island County SWCD, 3010 E. First Avenue, Milan, IL 61264, phone 309-764-1486 ext.3.
 - [Village of Carbon Cliff Ordinance Providing for the Control of Stormwater Drainage and Detention, Soil Erosion and Sediment Control \(January 2002\)](#)
- 3) The City of Clinton has a policy covering soil erosion and stormwater management in their zoning ordinance. Additional information may be obtained by contacting Administrative Assistant, City of Clinton, 118 W. Washington, Clinton, IL 61727, phone 217-935-6552 or the DeWitt County SWCD, RR4 Box 344A, Clinton, IL 61727, phone 217-935-6504 ext.3.
 - [Village of Clinton Soil Erosion and Stormwater Management Policy \(November 2001\)](#)
- 4) The Village of Dwight has a stand-alone ordinance covering stormwater drainage and detention and soil erosion and sediment control. Additional information may be obtained by contacting the Village Administrator, Village of Dwight, Village Hall, 209 S. Prairie, Avenue, Dwight, IL 60420, phone 815-584-3077 or Livingston County SWCD, 1510 West Reynolds, Box 80, Pontiac, IL 61764, phone 815-844-6127 ext.3.
 - [Village of Dwight Ordinance Providing for the Control of Stormwater Drainage and Detention, Soil Erosion and Sediment Control \(November 2001\)](#)
- 5) The Village of Plainfield has included modified versions of the NIPC model ordinances in their 2001 Subdivision Code. It should be noted that these versions may not represent the latest version of the NIPC model ordinances that are referenced above. Additional information may be obtained by contacting Village

Planner, Village of Plainfield, 530 W. Lockport, Plainfield, IL 60544, phone 815-439-2824.

- [Ordinance 1369 – An Ordinance Regulating Development in Special Flood Hazard Areas](#)
- [Ordinance 1748 – Soil Erosion and Sedimentation Control Ordinance](#)
- [Ordinance 1749 – Stream and Wetland Protection Ordinance](#)
- [Ordinance 1747 – Stormwater Drainage and Detention Ordinance](#)

Model Floodplain Ordinance

for Communities Within Northeastern Illinois

**Illinois Department of Natural Resources
Office of Water Resources
&
Northeastern Illinois Planning Commission
July 1996**

PREFACE

Floodplains and their associated stream, wetland and shoreline areas are among the State's greatest assets, because of multiple benefits related to environmental quality, natural resource management, and recreational opportunity. Floodplains are generally best able to provide these benefits if kept in a natural condition. Alterations of floodplains often have resulted in increased flood and stormwater hazards, reduced water quality, loss of habitat and recreational opportunities and poor aesthetics within communities. Wherever possible, the natural characteristics of floodplains and their associated water bodies should be preserved.

Unfortunately, unwise development practices and lack of planning have resulted in flooding for which mitigation has been sought through stream modifications such as channelization and reservoir construction. Such modifications may be costly to build and maintain and certainly do not provide for a full range of floodplain benefits, such as aquatic habitat, even though many millions of dollars have been spent to improve the water quality in the channels or watercourses within the floodplains. Often, the preservation of natural floodplains may have been more cost effective. In some situations, flood protection and other stream benefits can be achieved by remedial activities which restore natural characteristics of previously altered floodplain corridors.

In other instances, flood and stormwater problems simply cannot be addressed by natural floodplains and severe measures must be undertaken; similarly, intense demands for water-dependent recreational or commercial activities necessitate localized modifications within floodplains. Decisions to alter floodplains, and especially floodways and streams within floodplains should be the result of a careful planning process, which evaluates resource conditions and human needs. A well thought out and officially adopted plan is the best basis for land use regulations which affect the use and development of land.

Some citizens have verbally contested the legality and constitutionality of floodplain ordinances. And, in certain cases, the issues have been taken to the courts. Experience in various parts of the country, where such ordinances have been tested in the courts, reveals that when the purposes of such an ordinance have been clearly defined and the provisions judiciously enforced, the ordinances have been sustained. Restrictions, no matter how severe, are likely to be upheld if nuisances and threats to public health, safety and welfare are prevented. The purposes described here cover the broad range of circumstances for which protection of public interests is sought by enactment of this Ordinance. The rationale for this type of regulation is significantly strengthened if the regulation is an outgrowth of a planning process which establishes public policy and which has involved significant citizen participation and input.

This ordinance is intended for use in the following six counties of Northeastern Illinois: Cook, DuPage, Kane, Lake, McHenry, and Will. The adoption of this ordinance (or one that also satisfies the minimum federal and state requirements) is required of all communities which participate in the National Flood Insurance Program (NFIP).

Public Act 85-905, approved by the Illinois Legislature, and signed into law by the Governor on November 18, 1987, specified that the Illinois Department of Natural Resources, Office of Water Resources (IDNR/OWR) may delegate its permitting responsibilities to local units of government. Once your community has adopted this Ordinance, or an ordinance meeting the minimum federal and state requirements, and that Ordinance has been approved by IDNR/OWR; then your community may choose to be delegated the floodway permitting responsibilities.

P.A. 85-905 and P.A. 85-1266 provided additional authority to counties (55 Illinois Compiled Statutes, 5/5-10-62) to address floodplain and stormwater management issues under the provisions of the Stormwater Management Act. This legislation provides the authority and basis for many of the recommendations of the Northeastern Illinois Planning Commission (NIPC) that are contained within this model ordinance.

This ordinance is slightly longer than its predecessor. This increase in length is primarily a result of improved formatting to enhance the readability of the document. It is suggested that each community keep the Model Floodplain Ordinance on file because explanation and commentary on the regulations are provided in the right-hand margin. Copies of the ordinance can be obtained from:

IDNR/OWR
201 West Center Court
Schaumburg, Illinois 60196
(847) 705-4341

Copies can also be obtained from NIPC for a nominal charge:

NIPC
Publications Department
222 South Riverside Plaza, Suite 1800
Chicago, Illinois 60606
(312) 454-0400

Electronic copies of the ordinance can be obtained in IBM Microsoft Word or Word Perfect formats by sending a 3.5" disk to IDNR/OWR or for a nominal charge from NIPC.

For information and technical assistance on the "recommended" language in the ordinance, contact NIPC's Natural Resources Department.

HOW TO USE THIS ORDINANCE

The Model Floodplain Ordinance is drafted to reflect the minimum requirements of the Federal Emergency Management Agency (FEMA) for eligibility of units of government in the National Flood Insurance Program, and the minimum requirements of the Illinois Department of Natural Resources, Office of Water Resources (IDNR/OWR - formerly IDOT/DWR) concerning floodway construction and construction in designated and non-designated floodways that drain more than one square mile. Communities are encouraged to include more restrictive language. This Ordinance is intended to protect the hydrologic and hydraulic functions of floodplains and watercourses, and their related water quality and habitat functions as well as protect structures and their inhabitants. Presently, the vast majority of the waters of the State are designated as General Use waters and are to be protected for the uses of aquatic life, primary contact, agricultural and industrial water supply, and aesthetic quality. Waters of the State include natural and artificial, public and private stream channels, including headwaters. Experience in recent years in assessing the effects of development on both flooding and stream uses has led to a conclusion that a conservative, holistic floodplain management policy is essential to minimize public and private damages and to protect public benefits related to stream uses. The rationale for this type of regulation is significantly strengthened if the regulation is an outgrowth of a planning process which establishes public policy and which has involved significant citizen participation and input.

The minimum requirements established by FEMA and IDNR/OWR are included in the Model Ordinance in a normal type. The normal type also includes standard language used in floodplain ordinance statewide. Recommended requirements by IDNR/OWR and NIPC designed to preserve and enhance water quality, habitat, recreational opportunities, aesthetics, and/or provide an additional margin of safety are in ***bold italics***. Any commentary referring to these additional requirements is also in ***bold italics*** in the commentary column to the right of the corresponding Ordinance text.

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MODEL FLOODPLAIN ORDINANCE FOR COMMUNITIES WITHIN NORTHEASTERN ILLINOIS (CITIES, VILLAGES)

ORDINANCE NO.

An Ordinance Regulating Development in Special Flood Hazard Areas

Be it ordained by the (Board of Trustees, City Council) of the (Village, City) of _____, Illinois, as follows:

Section 100.0 Index

Table with 2 columns: Section and Page. Lists sections 100.0 through 1700.0 with corresponding page numbers.

Section 200.0 Purpose

This Ordinance is enacted pursuant to the police powers granted to this (Village, City) by 65 ILCS 5/1-2-1, 5/11-12-12, 5/11-30-2, 5/11-30-8, and 5/11-31-2 (1994). The purpose of this Ordinance is to maintain this (Village's/City's) eligibility in the National Flood Insurance Program; to minimize potential losses due to periodic flooding including loss of life, loss of property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety and general welfare; and to preserve and enhance the quality of surface waters, conserve economic and natural values and provide for the wise utilization of water and related land resources. This Ordinance is adopted in order to accomplish the following specific purposes:

200.1 To meet the requirements of 615 ILCS 5/18g Rivers, Lakes and Streams Act.

This section gives the reasons why this Ordinance is needed. In this case, it also explains why floodway development is unwise. The purpose and intent are broadly delineated in order to establish the public purpose and benefit (i.e. interest) on which the legality of this exercise of the police power is based.

If the adopting political body is a County, then the County or the County Board must be placed in all notations which now read (City, Village) or (City Council, Board of Trustees). In addition, Section 200.0 should read:

This Ordinance is enacted pursuant to the police powers granted to this County by the 55 ILCS 5/5-10-41, 5/5-10-42, 5/5-10-63. i

Although this ordinance requires that an applicant obtain a permit for a dam, where applicable, from IDNR/OWR, this ordinance is not meant to serve as a

200.2 To assure that new development does not increase the flood or drainage hazards to others, or creating unstable conditions susceptible to erosion;

200.3 To protect new buildings and major improvements to buildings from flood damage;

200.4 To protect human life and health from the hazards of flooding;

200.5 To lessen the burden on the taxpayer for flood control projects, repairs to flood-damaged public facilities and utilities, and flood rescue and relief operations; and

200.6 To make federally subsidized flood insurance available for property in the (City, Village) by fulfilling the requirements of the National Flood Insurance Program.

200.7 To comply with the rules and regulations of the National Flood Insurance Program codified as 44 CFR 59-79, as amended.

200.8 *To protect, conserve, and promote the orderly development of land and water resources;*

200.9 *To preserve the natural characteristics and functions of watercourses and floodplains in order to moderate flood and stormwater impacts, improve water quality, reduce soil erosion, protect aquatic and riparian habitat, provide recreational opportunities, provide aesthetic benefits and enhance community and economic development.*

Section 300.0 Definitions

For the purposes of this Ordinance, the following definitions are adopted:

300.1 "Act" "An act in relation to the regulation of the rivers, lakes and streams of the State of Illinois", 615 ILCS 5/5 et seq.

300.2 "Applicant" Any person, firm, corporation or agency which submits an application.

300.3 "Appropriate Use" Only uses of the designated floodway that are permissible and will be considered for permit issuance. The only uses that will be allowed are as specified in Section 802.0.

300.4 "Base Flood" The flood having a one-percent probability of being equaled or exceeded in any given year. The base flood is also known as the 100-year frequency flood event. Application of the base flood elevation at any location is as defined in Section 600.0 of this Ordinance.

Dam Safety ordinance, nor does it imply that this duty is delegated to the local government.

When interpreting this Ordinance, the definitions found in this section should be used. Any words not found in this section should take the standard definition found in the dictionary

NFIP definitions are in 44 CFR 59.1. IDNR/OWR definitions are in 92 Ill. Adm. Code 708

NIPC policy considers the following general categories as appropriate uses: public flood control projects, public recreation and open space uses, water dependent activities and crossing roads and bridges. A more specific definition of appropriate uses, and the distinctions between NIPC and IDNR/OWR appropriate uses, can be found in Section 802.0. In general, NIPC recognizes fewer activities as appropriate uses of the floodway.

300.5 "Building" A structure that is principally above ground and is enclosed by walls and a roof. The term includes a gas or liquid storage tank, a manufactured home, mobile home or a prefabricated building. This term also includes recreational vehicles and travel trailers to be installed on a site for more than 180 days, unless fully licensed and ready for highway use.

300.6 "Channel" *Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or man-made drainageway, which has a definite bed and banks or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.*

300.7 "Channel Modification" *Alteration of a channel by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, rip-rapping (or other armoring), widening, deepening, straightening, relocating, lining and significant removal of native vegetation from the bottom or banks. Channel modification does not include the clearing of dead or dying vegetation, debris, or trash from the channel. Channelization is a severe form of channel modification involving a significant change in the channel cross-section and typically involving relocation of the existing channel (e.g. straightening).*

300.8 "Compensatory Storage" An artificially excavated, hydraulically equivalent volume of storage within the SFHA used to balance the loss of natural flood storage capacity when artificial fill or structures are placed within the floodplain. The uncompensated loss of natural floodplain storage can increase off-site floodwater elevations and flows.

300.9 "Conditional Approval of a Designated Floodway Map Change" Preconstruction approval by IDNR/OWR and FEMA of a proposed change to the floodway map. This preconstruction approval, pursuant to this Part, gives assurances to the property owner that once an Appropriate Use is constructed according to permitted plans, the floodway map can be changed, as previously agreed, upon review and acceptance of as-built plans.

300.10 "Conditional Letter of Map Revision (CLOMR)" A letter which indicates that FEMA will revise base flood elevations, flood insurance rate zones, flood boundaries or floodway as shown on an effective Flood Hazard Boundary Map or Flood Insurance Rate Map, once the as-built plans are submitted and approved.

300.11 "Control Structure" *A structure designed to control the rate of flow that passes through the structure, given a specific upstream and downstream water surface elevation.*

300.12 "Dam" All obstructions, wall embankments or barriers, together with their abutments and appurtenant works, if any, constructed for the purpose of storing or diverting water or creating a pool. Underground water storage tanks are not included.

300.13 "Designated Floodway" The channel, including on-stream lakes, and that portion of the floodplain adjacent to a stream or watercourse as designated by IDNR/OWR, which is needed to store and convey the existing 100-year frequency flood discharge with no

A channel includes on-stream lakes and impoundments. For purposes of this Ordinance, a channel does not include very small headwater swales or ditches which generally would not be mapped on U.S.G.S. 7.5 minute quadrangle maps. The regulation of small headwater swales and ditches is more appropriately addressed in a stormwater management ordinance.

It is recommended that the maps which explicitly delineate regulated channels be adopted as part of this Ordinance.

Floodway modifications, except for the purpose of appropriate uses, as defined in Section 802.0, are contrary to NIPC policy.

Although a conditional approval of a regulatory map change is approved, the use of the site must still be an appropriate use as defined in 92 Ill. Adm. Code Part 708.

The floodway is a high risk area where zoning ordinances and other land use controls should be used to prevent development so as to avoid flood damages and to permit the free passage of floodwaters. The accurate

more than a 0.1 foot increase in stage due to the loss of flood conveyance or storage, and no more than a 10 percent increase in velocities.

(a) The floodways are designated for _____ (river, creek, stream) on the Flood Boundary and Floodway Map prepared by FEMA (or the Department of Housing and Urban Development) and dated _____ and for _____ (river, creek, stream) on the Regulatory Floodplain Map prepared by IDNR/OWR and dated _____. When two floodway maps exist for a waterway, the more restrictive floodway limit shall prevail.

(b) The floodways for those parts of unincorporated _____ County that are within the extraterritorial jurisdiction of the (City, Village) that may be annexed into the (City, Village) are designated for _____ (river, creek, stream) on the Flood Boundary and Floodway map prepared by FEMA (or Department of Housing and Urban Development) and dated _____ and for _____ (river, creek, stream) on the Regulatory Floodplain Map prepared by IDNR/OWR and dated _____.

(c) To locate the designated floodway boundary on any site, the designated floodway boundary should be scaled off the designated floodway map and located on a site plan, using reference marks common to both maps. Where interpretation is needed to determine the exact location of the designated floodway boundary, IDNR/OWR should be contacted for the interpretation.

300.14 "Development" Any man-made change to real estate, including:

(a) Construction, reconstruction, repair, or placement of a building or any addition to a building.

(b) Installing a manufactured home on a site, preparing a site for a manufactured home, or installing a travel trailer or recreational vehicle on a site for more than 180 days. If the travel trailer or recreational vehicle is on site for less than 180 days, it must be fully licensed and ready for highway use.

(c) Drilling, mining, installing utilities, construction of roads, bridges, or similar projects.

(d) Demolition of a structure or redevelopment of a site.

(e) Clearing of land as an adjunct of construction.

(f) Construction or erection of levees, walls, fences, dams, or culverts; channel modification; filling, dredging, grading, excavating, paving, or other non-agricultural alterations of the ground surface; storage of materials; deposit of solid or liquid waste;

(g) Any other activity of man that might change the direction,

determination of floodways and their limits is of critical importance. It is a complex procedure, requiring detailed engineering studies and the development of considerable hydraulic data.

The basic approach is to first assume the extent of the floodway along the length of the stream. In effect, this also assumes the alignment of the floodway encroachment lines. Then assume that the flood fringes will be completely filled without compensatory storage. New highwater elevations are then computed. If the resulting increase in height of the design flood is significant (greater than 0.1 foot), the encroachment lines are tested at locations further out from the channel center line. On the other hand, if the increase is less than 0.1 foot, the encroachment lines may be moved closer to the center line and the resultant water levels again computed.

IDNR/OWR's Designated Floodway List provides each community with a list of regulatory maps applicable to that community. That list should be placed into the Ordinance at this point. Contact IDNR/OWR regarding correct maps and definitions. For communities which have received the new Countywide Flood Insurance Rate Maps (FIRM) with floodways, the Flood Boundary and Floodway Maps should be replaced with FIRM.

Many communities may only have to adopt portions of definition 300.13, depending on their unique circumstances. For example, a land-locked community would not have to adopt (b).

The definition of development includes those activities which could significantly alter the hydraulics or hydrology of the floodplain, or otherwise interfere with its natural functions. Certain development activities are considered appropriate uses of the floodway, as indicated in Section 802.0, others are not.

height, or velocity of flood or surface water, including extensive vegetation removal;

Development does not include maintenance of existing buildings and facilities such as re-roofing or re-surfacing of roads when there is no increase in elevation, or gardening, plowing, and similar agricultural practices that do not involve filling, grading, or construction of levees.

300.15 "Elevation Certificates" A form published by FEMA that is used to certify the elevation to which a building has been elevated.

300.16 "Erosion" *The general process whereby soils are moved by flowing water or wave action.*

300.17 "Exempt Organizations" Organizations which are exempt from this Ordinance per Illinois Compiled Statutes (ILCS) including state, federal or local units of government.

300.18 "Existing Manufactured Home Park or Subdivision" A manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) has been completed before April 1, 1990.

300.19 "Expansion to an Existing Manufactured Home Park or Subdivision" The preparation of additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads).

300.20 "FEMA" Federal Emergency Management Agency and its regulations at 44 CFR 59-79 effective as of September 29, 1989. This incorporation does not include any later editions or amendments.

300.21 "Flood" A general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal waves, or the unusual and rapid accumulation or runoff of surface waters from any source.

300.22 "Flood Frequency" *A period of years, based on a statistical analysis, during which a flood of a stated magnitude may be expected to be equaled or exceeded.*

300.23 "Flood Fringe" That portion of the floodplain outside of the designated floodway.

300.24 "Flood Insurance Rate Maps (FIRM)" A map prepared by FEMA that depicts the Special Flood Hazard Area (SFHA) within a community. This map includes insurance rate zones and floodplains and may or may not depict floodways.

Cook County communities should add to the end of definitions "such as the Metropolitan Water Reclamation District."

The flood fringes are those portions of the floodplain outside of the floodway where floodwaters are usually shallow and slow-moving. They are low risk areas where development may be permitted provided reasonable precautions are taken, such as elevating, filling and non-residential structural floodproofing, and further provided that the capacity of the floodplain to store and convey floodwaters is preserved. The latter may be done by requiring compensatory storage for all volumes of such storage lost through construction and filling. See commentary on "floodway" above.

300.25 "Floodplain" That land typically adjacent to a body of water with ground surface elevations at or below the base flood or the 100-year frequency flood elevation. Floodplains may also include detached Special Flood Hazard Areas, ponding areas, etc. The floodplain is also known as the Special Flood Hazard Area (SFHA).

(a) The floodplains are those lands within the jurisdiction of the (City, Village) that are subject to inundation by the base flood or 100-year frequency flood. The SFHA's of the (City, Village) are generally identified as such on the Flood Insurance Rate Map of the (City, Village) prepared by the Federal Emergency Management Agency (or the U.S. Department of Housing and Urban Development) and dated _____.

(b) The SFHA's of those parts of unincorporated _____ County that are within the extraterritorial jurisdiction of the (City, Village) or that may be annexed into the (City, Village) are generally identified as such on the Flood Insurance Rate Map prepared for _____ County by the Federal Emergency Management Agency (or the U.S. Department of Housing and Urban Development) and dated _____.

300.26 "Floodproofing" Any combination of structural and non-structural additions, changes or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.

300.27 "Floodproofing Certificate" A form published by FEMA that is used to certify that a building has been designed and constructed to be structurally dry floodproofed to the flood protection elevation.

300.28 "Flood Protection Elevation (FPE)" The elevation of the base flood or 100-year frequency flood *plus one foot of freeboard* at any given location in the SFHA.

300.29 "Freeboard" An increment of elevation added to the base flood elevation to provide a factor of safety for uncertainties in calculations, *future watershed development*, unknown localized conditions, wave actions and unpredictable effects such as those caused by ice or debris jams.

300.30 "Historic Structure" Any structure that is:

(a) Listed individually in the National Register of Historic Places or preliminary determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;

(b) Certified or preliminary determined by the Secretary of the Interior as contributing to the historic district or a district preliminary determined by the Secretary to qualify as a registered historic district;

(c) Individually listed on the State inventory of historic places by the Illinois Historic Preservation Agency;

(d) Individually listed on a local inventory of historic places that has been certified by the Illinois Historic Preservation

Maps that indicate the location and extent of floodplains and are available from FEMA (1-800-358-9616) and NIPC (312-454-0400). Questions regarding floodways should be directed to IDNR/OWR, 201 West Center Court, Schaumburg, Illinois, 60196-1096.

If your community is one of those communities that is included under countywide mapping, then there will be no individual FIRM's for your community, and Section 300.25 should be reworded to recognize only countywide maps.

Any ground elevation which is lower than the Base Flood Elevation, and adjacent to the river or stream shall be considered to be in the floodplain.

Contact IDNR/OWR or FEMA for the date of your FIRM. Refer to your flood insurance study to determine which agency (FEMA or HUD) prepared the maps.

One foot is IDNR/OWR recommended minimum freeboard.

In appropriate parts of this Ordinance, a freeboard of one foot or more is recommended. Some local governments presently require a freeboard of two feet or more. The selection of a freeboard elevation for regulation should consider the degree of risk as well as the water body(s) to which it applies.

Agency.

300.31 "Hydrologic and Hydraulic Calculations"

Engineering analysis which determine expected flood flows and flood elevations based on land characteristics and rainfall events.

300.32 "IDNR/OWR" Illinois Department of Natural Resources, Office of Water Resources.

300.33 "Letter of Map Amendment (LOMA)" Official determination by FEMA that a specific structure is not in a 100-year flood zone; amends the effective Flood Hazard Boundary Map (FHBM) or FIRM.

300.34 "Letter of Map Revision (LOMR)" Letter that revises base flood or 100-year frequency flood elevations, flood insurance rate zones, flood boundaries or floodways as shown on an effective FHBM or FIRM.

300.35 "Manufactured Home" A structure, transportable in one or more sections, which is built on a permanent chassis and is designated for use with or without a permanent foundation when attached to the required utilities. The term manufactured homes also includes park trailers, travel trailers and other similar vehicles placed on site for more than 180 consecutive days. The term "manufactured home" does not include a "recreational vehicle".

300.36 "Manufactured Home Park or Subdivision" A parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

300.37 "Mitigation" Mitigation includes those measures necessary to minimize the negative effects which floodplain development activities might have on the public health, safety and welfare. Examples of mitigation include compensatory storage, soil erosion and sedimentation control, and channel restoration. Mitigation may also include those activities taken to reduce a structure's susceptibility to flooding.

300.38 "New Manufactured Home Park or Subdivision" Manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including at a minimum, the installation of utilities, the construction of streets, and either final site grading or the pouring of concrete pads) has been completed on or after April 1, 1990.

300.39 "NGVD" National Geodetic Vertical Datum of 1929. Reference surface set by the National Geodetic Survey deduced from a continental adjustment of all existing adjustments in 1929.

300.40 "Natural" *When used in reference to channels means those channels formed by the existing surface topography of the earth prior to changes made by man. A natural stream tends to follow a meandering path; its floodplain is not constrained by levees; the area near the bank has not been cleared, mowed or cultivated; the stream flows over soil and geologic materials typical of the area with no substantial alteration of the course or cross-section of the stream caused by filling or excavating. A modified channel may regain some natural characteristics over time as the channel meanders and vegetation is re-established. Similarly, a modified channel may be restored to more natural conditions by man through*

regrading and revegetation.

300.41 "Ordinary High Water Mark (OHWM)" *The point on the bank or shore up to which the presence and action of surface water is so continuous so as to leave a distinctive mark such as by erosion, destruction or prevention of terrestrial vegetation, predominance of aquatic vegetation or other easily recognized characteristics.*

300.42 "Public Flood Control Project" A flood control project which will be operated and maintained by a public agency to reduce flood damages to existing buildings and structures which includes a hydrologic and hydraulic study of the existing and proposed conditions of the watershed. Nothing in this definition shall preclude the design, engineering, construction or financing, in whole or in part, of a flood control project by persons or parties who are not public agencies.

300.43 "Public Bodies of Waters" All open public streams and lakes capable of being navigated by watercraft, in whole or in part, for commercial uses and purposes, and all lakes, rivers, and streams which in their natural condition were capable of being improved and made navigable, or that are connected with or discharge their waters into navigable lakes or rivers within, or upon the borders of the State of Illinois, together with all bayous, sloughs, backwaters, and submerged lands that are open to the main channel or body of water directly accessible thereto.

300.44 "Recreational Vehicle or Travel Trailer" A vehicle which is:

- (a) Built on a single chassis;
- (b) 400 square feet or less when measured at the largest horizontal projection;
- (c) Designed to be self-propelled or permanently towable by a light duty truck; and
- (d) Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

300.45 "Registered Land Surveyor" A land surveyor registered in the State of Illinois, under The Illinois Land Surveyors Act. (225 ILCS 330/1, et seq.)

300.46 "Registered Professional Engineer" An engineer registered in the State of Illinois, under The Illinois Professional Engineering Practice Act. (225 ILCS 325/1 et seq.)

300.47 "Repair, Remodeling or Maintenance" Development activities which do not result in any increases in the outside dimensions of a building or any changes to the dimensions of a structure.

300.48 "Retention/Detention Facility" *A retention facility stores stormwater runoff without a gravity release. A detention facility provides for storage of stormwater runoff and controlled*

release of this runoff during and after a flood or storm.

300.49 "Riverine SFHA" Any SFHA subject to flooding from a river, creek, intermittent stream, ditch, on stream lake system or any other identified channel. This term does not include areas subject to flooding from lakes, ponding areas, areas of sheet flow, or other areas not subject to overbank flooding.

300.50 "Runoff" *The water derived from melting snow or rain falling on the land surface, flowing over the surface of the ground or collected in channels or conduits.*

300.51 "Sedimentation" *The processes that deposit soils, debris, and other materials either on other ground surfaces or in bodies of water or watercourses.*

300.52 "Special Flood Hazard Area (SFHA)" Any base flood area subject to flooding from a river, creek, intermittent stream, ditch, or any other identified channel or ponding and shown on a Flood Hazard Boundary Map or Flood Insurance Rate Map as Zone A, A0, A1-30, AE, A99, AH, VO, V30, VE, V, M, E, D, or X.

300.53 "Structure" The results of a man-made change to the land constructed on or below the ground, including the construction, reconstruction or placement of a building or any addition to a building; installing a manufactured home on a site; preparing a site for a manufactured home or installing a travel trailer on a site for more than 180 days unless they are fully licensed and ready for highway use.

300.54 "Substantial Damage" A building is considered substantially damaged when it sustains damage from any cause (fire, flood, earthquake, etc.), whereby the cost of fully restoring the structure would equal or exceed 50 percent of the pre-damage market value of the structure, regardless of the actual repair work performed.

300.55 "Substantial Improvement"

(a) Any repair, reconstruction or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure either, (1) before the improvement or repair is started, or (2) if the structure has been damaged, and is being restored, before the damage occurred.

(b) For the purposes of this definition "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure.

(c) The term does not, however, include either (1) any project for improvement of a structure to comply with existing state or local health, sanitary, or safety code specifications which are solely necessary to assure safe living conditions or (2) any alteration of a "historic structure", provided that the alteration will not preclude the structure's continued designation as a historic structure.

300.56 "Transition Section" Reaches of the stream or floodway where water flows from a narrow cross-section to a wide cross-section or vice versa.

The cost of repair must be calculated for full repair to "pre-damage" conditions, even if the owner elects to do less. The total cost of repair includes structural and finish materials, and labor. A substantially damaged building which is repaired must comply with the NFIP requirements for new construction.

Section 400.0 How to Use This Ordinance

401.0 The _____ shall be responsible for fulfilling all of the duties listed in Section 500.0.

402.0 To fulfill those duties, the _____ first should use the criteria listed in Section 600.0, Base Flood Elevations, to determine whether the development site is located within a floodplain.

403.0 Once it has been determined that a site is located within a floodplain, the _____ must determine whether the development site is within a flood fringe, a designated floodway, or within a SFHA or floodplain for which no floodway has been identified.

403.1 If the site is within a flood fringe, the _____ shall require that the minimum requirements of Section 700.0 be met.

403.2 If the site is within a floodway, the _____ shall require that the minimum requirements of Section 800.0 be met.

403.3 If the site is located within a SFHA or floodplain for which no detailed study has been completed and approved, the _____ shall require that the minimum requirements of Section 900.0 be met.

404.0 In addition, the general requirements of Section 1000.0 shall be met for all developments meeting the requirements of Section 700.0, 800.0, or 900.0.

405.0 The _____ shall assure that all subdivision proposals shall meet the requirements of Section 1100.0.

406.0 If a variance is to be granted for a proposal, the _____ shall review the requirements of Section 1200.0 to make sure they are met. In addition, the _____ shall complete all notification requirements.

407.0 In order to assure that property owners obtain permits as required in this Ordinance, the _____ may take any and all actions as outlined in Section 1400.0.

Section 500.0 Duties of the Enforcement Official(s)

The _____ shall be responsible for the general administration and enforcement of this Ordinance which shall include the following:

501.0 Determining the Floodplain Designation.

501.1 Check all new development sites to determine whether they are in a Special Flood Hazard Area (SFHA).

501.2 If they are in a SFHA, determine whether they are in a floodway, flood fringe or in a floodplain for which a detailed study has not been conducted and which drains more than one (1) square mile.

501.3 *Check whether the development is potentially within*

This section explains the procedure which the enforcement official is expected to follow when enforcing this Ordinance.

List the title of the official responsible for administering the floodplain Ordinance.

This Ordinance should be administered by a Professional Engineer (P.E.), or a combination of a P.E. and a Building Official. However, a Building Official, who is not a P.E. should not attempt to administer Section 800.0 or 900.0 of this Ordinance.

This section explains the duties of the enforcement official, in enforcing this Ordinance. It also explains what records the official is expected to maintain on file for public inspection.

Often, one square mile is the minimum regulated watershed size in urban areas. However, substantial local flooding can occur in headwater areas draining less than one square mile, and modifications and fills in these smaller watersheds can greatly exacerbate local and downstream flooding. Wherever possible, regulatory maps should be extended upstream of the one square mile cutoff as far as is practical. U.S.G.S. Hydrologic Atlas series maps provide a source of pre-1971 flood of record information in Northeastern Illinois, which may be useful in making preliminary

an extended SFHA (with a drainage area less than one square mile), indicating that the development would have adverse impacts regarding storage, conveyance, or inundation which would be the basis for the applicant being required to delineate the floodplain and floodway and be subject to the remaining Sections of this Ordinance.

502.0 Professional Engineer Review.

502.1 If the development site is within a floodway or in a floodplain for which a detailed study has not been conducted and which drains more than one square mile, the permit shall be referred to a registered professional engineer under the employ or contract of the (City, Village) for review to ensure that the development meets Sections 800.0 or 900.0.

502.2 In the case of an Appropriate Use, the P.E. shall state in writing that the development meets the requirements of Section 800.0.

503.0 Dam Safety Requirements.

503.1 Ensure that an IDNR/OWR permit has been issued or a letter indicating no permit is required, if the proposed development activity includes construction of a dam as defined in Section 300.12.

503.2 Regulated dams may include weirs, restrictive culverts or impoundment structures.

504.0 Other permit requirements.

Ensure that any and all required federal, state and local permits are received prior to the issuance of a floodplain development permit.

505.0 Plan Review and Permit Issuance.

505.1 Ensure that all development activities within the SFHAs of the jurisdiction of the (City, Village) meet the requirements of this Ordinance, and;

505.2 Issue a floodplain development permit in accordance with the provisions of this Ordinance and other regulations of this community when the development meets the conditions of this Ordinance.

506.0 Inspection Review.

Inspect all development projects before, during and after construction to assure proper elevation of the structure and to ensure compliance with the provisions of this Ordinance;

507.0 Elevation and Floodproofing Certificates.

Maintain permit files including:

507.1 An Elevation Certificate certifying the elevation of the lowest floor (including basement) of a residential or non-residential building subject to Section 1000.0 of this Ordinance, and/or;

507.2 The elevation to which a non-residential building has been floodproofed, using a Floodproofing Certificate, for all buildings

identifications of headwater and other unidentified floodplains. Increasingly, countywide stormwater management agencies, local governments, and landowners are becoming aware of the flood risks associated with unmapped floodplains, including isolated depressions.

If the adopting political body is a County, then in place of “more than one square mile” the following should be inserted:

“more than one (1) square mile in an urban or urbanizing area, or more than ten (10) square miles in a rural area”.

Some construction activities in the floodway involve fill in “waters of the United States” (i.e., wetlands and streams) and are subject to U.S. Army Corps of Engineers regulations under Section 404 and to stream and wetland protection requirements of some local communities. Necessary permits, or signoffs, from the Corps and/or the local community should be received prior to, or jointly with, issuance of a floodplain development permit.

Required by NFIP: 44 CFR 60.3(b)(4).

Copies to be provided for property owners or renters seeking Flood Insurance.

subject to Section 1000.0 of this Ordinance

508.0 Records for Public Inspection.

Maintain for public inspection and furnish upon request base flood data, SFHA and designated floodway maps, copies of federal or state permit documents, variance documentation, Conditional Letter of Map Revision, Letter of Map Revision, Letter of Map Amendment and "as-built" elevation and floodproofing and/or elevation certificates for all buildings constructed subject to this Ordinance.

509.0 State Permits.

Ensure that construction authorization has been granted by IDNR/OWR, for all development projects subject to Sections 800.0 and 900.0 of this Ordinance, unless enforcement responsibility has been delegated to the (City, Village). However, the following review approvals are not delegated to the (City, Village) and shall require review or permits from IDNR/OWR:

509.1 Organizations which are exempt from this Ordinance, as per the Illinois Compiled Statutes;

509.2 IDNR/OWR projects, dams or impoundment structures as defined in Section 300.12 and all other state, federal or local unit of government projects, including projects of the (City, Village) and County, except for those projects meeting the requirements of Section 802.7;

509.3 An engineer's determination that an existing bridge or culvert crossing is not a source of flood damage and the analysis indicating the proposed flood profile, per Section 802.3(e);

509.4 An engineer's analysis of the flood profile due to Section 802.3(d);

509.5 Alternative transition sections and hydraulically equivalent compensatory storage as indicated in Section 802.3(a, b, h);

509.6 Permit issuance of structures within, under, or over publicly navigable rivers, lakes and streams;

509.7 Any changes in the Base Flood Elevation or floodway locations; and,

509.8 Base Flood Elevation determinations where none now exist.

510.0 Cooperation with Other Agencies.

510.1 Cooperate with state and federal floodplain management agencies to improve base flood or 100-year frequency flood and floodway data and to improve the administration of this Ordinance;

510.2 Submit data to IDNR/OWR and FEMA for proposed revisions of a regulatory map;

IDNR/OWR can delegate state permitting authority in the floodway for certain minor projects. State delegation means your community will be responsible for issuing development permits for several types of minor floodway development activities, without first obtaining a State permit. This delegation will free up state staff to work on the detailed projects that involve a change to the base flood elevation or floodway location.

510.3 Submit reports as required for the National Flood Insurance Program; and

510.4 Notify FEMA of any proposed amendments to this Ordinance.

511.0 Promulgate Regulations.

Promulgate rules and regulations as necessary to administer and enforce the provisions of this Ordinance, subject however to the review and approval of IDNR/OWR and FEMA for any Ordinance changes.

Section 600.0 Base Flood Elevation

This Ordinance's protection standard is based on the Flood Insurance Study for the (City, Village).

600.1 If a base flood elevation or 100-year frequency flood elevation is not available for a particular site, then the protection standard shall be according to the best existing data available in the Illinois State Water Survey's Floodplain Information Repository that has been approved by IDNR/OWR and FEMA.

600.2 When a party disagrees with the best available data, he/she may finance the detailed engineering study needed to replace existing data with better data and submit it to IDNR/OWR and FEMA.

601.0 The base flood or 100-year frequency flood elevation for the SFHAs of ____ (river, creek, stream) shall be as delineated on the 100-year flood profiles in the Flood Insurance Study of the (City, Village) prepared by FEMA (or the Department of Housing and Urban Development) and dated____, and such amendments to such study and maps as may be prepared from time to time.

602.0 The base flood or 100-year frequency flood elevation for the SFHAs of those parts of unincorporated _____ County that are within the extraterritorial jurisdiction of the (City, Village) or that may be annexed into the (City, Village) shall be as delineated on the 100-year flood profiles in the Flood Insurance Study of____County prepared by FEMA (or Department of Housing and Urban Development) and dated _____, and such amendments or revisions to such study and maps as may be prepared from time to time.

603.0 The base flood or 100-year frequency flood elevation for each SFHA delineated as an "AH Zone" or "AO Zone" shall be that elevation (or depth) delineated on the Flood Insurance Rate Map of the (City, Village).

604.0 The base flood or 100-year frequency flood elevation for each of the remaining SFHAs delineated as an "A Zone" on the Flood Insurance Rate Map of the (City, Village) shall be according to the best existing data available in the Illinois State Water Survey Floodplain Information Repository.

604.1 When no base flood or 100-year frequency flood elevation exists, the base flood or 100-year frequency flood elevation for a riverine SFHA shall be determined from a backwater model, such as HEC-II, WSP-2, or a dynamic model such as HIP.

This section explains which maps are to be used or which procedures are to be followed in determining whether a parcel of land is in the floodplain.

NFIP requirement: 44 CFR 60.3(b)(4)

Contact IDNR/OWR or FEMA for the date of your FIS.

Contact IDNR/OWR to determine which Sections (601, 602, 603 or 604) are required for your community. Many communities may only have to adopt portions of this Section, depending on their unique circumstances. For example, a land-locked community would not have to adopt 602; a community with no AH or AO zones would not have to adopt 603.

The 100-year frequency flood event is that event which has a 1 percent statistical chance of occurring in any given year.

Flood flows should be based on anticipated future land use conditions in the watershed as determined from adopted local and regional land use plans. Anticipated future development will exacerbate existing flooding in many cases. In small to moderately sized watersheds, it has been shown that stringent stormwater detention requirements for new development can minimize or prevent increases in the flood peak. However, for larger watersheds (e.g., 100 square miles or larger), it is expected that future development will increase both flood peaks and durations, regardless of local

604.2 The flood flows used in the hydraulic models shall be obtained from a hydrologic model, such as HEC-I, TR-20, or HIP, or by techniques presented in various publications prepared by the United States Geological Survey for estimating peak flood discharges.

604.3 Along any watercourses draining more than one (1) square mile, the above analyses shall be submitted to IDNR/OWR for approval. Once approved it must be submitted to the Illinois State Water Survey Floodplain Information Repository for filing.

604.4 For a non-riverine SFHA, the Base Flood Elevation shall be the historic Flood of Record plus *three feet*, unless calculated by a detailed engineering study and approved by IDNR/OWR for drainage areas greater than one square mile.

604.5 For an unmapped extended SFHA (with a drainage area less than one square mile) which has been identified by the _____ pursuant to Section 501.3, the base flood elevation shall be determined by the applicant utilizing a method as approved in Section 604, with concurrence of the _____.

stormwater controls, due to increases in the total volume of runoff. In the situations where flood increases related to future development are expected, it is critical that flood flows and the resultant maps be based on anticipated future land use. In determining future flood flows, the influence of stormwater detention which is required and enforced by local government ordinances should be factored into the hydrologic model.

If the adopting political body is a County, then in place of “more than one square mile” the following should be inserted:

“more than one (1) square mile in an urban or urbanizing... area, or more than ten (10) square miles in a rural area”.

NIPC recommends that, at a minimum, floodplain mapping be performed for any watercourse draining more than one square mile, even if the political body is a county. Current development patterns and trends in northeastern Illinois indicate that urban development can occur anywhere, even in predominantly rural areas. Without floodplain mapping for many of the watercourses in these areas, it will be difficult to prevent new development from locating in floodprone zones.

The +3 foot requirement is recommended language from IDNR/OWR.

As described in the commentary opposite Section 501.0, it is important that significant floodplains be identified and be subject to the requirements of this Ordinance, even if the tributary drainage area is less than one square mile.

List the title of the official responsible for administering the floodplain ordinance.

Section 700.0 Occupation and Use of Flood Fringe Areas

Development in and/or filling of the flood fringe will be permitted if protection is provided against the base flood or 100-year frequency flood by proper elevation, and compensatory storage, and other applicable provisions of this Ordinance. No use will be permitted which adversely affects the capacity of drainage facilities or systems. Developments located within the flood fringe shall meet the requirements of this Section, along with the requirements of Section 1000.0.

701.0 Development Permit.

701.1 No person, firm, corporation, or governmental body not exempted by state law shall commence any development in the SFHA without first obtaining a development permit from the _____.

701.2 Application for a development permit shall be made on a form provided by the _____.

(a) The application shall be accompanied by drawings of the site, drawn to scale, showing property line dimensions and legal description for the property and sealed by a licensed engineer, architect or land surveyor; existing grade elevations in M.S.L., 1929 adj. datum or N.G.V.D. and all changes in grade resulting from excavation or filling; the location and dimensions of all buildings and additions to buildings.

(b) For all proposed buildings, the elevation of the lowest floor (including basement) and lowest adjacent grade shall be shown on the submitted plans and the development will be subject to the requirements of Section 1000.0 of this Ordinance.

701.3 Upon receipt of a development permit application, the _____ shall compare the elevation of the site to the base flood or 100-year frequency flood elevation.

(a) Any development located on land that can be shown to be higher than the base flood elevation of the current Flood Insurance Rate Map and which has not been filled after the date of the site's first Flood Insurance Rate Map without a permit as required by this ordinance is not in the SFHA and, therefore, not subject to the requirements of this Ordinance.

(b) The _____ shall maintain documentation of the existing ground elevation at the development site and certification that this ground elevation existed prior to the date of the site's first Flood Insurance Rate Map identification.

701.4 A soil erosion and sediment control plan for disturbed areas shall be submitted. This plan shall include a description of the sequence of grading activities and the temporary sediment and erosion control measures to be implemented to mitigate their effects. This plan shall also include a description of final stabilization and revegetation measures, and the identification of a responsible party to ensure post-construction maintenance.

701.5 The _____ shall be responsible for obtaining from the applicant copies of all other federal, state, and local permits, approvals or permit-not-required letters that may be required for this

This section explains the procedures which are to be followed in determining whether a parcel of land is in a flood fringe, and sets the minimum requirements for all developments within a flood fringe.

Developments in the flood fringe may include the construction of a dam as defined in Section 300.12. An IDNR/OWR permit for the dam or a letter indicating "no IDNR/OWR permit is required" is necessary for any such construction.

NFIP requirement: 44 CFR 60.3(b)(1). List the title of the official responsible for administering the floodplain ordinance.

List the title of the official responsible for administering the floodplain ordinance.

List the title of the official responsible for administering the floodplain ordinance.

Such a project will still be subject to the flood insurance purchase requirements unless the owner receives a Letter of Map Amendment from FEMA.

List the title of the official responsible for administering the floodplain ordinance.

Assistance in administration of soil erosion and sedimentation control requirements is provided in "Model Soil Erosion and Sediment Control Ordinance: A Guide for Local Officials" September, 1991.

List the title of the official responsible for administering the floodplain ordinance.

type of activity. The _____ shall not issue a permit unless all other federal, state, and local permits have been obtained.

702.0 Preventing Increased Damages.

No development in the flood fringe shall create a threat to public health and safety.

702.1 If fill is being used to elevate the site above the base flood or 100-year frequency flood elevation, the applicant shall submit sufficient data and obtain a letter of map revision (LOMR) from FEMA for the purpose of removing the site from the floodplain.

702.2 Compensatory Storage.

(a) Whenever any portion of a floodplain is authorized for use, the volume of space which will be occupied by the authorized fill or structure below the base flood or 100-year frequency flood elevation shall be compensated for and balanced by a hydraulically equivalent volume of excavation taken from below the base flood or 100-year frequency flood elevation.

(b) The excavation volume shall be at least equal to **1.5 times** the volume of storage lost due to the fill or structure.

(c) In the case of streams and watercourses, such excavation shall be made opposite or adjacent to the areas so filled or occupied.

(d) All floodplain storage lost below the existing 10-year flood elevation shall be replaced below the proposed 10-year flood elevation. All floodplain storage lost above the existing 10-year flood elevation shall be replaced above the proposed 10-year flood elevation.

(e) All such excavations shall be constructed to drain freely and openly to the watercourse.

NFIP requirement: 44 CFR 60.3(a)(2).

NFIP requirement: 44 CFR 60.3(a)(4)(i), 60.3(c)(10) and 60.3(d)(3).

NIPC policy supports the requirement for a safety factor for compensatory storage equal to at least 1.5 times the volume of storage lost due to fill or structures. This safety factor is intended to compensate for uncertainties in the estimation of the base flood elevation and in the determination of project impacts.

This section requires compensatory storage in the flood fringe and the floodway. Compensatory storage in the floodway is required by IDNR/OWR. ***Compensatory storage in the flood fringe is recommended by both NIPC and IDNR/OWR but is not required.*** If compensatory storage is not provided within the flood fringe, IDNR/OWR will require that all future mapping have storage floodways rather than the current conveyance floodways. Storage floodways are normally much wider than conveyance floodways and will result in the more stringent requirements of Section 800 being enforced in a larger area of the community.

If your community and other communities along a hydraulically significant portion of a stream desire to have the floodway defined on the basis of conveyance only and not storage, effective compensatory storage will be required for all construction in the floodplain for projects under the control of your community as well as any projects constructed that affects floodplain storage. If the municipality owns a regional flood control or stormwater storage facility, and has a plan for developing additional storage at the facility, the municipality may prefer to offer developers of isolated single lots, one quarter acre or smaller in size, the ability to provide hydraulically equivalent storage in the regional facility as an alternative to providing on-site compensatory storage. It would need to be shown through the use of hydrologic and hydraulic models, however, that the additional storage created in the regional facility is hydraulically equivalent to the storage lost at the development site.

Section 800.0 Occupation and Use of Designated Floodways

This section applies to proposed development, redevelopment, site modification or building modification within a designated floodway. The designated floodway for _____(river, creek, stream) shall be as delineated on the designated floodway maps designated by IDNR/OWR according to and referenced in Section 300.13. Only those uses and structures will be permitted which meet the criteria in this section. All floodway modifications shall be the minimum necessary to accomplish the purpose of the project. The development shall also meet the requirements of Section 1000.0.

801.0 Development Permit.

No person, firm, corporation or governmental body not exempted by state law shall commence any development in a floodway without first obtaining a development permit from the _____ and IDNR/OWR.

801.1 Application for a development permit shall be made on a form provided by the _____. The application shall include the following information:

- (a) Name and address of applicant;
 - (b) Site location (including legal description) of the property, drawn to scale, on the designated floodway map, indicating whether it is proposed to be in an incorporated or unincorporated area;
 - (c) Name of stream or body of water affected;
 - (d) Description of proposed activity;
 - (e) Statement of purpose of proposed activity;
 - (f) Anticipated dates of initiation and completion of activity;
 - (g) Name and mailing address of the owner of the subject property if different from the applicant;
 - (h) Signature of the applicant or the applicant's agent;
 - (i) If the applicant is a corporation, the president or other authorized officer shall sign the application form;
 - (j) If the applicant is a partnership, each partner shall sign the application form; and
 - (k) If the applicant is a land trust, the trust officer shall sign the name of the trustee by him (her) as trust officer. A disclosure affidavit shall be filed with the application, identifying each beneficiary of the trust by name and address and defining the respective interests therein.
- (l) Plans of the proposed activity shall be provided which

This section explains the procedures which are to be followed to determine if a site is within a floodway and sets the minimum requirements for all development within a floodway.

IDNR/OWR requirements. Section 800.0, in its entirety, meets the requirements of 92 Ill. Adm. Code Part 708.

NFIP requirement: 44 CFR 60.3(b)(1).

List the title of the official responsible for administering the floodplain Ordinance.

If IDNR/OWR has delegated its permitting authority in the floodway to the community, then only those development activities in Section 802.4 would still require permits from IDNR/OWR.

List the title of the official responsible for administering the floodplain Ordinance.

include as a minimum:

i. A vicinity map showing the site of the activity, name of the waterway, boundary lines, names of roads in the vicinity of the site, graphic or numerical scale, and north arrow;

ii. A plan view of the project and engineering study reach showing existing and proposed conditions including principal dimensions of the structure or work, elevations in mean sea level (1929 adjustment) datum or N.G.V.D. or North American Vertical Datum, adjacent property lines and ownership, drainage and flood control easements, **location of any channels and any existing or future access roads, distance between** proposed activity and navigation channel (when the proposed construction is near a commercially navigable body of water), designated floodway limit, floodplain limit, **specifications and dimensions of any proposed channel modifications**, location and orientation of cross-sections, north arrow, and a graphic or numerical scale;

iii. Cross-section views of the project and engineering study reach showing existing and proposed conditions including principal dimensions of the work as shown in plan view, existing and proposed elevations, normal water elevation, 10-year frequency flood elevation, 100-year frequency flood elevation, and graphic or numerical scales (horizontal and vertical);

iv. A soil erosion and sediment control plan for disturbed areas. This plan shall include a description of the sequence of grading activities and the temporary sediment and erosion control measures to be implemented to mitigate their effects. This plan shall also include a description of final stabilization and revegetation measures, and the identification of a responsible party to ensure post-construction maintenance.

v. A copy of the designated floodway map, marked to reflect any proposed change in the designated floodway location.

(m) Any and all other federal, state, and local permits or approval letters that may be required for this type of development.

(n) Engineering calculations and supporting data shall be submitted showing that the proposed work will meet the permit criteria of Section 802.0.

(o) If the designated floodway delineation, base flood or 100-year frequency flood elevation will change due to the proposed project, the application will not be considered complete until IDNR/OWR has indicated conditional approval of the designated floodway map change. No structures may be built until a Letter of Map Revision has been approved by FEMA.

prepared by the Northeastern Illinois Planning Commission requires the preparation and submittal of a series of plans which further document the conditions and provide for natural resources management. These include (1) a geologic and soil report, (2) a drainage control plan, (3) a site grading and excavation plan, and (4) a landscape plan. In some communities, the information included in these plans may be required through subdivision regulations or other existing ordinances. They were included in the Model Ordinance in order to insure a comprehensive approach to stream and wetland protection. Where communities have ordinance provisions which already require such information, it would not be necessary to require it through a stream and wetland protection ordinance. A stream and wetland protection ordinance, or a floodplain ordinance, may make reference to the other ordinances that deal with geology and soils, drainage, grading and excavation, and landscaping.

Assistance in administration of soil erosion and sedimentation control requirements is provided in "Model Soil Erosion and Sediment Control Ordinance: A Guide for Local Officials" September, 1991.

Floodway fill or channel modification activities often will require a permit from the U.S. Army Corps of Engineers if they constitute fill in "waters of the U.S."

(p) The application for a structure shall be accompanied by drawings of the site, drawn to scale showing property line dimensions and existing ground elevations and all changes in grade resulting from any proposed excavation or filling, and floodplain and floodway limits; sealed by a registered professional engineer, licensed architect or registered land surveyor; the location and dimensions of all buildings and additions to buildings; and the elevation of the lowest floor (including basement) of all proposed buildings subject to the requirements of Section 1000.0 of this Ordinance.

(q) If the proposed project involves a channel modification, the applicant shall submit the following information:

i. A discussion of the purpose of and need for the proposed work;

ii. A discussion of the feasibility of using alternative locations or methods (see 802.3(i).i.) to accomplish the purpose of the proposed work;

iii. An analysis of the extent and permanence of the impacts each feasible alternative identified in 802.3 (i).i. of this Section would have on the physical and biological conditions of the body of water affected; and

iv. An analysis of the impacts of the proposed project, considering cumulative effects on the physical and biological conditions of the body of water affected.

801.2 The _____ shall be responsible for obtaining from the applicant copies of all other federal, state, and local permits and approvals that may be required for this type of activity.

(a) The _____ shall not issue the development permit unless all required federal and state permits have been obtained.

(b) A Registered Professional Engineer, under the employ or contract of the (City, Village) shall review and approve applications reviewed under this Section.

802.0 Preventing Increased Damages and a List of Appropriate Uses.

802.1 The only development in a floodway which will be allowed are Appropriate Uses, which will not cause a rise in the base flood elevation, and which will not create a damaging or potentially damaging increase in flood heights or velocity or be a threat to public health and safety and ***welfare or impair the natural hydrologic and hydraulic functions of the floodway or channel, or permanently impair existing water quality or aquatic habitat. Construction impacts shall be minimized by appropriate mitigation methods as called for in this Ordinance.*** Only those Appropriate Uses listed in 92 Ill. Adm. Code Part 708 will be allowed. The approved Appropriate Uses are as follows:

(a) Flood control structures, dikes, dams and other public works or private improvements relating to the control of

Channel modifications are of particular concern because of their potential impacts on erosion, water quality and habitat, as well as flood height and velocity. Therefore, specific additional information is required to assess their impacts. The depth and extent of required impact analyses should be generally related to the severity of the proposed modification, the quality of the existing resource, and the length of channel affected. Certain activities involving fill in existing channels are also regulated by the U.S. Army Corps of Engineers, which requires its own assessment of environmental impacts. Review of such activities should be coordinated with the Corps.

List the title of the official responsible for administering the floodplain ordinance.

NFIP requirement: 44 CFR 60.3(a)(2).

NFIP requirement: 44 CFR 60.3(a)(4)(i), 60.3(c)(10) and 60.3(d)(3).

NIPC policy supports development in the floodway for only the following appropriate uses: public flood control projects, public recreation and open space uses, water dependent activities, and crossing roads and bridges. Recommended NIPC appropriate uses are listed in Alternative Section 802.1

Regrading or other modifications of the floodway for convenience of site design for private developments

drainage, flooding, erosion, or water quality or habitat for fish and wildlife.

(b) Structures or facilities relating to the use of, or requiring access to, the water or shoreline, such as pumping and treatment facilities, and facilities and improvements related to recreational boating, commercial shipping and other functionally water dependent uses;

(c) Storm and sanitary sewer relief outfalls;

(d) Underground and overhead utilities;

(e) Recreational facilities such as playing fields and trail systems, including any related fencing (at least 50 percent open when viewed from any one direction) built parallel to the direction of flood flows, and including open air pavilions and toilet facilities (4 stall maximum) that will not block flood flows nor reduce floodway storage

(f) Detached garages, storage sheds, or other non-habitable accessory structures that will not block flood flows nor reduce floodway storage;

(g) Bridges, culverts, roadways, sidewalks, railways, runways and taxiways and any modification thereto;

(h) Parking lots built at or below existing grade where either:

are not considered by NIPC to be appropriate uses of the floodway. Private flood control structures are considered appropriate uses if they are supported by the local government entity and if they reduce flood damages to existing structures both on and off site (i.e., if there are “regional” benefits).

NIPC policy does not consider the location of new treatment facilities and unnecessary pumping facilities in the floodway as appropriate unless such facility requires access to the water or shoreline. While wastewater treatment plants have traditionally been located along watercourses, often in the floodway, experience has indicated that such locations may be inappropriate. Facilities have been severely damaged by recent floods and disrupted plant operations have resulted in degraded water quality which, in turn, has resulted in increased flood damages. Floodproofing has been only partially successful in protecting facilities from severe floods. Other water dependent, treatment-related facilities, such as instream aeration, siphons, debris booms, etc., are considered appropriate uses as long as they are designed and operated so as to minimize negative impacts on the natural functions of the floodway and stream channels.

IDNR/OWR has determined that a small toilet facility for a park building would be appropriate because the use of floodways as parks or other open spaces should be encouraged.

NIPC policy discourages the inclusion of small toilet facilities as an appropriate use of the floodway. Such facilities could impede flood flows and/or contribute to water quality contamination. If such facilities are necessary, they should be located outside the floodplain, or at least in the flood fringe.

NIPC policy does not consider detached garages, storage sheds, or other accessory structures appropriate in the floodway. Although small, non-habitable structures may not be a large source of flood damages, they can impede flood flows and may impose a debris hazard in areas of high flow velocity.

Garages, storage sheds and other non-habitable accessory structures may be allowed if they are in the hydraulic shadow of an existing building and are designed to be wet floodproofed, or if the floodway has been excavated for conveyance and storage.

NIPC policy does not consider the placement of unnecessary impervious surfaces in the floodway as appropriate. Roadways, railways, and sidewalks necessary for conveyance over a channel, and associated bridges and culverts are considered

i. The depth of flooding at the 100-year frequency flood event will not exceed 1.0 foot; or

ii. The applicant of a short-term recreational use facility parking lot, formally agrees to restrict access during overbank flooding events and accepts liability for all damage caused by vehicular access during all overbank flooding events.

(i) Designated floodway regrading, without fill, to create a positive non-erosive slope toward a watercourse.

(j) Floodproofing activities to protect previously existing lawful structures including the construction of water tight window wells, elevating structures, or construction of floodwalls around residential, commercial or industrial principal structures where the outside toe of the floodwall shall be no more than ten (10) feet away from the exterior wall of the existing structure, and, which are not considered substantial improvements to the structure.

(k) The replacement, reconstruction, or repair of a damaged building, provided that the outside dimensions are not increased, and if the building was damaged to 50 percent or more of the market value before the damage occurred, the building will be protected from flooding to the flood protection elevation.

(l) Modifications to an existing building that would not increase the enclosed floor area of the building below the 100-year frequency flood elevation, and which will not block flood flows including but not limited to, fireplaces, bay windows, decks, patios, and second story additions. If the building improved to 50 percent or more of the market value before the modification occurred, the building will be protected from flooding to the flood protection elevation.

appropriate uses. Uses such as roadways parallel to a watercourse, taxiways and parking lots are not considered necessary or appropriate in the floodway. Impervious surfaces in the floodway may increase conveyance as well as reduce the absorption and recharge of storm and flood water. Such uses may increase the potential for vehicular flood damages and traffic disruptions.

NIPC further discourages short-term recreational use facility parking lots, particularly since this provision does not restrict the depth of flooding. In addition to the concerns previously stated regarding increased flood damage liability and impairment of natural functions, there is the concern that it will sometimes be impossible to accurately predict when flooding will occur and, correspondingly, it may be difficult to ensure that vehicles will be removed in a timely fashion.

NIPC policy does not consider the unnecessary regrading of a floodway to improve drainage as appropriate. Undrained, depressional areas in a floodway function to retain floodwaters after a flood has passed, discharging it slowly to the channel or recharging groundwater. Floodway regrading to improve drainage when necessary to achieve a valid public purpose, can be considered an appropriate use.

NIPC policy discourages the replacement, repair, or reconstruction of a substantially damaged (damages exceeding 50 percent of the market value) building in the floodway. Prohibiting repairs, etc. on substantially damaged buildings will result in long-term reductions in damage liability, reduced needs for emergency response, and increased incentives for buyouts of high-risk properties. To minimize financial hardships to existing property owners, it is recommended that federal, state, and/or local measures be implemented to compensate property owners for the dollar difference between the amount they are compensated for their property (i.e., insurance and/or buyouts) and its fair market value.

802.1 Alternative

(a) Public flood control structures, dikes, dams and other public works or private improvements relating to the control of drainage, flooding of existing structures, erosion, or water quality or habitat for fish and wildlife.

(b) Structures or facilities relating to the use of, or requiring access to, the water or shoreline, such as instream aeration and similar treatment facilities, facilities and improvements related to recreational boating, and commercial shipping and other functionally water dependent uses;

(c) Storm and sanitary sewer outfalls;

(d) Underground and overhead utilities;

(e) Public open space and recreational facilities such as playing fields and trail systems including any related fencing (at least 50 percent open when viewed from any one direction) built parallel to the direction of flood flows, and including open air pavilions;

(f) Bridges, culverts, and associated roadways, sidewalks, and railways, necessary for crossing over the floodway or for providing access to other appropriate uses in the floodway and any modification thereto;

(g) Flood proofing activities to protect previously existing lawful structures including the construction of water tight window wells, elevating structures, or construction of floodwalls around residential, commercial or industrial principal structures where the outside toe of the floodwall shall be no more than ten (10) feet away from the exterior wall of the existing structure, and, which are not considered substantial improvements to the structure.

(h) In the case of damaged or replacement buildings, reconstruction or repairs made to a building that are valued at less than 50 percent of the market value of the building before it was damaged or replaced, and which does not increase the outside dimensions of the building.

802.2 Appropriate uses do not include the construction or placement of any new structures, fill, building additions, buildings on stilts, *excavation or channel modifications done to accommodate otherwise non-appropriate uses in the floodway*, fencing (including landscaping or planting designed to act as a fence) and storage of materials except as specifically defined above as an Appropriate Use.

802.3 Within the designated floodway as identified on the floodway maps designated by IDNR/OWR, the construction of an Appropriate Use, will be considered permissible provided that the proposed project meets the following engineering and mitigation criteria and is so stated in writing with supporting plans, calculations and data by a registered professional engineer and provided that any structure meets the protection requirements of Section 1000.0 of this Ordinance:

This "Alternative" section lists NIPC recommended appropriate uses which are more restrictive than the appropriate uses allowed by State rules. In particular, uses such as pumping and treatment facilities, garages and sheds, roadways running longitudinally along a watercourse, and parking lots are not considered appropriate because of concerns that they will increase flood damages, interfere with natural functions of floodways, and/or impair water quality and habitat.

State law allows local regulations that are more restrictive than state requirements if they are reasonable. Local governments choosing to adopt the NIPC definition of appropriate uses are encouraged to back up their regulations with a planning process which supports and endorses the broad purposes of this Ordinance, and to document any problems which it has experienced with non-appropriate floodway development activities.

If the NIPC Alternative Section 802.1 is adopted, Section 802.1 should not be included.

(a) Preservation of Flood Conveyance, so as Not to Increase Flood Stages Upstream. For appropriate uses other than bridge or culvert crossings, on-stream structures or dams, all effective designated floodway conveyance lost due to the project will be replaced for all flood events up to and including the 100-year frequency flood. In calculating effective designated floodway conveyance, the following factors shall be taken into consideration:

i. Designated floodway conveyance,

$$"K" = (1.486/n)(AR^{2/3})$$

where "n" is Manning's roughness factor, "A" is the effective flow area of the cross-section, and "R" is the ratio of the area to the wetted perimeter. (See Open Channel Hydraulics, Ven Te Chow, 1959, McGraw-Hill Book Company, New York)

ii. The same Manning's "n" value shall be used for both existing and proposed conditions unless a recorded maintenance agreement with a federal, state, or local unit of government can assure the proposed conditions will be maintained or the land cover is changing from a vegetative to a non-vegetative land cover.

iii. Transition sections shall be provided and used in calculations of effective designated floodway conveyance. The following expansion and contraction ratios shall be used unless an applicant's engineer can prove to IDNR/OWR through engineering calculations or model tests that more abrupt transitions may be used with the same efficiency:

(1) When water is flowing from a narrow section to a wider section, the water should be assumed to expand no faster than at a rate of one foot horizontal for every four feet of the flooded stream's length.

(2) When water is flowing from a wide section to a narrow section, the water should be assumed to contract no faster than at a rate of one foot horizontal for every one foot of the flooded stream's length.

(3) When expanding or contracting flows in a vertical direction, a minimum of one foot vertical transition for every ten feet of stream length shall be used.

(4) Transition sections shall be provided between cross-sections with rapid expansions and contractions and when meeting the designated floodway delineation on adjacent properties.

(5) All cross-sections used in the calculations shall be located perpendicular to flood flows.

(b) Preservation of Floodway Storage so as Not to Increase

Any increase in stage associated with construction in the floodway is contrary to NIPC policy, unless the increase in stage is associated with a necessary public flood control project and there is no increase in off-site flood damages.

For communities without sophisticated word processing software, the formula can also be written as:

$$"K" = (1.486/n)*(A*(R^{0.667}))$$

For certain proposed activities, the floodway roughness may be increased by the activity. An example is a habitat restoration project. In these instances, the same Manning's "n" value should not be used for existing and proposed conditions. In general, floodway roughness should not be reduced by a proposed activity, unless the activity is a public flood control project designed to increase conveyance. Substantial reductions in roughness associated with, for example, changing from a vegetative to a non-vegetative land cover, are not supported by NIPC policy. Proposed activities which rely on continued future maintenance (e.g., mowing) to maintain a low roughness coefficient also are discouraged.

Floodway modification, particularly channel modification, should provide smooth transitions for flowing water to avoid unstable conditions or substantial head losses. It is recommended that neither contractions or expansions occur at a rate greater than one foot horizontal for every four feet of the flooded stream's length. Chow in "Open-Channel Hydraulics" states that the optimum maximum angle between the channel axis and a line connecting the channel sides is 12.5 degrees, which is approximately equal to 1 to 4.

Downstream Flooding.

i. Compensatory storage shall be provided for any designated floodway storage lost due to the proposed work from the volume of fill or structures placed and the impact of any related flood control projects.

ii. Compensatory storage for fill or structures shall be equal to at least **1.5 times** the volume of floodplain storage lost.

iii. Artificially created storage lost due to a reduction in head loss behind a bridge shall not be required to be replaced.

iv. The compensatory designated floodway storage shall be placed between the proposed normal water elevation and the proposed 100-year flood elevation. All designated floodway storage lost below the existing 10-year flood elevation shall be replaced below the proposed 10-year flood elevation. All designated floodway storage lost above the existing 10-year flood elevation shall be replaced above the proposed 10-year flood elevation. All such excavations shall be constructed to drain freely and openly to the watercourse.

v. If the compensatory storage will not be placed at the location of the proposed construction, the applicant's engineer shall demonstrate to IDNR/OWR through a determination of flood discharges and water surface elevations that the compensatory storage is hydraulically equivalent.

vi. There shall be no reduction in floodway surface area as a result of a floodway modification, unless such modification is necessary to reduce flooding at existing structure.

(c) Preservation of Floodway Velocities so as Not to Increase Stream Erosion or Flood Heights.

i. For all Appropriate Uses, except bridges or culverts or on stream structures, the proposed work will not result in an increase in the average channel or designated floodway velocities **or stage for all flood events up to and including the 100-year frequency event.**

ii. In the case of bridges or culverts or on stream structures built for the purpose of backing up water in the stream during normal or flood flows, velocities may be increased at the structure site if scour, erosion and sedimentation will be avoided by the use of rip-rap or other design measures.

(d) Construction of New Bridges or Culvert Crossings and Roadway Approaches.

i. The proposed structure shall not result in an increase

Compensatory Storage: NIPC policy supports the requirement for a safety factor for compensatory storage equal to at least 1.5 times the volume of storage lost due to fill or structures. This safety factor is intended to compensate for uncertainties in the estimate of the base flood elevation and in the determination of project impacts. NIPC policy also recommends that there be no reduction in existing floodway surface area. Any loss of upstream floodplain storage due to downstream conveyance improvements should be compensated with at least an equal volume of compensatory storage on the downstream site. As indicated in the commentary to 802.3(c), if reduced head loss is expected to increase downstream stages, downstream property owners should be notified of any changes to the Base Flood Elevation.

Artificially created storage is defined as that amount of water held or stored behind a bridge or culvert due to an opening which is too small to allow the passage of water without obstruction, during a base flood event.

Any increase in stage associated with construction in the floodway is contrary to NIPC policy, unless the increase in stage is associated with a necessary public flood control project and there is no increase in off-site flood damages.

Any increase in stage associated with construction in the floodway is contrary to NIPC policy, unless the increase in stage is associated with a necessary public flood control project and there is no increase in off-

of upstream flood stages greater than 0.1 foot when compared to the existing conditions for all flood events up to and including the 100-year frequency event; or the upstream flood stage increases will be contained within the channel banks (or within existing vertical extensions of the channel banks) such as within the design protection grade of existing levees or flood walls or within recorded flood easements.

ii. If the proposed construction will increase upstream flood stages greater than 0.1 feet, the developer must contact IDNR/OWR to obtain a permit for a dam or waiver.

(1) The engineering analysis of upstream flood stages must be calculated using the flood study flows, and corresponding flood elevations for tailwater conditions for the flood study specified in Section 600.0 of this Ordinance. Culverts must be analyzed using the U.S. DOT, FHWA Hydraulic Chart for the Selection of Highway Culverts. Bridges must be analyzed using the U.S. DOT/Federal Highway Administration Hydraulics of Bridge Waterways calculation procedures.

(2) Lost floodway storage must be compensated for per Section 802.3(b).

(3) Velocity increases must be mitigated per Section 802.3(c).

(4) If the crossing is proposed over a public water that is used for recreational or commercial navigation, an IDNR/OWR permit must be received.

(5) The hydraulic analysis for the backwater caused by the bridge showing the existing condition and proposed regulatory profile must be submitted to IDNR/OWR for concurrence that a CLOMR is not required by Section 802.0.

(6) All excavations for the construction of the crossing shall be designed per Section 802.3(h).

(e) Reconstruction or Modification of Existing Bridges, Culverts, and Approach Roads.

i. The bridge or culvert and roadway approach reconstruction or modification shall be constructed with no more than 0.1 foot increase in backwater over the existing flood profile for all flood frequencies up to and including the 100-year event, if the existing structure is not a source of flood damage.

ii. If the existing bridge or culvert and roadway approach is a source of flood damage to buildings or structures in the upstream floodplain, the applicant's engineer shall evaluate the feasibility of redesigning the structure to reduce the existing backwater, taking into consideration the effects on flood stages on upstream and downstream properties.

site flood damages.

If a bridge or culvert is modified to reduce existing backwater, it is likely that downstream flood stages will increase. While this section does not require mitigation for such an increase, downstream property owners should be notified of changes to the Base Flood Elevation, which might affect their flood prone status and their consideration of purchasing flood insurance.

iii. The determination as to whether or not the existing crossing is a source of flood damage and should be redesigned must be prepared in accordance with 92 Ill. Adm. Code Part 708 (Floodway Construction in Northeastern Illinois) and submitted to IDNR/OWR for review and concurrence before a permit is issued.

(f) On-Stream Structures Built for the Purpose of Backing Up Water.

i. Any increase in upstream flood stages greater than 0.0 foot when compared to the existing conditions, for all flood events up to and including the 100-year frequency event shall be contained within the channel banks (or within existing vertical extensions of the channel banks) such as within the design protection grade of existing levees or flood walls or within recorded flood easements.

ii. A permit or letter indicating a permit is not required must be obtained from IDNR/OWR for any structure built for the purpose of backing up water in the stream during normal or flood flow.

iii. All dams and impoundment structures as defined in Section 300.12 shall meet the permitting requirements of 92 Ill. Adm. Code Part 702 (Construction and Maintenance of Dams). *If the proposed activity involves a modification of the channel or floodway to accommodate an impoundment, it shall be demonstrated that:*

(1) The impoundment is determined to be in the public interest by providing flood control, public recreation, or regional stormwater detention;

(2) The impoundment will not prevent the migration of indigenous fish species, which require access to upstream areas as part of their life cycle, such as for spawning;

(3) The impoundment will not cause or contribute to degraded water quality or habitat conditions. Impoundment design should include gradual bank slopes, appropriate bank stabilization measures, and a pre-sedimentation basin.

(4) A nonpoint source control plan has been implemented in the upstream watershed to control the effects of sediment runoff as well as minimize the input of nutrients, oil and grease, metals, and other pollutants. If there is more than one municipality in the upstream watershed, the municipality in which the impoundment is constructed should coordinate with upstream municipalities to ensure comprehensive watershed control;

(5) The project otherwise complies with the requirements of Section 800.0.

Impoundment of streams is often undesirable, for several reasons. Impoundments create quiescent conditions which may be conducive to depressed dissolved oxygen levels, the accumulation of polluted sediments and nutrient regeneration, and the proliferation of excessive plant and algae growth. Dams on streams may prevent the upstream migration of fish. In general, these concerns are most significant when permanent pools are constructed on larger streams (i.e. with watersheds larger than one or two square miles), or where nutrient-rich discharges, such as point sources are present. Use of on-stream impoundments for stormwater retention, without upstream nonpoint source pollutant controls, utilizes the stream for pollutant removal but may impair potential recreational and aquatic habitat uses of the impoundment. Impoundments without permanent low-flow pools are preferred except where a permanent pool is necessary to achieve the intended benefits of the impoundment (e.g. recreation or water quality mitigation). Design of such permanent pools should include criteria which will minimize the deleterious effects discussed above.

(g) Flood Proofing of Existing Habitable, Residential and Commercial Structures.

i. If construction is required beyond the outside dimensions of the existing building, the outside perimeter of the floodproofing construction shall be placed no further than 10 feet from the outside of the building.

ii. Compensation of lost storage and conveyance will not be required for floodproofing activities.

(h) Excavation in the Floodway.

i. When excavation is proposed in the design of bridges and culvert openings, including the modifications to and replacement of existing bridge and culvert structures, or to compensate for lost conveyance or other Appropriate Uses, transition sections shall be provided for the excavation.

ii. The following expansion and contraction ratios shall be used unless an applicant's engineer can prove to IDNR/OWR through engineering calculations or model tests that more abrupt transitions may be used with the same efficiency:

(1) When water is flowing from a narrow section to a wider section, the water should be assumed to expand no faster than at a rate of one foot horizontal for every four feet of the flooded stream's length;

(2) When water is flowing from a wide section to a narrow section, the water should be assumed to contract no faster than at a rate of one foot horizontal for every one foot of the flooded stream's length; and

(3) When expanding or contracting flows in a vertical direction, a minimum of one foot vertical transition for every ten feet of stream length shall be used.

(4) Erosion/scour protection shall be provided inland upstream and downstream of the transition sections.

(i) If the proposed activity involves a channel modification, it shall be demonstrated that:

i. There are no practicable alternatives to the activity which would accomplish its purpose with less impact to the natural conditions of the body of water affected. Possible alternatives include levees, bank stabilization, flood proofing of existing structures, removal of structures from the floodplain, clearing the channel, high flow channel, or the establishment of a stream side buffer strip or green belt. Channel modification is acceptable if the purpose is to restore natural conditions and improve water quality and fish and wildlife habitat;

Channel modifications are particularly sensitive activities because of their potential direct impacts on channel stability, conveyance, water quality, habitat, and aesthetics. In general, watercourse modifications should be avoided unless necessary to achieve the purposes of an appropriate use, such as habitat restoration or a public flood control project. Channel modifications should not be permitted if the purpose is to accommodate private development activities in the floodplain. Rigorous enforcement of mitigation requirements for necessary modifications can eliminate some of the temporary and most of the permanent impacts of modification. Some suggested references which discuss mitigation measures are: "Manual of Conservation Engineering Guidelines," Illinois Department of Conservation, 1983;

ii. *Water quality, habitat, and other natural functions would be significantly improved by the modification and no significant habitat area may be destroyed, or the impacts are offset by the replacement of an equivalent degree of natural resource values;*

iii. *The activity has been planned and designed and will be constructed in a way which will minimize its adverse impacts on the natural conditions of the body of water affected, consistent with the following criteria:*

(1) The physical characteristics of the modified channel shall match as closely as possible those of the existing channel in length, cross-section, slope and sinuosity. If the existing channel has been previously modified, restoration of more natural physical conditions should be incorporated into channel modification design, where practical.

(2) Hydraulically effective transitions shall be provided at both the upstream and downstream ends of the project, designed such that they will prevent erosion.

(3) One-sided construction of a channel shall be used when feasible. Removal of streamside (riparian) vegetation should be limited to one side of the channel, where possible, to preserve the shading and stabilization effects of the vegetation.

(4) Clearing of stabilizing vegetation shall be limited to that which is essential for construction of the channel.

(5) Channel banks shall be constructed with a side slope no steeper than 3:1 horizontal to vertical, wherever practicable. Native vegetation and gradual side slopes are the preferred methods for bank stabilization. Where high velocities or sharp bends necessitate the use of alternative stabilization measures, soil bioengineering techniques, natural rock or rip-rap are preferred approaches. Artificial materials such as concrete, gabions, or construction rubble should be avoided unless there are no practicable alternatives.

(6) All disturbed areas associated with the modification shall be seeded or otherwise stabilized as soon as possible upon completion of construction. Erosion blanket or an equivalent material shall be required to stabilize disturbed channel banks prior to establishment of the vegetative cover.

(7) If the existing channel contains considerable bottom diversity such as deep pools, riffles, and other similar features, such features shall be provided in the new channel. Spawning and nesting areas and flow characteristics compatible with fish habitat

“Mitigating the Impacts of Stream Alterations,” U.S. Army Corps of Engineers, Nashville (undated); and “Best Management Practices for Hydrologic Modification Projects,” Illinois Environmental Protection Agency (undated). Additional assistance is available from the Office of Resource Conservation, IDNR (Phone: (217) 785-8287).

For public flood control projects or water dependent activities, steeper side slopes may be unavoidable, due to limited land availability or conveyance factors. Where practicable, steep side slopes and artificial stabilization materials should be avoided.

Soil bioengineering techniques combine engineering principles and, in some cases, manufactured materials, with the use of native vegetation to accomplish effective, environmentally sensitive control of bank erosion. A number of bioengineering techniques, including lunger structures, A-jacks, coconut fiber rolls, and brush layering, have been successfully installed in northeastern Illinois channels in recent years. Advice on appropriate native vegetation can be found in the “Streambank Stabilization Program” report produced by the DuPage County Department of Environmental Concerns (DCDEC, 1995).

shall also be established, where appropriate.

(8) *A sediment basin shall be installed at the downstream end of the modification to reduce sedimentation and degradation of downstream water quality.*

(9) *New or relocated channels should be built in the dry and all items of construction, including vegetation, should be completed prior to diversion of water into the new channel.*

(10) *There shall be no increases in stage or velocity as the channel enters or leaves the project site for any frequency flood unless necessitated by a public flood control project or unless such an increase is justified as part of a habitat improvement or erosion control project.*

(11) *Unless the modification is for a public flood control project, there shall be no reduction in the volume of floodwater storage outside the floodway as a result of the modification; and*

iv. The project otherwise complies with the requirements of Section 800.0

(j) Seeding and Stabilization Plan.

For all activities located in a floodway, a seeding and stabilization plan shall be submitted by the applicant.

(k) *Soil Erosion and Sedimentation Measures.*
For all activities in the floodway, including grading, filling, and excavation, in which there is potential for erosion of exposed soil, soil erosion and sedimentation control measures shall be employed consistent with the following criteria:

i. The construction area shall be minimized to preserve the maximum vegetation possible. Construction shall be scheduled to minimize the time soil is exposed and unprotected. In no case shall the existing natural vegetation be destroyed, removed, or disturbed more than 15 days prior to the initiation of improvements.

ii. Temporary and/or permanent soil stabilization shall be applied to denuded areas as soon as possible. As a minimum, soil stabilization shall be provided within 15 days after final grade is reached on any portion of the site, and within 15 days to denuded areas which may not be at final grade but will remain undisturbed for longer than 60 days.

iii. Sedimentation control measures shall be installed before any significant grading or filling is initiated on the site to prevent the movement of eroded sediments off site or into the channel. Potential sediment control devices include filter fences, straw bale fences, check dams, diversion ditches, and sediment traps and basins.

Soil erosion and sedimentation control are critical mitigation requirements for floodway construction activities because of the proximity of these activities to channels and their potential for inundation. Lack of proper controls can lead to sediment runoff into channels and unstable soil conditions. These, in turn, can result in loss of downstream flood storage, impaired water quality and habitat, and increased demands on taxpayers to mitigate problems such as channel erosion. In addition to the indicated references, it is suggested that the following NIPC document be consulted: "Model Soil Erosion and Sediment Control Ordinance: A Guide for Local Officials" September, 1991.

iv. A vegetated buffer strip of at least 25 feet in width shall be preserved and/or re-established, where possible, along existing channels (See 802.3 (p)). Construction vehicle use of channels shall be minimized. Temporary stream crossings shall be constructed, where necessary, to minimize erosion. Necessary construction in or along channels shall be restabilized immediately.

v. Soil erosion and sedimentation control measures shall be designed and implemented consistent with "Procedures and Standards for Urban Soil Erosion and Sedimentation Control in Illinois" (1988) also known as the "Green Book" and "The Illinois Urban Manual" (NRCS, 1995).

(l) Public Flood Control Projects. For public flood control projects, the permitting requirements of this section will be considered met if the applicant can demonstrate to IDNR/OWR through hydraulic and hydrologic calculations that the proposed project will not singularly or cumulatively result in increased flood heights outside the project right-of-way or easements for all flood events up to and including the 100-year frequency event.

(m) General Criteria for Analysis of Flood Elevations.

i. The flood profiles, flows and floodway data in the designated floodway study, referenced in Section 600.0, must be used for analysis of the base conditions. If the study data appears to be in error or conditions have changed, IDNR/OWR shall be contacted for approval and concurrence on the appropriate base conditions data to use.

ii. If the 100-year designated floodway elevation at the site of the proposed construction is affected by backwater from a downstream receiving stream with a larger drainage area, the proposed construction shall be shown to meet:

(1) The requirements of this section for the 100-year frequency flood elevations of the designated floodway conditions; and,

(2) Conditions with the receiving stream at normal water elevations.

iii. If the applicant learns from IDNR/OWR, local governments, or a private owner that a downstream restrictive bridge or culvert is scheduled to be removed, reconstructed, modified, or a regional flood control project is scheduled to be built, removed, constructed or modified within the next five years, the proposed construction shall be analyzed and shown to meet the requirements of this section for both the existing conditions and the expected flood profile conditions when the bridge, culvert or flood control project is built.

(n) Conditional Letter of Map Revision.

i. If the Appropriate Use would result in a change in the

The "Green Book" is available through County Soil and Water Conservation District offices.

NIPC recommends that public flood control projects also meet the criteria of no offsite increase in velocities, unless such an increase is necessary to accomplish the purpose of the project. Any permitted increase in velocity shall not result in negative impacts offsite, such as erosive conditions. In addition, public flood control projects should be subject to the mitigation requirements of this section, including those dealing with sediment and erosion control, channel modifications and instream structures. In general, NIPC policy recommends the use of nonstructural methods for flood control wherever feasible. Modifications of the floodway for flood control should be the minimum necessary to accomplish the purpose of the project.

designated floodway location or the 100-year frequency flood elevation, the applicant shall submit to IDNR/OWR and FEMA all information, calculations and documents necessary to be issued a conditional designated floodway map revision and receive from IDNR/OWR a conditional concurrence of the designated floodway change before a permit is issued.

ii. The final designated floodway map will not be changed by FEMA until as-built plans or record drawings of initial filling, grading, dredging, or excavating activities are submitted and accepted by FEMA and IDNR/OWR.

iii. In the case of non-government projects, the municipality in incorporated areas and the county in unincorporated areas shall concur with the proposed conditional designated floodway map revision before IDNR/OWR approval can be given.

iv. No filling, grading, dredging or excavating shall take place until a conditional approval is issued.

v. After initial filling, grading, dredging or excavating, no activities shall take place until a final Letter of Map Revision (LOMR) is issued by FEMA with concurrence from IDNR/OWR.

(o) Professional Engineer's Supervision.

All engineering analyses shall be performed by or under the supervision of a registered professional engineer.

(p) For all activities in the floodway involving construction within 25 feet of the channel, the following criteria shall be met:

i. A natural vegetation buffer strip shall be preserved within at least 25 feet of the ordinary high water mark of the channel.

ii. Where it is impossible to protect this buffer strip during the construction of an Appropriate Use, a vegetated buffer strip shall be established upon completion of construction.

(q) After receipt of conditional approval of the designated floodway change and issuance of a permit and a Conditional Letter of Map Revision, construction as necessary to change the

The purpose of a vegetated buffer strip is to minimize erosion, stabilize the streambank, protect water quality, maintain water temperature at natural levels, preserve fish and wildlife habitat, to screen man-made structures, and also to preserve aesthetic values of the channel. While native riparian vegetation is preferred in the buffer strip, alternative vegetation is acceptable if it is consistent with these purposes. Urban areas present constraints which require consideration of local conditions including stream width, the potential need for public access, etc. Twenty-five feet is generally considered a minimum width for a buffer strip. On larger streams or in more natural settings, a wider buffer strip is recommended. The U.S. Department of Agriculture (USDA), through its Conservation Reserve Program, encourages farmers to create "water quality enhancement zones" along streams, wetlands and lakes. The USDA recommend that these "filter strips" extend 66 to 99 feet from stream banks. The Dane County (WI) Regional Planning Commission has made buffer strip recommendations based upon stream size and need for public access. Their recommended buffer widths range from 25 to 75 feet. Similarly, a number of northeastern Illinois communities and counties now require buffers ranging from 30 to 50 feet.

Modifications of the floodway are supported by NIPC policy only if the modification is for an appropriate use. A change in the regulatory floodway location or

floodway designation may proceed but no buildings or structures or other construction that is not an Appropriate Use may be placed in that area until the designated floodway map is changed and a final Letter of Map Revision is received. The designated floodway map will be revised upon acceptance and concurrence by IDNR/OWR and FEMA of the "as-built" plans.

802.4 Development Activities In Delegated Communities Requiring State Review.

For those projects listed below located in a designated floodway, the following criteria shall be submitted to IDNR/OWR for their review and concurrence prior to the issuance of a permit by a community or county delegated state permitting authority in the floodway.

- (a) An engineer's analysis of the flood profile due to a proposed bridge pursuant to Section 802.3(d).
- (b) An engineer's determination that an existing bridge or culvert crossing is not a source of flood damage and the analysis indicating the proposed flood profile, pursuant to Section 802.3(e).
- (c) Alternative transition sections and hydraulically equivalent storage pursuant to Section 802.3 (a, b, h).
- (d) The construction of any IDNR/OWR projects, dams (as defined in Section 300.12) and all other state, federal, or local units of government projects, including projects of the municipality or county.
- (e) An engineer's determination that a proposed bridge affected by backwater from a downstream receiving stream may be built with a smaller opening.
- (f) Projects which revise the floodway and/or flood profiles.
- (g) Projects in public bodies of water.

802.5 Other Permits.

- (a) In addition to the other requirements of this Ordinance, a development permit for a site located in a floodway shall not be issued unless the applicant first obtains a permit or written documentation that a permit is not required from IDNR/OWR, issued pursuant to 615 ILCS 5/5 et seq.
- (b) No permit from IDNR/OWR shall be required if IDNR/OWR has delegated this responsibility to the (City, Village).

802.6 Permits for Dams

the 100-year flood frequency elevation for any other use is not supported.

All construction activity in the floodway should be required to meet the construction and mitigation criteria outlined in this modification for other than appropriate uses. The minimum state requirements allow such modifications to facilitate development. If the adopted ordinance permits such modifications, they should be subject to the construction and mitigation requirements of this section.

This section may be deleted if a community has not been delegated state permitting authority in the designated floodway.

For information regarding delegation, contact the IDNR/OWR -Northeastern Illinois Regulatory Programs Section at (847) 705-4341.

Many activities in floodways will require a permit from the U.S. Army Corps of Engineers. In particular, the Corps regulates fill activities in "waters of the United States," which include most stream channels and wetlands. As a rule, a development permit should not be issued for a fill or related activity in the floodway until the applicant has received a permit or signoff from the Corps.

If IDNR/OWR has delegated its permitting authority in the floodway to the community, then only those development activities in Section 802.4 would still require permits from IDNR/OWR.

(a) Any work involving the construction, modification or removal of a dam as defined in Section 300.12 per 92 Ill. Adm. Code Part 702 (Rules for Construction of Dams) shall obtain an IDNR/OWR permit prior to the start of construction of a dam.

(b) If the _____ finds a dam that does not have an IDNR/OWR permit, the _____ shall immediately notify the IDNR/OWR Schaumburg office.

(c) If the _____ finds a dam which is believed to be in unsafe condition, the _____ shall immediately notify the owner of the dam, the IDNR/OWR Schaumburg office, and the Illinois Emergency Management Agency (IEMA).

802.7 Activities That Do Not Require a Registered Professional Engineer's Review.

The following activities may be permitted without a registered professional engineer's review. Such activities shall still meet the other requirements of this Ordinance, including the mitigation requirements.

(a) Underground and overhead utilities that:

i. Do not result in any increase in existing ground elevations, or

ii. Do not require the placement of above ground structures in the floodway, or

iii. In the case of underground stream crossings, the top of the pipe or encasement is buried a minimum of 3' below the existing streambed, and

iv. Overhead utility lines shall be constructed above the estimated 100-year frequency flood elevation or attached above the low chord of an existing bridge (with the permission of the bridge owner). No supporting towers shall be placed in the watercourse and shall be designed so as to not catch debris.

v. Disturbance of streamside vegetation shall be kept to minimum during construction to prevent erosion and sedimentation. All disturbed floodway areas, including the stream banks shall be restored to their original contours and seeded or otherwise stabilized upon completion of construction.

vi. A utility crossing carrying material which may cause water pollution as defined by the Environmental Protection Act 415 ILCS 5 (1992 State Bar Edition) shall be provided with shut-off valves on each side of the body of water to be crossed.

vii. All Illinois Commerce Commission, National Electric Safety Codes, and federal requirements for clearance must be met.

(b) Storm and sanitary sewer relief outfalls that:

i. Do not extend riverward or lakeward of the existing

List the title of the official responsible for administering the floodplain ordinance.

List the title of the official responsible for administering the floodplain ordinance.

Local governments are encouraged to evaluate these exemptions and delete any which, based on local experience, should be subject to a professional engineer's review.

adjacent natural bank slope, and

ii. Do not result in an increase in ground elevation,

iii. Are designed so as not to cause stream erosion at the outfall location.

(c) Construction of sidewalks, athletic fields (excluding fences), properly anchored playground equipment and patios at grade.

(d) Construction of shoreline and streambank protection that:

i. Does not exceed 1000 feet in length.

ii. Materials are not placed higher than the existing top of bank.

iii. Materials are placed so as not to reduce the cross-sectional area of the stream channel or bank of the lake.

iv. Stabilization utilizing native vegetation and gradual side slopes are the preferred mitigation methods for existing erosion problems. Where high channel velocities, sharp bends or wave action necessitate the use of alternative stabilization measures, soil bioengineering techniques, natural rock or rip-rap are preferred materials. Artificial materials such as concrete, construction rubble, and gabions should be avoided unless there are no practicable alternatives.

(e) Temporary stream crossings in which:

i. The approach roads will be 1/2 foot or less above natural grade.

ii. The crossing will allow stream flow to pass without backing up the water above the stream bank vegetation line or above any drainage tile or outfall invert.

iii. The top of the roadway fill in the channel will be at least 2' below the top of the lowest bank. ***Any fill in the channel shall be non-erosive material, such as rip-rap or gravel.***

iv. All disturbed stream banks will be seeded or otherwise stabilized as soon as possible upon installation and again upon removal of construction.

v. The access road and temporary crossings will be removed within one year after authorization.

Stabilization activities involving 1000 feet or less of shoreline or streambank, and which utilize vegetative or soil bioengineering techniques, need not be subject to the review of a registered professional engineer. However, "artificial" methods, such as concrete lining or gabions, which are likely to increase conveyance and potentially exacerbate erosion and/or flooding, downstream, should be subject to the review of a registered professional engineer

Section 900.0 Occupation and Use of SFHA Areas Where Floodways Are Not Identified.

In SFHA or floodplains, (including AE, AH, AO and Unnumbered A Zones) where no floodways have been identified and no base flood or 100-year frequency flood elevations have been established by FEMA, and draining more than a square mile, no development shall be permitted unless the cumulative effect of the proposals, when combined with all other existing and anticipated uses and structures, shall not significantly impede or increase the flow and passage of the floodwaters nor significantly increase the base flood or 100-year frequency flood elevation.

901.0 Development Permit.

901.1 No person, firm, corporation, or governmental body, not exempted by state law, shall commence any development in a SFHA or floodplain without first obtaining a development permit from the _____.

901.2 Application for a development permit shall be made on a form provided by the _____ .

(a) The application shall be accompanied by drawings of the site, drawn to scale showing property line dimensions; and existing grade elevations and all changes in grade resulting from excavation or filling, sealed by a licensed engineer, architect or surveyor; the location and dimensions of all buildings and additions to buildings; and the elevations of the lowest floor (including basement) of all proposed buildings subject to the requirements of Section 1000.0 of this Ordinance.

(b) The application for a development permit shall also include the following information:

- i. A detailed description of the proposed activity, its purpose, and intended use;
- ii. Site location (including legal description) of the property, drawn to scale, on the designated floodway maps, indicating whether it is proposed to be in an incorporated or unincorporated area;
- iii. Anticipated dates of initiation and completion of activity;
- iv. Plans of the proposed activity shall be provided which include as a minimum:

This section explains the procedures for determining whether a parcel is in a floodplain, where no detailed analysis has been completed; and how to determine whether development would be allowed. It also sets minimum development standards within the zone.

Floodways Not Identified: The floodways of a substantial number of urban channels in northeastern Illinois have not been identified on regulatory maps. It is recommended that these areas be regulated in a conservative manner by defining an interim floodway as part of the permit process for any proposed construction in this area. This section already requires that the applicant delineate the floodway under existing and proposed conditions. If this interim delineation indicates that the proposed activity is in the floodway, then the activity should be subject to the requirements of Section 800.0. In particular, only appropriate uses would be permitted and all activities would be subject to the construction and mitigation criteria. Activities in floodplain areas outside the delineated floodway would be subject to the flood fringe requirements of Section 700.0.

NFIP requirement: 44 CFR 60.3(b)(1).

List the title of the official responsible for administering the floodplain ordinance.

List the title of the official responsible for administering the floodplain ordinance.

Required plans should include a delineation of the floodway for both the existing and proposed

(1) A vicinity map showing the site of the activity, name of the waterway, boundary lines, names of roads in the vicinity of the site, graphic or numerical scale, and north arrow;

(2) A plan view of the project and engineering study reach showing existing and proposed conditions including principal dimensions of the structure or work, elevations in mean sea level (1929 adjustment) datum or N.G.V.D., adjacent property lines and ownership, drainage and flood control easements, distance between proposed activity and navigation channel (when the proposed construction is in or near a commercially navigable body of water), floodplain limit, location and orientation of cross-sections, north arrow, and a graphical or numerical scale;

(3) Cross-section views of the project perpendicular to the flow of floodwater and engineering study reach showing existing and proposed conditions including principal dimensions of the work as shown in plan view, existing and proposed elevations, normal water elevation, 10-year frequency flood elevation, 100-year frequency flood elevation, and graphical or numerical scales (horizontal and vertical); and

(4) A soil erosion and sedimentation control plan for disturbed areas. This plan shall include a description of the sequence of grading activities and the temporary sediment and erosion control measures to be implemented to mitigate their effects. This plan shall also include a description of final stabilization and revegetation measures, and the identification of a responsible party to ensure post-construction maintenance.

(c) Engineering calculations and supporting data shall be submitted showing that the proposed work will meet the criteria of Section 902.0.

(d) Any and all other federal, state, and local permits or approvals that may be required for this type of development.

901.3 Based on the best available existing data according to the Illinois State Water Survey's Floodplain Information Repository, the _____ shall compare the elevation of the site to the base flood or 100-year frequency flood elevation.

(a) Should no elevation information exist for the site, the developer's engineer shall calculate the elevation according to Section 604.0.

(b) Any development located on land that can be shown to have been higher than the base flood elevation of the current Flood Insurance Rate Map Identification is not in the SFHA and, therefore, not subject to the requirements of this Ordinance.

conditions. This floodway delineation, made by the applicant, should be consistent with the requirements of Section 600.0, Base Flood Elevation and Section 300.13, definition of the Designated Floodway. Floodplain and floodway delineations should be based on anticipated future watershed land use conditions (see Section 604.2). This delineation should be verified and approved by IDNR/OWR.

List the title of the official responsible for administering the floodplain ordinance.

Such a project will still be subject to the flood insurance purchase requirements unless the owner appeals to amend the FIRM.

(c) The Building Official shall maintain documentation of the existing ground elevation at the development site and certification that this ground elevation existed prior to the date of the site's first Flood Insurance Rate Map identification.

901.4 The _____ shall be responsible for obtaining from the applicant copies of all other federal, state, and local permits, approvals or permit-not-required letters that may be required for this type of activity. The _____ shall not issue the development permit unless all required federal, state, and local permits have been obtained.

902.0 Preventing Increased Damages.

902.1 No development in the SFHA, where a floodway has not been determined shall create a damaging or potentially damaging increase in flood heights or velocity or threat to public health, safety *and welfare or impair the natural hydrologic and hydraulic functions of the floodway or channel, or impair existing water quality or aquatic habitat. Construction impacts shall be minimized by appropriate mitigation methods as called for in this Ordinance.*

902.2 Within all riverine SFHA's where the floodway has not been determined, the following standards shall apply:

(a) The developer shall have a Registered Professional Engineer state in writing and show through supporting plans, calculations, and data that the project meets the engineering requirements of Section 802.3 (a) through (l) for the entire floodplain as calculated under the provisions of Section 604.0 of this Ordinance.

i. As an alternative, the developer should have an engineering study performed to determine a floodway and submit that engineering study to IDNR/OWR for acceptance as a designated floodway.

ii Upon acceptance of the floodway by IDNR/OWR, the developer shall then demonstrate that the project meets the requirements of Section 800.0 for the designated floodway. The floodway shall be defined according to the definition in Section 300.13 of this Ordinance.

(b) A development permit shall not be issued unless the applicant first obtains a permit from IDNR/OWR or written documentation that a permit is not required from IDNR/OWR.

(c) No permit from IDNR/OWR shall be required if IDNR/OWR has delegated permit responsibility to the (City, Village) per 92 Ill. Adm. Code Part, Part 708 for designated floodways.

(d) Permits for Dams

i. Any work involving the construction, modification or removal of a dam as defined in Section 300.12 per 92 Ill. Adm. Code Part 702 (Rules for Construction of Dams) shall obtain an IDNR/OWR permit prior to the start of construction of a dam.

ii. If the _____ finds a dam that does not have an

NFIP requirement: 44 CFR 60.3(a)(2).

List the title of the official responsible for administering the floodplain ordinance.

NFIP requirement: 44 CFR 60.3(a)(4)(i), 60.3(c)(10) and 60.3(d)(3).

Within all SFHA's where a regulatory floodway has not been defined, it is recommended that an interim floodway be defined by the applicant for purposes of this Ordinance. This interim floodway would be subject to the appropriate use, engineering and mitigation requirements of Section 800.0. A suggested interim floodway determination approach was discussed in the commentary to Section 900.0 above. As a minimum, all channels with the SFHA should be considered floodways for purposes of this Ordinance.

List the title of the official responsible for administering

IDNR/OWR permit, the _____ shall immediately notify the IDNR/OWR Schaumburg office.

iii. If the _____ finds a dam which is believed to be in unsafe condition, the _____ shall immediately notify the owner of the dam, the IDNR/OWR Schaumburg office, and the Illinois Emergency Management Agency (IEMA).

902.3 The following activities may be permitted without a Registered Professional Engineer's review or calculation of a base flood elevation and designated floodway. Such activities shall still meet the other requirements of this Ordinance:

(a) Underground and overhead utilities that:

i. Do not result in any increase in existing ground elevations, or

ii. Do not require the placement of above ground structures in the floodway, or

iii. In the case of underground stream crossings, the top of the pipe or encasement is buried a minimum of 3' below the existing streambed, and

iv. Overhead utility lines shall be constructed above the estimated 100-year frequency flood elevation or attached above the low chord of an existing bridge (with the permission of the bridge owner). No supporting towers shall be placed in the watercourse and shall be designed so as to not catch debris.

v. Disturbance of streamside vegetation shall be kept to minimum during construction to prevent erosion and sedimentation.

vi. A utility crossing carrying material which may cause water pollution as defined by the Environmental Protection Act 415 ILCS 5 (1992 State Bar Edition) shall be provided with shut-off valves on each side of the body of water to be crossed.

vii. All Illinois Commerce Commission, National Electric Safety Codes, and federal requirements for clearance must be met.

(b) Storm and sanitary sewer relief outfalls that:

i. Do not extend riverward or lakeward of the existing adjacent natural bank slope, and

ii. Do not result in an increase in ground elevation, and

iii. Are designed so as not to cause stream erosion at the outfall location.

(c) Construction of shoreline and streambank protection that:

i. Does not exceed 1000 feet in length.

the floodplain ordinance.

Use of artificial shoreline and streambank materials for the convenience of site design for private developments is not supported. Construction activities

- ii. Materials are not placed higher than the existing top of bank.
- iii. Materials are placed so as not to reduce the cross-sectional area of the stream channel by more than 10 percent.

iv. Stabilization utilizing native vegetation and gradual side slopes are the preferred mitigation methods for existing erosion problems. Where high channel velocities, sharp bends or wave action necessitate the use of alternative stabilization measures, soil bioengineering techniques, natural rock or rip-rap are preferred materials. Artificial materials such as concrete, construction rubble, and gabions should be avoided unless there are no practicable alternatives.

(d) Temporary stream crossings in which:

- i. The approach roads will be 1/2 foot or less above natural grade.
- ii. The crossing will allow stream flow to pass without backing up the water above the stream bank vegetation line or above any drainage tile or outfall invert.
- iii. The top of the roadway fill in the channel will be at least 2' below the top of the lowest bank. ***Any fill in the channel shall be non-erosive material, such as rip-rap or gravel.***
- iv. All disturbed stream banks will be seeded or otherwise stabilized as soon as possible upon installation and again upon removal of construction.
- v. The access road and temporary crossings will be removed within one year after authorization.

(e) The construction of light poles, sign posts and similar structures;

(f) The construction of sidewalks, driveways, athletic fields (excluding fences), patios and similar surfaces which are built at grade;

(g) The construction of properly anchored, unwalled, open structures such as playground equipment, pavilions, and carports built at or below existing grade that would not obstruct the flow of flood waters;

(h) The placement of properly anchored buildings not exceeding seventy (70) square feet in size, nor ten (10) feet in any one dimension (e.g., animal shelters and tool sheds);

(i) The construction of additions to existing buildings which do not increase the first floor area by more than twenty (20) percent, which are located on the upstream or downstream side of the existing building, and which do extend beyond the sides of the existing building that are parallel to the flow of flood waters;

involving 1000 feet of shoreline or streambank are not minor and should be subject to the review of a registered professional engineer. NIPC recommends there be no reduction in the cross-sectional area of the channel

NIPC policy discourages the building of any unnecessary private buildings in the floodway.

NIPC policy discourages the building of any unnecessary private buildings in the floodway.

(j) Minor maintenance dredging of a stream channel where:

- i The affected length of stream is less than 1000 feet.
- ii. The work is confined to reestablishing flows in natural stream channels, or
- iii. The cross-sectional area of the dredged channel conforms to that of the natural channel upstream and downstream of the site.

902.4 The flood carrying capacity within any altered or relocated watercourse shall be maintained.

902.5 Compensatory Storage.

(a) Whenever any portion of a floodplain is authorized for use, the volume of space which will be occupied by the authorized fill or structure below the base flood or 100-year frequency flood elevation shall be compensated for and balanced by a hydraulically equivalent volume of excavation taken from below the base flood or 100-year frequency flood elevation.

(b) The excavation volume shall be at least equal to **1.5 times** the volume of storage lost due to the fill or structure.

(c) In the case of streams and watercourses, such excavation shall be made opposite or adjacent to the areas so filled or occupied.

(d) All floodplain storage lost below the existing 10-year flood elevation shall be replaced below the proposed 10-year flood elevation. All floodplain storage lost above the existing 10-year flood elevation shall be replaced above the proposed 10-year flood elevation. All such excavations shall be constructed to drain freely and openly to the watercourse.

Section 1000.0 Permitting Requirements Applicable to All Floodplain Areas.

In addition to the requirements found in Sections 700.0, 800.0 and 900.0 for development in flood fringes, designated floodways, and SFHA or floodplains where no floodways have been identified (Zones A, AO, AH, AE, A1-A30, A99, VO, V1-30, VE, V, M, E, D, or X), the following requirements shall be met.

1001.0 Public Health Standards

1001.1 No developments in the SFHA shall include locating or storing chemicals, explosives, buoyant materials, animal wastes, fertilizers, flammable liquids, pollutants, or other hazardous or toxic materials below the flood protection elevation (FPE).

1001.2 New and replacement water supply systems, wells, sanitary sewer lines and on-site waste disposal systems may be permitted providing all manholes or other above ground openings located below the FPE are watertight.

Compensatory Storage. NIPC policy supports the requirement for a safety factor for compensatory storage equal to at least 1.5 times the volume of storage lost due to fill or structures. This safety factor is intended to compensate for uncertainties in the estimate of the base flood elevation and in the determination of project impacts.

If the municipality owns a regional flood control or stormwater storage facility, and has a plan for developing additional storage at the facility, the municipality may prefer to offer developers of isolated single lots, one quarter acre or smaller in size, the ability to provide hydraulically equivalent storage in the regional facility as an alternative to providing on-site compensatory storage. It would need to be shown through the use of hydrologic and hydraulic models, however, that the additional storage created in the regional facility is hydraulically equivalent to the storage lost at the development site.

This section sets minimum development standards within all floodplain zones.

NFIP requirement: 44 CFR 60.3(a)(6).

NIPC policy does not support wells, new sanitary sewer lines (except interceptor sewers) or on-site

1002.0 Carrying Capacity and Notification.

1002.1 For all projects involving channel modification, fill, or stream maintenance (including levees), the flood carrying capacity of the watercourse shall be maintained.

1002.2 In addition, the (City, Village) shall notify adjacent communities in writing 30 days prior to the issuance of a permit for the alteration or relocation of the watercourse.

1003.0 Protecting Buildings.

1003.1 All buildings located within a 100-year floodplain also known as a SFHA, **and all buildings located outside the 100-year floodplain but within the 500-year floodplain**, shall be protected from flood damage below the flood protection elevation. This building protection criteria applies to the following situations:

- (a) Construction or placement of a new building.
- (b) A structural alteration to an existing building that either increases the first floor area by more than 20 percent or the building's market value by more than 50 percent. ***This alteration shall be figured cumulatively beginning with any alteration which has taken place subsequent to April 1, 1990.***
- (c) Installing a manufactured home on a new site or a new manufactured home on an existing site. This building protection requirements does not apply to returning a mobile home to the same site it lawfully occupied before it was removed to avoid flood damage; and
- (d) Installing a travel trailer on a site for more than 180 days.

This building protection requirement may be met by one of the following methods.

1003.2 A residential or non-residential building, when allowed, may be constructed on permanent land fill in accordance with the following:

- (a) The lowest floor (including basement) shall be at or above the flood protection elevation.

waste disposal systems in the floodway.

NIPC policy supports such modifications or fills only for appropriate uses, where necessary.

For communities that would like to restrict the expansion or additions to existing buildings in the floodplain, it is suggested that the following language be substituted for Section 1003.1 (b):

Nonconforming structures may remain in use, but shall not be enlarged, replaced or structurally altered. A nonconforming structure damaged by flood, fire, wind or other man-made or natural disaster may be restored unless the damage exceeds fifty percent (50 percent) of its market value. In which case, it must, thereafter, conform to this Ordinance.

Community Rating System (CRS) points can be obtained by tracking cumulative substantial improvements.

All buildings proposed at locations which are at or below the flood protection elevation should be elevated. In situations where a community has identified a flood protection elevation which is higher than the 100-year, or base flood, elevation (i.e., it has a freeboard requirement), its elevation requirements should, by definition, extend beyond the 100-year floodplain, or SFHA. The recommended requirement to elevate all buildings within the 500-year floodplain is derived from DuPage County's Stormwater and Floodplain Ordinance. An alternative would be to require the applicant to identify all building locations which are outside the 100-year floodplain and below the flood protection elevation and require protection/elevation of the building. In situations where the freeboard requirement is one foot or greater, this alternative approach is recommended since the 500-year floodplain generally will not extend far enough.

NFIP requirement: 44 CFR 60.3(b)(5)(iii) and 59.22(a)(9)(iii).

NFIP requirement: 44 CFR 60.3(b)(4)(i) and 60.3(c)(2).

The minimum recommended flood protection elevation (FPE) is one foot above the Base Flood

(b) Fill Requirements.

i. The fill shall be placed in layers no greater than one (1) foot deep before compaction and should extend at least ten (10) feet beyond the foundation of the building before sloping below the flood protection elevation.

ii. The top of the fill shall be above the flood protection elevation. However, the ten (10) foot minimum may be waived if a structural engineer certifies an alternative method to protect the building from damages due to hydrostatic pressures.

iii. The fill shall be protected against erosion and scour.

iv. The fill shall not adversely affect the flow or surface drainage from or onto neighboring properties.

1003.3 A residential or non-residential building may be elevated in accordance with the following:

(a) The building or improvements shall be elevated on crawl space, stilts, piles, walls, or other foundation that is permanently open to flood waters and not subject to damage by hydrostatic pressures of the base flood or 100-year frequency flood. The permanent openings shall be no more than one foot above existing grade, and consists of a minimum of two openings. The openings must have a total net area of not less than one square inch for every one square foot of enclosed area subject to flooding below the Base Flood Elevation.

(b) The foundation and supporting members shall be anchored and aligned in relation to flood flows and adjoining structures so as to minimize exposure to known hydrodynamic forces such as current, waves, ice and floating debris.

(c) All areas below the flood protection elevation shall be constructed of materials resistant to flood damage.

i. The lowest floor (including basement) and all electrical, heating, ventilating, plumbing, and air conditioning equipment and utility meters shall be located at or above the flood protection elevation.

ii. Water and sewer pipes, electrical and telephone lines, submersible pumps, and other waterproofed service facilities may be located below the flood protection elevation.

(d) The areas below the flood protection elevation may only be used for the parking of vehicles, building access or storage in an area other than a basement.

Elevation. A number of communities in northeastern Illinois have more conservative requirements, such as 2 or 3 feet. It is recommended that a more conservative FPE be evaluated to provide a reasonable safety factor.

NFIP requirement: 44 CFR 60.3(a)(3) and 60.3(c)(5).

The following language is required for ordinances adopted by communities within the jurisdiction of MWRDGC:

When the building wall encloses open space that is below the Base Flood Elevation, gravity storm and sanitary sewer connections are specifically prohibited and overhead sewers are required for the sanitary connections and sumps for the storm sewer

(e) Manufactured homes, and travel trailers to be installed on a site for more than 180 days, shall be elevated to or above the flood protection elevation; and, shall be anchored to resist flotation, collapse, or lateral movement by being tied down in accordance with the Rules and Regulations for the Illinois Mobile Home Tie-Down Act issued pursuant to 77 Ill. Adm. Code Part 870. In addition, all manufactured homes shall meet the following elevation requirements:

i. In the case of manufactured homes placed or substantially improved (1) outside of a manufactured home park or subdivision, (2) in a new manufactured home park or subdivision, (3) in an expansion to an existing manufactured home park or subdivision, or (4) in an existing manufactured home park or subdivision on which a manufactured home has incurred substantial damage from a flood, the top of the lowest floor shall be elevated to or above the flood protection elevation.

ii. In the case of manufactured homes placed or substantially improved in an existing manufactured home park or subdivision, the manufactured home shall be elevated so that either the top of the lowest floor is above the base flood elevation or the chassis is at least 36 inches in height above grade and supported by reinforced piers or other foundations of equivalent strength, whichever is less.

(f) Recreational vehicles or travel trailers shall be required to meet the elevation and anchoring requirements of Subsection 1003.3(e) above unless:

i. They are on site for fewer than 180 consecutive days; and,

ii. They are fully licensed and ready for highway use. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utility and service devices, and has no permanently attached additions.

1003.4 Only a non-residential building may be structurally dry floodproofed (in lieu of elevation) provided that:

(a) A registered professional engineer shall certify that the building has been structurally dry floodproofed below the flood protection elevation, the structure and attendant utility facilities are watertight and capable of resisting the effects of the base flood or 100-year frequency flood.

(b) The building design shall take into account flood velocities, duration, rate of rise, hydrostatic and hydrodynamic forces, the effects of buoyancy, and impacts from debris or ice.

(c) Floodproofing measures shall be operable without human intervention and without an outside source of electricity (levees, berms, floodwalls and similar works are not considered floodproofing for the purpose of this subsection).

1003.5 Tool sheds and detached garages on an existing

connections.

NFIP requirement: 44 CFR 60.3(b)(4)(ii) and 60.3(c)(3) and (4).

NFIP requirement: 44 CFR 60.3(b)(4) and 60.3(c)(4).

Tool sheds and detached garages can be constructed

single-family platted lot, may be constructed with the lowest floor below the flood protection elevation in accordance with the following:

- (a) The building is not used for human habitation.*
- (b) All areas below the base flood or 100-year frequency flood elevation shall be constructed with waterproof material. Structures located in a designated floodway shall be constructed and placed on a building site so as not to block the flow of flood waters and shall also meet the Appropriate Use criteria of Section 800.0. In addition, all other requirements of Section 700.0, 800.0 and 900.0 must be met.*
- (c) The structure shall be anchored to prevent flotation.*
- (d) Service facilities such as electrical and heating equipment shall be elevated or floodproofed to the flood protection elevation.*
- (e) The building shall be valued at less than \$7,500 and be less than 500 square feet in floor size.*
- (f) The building shall be used only for the storage of vehicles or tools and may not contain other rooms, workshops, greenhouses or similar uses.*
- (g) The building shall meet the permanent opening criteria of Section 1003.3(a)*

1003.6 Existing buildings located within a designated floodway shall also meet the more restrictive Appropriate Use standards included in Section 800.0. Non-conforming structures located in a designated floodway may remain in use and may only be enlarged, replaced or structurally altered in accordance with Section 802.0. A non-conforming structure damaged by flood, fire, wind or other natural or man-made disaster may be restored unless the damage exceeds fifty percent (50%) of its market value before it was damaged, in which case it shall conform to this Ordinance.

Section 1100.0 Other Development Requirements

The (City Council or Board of Trustees) shall take into account flood hazards, to the extent that they are known in all official actions related to land management, use and development.

1101.0 New subdivisions, manufactured home parks, annexation agreements, and Planned Unit Developments (PUDs) within the SFHA shall be reviewed to assure that the proposed developments are consistent with Sections 700.0, 800.0, 900.0 and 1000.0 of this Ordinance and the need to minimize flood damage. Plats or plans for new subdivisions, mobile home parks and Planned Unit Developments (PUDs) shall include a signed statement by a Registered Professional Engineer that the plat or plans account for changes in the drainage of surface waters in accordance with the Plat Act (765 ILCS 205/2).

below the flood protection elevation if Section 1003.5 is included in the community's ordinance. Communities desiring a more restrictive use of the floodplain, should omit this Section.

NIPC policy discourages locating sheds and garages below the flood protection elevation for the following reasons: such structures will increase the potential for flood damages to equipment, machinery, and vehicles; and materials stored in such facilities may contribute to water quality contamination during flood events.

This figure must be the minimum necessary to construct a two car garage or tool shed.

This section sets minimum subdivision design review, and recording standards, when the subdivisions are located within a floodplain.

NFIP requirement: 44 CFR 60.1(c).

NFIP requirement 44 CFR 60.3(b)(3) only requires this for subdivisions greater than 5 acres or 50 lots.

1102.0 Proposals for new subdivisions, manufactured home parks, travel trailer parks, planned unit developments (PUDs) and additions to manufactured home parks and additions to subdivisions shall include base flood or 100-year frequency flood elevation data and floodway delineations.

1102.1 Where this information is not available from an existing study filed with the Illinois State Water Survey, the applicant's engineer shall be responsible for calculating the base flood or 100-year frequency flood elevation per Section 604.0 and the floodway delineation per the definition in Section 300.13

1102.2 The applicant's engineer shall submit the data to IDNR/OWR for review and approval as best available regulatory data and then send it to the State Water Survey.

1103.0 Streets, blocks, lots, parks and other public grounds shall be located and laid out in such a manner as to preserve and utilize natural streams and channels. Wherever possible, the floodplains shall be included within parks or other public grounds.

1104.0 The (City Council, Board of Trustees, County Board) shall not approve any Planned Unit Development (PUD) or plat of subdivision located outside the corporate limits unless such agreement or plat is in accordance with the provisions of this Ordinance.

Section 1200.0 Variances

1201.0 No variances shall be granted to any development located in a designated floodway as defined in Section 300.13.

1201.1 Whenever the standards of this Ordinance place undue hardship on a specific development proposal, the applicant may apply to the _____ for a variance.

1201.2 The _____ shall review the applicant's request for a variance and shall submit its recommendation to the (City Council, Board of Trustees).

All new plats recorded must show the location of any SFHA which appears on the plat and must be signed, sealed, and certified by an Illinois Registered Land Surveyor as per the requirements of Public Act 85-267.

This section explains the criteria for a floodplain variance and explains the procedure which the community must follow when granting a variance.

NFIP guidelines: 44 CFR 60.6(a).

Communities in the NFIP are required to maintain a record of all variance actions, including justification for their issuance, and report them to FEMA in the Biennial Report. FEMA may review variances and may take compliance action against a community if the review "indicates a pattern inconsistent with the objectives of sound floodplain management...."

If a city/village adopts NIPC language which prohibits changing the regulatory floodway to facilitate development related to a non-appropriate use, it has precluded certain development activities in the existing floodway which are allowable under state rules. Such a floodway modification activity should be made eligible for the variance procedure described in this section if an exceptional hardship would otherwise result.

Similarly, if the city/village adopts NIPC language for mitigation (including soil erosion and sedimentation control, channel protection, vegetated buffer strips, etc.) which goes beyond the minimum state requirements, such requirements also should be eligible for the variance procedure described in this section if an exceptional hardship would otherwise result. All such variances must meet the minimum state requirements for appropriate uses and are otherwise subject to the requirements of Sections

1202.0 No variance shall be granted unless the applicant demonstrates that:

1202.1 The development activity cannot be located outside the SFHA;

1202.2 An exceptional hardship would result if the variance were not granted;

1202.3 The relief requested is the minimum necessary;

1202.4 There will be no additional threat to public health, safety, *beneficial stream uses and functions, especially aquatic habitat, or creation of a nuisance*;

1202.5 There will be no additional public expense for flood protection, *lost environmental stream uses and functions*, rescue or relief operations, policing, or repairs to *streambeds and banks*, roads, utilities, or other public facilities;

1202.6 The provisions of Sections 702.0 and 902.0 of this Ordinance shall still be met;

1202.7 The activity is not in a designated floodway;

1202.8 The applicant's circumstances are unique and do not represent a general problem, and;

1202.9 *The granting of the variance will not alter the essential character of the area involved including existing stream uses.*

1203.0 The _____ shall notify an applicant in writing that a variance from the requirements of Section 1000.0 that would lessen the degree of protection to a building will:

1203.1 Result in increased premium rates for flood insurance

700.0, 800.0 and 900.0. *In no case shall a variance from the minimum State requirements of Section 800.0 be considered for any development activity.*

A city/village which adopts requirements for floodway development which are more restrictive than state requirements, and which chooses to provide the opportunity for variances for such restrictions, should draft variance language which specifically references the more restrictive requirements. This language should be inserted into Section 1200.0 after the first sentence. Suggested language follows: "However, the following Ordinance requirements for floodway development, which are more restrictive than minimum state requirements shall be eligible for variance considerations: Sections _____, etc."

The blanks in Subsections 1201.1 and 1201.2 should be filled in with the title of the body reviewing requests for variances (e.g. the Plan Commission or the Zoning Board of Appeals).

As much as possible the variance procedure should be tied to existing zoning or building code variance procedure

The criteria for granting a variance should recognize and include the fact that there are legitimate stream uses and functions which may be adversely affected by the granting of the variance. These uses include aesthetics, aquatic habitat and recreation. Since these uses have a definite, though difficult to quantify, economic value, the applicant should demonstrate that these uses will not be impaired by the proposed activity as part of the application for a variance

These provisions still prohibit the placement of inappropriate uses in the floodway, meaning a variance for such placement cannot be obtained.

65 ILCS 5/11-13-4 and 5/11-13-5 *establishes specific municipal zoning variance criteria.*

1202.8 and 1202.9 *are based on those criteria which are an essential component of all municipal zoning ordinances.*

NFIP guidelines: 44 CFR 60.6(a)(5).

List the title of the official responsible for administering the floodplain ordinance.

up to amounts as high as \$25 for \$100 of insurance coverage;

1203.2 Increase the risks to life and property; and

1203.3 Require that the applicant proceed with knowledge of these risks and that he will acknowledge in writing that he assumes the risk and liability.

1204.0 Variances requested in connection with restoration of a historic site or historic structure as defined in 300.30 “Historic Structures”, may be granted using criteria more permissive than the requirements of Sections 1200.2 and 1200.3, subject to the conditions that:

1204.1 The repair or rehabilitation is the minimum necessary to preserve the historic character and design of the structure; and,

1204.2 The repair or rehabilitation will not result in the structure being removed as a certified historic structure.

Section 1300.0 Disclaimer of Liability

1301.0 The degree of flood protection required by this Ordinance is considered reasonable for regulatory purposes and is based on available information derived from engineering and scientific methods of study.

1302.0 Larger floods may occur or flood heights may be increased by man-made or natural causes.

1303.0 This Ordinance does not imply that development, either inside or outside of the SFHA, will be free from flooding or damage.

1304.0 This Ordinance does not create liability on the part of the (City, Village) or any officer or employee thereof for any flood damage that results from reliance on this Ordinance or any administrative decision made lawfully thereunder.

Section 1400.0 Penalty

Failure to comply with the requirements of a permit or conditions of a variance resolution shall be deemed to be a violation of this Ordinance. Upon due investigation, the _____ may determine that a violation of the minimum standards of this Ordinance exist. The _____ shall notify the owner in writing of such violation.

1401.0 If such owner fails after ten days notice to correct the violation:

1401.1 The (City, Village) may make application to the

An insurance agent can estimate the rate increase for specific projects (Example: for a new slab on grade home, with the top of the lowest floor four feet below the Base Flood Elevation, flood insurance could cost about \$50.00 per \$1000.00 of coverage).

The Standard Flood Insurance Policy permits an insurance adjuster to not pay for damage that was caused by something the owner did which increased the hazard to the property. Section 1316 of the National Flood Insurance Act authorizes local officials to request denial of flood insurance for buildings in violation of local floodplain codes.

Contact the Illinois Historic Preservation Agency at (217) 785-1153 for more information.

This section explains that this Ordinance does not guarantee that flood damage will not occur, and that the municipality, county, or enforcing official is not liable for decisions made lawfully under this Ordinance.

This section explains the penalty for not abiding by this Ordinance, and explains what actions the enforcement official may take in seeking compliance.

List the title of the official responsible for administering the floodplain ordinance.

A community may wish to treat a violation as a

Circuit Court for an injunction requiring conformance with this Ordinance or make such other order as the Court deems necessary to secure compliance with the Ordinance.

1401.2 Any person who violates this Ordinance shall, upon conviction thereof, be fined not less than fifty dollars (\$50.00) or more than one-thousand dollars (\$1,000.00) for each offense.

1401.3 A separate offense shall be deemed committed upon each day during or on which a violation occurs or continues.

1401.4 The (City, Village) may record a notice of violation on the title to the property.

1402.0 The _____ shall inform the owner that any such violation is considered a willful act to increase flood damages and, therefore, may cause coverage by a Standard Flood Insurance Policy to be suspended.

1402.1 The _____ is authorized to issue an order requiring the suspension of the subject development. The stop-work order shall be in writing, shall indicate the reason for the issuance, and shall order the action, if necessary, to resolve the circumstances requiring the stop-work order. The stop-work order constitutes a suspension of the permit

1402.2 No site development permit shall be permanently suspended or revoked until a hearing is held by the (Board of Appeals). Written notice of such hearing shall be served on the permittee and shall state: (1) the grounds for complaint or reasons for suspension or revocation; and (2) the time and place of the hearing. At such hearing, the permittee shall be given an opportunity to present evidence on his/her behalf. At the conclusion of the hearing, the (Board of Appeals) shall determine whether the permit shall be suspended or revoked.

1403.0 Nothing herein shall prevent the (City, Village) from taking such other lawful action to prevent or remedy any violations. All costs connected therewith shall accrue to the person or persons responsible.

Section 1500.0 Abrogation and Greater Restrictions

1501.0 This Ordinance is not intended to repeal, abrogate or impair any existing easements, covenants, or deed restrictions.

1502.0 Where this Ordinance and other ordinance, easements, covenants, or deed restrictions conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

1503.0 This Ordinance is intended to repeal the original ordinance or resolution which was adopted to meet the National Flood Insurance Program regulations, but is not intended to repeal the resolution which the (City, Village) passed in order to establish initial eligibility for the program.

misdemeanor, in order to reinforce the necessity for compliance.

The fine amounts are the minimum recommended by IDNR/OWR.

Consideration should be given to increasing these suggested fine amounts. Certain violations can potentially lead to substantial off-site damages (e.g., increased flooding or sedimentation) and should be treated accordingly.

List the title of the official responsible for administering the floodplain ordinance.

A stop-work order should be issued if the development is proceeding in a manner which creates an imminent hazard of severe harm to persons or property (e.g., an unauthorized fill in the floodplain); or development has been accomplished in violation of the requirements of this Ordinance and a period of at least 15 days has elapsed since the permittee has received written notice of violation; or the development is proceeding without a permit.

This section explains which Ordinances are repealed when this Ordinance is adopted.

NFIP requirement: 44 CFR 60.1(b). This section should include a list of the specific ordinances that are repealed by this new Ordinance.

Section 1600.0 Separability

The provisions and sections of this Ordinance shall be deemed separable and the invalidity of any portion of this Ordinance shall not affect the validity of the remainder.

Section 1700.0 Effective Date

This Ordinance shall be in full force and effect from and after its passage and approval and publication, as required by law.

PASSED by the _____ of the _____ of _____, Illinois, this ____ day of _____, 19__.

Clerk

APPROVED by me this ____ day of _____, 19__.

Mayor

ATTESTED and FILED in my office this ____ day of _____, 19__.

Clerk

This section explains that if one part of this Ordinance is ruled to be invalid by the courts, the remainder of this ordinance is still in effect.

This section sets the date when this Ordinance goes into effect and contains sections which the authorized officials must sign to approve the passage of this Ordinance.

MODEL SOIL EROSION AND SEDIMENT CONTROL ORDINANCE

A GUIDE FOR LOCAL OFFICIALS

ANOTHER IN THE SERIES OF PLANNING AIDS FROM THE:
NORTHEASTERN ILLINOIS PLANNING COMMISSION

MODEL SOIL EROSION AND SEDIMENT CONTROL ORDINANCE

Northeastern Illinois Planning Commission
400 West Madison Street • Suite 200
Chicago, Illinois 60606

September 1991

This is another in a series of planning aids and manuals prepared by the Northeastern Illinois Planning Commission as a service to local governments under a section of its enabling act which authorizes the Commission to "prepare and make available to units of government standards for planning and regulatory ordinances, practices, and procedures." This ordinance has been prepared as a model to assist local units of government in developing their own regulations. This model ordinance is also available on computer diskettes at no charge to local governments.

Price: \$4.50

The preparation of revisions to this model ordinance was financed using federal Water Pollution Control Act Section 205(j) funds from the Illinois Environmental Protection Agency. The policies contained herein are not necessarily those of the Illinois Environmental Protection Agency.

Revision to NIPC's Model Soil Erosion and Sediment Control Ordinance

New Reference for Standards and Specifications

There are several references in the Ordinance to the Illinois Environmental Protection Agency's (EPA) *Standards and Specifications for Soil Erosion and Sediment Control* (sometimes called the Yellow Book). These references appear on pages 12 and 21.

This reference should be replaced with the *Illinois Urban Manual: A Technical Manual Designed for Urban Ecosystem Protection and Enhancement*, prepared by the Natural Resources Conservation Service for the Illinois EPA in 1995. The *Urban Manual* has revised many of the practices found in the Yellow Book and contains more in-depth information of construction specifications, material specifications, and standard drawings. The *Urban Manual* is available from county Soil and Water Conservation District offices throughout northeastern Illinois.

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INTRODUCTION

Soil erosion and offsite sediment runoff are continuing serious environmental problems in northeastern Illinois. Each year, millions of tons of soil are eroded by water and wind from agricultural land, areas undergoing development, and developed areas which are improperly protected. The Illinois Water Quality Management Plan identifies sedimentation as a major water pollution problem in both rural and urbanized areas. Sediment reduces the carrying capacity of streams, transports pesticides and other pollutants, and degrades aquatic habitat. In addition, uncontrolled erosion and sedimentation lower the economic value of farmland, reduce the effectiveness of stormwater management facilities, and create hazards on streets and sidewalks.

The model ordinance which follows addresses one aspect of this problem: erosion and sedimentation from areas undergoing urbanization. The ordinance provides a means by which county and municipal governments can assure that site planning and development take potential erosion problems into account and include effective measures for their control. While the principal intent of the ordinance is preventive, it also includes provisions for enforcement action where this becomes necessary.

The Illinois Water Quality Management Plan recommends that erosion and sedimentation control ordinances be adopted by all counties and municipalities. More recently, the U.S. Environmental Protection Agency (USEPA) has promulgated regulations which will require stormwater permits for construction sites. All construction activities of 5 acres or greater will be required to implement erosion and sediment control measures and to perform routine maintenance and inspection of these measures.

The majority of local governments in northeastern Illinois have already adopted ordinances. Many of their ordinances are similar to the Commission model prepared in 1980. If effectively enforced, these ordinances satisfy basic erosion and sediment control objectives and need not be discarded. However, it is recommended that revisions contained in the new model be considered by local governments to enhance the achievement of ordinance objectives, particularly water quality protection, and to conform to USEPA guidelines.

The present model uses the 1980 model as a base and includes additions and revisions based on experience gained in this region and in other parts of the country. Many of the changes are based on ordinances previously adopted or currently under consideration by other agencies, including: the DuPage County Stormwater Committee; Kane County; Lake County Stormwater Commission; Dane County, Wisconsin; Loudoun County, Virginia; St. Charles, Missouri SWCD; and the states of Georgia, Maryland, Ohio, and Wisconsin.

This ordinance is similar to others in the series of planning aids prepared by the Commission. It is presented as a model for the guidance of local governments in adopting their own erosion and sediment control programs. It is understood that each local government may wish to modify the model

presented here to conform to its existing regulations and practices.

The Commission will provide technical assistance upon request in developing such modifications. However, it is important that each local government submit the model to careful review by administrative officials and legal counsel prior to adoption. Another potential source of technical assistance is the county Soil and Water Conservation District (SWCD) office. SWCD's in northeastern Illinois are becoming more attuned to urban issues, such as construction site erosion control, and can offer advice on ordinance implementation and site inspection.

The model ordinance contained herein is intended to stand by itself alongside other county or municipal development regulations. It provides for the issuance of a site development permit based on development plans and erosion control measures proposed by a developer and submitted to the local government with land use jurisdiction. Developments below a minimum size would not be required to secure a separate permit but would still be expected to include effective erosion control measures during construction.

This model may not be equally applicable to all communities. For example, a community which is largely built-up and experiencing relatively little new construction may require only amendment of its building code. Where large-scale development is going on, the development permit or subdivision approach may be more effective in regulating land-disturbing activities which take place prior to application for building permits. Some local governments will wish to adopt ordinances or amendments applicable to both small and large-scale developments.

The new model ordinance contains a section specifying minimum site design requirements. Beyond these requirements, though, the model ordinance must be supported by technical standards and specifications for the design of erosion control measures if they are to be effective. The ordinance identifies both "Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control" (the Green Book) and IEPA's "Standards and Specifications for Soil Erosion and Sediment Control" (the Yellow Book) as appropriate technical references. In its recent "Investigation of the Effectiveness of Urban Soil Erosion and Sediment Control Programs in Northeastern Illinois," NIPC noted that there are some deficiencies in both of these documents as stand-alone technical references. There also are some obvious inconsistencies between them. Until this situation is resolved, however, it is recommended in the model ordinance that these manuals be adopted by reference as guides to the design engineer in preparing, and the local government in reviewing, site plans and erosion control measures.

MODEL SOIL EROSION AND SEDIMENT CONTROL ORDINANCE

AN ORDINANCE PROVIDING FOR THE CONTROL
OF SOIL EROSION AND SEDIMENT RUNOFF FROM
AREAS UNDERGOING DEVELOPMENT

ORDINANCE

COMMENTARY

100.0 Findings and Purpose

100.0 Findings and Purpose

101.0 Findings

101.0 Findings

The (Board of Trustees) of the (village) hereby finds that:

This section identifies a range of circumstances which threaten the public health, safety, or welfare and from which protection is sought by the enactment of this ordinance.

At a number of points in the ordinance, the name of the unit of local government enacting it is to be entered. While the references in this model are to a village, the ordinance is also applicable to a city or county. The reference to the Board of Trustees may be changed to City Council or Board of Commissioners as appropriate.

101.1 Excessive quantities of soil may erode from areas undergoing development for certain non-agricultural uses including but not limited to the construction of dwelling units, commercial buildings and industrial plants, the building of roads and highways, the modification of stream channels and drainageways, and the creation of recreational facilities;

101.2 The washing, blowing, and falling of eroded soil across and upon roadways endangers the health and safety of users thereof, by decreasing vision and reducing traction of road vehicles;

101.3 Soil erosion necessitates the costly repairing of gulleys, washed-out fills, and embankments;

101.4 Sediment from soil erosion tends to clog sewers and ditches and to pollute and silt rivers, streams, lakes, wetlands, and reservoirs;

101.5 Sediment limits the use of water and waterways for most beneficial purposes, promotes the growth of undesirable aquatic weeds, destroys fish and other desirable aquatic life, and is costly and difficult to remove; and

101.6 Sediment reduces the channel capacity of waterways and the storage capacity of floodplains and natural depressions, resulting in increased chances of flooding at risk to public health and safety

102.0 Purpose

The (Board of Trustees) therefore declares that the purpose of this ordinance is to safeguard persons, protect property, prevent damage to the environment, and promote the public welfare by guiding, regulating and controlling the design, construction, use and maintenance of any development or other activity which disturbs or breaks the topsoil or otherwise results in the movement of earth on land situated in the (village). It is the intention of this ordinance that the delivery of sediment from sites affected by land disturbing activities be limited, as closely as practicable, to that which would have occurred if the land had been left in its natural undisturbed state.

200.0 Definitions

For the purposes of this Ordinance certain terms used herein are defined as set forth below:

200.1 BUILDING PERMIT: A permit issued by the (village) for the construction, erection or alteration of a structure or building.

200.2 CERTIFY OR CERTIFICATION: Formally attesting that the specific inspections and tests where required have been performed, and that such tests comply with the applicable requirements of this Ordinance.

200.3 CLEARING: Any activity which removes vegetative ground cover.

200.4 CUBIC YARDS: The amount of material in excavation and/or fill measured by the method of "average end areas."

200.5 EXCAVATION: Any act by which organic matter, earth, sand, gravel, rock or any other similar, material is cut into, dug, quarried, uncovered, removed, displaced, relocated or bulldozed and shall include the conditions resulting therefrom.

200.6 EXISTING GRADE: The vertical location of

200.0 Definitions

The local government adopting the ordinance may wish to expand or shorten the list of definitions provided here, depending on the terms already defined in other ordinances or regulations.

the existing ground surface prior to excavation or filling.

200.7 FILL: Any act by which, earth, sand, gravel, rock or any other material is deposited, placed, replaced, pushed, dumped, pulled, transported or moved by man to a new location and shall include the conditions resulting therefrom.

200.8 FINAL GRADE: The vertical location of the ground or pavement surface after the grading work is completed in accordance with the site development plan.

200.9 GRADING: Excavation or fill or any combination thereof and shall include the conditions resulting from any excavation or fill.

200.10 NATURAL DRAINAGE: Channels formed in the existing surface topography of the earth prior to changes made by unnatural causes.

200.11 PARCEL: All contiguous land in one ownership.

200.12 PERMITTEE: Any person to whom a site development permit is issued.

200.13 PERSON: Any individual, firm or corporation, public or private, the State of Illinois and its agencies or political subdivisions, and the United States, of America, its agencies and instrumentalities, and any agent, servant, officer or employee of any of the foregoing.

200.14 REMOVAL: Cutting vegetation to the ground or stumps, complete extraction, or killing by spraying.

200.15 SITE: A lot or parcel of land, or a contiguous combination thereof, where grading work is performed as a single unified operation.

200.16 SITE DEVELOPMENT: Altering terrain and/or vegetation and constructing improvements.

200.17 SITE DEVELOPMENT PERMIT: A permit issued by the (village) for the construction or alteration of ground improvements and structures for the control of erosion, runoff and grading.

ORDINANCE

COMMENTARY

200.18 STREAM: Any river, creek, brook, branch, flowage, ravine, or natural or man-made drainageway which has a definite bed and banks or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

200.19 STRIPPING: Any activity which removes the vegetative surface cover including tree removal, clearing, and storage or removal of top soil.

200.20 VACANT: Land on which there are no structures or only structures which are secondary to the use or maintenance of the land itself.

200.21 VILLAGE: The Village of _____, _____ County, Illinois.

200.22 WETLANDS: Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

200.18 STREAM: For purposes of this ordinance, a stream does not include very small headwater swales or ditches which generally would not be mapped on U.S.G.S. 7.5 minute quadrangle maps.

200.21 VILLAGE: Identification of the City or County should be substituted in the appropriate alphabetic position where one of these is the unit adopting the ordinance.

200.22 WETLANDS: In the context of this ordinance, wetlands are intended to refer to areas which are subject to regulations of the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act. It is not intended that very small areas meeting the wetland definition (e.g., a roadside ditch) would be subject to the special provisions of this ordinance which require an erosion and sediment control permit for very minor disturbances.

300.0 General Principles

It is the objective of this ordinance to control soil erosion and sedimentation caused by development activities, including clearing, grading, stripping, excavating, and filling of land, in the (village). Measures taken to control soil erosion and offsite sediment runoff should be adequate to assure that sediment is not transported from the site by a storm event of ten-year frequency or less. The following principles shall apply to **all** development activities within the (village) and to the preparation of the submissions required under Section 400.0 of this ordinance:

300.0 General Principles

The approaches outlined here have been proven effective in minimizing soil erosion from development sites and in reducing the damaging effects of that erosion which does occur. They should serve as guidelines for the preparation of site development and erosion control plans required under Section 400.0, and in the conduct of development activities which are exempted from the permit requirements of this ordinance.

The erosion and sedimentation control practices discussed in this ordinance and the manual of

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300.1 Development should be related to the topography and soils of the site so as to create the least potential for erosion. Areas of steep slopes where high cuts and fills may be required should be avoided wherever possible, and natural contours should be followed as closely as possible.

300.2 Natural vegetation should be retained and protected wherever possible. Areas immediately adjacent to natural watercourses, lakes, ponds, and wetlands should be left undisturbed wherever possible. Temporary crossings of watercourses, when permitted, must include appropriate stabilization measures.

300.3 Special precautions should be taken to prevent damages resultant from any necessary development activity within or adjacent to any stream, lake, pond, or wetland. Preventative measures should reflect the sensitivity of these areas to erosion and sedimentation.

300.4 The smallest practical area of land should be exposed for the shortest practical time during development.

300.5 Sediment basins or traps, filter barriers, diversions, and any other appropriate sediment or runoff control measures should be installed prior to site clearing and grading and maintained to remove sediment from run-off waters from land undergoing development.

300.6 The selection of erosion and sedimentation control measures should be based on assessment of the probable frequency of climatic and other events likely to contribute to erosion, and on evaluation of the risks, costs, and benefits involved.

300.7 In the design of erosion control facilities

"Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control" (prepared by the Northeastern Illinois Erosion & Sedimentation Control Steering Committee, in cooperation with area Soil and Water Conservation Districts and the U.S. Soil Conservation Service, and known as the Green Book) are designed to provide protection against sediment leaving the site during a ten-year storm.

300.2 In its floodplain and wetland protection model ordinances, NIPC recommends that a minimum 25 foot buffer strip be preserved along waterbodies and wetlands. It is recognized that mitigation wetlands will involve disturbance in their immediate proximity. In these situations, the time of disturbance should be kept to a minimum.

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and practices, aesthetics and the requirements of continuing maintenance should be considered.

300.8 Provision should be made to accommodate the increased run-off caused by changed soil and surface conditions during and after development. Drainageways should be designed so that their final gradients and the resultant velocities and rates of discharge will not create additional erosion onsite or downstream.

300.9 Permanent vegetation and structures should be installed and functional as soon as practical during development.

300.10 Those areas being converted from agricultural purposes to other land uses should be vegetated with an appropriate protective cover prior to development.

300.11 All waste generated as a result of site development activity should be properly disposed of and should be prevented from being carried off the site by either wind or water.

300.12 All construction sites should provide measures to prevent sediment from being tracked onto public or private roadways.

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400.0 Site Development Permit

400.0 Site Development Permit

401.0 Permit Required

401.0 Permit Required

Except as otherwise provided in this ordinance, no person shall commence or perform any clearing, grading, stripping, excavating, or filling of land which meets the following provisions without having first obtained a site development permit from the (permitting authority) of the (village).

The requirement of a site development permit is the means by which the local government can assure that adequate steps are taken before and during development to control erosion and its effects.

The adopted ordinance should specify the official or department (the "permitting authority") responsible for issuing permits, inspecting work in progress, and taking enforcement action if necessary. In most cases, this will be the administrative official responsible for other aspects of development regulation. Depending on practice in the particular local government, this may be the Building Officer, Zoning Officer, Plat Officer, Engineer, or other official with related responsibilities including enforcement authority. Identification of this authority should also be included among the definitions in Section 200.0.

401.1 Any land disturbing activity (i.e., clearing, grading, stripping, excavation, fill, or any combination thereof) that will affect an area in excess of 5000 square feet;

401.2 Any land disturbing activity that will affect an area in excess of 500 square feet if the activity is within 25 feet of a lake, pond, stream, or wetland; or

401.3 Excavation, fill, or any combination thereof that will exceed 100 cubic yards.

402.0 Exceptions

402.0 Exceptions

A permit shall not be required for any of the following provided that the person responsible for any such development shall implement necessary soil erosion and sediment control measures to satisfy the principles set forth in Section 300.0 of this Ordinance:

For certain soil-disturbing activities, it may be unnecessary or impractical to require application for and issuance of a permit. This is due to the type or scale of development activities involved. These exceptions should be clearly specified in the ordinance.

On development sites below a minimum size, it may be impractical to require the developer to prepare full site development and erosion control plans, given the relatively small area of soil disturbance. However, effective erosion and

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sedimentation controls should still be required during development to avoid silting of streets and drainage channels and offsite water quality impacts. The local government may wish to include the requirement of basic erosion and sedimentation control measures as a condition for issuance of a building permit in such cases.

Some local governments may wish to establish a more restrictive minimum area for the issuance of permits than the 5000 square feet suggested here. This would be appropriate in areas of relatively steep slopes or erodible soils, in addition to areas involving streams, lakes, and wetlands referenced in the ordinance. An alternative approach is to base the need for a permit on the anticipated soil loss from the site during development. A model ordinance developed in Ohio limits erosion from development sites to an average annual soil loss of 15 tons/acre/year. Such a quantitative standard can take into account the existence of small but steep and highly erodible lots on which stringent erosion controls may be necessary, and larger but extremely pervious and flat areas, from which erosion may not be a serious problem. However, the most common soil-loss estimation techniques are not applicable to sites of much less than 50 acres, making the administration of such an ordinance impractical. The present model ordinance contains procedures for the granting of exceptions which may be applied to unique development sites.

402.1 Excavation below final grade for the basement and footings of a single-family residence and appurtenant structures on a site in excess of two acres for which a building permit has been issued by the (village);

402.1 This provision permits the construction of single residences in estate-zoned or agricultural areas where much potential sediment may be absorbed by the site itself. Again, the local government should include basic sediment control measures in its building permit requirements.

402.2 Agricultural use of land, including the implementation of conservation measures included in a farm conservation plan approved by the Soil and Water Conservation District, and including the construction of agricultural structures;

402.3 Installation, renovation, or replacement of a septic system to serve an existing dwelling or structure.

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403.0 Application for Permit

Application for a site development permit shall be made by the owner of the property or his authorized agent to the (permitting authority) on a form furnished for that purpose. Each application shall bear the name(s) and address(es) of the owner or developer of the site and of any consulting firm retained by the applicant together with the name of the applicant's principal contact at such firm, and shall be accompanied by a filing fee of __. Each application shall include certification that any land clearing, construction, or development involving the movement of earth shall be in accordance with the plans approved upon issuance of the permit.

404.0 Submissions

Each application for a site development permit shall be accompanied by the following information:

404.1 A vicinity map in sufficient detail to enable easy location in the field of the site for which the permit is sought, and including the boundary line

403.0 Application for Permit

The application form for the permit can be relatively brief. It need contain only (1) identification of the applicant and of the person or firm responsible for development activity and for preparation of the required plans, (2) identification of the plans and other documents submitted with the application, and (3) certification that development will take place in accordance with the plans as approved upon issuance of the permit.

The local government may wish to require that each application be signed by a licensed professional engineer as an assurance of the technical validity of the submissions.

The filing fee is intended to defray the local government's cost of reviewing and acting upon the permit application. The amount of the fee should be consistent with existing practice of the local government, and may either be a flat amount or be based on a sliding fee scale related to the size and character of the proposed development. It may also be desired to provide for a separate supplemental fee where a hearing is required on an exception requested under Section 600.0.

404.0 Submissions

The application for a site development permit is to be accompanied by sufficient information to describe the erosion control measures which the developer proposes to take and to permit evaluation of the adequacy of those measures by local authorities. While these submissions are to be included as attachments to the permit application, the local government may wish to have them submitted informally for staff review in advance of the formal application. A local government may wish to expand or reduce the amount of detailed information to be submitted from that suggested here, taking into consideration the size of the area disturbed.

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and approximate acreage of the site, existing zoning, and a legend and scale.

404.2 A development plan of the site showing:

- a. Existing topography of the site and adjacent land within approximately 100 feet of the boundaries, drawn at no greater than two-foot contour intervals and clearly portraying the conformation and drainage pattern of the area.
- b. The location of existing buildings, structures, utilities, streams, lakes, floodplains, wetlands and depressions, drainage facilities, vegetative cover, paved areas, and other significant natural or man-made features on the site and adjacent land within 100 feet of the boundary.
- c. A general description of the predominant soil types on the site, their location, and their limitations for the proposed use.
- d. Proposed use of the site, including present development and planned utilization; areas of clearing, stripping, grading, excavation, and filling; proposed contours, finished grades, and street profiles; provisions for storm drainage, including storm sewers, swales, detention basins and any other measures to control the rate of runoff, with a drainage area map, indications of flow directions, and computations; kinds and locations of utilities; and areas and acreages proposed to be paved, covered, sodded or seeded, vegetatively stabilized, or left undisturbed.

404.3 An erosion and sediment control plan showing all measures necessary to meet the objectives of this ordinance throughout all phases of construction and permanently after completion of development of the site, including:

- a. Location and description, including standard details, of all sediment control measures and design specifics of sediment basins and traps, including outlet details.

- a. In most of northeastern Illinois, two-foot contour intervals are adequate to portray the topography of the construction site. Local governments which anticipate development of exceptionally flat sites may wish to specify one-foot contour intervals instead of or in addition to the two-foot intervals suggested here. The local government may wish to specify that a boundary area greater or less than 100 feet be shown.

- d. The local government may wish to waive the requirement of proposed contours where finished grades are adequate to evaluate the plan.

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- b. Location and description of all soil stabilization and erosion control measures, including seeding mixtures and rates, types of sod, method of seedbed preparation, expected seeding dates, type and rate of lime and fertilizer application, kind and quantity of mulching for both temporary and permanent vegetative control measures, and types of non-vegetative stabilization measures.
 - c. Location and description of all runoff control measures, including diversions, waterways, and outlets.
 - d. Location and description of methods to prevent tracking of sediment offsite, including construction entrance details, as appropriate.
 - e. Description of dust and traffic control measures.
 - f. Locations of stockpiles and description of stabilization methods.
 - g. Description of off-site fill or borrow volumes, locations, and methods of stabilization.
 - h. Provisions for maintenance of control measures, including type and frequency of maintenance, easements, and estimates of the cost of maintenance.
 - i. Identification (name, address, and telephone) of the person(s) or entity which will have legal responsibility for maintenance of erosion control structures and measures during development and after development is completed.
- i. Permanent maintenance of erosion control measures may be the responsibility of various entities, including the homeowner, the park district, and the village or county. These responsibilities should be identified as precisely as possible in the plan.

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404.4 The proposed phasing of development of the site, including stripping and clearing, rough grading and construction, and final grading and landscaping. Phasing should identify the expected date on which clearing will begin, the estimated duration of exposure of cleared areas, and the sequence of installation of temporary sediment control measures (including perimeter controls), clearing and grading, installation of temporary soil stabilization measures, installation of storm drainage, paving streets and parking areas, final grading and the establishment of permanent vegetative cover, and the removal of temporary measures. It shall be the responsibility of the applicant to notify the (permitting authority) of any significant changes which occur in the site development schedule after the initial erosion and sediment control plan has been approved.

These submissions shall be prepared in accordance with the requirements of this ordinance and the standards and requirements contained in "Standards and Specifications for Soil Erosion and Sediment Control" (the Yellow Book) published by the Illinois Environmental Protection Agency and the "Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control" (the Green Book) prepared by the Northeastern Illinois Soil Erosion and Sedimentation Control Steering Committee and adopted by the (county) Soil and Water Conservation District, which standards and requirements are hereby incorporated into this ordinance by reference.

The (permitting authority) may waive specific requirements for the content of submissions upon finding that the information submitted is sufficient to show that the work will comply with the objectives and principles of this ordinance.

405.0 Bonds

The applicant is required to file with the (village) a faithful performance bond or bonds, letter of credit, or other improvement security satisfactory to the (municipal attorney) in an amount deemed sufficient by the (permitting authority) to cover all costs of improvements, landscaping, maintenance of improvements and landscaping, and soil

404.4 It is strongly recommended that a standard manual of practices and procedures for erosion control be adopted by reference to provide the technical basis for the development and review of erosion control plans. The Green Book provides valuable guidance on the development of an erosion and sediment control plan. The Yellow Book provides additional guidance on the selection and design of appropriate control measures. Presently, there are some inconsistencies between the two references. Also, in some cases this ordinance is more stringent than one or both references. In those cases, the ordinance shall govern.

405.0 Bonds

The filing of a performance bond by the developer may be made mandatory with respect to all developments or left at the discretion of the permitting authority. Some local governments in northeastern Illinois have specified the amount of the performance bond as a percentage of the cost of improvements and erosion controls on the site.

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erosion and sediment control measures for such period as specified by the (village), and engineering and inspection costs to cover the cost of failure or repair of improvements installed on the site.

Bonds for development performance and maintenance may be separate. Where permanent maintenance will be assumed by an agency or entity other than the developer, the time period of the maintenance bond should be limited accordingly.

406.0 Review and Approval

Each application for a site development permit shall be reviewed and acted upon according to the following procedures:

406.1 The (permitting authority) will review each application for a site development permit to determine its conformance with the provisions of this ordinance. The (authority) may also refer any application to the (county) Soil and Water Conservation District and/or any other local government or public agency within whose jurisdiction the site is located for review and comment. Within thirty (30) days after receiving an application, the (permitting authority) shall in writing:

406.1 A reasonable time limit should be placed on local government action on permit applications in order to minimize the serious financial costs to the developer of delays. Informal review of the project prior to submittal of the final application can contribute to this objective.

The Soil and Water Conservation Districts have specialized expertise in soils analysis and erosion control techniques. The quality of local plan reviews may be improved by referring projects to the appropriate District for advisory technical review. Review of some projects (e.g., subdivision of agricultural lands) within the overlapping jurisdiction of the local government and a District may be required under 5 Ill. Rev. Stat. 127.2a. Communities which do not wish to retain specialized staff may choose to enter into a contract or intergovernmental agreement with the District for the conduct of all reviews and the preparation of recommended actions. Approval or disapproval of applications would remain the responsibility of the local government.

Where another public body (such as a park district) is to assume ownership and/or maintenance responsibility for part of a development, it should also be given an opportunity to review the development plans. This review should be completed within the 30-day period allowed the permitting authority, in order that the permitting authority may take action on the application within the time allowed.

- a. Approve the permit application if it is found to be in conformance with the provisions of this ordinance, and issue the permit;

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- b. Approve the permit application subject to such reasonable conditions as may be necessary to secure substantially the objectives of this ordinance, and issue the permit subject to these conditions; or
 - c. Disapprove the permit application, indicating the deficiencies and the procedure for submitting a revised application and/or submission.

406.2 No site development permit shall be issued for an intended development site unless:

- a. the development, including but not limited to subdivisions and planned unit development, has been approved by the (village) where applicable, or
- b. such permit is accompanied by or combined with a valid building permit issued by the (village), or
- c. the proposed earth moving is coordinated with any overall development program previously approved by the (village) for the area in which the site is situated; and
- d. all relevant federal and state permits (i.e., for floodplains and wetlands) have been received for the portion of the site subject to soil disturbance.

406.2 Before earth movement begins, the local government will wish to be assured that the proposed development will comply with all applicable regulations. This can be done by mandating that the other required approvals or permits be secured prior to or concurrent with the site development permit, or by finding that the proposed earth moving is related to an annexation agreement, planned unit development, or other approved development program.

- d. This paragraph is not intended to address all federal and state permits, only those relevant to soil erosion and sediment control. For example, a site development permit could be issued while a developer awaits final IEPA approval regarding wastewater service.

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406.3 Failure of the (permitting authority) to act on an original or revised application within thirty (30) days of receipt shall authorize the applicant to proceed in accordance with the plans as filed unless such time is extended by agreement between the (permitting authority) and the applicant. Pending preparation and approval of a revised plan, development activities shall be allowed to proceed in accordance with conditions established by the (permitting authority).

406.3 This provision is directed at reducing development costs by avoiding delays in government action. When some aspects of a proposed plan require modification, it may be reasonable to permit other parts of development to proceed as long as they do not render the modifications nugatory.

407.0 Expiration of Permit

Every site development permit shall expire and become null and void if the work authorized by such permit has not been commenced within one hundred and eighty (180) days, or is not completed by a date which shall be specified in the permit; except that the (permitting authority) may, if the permittee presents satisfactory evidence that unusual difficulties have prevented work being commenced or completed within the specified time limits, grant a reasonable extension of time if written application is made before the expiration date of the permit. The (permitting authority) may require modification of the erosion control plan to prevent any increase in erosion or offsite sediment runoff resulting from any extension.

407.0 Expiration of Permit

Because the erosion control measures required on a site are related to seasonal variations and other factors, changes may be required if the development does not proceed on the anticipated schedule. Some communities in northeastern Illinois have established 90 days (rather than 180) as the period within which development should begin. It is suggested that any fixed completion date be omitted from the ordinance and that this date be specified in the permit itself, relating the date to the developer's proposed schedule.

408.0 Appeals

The applicant, or any person or agency which received notice of the filing of the application, may appeal the decision of the (permitting authority) as provided in Section 406.0, to the (board of appeals). Upon receipt of an appeal, the (board of appeals) shall schedule and hold a public hearing, after giving 15 days notice thereof. The (board) shall render a decision within thirty (30) days after the hearing. Factors to be considered on review shall include, but need not be limited to, the effects of the proposed development activities on the surface water flow to tributary and downstream lands, any comprehensive watershed management plans, or the use of any retention facilities; possible saturation of fill and unsupported cuts by water, both natural and domestic; runoff surface waters that produce erosion and silting of drainageways; nature and type of soil or

408.0 Appeals

Provision should be made for the appeal of administrative decisions to a policy body of the local government. Appeal should be available to the applicant or to any body (e.g., the local Planning Commission or Soil and Water Conservation District) which has received the permit application for review. The ordinance should specify the body responsible for hearing and acting upon appeals, and for granting exceptions to the ordinance under Section 600.0. Depending on local practice, this may be the Zoning Board of Appeals, the Council or Trustees or Commissioners or its Planning or Development Committee, or the Planning Commission. The body should be identified among the definitions in Section 200.0. It may be desired to provide that this body seek a recommendation from those bodies which themselves have the right of appeal

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rock which when disturbed by the proposed development activities may create earth movement and produce slopes that cannot be landscaped; and excessive and unnecessary scarring of the natural landscape through grading or removal of vegetation.

before it acts.

409.0 Retention of Plans

Plans, specifications, and reports for all site developments shall be retained in original form or on microfilm by the (permitting authority).

500.0 Design and Operation Standards and Requirements

500.0 Design and Operation Standards and Requirements

501.0 Applicability

501.0 Applicability

All clearing, grading, stripping, excavating, and filling which is subject to the permit requirements of this ordinance shall be subject to the applicable standards and requirements set forth in this Section 500.0.

It is reiterated that developments which are exempted from the permit requirements of this ordinance are still required to take actions to control erosion and sedimentation leaving the development site, and that those actions shall be generally consistent with this Section 500.0.

502.0 Responsibility

The permittee shall not be relieved of responsibility for damage to persons or property otherwise imposed by law, and the (village) or its officers or agents will not be made liable for such damage, by (1) the issuance of a permit under this ordinance, (2) compliance with the provisions of that permit or with conditions attached to it by the (permitting authority), (3) failure of (village) officials to observe or recognize hazardous or unsightly conditions, (4) failure of (village) officials to recommend denial of or to deny a permit, or (5) exemptions from the permit requirements of this ordinance.

503.0 Site Design Requirements

503.1 On-site sediment control measures, as

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specified by the following criteria, shall be constructed and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.

- a. For disturbed areas draining less than 1 acre, filter barriers (including filter fences, straw bales, or equivalent control measures) shall be constructed to control all offsite runoff as specified in referenced handbooks. Vegetated filter strips, with a minimum width of 25 feet, may be used as an alternative only where runoff in sheet flow is expected.

- b. For disturbed areas draining more than 1 but less than 5 acres, a sediment trap or equivalent control measure shall be constructed at the downslope point of the disturbed area.

- c. For disturbed areas draining more than 5 acres, a sediment basin or equivalent control measure shall be constructed at the downslope point of the disturbed area.

- d. Sediment basins and sediment traps designs shall provide for both detention storage and sediment storage. The detention storage shall be composed of equal volumes of "wet"

- a. Filter barriers are appropriate sediment control measures for small drainage areas where concentrated flow is not present. Existing references specify a range of appropriate drainage areas for their application. The Green Book recommends that filter barrier usage be limited to 1/2 acre drainage areas, except for individual lots where the drainage area may be increased to 1 acre. Draft USEPA guidance allows filter barriers for drainage areas up to 10 acres.

The Green Book recommends a minimum vegetative filter width of 15 feet to protect adjacent property or streams. While there is no clearly recognized standard for this width, NIPC recommends 25 feet for consistency with its stream and wetland protection ordinance and floodplain ordinance.

- b. Sediment traps or basins are required to control sediment runoff in situations where concentrated or channelized flow is likely to be present. Generally speaking, sediment barriers such as silt fences are ineffective and unreliable in such situations. In particular, they are subject to undercutting and blowout due to high water velocities.

It is recommended that the construction of sediment traps or basins be coordinated with the needs for stormwater detention. If properly designed, located, and maintained, sediment basins can be readily converted to permanent detention basins after the site is fully stabilized.

- d. Capacity must be provided in sediment basins for both sediment storage and detention storage. The detention storage detains the water for a sufficient period of time to

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detention storage and "dry" detention storage and each shall be sized for the 2-year, 24-hour runoff from the site under maximum runoff conditions during construction. The release rate of the basin shall be that rate required to achieve minimum detention times of at least 10 hours. The elevation of the outlet structure shall be placed such that it only drains the dry detention storage.

settle out the eroded sediment. The sediment storage stores the settled sediment so that there is no loss of detention storage during the life of the sediment basin.

Both "wet" detention storage and "dry" detention storage are needed to maximize the effectiveness of the sediment basin. The total detention storage equal to twice the volume needed to detain the 2-year, 24-hour runoff for ten hours is approximately equal to the 10-year detention storage recommended by the Green Book and also recommended in draft USEPA guidance. For a typical site, this combined wet/dry storage is equivalent to 2.0 inches of runoff from the site.

The wet portion of the detention storage contains a permanent pool which drains by evaporation and infiltration only. The permanent pool prevents resuspension of previously deposited sediment and creates better settling conditions than a basin with no wet detention storage by reducing the energy of the incoming runoff. If the wet detention storage dries between events, it will detain with no release, the majority of runoff generated by the site for most events. The sediment basin should be equally effective if the wet detention storage dries between events or remains a permanent pool.

The dry portion of the detention storage is drained by an outlet structure and temporarily stores runoff for a sufficient period of time to allow settling of the settleable solids. The Green Book has examples and figures for calculating the required storage to achieve the design detention times and also has illustrations of outlet control devices. For most applications a release rate of 0.06 cfs/acre-inch of runoff should achieve the required detention time of ten hours. The Greenbook recommends using a Curve Number of 90 for sites under construction.

- e. The sediment storage shall be sized to store the estimated sediment load generated from the site over the duration of the construction period with a minimum storage equivalent to the volume of sediment generated in one

- e. The required sediment storage volume may be calculated using the Universal Soil Loss Equation or from Figure 6-20 in the Green Book.

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year. For construction periods exceeding 1 year, the 1-year sediment load and a sediment removal schedule may be substituted.

503.2 Stormwater conveyance channels, including ditches, swales, and diversions, and the outlets of all channels and pipes shall be designed and constructed to withstand the expected flow velocity from the 10-year frequency storm without erosion. All constructed or modified channels shall be stabilized within 48 hours, consistent with the following standards:

- a. For grades up to 4 percent, seeding in combination with mulch, erosion blanket, or an equivalent control measure shall be applied. Sod or erosion blanket or mat shall be applied to the bottom of the channel.
- b. For grades of 4 to 8 percent, sod or an equivalent control measure shall be applied in the channel.
- c. For grades greater than 8 percent, rock, riprap, or an equivalent control measure shall be applied, or the grade shall be effectively reduced using drop structures.

503.3 Disturbed areas shall be stabilized with temporary or permanent measures within 7 calendar days following the end of active disturbance, or redisturbance, consistent with the following criteria:

- a. Appropriate temporary or permanent stabilization measures shall include seeding, mulching, sodding, and/or non-vegetative measures.
- b. Areas having slopes greater than 12 percent shall be stabilized with sod, mat or blanket in combination with seeding, or equivalent.

503.2 Conveyance channels, because of the presence of concentrated flows typically having high velocities, warrant special consideration. The slope categories and recommended control measures presented here are derived from language in the Kane County, Illinois draft ordinance.

Diversion channels, which are intended to route off-site flows away from disturbed areas, should be constructed as soon as possible in the construction process.

503.3 Early stabilization of disturbed areas is essential. USEPA guidance for the permitting of construction activities requires vegetative stabilization within 7 days. The Green Book recommends stabilization within 15 days.

- b. This provision recognizes the fact that steep slopes generally cannot be effectively stabilized with seeding and mulching alone. Slope instability and high runoff velocities necessitate the use of more substantial measures. The reference to a maximum slope of 12 percent, based on a Kane County

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critterion, is subject to local discretion and soil conditions. Other ordinances refer to slopes as steep as 33 percent as needing special measures.

503.4 Land disturbance activities in stream channels shall be avoided, where possible. If disturbance activities are unavoidable, the following requirements shall be met:

- a. Construction vehicles shall be kept out of the stream channel to the maximum extent practicable. Where construction crossings are necessary, temporary crossings shall be constructed of non-erosive material, such as riprap or gravel.
- b. The time and area of disturbance of stream channels shall be kept to a minimum. The stream channel, including bed and banks, shall be restabilized within 48 hours after channel disturbance is completed, interrupted, or stopped.
- c. Whenever channel relocation is necessary, the new channel shall be constructed in the dry and fully stabilized before flow is diverted.

503.5 Storm sewer inlets and culverts shall be protected by sediment traps or filter barriers meeting accepted design standards and specifications.

503.5 Protection of storm sewer inlets should be implemented in a manner which will avoid unacceptable flooding of public streets.

503.6 Soil storage piles containing more than 10 cubic yards of material shall not be located with a downslope drainage length of less than 25 feet to a roadway or drainage channel. Filter barriers, including straw bales, filter fence, or equivalent, shall be installed immediately on the downslope side of the piles.

503.7 If dewatering devices are used, discharge locations shall be protected from erosion. All pumped discharges shall be routed through appropriately designed sediment traps or basins, or equivalent.

503.8 Each site shall have graveled (or equivalent) entrance roads, access drives, and parking areas of sufficient length and width to

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prevent sediment from being tracked onto public or private roadways. Any sediment reaching a public or private road shall be removed by shoveling or street cleaning (not flushing) before the end of each workday and transported to a controlled sediment disposal area.

503.9 All temporary and permanent erosion and sediment control practices must be maintained and repaired as needed to assure effective performance of their intended function.

503.10 All temporary erosion and sediment control measures shall be disposed of within 30 days after final site stabilization is achieved with permanent soil stabilization measures. Trapped sediment and other disturbed soils resulting from the disposition of temporary measures should be permanently stabilized to prevent further erosion and sedimentation.

504.0 Handbooks Adopted by Reference

The standards and specifications contained in "Standards and Specifications for Soil Erosion and Sediment Control" (the Yellow Book) and the "Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control" (the Green Book) cited in Section 400.0, are hereby incorporated into this Section 500.0 and made a part hereof by reference for the purpose of delineating procedures and methods of operation under site development and erosion and sedimentation control plans approved under Section 400.0. In the event of conflict between provisions of said manuals and of this ordinance, the ordinance shall govern.

504.0 Handbooks Adopted by Reference

As previously indicated, there are certain inconsistencies between this ordinance and the manuals adopted by reference. For example, Paragraph 503.1 specifies design criteria for the sizing of sediment traps and basins. These criteria are similar to, but more explicit than, the Green Book. However, the Yellow Book specifies radically different criteria for the sizing of sediment traps and basins. In these cases, this ordinance governs.

Nonetheless, the two references can be valuable in the development of the erosion and sediment control plan and in the design and implementation of erosion and sediment control measures. In particular, the Yellow Book provides design specifications not provided by either the Ordinance or the Green Book.

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505.0 Maintenance of Control Measures

All soil erosion and sediment control measures necessary to meet the requirements of this ordinance shall be maintained periodically by the applicant or subsequent land owner during the period of land disturbance and development of the site in a satisfactory manner to ensure adequate performance.

506.0 Inspection

The (permitting authority) shall make inspections as hereinafter required and shall either approve that portion of the work completed or shall notify the permittee wherein the work fails to comply with the site development or erosion and sedimentation control plan as approved. Plans for grading, stripping, excavating, and filling work bearing the stamp of approval of the (permitting authority) shall be maintained at the site during progress of the work. In order to obtain inspections and to ensure compliance with the approved erosion and sediment control plan, the grading or building permit, and this Ordinance, the permittee shall notify the (permitting authority) within two (2) working days of the completion of the construction stages specified below:

1. Upon completion of installation of sediment and runoff control measures (including perimeter controls and diversions), prior to proceeding with any

505.0 Maintenance of Control Measures

Effective maintenance of control measures is critical to their success and should be budgeted into the erosion and sediment control plan. Particular emphasis should be placed on the following types of maintenance needs: repair and replacement of sediment barriers, such as straw bales; removal of excess accumulated sediment from traps, basins, and channels; irrigation, fertilization, or reseeded of vegetatively stabilized areas; repair of scour or gully development on slopes and in channels; removal of sediment from roadways; and control of dust.

506.0 Inspection

On-site inspections are provided at critical junctures in the development process to assure that development practices and erosion control measures are effective in securing the objectives of the ordinance. Local governments will wish to coordinate this inspection schedule with those required under other permits. In general, inspection should be provided at least monthly, or more frequently in the event of major rainfall events. In some instances (e.g., very small sites), fewer inspections than the six suggested here may be sufficient. Provision is made for development to proceed in the event the local government cannot provide timely inspection, and for inspection at the stage of partial completion in the case of large, phased developments. The phases or areas for which separate inspections will be requested should be identified in the plan.

The "Illinois Field Manual for Implementation and Inspection of Erosion and Sediment Control Plans" is an excellent reference for conducting inspections. This manual includes a detailed checklist of inspection criteria and recommends that inspection be performed by a designated site inspector after every storm. USEPA recommends inspection by onsite personnel at least once every 7 days.

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-
- other earth disturbance or grading,
 2. After stripping and clearing,
 3. After rough grading,
 4. After final grading,
 5. After seeding and landscaping deadlines,
and
 6. After final stabilization and landscaping,
prior to removal of sediment controls.

If stripping, clearing, grading and/or landscaping are to be done in phases or areas, the permittee shall give notice and request inspection at the completion of each of the above work stages in each phase or area. If an inspection is not made and notification of the results given within five working days after notice is received by the (village) from the permittee, the permittee may continue work at his/her own risk, without presuming acceptance by the (village). Notification of the results of the inspection shall be given in writing at the site.

507.0 Special Precautions

507.1 If at any stage of the grading of any development site the (permitting authority) determines by inspection that the nature of the site is such that further work authorized by an existing permit is likely to imperil any property, public way, stream, lake, wetland, or drainage structure, the (permitting authority) may require, as a condition of allowing the work to be done, that such reasonable special precautions to be taken as is considered advisable to avoid the likelihood of such peril. "Special precautions" may include, but shall not be limited to, a more level exposed slope, construction of additional drainage facilities, berms, terracing, compaction, or cribbing, installation of plant materials for erosion control, and recommendations of a registered soils engineer and/or engineering geologist which may be made requirements for further work.

507.2 Where it appears that storm damage may result because the grading on any development site is not complete, work may be stopped and the permittee required to install temporary structures or take such other measures as may be required to protect adjoining property or the public safety. On large developments or where unusual site conditions prevail, the (permitting authority) may

507.0 Special Precautions

507.1 Unanticipated (1) site conditions or (2) storm events may require that erosion control measures beyond those provided for in the approved plan be instituted. These should be reasonable in terms of the additional costs or delays they impose on the developer in relationship to the risks incurred by the failure to undertake such measures.

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specify the time of starting grading and time of completion or may require that the operations be conducted in specific stages so as to insure completion of protective measures or devices prior to the advent of seasonal rains.

508.0 Amendment of Plans

Major amendments of the site development or erosion and sedimentation control plans shall be submitted to the (permitting authority) and shall be processed and approved or disapproved in the same manner as the original plans. Field modifications of a minor nature may be authorized by the (permitting authority) by written authorization to the permittee.

600.0 Enforcement

601.0 Exceptions

The (board of appeals) may, in accordance with the following procedures, authorize exceptions to any of the requirements and regulations set forth in this ordinance:

601.1 Application for any exception shall be made by a verified petition of the applicant for a site development permit, stating fully the grounds of the petition and the facts relied upon by the applicant. Such petition shall be filed with the site development permit application. In order for the petition to be granted, it shall be necessary that the (board of appeals) find all of the following facts with respect to the land referred to in the petition:

- a. That the land is of such shape or size or is affected by such physical conditions or is subject to such title limitations of record,that it

508.0 Amendment of Plans

Particularly on large or phased developments, changed conditions during development may require changes in the plans on which the permit was based. Whether these are of such magnitude as to require a complete review of the project and the adequacy of erosion control measures is a matter of administrative judgment as to potential costs to the developer and the public.

600.0 Enforcement

601.0 Exceptions

Exceptions to the requirements of the ordinance may be granted where such exception would not be contrary to the public welfare and where enforcement of the requirements would work undue hardship on the landowner. The required findings and procedures (including public hearing) are intended to assure that exceptions are granted only after full assessment of their benefits and costs, including any adverse environmental impacts. If it is the local government's practice to permit decisions by the board of appeals to be referred to the principal policy body (county or municipal board or council), provisions for this second appeal should be added to this Section.

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is impossible or impractical for the applicant to comply with all of the requirements of this ordinance;

- b. That the exception is necessary for the preservation and enjoyment of a substantial property right of the applicant; and
- c. That the granting of the exception will not be detrimental to the public welfare or injurious to other property in the vicinity of the subject property.

601.2 Each application for an exception shall be referred to the (permitting authority) for review. The (authority) shall transmit its recommendations to the (board of appeals), which shall review such recommendations prior to granting or denying the exception.

601.3 The (board of appeals) shall hold a public hearing on each application for exception, within thirty (30) days after receiving application, in the manner provided with respect to appeals. After public hearing, the (board) may approve the site development permit application with the exceptions and conditions it deems necessary or it may disapprove such site development permit application and exception application or it may take such other action as appropriate.

602.0 Stop-Work Order; Revocation of Permit

In the event any person holding a site development permit pursuant to this ordinance violates the terms of the permit, or carries on site development in such a manner as to materially adversely affect the health, welfare, or safety of persons residing or working in the neighborhood of the development site or so as to be materially detrimental to the public welfare or injurious to property or improvements in the neighborhood, the (permitting authority) may suspend or revoke the site development permit.

602.1 Suspension of a permit shall be by a written stop-work order issued by the (permitting authority) and delivered to the permittee or his agent or the person performing the work. The stop-work order shall be effective immediately,

601.3 If local practice includes the use of a hearing officer who makes a report and recommendation to the board of appeals, this provision may be added here.

602.0 Stop-Work Order; Revocation of Permit

A stop-work order may be issued in the event the requirements of the ordinance are violated. This order is temporary unless confirmed by the body responsible for hearing appeals and exceptions. A local government may wish to specify a maximum term for such a temporary permit (e.g., 30 days), after which action by the appeal body will be necessary for the order to remain in force, rather than referring to the board of appeals' next regular meeting.

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shall state the specific violations cited, and shall state the conditions under which work may be resumed. A stop-work order shall remain in effect until the next regularly scheduled meeting of the (board of appeals) at which the conditions of sub-paragraph 602.2 below can be met.

602.2 No site development permit shall be permanently suspended or revoked until a hearing is held by the (board of appeals). Written notice of such hearing shall be served on the permittee, either personally or by registered mail, and shall state:

1. the grounds for complaint or reasons for suspension or revocation, in clear and concise language; and
2. the time when and place where such hearing will be held.

Such notice shall be served on the permittee at least five (5) days prior to the date set for the hearing. At such hearing, the permittee shall be given an opportunity to be heard and may call witnesses and present evidence on his behalf. At the conclusion of the hearing the (board of appeals) shall determine whether the permit shall be suspended or revoked.

603.0 Violations and Penalties

No person shall construct, enlarge, alter, repair, or maintain any grading, excavation or fill, or cause the same to be done, contrary to or in violation of any terms of this ordinance. Any person violating any of the provisions of this ordinance shall be deemed guilty of a misdemeanor, and each day during which any violation of any of the provisions of this ordinance is committed, continued, or permitted shall constitute a separate offense. Upon conviction of any such violation, such person, partnership, or corporation shall be punished by a fine of not more than (\$500) for each offense. In addition to any other penalty authorized by this section, any person, partnership, or corporation convicted of violating any of the provisions of this ordinance shall be required to restore the site to the condition existing prior to commission of the violation, or to bear the expense of such restoration.

603.0 Violations and Penalties

Financial penalties are provided for conviction of violation of the ordinance. Several referenced ordinances also allow for imprisonment. Depending on local practice, it may be desired to identify in the ordinance the official by whom action against alleged violations will be brought and the procedure to be followed. The amount of the penalty should be related to the local government's overall fine schedule.

604.0 Separability

The provisions and sections of this ordinance shall be deemed to be separable, and the invalidity of any portion of this ordinance shall not affect the validity of the remainder.

June 2000 revised draft
Northeastern Illinois Planning Commission

**MODEL
STORMWATER
DRAINAGE AND
DETENTION ORDINANCE**

100.0 Authority and Purpose

This ordinance is enacted pursuant to the police powers granted to (County, City, Village) by the Illinois Revised Statutes (Chapter __, Sections ____).

The purpose of this ordinance is to diminish threats to public health, safety and welfare caused by runoff of excessive stormwater from new development and redevelopment. This excessive stormwater could result in the inundation of damageable properties, the erosion and destabilization of downstream channels, and the pollution of valuable stream and lake resources. The cause of increases in stormwater runoff quantity and rate and impairment of quality is the development and improvement of land and as such this ordinance regulates these activities to prevent adverse impacts.

This ordinance is adopted to accomplish the following objectives:

100.1 To assure that new development does not increase the drainage or flood hazards to others, or create unstable conditions susceptible to erosion;

100.2 To protect new buildings and major improvements to buildings from flood damage due to increased stormwater runoff;

100.3 To protect human life and health from the hazards of increased flooding on a watershed basis;

100.4 To lessen the burden on the taxpayer for flood control projects, repairs to flood-damaged public facilities and utilities, correction of channel erosion problems, and flood rescue and relief operations caused by increased stormwater runoff quantities from new development;

100.5 To protect, conserve, and promote the orderly development of land and water resources;

100.6 To preserve the natural hydrologic and hydraulic functions of watercourses and floodplains and to protect water quality and aquatic habitats;

100.7 To preserve the natural characteristics of stream corridors in order to moderate flood and stormwater impacts, improve water quality, reduce soil erosion, protect aquatic and riparian habitat, provide recreational opportunities, provide aesthetic benefits and enhance

100.0 Authority and Purpose

In order to stand the tests of legality and constitutionality, ordinances should clearly define the purposes for which they are enacted. The purposes described here cover the full range of beneficial water resources uses for which protection of public interests is sought by enactment of this ordinance.

County authority to regulate drainage derives from Chapter 34 Sections 414 (subdivision control), 422 (building codes), and 3151 (zoning). Municipal authority derives from Chapter 24, Sections 11-12-5,6, and 12 (subdivision regulations), 11-13-1 (zoning), 11-14-1 (set-back lines), 11-30-2 and 8 (building codes), 11-105-1 (public lands), 11-109-1 (culverts, drains), 11-110-11 (drainage, flood control), and Chapter 85, Section 1711 (on-site detention). Additionally, the Water Quality Act of 1987 and proposed federal regulations 40CFR Parts 122, 123, 124, and 504 will require new construction discharging to the waters of the United States to provide on-site management of stormwater pollutants. Finally, P.A.s 85-905 and 1266 add comprehensive stormwater management authority to northeastern Illinois counties (excluding Cook) which choose to exercise them.

community and economic development.

200.0 Definitions

200.1 Adverse Impacts: Any deleterious impact on water resources or wetlands affecting their beneficial uses including recreation, aesthetics, aquatic habitat, quality, and quantity.

200.2 Applicant: Any person, firm, or governmental agency who executes the necessary forms to procure official approval of a development or permit to carry out construction of a development from the (County, City, Village of _____).

200.3 Base Flood Elevation: The elevation at all locations delineating the level of flooding resulting from the 100-year frequency flood event.

200.4 Best Management Practice (BMP): A measure used to control the adverse stormwater-related effects of development. BMPs include site design approaches (e.g., cluster development) and structural devices (e.g., swales, filter strips, infiltration trenches, and detention basins) designed to reduce pollutant runoff, reduce runoff rates and volumes, and protect aquatic habitats. BMPs also include non-structural approaches, such as public education efforts to prevent the dumping of household chemicals into storm drains.

200.5 Bypass Flows: Stormwater runoff from upstream properties tributary to a property's drainage system but not under its control.

200.6 Channel: Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or manmade drainageway, which has a definite bed and bank or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

200.7 Channel Modification: Alteration of a channel by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, riprapping (or other armoring), widening, deepening, straightening, relocating, lining, and significant removal of bottom or woody rooted vegetation. Channel

200.0 Definitions

Local governments may choose to shorten or expand this list of definitions dependent on information contained in other ordinances. It is important to note that a number of definitions are directly applicable to floodplain ordinances. They are included because of the interaction between stormwater drainage and flood control facilities.

200.6 Channel: Channels include on-stream lakes and impoundments.

200.7 Channel Modification: NIPC policy expressly opposes unnecessary channel modifications because of the extreme damage they can cause to aquatic habitat and because of the uncertainty that modified systems can provide the same beneficial uses and functions as natural systems.

modification does not include the clearing of debris or removal of trash.

200.8 Compensatory Storage: An artificially excavated, hydraulically equivalent volume of storage within the floodplain used to balance the loss of natural flood storage capacity when fill or structures are placed within the floodplain.

200.9 Conduit: Any channel, pipe, sewer or culvert used for the conveyance or movement of water, whether open or closed.

200.10 Detention Basin: A facility constructed or modified to provide for the temporary storage of stormwater runoff and the controlled release by gravity of this runoff at a prescribed rate during and after a flood or storm.

200.11 Detention Time: The mean residence time of stormwater in a detention basin.

200.12 Development: Any man-made change to real estate, including:

- a) Preparation of a plot of subdivision;
- b) Construction, reconstruction or placement of a building or any addition to a building;
- c) Installation of a manufactured home on a site, preparing a site for a manufactured home, or installing a travel trailer on a site for more than 180 days;
- d) Construction of roads, bridges, or similar projects;
- e) Redevelopment of a site;
- f) Filling, dredging, grading, clearing, excavating, paving, or other non-agricultural alterations of the ground surface;
- g) Storage of materials or deposit of solid or liquid waste;
- h) Any other activity that might alter the magnitude, frequency, deviation, direction, or velocity of stormwater flows from a property.

200.13 Drainage Plan: A plan, including engineering drawings and supporting calculations, which describes the existing stormwater drainage system and environmental features, as well as the drainage system and environmental features which are proposed after development of a property.

200.14 Dry Basin: A detention basin designed to drain completely after temporary storage of stormwater flows and to normally be dry over the majority of its bottom area between runoff events.

200.15 Erosion: The general process whereby earth is removed by flowing water or wave action.

200.16 Excess Stormwater Runoff: The volume and rate of flow of stormwater discharged from an urbanized drainage area which is or will be in excess of that volume and rate which occurred before urbanization.

200.17 Floodplain: That land, generally adjacent to a body of water, with ground surface elevations at or below the base flood or the 100-year frequency flood elevation. The floodplain is also known as the Special Flood Hazard Area (SFHA).

200.18 Flood Fringe: That portion of the floodplain outside of the regulatory floodway.

200.19 Floodway: The channel and that portion of the flood-plain adjacent to a stream or watercourse which is needed to store and convey the anticipated existing and future 100-year frequency flood discharge with no more than a 0.1 foot increase in stage due to any loss of flood conveyance or storage and no more than a ten percent increase in velocities.

200.20 Hydrograph: A graph showing for a given location on a stream or conduit, the flow rate with respect to time.

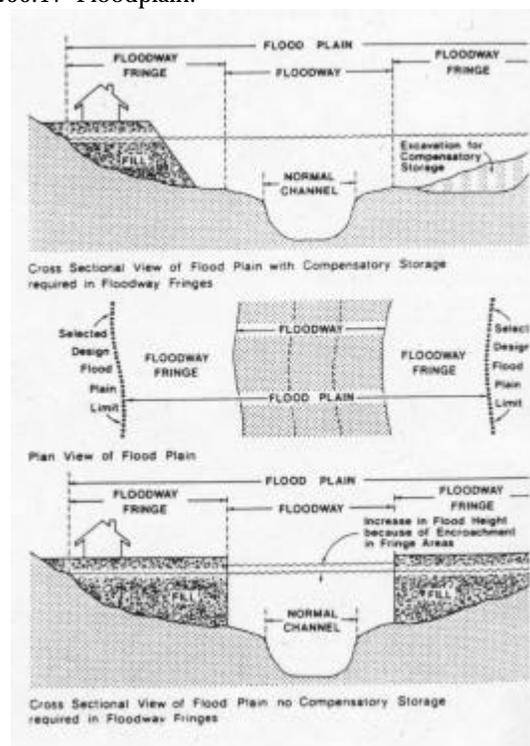
200.21 Infiltration: The passage or movement of water into the soil surfaces.

200.22 Major Drainage System: That portion of a drainage system needed to store and convey flows

200.14 Dry Basin: Conventional dry bottom detention designs are not recommended, for several reasons. 1) Dry basins are relatively ineffective in removing runoff pollutants and 2) it will be difficult to maintain conventional turf vegetation in dry basin bottoms due to the restrictive release rates of this ordinance that are intended to promote extended detention times.

200.15 Erosion: For the purposes of this ordinance, only erosion by water is considered.

200.17 Floodplain:



beyond the capacity of the minor drainage system.

200.23 Minor Drainage System: That portion of a drainage system designed for the convenience of the public. It consists of street gutters, storm sewers, small open channels, and swales and, where manmade, is usually designed to handle the 10-year runoff event or less.

200.24 Mitigation: Mitigation includes those measures necessary to minimize the negative effects which stormwater drainage and development activities might have on the public health, safety and welfare. Examples of mitigation include compensatory storage, soil erosion and sedimentation control, and channel restoration.

200.25 Natural: Conditions resulting from physical, chemical, and biological processes without intervention by man.

200.26 One Hundred-Year Event: A rainfall, runoff, or flood event having a one percent chance of occurring in any given year.

200.27 Positive Drainage: Provision for overland paths for all areas of a property including depressional areas that may also be drained by storm sewer.

200.25 Natural: There are few truly natural stream reaches in northeastern Illinois or the entire state for that matter. Channel modification, treatment plant discharges, and urban runoff all have reduced the naturalness of Illinois streams. NIPC has placed high priority on the protection of natural features that remain on northeastern Illinois streams because of the beneficial uses they provide, including recreation, aquatic habitat, flood control and groundwater recharge.

200.26 One-hundred Year Event: It is important to note that the term "one-hundred year event" does not mean that only one such event will occur every one hundred years. The more correct way of thinking about such an event is that it will have a one percent chance of occurring in any given year. For example there is an 18 percent chance that two 100-year events will occur within any given 100 year period.

Another important point is that the magnitude of such an event is a statistical estimate whose reliability depends on the size of the sample which is available for analysis and the variability of the data in that sample. In short, factors of safety are strongly encouraged when utilizing these estimates in drainage system design.

Finally, it is important to reiterate that the 100-year rainfall event does not equate to the 100-year runoff event. Antecedent soil moisture, temperature, and streamflow conditions can combine to turn the 25-year rainfall event into the 100-year flood event as in the 1986 flooding in northeastern Illinois.

200.28 Peak Flow: The maximum rate of flow of water at a given point in a channel or conduit.

200.29 Property: A parcel of real estate.

200.30 Regulatory Floodway: The channel, including on-stream lakes, and that portion of the flood plain adjacent to a stream or watercourse as designated by the IDNR/OWR, which is needed to store and convey the existing and anticipated future 100-year frequency flood discharge with no more than a 0.1 foot increase in stage due to the loss of flood conveyance or storage, and no more than a 10% increase in velocities. The regulatory floodways are designated for ____ (stream) on the Flood Boundary and Floodway Map prepared by FEMA (or Department of Housing and Urban Development) and dated ____ and for ____ (stream) on the Regulatory Flood Plain Map prepared by the IDNR/OWR and dated _____. The regulatory floodways or those parts of unincorporated County that are within the extraterritorial jurisdiction of the (City, Village) that may be annexed into the (City, Village) are designated for ____ (stream) on the Flood Boundary and floodway map prepared by the FEMA (or Department of Housing and Urban Development) and dated _____. To locate the regulatory floodway boundary on any site, the regulatory floodway boundary should be scaled off the regulatory floodway map and located on a site plan, using reference marks common to both maps. Where interpretation is needed to determine the exact location of the regulatory floodway boundary, the Division should be contacted for the interpretation.

200.31 Retention Basin: A facility designed to completely retain a specified amount of stormwater runoff without release except by means of evaporation, infiltration, emergency bypass or pumping.

200.32 Sedimentation: The process that deposits soils, debris, and other materials either on other ground surfaces or in bodies of water or stormwater drainage systems.

200.33 Stormwater Drainage System: All means, natural or man-made, used for conducting stormwater to, through or from a drainage area to the point of final outlet from a property. The stormwater drainage system includes but is not limited to any of the following: conduits and appurtenance features, canals, channels,

200.30 Regulatory Floodway: This definition is only applicable to Cook, DuPage, Kane, Lake, McHenry, and Will counties and is the result of Public Act 85-905.

200.31 Retention Basin: This term is sometimes used by others to describe a wet bottom basin. That usage is different from that intended in this ordinance.

ditches, streams, culverts, streets, storm sewers, detention basins, swales and pumping stations.

200.34 Stormwater Runoff: The waters derived from melting snow or rain falling within a tributary drainage basin which are in excess of the infiltration capacity of the soils of that basin, which flow over the surface of the ground or are collected in channels or conduits.

200.35 Storm Sewer: A closed conduit for conveying collected stormwater.

200.36 Time of Concentration: The elapsed time for stormwater to flow from the most hydraulically remote point in a drainage basin to a particular point of interest in that watershed.

200.37 Tributary Watershed: all of the land surface area that contributes runoff to a given point.

200.38 Two-year Event: A runoff, rainfall, or flood event having a fifty percent chance of occurring in any given year.

200.39 Urban Runoff Pollutants: Contaminants commonly found in urban runoff which have been shown to adversely affect uses in receiving waterbodies. Pollutants of concern include sediment, heavy metals, petroleum-based organic compounds, nutrients, oxygen-demanding organics (BOD), pesticides, salt, and pathogens.

200.40 Wet Basin: A detention basin designed to maintain a permanent pool of water below the active storage zone for stormwater runoff.

200.41 Wetland Basin: A detention basin designed with all or a portion of its bottom area as a wetland.

200.34 Stormwater Runoff: The volume and rate of stormwater runoff produced by any rainfall event is a variable dependent on land cover capability to intercept and infiltrate the precipitation. As a result the probability of stormwater runoff volumes and rates are not the same as the probability of rainfall but rather are a function of the probability of antecedent soil moisture conditions and rainfall, as well as temperature (frozen ground) and land cover conditions.

200.39 Urban Runoff Pollutants: Adverse effects of runoff pollutants include toxicity to fish and aquatic life, sediment contamination, excessive growth of aquatic plants (eutrophication), impairment of water supplies, beach closings, and destruction of sensitive wetland plant communities.

200.41 Wetland Basin: While some of the bottom area of a wetland basin can be used for recreational purposes (similar to a dry basin), a substantial portion will be vegetated as a wetland and/or excavated as a stilling basin.

300.0 Applicability

This ordinance shall apply to all development in the (County, City, Village) of _____.

400.0 Drainage Plan Submittal Requirements

Each applicant shall submit the following information, depending on development size, to ensure that the provisions of this ordinance are met. The submittal shall include sufficient information to evaluate the environmental characteristics of the property, the potential adverse impacts of the development on water resources both on-site and downstream, and the effectiveness of the proposed drainage plan in managing stormwater runoff. The applicant shall certify on the drawings that all clearing, grading, drainage, and construction shall be accomplished in strict conformance with the drainage plan. The following information shall be submitted for both existing and proposed property conditions.

Properties smaller than 10 acres shall submit only the

300.0 Applicability

It is important that all properties within the local government's jurisdiction be treated equitably which suggests the need for uniform applicability of regulations.

However, special considerations may be necessary for smaller development sites where very small detention basins would result from the requirements of this ordinance. The necessarily small outlets of these basins could result in a greater likelihood of operational and maintenance problems.

Communities are encouraged to establish a master drainage plan which provides for regional detention sites and facilities at strategic points in the community's watersheds so that properties not providing on-site detention are still controlled at regional sites. This would require the establishment of a fee-in-lieu of detention system for properties not building on-site detention and a means for collecting and spending these fees, purchasing land for regional basins, constructing regional detention basins and participating in up-sizing detention basins to regionalize their function ("opportunity regionalization," see Section 800).

Communities should remain cognizant of their legal responsibilities to ensure that new development will not damage downstream properties. It is likely that even a one-acre commercial site will cause downstream drainage problems if not adequately mitigated. The ordinance therefore recommends that a community review small site exceptions on a case by case basis.

400.0 Drainage Plan Submittal Requirements

The drainage plan is the essence of the application for a permit to construct. The intent is for the drainage plan to depict existing drainage and environmental (wetlands, watercourses, floodplains, floodways) features on the property and then to define how the applicant intends to modify and/or utilize those features to accommodate the drainage needs for the development. Requirements are divided between small developments whose individual impacts are not likely to be major and larger properties where more detailed analysis of onsite and offsite impacts is warranted.

Properties smaller than one acre should be evaluated for

Basic Drainage Plan called for in Section 401.0. Properties larger than 10 acres shall comply with the submittal requirements of both the Basic Drainage Plan and the Advanced Drainage Plan of Section 402.0.

drainage plan submittal requirements by the zoning administrator. If it is determined that the impact of the proposed development is insignificant, detailed submittals may be waived.

401.0 Basic Drainage Plan

401.1 Topographic Map: A topographic survey of the property at one-foot contours under existing and proposed conditions, and areas upstream and downstream, necessary to determine off-site impacts of the proposed drainage plan. The map shall be keyed to a consistent datum specified by the (County, City, Village).

401.1 Topographic Map: Local governments should substitute whatever contour interval they would normally require in reviewing plats. However, intervals greater than two feet may lead to the inability to accurately judge drainage plan effectiveness particularly for smaller sites.

401.2 Drainage System: Mapping and descriptions, where relevant, of existing and proposed drainage system features of the property and immediate vicinity including:

- a) the banks and centerline of streams and channels;
- b) shoreline of lakes, ponds, and detention basins;
- c) farm drains and tiles;
- d) sub-watershed boundaries within the property;
- e) watershed soils classifications;
- f) the property's location within the larger watershed;
- g) location, size and slope of stormwater conduits and drainage swales;
- h) sanitary or combined sewers;
- i) depressional storage areas;
- j) delineation of upstream and downstream drainage features and watersheds which might be affected by the development;
- k) detention facilities;
- l) roads and streets and associated stormwater inlets;
- m) base flood elevation, and regulatory floodway where identified for the property; and
- n) basis of design for the final drainage network components.
- o)

401.3 Environmental Features: A depiction of environmental features of the property and immediate vicinity including the following:

- a) the limits of wetland areas;
- b) any designated natural areas; and
- c) any proposed environmental mitigation features.

401.3 Environmental Features: Consistent with the comprehensive stormwater management intent of this ordinance, a full depiction of existing and proposed environmental features is required as part of the drainage plan. Proposed measures to mitigate impacts of development on these features is also required.

402.0 Advanced Drainage Plan

402.0 Advanced Drainage Plan

The same information as required in Section 401.0 is required for properties larger than 10 acres along with the following additional information for the minor drainage system's design runoff event and the 100-year runoff event of critical duration:

- a) elevations and maps of 100-year flooding;
- b) cross-section data for open channel flow paths and designated overland flow paths;
- c) direction of storm flows;
- d) flow rates and velocities at representative points in the drainage system; and
- e) a statement by the design engineer of the drainage system's provisions for handling events greater than the 100-year's runoff.

500.0 Minimization of Increases in Runoff Volumes and Rates

In the preparation of a site design and drainage plan for a development, the applicant shall evaluate and implement, where practicable, site design features which minimize the increase in runoff volumes and rates from the site. The applicant's drainage plan submittal shall include evaluations of site design features which are consistent with the following hierarchy:

- 1) Preserve natural resource features of the development site (e.g., native woodlands, prairie remnants, wetlands, and floodplains);
- 2) Preserve existing natural swales, drainageways, streams, and depressions;
- 3) Minimize impervious surfaces on the property, consistent with the needs of the project (e.g., reduce road widths, minimize driveway length and width, share driveways, cluster houses);
- 4) Preserve the natural infiltration characteristics of the site and incorporate designed infiltration devices (e.g., trenches and basins), where feasible;
- 5) Attenuate surface runoff flows by use of open vegetated swales and natural depressions and preserve existing natural stream channels;
- 6) Provide stormwater retention structures;
- 6) Provide wet bottom or wetland detention structures

The intent of this section of the drainage plan is to demonstrate that the applicant's design takes into account the extent of flooding on the property for a full range of conditions, that velocities within the drainage system will not be dangerous or erosive, and that flow patterns to any detention facility are identified. The referenced critical duration is the duration of the design event which results in the greatest peak flows at a given point in the drainage system. Local governments should substitute the design event they require for the minor drainage system (storm sewers, etc.) into the ordinance language.

500.0 Minimization of Increases in Runoff Volumes and Rates

Conventional site designs incorporate features that seek to rapidly drain surface stormwater runoff from the site as a waste product. The approach recommended in this ordinance seeks to maximize the natural infiltration of precipitation and minimize the generation of surface stormwater runoff, mimicking as closely as practicable the natural drainage characteristics of the site prior to development.

Local governments should carefully evaluate the hierarchy recommended in the model ordinance for applicability to their situations. Some communities may find certain alternative site design and natural drainage approaches volume control and swale drainage difficult to implement on some sites due to topographical, soil, and building density constraints. However, many all communities, particularly those experiencing development in previously rural watersheds, may should be able to apply adapt this hierarchy to achieve better control of both stormwater quantity and quality. Land developers may also benefit from the lower costs of drainage systems which rely less on storm sewers and large detention basins.

It is important to recognize that certain infiltration practices such as dry wells will require a Class V injection well permit from IEPA. The Illinois Groundwater Protection Act also has resulted in the establishment of setback zones around community wells which need to be observed when siting certain infiltration practices (e.g., for industrial facilities) which could be considered

to slow the rate of runoff and reduce runoff pollutants leaving the site; and

- 7) Construct storm sewers.

600.0 Water Quality and Multiple Uses

The drainage system should be designed to minimize adverse water quality impacts downstream and on the property itself. Detention basins shall incorporate design features to capture stormwater runoff pollutants. In particular, designers shall utilize wet bottom and wetland detention designs and all flows from the development shall be routed through the basin (i.e., low flows shall not be bypassed). Retention and infiltration of stormwater shall be promoted throughout the property's drainage system to reduce the volume of stormwater runoff and to reduce the quantity of runoff pollutants.

The drainage system should incorporate multiple uses, where practicable. Uses considered compatible with stormwater management include open space, aesthetics, aquatic habitat, recreation (boating, trails, playing fields), wetlands and water quality mitigation.

potential pollution sources.

600.0 Water Quality and Multiple Uses

~~Local governments should add language to this section to note that federal National Pollutant Discharge Elimination System (NPDES) permit requirements may apply to construction activities on the property. Final regulations are expected to be available in mid-1990 and would mandate implementation of stormwater quality management practices for land development activities.~~

Stormwater system designs should be in conformance with Illinois EPA stormwater permitting requirements. In particular, a state National Pollutant Discharge Elimination System (NPDES) Permit for Construction Site Activities is required for land disturbances of five or more acres. (Soon, the requirement will apply to sites of one or more acres, as part on NPDES Phase 2.) Permit requirements for a "stormwater pollution prevention plan" specifically reference the need for stormwater detention, vegetated swales and natural depressions, infiltration measures, and velocity dissipation devices to control runoff pollutants and to maintain pre-development hydrologic conditions.

Good drainage system design strives to develop a drainage plan which accomplishes the safe conveyance and storage of stormwater from a property while also achieving the multiple objectives of water quality, recreation, open space, and aesthetics. While recreation is encouraged, particularly for residential sites, water contact activities (e.g., swimming) generally should be discouraged in detention basins due to the occurrence of potential human pathogens (i.e., fecal coliform bacteria) in stormwater runoff.

The design philosophy of this ordinance recognizes a tradeoff. By isolating runoff pollutants in facilities like sediment basins, and preventing them from impairing uses in downstream waterbodies, the use of certain stormwater facilities may be constrained. However, pollutant control is greatly facilitated and the burden for mitigating development impacts is placed on developers and new residents rather than on society as a whole. Local use constraints can be minimized by certain non-structural BMPs, such as source control programs for

residents.

700.0 Design Criteria, Standards, and Methods

701.0 Release Rates - The drainage system for a property shall be designed to control the peak rate of discharge from the property for the two-year, 24-hour and 100-year, 24-hour events to levels which will not cause an increase in flooding or channel instability downstream when considered in aggregate with other developed properties and downstream drainage capacities. The peak discharge from events less than or equal to the two-year event shall not be greater than 0.04 cfs per acre of property drained. The peak 100-year discharge shall not be greater than 0.15 cfs per acre of property drained.

700.0 Design Criteria, Standards, and Methods

Local governments may wish to modify or add language to this section depending on their local conditions or needs. For example, if local governments wish to adopt a design recurrence other than the 10-year event for storm sewer design, it should be substituted wherever the 10-year event requirement appears.

701.0 Release Rates - In the absence of a detailed watershed-specific planning study, it is felt that these release rates, in combination with the ordinance storage requirements, will be effective in 1) limiting 100-year flooding to existing conditions and 2) controlling flooding to existing conditions for events less than the 100-year event. The recommended release rates are based in part on the results of a study of detention effectiveness in a 30-square mile watershed. The study results indicate that the recommended release rates likely will be effective for larger watersheds, but larger watersheds have not been explicitly evaluated.

The recommended 100-year release rate of 0.15 cfs/acre is the same as that recommended in NIPC's previous detention ordinance (dated March 1980) which was based on observed maximum recorded streamflows in northeastern Illinois.

The two-year release rate criteria is intended to control the magnitude, frequency, and duration of bankfull streamflows downstream of the property. Urbanization without detention control of the two-year event results in dramatic increases (200 percent) in the magnitude of the 2-year event and frequency of bankfull conditions resulting in stream destabilization. This leads to streambed and bank erosion and damages, both economic and environmental.

The two-year, 24-hour event release rate requirement also will provide additional settling time to remove suspended stormwater pollutants. About 80 percent of the long term runoff volume from a watershed results from events less than or equal to this two-year event. Small events (0.1 to 0.2 inches of runoff) will likely be detained for at least 5 to 10 hours and larger runoffs (1 inch or more) will receive detention times exceeding 24 hours.

701.1 Detention Basin Outlet Design: Backwater on the outlet structure from the downstream drainage system shall be evaluated when designing the outlet.

702.0 Detention Storage Requirements - The design maximum storage to be provided in a detention basin shall be based on the runoff from the 100-year, 24-hour event and reservoir (also called modified puls or level pool) routing or equal. Detention storage shall be computed using hydrograph methods as described in this section.

703.0 Drainage System Design and Evaluation - The following criteria should be used in evaluating and designing the drainage system. The underlying objective is to provide capacity to pass the 10-year peak flow in the minor drainage system and an overload flow path for flows in excess of the design capacity.

703.1 Design Methodologies: Major and minor conveyance systems for areas up to 10 acres may be designed using the rational formula. The rational formula may also be used in sizing the minor drainage system for larger sites. Runoff hydrograph methods as described in Section 704.0 must be used for major drainage system design for all systems with greater than 10 acres of drainage area and for the design of all detention basins.

703.2 Positive Drainage: Whenever practicable, all areas of the property must be provided an overland flow path that will pass the 100-year flow at a stage at least 1

Control of the two-year release rate to 0.04 cfs/acre likely will result in longer detention times than most existing ordinances. As a result, special design features should be considered to avoid maintenance and operational problems.

701.1 Detention Basin Outlet Design: If downstream conditions are not considered when determining the capacity of the outlet structure, the detention basin may fill quicker and release a higher peak discharge through the overflow structure than required by the ordinance.

702.0 Detention Storage Requirements - The requirements of this ordinance will result in substantially larger storage volumes than typically required by most existing ordinances. NIPC's study of detention effectiveness indicated that detention basins designed using traditional assumptions of rainfall (i.e. T.P.40) and the simple runoff relationships of the modified rational formula will have too little storage and will likely overflow for events much smaller than the 100-year event.

If use of the modified rational formula is to be allowed (which is extremely discouraged), the 100-year event of critical duration should be specified when the modified rational formula is used, durations of less than 24 hours are often critical.

703.0 Drainage System Design and Evaluation - The local government should substitute the design event they require for minor drainage systems (storm sewers, swales, etc.).

703.1 Design Methodologies: The rational formula is an adequate design tool for small conveyance systems but is not appropriate for larger sites or for the design of detention basins. More sophisticated hydrograph methods are widely available and are relatively easy to apply using personal computers.

703.2 Positive drainage is provided to prevent flooding when the design capacity of the minor conveyance system is exceeded. Positive drainage also makes

foot below the lowest foundation grade in the vicinity of the flow path. Overland flow paths designed to handle flows in excess of the minor drainage system capacity shall be provided drainage easements. Street ponding and flow depths shall not exceed curb heights by more than one inch.

704.0 Methods for Generating Runoff Hydrographs - Runoff hydrographs shall be developed incorporating the following assumptions of rainfall amounts and antecedent moisture.

704.1 Rainfall: Unless a continuous simulation approach to drainage system hydrology is used, all design rainfall events shall be based on the Illinois State Water Survey's Bulletin 70. The first quartile point rainfall distribution shall be used for the design and analysis of conveyance systems with critical durations less than or equal to 12 hours. The third quartile point rainfall distribution shall be used for the design and analysis of detention basins and conveyance system with critical durations greater than 12 and less than or equal to 24 hours. The fourth quartile distribution shall be used in the design and analysis of systems with durations greater than 24 hours. The first, third, and fourth quartile distributions described by Huff are presented in Table 37 of Bulletin 70. The SCS Type II distribution may be used as an alternate to the Huff distributions.

accurate calculation of peak flows for conveyance system sizing less critical.

704.0 Methods for Generating Runoff Hydrographs - The following hydrologic design procedures are considered acceptable for generation of hydrographs: Corps of Engineers HEC-1, Soil Conservation Service TR-20 (and TR-55, subject to rainfall distribution modifications), Illinois State Water Survey ILLUDAS, U.S. EPA's SWMM, and continuous simulation (e.g., HSPF).

A community may wish to select one of these models as the preferred approach to provide consistency in plan submittals and to ease the burden of permit review.

704.1 Rainfall: Recent research by the Illinois State Water Survey on rainfall statistics for northeastern Illinois has led to the publication of Bulletin 70. This is the most accurate and up-to-date information available and should be the design standard. NIPC's study of detention effectiveness has indicated that detention designs relying on 100-year rainfall amounts from the U.S. Weather Bureau's Technical Paper No. 40 will overflow for runoff events substantially smaller than the 100-year event.

Bulletin 70 reports a 100-year, 24-hour rainfall amount of 7.6 inches as the regional average for northeastern Illinois, but also indicates greater and lesser amounts on regional isohyetal maps. It is recommended that the ordinance specify design rainfall amounts which are the larger of the Bulletin 70 regional average and the local isohyetal amount to provide a conservative design.

The Huff rainfall distribution is particularly applicable to northeastern Illinois storms but is also an integral part of ILLUDAS. It is important to note that TR-55 assumes SCS Type II rainfall distribution.

704.2 Antecedent Moisture: Computations of runoff hydrographs which do not rely on a continuous accounting of antecedent moisture conditions shall assume a conservative wet antecedent moisture condition as a minimum.

704.2 Antecedent Moisture: It is important that local governments stipulate what design assumptions they will allow concerning antecedent moisture conditions and the ability of pervious areas to abstract rainfall. The ordinance should specify minimum antecedent moisture conditions for approved models. (Eg., SCS TR-20 and TR-55 - antecedent moisture condition two; ILLUDAS - ILLUDAS number 3, "rather wet").

705.0 Wet Detention Basin Design - Wet detention basins shall be designed to remove stormwater pollutants, to be safe, to be aesthetically pleasing, and as much as feasible to be available for recreational use.

705.1 Wet Basin Depths: Wet basins shall be at least three feet deep, excluding nearshore ~~banks zones~~ and safety ledges. If fish habitat is to be provided, basins shall be at least ten feet deep over twenty-five percent of the bottom area to prevent winter freeze-out.

705.1 Wet Detention Basin Depths: Wet basins need to be deep enough to discourage emergent aquatic plant growth in interior areas intended to be open water, unless wetland creation is envisioned by the local government. Local governments wishing to encourage wetland recreation should change this section to allow shallower depths in the interior of the basin as needed for the establishment of wetland vegetation. The fish habitat recommendations were developed by the Illinois Department of Conservation.

To facilitate future maintenance needs of wet basins, stilling/sedimentation basins (similar to section 706.4) may be required to isolate large sediment particles in a manageable area for dredging.

705.2 Wet Basin Shoreline Slopes: The side slopes of wet basins ~~at the normal pool elevation~~ shall not be steeper than ~~5 to 1~~ 10 to 1 (horizontal to vertical) from one foot above the normal pool stage to at least one foot below the normal pool stage.

705.2 Wet Basin Shoreline Slopes: Flat side slopes are important in preventing shoreline erosion due to wave action and fluctuating water levels. The recommended 10:1 shoreline slope will provide for a relatively flat underwater safety shelf with a minimum width of at least 10-feet around the periphery of the basin. The shelf will have an average depth of six inches and a maximum depth of 12 inches below the normal pool stage to facilitate the growth of emergent wetland vegetation.

Appropriate soil conditions shall be provided in this shoreline zone. First, compaction of both subsoil and topsoil shall be minimized (i.e., to less than 275 psi). Where subsoil compaction cannot be avoided, it should be disced to a depth of 6 - 8 inches with a chisel plow before spreading topsoil. Second, a suitable uncompacted topsoil, at a minimum thickness of one foot, shall be spread to provide a suitable growing medium for aquatic plants. Coarse soils with minimal clay content and a high organic content are recommended.

A critical consideration in site preparation is the provision of an adequate growing medium for new plants. Because construction of stormwater facilities typically requires extensive grading, resultant soils become highly disturbed and unsuitable for planting. *The Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois* provides additional recommended guidance on soil preparation.

Upper slopes of detention basins (higher than one foot above normal stage) should be no steeper than 4:1.

(Flatter slopes (i.e., 5:1) are preferred to enhance plant establishment and to facilitate long-term maintenance.)

705.3 Shoreline Vegetation: Water tolerant native vegetation shall be used to landscape the shorelines of wet detention facilities. The selected plants and planting methods shall conform to the soils, hydrology, and water quality conditions present in such facilities, with plants being tolerant of highly variable hydrologic conditions and degraded water quality (e.g., high turbidity and salinity content). Plant selection should conform to the guidance in the *Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois* (NRCS et al, 1998), which is hereby adopted by reference.

Native vegetation is recommended, but not required, for side slopes (higher than one foot above normal stage) of all detention facilities.

705.4 Permanent Pool Volume: The permanent pool volume in a wet basin at normal depth shall be equal to the runoff volume from its watershed for the two-year event.

705.5 Inlet and Outlet Orientation: To the extent feasible, the distance between detention inlets and outlets shall be maximized. If possible, they should be at opposite ends of the basin. There should be no low flow bypass between the inlet and outlet.

706.0 ~~Dry Wetland~~ Detention Basin Design - In addition to the other requirements of this ordinance, ~~dry wetland~~ basins shall be designed to remove stormwater

705.3 Shoreline Vegetation: Native vegetation is recommended in shoreline zones for several reasons. 1) It provides soil stability in a zone where conventional turf is prone to failure. 2) It aids in pollutant removal/transformation. 3) It can significantly limit nuisance goose populations, and associated water quality and nuisance problems. 4) It provides aquatic and wildlife habitat. 5) It is relatively inexpensive to maintain.

The *Native Plant Guide* provides recommended plantings for three detention basin zones (emergent, saturated, and upland). Guidance on plant and seed installation, including optimal time of year, also is provided. Planting can be done with live plants and/or seeds. Use of live plants, tubers, or root stock is preferred in shoreline zones and shallow ponded areas of detention basins, and in other areas prone to frequent inundation, because it results in rapid establishment of stabilizing vegetative cover. It is desirable to install most live plants, tubers and root stock in the spring or early summer (i.e., before summer dry periods) to allow for effective root establishment before the following winter.

Finally, areas newly planted with live plants or seeds generally need to be protected from predation, particularly by Canada geese. Protection in the form of "goose cages," or similar devices that fence out plant predators, is particularly important in emergent wetland zones and areas adjacent to significant open water.

705.4 Permanent Pool Volume: The pool volume needs to be sufficient so that incoming stormwater will generally just displace resident pool water resulting in longer detention times and better settling of suspended stormwater pollutants.

705.5 Inlet and Outlet Orientation: Maximizing the distance between inlets and outlets will prevent the short-circuiting of flows through a basin. Short-circuiting is counter productive to the removal of stormwater pollutants. Short-circuiting can also be avoided by the use of baffles or berms in the basin bottom.

706.0 ~~Dry Wetland~~ Detention Basin Design - The use of conventional dry basins ~~will be complicated~~ is generally not consistent with the nonpoint source

pollutants, to be safe, to be aesthetically pleasing and, where feasible, to be available for multiple uses.

pollution control objectives of this ordinance. Wetland basins have been shown to be much more effective at removing nonpoint source pollutants. Further, by the more restrictive low flow release rates this model ordinance requires will result in extended detention times and longer durations of standing water that will preclude the establishment of turf grass in much of the basin bottom. Detention times will increase relative to most existing ordinance requirements and a larger percentage of storms will be detained resulting in standing water for longer periods of time.

Dry Wetland basin designs should recognize this fact and address it by planning to minimize the amount of basin area which has standing water by creating "wet" and "dry" zones within the basin are intended to maximize the opportunity to remove/transform nonpoint source pollutants while providing for aesthetics, wildlife habitat, and, where feasible, recreational uses. Larger wetland basins can be designed to include zones that will normally be dry and that can be used for recreational purposes (e.g., ball fields).

706.1 Wetland Basin Grading: The side slopes of wet basins (from one foot above the normal pool stage to at least one foot below the normal pool stage) and the basin bottom shall not be steeper than 10 to 1 (horizontal to vertical). Steeper slopes are permitted in settling basins and open water zones near the basin outlet.

706.1 Wetland Basin Grading: As for wet basins, flat side slopes are important in preventing shoreline erosion due to wave action and fluctuating water levels, and in establishing wetland vegetation. Depths in wetland basins should be no greater than one foot in zones where emergent wetland vegetation is desired. Depths greater than approximately one foot generally will result in open water zones.

Appropriate soil conditions shall be provided in the shoreline zone and basin bottom. First, compaction of both subsoil and topsoil shall be minimized (i.e., to less than 275 psi). Where subsoil compaction cannot be avoided, it should be disced to a depth of 6 - 8 inches with a chisel plow before spreading topsoil. Second, a suitable uncompacted topsoil, at a minimum thickness of one foot, shall be spread to provide a suitable growing medium for aquatic plants. Coarse soils with minimal clay content and a high organic content are recommended.

As indicated in the guidance for wet basins, soil preparation is critical in shoreline and shallow water zones. Useful guidance is found in the *Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois*.

Upper slopes of detention basins (higher than one foot above normal stage) should be no steeper than 4:1. (Flatter slopes (i.e., 5:1) are preferred to enhance plant establishment and to facilitate long-term maintenance.)

706.2 Wetland Vegetation: Water tolerant native vegetation shall be used to landscape the shorelines and bottoms (non-open water areas) of wetland detention

706.2 Wetland Vegetation: Native wetland vegetation is intend to be the dominant landscaping material in the bottom and shoreline zones of wetland basins, for similar

facilities. The selected plants and planting methods shall conform to the soils, hydrology, and water quality conditions present in such facilities, with plants being tolerant of highly variable hydrologic conditions and degraded water quality (e.g., high turbidity and salinity content). Plant selection should conform to the guidance in the *Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois* (NRCS et al, 1998), which is hereby adopted by reference.

Native vegetation is recommended, but not required, for side slopes (higher than one foot above normal stage) of all detention facilities.

706.1 Dry Basin Drainage: Dry basins shall be designed so that eighty percent of their bottom area shall have standing water no longer than seventy-two hours for any runoff event less than the 100-year event. Underdrains directed to the outlet control shall be used if necessary to accomplish this requirement.

706.3 Velocity Dissipation Stilling/Sedimentation Basins: Wetland detention basins should be constructed with sediment basins or forebays at all major inlets to the basins. The volume of the basins should be at least 500 cubic feet per acre of impervious surface in the drainage area. Side slopes below one foot of depth should be no steeper than 3 to 1 (horizontal to vertical) and basin depth should be at least 3 feet and designed to allow access for sediment removal equipment. Velocity dissipation measures shall be incorporated into dry basin designs to minimize erosion at inlets and outlets and to minimize the resuspension of pollutants.

706.4 Inlet and Outlet Orientation: To the extent feasible, the distance between detention inlets and outlets shall be maximized. If possible, they should be at opposite ends of the basin. There should be no low flow bypass between the inlet and outlet and paved low flow channels shall not be used.

reasons described for wet basin shorelines. The *Native Plant Guide* provides extensive guidance on plant selection, installation, and protection from predation.

706.1 Dry Basin Drainage: It is very important that dry basins not have standing water unintentionally as a result of poor drainage because of aesthetic and maintenance considerations. The maximum inundation time of 72 hours was chosen to ensure the viability of grass based on recommendations received from NIPC's Stormwater Management Technical Advisory Committee. Two-level designs for dry basins should be considered. The lower wetter portion may be managed as a wetland and should be maintained over time to remove accumulated sediment.

706.3 Stilling/Sedimentation Basins: These basins are intended to both dissipate the erosive energy of stormwater inlets and settle out large sediment particles in an isolated area to facilitate future maintenance. The recommended design volume is based on the objective of removing 50 percent of the annual suspended solids load. While most fine sediment particles will pass through this basin, most of the larger solids will settle. Sediment removal will be required infrequently. Sediment quality will be similar to street sweeping debris and disposal should be handled accordingly.

706.4 Inlet and Outlet Orientation: Maximizing the distance between inlets and outlets will prevent the short-circuiting of flows through a basin. short-circuiting is counter productive to the removal of stormwater pollutants. Short-circuiting can be avoided by designing elongated basins (ideal length:width ratio of at least 3:1), or by the use of baffles or berms in the basin bottom. Because low flows and the "first flush" of storm runoff often contain the most concentrated pollutants, it is critical that all flows be routed through the basin to provide opportunities for effective pollutant removal.

707.0 Minimum Detention Outlet Size - Where a single pipe outlet or orifice plate is to be used to control discharge, it shall have a minimum diameter of 4 inches.

If this minimum orifice size permits release rates greater than those specified in this section, and regional detention is not a practical alternative, alternative outlet designs shall be utilized which incorporate self cleaning flow restrictors.

708.0 Detention in Floodplains -The placement of detention basins within the floodplain is strongly discouraged because of questions about their reliable operation during flood events. However, the stormwater detention requirements of this ordinance may be fulfilled by providing detention storage within flood fringe areas on the project site provided the following provisions are met.

708.1 Detention in Flood Fringe Areas: The placement of a detention basin in a flood fringe area shall require compensatory storage for 1.5 times the volume below the base flood elevation occupied by the detention basin including any berms. The release from the detention storage provided shall still be controlled consistent with the requirements of this section. The applicant shall demonstrate its operation for all streamflow and floodplain backwater conditions. Excavations for compensatory storage along watercourses shall be opposite or adjacent to the area occupied by detention.

All floodplain storage lost below the ten-year flood elevation shall be replaced below the ten-year flood elevation. All floodplain storage lost above the existing ten-year flood elevation shall be replaced above the proposed ten-year flood elevation. All compensatory storage excavations shall be constructed to drain freely and openly to the watercourse.

708.2 Detention in Floodways: Detention basins shall be placed in the floodway only in accordance with 708.3.

707.0 Minimum Detention Outlet Size - Use of single orifices smaller than 4 inches may result in operating difficulties due to obstructions. If design release rates call for outlets smaller than this, self cleaning flow restrictors such as perforated risers should be utilized. This situation likely will occur for small sites, particularly those less than 5 acres in drainage area.

708.0 Detention in Floodplains -Detention in floodplains requires additional design criteria if the environmental and flood storage and conveyance functions of the floodplain are to be preserved.

708.1 Detention in Flood Fringe Areas: Detention in flood fringe areas can present great design difficulties in preventing streamflows from backing up into the basin and in being able to discharge a property's runoff during flood stages on the stream. Allowing detention in the flood fringe requires careful review of final design and a community may find it better to not allow it at all. It is important to note that merely adding additional flood fringe storage equivalent to the stormwater detention volume needed for the property is not acceptable unless the rate at which it enters the flood fringe is also controlled consistent with this section.

708.2 Detention in Floodways: Detention basins are not an appropriate use for floodway construction as defined by 92 Illinois Administrative Code, Part 708. NIPC policy also recommends against location of detention facilities in the floodway because of serious questions about their ability to meet this ordinance's requirements over the full range of flood stages which will occur in such a location. For example if the outlet of a basin is submerged during a flood event, release from the basin will be controlled by the backwater condition. If the flood stage is high enough no discharge may occur from the basin until overflow from the basin spillway occurs, at a rate considerably higher than that

specified by this ordinance.

NIPC also has serious concerns about the impact of placing basins in the floodway in light of the fact that current floodway boundaries are likely underestimated by steady state modeling techniques which may not adequately consider the effects of lost storage. Placement of any structure in the floodway, even if existing cross-sectional area and storage are maintained, may cause unexpected problems.

Finally, it is very difficult to successfully prevent short term environmental impacts associated with any construction in the floodway. For this reason NIPC recommends against any avoidable construction in floodway areas.

708.3 On-stream Detention: On-stream detention basins are discouraged but allowable if they provide regional public benefits and if they meet the other provisions of this ordinance with respect to water quality and control of the two-year and 100-year, 24-hour events from the property. Further criteria are presented in Section 800.0 of this ordinance.

If on-stream detention is used for watersheds larger than one square mile, it is recommended that the applicant use dynamic modeling to demonstrate that the design will not increase stage for any properties upstream or downstream of the property. Also, impoundment of the stream as part of on-stream detention:

- a. shall not prevent the migration of indigenous fish species, which require access to upstream areas as part of their life cycle, such as for spawning,
- b. shall not cause or contribute to the degradation of water quality or stream aquatic habitat,

708.3 On-stream Detention: NIPC policy discourages the modification of streams to construct on-stream detention basins unless they are designed to provide regional public benefits and their adverse environmental impacts are mitigated. On-stream detention basins may have a very difficult time meeting the release rate requirements of this section unless they are in the headwaters of a stream. This is because the time of concentration of an individual property is dramatically less than the time of concentration for an entire upstream watershed. As a result peak discharges from an individual property will pass through on-stream facilities relatively undetained well before upstream flood peaks arrive. This can result in downstream flood peaks being larger than if off-stream detention were applied.

The environmental criteria are provided in an effort to mitigate the impacts of on-stream detention on beneficial stream uses. The interruption of free-flowing stream reaches, by weirs and dams designed to produce on-stream detention, affects stream water quality in several ways.

The recommendation that dynamic modeling be performed for watersheds larger than one square mile is based on the concern that on-stream detention perform as effectively as off-stream detention as discussed above. The one-square mile cutoff was selected because watersheds larger than this will fall under IDNR/OWR permitting requirements and so the need to furnish additional data on potential impacts will be anticipated by developers.

Dynamic modeling, incorporating continuous simulation hydrologic modeling, can assess a full range of storm types, temporal and spatial distributions and antecedent moisture conditions. Gradually varied, unsteady flow hydraulics are needed to accurately assess the complex interactions of storage and conveyance which on-stream structures frequently present.

- a. The change from a free-flowing reach to a reservoir can adversely impact existing fish life and habitat.
- b. The slowing of in-stream flow velocities can reduce reaeration and the ability of the stream to assimilate organic pollutant loads. Sediment and pollutant deposition also is encouraged behind impoundments, leading to a potential in-stream water quality problem.

- c. shall include a design calling for gradual bank slopes, appropriate bank stabilization measures, and a pre-sedimentation basin,
- d. shall not involve any stream channelization or the filling of wetlands,
- e. shall require the implementation of an effective nonpoint source management program throughout the upstream watershed which shall include at a minimum: runoff reduction BMPs consistent with Section 500.0 of this ordinance; 2-year detention/sedimentation basins for all development consistent with Section 709.4; and a program to control nonpoint sources at the source for prior developments constructed without appropriate stormwater BMPs,
- f. shall not occur downstream of a wastewater discharge, and
- g. shall comply with 92 Illinois Administrative Code Parts 702 and 708 and the floodplain ordinance of (County, City, Village of _____).

709.0 Drainage into Protection of Wetlands and Depressional Storage Areas: Wetlands and other depressional storage areas shall be protected from damaging modifications and adverse changes in runoff quality and quantity associated with land developments. In addition to the other requirements of this ordinance, the following requirements shall be met for all developments whose drainage flows into wetlands and other depressional storage areas:

Channel modification is frequently a part of on-stream detention projects and this results in direct destruction of stream habitat.

e. Streams, wetlands, and other waters of the U.S. are not intended to be modified to become sinks or depositional zones for controllable nonpoint source pollution. Where regional, on-stream detention is determined to be in the public interest, nonpoint source BMPs must be implemented in the upstream watershed to minimize adverse water quality impacts. In addition to structural BMPs, watershed residents should be educated about the need to manage nonpoint impacts at the source through effective controls on discharges of household chemicals, used motor oil, and pesticides.

709.0 Drainage into Protection of Wetlands and Depressional Storage Areas: Wetlands provide valuable habitat, water quality, and hydrologic functions which may be adversely affected by development activities. Adverse impacts can result from direct modifications, the introduction of urban runoff pollutants, as well as changes in runoff rates. Changes in hydrology, in particular, can affect the delicate balance which exists in sensitive wetlands and result in loss of habitat diversity. For these reasons, wetlands should be protected from urban runoff changes by the measures specified in this ordinance and moderate to high quality wetlands should not be modified to accommodate stormwater detention.

Non-wetland depressional storage areas are areas in the pre-development landscape (e.g., in farm fields) which are undrained or very poorly drained. While not providing important habitat values, these depressions often store considerable volumes of runoff for extended time periods (e.g., weeks) and provide important pollutant removal benefits.

709.1 Detention in Wetlands and Depressional Storage Areas: Existing wetlands shall not be modified for the purposes of stormwater detention unless it is demonstrated that the existing wetland is low in quality and the proposed modifications will maintain or improve its habitat and ability to perform beneficial functions. Existing depressional storage and release rate characteristics of in wetlands and other depressional storage areas shall be maintained and the volume of detention storage provided to meet the requirements of this section shall be in addition to this existing storage.

709.2 Sediment Control: The existing wetland shall be protected during construction by appropriate soil erosion and sediment control measures and shall not be filled.

709.3 Alteration of Drainage Patterns: Site drainage patterns shall not be altered to substantially decrease or increase the existing area tributary to the wetland.

709.4 Detention/Sedimentation: All runoff from the development shall be routed through a preliminary detention/sedimentation basin designed to capture the two-year, 24-hour event and hold it for at least 24 hours, before being discharged to the wetland. Basin design shall conform to the criteria for wet bottom or wetland basins contained in Sections 705 or 706. This basin shall be constructed before property grading begins. In addition, the drainage hierarchy defined in section 500.0 should be followed to minimize runoff volumes and rates being discharged to the wetland.

709.5 Vegetated Buffer Strip: A buffer strip of at least 25 feet in width, ~~preferably~~ vegetated with native plant species, shall be maintained or restored around the periphery of the wetland.

710.0 Street, Parking Lot, and Culvert Drainage

710.1 Streets: If streets are to be used as part of the minor or major drainage system, ponding depths shall not exceed curb heights by more than one inch and shall not remain flooded for more than eight (8) hours for any event less than or equal to the 100-year event.

709.1 Detention in Wetlands and Depressional Storage Areas: Low quality wetlands, with adequate protection and mitigation, can be beneficially utilized for detention, consistent with the mitigation requirements of this section. Low quality wetlands are those which have been substantially disturbed. This disturbance is usually reflected in a low diversity of habitat and the presence of only insensitive plant species (e.g., a monoculture of cattails). Certain modifications of low quality wetlands, such as the limited excavation of open water areas, may actually enhance their value. It is important, however, that the storage functions of wetlands and depressional storage areas be preserved, in addition to meeting the detention requirements of this ordinance.

709.2 Sediment Control: This provision is consistent with "Greenbook" recommendations for controlling soil erosion from disturbed sites.

710.1 Streets: Local governments should substitute whatever depth and duration of ponding their citizens are willing to tolerate. Since there are a variety of curb types in use with varying heights it is important that each local government tailor this section to its design stan-

710.2 Parking Lots: The maximum stormwater ponding depth in any parking area shall not exceed six (6) inches for more than four (4) hours.

710.3 Culvert Road and Driveway Crossings: Sizing of culvert crossings shall consider entrance and exit losses as well as tailwater conditions on the culvert.

711.0 Infiltration Practices - To effectively reduce runoff volumes, infiltration practices including basins, trenches, and porous pavement should be located on soils in hydrologic soil groups "A" or "B" as designated by the U.S. Soil Conservation Service. Infiltration basins and trenches designed to recharge groundwater shall not be located within seventy-five feet of a water supply well or a building foundation. A sediment settling basin shall be provided to remove coarse sediment from stormwater flows before they reach infiltration basins or trenches. Stormwater shall not be allowed to stand more than seventy-two hours over eighty percent of a dry basin's bottom area for the maximum design event to be ex-filtrated. The bottom of infiltration facilities shall be a minimum of four feet above seasonally high groundwater and bedrock.

711.a Vegetated Filter Strips and Swales: To effectively filter stormwater pollutants and promote infiltration of runoff, sites should be designed to maximize the use of vegetated filter strips and swales. Wherever practicable,

dards. It is also very important that local governments take into consideration curb cuts leading to garages below grade. Where street storage of runoff is considered, below grade parking should be prohibited.

710.2 Parking Lots: The use of parking lots to provide stormwater detention will be limited by the storage volume and detention time requirements of this ordinance. In addition, parking lot detention will provide little or no water quality benefits and is therefore discouraged as a primary source of detention. However, parking lot storage may be useful in providing supplementary storage for a traditional detention basin. In such an application, the parking lot may be located at a higher elevation than the detention basin bottom and would only store water for more extreme events (e.g., greater than 5 or 10-year recurrence interval).

710.3 Culvert Road and Driveway Crossings: Use of Mannings equation to size culverts does not account for the significant entrance and exit head losses. Federal Highway Administration culvert nomographs or more sophisticated backwater models are recommended, as appropriate.

711.0 Infiltration Practices - There is considerable potential for the use of infiltration practices in northeastern Illinois but their application must be carefully analyzed before they are implemented. Soil acceptability and the potential for groundwater contamination must be carefully assessed. Infiltration practices are also very sensitive to maintenance concerns, especially clogging by sediment. As a result pre-sedimentation basins to remove the bulk of any sediment load are recommended. Local governments should refer to publications from the state of Maryland and the Metropolitan Washington Council of Governments listed in this document's references for further information.

Local governments also need to be aware of IEPA Class V injection well permit requirements and setback zones from community wells established by the Illinois Groundwater Protection Act.

711.a Vegetated Filter Strips and Swales: Existing subdivision codes often discourage filter strips and swales by mandating curbs and gutters and direct discharge of runoff into storm sewers. A more effective, often lower-

runoff from impervious surfaces should be directed onto filter strips and swales before being routed to a storm sewer or detention basin. Native vegetation is recommended, but not required, for landscaping of filter strips and swales.

712.0 Safety Considerations - The drainage system components, especially all detention basins, shall be designed to protect the safety of any children or adults coming in contact with the system during runoff events.

712.1 Side Slopes: The side slopes of all detention basins at one-hundred year capacity shall be as level as practicable to prevent accidental falls into the basin and for stability and ease of maintenance. Side slopes of detention basins and open channels shall not be steeper than ~~three~~ four to one (horizontal to vertical).

712.2 Safety Ledge: All wet detention basins shall have a level safety ledge at least (four) feet in width (2.5 to three) feet below the normal water depth.

712.3 Velocity: Velocities throughout the surface drainage system shall be controlled to safe levels taking into consideration rates and depths of flow.

712.4 Overflow Structures: All stormwater detention basins shall be provided with an overflow structure capable of safely passing excess flows at a stage at least 1 foot below the lowest foundation grade in the vicinity of the detention basin. The design flow rate of the overflow

cost alternative is to route runoff through slotted curbs (or curb stops) onto vegetated strips. In this preferred design, many landscaped areas would occupy the lower portions of the site (e.g., rather than raised islands) and effectively filter and infiltrate stormwater from impervious surfaces. A simple application of a filter strip in a residential setting is a lawn which receives runoff from rooftops, driveways, and (ideally) streets. Swales are cost effective options to storm sewers in many settings, such as office campuses, industrial parks, low density single-family developments, and multifamily uses.

Both swales and filter strips are most effective when well vegetated, preferably with native vegetation, and when slopes are relatively flat.

712.0 Safety Considerations - Safety of stormwater drainage system components is always a principal design criteria. The local government should avoid the use of fencing around detention basins by designing safe facilities. However, certain extreme cases may require the use of fences to protect the public.

712.1 Side Slopes: The Illinois Department of Transportation Standards and Specifications for Highway Construction call for maximum embankment slopes of 3 to 1 for safe mowing. Based on actual experience with basins in northeastern Illinois, 4 to 1 is recommended for reasons of soil stability, ease of establishing vegetation, and access for maintenance and recreational use.

712.2 Safety Ledge: The recommended requirements for safety ledge design are based on a review of a number of sources whose design criteria vary. A community may wish to revise these requirements based on its local experience. It may be concluded that a safety ledge is unnecessary in light of the requirement for a 10:1 shoreline shelf at the edge of all basins.

712.3 Velocity: One common rule of thumb for safe velocities calls for the product of velocity (feet/second) times depth (feet) not to exceed 4 for human safety.

712.4 Overflow Structures: Recent NIPC inspections of stormwater detention basins revealed that few had a stable and clearly defined overflow spillway to safely pass flows exceeding the 100-year design event, or to pass flows if an outlet becomes obstructed. This is a very

structure shall be equivalent to the 100-year inflow rate.

713.0 Maintenance Considerations: The stormwater drainage system shall be designed to minimize and facilitate maintenance. Detention basins shall be provided with alternate outflows which can be used to completely drain the pool for sediment removal. (Pumping may be considered if drainage by gravity is not feasible.) Pre-sedimentation basins shall be included, where feasible, for localizing sediment deposition and removal. Access for heavy equipment shall be provided.

Long term maintenance also shall include the routine removal of excessive trash or debris and the removal of obstructions from the basin outlet structure. Periodic removal of accumulated sediment (e.g., from swales, forebays, and settling basins) also shall be done to maintain the function and aesthetics of stormwater facilities. At a minimum, sediment shall be removed from forebays and sediment basins whenever one foot or more of sediment has accumulated in the basin bottom. Naturally landscaped areas of detention and drainage facilities shall be maintained via controlled burning every one to three years, as needed to control invasive weeds. Where controlled burning is not feasible, mowing shall be performed as needed. Mowing should be performed on naturally landscaped areas not suitable for burning on an annual basis and on all turfing areas on a regular basis to maintain grass height below 6 inches. Turfed side slopes shall be designed to allow lawn mowing equipment to easily negotiate them.

important design consideration as the invert for the spillway will control the depth of storage and potential flood stages on properties tributary to the detention basin. Spillway velocity and rate considerations should be addressed in the drainage plan. The probable maximum storm has been recommended as a design event by ASCE, but may be excessively conservative for most applications. More conservative overflow designs may be necessary for large detention basins if their size makes them subject to IDNR/OWR's Dam Safety Rules.

713.0 Maintenance Considerations: Local governments should tailor this section to meet their maintenance concerns. The ability to completely drain wet basins for sediment removal is an important maintenance option, as is the ability for heavy equipment to access a basin.

Experience from around the country indicates that maintenance to remove accumulated sediment will be needed on an infrequent basis (i.e., every 10-20 years). Sediment, similar to street sweeping debris, should be disposed appropriately.

Continued maintenance shall be provided to maintain a diverse native plant community, minimize the proliferation of weeds and undesired woody vegetation, and minimize erosion of slopes and shorelines.

800.0 Accommodating Flows From Upstream Tributary Areas

Stormwater runoff from areas tributary to the property shall be considered in the design of the property's drainage system. Whenever practicable, flows from upstream areas that are not to be detained should be routed around the basin being provided for the site being developed.

801.0 Upstream Areas Not Meeting Ordinance Requirements - When there are areas not meeting the storage and release rates of this ordinance, tributary to the applicant's property, regionalized detention on the applicant's property shall be explored by the applicant. The following steps shall be followed.

- a. The applicant shall compute the storage volume needed for his property using the release rates of Section 600.0, the applicant's property area, and the procedures described in Section 700.0.
- b. Areas tributary to the applicant's property, not meeting the storage and release rate requirements of this ordinance, shall be identified.
- c. Using the areas determined in 801.b. above plus the applicant's property area, total storage needed for the combined properties shall be computed.

Allowable release rates shall be computed using the combined property areas. Storage shall be computed as described in Section 700.0. If tributary areas are not developed, a reasonable fully developed land cover,

800.0 Accommodating Flows From Upstream Tributary Areas

The model ordinance is designed to provide flexibility in managing tributary area flows while retaining the degree of control needed to protect downstream property owners.

It is strongly recommended that local governments look for opportunities to participate with applicants to build regional detention facilities in advance of upstream property development. The costs for the local government share could be paid by the downstream property and then recaptured when upstream properties develop; or the local government could use special assessments on the upstream properties to pay the costs immediately. Finally, costs could be paid from any fee in lieu of detention programs for the areas in question.

Where bypassing of flows from upstream areas is the selected approach, it is recommended that these flows be routed around the detention basin for the same reason that online storage is discouraged. (I.e., the peak flows from the individual site may pass virtually undetained before the upstream peaks arrive).

based on local zoning, shall be assumed for the purposes of computing storage.

Once the necessary combined storage is computed the (County, City, Village) may choose to pay for over-sizing the applicant's detention basin to accommodate the regional flows. The applicant's responsibility will be limited to the storage for his property as computed in "a" above. If regional storage is selected by the (County, City, Village), then the design produced in "c" above shall be implemented. If regional storage is rejected by the (County, City, Village), the applicant shall bypass all tributary area flows around the applicant's basin whenever practicable. If the applicant must route upstream flows through his basin and the upstream areas exceed one-square mile in size, the applicant must meet the provisions of Section 708.30 for on-stream basins.

802.0 Upstream Areas Meeting Ordinance Requirements - When there are areas which meet the storage and release rate requirements of this ordinance, tributary to the applicant's property, the upstream flows shall be bypassed around the applicant's detention basin, or be routed through the applicant's detention basin if this is the only practicable alternative. Storage needed for the applicant's property shall still be computed as described in Section 801.0, a. However, if the (County, City, Village) decides to route tributary area flows through an applicant's basin, the final design stormwater releases shall be based on the combined total of the applicant's property plus tributary areas. It must be shown that at no time will the runoff rate from the applicant's property exceed the allowable release rate for his/her property alone.

900.0 Early Completion of Detention Facilities

Where detention, retention, or depressional storage areas are to be used as part of the drainage system for a property, they shall be constructed as the first element of the initial earthwork program. Any eroded sediment captured in these facilities shall be removed by the applicant before project completion in order to maintain the design volume of the facilities.

900.0 Early Completion of Detention Facilities

Completion of detention facilities first on a property provides a vital element of a runoff management and soil erosion and sediment control strategy for a property. It also places the burden for cleanup of soil eroded from a construction site on the applicant before the drainage system can receive a final permit. These recommendations are consistent with the Northeastern Illinois Soil Erosion and Sediment Control Steering Committee's Green Book.

1000.0 Fee In Lieu of Detention

All single-family residential developments under 5 acres in size and all other development under 1 acre in size shall pay a fee of \$_____ for each acre-foot of detention which would be required under this ordinance rather than installing detention facilities on the property, unless specifically directed to do otherwise by the (insert appropriate local official's title). The (County, City, Village of _____) also shall have the option for larger properties of requiring a fee of \$_____ for each acre-foot of detention needed in lieu of the applicant building a basin on-site provided the property will discharge stormwater to the (County's, City's, Village's) storm sewer system.

In instances where regional benefits and economies of scale can be achieved, it will be permissible for adjacent properties to utilize a common regional detention basin. Applicants shall have the option of paying a fee of \$_____ for each-acre foot of detention required so that the (County, City, Village of _____) can build regional facilities or they can jointly build the necessary facilities themselves.

1000.0 Fee In Lieu of Detention

The intent of this ordinance is to minimize the number of small detention basins which may have greater maintenance and operational problems. At the same time, there may be a need for small, onsite basins in situations where in-fill development occurs, potentially resulting in local drainage problems on adjacent properties. This situation always should be evaluated by the local government.

Local governments should not implement this section of the ordinance unless they have a completed master drainage plan for their watersheds, an administrative mechanism for collecting fees, and financial reserves to participate in the purchase of land and construction of regional detention basins. Obviously, a local government must be certain that properties which pay a fee will have their stormwater runoff adequately managed. The responsibility for this management will fall either to the local governments directly or to joint efforts between downstream developers and the local government. Failure to expeditiously invest fees could lead to the municipality being charged with not meeting the "reasonable use" rules of Illinois drainage law.

The model ordinance might recommend a higher minimum lot size if it were not for the distinct possibility that the U.S. Environmental Protection Agency will soon be requiring NPDES permits and the implementation of best management practices from all land development activities over 5 acres (1 acre for non-residential development). It would appear that if a local government builds a regional facility which accepts flows from such activities the NPDES permit responsibility and some of the best management practice implementation responsibility will fall to the local government.

Each unit of local government should determine an equitable basis for assessing an adequate fee in lieu of detention. Typical methods include fees based on percent impervious area on the property, fees based on acre feet of detention required, and fees based on the actual cost to construct facilities.

1100.0 Maintenance Responsibility

Maintenance of stormwater drainage facilities located on private property shall be the responsibility of the owner of that property. Before a (insert appropriate permit) is obtained from the (County, City, Village of _____) the applicant shall execute a maintenance agreement with the (County, City, Village of _____) guaranteeing that the applicant and all future owners of the property will maintain its stormwater drainage system. The maintenance agreement shall also specifically authorize representatives of the (County, City, Village) to enter onto the property for the purpose of inspections and maintenance of the drainage system. Such agreement shall be recorded with the Recorder of Deeds of(_____ County). The maintenance agreement shall include a schedule for regular maintenance of each aspect of the property's stormwater drainage system and shall provide for access to the system for inspection by authorized personnel of the (County, City, Village of _____). The maintenance agreement shall also stipulate that if the (appropriate authorized personnel of the County, City, Village of _____) notify the property owner in writing of maintenance problems which require correction, the property owner shall make such corrections within 30 (thirty) calendar days of such notification. If the corrections are not made within this time period the (County, City, Village) may have the necessary work completed and assess the cost to the property owner.

The (County, City, Village of _____) has the option of requiring a bond to be filed by the property owner for maintenance of the stormwater drainage system.

1100.0 Maintenance Responsibility

It is critical if maintenance contracts are used by a local government that the maintenance organizations have the ability to assess and collect fees. Local governments may also wish to investigate the requirement that covenants be added to property recordings to reflect maintenance responsibilities.

Some local governments, ~~particularly at the county level,~~ may wish to undertake all maintenance activities themselves. In this instance impact fees or some other means of regularly collecting the cost of such activities needs to be investigated.

Property owners may include individuals, corporations, or homeowners associations.

Local governments also should require maintenance easement from property owners in the event they must enter property to correct deficiencies.

1200.0 Administration

1201.0 Inspections

1201.10 Inspections During Construction: General site grading shall not begin until the (appropriate official of the County, City, Village) has certified in writing to the applicant that any necessary detention facilities are in place and operational. The (appropriate official of the County, City, Village) or his representative will also conduct periodic inspections of the work in progress to be certain that the drainage system is being built as designed. If any violations of the provisions or requirements of this ordinance are noted during such inspections, the () shall notify the property owner in writing of the items needing correction. The property owner shall have ten (10) calendar days to make such corrections unless given a specific extension of time in writing by the ().

Failure to complete such corrections within the specified time period shall constitute a violation of this ordinance.

1201.20 Final Inspection: Upon notification by the applicant that the drainage system is completed, the (appropriate official of the County, City, Village) or his representative shall conduct a final inspection. If the drainage system is found to contain deficiencies which require correction the () or his representative shall notify the property owner of the necessary corrections. The property owner shall correct such deficiencies within ten (10) calendar days unless given a specific extension of time in writing by the (). Failure to make necessary corrections within the specified time period shall constitute a violation of this ordinance. Upon finding that the drainage system meets the provisions and requirements of this ordinance the () shall issue in writing a notice of drainage system completion to the property owner.

1201.30 Routine Inspections: All privately owned drainage systems shall be inspected by representatives of the (County, City, Village) not less often than once per year. A written report shall be filed of the results of any inspection and a copy sent to the property owner detailing any problems which need correction.

1202.0 Enforcement - The administration and enforcement of this ordinance shall be the responsibility of the () Department of the (County, City, Village) of () or his representatives.

1203.0 Appeals - All appeals to the Director of (_____) Department's decisions regarding the interpretation of this ordinance shall be heard by the (_____) Board of the (County, City, Village of _____).

1300.0 Severability

If any section, clause, provision or portion of this ordinance is judged unconstitutional or invalid by a court of competent jurisdiction, the remainder of this ordinance shall remain in force and not be affected by such judgement.

1400.0 Penalties

Any person convicted of violating any of the provisions or requirements of this ordinance shall be guilty of a misdemeanor and shall be subject to a fine of not more than One Thousand Dollars (\$1,000.00) or be imprisoned for not more than (____). Each day the violation continues shall be considered a separate offense.

1500.0 Effective Date

This ordinance shall be in full force and effect from and after its passage and approval and publication, as required by law.

Passed by the _____ of the _____, Illinois, this ____ day of _____, 19__.

Clerk
APPROVED by me this _____ day of _____, 19__.

Mayor/Village President

ATTESTED and FILED in my office this _____ day of _____, 19__.

Clerk

MODEL STREAM AND WETLAND PROTECTION ORDINANCE
for the creation of a
Lowland Conservancy Overlay District

Northeastern Illinois Planning Commission
222 South Riverside Plaza Suite 1800
Chicago, Illinois 60606 October 1988

\$3.00

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INTRODUCTION

This is one of a series of planning aids and manuals prepared by the Northeastern Illinois Planning Commission (NIPC) as a service to local governments.

The streams, wetlands and other surface water resources of northeastern Illinois compose one of the region's greatest assets. In their natural state these areas provide water quality, flood and stormwater, habitat, recreational and aesthetic benefits. Modification of streams, floodplains, and wetlands has altered or destroyed the natural conditions of over half the streams and the vast majority of the wetlands in northeastern Illinois. This has an adverse impact on the region's environment and negatively affects the region's economic development potential as well.

Since state and federal regulations are not adequate currently to protect these resources, local regulation is all the more important. Such regulation is within the police power authority granted to local government. It is also at the local level that effective day-to-day decisions can be made in support of a high quality growth management process.

With these factors in mind, the Northeastern Illinois Planning Commission has developed a Model Stream and Wetland Protection Ordinance. This ordinance creates a "Lowland Conservancy Overlay District" as a complement to a jurisdiction's (municipal or county) zoning ordinance. Within a designated overlay district, special criteria and procedures are applied so that the development process results in protection and conservation of streams, wetlands and related resource areas. The model will need to be modified to satisfy the particular needs of each jurisdiction.

This document is divided into two main sections. The first is a question and answer section which provides background for the model ordinance in terms of certain technical aspects of stream and wetland management as well as the legal framework for such regulations.

The second part is the text of the model ordinance with a side-by-side "commentary" which explains the reasons for certain provisions, the ways in which provisions can be tailored to local conditions, and sources of additional information.

This model may be used in conjunction with other suggested ordinances and planning aids prepared by NIPC: Suggested Soil Erosion and Sedimentation Control Ordinance, Suggested Flood Damage Prevention Ordinance, Suggested On-Site Stormwater Detention Ordinance, and Stormwater Detention for Water Quality Benefits.

Part I: Questions and Answers Regarding Streams and Wetland Protection

1. Q. What is a wetland?

A. A wetland is defined in this ordinance as an area where water is at or near or above the land surface long enough to support aquatic or hydrophytic vegetation and which has soils indicative of wet conditions. What this means in simple terms is that a wetland is an area so influenced by water that only plants and animals that are specifically adapted to a wet environment survive there. Places that are wet only for short periods of time, for example, after a hard rain, or in the spring, but which do not contain aquatic plants and animals or characteristic wetland soils, are not wetlands and are not covered by this ordinance.

2. Q. Why are wetlands important?

A. Historically, wetlands have been thought of as wasteland that should be converted to better uses. And, historically, wetlands were converted about one-half of the original American wetlands (and more than 90 percent of Illinois') are now gone. Unfortunately, we have discovered that the conversion was not to a necessarily better use.

Wetlands are highly complex natural systems; no two wetland areas provide the same levels or rates of function in the maintenance of the environment. Wetlands represent the edge between the land and the water and are generally highly productive in terms of supporting plants and animals. Some wetlands provide places for the breeding, nesting, and rearing of young wildlife species of birds, mammals, fish and reptiles. Recreational activities, such as hiking, fishing, hunting, etc. are enjoyed in wetlands.

Wetlands are particularly important in protecting water resources, drainage and hydrologic functions. Wetlands are of ten groundwater recharge areas that provide protection against contamination of groundwater supplies. Wetlands provide temporary detention and storage of floodwaters and runoff, which reduces flood damage and maintains a hydrologic balance between ground and surface waters. Wetlands serve to filter pollutants and allow sediment in stormwater runoff to settle before the pollutants and sediments reach the state's water bodies, resolving pollution problems at a nominal cost to the state's citizens. Wetlands also enhance scenic beauty and provide logical barriers to urban development as well as buffers between incompatible land uses.

3. Q. What effect does unregulated development in a stream watershed have upon water quantity?
- A. Unregulated development, with an increase of impervious surfaces and the destruction of vegetation and wetlands, results in an absolute increase in water runoff. Soils, vegetation and wetlands normally absorb runoff which prevents flooding and allows the runoff to filter slowly into groundwater reservoirs. An increased flow of runoff causes irregular groundwater levels and increases the chances of stream flooding. To maintain a stable surface and groundwater supply, protective soils, vegetation and wetlands must be maintained.
4. Q. What effect does unregulated development in a stream watershed have upon water quality?
- A. Increased runoff results in erosion of stream banks and increased sedimentation of stream beds. An increase in sediments can cause water turbidity, an increase in suspended particles, that reduces the light necessary for keeping stream plants and animals alive. An increase in organic sediments entering the stream can cause oxygen depletion affecting plants and animals, and the destruction of shading vegetation increases water temperature, also to the detriment of plants and animals. Impervious surfaces not only increase the quick flow of runoff into streams but that runoff carries pollutants such as de-icing salts, nutrients, heavy metals, and petroleum products. As sediment or pollution-laden runoff is carried quickly to streams, the natural filtering capacity of soils and vegetation is lost, and the streams become polluted.
5. Q. Are there economic costs associated with the degradation of stream and wetland areas?
- A. Many private landowners and communities learn about stream and wetland degradation the hard way, after the land is eroded or the water polluted. The direct economic costs at that point can be very high indeed. Private landowners will pay dearly with a reduction of property value or the actual destruction of their property. The public may incur high costs in finding alternative water sources or in having to construct expensive storm sewers, flood control projects, or water purification systems.
6. Q. What are the benefits of local stream and wetland protection zoning?
- A. Stream and wetland zoning ensures that the valuable functions of streams and wetlands will be protected. This includes protection of the areas' ability to hold flood waters, to provide habitats for fish and wildlife, to maintain water of high quality, to protect the areas for recreational values and uses, and to protect the areas' aesthetic character for the adjacent property owners and the general public. Adjacent landowners are ensured of a reasonable use of their property without the fear that future development will spoil the character and quality of water areas.

Local governments have an important opportunity in adopting zoning regulations for the protection of these natural resources. The long tradition of local zoning authority means that residents are accustomed to turning to their local government, rather than the state, for approval of development. Local zoning in stream and wetland areas helps ensure that fragmentation of development controls does not occur. Various local controls, such as planning, subdivision, zoning, building codes, soil erosion and floodplain management, can be coordinated locally in an effective manner.

7. Q. Don't existing state and federal regulations adequately protect streams and wetlands?

A. No. The U.S. Army Corps of Engineers, under Section 10 of the Rivers and Harbors Act, regulates construction in, and other work affecting, "navigable waters" which include only Lake Michigan and the major waterways. Under Section 404 of the Clean Water Act, the Corps issues permits for deposition of dredged and fill materials in the water of the cited States. This program is of limited effectiveness because of discretion used in evaluating practicable alternatives and in regulating activities in small streams and wetlands. Also, activities that may have adverse impact but do not involve deposition of dredged or fill material are beyond the scope of the regulatory program.

The Division of Water Resources in the Illinois Department of Transportation (IDOT) issues permits for activities such as channel modification, bridge and level construction, utility crossings, sewer outfalls, and construction in the floodway. Under current policy, IDOT does not consider environmental impacts in its review of projects involving non-public water bodies (about 90% of the stream miles in northeastern Illinois). Though Illinois law authorizes IDOT to require permits for construction activities on smaller streams, they are regulated only for hydrologic and hydraulic considerations, and not for impacts on habitat, water quality or aesthetic impacts. There is no state regulation of wetlands unless they are adjacent to public water bodies.

8. Q. Why is an overlay district along streams and wetlands important?

A. Within the overlay district, there are natural vegetation buffer strips along streams and around wetlands or ponds which protect water resources. These buffer strips provide pollution control by allowing natural vegetation in the buffer strips to filter sediments and contaminants from surface runoff which enters water bodies. These buffer strips also allow vegetation to stabilize erosion of the natural drainageway and streambank.

In many instances, stream buffer strips provide a significant amount of open space and recreational opportunities for neighborhoods or subdivisions. These strips also provide a continuous wildlife habitat which is especially important in urban or urbanizing areas. The buffer strips enhance scenic beauty and provide logical barriers to urban development as well as buffers between incompatible land uses.

9. Q. Why is the Lowland Conservancy District created as an overlay district as compared to alternative zoning techniques?

A. There are three principal methods for creating a stream and wetland protection ordinance. For those jurisdictions that do not have a zoning ordinance, a partial zoning ordinance could be structured affecting land activities in the stream and wetland areas, leaving the rest of the jurisdiction unzoned.

For those jurisdictions that have zoning, the current ordinance can be amended to create a separate stream and wetland district or zone. The third method is to amend a current zoning ordinance to create an overlay zone that covers the stream and wetland areas, and impose regulations in addition to those regulations in the underlying district.

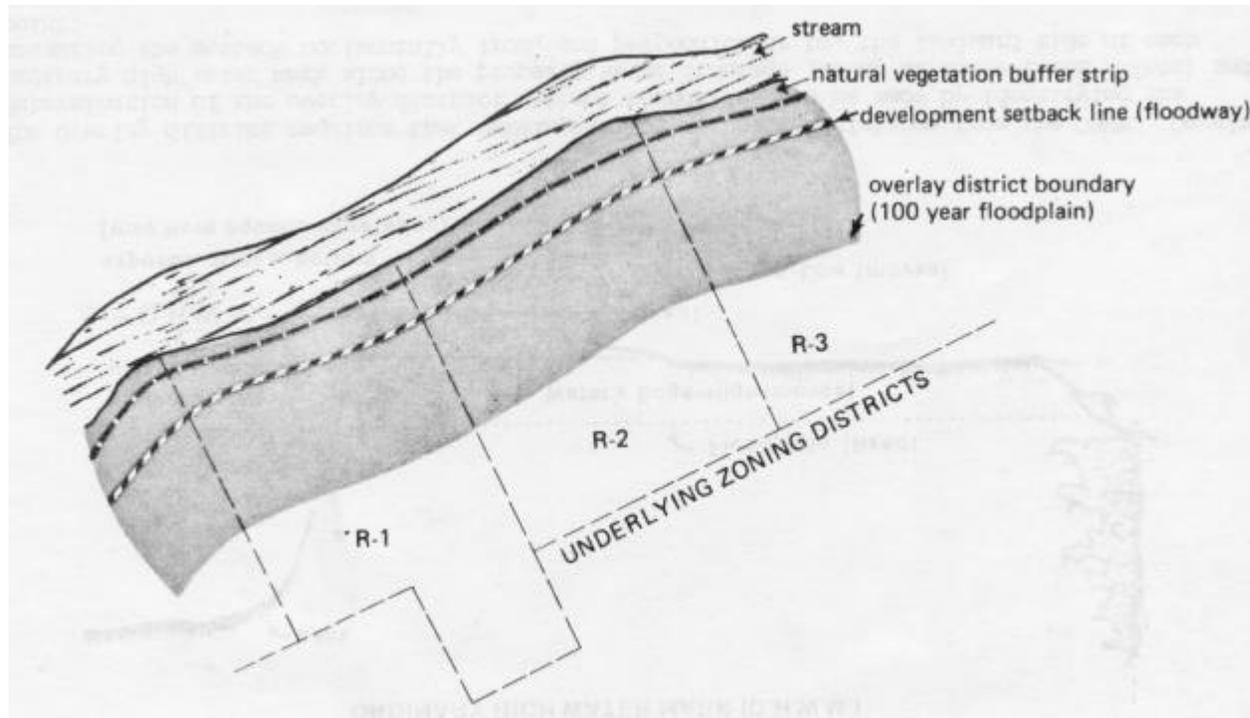
We have assumed in adopting the Lowland Conservancy Overlay District that the communities we are addressing have an existing comprehensive zoning ordinance. However, for those communities that do not have a zoning ordinance, the stream and wetland overlay district ordinance can be amended to become a partial zoning ordinance. A partial zoning ordinance (containing only those provisions necessary to effectively protect the stream and wetland areas) would have to be adopted in accordance with all the procedures of the state's zoning enabling act, just as would a comprehensive zoning ordinance.

The creation of a separate natural stream and wetland district, with permitted activities and site development requirements specific to the district, has the advantage of focusing attention on regulations designed to achieve very specific public objectives and wetland management. An overlay district, however, is probably the most acceptable to communities because the district does not greatly disturb the communities' underlying zoning, in order to achieve appropriate stream and wetland management objectives.

As long as the uses permitted in the underlying district are compatible with the objectives of the stream and wetland protection ordinance, an overlay district is more effective.

An overlay district is a mapped zone that imposes an additional set of requirements upon those of the underlying zoned district. The land must then be used under the conditions and requirements of both zones. The most restrictive requirements prevail in cases of conflict. Provisions of the zone are administered through the usual zoning processes.

A LOWLAND CONSERVANCY OVERLAY DISTRICT



The adoption of stream and wetland overlay districts easily withstands judicial attack. The restrictions do not constitute an uncompensated taking of property, because the property can be improved provided the appropriate special use permit conditions are met. Furthermore, the Illinois Constitution specifically recognizes the importance of the environment:

Section 1. Public Policy-Legislative Responsibility

The public policy of the State and the duty of each person is to provide and maintain a healthful environment for the benefit of this and future generations. The General Assembly shall provide by law for the implementation and enforcement of this public policy.

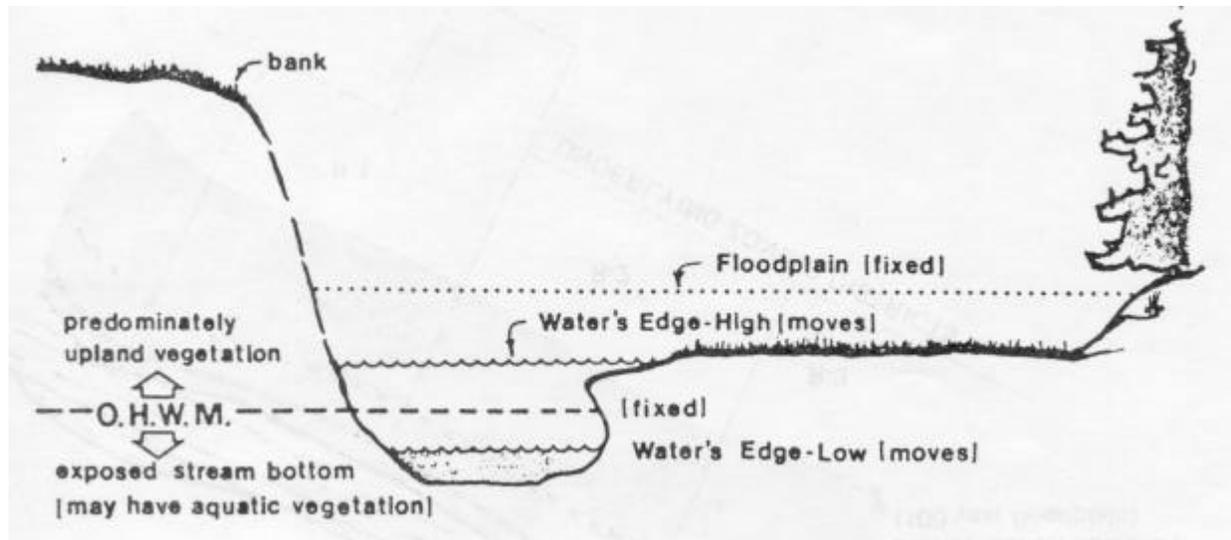
The stream and wetland overlay district zoning technique is merely a means toward achieving this end.

10. Q. What is a stream's "ordinary high water mark (OHWM)?"

A. Streams pose unusual problems with regard to measuring the distance from the stream across the land and determining the area which is to be included in the Lowland Conservancy Overlay District. Streams move (that is, change their location) over time and also rise and fall with the seasons, rainfall, and drought. To administer this ordinance uniformly, the edge of the stream should be measured from the ordinary high water mark for the stream. The ordinary high water mark is fairly easily delineated in the field. As defined by the ordinance:

Ordinary high water mark means the point on the bank or shore up to which the presence and action of surface water is so continuous so as to leave a distinctive mark such as by erosion, destruction or prevention of terrestrial vegetation, predominance of aquatic vegetation, or other easily recognized characteristics.

ORDINARY HIGH WATER MARK (OHWM)



The overlay district requires that development be set back a distance from the OHWM. On-site determination of the overlay district setback boundaries can be made by identifying the ordinary high water mark along the property water frontage (using at least three points) and measuring the setback horizontally from, and perpendicular to, the landward side of each point.

11. Q. Where does a municipality obtain the authority to impose stream and wetland setbacks?

A. The power to impose setback restrictions has been delegated to municipalities and counties by Illinois' basic zoning enabling legislation. Communities usually employ this zoning technique in a roadway context; that is, the technique usually relates building location to the street or right-of-way line.

Setback regulations are, however, also a powerful tool for managing the vital stream and wetland resources in northeastern Illinois.

12. Q. Why utilize a special use permit procedure?

A. Development activities which require a special use permit have a strong potential for damaging the environment or conflicting with surrounding uses. Through the special use permit process, these activities may be allowed in a given district as long as they can meet standards and conditions specified in the zoning ordinance. A special use permit is ideal in a stream and wetland protection overlay district because it assumes that any development can impair the values of the district if there is not proper attention given to the conditions under which the development proceeds. A special use permit procedure provides local zoning bodies with the flexibility that may not otherwise be available in the zoning ordinance to deal with difficult situations.

The standards for approval of special uses must be specified in the zoning ordinance. If a request is made for a special use that complies with all the requirements, the use, after thorough review, must be approved. Every special use permit should contain: 1) procedures for application for a special use permit; 2) the criteria or standards which must be met; 3) an identification of the decision-making body; 4) the requirements for a hearing, presentation of evidence, documentation of the findings and the decision, and 5) the procedures for appeal. Of course, many of these items need not be contained in the Lowland Conservancy Overlay District Ordinance but rather in the underlying zoning ordinance.

13. Q. Must the special use permit provisions be very specific?

A. Yes. Because each instance of development occurring in the overlay district is approved by testing whether it meets the special use permit criteria, there is a heavy burden on the administrative process. This burden can easily become time-consuming and costly for both administrators and property owners, yet can be alleviated by defining the conditions and application procedures as precisely as possible.

14. Q. Why doesn't the model ordinance contain a list of permitted and prohibited uses in the overlay district?

A. The uses permissible in the overlay district are those listed in the underlying zoning district. For example, if the underlying district is a residential district such as an R-1 district, those uses permitted and prohibited in the district are allowed to stand in the overlay district. However, these uses must meet the special use requirements specified for the overlay district as well as the requirements of the underlying district.

15. Q. Will the stream and wetland overlay protection ordinance create nonconforming uses?

A. At the time that the ordinance becomes effective, it is likely that certain existing uses in the stream and wetland areas will not meet the requirements of the ordinance. Specific provisions covering nonconforming uses are not contained in the model ordinance. Further, reference is made to the underlying zoning ordinance.

The abatement of nonconforming uses is a traditional land use management technique that has been upheld by the courts when supported by consistent public interest justifications. Amortization provisions can be incorporated into the ordinance by a community that so desires.

16. Q. Is the protection of aesthetics appropriate in the stream and wetland ordinance?

A. The acceptance of aesthetic criteria as a lawful land use management technique has been slow. However, today the Illinois courts readily uphold the reasonable aesthetic concerns of communities as enunciated in the communities' zoning ordinance.

Typically, Illinois' shoreline communities have been in the vanguard of those municipalities with aesthetic regulations. The basic thrust of the model stream and wetland ordinance is to protect a fragile resource, yet this protection surely can be accomplished in an aesthetically pleasing manner.

For some communities adopting the model ordinance, aesthetics will be a very important concern.

17. Q. Should the ordinance contain more elaborate references to procedures and processes?

A. Illinois zoning enabling legislation sets forth the broad parameters for legislative/administrative processes that protect the constitutional rights of due process and equal protection of the law. Furthermore, Illinois courts require strict adherence to the formalities of notice and hearing contained in a community's comprehensive zoning ordinance. Because the overlay district must also comply with a municipality's zoning ordinance, the procedures and processes contained in that ordinance apply to the overlay district.

18. Q. Should the community adopting the stream and wetland protection ordinance amend their zoning map?
- A. Yes. Although the community will probably rely on the mapping of streams and wetlands as carried out by the U.S. Geological Survey and the U.S. Fish and Wildlife Service, the local community may have to adjust these maps for specific site inaccuracies or to provide greater detail. Furthermore, citizens who live in the area or plan to develop in the area should be aware of the boundaries of the overlay district.
19. Q. Could limitations on development within the overlay district be viewed as an uncompensated, hence unconstitutional taking of property?
- A. Those opposing restrictions on development in general have traditionally advanced the argument that such regulations result in the confiscation of private property without providing just compensation. Proponents of the regulations counter these claims by stating that it is the responsibility of government to protect the public from unwise land use that may cause physical harm and property damage. If the ordinance prohibits development that constitutes neither a hazard to its occupants nor a nuisance to the public, and further, reduces the value of the property towards zero, its invalidation in the courts as a taking of property would be likely. The fact that the stream and wetland protection ordinance allows administrative discretion to grant variances in case of extreme hardship will insulate the ordinance from constitutional attack as an uncompensated taking.
20. Q. How is the stream and wetland protection ordinance different from floodplain regulations?
- A. Floodplain ordinances serve as overlay districts and are, in form, very similar to the stream and wetland overlay district regulations. The purpose of floodplain regulations is to reduce risk of human injury and damage to property due to flooding. Those regulations restrict the construction of buildings in flood prone areas and require "flood proofing" of structures.
- The stream and wetland protection ordinance has more comprehensive objectives, dealing also with water quality and resource management. The areas affected by these ordinances will be the same or similar, but each has its own requirements. Administration of the ordinance is simplified where the stream protection district and the regulated floodplain are made to coincide.
21. Q. Do the communities of northeastern Illinois already have zoning provisions for the protection of the environment?
- A. Several communities throughout northeastern Illinois have ordinances complementary to the stream and wetland protection ordinance. For example,, many communities have soil erosion and sedimentation ordinances that govern and regulate the clearing, grading, excavating and

transporting of soil to reduce the hazards of erosion. These ordinances do not set forth regulations regarding the permissible types of development, but do establish construction procedures. Also of specific concern to many communities is the regulation of septic systems where communities rely exclusively on individual wastewater treatment systems. Used in conjunction with the stream and wetland overlay ordinances, existing septic system ordinances help ensure that septic effluent is not released directly into any of an area's drainage systems.

22. Q. Will local zoning regulation along streams and wetlands become ineffective because streams and wetlands tend to cut across jurisdictions?

A. Ideally, uniform regulations would cover development near streams and wetlands throughout northeastern Illinois. While it may be difficult to achieve uniform regulations, it is important that some form of control be established to prevent the degradation of streams and wetlands.

Jurisdictions in a drainage basin are encouraged to cooperate in the development of uniform regulations for development affecting streams and wetlands. In Illinois, P.A. 85-905 enables five northeastern Illinois counties (excluding Cook) to prepare and implement countywide watershed stormwater plans. This legislation provides an excellent opportunity for northeastern Illinois jurisdictions to incorporate stream and wetland protection into the stormwater management planning process.

23. Q. Is the Lowland Conservancy Overlay District sufficient to protect water resources in a community?

A. This ordinance, although important, is just one tool in an array of potential water resources protection measures. The effectiveness of this ordinance will be enhanced by the adoption of a sediment and erosion control ordinance, a stormwater drainage and detention ordinance, and a floodplain protection ordinance. Stream maintenance programs are important for keeping streams clear of debris. In addition, where public access is desired (e.g. for fishing, hiking or bicycling), a program of stream corridor (greenway) open space acquisition is necessary. In situations where public recreational access is not desirable, the dedication of conservation easements to a public jurisdiction or an appropriate open space/conservation organization can help ensure the protection of the stream corridor resources.

Part II: MODEL STREAM AND WETLAND
PROTECTION ORDINANCE
Lowland Conservancy Overlay District

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Sec. 1.00 Authority

The Lowland Conservancy Overlay District is adopted by the (legislative body) of _____, Illinois, under the authority of (village/ city/county's) Home Rule Powers as set forth in Article VII, Section 6, of the 1970 Illinois Constitution (home rule city or county); of the Illinois Revised Statutes, Chapter 34, Paragraphs 3151 et seq. (non-home rule county); of the Illinois Revised Statutes, Chapter 24, Paragraphs 11-13-1 et seq. (non-home rule village or city).

Sec. 2.00 Short Title

This ordinance shall be known and may be cited as the (local government name) Lowland Conservancy Overlay District Ordinance.

Sec. 3.00 Purpose and Intent

It is the purpose and intent of this ordinance to promote the health, safety and general welfare of the present and future residents of (local government name) and downstream drainage areas by providing for the protection, preservation, proper maintenance, and use of (local government name) watercourses, lakes, ponds, floodplain and wetland areas. The ordinance is more specifically adopted:

- a. to prevent flood damage by preserving storm and flood water storage capacity;
- b. to maintain the normal hydrologic balance of streams, floodplains, ponds, lakes, wetlands, and groundwater by storing and providing for infiltration of wet-period runoff in floodplains and wetlands, and releasing it slowly to the stream to maintain in-stream flow;

Sec. 1.00 Authority

State legal authority for local government regulations such as the Lowland Conservancy Overlay District, is granted in one of three ways. The Illinois Constitution provides the authority to home rule governments as provided within the parentheses to the left. State statutes provide the authority for non-home rule counties (Illinois Revised Statutes, Chapter 34, Paragraphs 3151 et. seq.) and non-home rule villages and cities (Illinois Revised Statutes, Chapter 24, Paragraphs 11-13-1 et seq.). The information within the parentheses should be replaced as appropriate for the municipality adopting this ordinance.

Sec. 3.00 Purpose and Intent

The purpose and intent is broadly delineated in order to establish the public purpose and benefit (i.e. interest) on which the legality of this exercise of the police power is based.

The rationale for this type of regulation is significantly strengthened if the regulation is an outgrowth of a planning process which establishes public policy for stream protection and which has involved significant citizen participation and input.

Ordinance Text

Commentary

c. to manage stormwater runoff and maintain natural runoff conveyance systems, and minimize the need for major storm sewer construction and drainageway modification;

d. to improve water quality, both by filtering and storing sediments and attached pollutants, nutrients, and organic compounds before they drain into streams or wetlands, and by maintaining the natural pollutant-assimilating capabilities of streams, floodplains and wetlands;

e. to protect shorelines and stream banks from soil erosion, using natural means and materials wherever possible;

f. to protect fish spawning, breeding, nursery and feeding grounds;

g. to protect wildlife habitat;

h. to preserve areas of special recreational, scenic, or scientific interest, including natural areas and habitats of endangered species;

i. to maintain and enhance the aesthetic qualities of developing areas; and

j. to encourage the continued economic growth and high quality of life of the (local government name) which depends in part on an adequate quality of water, a pleasing natural environment, and recreational opportunities in proximity to the (local government name).

In order to achieve the purpose and intent of this ordinance, (local government name) hereby designates the Lowland Conservancy Overlay District which shall be considered as an overlay

to the zoning districts created by (local government name) zoning ordinances as amended. (See Section 1.00) Any proposed development activity within the District must obtain a Special Use Permit as approved by the governing body of (local government name). See Section 5.00.

Sec. 4.00 Definitions

a. "Armoring" is a form of channel modification which involves the placement of materials (concrete, riprap, bulkheads, etc.) within a stream channel or along a shore line to protect property above streams, lakes and ponds from erosion and wave damage caused by wave action and stream flow.

b. "Bulkhead" means a retaining wall that protects property along water.

c. "Channel" means a natural or artificial watercourse of perceptible extent that periodically or continuously contains moving water, or which forms a connecting link between two bodies of water. It has a definite bed and banks that serve to contain the water.

d. "Channel modification" or "channelization" means to alter a watercourse by changing the physical dimension or materials of the channel. Channel modification includes damming, riprapping (or other armoring), widening, deepening, straightening, relocating, lining and significant removal of bottom or woody vegetation. Channel modification does not include the clearing of debris or trash from the watercourse. Channelization is a severe form of channel modification involving a significant change in the channel cross-section and typically involving relocation of the existing channel (e.g. straightening).

e. "Control structure" means a structure designed to control the rate of stormwater runoff that passes through the structure, given a specific upstream and downstream water surface elevation.

f. "Culvert" means a structure designed to carry drainage water or small streams below barriers such as roads, driveways, or railway embankments.

g. "Depression 1 area" means any area which is lower in elevation on all sides than surrounding properties (i.e. does not drain freely), or whose drainage is severely limited such as by a restrictive culvert. A depression area will fill with water on occasion when runoff into it exceeds the rate of infiltration into underlying soil or exceeds the discharge through its controlled outlet. Large depression areas may provide significant stormwater or floodplain storage.

h. "Development" means the carrying out of any building, agricultural, or mining operation, or the making of any change in the use or appearance of land, and the dividing of land into two or more parcels. The following activities or uses shall be taken, for the purposes of this ordinance, to involve development as defined herein:

1. any construction, reconstruction, or alteration of a structure to occupy more or less ground area, or the on-site preparation for same;
2. any change in the intensity of use of land, such as an increase in the number of dwelling units on land, or a material increase in the site coverage of businesses, manufacturing establishments, offices, and dwelling units, including mobile homes, campers, and recreational vehicles, on land;

Ordinance Text

3. any agricultural use of land including, but not limited to, the use of land in horticulture, floriculture, forestry, dairy, livestock, poultry, beekeeping, pisciculture, and all forms of farm products and farm production;
4. the commencement of drilling, except to obtain soil samples, or the commencement of mining, filling, excavation, dredging, grading or other alterations of the topography;
5. demolition of a structure or redevelopment of a site;
6. clearing of land as an adjunct of construction for agricultural, private residential, commercial or industrial use;
7. deposit of refuse, solid or liquid waste, or fill on a parcel of land, or the storage of materials;
8. construction, excavation, or fill operations relating to the creation or modification of any road, street, parking facility or any drainage canal, or to the installation of utilities or any other grading activity that alters the existing topography;
9. construction or erection of dams, levees, walls, fences, bridges or culverts; and
10. any other activity that might change the direction, height, or velocity of flood or surface waters.

i. "District" means the Lowland Conservancy Overlay District as defined in Section 6.02 of this ordinance.

Commentary

3. This ordinance is primarily intended for use in developing urban and suburban areas. The unit of government should consider whether, or to what extent, it wishes to apply the ordinance to agricultural areas and agricultural activities, recognizing that row crop production and livestock grazing can have significant non-point pollution impacts. At a minimum there may be a need in agricultural areas to provide for the natural vegetation buffer strip. It would also be recommended that live stock be removed from the buffer strip area as well. Note that Section 5.05, Permit Exceptions, removes farm drainage ditches from regulation, but a vegetated buffer strip is recommended.

Ordinance Text

Commentary

j. "Erosion" means the general process whereby soils are moved by flowing water or wave action.

k. "Filtered view" means the maintenance or establishment of woody vegetation of sufficient density to screen developments from a stream or wet land, to provide for streambank stabilization and erosion control, to serve as an aid to infiltration of surface runoff, and to provide cover to shade the water. The vegetation need not be so dense as to completely block the view. Filtered view means no clear cutting.

l. "Floodplain" means that land adjacent to a body of water with ground surface elevations at or below the 100-year frequency flood elevation.

m. "Floodway" means that portion of the floodplain (sometimes referred to as the base floodplain or Special Flood Hazard Area) required to store and convey the base flood. The floodway is the 100 year floodway as designated and regulated by the Illinois Department of Transportation /Division of Water Resources. The remainder of the floodplain which is outside the regulatory floodway is referred to as the flood fringe or floodway fringe.

n. "Hydraulic characteristics" means the features of a watercourse which determine its water conveyance capacity. These features include but are not limited to: size and configuration of the cross-section of the watercourse and floodway; texture and roughness of materials along the watercourse; alignment of watercourse; gradient of watercourse; amount and type of vegetation within the watercourse; and size, configuration, and other characteristics of structures within the watercourse. In low-lying area the characteristics of the overbank area also determine water conveyance capacity.

l. The report, "Floodplain Regulations" (Local Assistance Series 2C), January 1987, published by the Illinois Department of Transportation/Division of Water Resources, provides an excellent overview of state and federal floodplain regulations as well as explanations and definitions of technical flood management terminology. Maps published by the Federal Emergency Management Agency (FEMA) indicate the location and extent of floodplains (Special Flood Hazard Area, SFHA) and are available from the Northeastern Illinois Planning Commission. Questions regarding floodways should be directed to FEMA, 175 West Jackson Boulevard, Chicago, Illinois 60604, and the Illinois Department of Transportation/Division of Water Resources, 201 West Center Court, Schaumburg, Illinois 60196-1096.

Ordinance Text

o. "Lot" means an area of land, with defined boundaries, that is designated in official assessor's records as being one parcel.

p. "Lake or pond" means any inland waterbody, fed by spring or surface water flow.

q. "Natural" in reference to watercourses means those stream channels, grassed waterways and swales formed by the existing surface topography of the earth prior to changes made by unnatural causes. A natural stream tends to follow a meandering path; its floodplain is not constrained by levees; the area near the bank has not been cleared, mowed or cultivated; the stream flows over soil and geologic materials typical of the area with no alteration of the course or cross-section of the stream caused by filling or excavating.

r. "Ordinary high water mark" (OHWM) means the point on the bank or shore up to which the presence and action of surface water is so continuous so as to leave a distinctive mark such as by erosion, destruction or prevention of terrestrial vegetation, predominance of aquatic vegetation, or other easily recognized characteristics.

s. "Qualified professional" means a person trained in one or more of the disciplines of biology, geology, soil science, engineering, or hydrology whose training and experience ensure a competent analysis and assessment of stream, lake, pond and wetland conditions and impacts.

t. "Registered professional engineer" means a professional engineer registered under the provisions of "The Illinois Professional Engineering Act" and any act amendatory thereof.

Commentary

p. Local jurisdictions, after studying the water bodies within their boundaries, may wish to adopt criteria in order to bring certain lakes or ponds under the ordinance regulations. Generally speaking, smaller ponds and especially retention facilities are more difficult to manage and maintain as "natural" water bodies because they are less resilient to the impacts of adjacent development and inflow as well as the natural aging processes.

s. and t. Persons trained as environmental engineers have training in the environmental sciences as well as engineering, and are therefore generally qualified to work with the requirements of this ordinance. Geoscientists and biologists have training that allows assessment of environmental impacts. Not all engineers are familiar with non-structural management approaches that are encouraged by this ordinance.

Ordinance Text

u. "Retention/detention facility" means a facility that provides for storage of storm water runoff and controlled release of this runoff during and after a flood or storm.

v. "Runoff" means the portion of precipitation on the land that is not absorbed by the soil or plant material and which runs off the land.

w. "Sedimentation" means the processes that deposit soils, debris, and other materials either on other ground surfaces or in water bodies or watercourses.

x. "Setback" means the horizontal distance between any portion of a structure or any development activity and the ordinary high water mark of a perennial or intermittent stream, the ordinary high water mark of a lake or pond, or the edge of a wetland, measured from the structure's or development's closest point to the ordinary high water mark, or edge.

y. "Stream" means a body of running water flowing continuously or intermittently in a channel on or below the surface of the ground. 7.5 minute topographic maps of the U.S. Geological Survey are one reference for identifying perennial and intermittent streams. For purposes of this ordinance, the term "stream" does not include storm sewers.

z. "Structure" means anything that is constructed, erected or moved to or from any premise which is located above, on, or below the ground including, but not limited to roads, signs, billboards, and mobile homes. Temporary recreational facilities including, but not limited to, tents, camper trailers, and recreation vehicles are not considered structures when used less than 180 days per year and located landward of the minimum setback provided as a natural vegetation strip.

Commentary

u. A retention facility maintains a permanent pool of water. A detention facility does not.

Ordinance Text

aa. "Vegetation" means all plant growth, especially trees, shrubs, mosses, and grasses.

bb. "Watercourse" means any river, stream, creek, brook, branch, natural or artificial depression, ponded area, slough, gulch, draw, ditch, channel, conduit, culvert, swale, grass waterway, gully, ravine, wash, or natural or man-made drainageway, which has a definite channel, bed and banks, in or into which stormwater runoff and floodwater flow either regularly or intermittently.

cc. "Wetland" means those transitional lands between terrestrial and aquatic system where the water table is usually at or near the surface or the land is covered by shallow water. Classification of areas as wetlands shall follow the "Classification of Wetlands and Deepwater Habitats of the United States" as published by the U.S. Fish and Wildlife Service (FWS/OBS-79/31).

Sec. 5.00 Special Use Permit

To ensure that proposed development activity can be carried out in a manner which is compatible and harmonious with the natural amenities of the Lowland Conservancy Overlay District and with surrounding land uses, a request for a Special Use Permit for such development activity must be submitted for approval by the governing body of (local government name).

No special use permit shall be issued unless the (local government name) finds that:

a. the development will not detrimentally affect or destroy natural features such as ponds, streams, wetlands, and forested areas, nor impair their natural functions, but will preserve and incorporate such features into the development's site;

Commentary

aa. Wherever possible, native species should be preserved or introduced as necessary. "Naturalized" species should be utilized if proven that there will be no negative impacts such as rapid takeover and "choking" of other beneficial species. The Illinois Department of Conservation may be consulted regarding appropriate stream and wetland vegetation.

cc. NIPC is a distributor of the U.S. Fish and Wildlife Service/Illinois Department of Conservation National Wetlands Inventory maps, as is Northern Illinois University. Additional references include Wetland Plants of the State of Illinois, 1986, Hydric Soils of the State of Illinois, 1985, and A Field Guide to the Wetlands of Illinois, Illinois Department of Conservation, 1988.

b. the location of natural features and the site's topography have been considered in the designing and siting of all physical improvements;

c. adequate assurances have been received that the clearing of the site of topsoil, trees, and other natural features will not occur before the commencement of building operations; only those areas approved for the placement of physical improvements may be cleared;

d. the development will not reduce the natural retention storage capacity of any watercourse, nor increase the magnitude and volume of flooding at other locations; and that in addition, the development will not increase stream velocities; and

e. the soil and subsoil conditions are suitable for excavation and site preparation, and the drainage is designed to prevent erosion and environmentally deleterious surface runoff.

There shall be no development, including the immediate or future clearing or removal of natural ground cover and/or trees, within the Lowland Conservancy Overlay District for any purpose, unless a special use permit is granted subject to the provisions of this ordinance or the provisions of the (local government name) zoning ordinance.

Dumping, filling, mining, excavating, dredging, or transferring of any earth material within the district is prohibited unless a special use permit is granted. No ponds or impoundments shall be created nor other alterations or improvements shall be allowed in the district for recreational uses, storm water management, flood control, agricultural uses or as scenic features unless a special use permit is granted.

The ordinance is not intended to preclude removal of vegetation (for example, removal of exotic species or selective thinning in order to increase sunlight penetration) as part of a management program for maintenance and restoration of natural areas. Jurisdictions may wish to add specific language to this effect.

Sec. 5.01 Application for Permit

Application for a special use permit, shall be made by the owner of the property, or his/her authorized agent, to the (local government name) on a form furnished for that purpose. Each application shall bear the name(s) and address(es) of the owner or developer of the site and of any consulting firm retained by the applicant together with the name of the applicant's principal contact at such firm, and shall be accompanied by a filing fee of _____. Each application shall include certification that any land clearing, construction, or development involving the movement of earth shall be in accordance with the plans approved upon issuance of the permit.

Sec. 5.02 Submissions

Each application for a special use permit shall be accompanied by the following information as specified in the ordinance sections cited:

General Provisions:

Site Development Plan	Sec. 6.04
Geologic and Soil Report	Sec. 6.05
Drainage Control Plan	Sec. 6.06
Site Grading & Excavation Plan	Sec. 6.07
Landscape Plan	Sec. 6.08

Justification for Watercourse
Relocation and Minor Modifications:

Stream "Modification/Relocation Plan	Sec. 7.02
Channel and Bank Armoring	Sec. 7.03
Culverts	Sec. 7.04
On-Stream Impoundments	Sec. 7.05
Impact Assessment (at option of (local government name))	Sec. 8.00

Sec. 5.02 Submissions

Large development projects require submittal of extensive documentation. In order that the regulation does not become unreasonable and onerous for very small development projects, the local jurisdiction should have the flexibility of waiving or simplifying submission requirements.

Where ordinance requirements are considered to be burdensome due to unusual lot configurations, for example, a very small lot area covered by the District, the special use permit applicant may petition for a variance under the provisions of Section 11.01.

The submissions called for in Sections 6.04 through 6.08 may be required by existing ordinances. If so, they may be deleted from this ordinance with a cross-reference to the other ordinance or ordinances.

In some instances, a jurisdiction may wish to amend existing ordinances with provisions from this ordinance rather than, or in addition to, adopting a new ordinance.

Where a proposed development activity is less than 2 1/2 acres in area the (permit issuing agency), upon approval of the (local government name) engineer, may waive or simplify any or all of the submission requirements (Sec. 6.04-6.08) provided that the person responsible for any such development shall implement necessary protection measures to satisfy the purpose and intent set forth in Section 3.00 of this ordinance. (See Sec. 11.01, Variances)

Sec. 5.03 Bonds

The applicant may be required to file with the (local government name) a faithful performance bond or bonds, letter of credit, or other improvement security satisfactory to the (municipal attorney), in an amount deemed sufficient by the (local government name) to cover all costs of improvements, landscaping, or maintenance of improvements and landscaping, for such period as specified by the (local government name), and engineering and inspection costs to cover the cost of failure or repair of improvements installed on the site.

Sec. 5.04 Review and Approval

Each application for a special use permit shall be reviewed and acted upon according to the following procedures:

1. The (local government name) will review each application for a special use permit to determine its conformance with the provisions of this ordinance. The (local government name) may also refer any application to the (county) Soil and Water Conservation District and/or any other local government or public agency within whose jurisdiction the site is located for review and comments. Within thirty (30) days after receiving an application, the (local government name) shall in writing, (a) approve the permit application, if it is found to be in conformance with the

provisions of this ordinance, and issue the permit;
(b) approve the Permit application subject to such reasonable conditions as may be necessary to secure substantially the objectives of this ordinance, and issue the permit subject to these conditions; or (c) disapprove the permit application, indicating the deficiencies and the procedure for submitting a revised application and/or submission.

2. No special use permit shall be issued for an intended development site unless:

a. the development, including but not limited to subdivisions and planned unit developments, has been approved by the (local government name) where applicable; or

b. such Permit is accompanied by or combined with a valid building permit issued by the (local government name); or

c. the proposed development is coordinated with any overall development program previously approved by the (local government name) for the area in which the site is situated.

3. Failure of the (local government name) to act on an original or revised application within thirty days' of receipt shall authorize the applicant to proceed in accordance with the plans as filed, unless such time is extended by agreement between the (local government name) and the applicant. Pending preparation and approval of a revised plan, development activities shall be allowed to proceed in accordance with conditions established by the (local government name).

Sec. 5.05 Permit Exceptions

The provisions of this ordinance shall not apply to:

a. emergency work necessary to preserve life or property; when emergency work is performed under this section, the person performing it shall report the pertinent facts relating to the work to the (permit issuing agency) within ten (10) days after commencement of the work and shall thereafter obtain a special use permit and shall perform such work as may be determined by the agency to be reasonably necessary to correct any impairment to the watercourse, lake, pond, floodplain or wetland (in terms of the purposes of this ordinance Section 3.00 a-j);

b. work consisting of the operation, repair, or maintenance of any lawful use of land existing on the date of adoption of this ordinance;

c. lands adjacent to farm ditches if:

1. such lands are not adjacent to a natural stream or river; or
2. those parts of such drainage ditches adjacent to such lands were not streams before ditching; or
3. such lands are maintained in agricultural uses without buildings and structures.

Where farm ditches are found to contribute to adverse environmental impacts or hazards to persons or property, the (local government name) may include designated farm ditches in the District. The (local government name) may also require that linings, bulkheads, dikes and culverts be removed to mitigate hazards, or that other mitigative measures be taken, such as the maintenance of a natural vegetation buffer strip.

c. Many drainageways in the region were created as agricultural drainage ditches, or drainage ditches were created by channelizing streams or swales. The primary purpose of this ordinance is not to regulate agricultural activities and farm ditches specifically. Therefore this language is provided. Where streams flowing through agricultural areas have a reasonable degree of natural amenity, the jurisdiction is justified in regulating them, particularly if a planning process has specifically identified such streams and if protection of those streams in agricultural areas is necessary for managing water resources in downstream areas that are urbanizing or are already urbanized. It is recommended that a vegetation buffer strip be maintained on both sides of agricultural drainage ditches.

Sec. 5.06 Effect on Other Permits

The granting of a special use permit under the provisions herein shall in no way affect the owner's responsibility to obtain the approval required by any other statute, ordinance, or regulation of any state agency or subdivision thereof, or to meet other (local government name) ordinances and regulations. Where state and/or federal permits are required, a special use permit will not be issued until they are obtained.

Sec. 6.00 General Provisions: Area Affected

This ordinance applies to development in or near streams, lakes, ponds and wetlands within (local government name). Streams, lakes, and ponds (including intermittent streams) are those which are shown on the United States Department of the Interior Geological Survey (USGS) 7.5 minute quadrangle maps and those additional streams, lakes, and ponds delineated on maps adopted as part of this ordinance. Those maps are hereby made a part of this ordinance, and two copies thereof shall remain on file in the office of the (local government name) administrator for Public inspection. Within the jurisdiction of (local government name), those waterbodies and watercourses that are named and are subject to the provisions of this ordinance are (list of water bodies and water courses). Wetlands are those designated in the U.S. Fish and Wildlife Service/ Illinois Department of Conservation wetland inventory and those additional wetlands delineated on maps adopted as part of this ordinance.

If new drainage courses, lakes, ponds or wetlands are created as part of a development, the requirements for setbacks and uses within setbacks, and the criteria for watercourse relocation and minor modification shall apply. The District shall be amended as appropriate to include these areas.

Sec. 5.06 Effect on Other Permits

The U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, and the Illinois Department of Transportation/Division of Water Resources all have water resource management and regulatory authority which is independent of, and in addition to, any requirements of this ordinance. Their regulations may or may not apply to the streams covered by this ordinance.

Sec. 6.00 General Provisions: Area Affected

USGS quadrangle maps may not be up to date in all areas, and they may not be of sufficient detail except to serve as a general location reference. It is recommended that the ordinance contain more detailed maps which show the location of drainageways, wetlands and ponds to be regulated, with careful attention to the end Points of stream reaches affected. The width of the District can also be mapped in addition to width specifications in the ordinance text.

The width of the District may need to vary in order to reflect stream conditions, need for nonpoint source pollution control, and planned land use considerations (e.g. need for public access in certain areas). A rationale should exist for variations in District width, and all areas with similar characteristics should be treated uniformly. The ordinance would have to identify the locations of the various District widths.

The U.S. Fish and Wildlife Service/Illinois Department of Conservation Wetland Inventory, although very detailed, may not include all wetlands within a given jurisdiction. The local jurisdiction may want to review wetlands in their area with technical personnel of the Illinois Department of Conservation or local experts before deciding which wetlands to regulate with this ordinance.

Sec. 6.01 The Lowland Conservancy Overlay District

The Lowland Conservancy Overlay District shall be considered as an overlay to the zoning districts created by the (local government name) zoning ordinance as amended in addition to the requirements of this ordinance, applicants for a special use permit within the District shall meet all requirements of the underlying zoning districts. In the event of a conflict between the overlay district requirements and the underlying zoning district requirements, the most restrictive requirements prevail.

Sec. 6.02 District Boundary

The procedures, standards and requirements contained in this ordinance shall apply to all lots within wetlands and streams, and all lots lying wholly or in part:

- a. within the Special Flood Hazard Area (SFHA) designated by the Federal Emergency Management Agency (FEMA); or
- b. within 100 feet of the ordinary high water mark (OHWM) of a perennial stream or intermittent stream, the ordinary high water mark of a lake or pond, or the edge of a wetland; or
- c. within depressional areas serving as floodplain or stormwater storage areas, as designated on the Lowland Conservancy District Map.

The District is designated on a map labeled "Lowland Conservancy Overlay District Map", which is made to be part of this ordinance and which has the same force and effect as if all the notations, references, and descriptions shown thereon were set forth or described herein. Designated areas are attached as Exhibits _____ and additional areas may be approved from time to time and be made exhibits hereto.

Sec. 6.02 District Boundary

An overlay district can be defined by fixed or floating boundaries. A fixed boundary is set at a certain number of feet from the ordinary high water mark of a stream, lake or pond, or the edge of a wetland. A floating boundary varies in width according to the location of sensitive areas along the stream or wetland.

The value and the problems associated with either type of boundary are obvious. Fixed boundaries, although easy to set and administer, may be rigid and potentially arbitrary. A review of ordinances from around the country indicates that fixed boundaries can be anywhere from 25 to 300 feet wide. Floating boundaries are more sensitive to critical areas along streams and adjacent to wetlands, yet defining a floating boundary takes both investigation and evaluation of environmental data (a relatively difficult task when staff and other resources are limited). The criteria included in the model ordinance use a combination approach. The boundary is defined by the floodplain (SFHA) which has been delineated for most streams in the region, or by a fixed distance which is a minimum. Not all floodplain areas have been mapped by FEMA.

Sec. 6.03 Minimum Setback of Development Activity from Streams, lakes, Ponds, and Wetlands

Absolutely no development activity (except as provided below) may occur within the minimum setback which is defined as 75 feet from the ordinary high water mark of streams, lakes and ponds, or the edge of wetlands, or within a designated depressional areas. In no case shall the setback be less than the boundary of the 100-year floodway as defined by FEMA. These setback requirements do not apply to a stream in a culvert unless the stream is taken out of the culvert as part of development activity. If a culvert functions as a low-flow culvert, where water is intended to periodically flow over it, the setback requirements apply.

The following development activities may be permitted, subject to issuance of a special use permit, within the minimum setback areas only if, as a practical matter, they cannot be located outside the setback area. Such development activities will only be approved based upon a report, prepared by a qualified professional, which demonstrates that they will not adversely affect water quality; destroy, damage or disrupt significant habitat area; adversely affect drainage and/or stormwater retention capabilities; adversely affect flood conveyance and storage; lead to unstable earth conditions, create erosion hazards, or be materially detrimental to any other property in the area of the subject property or to the (local government name) as a whole, including the loss of open space or scenic vistas:

- a. minor improvements such as walkways, benches, comfort stations, informational displays, directional signs, foot bridges, observation decks, and docks;
- b. the maintenance, repair, replacement, and reconstruction of existing highways and bridges, electrical transmission and telecommunication lines, poles, and towers; and

The publication, "Manual of Conservation Engineering Guidelines" (Illinois Department of Conservation, 1983), is an excellent resource. It contains a chapter on streambank erosion control with discussion of vegetative stabilization.

c. the establishment and development of public and private parks and recreation areas, outdoor education areas, historic natural and scientific areas, game refuges, fish and wildlife improvement projects, game bird and animal farms, wildlife preserves and public boat launching ramps.

Review of the proposed development activity within the minimum setback area will consider the following:

a. Only limited filling and excavating necessary for the development of public boat launching ramps, swimming beaches, or the development of park shelters or similar structures is allowed. The development and maintenance of roads, parking lots and other impervious surfaces necessary for permitted uses are allowed only on a very limited basis, and where no alternate location outside of the setback area is available.

b. Land surface modification within the minimum setback shall be permitted for the development of stormwater drainage swales between the developed area of the site (including a stormwater detention facility on the site) and a stream, lake or pond, or wetland. Detention basins within the setback are generally discouraged, unless it can be shown that resultant modifications will not impair water quality, habitat, or flood storage functions.

c. No filling or excavating within wetlands is permitted except to install piers for the limited development of walkways and observation decks. Walkways and observation decks should avoid high quality wetland areas, and should not adversely affect natural areas designated in the Illinois Natural Areas Inventory or the habitat of rare or endangered species.

d. Wetland area occupied by the development of decks and walkways must be mitigated by an equal area of wetland habitat improvement.

e. Modification of degraded wetlands for purposes of stormwater management is permitted where the quality of the wetland is improved and total wetland acreage is preserved. Where such modification is permitted, wetlands shall be protected from the effects of increased stormwater runoff by measures such as detention or sedimentation basins, vegetated swales and buffer strips, and sediment and erosion control measures on adjacent developments. The direct entry of storm sewers into wetlands shall be avoided. Environmental impact analysis of wetland modification may be required in accordance with Section 8.00 of this ordinance.

An applicant for a special use permit (See Section 5.00) must stabilize areas left exposed after land surface modification with vegetation normally associated with that stream or wetland. The planting of native riparian vegetation is recommended as the preferred stabilization measure. Other techniques should be used only when and where vegetation fails to control erosion. The preferred alternative is riprap, using natural rock materials where practicable, installed on eroding bank areas in a manner that provides interstitial space for vegetative growth and habitat for macroinvertebrates and other stream organisms. Lining of the stream channel bottom is not permitted.

The applicant shall minimize access to the applicant's proposed development activity within all or part of the Lowland Conservancy Overlay District where such access could adversely affect the stream, lake, pond, wetland, or related environmentally sensitive areas.

Sec. 6.04 Site Development Plan

A site development plan must be prepared for any proposed development within, or Partly within, the Lowland Conservancy Overlay District and must indicate:

- a. dimension and area of parcel, showing also the vicinity of the site in sufficient detail to enable easy location, in the field, of the site for which the special use permit is sought, and including the boundary line, underlying zoning, a legend, a scale, and a north arrow. (This requirement may be satisfied by the submission of a separate vicinity map.);
- b. location of any existing and proposed structures;
- c. location of existing or proposed on-site sewage systems or private water supply systems;
- d. location of any perennial or intermittent stream, lake or pond, and its ordinary high water mark;
- e. location and landward limit of all wetlands;
- f. location of setback lines as defined in this ordinance;
- g. location of the 100-year floodway;
- h. location of existing or future access roads;
- i. specifications and dimensions of stream, wetland or other water areas proposed for alterations;
- j. cross-sections and calculations indicating any changes in flood storage volumes; and

k. such other information as reasonably requested by (local government name).

The applicant shall present evidence, prepared by a qualified professional, that demonstrates that the proposed development activity will not endanger health and safety, including danger from the obstruction or diversion of flood flow. The developer shall also show, by submitting appropriate calculations and resource inventories, that the proposed development activity will not substantially reduce natural floodwater storage capacity, destroy valuable habitat for aquatic or other flora and fauna, adversely affect water quality or ground water resources, increase stormwater runoff velocity so that water levels on other lands are substantially raised or the danger from flooding increased, or adversely impact any other natural stream, floodplain, or wetland functions, and is otherwise consistent with the intent of this ordinance.

**Sec. 6.05 Geologic and Soil
Characteristics/Geologic and Soil Report**

The site proposed for development shall be investigated to determine the soil and geologic characteristics, including soil erosion potential. A report, prepared by a licensed professional engineer, geoscientist, or soil scientist experienced in the practice of geologic and soil mechanics, shall be submitted with every application for land development within the Lowland Conservancy Overlay District. This report shall include a description of soil type and stability of surface and subsurface conditions. Any area which the investigation indicates as being subject to geologic or soil hazards shall not be subjected to development, unless the engineer or soil scientist can demonstrate conclusively that these hazards can be overcome.

Sec. 6.06 Hydrologic Controls/Drainage Control Plan

A drainage control plan that describes the hydraulic characteristics of on-site and nearby watercourses as well as the proposed drainage plan, prepared by a registered Professional engineer experienced in hydrology and hydraulics, shall be submitted with each application for land development within the Lowland Conservancy Overlay District. Unless otherwise noted, the following restrictions, requirements and standards shall apply to all development within the Lowland Conservancy Overlay District:

a. natural open-channel drainageways shall be preserved; and

b. runoff from areas of concentrated impervious cover (e.g., roofs, driveways, streets, patios, etc.) shall be collected and transported to a drainageway (preferably a natural drainageway) with sufficient capacity to accept the discharge without undue erosion or detrimental impact. Vegetated drainage swales are preferred over conveyances constructed of concrete or other manufactured materials.

The drainage control Plan shall identify appropriate measures, such as recharge basins and detention/retention basins, which will limit the quantitative and qualitative effects of stormwater runoff to pre-development conditions.

Section 6.07 Site Grading and Excavation Plan

Section 6.07 applies to the extent that grading and excavation and erosion control plans, which satisfy the following requirements, are not already required by a jurisdiction.

Sec. 6.06 Hydrologic Controls/Drainage Control Plan

It is desirable to have the drainage control plan reviewed by a qualified professional from the environmental field.

Sec. 6.07 Site Grading and Excavation Plan

Reference: NIPC Planning Aid No. 11, Suggested Soil Erosion and Sedimentation Control Ordinance: A Guide for Local Officials, January 1980.

A site grading and excavation Plan, prepared by a registered professional engineer, trained and experienced in civil engineering, shall be submitted with each application for a special use permit and shall include the following:

- a. details of the existing terrain and drainage pattern with one-foot contours;
- b. proposed site contours at one-foot intervals;
- c. dimensions, elevation and contours of grading, excavation and fill;
- d. a description of methods to be employed in disposing of soil and other material that is removed from allowable grading and excavation sites, including location of the disposal site if on the property;
- e. a schedule showing when each stage of the project will be completed, including the total area of soil surface to be disturbed during each stage, and estimated starting and completion dates. The schedule shall be prepared so as to limit, to the shortest possible period, the time soil is exposed and unprotected. In no case shall the existing natural vegetation be destroyed, removed or disturbed more than fifteen (15) days prior to initiation of the improvements; and
- f. a detailed description of the revegetation and stabilization methods to be employed, to be prepared in conjunction with the landscape plan per Section 6.08. This description should include locations of erosion control measures such as sedimentation basins, straw bales, diversion swales, etc.

Ordinance Text

Commentary

The grading and excavation plan must be consistent with all the provisions of this ordinance.

Unless otherwise provided in this ordinance, the following restrictions, requirements and standards shall apply to all development within the District:

a. every effort shall be made to develop the site in such a manner so as to minimize the alteration of the natural topography;

b. no grading, filling, cleaning, clearing, terracing or excavation of any kind shall be initiated until final engineering plans are approved and the special use permit is granted by the (local government name); and

c. the depositing of any excavation, grading or clearing material within a stream, lake, pond or wetland area (i.e. within the District) shall be prohibited.

In addition to locating all site improvements on the subject property to minimize adverse impacts on the stream, lake, pond, or wetland, the applicant shall install a berm, curb, or other physical barrier during construction, and following completion of the project, where necessary, to prevent direct runoff and erosion from any modified land surface into a stream, lake, pond, or wetland. All parking and vehicle circulation areas should be located as far as possible from a stream, lake, pond, or wetland.

(Local government name) may limit development activity in or near a stream, lake, pond, or wetland to specific months, and to a maximum number of continuous days or hours, in order to minimize adverse impacts.

Also, the (local government name) may require that equipment be operated from only one side of a stream, lake, or pond in order to minimize bank disruption.

Other development techniques, conditions, and restrictions may be required in order to minimize adverse impacts on streams, lakes, ponds or wetlands, and on any related areas not subject to development activity.

Sec. 6.08 Natural Vegetation Buffer Strip Required: Vegetation and Revegetation/Landscape Plan

To minimize erosion, stabilize the streambank, protect water quality, maintain water temperature at natural levels, preserve fish and wildlife habitat, to screen man-made structures, and also to preserve aesthetic values of the natural water course and wetland areas, a natural vegetation strip shall be maintained along the edge of the stream, lake, pond or wetland. The natural vegetation strip shall extend landward a minimum of 25 feet from the ordinary high water mark of a perennial or intermittent stream, lake or pond and the edge of wetland.

Within the natural vegetation strip, trees and shrubs may be selectively pruned or removed for harvest of merchantable timber, to achieve a filtered view of the waterbody from the principal structure and for reasonable private access to the stream, lake, pond, or wetland. Said pruning and removal activities shall ensure that a live root system stays intact to provide for streambank stabilization and erosion control.

A landscape plan, prepared by a professional landscape architect, shall be submitted with each special use permit application for development activity within the Lowland Conservancy Overlay District and contain the following:

a. a plan describing the existing vegetative cover of the property and showing those areas where the vegetation will be removed as part of the proposed construction; and

Sec. 6.08 Natural Vegetation Buffer Strip Required: Vegetation and Revegetation/Landscape Plan

One purpose of this ordinance is to provide for the protection of a natural vegetation buffer strip. It is desirable to provide for maximum width of natural vegetation as a buffer area. Urban areas present constraints which require consideration of local conditions including stream width, the potential need for public access etc. The U.S. Department of Agriculture (USDA) through its Conservation Reserve Program, encourages farmers to create "water quality enhancement zones" along streams, wetlands and lakes.

The USDA recommend that these "filter strips" extend 66 to 99 feet from stream banks. The Dane County (WI) Regional Planning Commission has made buffer strip recommendations based upon stream size and need for public access. (See following page.)

Ordinance Text

b. a plan describing the proposed revegetation of disturbed areas specifying the materials to be used.

The vegetation must be planned in such a way that access for stream maintenance purposes shall not be prevented.

Sec. 7.00 Watercourse Relocation and Minor Modifications (including Channelization and Relocation)

Watercourse relocation or modification is generally not permitted because these activities are not usually consistent with the purposes of this ordinance. Under certain circumstances, relocation and minor modification may be permitted through a special use permit where certain problems can be mitigated by relocation and/or minor modification, specifically when:

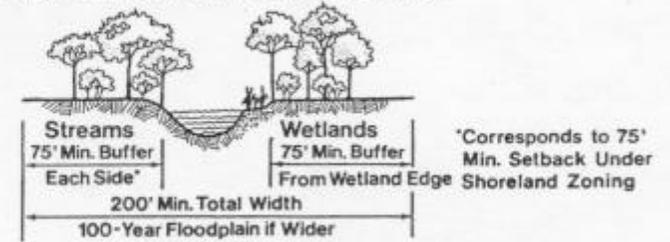
- a. off-site hydrologic conditions are causing erosion, flooding and related problems; or
- b. on-site soil and geologic conditions are resulting in unstable conditions that pose hazards to life, health, and existing structures or property; or
- c. the quality of previously modified or relocated streams can be improved through restoration; or
- d. officially adopted stormwater management plans call for placement of detention or retention facilities in a stream; or
- e. public utilities, including sanitary sewers, pipelines, and roadways require stream crossing or relocation where there are not practical alternatives.

Modification of watercourses as a convenience for site design purposes is not permitted.

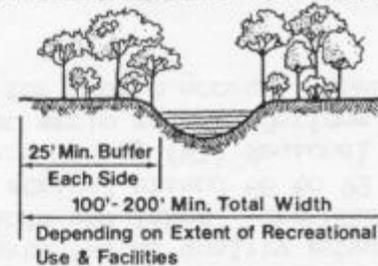
Commentary

BUFFER STRIP EXAMPLES*

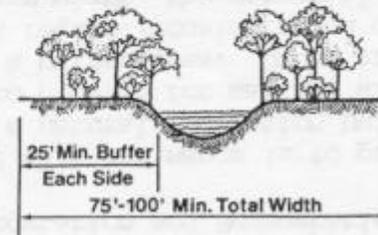
NAVIGABLE STREAMS & WETLANDS



INTERMITTENT STREAMS & DRAINAGEWAYS WITH PUBLIC ACCESS FOR RECREATION



INTERMITTENT STREAMS & DRAINAGEWAYS NO RECREATIONAL ACCESS



*Recommendations of the Dane County (WI) Regional Planning Commission

Sec. 7.01 Conditions and Restrictions for Permitting Stream Modification

Stream modification, when permitted, is subject to the following conditions and restrictions:

- a. water quality, habitat and other natural functions must be significantly improved by the modification; no significant habitat area may be destroyed;
- b. the amount of flow and velocity of a stream is not to be increased or decreased as the stream enters or leaves a subject property, unless this reflects an improvement over previous conditions in terms of reduced flooding, reduced erosion, or enhanced lowflow conditions;
- c. prior to diverting water into a new channel, a qualified professional approved by the (local government name) shall inspect the stream modification, and issue a written report to the (local government name) that the modified stream complies with the requirements in Section 7.02; and
- d. stream channel enlargement, or other modifications that would increase conveyance, shall not be permitted if the intended purpose is to accommodate development activities in the floodplain.

Sec. 7.02 Required Content of Stream Modification, Relocation Plan

Stream relocation may be permitted in accordance with a stream relocation plan which provides for:

- a. the creation of a natural meander pattern, pools, riffles, and substrate;

Sec. 7.02 Required Content of Stream Modification/Relocation Plan

Also see, Manual of Conservation Engineering Guidelines, p. IV-17

- b. the formation of gentle side slopes (at least three feet horizontally per one foot vertically), including installation of erosion control features;
- c. the utilization of natural materials wherever possible;
- d. the planting of vegetation normally associated with streams, including primarily native riparian vegetation;
- e. the creation of spawning and nesting areas wherever appropriate;
- f. the re-establishment of the fish population wherever appropriate;
- g. the restoration of water flow characteristics compatible with fish habitat areas, wherever appropriate;
- h. the filling and revegetation of the prior channel;
- i. a proposed phasing plan, specifying time of year for all project phases;
- j. plans for sediment and erosion control; and
- k. establishment of a low-flow channel which reflects the conditions of a natural stream.

Sec. 7.03 Criteria for Permitting Armoring of Channels and Banks

Armoring in the form of bulkheads, riprap or other materials or devices is not permitted except in accordance with the following:

- h. In some instances it may be desirable to retain the prior channel as a backwater lake for habitat management purposes.

Sec. 7.03 Criteria for Permitting Armoring of Channels and Banks

See also Manual of Conservation Engineering Guidelines, p.IV-21 - IV-26.

- a. significant erosion cannot be prevented in any other way and the use of vegetation and gradual bank slopes has not sufficiently stabilized the shoreline or bank;
- b. the bulkhead or other device is not placed within a wetland, or between a wetland and a lake or pond;
- c. the bulkhead, riprap or other device will minimize the transmittal of wave energy or currents to other properties; and
- d. the change in the horizontal or vertical, configuration of the land must be kept to a minimum where permission to install bulkheads or other armoring devices is requested as part of the special use permit application documentation and certification pertaining to the items above' must be submitted.

Sec. 7.04 Criteria for Permitting the Use of Culverts

Culverts are not permitted in streams except in accordance with the following:

- a. where a culvert is necessary for creating access to a property; use of culverts as a convenience, in order to facilitate general site design, is not to be considered;
- b. the culvert must allow passage of fish inhabiting the stream, and accommodate the 100-year flood event without increasing upstream flooding, except where a restricting culvert is desirable as part of an overall storm and floodwater management plan;
- c. the culvert must be maintained free of debris and sediment to allow free passage of water, and if applicable, fish; and

Sec. 7.04 Criteria for Permitting the Use of Culverts

See also Manual of Conservation Engineering Guidelines, p.III-17.

d. the stream bottom should not be significantly widened for the placement of a culvert as this increases siltation; if multiple culverts must be installed, one culvert should be at the level of the bottom of the stream and the others at or above normal water elevation.

Sec. 7.05 Criteria for Permitting On-Stream Impoundments

Impoundment of streams is not permitted except in accordance with the following:

a. the impoundment is determined to be in the public interest by providing regional stormwater detention, flood control, or public recreation;

b. the impoundment will not prevent the upstream migration of indigenous fish species;

c. a non-point source control plan has been implemented in the upstream watershed to control the effects of sediment runoff as well as minimize the input of nutrients, oil and grease, metals, and other pollutants;

d. impoundments without permanent low-flow pools are preferred except where a permanent pool is necessary to achieve the intended benefits of the impoundment (e.g. recreation or water quality mitigation); and

e. impoundment design shall include gradual bank slopes, appropriate bank stabilization measures, and a pre-sedimentation basin.

Sec. 8.00 Impact Assessment

(Local government name) may ask an applicant to submit a report prepared by a qualified professional, and approved by the (local government name), in order to

Sec. 7.05 Criteria for permitting On-Stream Impoundments

Impoundment of urban streams is often undesirable, for several reasons. Impoundments create conditions conducive to the accumulation of polluted sediments and the proliferation of excessive plant and algae growth. Dams on streams may prevent the upstream migration of fish. In general, these concerns are most significant when permanent pools are constructed on larger streams (i.e. with watersheds larger than two or three square miles), or where nutrient-rich point source discharges are present. Use of on-stream impoundments for stormwater retention, without upstream non-point source pollutant controls, utilizes the stream for pollutant removal but may impair potential recreational and aquatic habitat uses of the impoundment.

assess the potential impact of proposed development on a lake, stream or wetland and associated environmentally sensitive areas, including loss of flood storage potential, loss of habitat, changes in species diversity and quantity, impacts on water quality, increases in human intrusion, and impacts on associated streams, lakes, ponds, wetlands or downstream areas.

Sec. 9.00 Stream Maintenance Easement

The applicant shall grant an access easement for stream maintenance purposes to the (local government name), over twenty-five feet parallel to the stream bank.

Sec. 10.00 Nonconforming Uses

(To conform with the appropriate section of the (local government name) zoning ordinance.)

Sec. 11.00 Board of Appeals

(To conform with the appropriate section of the (local government name) zoning ordinance.)

Sec. 11.01 Variances

(To conform with the appropriate section of the (local government name) zoning ordinance.)

Sec. 11.02 Appeals

(To conform with the appropriate section of the (local government name) zoning ordinance.)

Sec. 9.00 Stream Maintenance Easement

In one sample out-of-state ordinance, the dedication of a conservation easement was required. Such an easement could be granted to a county or municipality, or to a private organization such as CorLands or the Nature Conservancy. Such easements are not for purposes of allowing general public access across private property. Where communities require dedication of open space for public access, the dedication can be encouraged or required to occur along streams or adjacent to wetlands or lakes.

Sec. 11.01 Variances

While special uses are permitted in the Overlay District as long as they meet certain conditions, variances are allowed only to relieve a unique hardship created by the application of the Overlay District which is borne by an individual property owner. A variance can be granted to permit the reasonable use of property which, often due to unusual natural conditions on the site, would not otherwise permit development in accordance with this ordinance's requirements. However, variances can be improperly approved to grant a special favor to one property owner that is not granted to others, and variances too liberally approved can undermine the objectives of the stream and wetland protection ordinance. To prevent this occurrence, the stream and wetland protection ordinance and/or the underlying zoning ordinance should provide the standards concerning the proper situations in which a zoning variance may be approved.

Sec. 12.00 Bonds

(Local government name) may require the posting of a bond or surety to ensure compliance with any aspect of this ordinance.

Sec. 13.00 Liability

Prior to issuance of a construction permit, the applicant shall enter into an agreement with the (local government name) which runs with the property, in a form acceptable to the (local government name) attorney, indemnifying the (local government name) for any damage resulting from development activity on the subject property which is related to the physical condition of the stream or wetland.

Sec. 14.00 Separability

Every section, provision, or part of this ordinance is declared separable from every other section, provision, or part; and if any section, provision, or part thereof shall be held invalid, it shall not affect any other section, provision, or part.

Sec. 15.00 Retroactivity

The requirements of this ordinance apply to all platted and unplatted lands within the jurisdiction of (local government name.)

Sec. 16.00 Enforcement

Authority for administration of this ordinance resides with the Zoning Administrator. (To conform with appropriate section of the (local government name) zoning ordinance.) Appeals regarding decisions of the Zoning Administrator in granting special permits shall be made according to the provisions of Section 11.02.

Sec. 16.01 Stop-Work Order; Revocation of Permit

In the event any person holding a special use permit pursuant to this ordinance violates the terms of the permit, or carries on site development in such a manner so as to materially and adversely affect the health, welfare, or safety of persons residing or working in the neighborhood of the development site, or so as to be materially detrimental to the public welfare or injurious to property or improvements in the neighborhood, the (local government name) may suspend or revoke the special, use permit.

1. Suspension of a permit shall be by a written stop-work order issued by the (local government name) and delivered to the permittee or his agent or the person performing the work. The stop-work order shall be effective immediately, shall state the specific violations cited, and shall state the conditions under which work may be resumed. A stop-work order shall remain in effect until the next regularly scheduled meeting of the Board of Appeals, at which the conditions of sub-paragraph 2 below can be met.

2. No special use permit shall be permanently suspended or revoked until a hearing is held by the Board of Appeals. Written notice of such hearing shall be served on the permittee, either personally or by registered mail, and shall state:

a. the grounds for complaint or reasons for suspension or revocation, in clear and concise language; and

b. the time when and place where such hearing will be held.

Such notice shall be served on the permittee at least five (5) days prior to the date set for the hearing. At such hearing, the permittee shall be given an opportunity to be heard and may call witnesses and present evidence on his/her behalf. At the conclusion of the hearing the Board of Appeals shall determine whether the permit shall be suspended or revoked.

Sec. 16.02 Violations and Penalties

No person shall undertake or continue any development activity contrary to or in violation of any terms of this ordinance. Any person violating any of the provisions of this ordinance shall be deemed guilty of a misdemeanor, and each day during which any violation of any of the provisions of this ordinance is committed, continued, or permitted shall constitute a separate offense. Upon conviction of any such violation, such person, partnership, or corporation shall be punished by a fine of not more than _____ for each offense. In addition to any other penalty authorized by this section, any person, partnership, or corporation convicted of violating any of the provisions of this ordinance shall be required to restore the site to the condition existing prior to commission of the violation, or to bear the expense of such restoration.

Sec. 17.00 Effective Date

This ordinance shall be in full force and effect from and after its passage and publication. The effective date is _____, 19 ____.

Stormwater and Floodplain Management Ordinance

Executive Summary

This ordinance has been prepared to best serve the stormwater management needs and flooding conditions in the south suburbs of Cook County. It meets all stormwater and floodplain management requirements of the Metropolitan Water Reclamation District, the Illinois Department of Natural Resources, and the National Flood Insurance Program. It includes most of the recommendations of the Northeastern Illinois Planning Commission. It is organized in three parts:

Part 1. General and Administrative Procedures. The first part of the ordinance covers administrative requirements for all development. It includes definitions of technical terms that are used and legal provisions, such as statutory authority, disclaimers and penalties.

All developments are subject to this ordinance. “Development” is defined as any man-made change to the land. Three levels of development are identified:

- Level 1 – multi-family, non-residential and larger single-family projects
- Level 2 – one or more single-family homes
- Level 3 – smaller projects (e.g., detached garages and regrading back yards)

The ordinance sets the most requirements for level 1 developments. Sections 4 and 5 specify the permit procedures and materials that must be included with an application for a permit.

Part 2. Site Development Requirements. This part lists the requirements that all new developments must meet to minimize problems caused by stormwater runoff. Sections 8 and 9 relate to managing the quantity of runoff to prevent increased flooding and drainage problems downstream of the development.

The primary approach to doing this is to require level 1 and level 2 development projects to provide on-site storage. The most common approach is a storage basin which must be designed with a permanent pool and/or wetland features to improve the quality of the water that leaves the development. Storage can be provided by other or additional means, including preserving existing depressional areas and using streets and parking lots.

Section 10 addresses erosion and sediment control measures that level 1 and level 2 development projects must incorporate during construction to reduce the amount of soil that runs off into receiving streams. Section 11 established buffer areas to protect stream banks and to provide a vegetative filter for runoff.

Part 3. Floodplain Development Requirements. The third part of the ordinance addresses projects located in floodplains. The requirements are in addition to the Part 2 site development requirements. All new buildings must be built to a flood protection level of at least one foot above the base (100-year) flood. Section 13 includes higher standards for critical facilities and lesser requirements for accessory buildings and smaller, temporary structures.

Section 14 states the rules for development in floodways. Certain small projects can be readily permitted, but larger projects will need a separate permit from the Illinois Department of Natural Resources to ensure that they will not adversely affect other properties.

ORDINANCE NO. _____.

**An Ordinance to Protect Development
From Flooding and Stormwater**

Be it ordained by the (Board of Trustees/City Council) of the (Village/City)
of _____, Illinois, as follows:

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Part 1. General and Administrative Procedures.

Section 1. Authority and Purpose

1.1. Authority. This Ordinance is enacted pursuant to the police powers granted to this (Village, City) by 65 ILCS 5/1-2-1, 5/11-12-12, 5/11-30-2, 5/11-30-8, and 5/11-31-2 .

1.2. Purpose. The purpose of this Ordinance is to:

- 1.2.1. Protect buildings and other property from damage due to flooding,
- 1.2.2. Protect the life, health and safety of the residents of this (Village/City),
- 1.2.3. Minimize disruption of commerce and governmental services and the impairment of the tax base caused by flooding,
- 1.2.4. Prevent new development from increasing the flood or drainage hazard to others,
- 1.2.5. Prevent future public expenditures for repairs and recovery activities following a flood and for drainage improvements and flood protection projects,
- 1.2.6. Preserve and enhance the quality of surface water,
- 1.2.7. Preserve the natural characteristics and functions of watercourses and floodplains to moderate flood and stormwater impacts, improve water quality, and preserve aquatic/riparian habitat,
- 1.2.8. Reduce the sedimentation in the watercourses of the (Village/City),
- 1.2.9. Meet the requirements of 615 ILCS 5/18g Rivers, Lakes and Streams Act.
- 1.2.10. Make federally subsidized flood insurance available for property in the (Village/City) by fulfilling the requirements of the National Flood Insurance Program.

Home rule communities can include their home rule authority under the Illinois Constitution.

This section gives the reasons why this Ordinance is needed. This helps if the specific regulatory standards are later challenged.

Section 2. Organization.

To protect people and property from flooding, development of land must be managed both in the watershed (where the water comes from) and in the floodplain (where it accumulates). Therefore, this ordinance has three parts.

2.1. General and Administrative Procedures. Part 1 of this ordinance includes the definitions, permit procedures and similar administrative matters that apply to all development projects

2.2. Site Development Requirements. Part 2 of this ordinance contains the land development requirements that manage the runoff of stormwater that leaves the development site. It includes criteria for the amount of water that can leave a site and measures that must be taken to improve the quality of the water.

2.3. Floodplain Development Requirements. Part 3 of this ordinance contains requirements for developments that will be located in the floodplain. It includes criteria to protect the new development, to minimize the impact of the development on flooding to other properties, and to protect the flood conveyance channel.

2.4. Overlapping Requirements.

2.4.1. Floodplains are part of the watershed. All floodplain developments must also meet the site development requirements of Part 2, where applicable.

2.4.2. The definitions in Section 3 and the administrative procedures in Sections 4 - 6 apply to both Parts 2 and 3.

2.5. “Development.” This ordinance regulates all development as defined in Section 3. Definitions.

2.5.1. The regulatory criteria are different for three different sizes of development: Level 1, Level 2 and Level 3, which are also defined in Section 3.

2.5.2. When the term “development” is used alone, it includes all three levels.

Section 3. Definitions

For the purposes of this Ordinance, the following definitions are adopted:

3.1. “Base Flood” The flood having a one-percent probability of being equaled or exceeded in any given year. The base flood is also known as the 100-year frequency flood event. Application of the base flood elevation at any location is as defined in Section 12 of this Ordinance.

3.2. “Best Management Practice (BMP)” A measure used to control the adverse impacts of a stormwater discharge on water quality downstream. BMPs include structural devices (e.g. grassed swales, filter strips and detention basins) designed to remove pollutants and reduce runoff volumes and non-structural measures such as public information on proper disposal and use of pesticides and herbicides.

3.3. “Building” A building that is principally above ground and is enclosed by walls and a roof. The term includes a gas or liquid storage tank, a manufactured home, mobile home or a prefabricated building. This term also includes recreational vehicles and travel trailers to be installed on a site for more than 180 days, unless fully licensed and ready for highway use.

3.4. “Buffer” An area of natural vegetation adjacent to channels, wetlands, lakes, ponds or other surface waters to be left open for the purpose of eliminating or minimizing adverse impacts to such areas.

3.5. “By-pass flow” An approach that routes tributary drainage area runoff around and not through a stormwater control structure.

3.6. “Channel” Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, flowage, slough, ditch, culvert, gully, ravine, wash, or natural or open man-made drainageway, which has a definite bed and banks or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

3.7. “Channel Modification” Alteration of a channel

A channel includes on-stream lakes and impoundments.

by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, rip-rapping (or other armoring), widening, deepening, straightening, relocating, lining and significant removal of native vegetation from the bottom or banks. Channel modification does not include the clearing of dead or dying vegetation, debris, or trash from the channel.

3.8. “CLOMR” “Conditional Letter of Map Revision.”

3.9. “Compensatory Storage” An artificially excavated, hydraulically equivalent volume of storage within the SFHA used to balance the loss of natural flood storage capacity when artificial fill or buildings are placed within the floodplain. The uncompensated loss of natural floodplain storage can increase off-site floodwater elevations and flows.

3.10. “Conditional Letter of Map Revision” A letter which indicates that FEMA will revise base flood elevations, flood boundaries or floodways once the as-built plans are submitted and approved.

3.11. Designated Floodway. The channel and that portion of the riverine floodplain adjacent to a stream or watercourse as designated by IDNR/OWR, which is needed to store and convey the existing base flood discharge with no more than a 0.1 foot increase in stage due to the loss of flood conveyance or storage, and no more than a 10 percent increase in velocities.

3.12. “Detention Basin” A man-made structure for the temporary storage of stormwater runoff with controlled release during and immediately following a storm.

3.13. “Development”

3.13.1. “Development” means any man-made change to real estate, including:

- (a) Construction, reconstruction, repair, or placement of a building or any addition to a building.

The designated floodway is shown on the community’s Flood Boundary and Floodway Map or Flood Insurance Rate Map.



The State mandated 0.1 floodway standard receives up to 150 points under Section 411.c.2 and 15 points under Section 431.ℓ in the *CRS Coordinator’s Manual*.

The definition of development includes those activities which could significantly alter the hydraulics or hydrology of the floodplain, or otherwise interfere with its natural functions.

This ordinance defines three levels of development: Level 1, Level 2 and Level 3 which are defined later in this section.

- (b) Installing a manufactured home on a site, preparing a site for a manufactured home, or installing a travel trailer or recreational vehicle on a site for more than 180 days. Parking a travel trailer or recreational vehicle on site for less than 180 days is not considered “development” provided it is fully licensed, not connected to any utilities, and ready for highway use.
- (c) Drilling, mining, installing utilities, construction of roads, bridges, or similar projects.
- (d) Demolition of a building or redevelopment of a site.
- (e) Clearing of land as an adjunct of construction.
- (f) Construction or erection of levees, walls, fences, dams, or culverts; channel modification; filling, dredging, grading, excavating, paving, or other non-agricultural alterations of the ground surface; storage of materials; deposit of solid or liquid waste;
- (g) Subdivision of land, annexation agreements, and finalization of a plat, replat, planned unit development or manufactured home park; and
- (h) Any other human development project that might change the direction, height, or velocity of flood or surface water, including extensive vegetation removal.

3.13.2. “Development” does *not* include:

- (a) Maintenance of existing buildings and facilities such as re-roofing or re-surfacing of roads when there is no increase in the ground or road surface elevation;

Small projects that do not alter the hydraulics or hydrology of the floodplain, or otherwise interfere with its natural functions, may be explicitly excluded. If the community wants to list additional types of projects that are not subject to these regulations, it must get the list approved by IDNR/OWR.

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<p>(b) Gardening, plowing, and similar agricultural practices that do not involve filling, grading, or construction of levees;</p> <p>(c) Erection of a storage shed, accessory building, fence and playground equipment, that:</p> <p>(1) Has a footprint of less than 50 square feet,</p> <p>(2) Is not located in a floodway or within 10 feet of a property line, and</p> <p>(3) Is properly anchored to withstand surface water flows.</p> <p>3.14. “Elevation Certificate” A form published by FEMA that is used to certify the elevation to which a building has been elevated.</p> <p>3.15. “Emergency Overflow” The structure in a detention or retention basin designed to protect the basin in the event of a malfunction of the primary outlet or a storm event greater than the basin design storm.</p> <p>3.16. “Excavation” Any act by which organic matter, earth, sand, gravel rock or any other similar material is cut into, dug, quarried, uncovered, removed, displaced, relocated or bulldozed. The term shall include the conditions resulting therefrom.</p> <p>3.17. “Exceptional Functional Value Wetland” Any wetland that either (1) meets the Illinois Natural Area Inventory’s definition for determining exceptional functional value or (2) is located in an Illinois Natural Area Inventory site.</p> <p>3.18. “Existing Grade” The vertical location of the existing ground surface prior to excavation or filling.</p> <p>3.19. “FEMA” The Federal Emergency Management Agency, the agency responsible for administering the National Flood Insurance Program.</p> <p>3.20. “FIRM” or “Flood Insurance Rate Map. A map prepared by the Federal Emergency Management</p>	<p>Projects within 10 feet of the property line may alter local drainage. Such projects, no matter how small, need a permit review to make sure they do not cause a problem on neighboring properties.</p> <p>The current Elevation Certificate is FEMA Form 81-31, dated August 1999.</p> <p>FEMA’s office is located at:</p> <p>FEMA Region V 536 South Clark Chicago, Illinois 60605 312/408-5500</p>

Agency that delineates the Special Flood Hazard Area of the (Village/City). The FIRM includes flood insurance rate zones and may or may not include floodways.

3.21. “Flood” A general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal waves, or the unusual and rapid accumulation or runoff of surface waters from any source.

3.22. “Flood Fringe” That portion of riverine floodplains outside of the designated floodway.

3.23. “Floodplain” Any land area susceptible to being inundated by flood waters from any source.

3.24. “Floodproofing” Any combination of structural and non-structural adjustments to a building which reduces or eliminates flood damage to that building, its contents and supporting utilities. “Dry floodproofing” techniques prevent flood waters from entering a building.

3.25. “Floodproofing Certificate” A form published by FEMA that is used to certify that a building has been designed and constructed to be structurally dry floodproofed.

3.26. FPE or Flood Protection Elevation. The elevation above sea level (NGVD) to which new buildings must be protected from flood damage.

3.27. “Historic Building” Any building that is:

- (a) Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;
- (b) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered

The term includes those areas mapped as Special Flood Hazard Areas and other land areas that can be flooded.

The current Floodproofing Certificate is FEMA Form 81-65, dated My 1993.

See section 6.4.5

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<p>historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;</p> <p>(c) Individually listed on the State inventory of historic places by the Illinois Historic Preservation Agency;</p> <p>(d) Individually listed on a local inventory of historic places that has been certified by the Illinois Historic Preservation Agency.</p> <p>3.28. “IDNR/OWR” The Illinois Department of Natural Resources, Office of Water Resources, the agency responsible for administering 615 ILCS 5/18g, the Rivers, Lakes and Streams Act.</p> <p>3.29. “Level 1 Development” A development project that meets <i>any</i> of the following criteria:</p> <p>(a) Is a single family residential development on 10 acres or more,</p> <p>(b) Is a multi-family or non-residential development on 3 acres or more, or</p> <p>(c) Disturbs more than 20,000 square feet of land area</p> <p>3.30. “Level 2 Development” A development project which does not qualify as a Level 1 development but meets any of the following criteria:</p> <p>(a) Has one or more new dwelling units,</p> <p>(b) Has more than one existing dwelling unit,</p> <p>(c) Has more than one platted lot,</p> <p>(d) Will be used for other than residential, agricultural or public purpose, or</p> <p>(e) Disturbs more than 10,000 square feet of land area or adds an additional 1,000 square feet of new impervious area.</p>	<p>The IDNR/OWR office is at:</p> <p>201 West Center Court Schaumburg, IL 60196 847/705-4341</p> <p>See also the definition for “development” and what is not considered “development.”</p> <p>Applicants for permits for Level 1 development projects must produce more accurate floodplain data and meet more restrictive requirements.</p> <p>Examples of Level 2 developments include construction of a new single family homes, altering or repairing a multi-family building or business, lot splits, and disturbing 10,000 square feet of land area.</p>

3.31. “Level 3 Development” A development project that does not meet the criteria for the definition of Level 2 development.

See also the definition for “development.” Level 3 development projects include altering or repairing a single family home, constructing a detached residential garage, and disturbing less than 500 square feet, regardless of the size of the lot.

3.32. Licensed Professional Engineer: An engineer registered in the State of Illinois, under the Professional Engineer Practice Act of 1989, 225 ILCS 325/1-49.

3.33. “Major Drainage System” That portion of a drainage system needed to store and convey flows beyond the capacity of the minor drainage system.

3.34. “Manufactured Home” A building, transportable in one or more sections, which is built on a permanent chassis and is designated for use with or without a permanent foundation when attached to the required utilities. The term manufactured homes also includes park trailers, travel trailers and other similar vehicles placed on site for more than 180 consecutive days. The term “manufactured home” does not include a “recreational vehicle.”

3.35. “Minor Drainage System” That portion of a drainage system designed to safely convey the 10-year runoff event or less. It includes street gutters, storm sewers, small open channels and swales.

3.36. “NGVD” National Geodetic Vertical Datum of 1929. Reference surface set by the National Geodetic Survey deduced from a continental adjustment of all existing adjustments in 1929.

3.37. “Natural” When used in reference to channels, means those channels formed by the existing surface topography of the earth prior to changes made by humans.

3.38. “Ordinary Highwater Mark” The point on the bank or shore at which the presence and movement of surface water are continuous so as to leave a distinctive mark, such as by erosion, destruction or prevention of terrestrial vegetation, predominance of aquatic vegetation or other such recognized characteristics.

3.39. “Overland Flow Path” An area of land which conveys stormwater for all events up to and including the base flood event. The overland flow path can be determined using topographic information and shall take into account all on-site and off-site tributary areas.

3.40. “Public Bodies of Water” All open public streams and lakes capable of being navigated by watercraft, in whole or in part, for commercial uses and purposes, and all lakes, rivers, and streams which in their natural condition were capable of being improved and made navigable, or that are connected with or discharge their waters into navigable lakes or rivers within, or upon the borders of the State of Illinois, together with all bayous, sloughs, backwaters, and submerged lands that are open to the main channel or body of water directly accessible thereto.

3.41. “Recreational Vehicle or Travel Trailer” A vehicle which is:

- (a) Built on a single chassis;
- (b) 400 square feet or less when measured at the largest horizontal projection;
- (c) Designed to be self-propelled or permanently towable by a light duty vehicle; and
- (d) Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

3.42. “Retention Basin” A facility designed to completely retain a specified amount of stormwater runoff without release except by means of evaporation, infiltration or pumping.

3.43. “Riverine” Related to a river, creek, intermittent stream, ditch, or any other identified channel. This term does not include areas subject to flooding from lakes, ponding areas, or areas of sheet flow.

3.44. “SFHA” or “Special Flood Hazard Area” The area subject to flooding by the base flood and shown on the November 6, 2000, Cook County county-wide Flood Insurance Rate Map as Zone A, A1-30, AE, A0, AH and/or A99.

The list of the types of “A” zones can be shortened to reflect those zone designations in the (Village/City) and adjacent unincorporated areas. See also section 12.1.

3.45. “Substantially Damaged”

- (a) A building that has been damaged by any cause (fire, flood, earthquake, etc.) whereby the cost of restoring the building to its before damaged condition would equal or exceed 50% of the market value of the building before the damage occurred.
- (b) *A building that has been damaged by a flood on two separate occasions during a 10-year period for which the cost of repairs at the time of each such flood event, on the average, equals or exceeds 25% of the market value of the building before the damage occurred.*

The cost of repair must be calculated for full repair to “pre-damage” conditions, even if the owner elects to do less. The total cost of repair includes structural and finish materials, and labor. A substantially damaged building which is repaired must comply with the requirements for new construction.

The second part of the definition (b) provides the legal language for a repetitively damaged building to qualify for “Increased Cost of Compliance.” This is an additional flood insurance claim payment that helps finance bringing a damaged building into compliance with the ordinance.

3.46. “Substantially Improved”

- (a) A building that has been remodeled, repaired added to, or otherwise improved whereby the cost of the project equals or exceeds 50 percent of the market value of the building before the improvement is started. The cost of the project is based on the prevailing costs of labor, equipment and supplies, even if some of these are donated or obtained at reduced rates.
- (b) For the purposes of this definition a substantial improvement is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the building regardless of the actual work performed.
- (c) The term does not include either (1) any project for improvement of a building to comply with existing state or local health, sanitary, or safety code specifications which are solely necessary to assure safe living

conditions or (2) any alteration of a “historic building,” provided that the alteration will not preclude the building’s continued designation as a historic building.

3.47. “Watershed” The land area above a given point on a channel that contributes stormwater to that point.

3.48. “Waters of the United States” Those waters under the authority of the Corps of Engineers under the Clean Water Act and defined in 33 CFR Part 328, as amended. This includes most lakes, rivers, streams ponds and wetlands.

3.49. “Wetland” A subset of the Waters of the United States. A wetland is land that is inundated or saturated by surface or ground water at a frequency and duration sufficient to support, under normal conditions, a prevalence of vegetation adapted for life in saturated soil conditions (known as hydrophytic vegetation). A wetland is identified based upon three attributes: 1) hydrology, 2) soils and 3) vegetation as mandated by the Federal wetland determination methodology.

3.50. “Wetland Impact” Any development activity within the boundary of a delineated wetland. Final determination of wetland impact is performed by the US Environmental Protection Agency and the US Corps of Engineers based on 33 CFR Part 230 - Section 404(b)(1) and 33 CFR Parts 320 through 330, as amended.

3.51. “Zone S” *The area subject to flooding by the base flood and shown on the [name] Map prepared by the [name of preparing organization] and dated [date of map].*

The “S” in “Zone S” stands for small drainage area that does not show as SFHA on the community’s FIRM. NIPC has guidelines on how to prepare maps showing these areas. This section is optional, but communities are encouraged to regulate floodplains in drainage areas smaller than FEMA’s and IDNR’s mapping standard.

Section 4. Permit Procedures.**4.1. Site Development Permit Required.**

- 4.1.1. No person, firm, corporation or governmental agency shall commence any development regulated by this Ordinance on any lot or parcel of land without first obtaining a Site Development Permit from [title of permit official].
- 4.1.2. A permit shall be issued if the proposed development meets the requirements of this Ordinance.
- 4.1.3. No development site shall be occupied, no certificate of occupancy shall be issued, and no subdivision or other development shall be accepted by the (City Council/Village Board of Trustees) unless and until all provisions of this Ordinance are met, including the issuance of a final Letter of Map Revision, where appropriate.

4.2. Grandfathering.

- 4.2.1. Development projects that have been approved or permitted prior to the effective date of this ordinance are exempt from this ordinance providing the stormwater management facilities and flood protection measures are installed, functioning and in compliance with all applicable stormwater and floodplain regulations in effect at the time of approval or permit.
- 4.2.2. If a previously developed site is redeveloped or modified so that the amount of impervious surface or the amount of stormwater runoff will increase, then the redevelopment or modification project shall comply with the provisions of this ordinance.
- 4.2.3. Improvements, modifications, additions and repairs to an existing building in the Special Flood Hazard Area shall meet the requirements of this Ordinance.

See Section 13.5 in Part 3.

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<p>4.3. Contiguous Property.</p> <p>4.3.1. In order to preclude inappropriate phasing of developments to circumvent the intent of this Ordinance, when a proposed development activity will occur on a lot or parcel of land that has contiguous lots or parcels of lands owned by the same property owner, then the criteria as defined in this section will be applied to the total land area compiled from aggregate ownership parcels.</p> <p>4.3.2. The determination of Level 1, 2 or 3 development will be based on the total area of all of the contiguous parcels under the same ownership.</p>	<p>See the definitions for “development” and “Level 1, 2 and 3 development.”</p>
<p>4.4. Other Permits.</p> <p>4.4.1. The permit applicant shall be responsible for:</p> <ul style="list-style-type: none"> (a) Obtaining all other federal, state, and local permits, approvals or permit-not-required letters that may be required for this type of activity, and (b) Providing copies of the permits, approvals and letters to [title of permit official]. <p>4.4.2. The [title of permit official] shall not issue a Site Development Permit unless all other federal, state, and local permits have been obtained.</p>	<p>It is strongly recommended that the community develop a list of locations and conditions where other agencies, such as the Corps of Engineers and IDNR, will require permits. A complete list of other required permits should be prepared. It should include:</p> <p>IDNR/OWR permits for floodway development (see section 14.6).</p> <p>IDNR/OWR dam safety permits for construction, modification or removal of a dam or on-stream structure to impound water.</p> <p>US Army Corps of Engineers Section 404 permits for development in wetlands.</p> <p>Written opinion and natural resource information from the Soil and Water Conservation District</p> <p>Approval from sanitary district</p> <p>Local zoning permit</p> <p>Local building code permit</p> <p>Fire Marshall approval</p> <p>Health department approval</p> <p>NPDES Notice of Intent</p> <p>While Section 4.4.1 notes that the permit applicant must provide copies of other federal, state and local permits, the local permit official is still responsible for obtaining</p>

Ordinance	Commentary
<p>4.4.3. The [title of permit official] is responsible for obtaining and maintaining copies of all other required federal, state, and local permits</p>	<p>copies of those permits. The permit official should discuss them with the issuing agency to verify how inspections will be made. Because this ordinance depends on IDNR/OWR permits to assure compliance with the community's NFIP requirements, the community is responsible for ensuring that the project is constructed in conformance with IDNR/OWR permits.</p>
<p>4.5. Conditional Approval.</p>	
<p>4.5.1. The [title of permit official] may issue a letter of conditional approval of</p> <ul style="list-style-type: none"> (a) the regulatory floodplain and regulatory floodway delineation, overland flow path, wetland delineation, runoff volume reduction hierarchy, and/or detention and bypass computations for a development and/or (b) parts of the development project that comply with local requirements. A letter of conditional approval shall not be issued for those parts of the project that are awaiting state or federal approval. 	<p>An example of a conditional approval would be to allow regrading of the flood fringe portion of the site pending IDNR approval of the floodway portion.</p>
<p>4.5.2. A conditional approval to alter the floodway delineation shall not be granted until a CLOMR has been issued by FEMA.</p>	<p>"CLOMR" is defined in Sections 3.8 and 3.10. IDNR does not permit fill in a floodway without a CLOMR or its equivalent in order to assure that the final project will result in an approveable floodway change.</p>
<p>4.5.3. A conditional approval will be based on conformance with the performance standards, and the submittal of the appropriate application requirements.</p>	
<p>4.5.4. The letter of conditional approval will state the conditions placed on the permit applicant. Variation from these conditions is considered a violation of the provisions of this ordinance.</p>	

Ordinance	Commentary
<p>4.5.5. Before the issuance of a letter of conditional approval, the permit applicant shall sign a statement that he or she understands that:</p> <ul style="list-style-type: none"> (a) the project has not been granted a final site development permit, (b) the final site development permit may require changes to the plans, and (c) the applicant proceeds at his or her own risk pending issuance of the final permit. 	
<p>4.6. Timing of Work</p>	
<p>4.6.1. Stormwater management facilities shall be functional before building permits are issued.</p>	
<p>4.6.2. Foundation only permits may be issued for non-residential developments prior to completion of the stormwater systems.</p>	
<p>4.6.3. Soil erosion and sediment control measures shall be functional before general construction begins.</p>	
<p>4.6.4. Where development of a site is to proceed in phases, the timing requirements shall apply to each phase.</p>	
<p>4.7. Fees. An application for a site development permit shall be accompanied by the appropriate fee:</p>	
<p>4.7.1. For a level 1 development: \$[amount]</p>	
<p>4.7.2. For a level 2 development: \$[amount]</p>	
<p>4.7.3. For a level 3 development: \$[amount]</p>	
<p>4.7.4. Additional fee for projects located in the Special Flood Hazard Area: \$[amount]</p>	
<p>4.7.5. Fee in lieu of providing an on-site stormwater management facility in accordance with Section 7.10: \$[amount]</p>	<p>Fees should be set based on the time and cost needed to review the application and conduct all the needed inspections during construction. A level 1 development permit should cost more than a level 3 development permit. A project in the SFHA has additional requirements which take additional time to review and inspect.</p>

4.8. Application Review.

- 4.8.1. The [title of permit official] shall approve, deny or identify what needs to be changed in an application within 60 days.
- 4.8.2. If an application is incomplete or otherwise needs to be revised, the amended permit applications shall be reviewed within 60 days of receipt.

4.9. Permit Termination. A permit shall be terminated for any of the following causes:

- 4.9.1. Noncompliance with any condition of the permit;
- 4.9.2. The permittee's failure to disclose fully all relevant facts in the application process or the permittee's misrepresentation of any relevant facts at any time; or
- 4.9.3. If the authorized work is not commenced within 180 days after issuance of the permit or, if the authorized work is suspended or abandoned, for a period of 180 days after the time of commencing the work, unless an extension has been granted in writing by the [title of permit official]. The extension should be requested of the [title of permit official], in writing no sooner than 90 days prior to the termination of the permit.

The 180 day expiration time period is the same as for a standard building permit. The community can extend the expiration date if the applicant is delayed because of waiting for permits from other agencies.

Section 5. Permit Materials

5.1. All Development. Application for a development permit shall be made on a form provided by the [title of permit official]. All applications for a Site Development Permit shall include the following:

- 5.1.1. Name and address of applicant;
- 5.1.2. Address and legal description of the property
- 5.1.3. Site location of the property, drawn to scale, showing
 - (a) If the project is in the SFHA and
 - (b) If the project is in an incorporated or unincorporated area;
- 5.1.4. Description of the proposed activity;
- 5.1.5. Statement of purpose of the proposed activity;
- 5.1.6. Anticipated dates of initiation and completion of activity;
- 5.1.7. Name and mailing address of the owner of the subject property if different from the applicant;
- 5.1.8. Plans of the proposed activity, drawn to scale, showing:
 - (a) Graphic or numerical scale,
 - (b) North arrow,
 - (c) Property lines and dimensions,
 - (d) Location and dimensions of easements,
 - (e) Location and names of roads in the vicinity,
 - (f) Location and names of waterways in the vicinity, and
 - (g) Location and dimensions of all buildings.

5.1.9. Acknowledgment by the applicant that representatives of any federal, state or local unit of government with regulatory authority over the project are authorized to enter upon the property to inspect the development.

5.1.10. Signature of the applicant or the applicant's agent;

- (a) If the applicant is a corporation, the president or other authorized officer shall sign the application form;
- (b) If the applicant is a partnership, each partner shall sign the application form; and
- (c) If the applicant is a land trust, the trust officer shall sign the name of the trustee by him (her) as trust officer. A disclosure affidavit shall be filed with the application, identifying each beneficiary of the trust by name and address and defining the respective interests therein.

5.2. Level 2 Development Application Materials. In addition to the materials required under Section 5.1, an application for a Level 2 development project shall also include:

5.2.1. A topographic survey of the property at one foot contour intervals keyed to the National Geodetic Vertical Datum 1929, adjusted. The survey shall show:

- (a) Existing terrain;
- (b) Proposed conditions; and
- (c) Adjacent areas necessary to determine off-site impacts to the proposed drainage plan.
- (d) If the development project does not involve regrading the site, then the elevations of the top of foundation, the corners of the lot and representative spots on the lot lines and within the lot may be submitted in lieu of a topographic survey.

Level 2 developments must submit these materials that are, in essence, a "basic" drainage plan.

- 5.2.2. A narrative describing the existing and proposed stormwater management system, including all discharge points, collection, conveyance and stormwater storage facilities.
- 5.2.3. A drainage system map including, but not limited to the following:
- (a) Sub-watershed boundaries and the property's location within the larger watershed;
 - (b) Location of all existing drainage features, such as streams, lakes, wetlands and field tiles;
 - (c) Proposed drainage system including but not limited to storm sewers, overland flow paths, detention facilities and roads;
 - (d) Proposed post-development terrain at one foot contour intervals;
 - (e) Soil classifications; and
 - (f) Proposed buffer areas.
- 5.2.4. Copy of all stormwater calculations, sealed by a Licensed Professional Engineer, including but not limited to, detention basin sizing, storm sewer sizing and overland flow path design.
- 5.2.5. Copy of the proposed plat or deed restrictions for all stormwater management features.
- 5.2.6. Copy of the draft operation and maintenance procedures for all stormwater management features.
- 5.2.7. Copy of any wetland submittal to the US Army Corps of Engineers, a letter from the Corps stating a permit is not required, or a letter from a qualified person stating no Corps of Engineers permits are required.



50 points are provided in Section 451.c.3 of the *CRS Coordinator's Manual*.



Up to 110 points are provided in Section 451.a.3 of the *CRS Coordinator's Manual* if the community accepts responsibility to ensure that all new storage basins will be maintained.

Ordinance	Commentary
<p>5.2.8. Subdivisions, annexation agreements, plats, replats, manufactured home parks and PUDs shall include a signed statement by a Licensed Professional Engineer that accounts for changes in the drainage of surface waters in accordance with the Plat Act (765 ILCS 205/2)</p> <p>5.2.9. Copy of the erosion and sediment control plan (see Section 10).</p>	
<p>5.3. Level 1 Development Application Materials. In addition to the materials required under Sections 5.1 and 5.2 for Level 2 development applications, an application for a Level 1 development project shall also include:</p> <p>5.3.1. Calculations and a plan defining the flood levels and flow areas through the development for the runoff from the 100-year storm;</p> <p>5.3.2. Cross-section data for open channel flow paths and designated overland flow paths;</p> <p>5.3.3. Flow rates and velocities at representative points in the drainage system;</p> <p>5.3.4. A statement by the design engineer of the drainage system’s provisions for handling events greater than the 100-year runoff.</p>	<p>Level 1 developments must submit these materials that are, in essence, an “advanced” drainage plan.</p> <p>This requirement should not be confused with the requirement to show the 100-year floodplain on a plat.</p>
<p>5.4. Level 3 Development Application Materials. An application for a Level 3 development project shall include a plan of the parcel showing pre-development and post-development surface drainage flows.</p>	<p>The plan can be a drawing. The objective is to ensure that both the applicant and the community check how the project will affect flows on the lot and from and onto adjoining properties.</p>
<p>5.5. Floodplain Development Application Materials. In addition to the site development application materials of Sections 5.1 – 5.3, a permit application for a development project in the SFHA shall include:</p> <p>5.5.1. A copy of the designated floodway map, showing:</p> <p>(a) The location of the project and property lines in relation to the floodplain and floodway boundaries;</p> <p>(b) Any proposed change in the designated</p>	

floodway location.

5.5.2. For all proposed buildings, the elevation of the lowest floor (including basement) and lowest adjacent grade shall be shown on the submitted plans.

5.5.3. Additional base flood elevation and floodway calculations and data that may be needed as identified in other sections of this Ordinance.

5.6. Plats. Plats or plans for new subdivisions, mobile home parks and Planned Unit Developments (PUDs) shall include:

5.6.1. A signed statement by a Licensed Professional Engineer that the plat or plans account for changes in the drainage of surface waters in accordance with 765 ILCS 205/2.

5.6.2. The delineation of all SFHAs which appear on the plat, signed and sealed by an Illinois Registered Land Surveyor as per the requirements of Public Act 85-267.

5.7. Records

5.7.1. The [title of permit official] shall maintain all permit and inspection records, including copies of elevation and floodproofing certificates. Such records shall be made readily available for a period of up to three years after the project is completed.

5.7.2. All stormwater management facilities shall be located and described within a deed or a plat restriction.

5.7.3. All stormwater management facilities shall be



See also the additional requirements for subdivisions and other large developments in the floodplain in Section 13.13.



Even though these provisions are required by State law, 10 points are provided under Section 341.b in the *CRS Coordinator's Manual*.

Records should be kept forever, but may be archived after three years. It is the community's responsibility to make records available for a Community Assistance Visit or CRS verification visit. Such visits may be as long as five years apart.

Communities in the Community Rating System must keep all Elevation and Floodproofing Certificates readily available forever. CRS communities should keep all other pertinent records until their ISO/CRS Specialist advises them that the credits have been verified and the records are no longer needed.

located within easements or rights-of-way that explicitly provide for public access for maintenance of such facilities.

- 5.7.4. Perpetual operation and maintenance responsibility and emergency access shall be designated on the plat or deed. Stormwater management facilities that service a single parcel (or two parcels) of property may be excused from this requirement upon approval of the [title of permit official].

Up to 110 points are provided in Section 451.a.3 of the *CRS Coordinator's Manual* z if the community accepts responsibility to ensure that all new storage basins will be maintained.

Section 6. General Provisions

6.1. Duties of the Enforcement Official(s)

The [title of permit official] be responsible for the general administration and enforcement of this Ordinance which shall include the following:

- 6.1.1. Ensure that any and all required federal, state and local permits are received prior to the issuance of a watershed development permit.
- 6.1.2. Ensure that all development activities within the SFHAs of the jurisdiction of the (Village/City) meet the requirements of this Ordinance.
- 6.1.3. Inspect all development projects before, during and after construction to assure proper elevation of the structure and to ensure compliance with the provisions of this Ordinance;
- 6.1.4. Require and obtain copies of all necessary federal, state and local permits and ensure that development projects are constructed in accordance with those permits;
- 6.1.5. Maintain permit files including Elevation and Floodproofing Certificates;
- 6.1.6. Maintain for public inspection and furnish upon request base flood data, SFHA and designated floodway maps, copies of federal or state permit documents, variance documentation, Conditional Letter of Map Revision, Letter of Map Revision, Letter of Map Amendment and elevation or floodproofing certificates for all buildings constructed subject to this Ordinance.
- 6.1.7. Cooperate with state and federal floodplain management agencies to improve base flood or 100-year frequency flood and floodway data and to improve the administration of this Ordinance;
- 6.1.8. Submit reports as required for the National Flood Insurance Program; and

See Section 4.4 and its commentary on other permits that may be required. Because this ordinance depends on IDNR/OWR permits to assure compliance with the community's NFIP requirements, the community is responsible for ensuring that the project is constructed in conformance with IDNR/OWR permits.

- 6.1.9. Notify FEMA of any proposed amendments to this ordinance.
- 6.1.10. Submit data to IDNR and FEMA to support proposed revisions to the regulatory maps.
- 6.1.11. Ensure that development projects authorized by state and federal authorities are constructed in accordance with the related state and federal permits.

6.2. Disclaimer of Liability

- 6.2.1. The degree of flood protection required by this Ordinance is considered reasonable for regulatory purposes and is based on available information derived from engineering and scientific methods of study.
- 6.2.2. Larger floods may occur or flood heights may be increased by man-made or natural causes. This Ordinance does not imply that development, either inside or outside of the SFHA, will be free from flooding or damage.
- 6.2.3. This Ordinance does not create liability on the part of the (Village/City) or any officer or employee thereof for any flood damage that results from reliance on this Ordinance or any administrative decision made lawfully thereunder.

6.3. Penalty

- 6.3.1. Failure to comply with the requirements of a permit or conditions of a variance resolution shall be deemed to be a violation of this Ordinance.
- 6.3.2. Upon due investigation, the [title of permit official] may determine that a violation of the minimum standards of this Ordinance exist. The [title of permit official] shall notify the owner in writing of such violation.
- 6.3.3. If such owner fails after ten days notice to correct the violation,

This section explains that this Ordinance does not guarantee that flood damage will not occur, and that the municipality, county, or enforcing official is not liable for decisions made lawfully under this Ordinance.

Ordinance	Commentary
<p>(a) The (Village/City) may make application to the Circuit Court for an injunction requiring conformance with this Ordinance or make such other order as the Court deems necessary to secure compliance.</p> <p>(b) Any person who violates this Ordinance shall, upon conviction thereof, be fined not less than fifty dollars (\$50.00) or more than one-thousand dollars (\$1,000.00) for each offense.</p> <p>(c) A separate offense shall be deemed committed upon each day during or on which a violation occurs or continues.</p> <p>(d) The (Village/City) may record a notice of violation on the title to the property.</p>	
<p>6.3.4. The [title of permit official] shall inform the owner that any such violation is considered a willful act to increase flood damages and, therefore, may cause coverage by a Standard Flood Insurance Policy to be suspended.</p>	<p>Section 1316 of the National Flood Insurance Act authorizes local officials to request denial of flood insurance for buildings in violation of the local floodplain ordinance.</p>
<p>6.3.5. The [title of permit official] is authorized to issue an order requiring the suspension of the subject development. The stop-work order shall be in writing, shall indicate the reason for the issuance, and shall order the action, if necessary, to resolve the circumstances requiring the stop-work order. The stop-work order constitutes a suspension of the permit.</p>	<p>A stop-work order should be issued if the development is proceeding in a manner which creates an imminent hazard of severe harm to persons or property (e.g., an unauthorized fill in the floodplain); or development has been accomplished in violation of the requirements of this Ordinance and a period of at least 15 days has elapsed since the permittee has received written notice of violation; or the development is proceeding without a permit.</p>
<p>6.3.6. No Site Development Permit shall be permanently suspended or revoked until a hearing is held by the (Board of Appeals). Written notice of such hearing shall be served on the permittee and shall state: (1) the grounds for compliant or reasons for suspension or revocation; and (2) the time and place of the hearing. At such hearing, the permittee shall be given an opportunity to present evidence on his/her behalf. At the conclusion of the hearing, the (Board of Appeals) shall determine whether the permit shall be suspended or revoked.</p>	

6.3.7. Nothing herein shall prevent the (Village/City) from taking such other lawful action to prevent or remedy any violations. All costs connected therewith shall accrue to the person or persons responsible.

6.4. Variances. Whenever the standards of this Ordinance place undue hardship on a specific development proposal, the applicant may apply to the [title of the board or commission responsible for issuing variances] for a variance.

6.4.1. The [title of the board or commission responsible for issuing variances] shall review the applicant's request for a variance and shall submit its recommendation to the (Board of Trustees/City Council).

6.4.2. No variance shall be granted to the requirements of this ordinance unless the applicant demonstrates that:

- (a) An exceptional hardship would result if the variance were not granted;
- (b) The relief requested is the minimum necessary;
- (c) There will be no additional threat to public health, safety, *beneficial stream uses and functions, especially aquatic habitat*, or creation of a nuisance;
- (d) There will be no additional public expense for flood protection, *lost environmental stream uses and functions*, rescue or relief operations, policing, or repairs to streambeds and banks, roads, utilities, or other public facilities;
- (e) The applicant's circumstances are unique and do not represent a general problem, and;
- (f) *The granting of the variance will not alter the essential character of the area involved including existing stream uses.*

6.4.3. No variance shall be granted to the floodplain

As much as possible the variance procedure should be tied to existing zoning or building code variance procedure.

These criteria are mandated by the NFIP, except the phrases in italics.

This last subsection is optional, but recommended.

Communities in the NFIP are required to

Ordinance	Commentary
<p>development requirements of this ordinance unless the applicant demonstrates that:</p>	<p>maintain a record of all variance actions, including justification for their issuance, and report them to FEMA in the Biennial Report.</p>
<ul style="list-style-type: none"> (a) The development project cannot be located outside the SFHA; (b) All floodway construction requirements, if any, will still be met; and (c) All requirements of other permitting agencies will still be met. 	<p>The community does not have the authority to grant a variance to the IDNR floodway requirements or the requirements of other regulatory agencies.</p>
<p>6.4.4. The [title of the board or commission responsible for issuing variances] shall notify an applicant in writing that a variance from the requirements of Section 13 that would lessen the degree of protection to a building will:</p>	<p>This subsection on floodplain variances are minimum NFIP requirements.</p>
<ul style="list-style-type: none"> (a) Result in increased premium rates for flood insurance up to amounts as high as \$25 for \$100 of insurance coverage; (b) Increase the risks to life and property; and (c) Require that the applicant proceed with knowledge of these risks and that he will acknowledge in writing that he assumes the risk and liability. 	<p>An insurance agent can estimate the rate increase for specific projects.</p> <p>The Standard Flood Insurance Policy permits an insurance adjuster to not pay for damage that was caused by something the owner did which increased the hazard to the property.</p>
<p>6.4.5. Variances requested in connection with restoration of a historic site, building or structure, may be granted using criteria more permissive than the above requirements, subject to the conditions that:</p>	<p>This subsection on floodplain variances are minimum NFIP requirements.</p>
<ul style="list-style-type: none"> (a) The repair or rehabilitation is the minimum necessary to preserve the historic character and design of the building or structure; and, (b) The repair or rehabilitation will not result in the building or structure being removed as a certified historic building or structure. 	<p>Contact the Illinois Historic Preservation Agency at 217/785-1153 for more information.</p>
<p>6.4.6. A variance to Section 13's prohibition of critical facilities in the SFHA may be issued, providing:</p>	<p>Just because the applicant owns land in the floodplain, it is not sufficient grounds for</p>
<ul style="list-style-type: none"> (a) The applicant demonstrates that the facility 	

Ordinance	Commentary
<p>cannot be located in a flood-free location,</p> <p>(b) The facility shall be protected from flood damage to the 500-year flood elevation, and</p> <p>(c) The facility shall be provided with at least one all-weather access road that connects the facility to areas outside the SFHA. The surface of the access road shall be at or above the base flood elevation.</p>	<p>granting a variance. There must be no alternative sites for the project.</p>
<p>6.5. Abrogation and Greater Restrictions</p> <p>6.5.1. This Ordinance is not intended to repeal, abrogate or impair any existing easements, covenants, or deed restrictions.</p> <p>6.5.2. Where this Ordinance and other ordinance, easements, covenants, or deed restrictions conflict or overlap, whichever imposes the more stringent restrictions shall prevail.</p> <p>6.5.3. This Ordinance is intended to repeal the original ordinance or resolution which was adopted to meet the National Flood Insurance Program regulations, but is not intended to repeal the resolution which the (Village/City) passed in order to establish initial eligibility for the program.</p>	<p>Required by the NFIP.</p>
<p>6.6. Separability</p> <p>The provisions and sections of this Ordinance shall be deemed separable and the invalidity of any portion of this Ordinance shall not affect the validity of the remainder.</p>	

Part 2. Site Development Requirements

Section 7. General Requirements

7.1. General Requirement. No development shall adversely affect the flow of surface waters to or from neighboring properties.

7.2. Existing Systems

7.2.1. Stormwater systems shall properly incorporate and be compatible with existing subsurface and surface drainage systems including agricultural systems.

7.2.2. All existing drain tiles shall be incorporated into the new storm sewer system.

7.3. Drainage Easements

7.3.1. No obstructions shall be placed in any drainage easement that may block or divert the flow of surface drainage.

7.3.2. All fences built in or across a drainage easement shall be either:

(a) Open to allow the flow of surface water, or

(b) Have the bottom of the fence at least 6 inches above grade to allow the unobstructed flow of surface water.

7.4. Stormwater Depths

7.4.1. The maximum depth of stormwater or floodwaters on new streets, parking lots, and other paved areas shall be eight inches measured at the gutter.

7.4.2. The maximum depth of stormwater in other areas that are not designated drainageways or water bodies, shall be one foot.

7.5. Diversions. Transfers of waters between watersheds shall be prohibited except when such transfers will not violate the provisions of this ordinance

Ordinance	Commentary
<p>7.6. Best Management Practices. Developments shall incorporate all best management practices as may be required pursuant to the United States Clean Water Act, as amended.</p> <p>7.7. Runoff Volume Reduction Hierarchy.</p> <p>7.7.1. An applicant shall choose a strategy to meet the release rate requirements that minimizes the increase in runoff volumes and rates from the development and improves water quality.</p> <p>7.7.2. The applicant shall use appropriate best management practices and the following hierarchy in preparing a drainage plan:</p> <ul style="list-style-type: none"> (a) Preservation of natural resource features of the development site (e.g. floodplains, wetlands, prairies and woodlands); (b) Preservation of the existing natural streams, channels and drainage ways; (c) Minimizing impervious surfaces created at the site (e.g., narrowing road width, minimizing driveway length and width, clustering homes and shared driveways); (d) Design of open vegetated channels to convey stormwater runoff; (e) Preservation of the natural infiltration and storage characteristics of the site (e.g., interspersing grass filter strips in areas with impervious cover and installing on-lot bioretention facilities); (f) Implementation of structural measures that provide water quality and quantity control, such as constructing wet bottom versus dry bottom basins; (g) Implementation of structural measures that provide only quantity control and conveyance. 	<p>The relevant provisions of the Clean Water Act are spelled out in Phase II of the U.S. Environmental Protection Agency's National Pollution Discharge Elimination System (NPDES).</p> <p>NPDES will require South Suburban communities to obtain a permit for their separate storm sewer systems. By requiring all new developments to begin reducing stormwater runoff from their sites through the use of best management practices, communities will also reduce the discharge of pollutants.</p> <p>The Phase II NPDES Rule outlines the following six minimum control measures for small community programs:</p> <ol style="list-style-type: none"> 1. Public Education and Outreach 2. Public Participation/Involvement 3. Illicit Discharge Detection and Elimination 4. Construction Site Runoff Control 5. Post-construction Runoff Control 6. Pollution Prevention/Good Housekeeping <p>Implementation of the runoff volume hierarchy and construction of best management practices spelled out in this model ordinance should help communities meet the requirements for measures 4 and 5.</p> <p>Additional information regarding the NPDES program is available from the USEPA at its website: www.epa.gov/owm/sw</p>

7.8. Design Rainfall

- 7.8.1. Unless a continuous simulation approach to drainage system hydrology is used, all design rainfall events shall be based on Illinois State Water Survey's *Bulletin 70*.
- 7.8.2. The first quartile point rainfall events shall be used for the design and analysis of conveyance systems with a duration of less than twelve hours.
- 7.8.3. The third quartile point rainfall distributions shall be used for the design and analysis of detention basins and conveyance systems with a duration greater than 12 and less than or equal to 24 hours.
- 7.8.4. The fourth quartile distribution shall be used in the design and analysis of systems with durations greater than 24 hours.
- 7.8.5. The SCS Type II distribution may be used as an alternative.

The first, third and fourth quartile distributions described by Huff are presented in Table 37 of *Bulletin 70*.

7.9. Design Methods

- 7.9.1. Major conveyance systems for tributary areas up to ten (10) acres may be designed using the rational method. All minor conveyance systems may be designed using the rational method.
- 7.9.2. Event hydrograph methods shall be used to calculate design runoff volumes for stormwater storage basins and major conveyance systems with greater than 10 acres of drainage area.
- 7.9.3. The following hydrologic design procedures are considered acceptable for generation of hydrographs: Corps of Engineers HEC-1, TR-20, TR-55 subject to rainfall distribution modifications, and continuous simulation models.
- 7.9.4. Event methods must use antecedent moisture condition 2.

7.9.5. *The hydrologic model used shall assume that the watershed is either fully urbanized or fully developed according to current zoning ordinances that have jurisdiction over the area. The model may assume that detention will be construction for new development as required by current ordinances that have jurisdiction over the area.*

7.10. Fee in Lieu. Where a regional drainage plan has been adopted and is being implemented, the applicant may pay a fee in lieu of meeting the requirements of this Part.

7.10.1. The fee shall be as set in Section 4.7.

7.10.2. Fees so paid shall be dedicated to implementing the drainage plan and shall not be used for other purposes.

7.10.3. Payment of the fee does not relieve the development from meeting all pertinent floodplain development requirements of Part 3 of this Ordinance.

Note that the fee in lieu approach can only be used if the community has adopted a regional drainage plan that shows how the fees will be spent.

Section 8. Stormwater Storage

8.1. Release Rates

- 8.1.1. No level 1 or 2 development shall allow the stormwater runoff to leave the development site at a rate greater than the peak runoff from the site under the conditions that exist when the permit is applied for.
- 8.1.2. The drainage system for a property shall be designed to control the peak rate of discharge from the property for the two-year, 24-hour and 100-year, 24-hour events.
- 8.1.3. The peak discharge for events less than or equal to the two-year event shall not be greater than 0.04 cfs per acre of property drained. The peak 100-year discharge shall not be greater than 0.15 cfs per acre of property drained.
- 8.1.4. Upon approval of the [title of permit official], storage volume calculations for Level 2 developments may be based on the development's percentage of impervious area, using the calculations in *Detention Volume versus Impervious Area*, (South Suburban Mayors and Managers Association, May, 2000)

8.2. Emergency Overflow

- 8.2.1. All stormwater infiltration, retention and detention facilities shall be provided with an emergency overflow structure capable of passing the 100-year peak flow inflow rate without damage to buildings or property.
- 8.2.2. The overflow shall be established at the 100-year highwater elevation.
- 8.2.3. The remainder of the basin shall have at least one foot of freeboard.

8.3. Outlet Design.

- 8.3.1. Single pipe outlets shall have a minimum inside diameter on 12 inches.
- 8.3.2. If design release rates call for a smaller outlet, a

This is a general performance standard: the development must not allow an increase in peak runoff from before-development conditions.



80 points are provided in Sections 451.a.1 and 2 of the *CRS Coordinator's Manual*.

This standard is more restrictive than the Metropolitan Water Reclamation District's criteria, which dates back to the early 1970's.

Using this figure leads to a conservative storage volume. The figure should not be used for sites with any off site flow being routed through the storage basin, on-stream detention or detention within a floodplain.

design that minimizes the possibility of clogging, such as a perforated riser, shall be used.

- 8.3.3. The minimum outlet restrictor size shall be four (4) inches in diameter provided there is adequate downstream capacity.
- 8.3.4. All outlets shall be “gravity only” unless otherwise approved by the [title of permit official].
- 8.3.5. Backwater on the outlet structure from the downstream drainage system shall be evaluated when designing the outlet.

8.4. Dam Construction. If the construction of a storage basin involves the construction, modification or removal of a dam or in-stream impoundment structure, as defined in 17 IL Adm. Code 3702 (Rules for Construction of Dams), the applicant shall obtain an Illinois Division of Water Resources Dam Safety Permit or letter stating no permit is required prior to the start of work.

8.5. Off-site Flow. Stormwater infiltration, retention and detention facilities required to meet a development’s discharge requirements shall be designed to bypass off-site tributary flow from streams and channels unless approved by the [title of permit official].

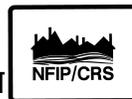
8.6. Depressional Storage

- 8.6.1. The function of existing on-site depressional storage shall be preserved independently of required detention.
- 8.6.2. When depressional storage is removed it must be compensated for by an on-site runoff storage facility at a 1 to 1 ratio. This requirement is in addition to the site runoff storage requirements of this Ordinance.

8.7. Storage Basins. Detention and retention basins shall be designed with the following guidelines:

- 8.7.1. Provisions for all basins.

- (a) The facility shall incorporate either open water or wetland features to improve water



The community may want to add provisions on safety, accessibility, signage and appearance.

25 points are provided in Section 451.e of the CRS

Ordinance	Commentary
<p>quality.</p> <p>(b) The facility shall be designed to remove stormwater pollutants.</p> <p>(c) To the extent feasible, the distance between detention inlets and outlets shall be maximized. Where possible, they should be at opposite ends of the basin.</p> <p>(d) The dry portions of the facility may be made available for recreational use.</p>	<p><i>Coordinator's Manual .</i></p>
<p>8.7.2. Provisions for areas with open water:</p> <p>(a) The water shall be at least three feet deep, excluding nearshore banks and safety ledges. If fish habitat is to be provided, at least twenty-five percent of the bottom area shall be ten feet deep to prevent winter freeze-out.</p> <p>(b) The side slopes shall be no steeper than 5 to 1 (horizontal to vertical).</p> <p>(c) The permanent pool volume at normal depth shall be equal to the runoff volume from its watershed for the 2-year storm. If this can not be achieved, the bottom shall be underdrained or wetland plantings shall be used.</p> <p>(d) Shoreline protection shall be provided to prevent erosion. Native vegetation is the preferred landscaping material.</p> <p>(e) Facilities shall be available, if possible, to allow the pond level to be lowered by gravity flow for cleaning purposes and shoreline maintenance.</p> <p>(f) <i>Aeration facilities may be required to prevent pond stagnation. Agreements for the perpetual operation and maintenance of aeration facilities shall be prepared to the satisfaction of the [title of permit official].</i></p>	<p>The use of aeration facilities is not encouraged because of their marginal benefits and maintenance concerns.</p>

8.7.3. Provisions where wetland features are used:

- (a) The design criteria, vegetation selection, performance criteria, and maintenance and monitoring guidelines in *Naturalized Stormwater Management Facilities* (South Suburban Mayors and Managers Association, May, 2000) shall be followed.
- (b) Sediment basins should be provided at all major inlets to the facility. The volume of the basins should be at least 500 cubic feet per acre of impervious surface in the drainage area. Side slopes below one foot of depth should be no steeper than 3 to 1 (horizontal to vertical) and basin depth should be at least 3 feet and designed to allow access for sediment removal equipment.
- (c) There should be no low flow bypass between the inlet and outlet. Paved low flow channels shall not be used.

Copies of *Naturalized Stormwater Management Facilities* can be obtained by calling SSMMA at 708/206-1155.

8.7.4. Provisions for shoreline zones.

- (a) The “shoreline zone” is that area between one foot above normal pool stage and one foot below normal pool stage.
- (b) The side slope in the shoreline zone shall not be steeper than 10 to 1 (horizontal to vertical).
- (c) Appropriate soil conditions shall be provided in the shoreline zone.
 - (1) Compaction of both subsoil and topsoil shall be minimized (i.e., to less than 275 psi).
 - (2) Where subsoil compaction cannot be avoided, it should be disked to a depth of 6 - 8 inches with a chisel plow before spreading topsoil.

This side slope requirement eliminates the need for a “safety shelf.”

(3) A suitable uncompacted topsoil, at a minimum thickness of one foot, shall be spread to provide a suitable growing medium for aquatic plants. Coarse soils with minimal clay content and a high organic content are recommended.

(d) Water tolerant, preferably native, vegetation shall be used to landscape the shoreline zone.

(1) The selected plants and planting methods shall conform to the soils, hydrology, and water quality conditions present in such facilities, with plants being tolerant of highly variable hydrologic conditions and degraded water quality (e.g., high turbidity and salinity content).

(2) Plant selection should conform to the guidance in the *Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois* (NRCS et al, 1998).

8.7.5. Provisions for areas (other than shoreline zones) that are intended to remain dry:

(a) The minimum bottom slope for turf shall be two percent (2%). If this can not be achieved, the bottom shall be underdrained or wetland plantings shall be used.

(b) The side slopes shall be no steeper than 4 to 1 (horizontal to vertical) for all turf areas.

8.8. Streets, Parking and Underground Storage.

8.8.1. No storage basin shall be constructed within a distance of 10 feet plus one and half times the depth of any basin to the right-of-way of any public roadway without written permission from [title of permit official].

This standard follows that defined in the Illinois Department of Transportation legislation, Public Act 86-616.

- 8.8.2. The owner of a parcel being developed adjacent to a state or county road right-of-way shall notify the proper highway authority in writing of the proposed development. The owner shall request that the proper highway authority provide, at the cost of the highway authority or as otherwise provided by law, the amount of additional capacity in any stormwater detention facility to be constructed in the development for the future availability of the highway authority for meeting stormwater detention requirements of any future public construction on the highway.
- 8.8.3. The maximum depth of stormwater storage for paved areas designated for public parking is eight inches.
- 8.8.4. Underground storage of stormwater shall be avoided. If used, adequate storm sewer inlets must be provided to pass the 100-year flow into the underground storage.

8.9. Storage in Floodplains.

- 8.9.1. Stormwater retention and detention facilities shall not be constructed in the SFHA unless approved by [title of permit official].
- 8.9.2. If a storage facility is constructed in the SFHA, the volume of detention storage required to meet the standards of this Section shall be in addition to the floodplain compensatory storage required for the development.

8.10. On-Stream Detention

- 8.10.1. "On-stream" detention means an in-stream impoundment or other detention basin that includes construction of a dam or other barrier in an existing channel.
- 8.10.2. All on-stream detention shall provide a Detention Volume Safety Factor equal to one plus 0.05 times the ratio of off-site tributary drainage area to on-site tributary drainage area. The maximum Detention Volume Safety Factor shall be 1.5.
- 8.10.3. The applicant for a permit to construct an on-

stream detention facility shall provide the [title of permit official] with either an IDNR dam safety permit or a letter from IDNR stating that a dam safety permit is not required.

8.10.4. On-stream detention shall not be allowed if:

- (a) The off-site to on-site tributary drainage area ratio is greater than 10:1, except for developments providing a watershed benefit or
- (b) The tributary drainage area is greater than 640 acres, except for detention that provides a watershed benefit.

8.10.5. The release rate shall be the total of the following:

- (a) 0.04 cubic feet per second per acre of the total tributary drainage area (on-site and off-site) at the elevation created by impoundment of the on-site 2-year storm volume plus the Detention Volume Safety Factor, AND
- (b) 0.15 cubic feet per second per acre of the total tributary drainage area (on-site and off-site) at the elevation created by impoundment of the on-site 100-year storm volume plus the Detention Volume Safety Factor, AND
- (c) the required compensatory storage.
- (d) The release rate and on-site detention volume shall be calculated using the 24-hour storm event. This release rate calculation shall be used unless other site conditions warrant further analysis and modification from this standard or unless watershed-specific release rates have been adopted.

8.10.6. On-stream detention shall provide water quality treatment. One of the following two methods shall be used:

(a) A wet detention facility shall be constructed with a minimum permanent pool volume equal to the calculated sediment volume accumulated over a one-year period for the entire upstream watershed and an average normal water depth of at least four feet. The facility shall also have a live storage volume that meets the standard storage requirements of this Section.

(b) A separate off-line sediment basin shall be used with a volume appropriate for the tributary drainage area to the sediment basin.

8.10.7. Impoundment of the stream as part of on-stream detention shall not prevent the migration of indigenous fish species, which require access to upstream areas as part of their life cycle, and shall not cause or contribute to the degradation of water quality or stream aquatic habitat. These fish species may be present or potentially present.

8.10.8. Compensatory storage requirements shall be satisfied and shall be in addition to detention volume requirements.

8.10.9. No on-stream detention shall be allowed in areas designated as an exceptional functional value wetland.

Section 9. Stormwater Conveyance**9.1. Capacity**

- 9.1.1. Minor stormwater conveyance systems shall be sized to convey the 10-year runoff.
- 9.1.2. Major conveyance systems shall be sized to carry the 100-year runoff.

9.2. Storm Sewers and Swales

- 9.2.1. The 10-year design storm shall be used as a minimum for storm sewers and minor swales.
- (a) Storm sewers shall contain the 10-year storm within the pipes and manholes.
- (b) Roadside ditches and swales shall contain the 10-year storm without water encroaching on the pavement.
- 9.2.2. Storm sewer design shall be based on full flow conditions; otherwise, hydraulic grade calculations shall be performed that show that the rims are not inundated at the design storm.
- 9.2.3. Storm sewers and swales shall not connect to sanitary sewers.

9.3. Existing Systems.

- 9.3.1. Field tile systems disturbed during construction must be reconnected by those responsible for their disturbance unless an approved drainage plan includes provisions for the disturbed system. All abandoned field tiles shall be removed in their entirety.
- 9.3.2. Storm sewers and swales may connect to existing drain tiles or storm sewers only if the applicant submits a maintenance agreement, recorded easements and a report that indicates the existing system has adequate hydraulic capacity and structural integrity. The recorded easement and maintenance agreement must extend from the connection to the discharge point in an open channel.

9.4. Easements

9.4.1. All storm sewers and swales shall be located in a public road right-of-way or maintenance easement.

9.4.2. The following easement widths shall be used to provide sufficient maintenance access:

Pipe diameter (inches)	Easement width (feet)
Less than 11	10
18 to 36	12
36 to 60	15
greater than 60	10 feet plus the diameter of the pipe

9.4.3. The [title of permit official] shall require additional easement widths if the storm sewer depth is greater than average.

9.4.4. All drainage easements shall be accessible to vehicular equipment; however, vehicles do not have to be able to drive down the entire length of the easement.

9.5. Erosion Protection.

9.5.1. All stormwater conveyance systems shall be designed and constructed to withstand the expected velocity of flow from all events up to the base flood without erosion.

9.5.2. Stabilization adequate to prevent erosion shall be provided at the inlets and outlets for all pipe and channel transitions.

9.6. Sewer Design

9.6.1. The minimum storm sewer shall be 10-inches for the first pipe and 12-inches for subsequent reaches unless approved by the [title of permit official].

9.6.2. The minimum design velocity for a storm sewer shall be 2.5 fps. The maximum design velocity for a storm sewer shall be 8.0 fps.

9.6.3. All flared end sections for 12-inch or larger

storm sewers shall have grates to stop people, animals or large debris from entering. The grates shall have openings no larger than 3-inches horizontal to 8-inches vertical.

9.7. Streams and Channels. Where an existing stream or channel is proposed as part of the conveyance system for the development's increased runoff, the following requirements shall apply:

- 9.7.1. The project shall meet all requirements in Sections 10, 11 and 14 on channel and bank protection.
- 9.7.2. Clearing of channel vegetation shall be limited to that which is necessary. A re-vegetation plan is required using the *Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois*, NRCS, et al, as a minimum standard.
- 9.7.3. A minimum maintenance easement of 12 feet from the top of bank is required along one side of all channels draining 20 or more acres.

9.8. Overland Flow Paths

- 9.8.1. The development must have an overland flow path that will pass the 100-year flood flow without damage to buildings or property.
- 9.8.2. If the upstream drainage area is less than 20 acres, the storm sewer pipe and inlet systems sized for the base flood can be constructed in lieu of providing an overland flow path.
- 9.8.3. The critical duration 100-year flood flow shall be used to design the overland flow path limits and it shall include all on-site and off-site tributary areas.
- 9.8.4. Overland flow paths shall be protected from fencing, landscaping or storage shed placement, which could impair its function. This protection shall be established through an easement, deed or plat restriction as required in Section 5.7.
- 9.8.5. All principal buildings on parcels containing or adjoining an overland flow path or other high

water level designation shall have a lowest adjacent grade elevation:

- (a) 0.5 feet above the overflow elevation for tributary areas of 20 acres or less.
- (b) 1 foot above the overflow elevation for tributary areas greater than 20 acres.

Section 10. Erosion and Sediment Control

10.1. General Principles

- 10.1.1. The requirements of this Section shall only affect Level 1 and 2 developments.
- 10.1.2. Development should be related to the topography and soils of the site so as to create the least potential for erosion. Areas of steep slopes, where high cut and fills may be required, should be avoided and natural contours should be followed as closely as possible.
- 10.1.3. Natural vegetation should be retained and protected. Clearing of natural ground cover and/or trees within a buffer area as defined in Section 11 should be left undisturbed wherever possible.
- 10.1.4. The smallest practical area of land should be exposed at any one time.
- 10.1.5. Prior to site clearing and grading, sediment basins or traps, filter barriers, diversions and other appropriate control measures shall be installed.
- 10.1.6. Permanent vegetation and structures should be installed and functional as soon as practical during development. Native vegetation is preferred for developments near, or adjacent to high quality natural areas, wetlands and streams.
- 10.1.7. Those areas being converted from agricultural purposes to other land uses shall be vegetated with an appropriate protective cover prior to development.
- 10.1.8. All waste generated as a result of site development shall be properly disposed of and shall be prevented from being carried off the site by either wind or water.

10.2. On-site control measures

The on-site control measures shall be designed based on the size of the disturbed areas as follows:



35 points are provided in Section 451.d.2 of the *CRS Coordinator's Manual*.

- 10.2.1. For disturbed areas draining less than one (1) acre, filter barriers (including filter fences, straw bales, or equivalent control measures) shall be constructed to control all off-site runoff as specified in referenced handbooks. Vegetated filter strips, with a minimum width of twenty-five (25) feet may be used as an alternative where runoff in sheet flow is expected.
- 10.2.2. For disturbed areas draining more than one (1) acre but less than five (5) acres, a sediment trap or equivalent control measure shall be constructed at the downslope point of the disturbed area in conjunction with other filter barriers.
- 10.2.3. For disturbed areas draining more than five (5) acres, a sediment basin or equivalent control measure shall be constructed at the downslope point of the disturbed area in conjunction with other filter barriers.
- 10.2.4. Sediment basin and trap design shall provide for both detention storage and sediment storage. The detention storage shall be for equal volumes of “wet” detention storage and “dry” detention storage. Each shall be sized for the 2-year, 24-hour runoff from the site. The release rate shall be that rate required to achieve a minimum detention time of ten (10) hours. The outlet structure shall be placed such that it only drains the dry detention storage.
- 10.2.5. The sediment storage shall be sized to store the estimated sediment load generated from the site over the duration of the construction period with a minimum storage equivalent to the volume of sediment generated in one year. A sediment removal schedule is required for construction periods exceeding one year.

10.3. Stormwater conveyance channels.

Stormwater conveyance channels, ditches, swales, and diversions, shall convey a 10-year frequency storm without erosion. All channels shall be stabilized within 48 hours, consistent with the following standards:

Ordinance	Commentary
<p>10.3.1. For grades up to 4 percent, seeding in combination with mulch or erosion blankets shall be placed along the channel sides with sod or erosion blanket applied to the bottom</p> <p>10.3.2. For grades of 4 to 8 percent, sod shall be used</p> <p>10.3.3. For grades greater than 8 percent, use rock or rip-rap, or reduce the grade using drop structures.</p>	
<p>10.4. Channel Protection</p> <p>10.4.1. A vegetated buffer strip of at least 25 feet in width shall be preserved and/or re-established, where possible, along existing channels.</p> <p>10.4.2. Land disturbance activities in stream channels and construction vehicle use of channels shall be minimized.</p> <p>10.4.3. Temporary stream crossings shall be constructed, where necessary, to minimize erosion. Temporary crossings shall be constructed of non-erosive materials such as rip-rap or gravel.</p> <p>10.4.4. The temporary stream crossing shall be completely removed and the stream restored to its preconstruction condition within 48 hours after completion of construction, incorporating appropriate native vegetation. Also see Section 14 Requirements in Floodways.</p>	<p>See also the provisions in Sections 11.5 and 14.5.</p>
<p>10.5. Additional Requirements</p> <p>10.5.1. Storm sewer inlets and culverts shall be protected by sediment traps or filter barriers meeting accepted design standards and specifications</p> <p>10.5.2. If dewatering devices are used, discharge locations shall be protected from erosion. All pumped discharges shall be routed through appropriately designed sediment traps or basins, or equivalent.</p>	

10.5.3. Each site shall have graveled entrance roads, access drives and parking areas of sufficient length and width to prevent sediment from being tracked onto public roadways. Any sediment reaching a public or private road shall be removed by shoveling or street cleaning (not flushing) before the end of each workday and transported to a controlled sediment disposal area.

10.6. References Adopted

10.6.1. Specifications for erosion control measures shall be in accordance with the “Illinois Urban Manual” (1995) or latest edition.

10.6.2. Sediment and erosion control planning shall be in accordance with “Procedures and Standards for Urban Soil Erosion and Sedimentation Control in Illinois” (revised July, 1988) by the Urban Committee of the Association of Illinois Soil and Water Conservation Districts (the “Green Book”) Chapters 1-5.

10.6.3. Where the requirements of Sections 10.2 – 10.5 of this ordinance, the Illinois Urban Manual or the “Green Book” conflict, the more restrictive requirement shall prevail.

10.7. Plan Requirements

An erosion and sediment control plan shall include the following:

10.7.1. Proposed sequencing schedule, including dates, for:

- (a) Stripping,
- (b) Installation of temporary on-site control measures and perimeter controls,
- (c) Clearing and grading,
- (d) Construction,

The Illinois Urban Manual has replaced the IEPA’s Standards and Specifications for Soil Erosion and Sediment Control (the Yellow Book).

A community may want to list its own standards and specifications instead of using the standard reference.

Ordinance	Commentary
<p>(e) Installation of storm drainage and paving, and</p> <p>(f) Final grading, removal of temporary measures and landscaping.</p> <p>10.7.2. Location, standard details and design specifics of sediment basins and traps. The design specifics should include outlet details and the drainage area to each measure.</p> <p>10.7.3. Location and description of all control measures, including seeding mixtures and rates, types of sod, method of seedbed preparation, expected seeding dates, kind and quantity of mulching for both temporary and permanent vegetative control measures and types of non-vegetative stabilization measures.</p> <p>10.7.4. Description of dust and traffic control measures and location and specifications for construction entrances.</p> <p>10.7.5. Locations of stockpiles and description of stabilization measures.</p> <p>10.7.6. Volumes, locations and methods of stabilization for off-site fill or borrow.</p> <p>10.7.7. Provisions for maintenance of control measures, including a maintenance schedule.</p> <p>10.7.8. Description of permanent stabilization measures</p> <p>10.7.9. Identification (name, address and telephone) of the person(s) or entity responsible for maintenance during and after construction.</p>	

10.8. Extended Construction Shutdown Period.

Disturbed areas shall be stabilized with temporary or permanent measures within seven (7) calendar days following the end of active disturbance or redisturbance. The condition of the construction site for the winter shut down period shall address proper sediment and erosion control early in the fall growing season. Stabilization measures include seeding, mulching, sodding or erosion control blankets.

10.9. Final Site Stabilization. All temporary control measures shall be disposed of within thirty days after permanent soil stabilization measures have been installed. Trapped sediment and other disturbed soils resulting from the temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.

Section 11. Stream and Wetland Protection

11.1. Buffer Areas Required. Buffer areas shall be required along all streams, lakes, waterways, channels and wetlands, except for the following:

- (a) Roadside ditches,
- (b) Existing excavated stormwater storage facilities,
- (c) Borrow pits and quarries,
- (d) Leveed waterways, and
- (e) Improvements to existing public roads and utilities.

11.2. Buffer Area Dimensions

11.2.1. Linear Buffers. Linear buffers shall be designated along both sides of all streams and natural channels. A minimum buffer of thirty feet on each side of the channel shall be provided.

11.2.2. Water Body Buffers. Water body buffers shall encompass all lakes, wetlands and other non-linear bodies of water. A minimum buffer of thirty feet on each side of the channel shall be provided.

11.2.3. Exceptional functional value wetlands shall have a minimum buffer of one hundred (100) feet.

11.2.4. In areas having state or federal threatened and endangered species present or for Illinois Natural Area Inventory Sites, buffer widths may be modified to meet the terms and conditions specified during consultation with the Illinois Department of Natural Resources or United States Fish and Wildlife Service, pursuant to state and federal laws and regulations.

11.2.5. The buffer area for all Waters of the United



15 points are provided in Section 431.g.3 of the *CRS Coordinator's Manual*.

States shall extend from the ordinary highwater mark. The buffer area for wetlands shall extend from the edge of the delineated wetland. A property may contain a buffer area that originates from the Waters of the United States on another property.

- 11.2.6. Buffer averaging may be allowed by the [title of permit official], provided the buffer width is at least half of the buffer width required by this ordinance or the minimum width required by a Corps of Engineers permit, whichever is wider.

11.3. Buffer Requirements

- 11.3.1. Features of the stormwater management system may be within the buffer area of a development.
- 11.3.2. Access through buffer areas shall be provided, when necessary, for maintenance purposes.
- 11.3.3. Preservation of buffer areas shall be provided by deed or plat restriction.

11.4. Allowed Uses in Buffer Areas

- 11.4.1. All buffer areas shall be maintained free from development except for the following uses:
- (a) Passive recreation, including pedestrian, bicycle or equestrian trails.
 - (b) Construction and maintenance of utilities and stormwater facilities.
- 11.4.2. Structures and impervious surfaces related to recreational facilities, such as trails and paths, may occupy a maximum of twenty (20) percent of the buffer surface area, provided the runoff from such facilities is diverted away from the Waters of the United States or such runoff is directed to enter the buffer area as unconcentrated flow. Boat docks, boathouses and piers shall be allowed and count as a structure when calculating percent of impervious area.
- 11.4.3. Buffer areas hydrologically disturbed by allowing construction or as part of a revegetation plan

shall be revegetated using the *Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois*, (NRCS, et al.) as a minimum standard.

11.5. Channel Protection

11.5.1. If the proposed activity involves a channel modification, the permit applicant shall demonstrate that

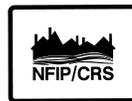
- (a) There are no practicable alternatives to the activity which would accomplish its purpose with less impact to the natural conditions of the body of water affected. Channel modification is acceptable if the purpose is to restore natural conditions and improve water quality and fish and wildlife habitat.
- (b) Water quality, habitat, and other natural functions would be significantly improved by the modification and no significant habitat area may be destroyed, or the impacts are offset by the replacement of an equivalent degree of natural resource values.

11.5.2. A channel modification shall be designed and constructed in a way which will minimize its adverse impacts on the natural conditions of the body of water affected, consistent with the following criteria:

- (a) The physical characteristics of the modified channel shall match as closely as possible those of the existing channel in length, cross-section, slope and sinuosity. If the existing channel has been previously modified, restoration of more natural physical conditions should be incorporated into channel modification design.
- (b) Hydraulically effective transitions shall be provided at both the upstream and downstream ends of the project, designed such

that they will prevent erosion

- (c) One-sided construction of a channel shall be used when feasible. Removal of stream-side (riparian) vegetation should be limited to one side of the channel, where possible, to preserve the shading and stabilization effects of the vegetation.
- (d) Clearing of stabilizing vegetation shall be limited to that which is essential for construction of the channel.
- (e) Channel banks shall be constructed with a side slope no steeper than 3:1 horizontal to vertical, wherever practicable. Native vegetation and gradual side slopes are the preferred methods for bank stabilization. Where high velocities or sharp bends necessitate the use of alternative stabilization measures, soil bioengineering techniques, natural rock or rip-rap are preferred approaches. Artificial materials such as concrete, gabions, or construction rubble should be avoided unless there are no practicable alternatives.
- (f) All disturbed areas associated with the modification shall be seeded or otherwise stabilized as soon as possible upon completion of construction. Erosion blanket or an equivalent material shall be required to stabilize disturbed channel banks prior to establishment of the vegetative cover.
- (g) If the existing channel contains considerable bottom diversity such as deep pools, riffles, and other similar features, such features shall be provided in the new channel. Spawning and nesting areas and flow characteristics compatible with fish habitat shall also be established, where appropriate.
- (h) A sediment basin shall be installed at the downstream end of the modification to reduce sedimentation and degradation of



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<p>downstream water quality.</p> <p>(i) New or relocated channels should be built in the dry and all items of construction, including vegetation, should be completed prior to diversion of water into the new channel.</p> <p>(j) There shall be no increases in stage or velocity as the channel enters or leaves the project site for any frequency flood unless necessitated by a public flood control project or unless such an increase is justified as part of a habitat improvement or erosion control project.</p> <p>(k) Unless the modification is for a public flood control project, there shall be no reduction in the volume of floodwater storage outside the floodway as a result of the modification.</p> <p>(l) The provisions of Sections 10.4 and 14.5 shall also be met.</p>	
<p>11.6. Dumping</p>	
<p>11.6.1. No person, firm, corporation or governmental agency shall dispose of or dump grass clippings, brush, fill, trash, debris, or other material that may obstruct the flow or storage of water in any channel, swale, culvert, storm sewer, wetland, storage basin or other natural or man-made watercourse or water body.</p>	<p>15 points are provided under Section 541.b of the <i>CRS Coordinator's Manual</i>.</p>
<p>11.6.2. No person, firm, corporation or governmental agency shall dispose of or dump any petroleum products, chemicals, noxious liquids, animal waste or other materials that will pollute the water in any channel, swale, culvert, storm sewer, wetland, storage basin or other natural or man-made watercourse or water body.</p>	

Part 3. Floodplain Development Requirements

Section 12. Regulatory Floodplain Data

12.1. Special Flood Hazard Area.

- 12.1.1. All development within the Special Flood Hazard Area is subject to this ordinance.
- 12.1.2. The “Special Flood Hazard Area” (SFHA) is the area subject to flooding by the base flood and shown on the November 6, 2000, Cook County county-wide Flood Insurance Rate Map as Zone A, A1-30, AE, A0, and/or AH.
- 12.1.3. The SFHA also includes all lands designated as “Zone S” on the *[name] Map prepared by the [name of preparing organization] and dated [date of map]*.

12.2. Base Flood Elevation.

- 12.2.1. The base flood elevation for the SFHAs of _____ (river/creek/stream) shall be as delineated on the 100-year flood profiles in the Cook County county-wide Flood Insurance Study prepared by FEMA and dated November 6, 2000, and such amendments to such study as may be prepared from time to time.

All parts of this section are required by the NFIP or Illinois State law unless otherwise noted.

This ordinance uses the Special Flood Hazard Area shown on the community’s FIRM as the area subject to floodplain regulations. If other areas are known to have flooding problems, communities are encouraged to delineate them on a map and include them in the definition of “SFHA.” If the base flood elevations of these other areas are known, they should also be adopted as part of the definition of “base flood elevation.”

The list of the types of “A” zones can be shortened to reflect those zone designations in the Village or City and adjacent unincorporated areas.

There are no base flood elevations for S Zones, so sections 15.2 and 15.3 are followed to determine their exact boundaries and regulatory flood levels.



The language in italics is recommended and can receive CRS credit under Section 411.a.2 of the *CRS Coordinator's Manual*.

Contact IDNR/OWR to determine which Sections are required for your community. Many communities may only have to adopt portions of this Section, depending on their circumstances.

12.2.2. The base flood elevation for each SFHA delineated as an “Zone AH” or “Zone AO” shall be that elevation (or depth) delineated on the November 6, 2000, Cook County county-wide Flood Insurance Rate Map.

12.2.3. The base flood elevation for all other SFHAs and regulated areas shall be as defined in Section 15.2.

12.3. SFHAs Defined by Elevation. Upon receipt of a development permit application, the [title of permit official] shall compare the elevation of the site to the base flood elevation. Any development located on land that can be shown to be higher than the base flood elevation and which has not been filled since the date of the site’s first Flood Insurance Rate Map as required by this ordinance, is not in the SFHA and therefore not subject to the requirements of this Ordinance.

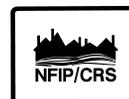
12.4. Flood Protection Elevation (FPE). The Flood Protection Elevation, or “FPE,” shall be the elevation of the base flood plus one foot at any given location in the SFHA.

Such a project will still be subject to the flood insurance purchase requirements unless the owner receives a Letter of Map Amendment from FEMA.

“Freeboard” is an increment of elevation added to the base flood elevation to obtain the flood protection elevation. This provides a factor of safety for uncertainties in calculations, future site development, unknown localized conditions, wave actions and unpredictable effects such as those caused by ice or debris jams. Requiring this extra margin of protection is not an NFIP or State requirement.

One foot is the recommended minimum freeboard. Two or more feet is encouraged and has been adopted by several communities. NIPC has identified watersheds that have changed significantly since the regulatory flood studies were completed. A freeboard of two or three feet is recommended in these areas because the published base flood elevation underestimates the current flood hazard.

100 points are provided in Section 431.a of the *CRS Coordinator’s Manual*. More credit is provided for a freeboard greater than one foot.



12.5. Designated Floodway.

12.5.1. The floodway includes the channel and that portion of the riverine floodplain adjacent to a stream or watercourse as designated by IDNR/OWR, which is needed to store and convey the existing base flood discharge with no more than a 0.1 foot increase in stage due to the loss of flood conveyance or storage, and no more than a 10 percent increase in velocities.

12.5.2. The floodways are designated for _____ (river/creek/stream) on the November 6, 2000, Cook County county-wide Flood Insurance Rate Map.

12.6. Challenges to Regulatory Floodplain Data.

When a party disagrees with the regulatory floodplain data proscribed by this ordinance, he/she may finance the detailed engineering study needed to replace existing data with better data and submit it to IDNR/OWR and FEMA.

To locate the designated floodway boundary on any site, the floodway boundary should be scaled off the floodway map and located on a site plan, using reference marks common to both maps. Where interpretation is needed to determine the exact location of the designated floodway boundary, IDNR/OWR should be contacted for the interpretation.

Section 13. Requirements in all Special Flood Hazard Areas

13.1. Jurisdiction. All development projects in all types of Special Flood Hazard Areas shall comply with this section. Development proposed in floodways and in SFHAs without regulatory floodplain data shall also comply with the additional requirements of sections 14 and 15.

13.2. Public Health Protection.

- 13.2.1. No development in the SFHA shall create a threat to public health or safety.
- 13.2.2. No development in the SFHA shall include locating or storing chemicals, explosives, buoyant materials, animal wastes, fertilizers, flammable liquids, pollutants, or other hazardous or toxic materials below the FPE.
- 13.2.3. New and replacement water supply systems, wells, and sanitary sewer lines may be permitted providing all manholes or other above ground openings located below the FPE are watertight.
- 13.2.4. Septic systems and other on-site waste disposal systems are prohibited in the SFHA.

13.3. Filling and Grading. Whenever a development project proposes to fill or grade vacant land in order to remove a portion of it from the SFHA or to change the floodway boundary,

- 13.3.1. The top of the resulting filled or graded area shall be at or above the FPE, and
- 13.3.2. The [title of permit official] shall not issue a development permit until the applicant has received a Conditional Letter of Map Revision from FEMA.

All parts of this section are required by the NFIP or Illinois State law unless otherwise noted.

Communities are encouraged to match their zoning ordinance to the flood hazard and prohibit intensive or hazardous development from the SFHA. The best zoning districts would be for conservation, open space, agriculture or low density residential uses.



5 points are provided in Section 431.g.1.b of the *CRS Coordinator's Manual*.

This is a more restrictive standard recommended by SSMMA to prevent health complications arising from septic systems in wet soils. The minimum NFIP requirement is to include "on-site waste disposal systems" in the previous section on water and sewer lines.

Going to the FPE instead of the BFE insures that areas removed from the SFHA are protected to the same level as buildings left in the SFHA.

This insures that there are sufficient floodplain details before any earthwork permit is granted. Often the grading work is done months before the final Letter of Map Revision (LOMR) request is submitted and issued. If FEMA has any ques-

13.3.3. The [title of permit official] shall not issue a certificate of occupancy until the applicant has received a Letter of Map Revision from FEMA.

13.4. Compensatory Storage.

13.4.1. Whenever any portion of a floodplain is authorized for use, the volume of space which will be occupied by the authorized fill or building below the base flood elevation shall be compensated for and balanced by a hydraulically equivalent volume of excavation taken from below the base flood elevation.

13.4.2. The excavation volume shall be at least equal to 1.25 times the volume of storage lost due to the fill or building.

13.4.3. In the case of streams and watercourses, such excavation shall be made opposite or adjacent to the areas so filled or occupied.

13.4.4. All floodplain storage lost below the existing 10-year flood elevation shall be replaced below the proposed 10-year flood elevation at at least a 1:1 ratio. All floodplain storage lost above the existing 10-year flood elevation shall be replaced above the proposed 10-year flood elevation at at least a 1:1 ratio.

13.4.5. If the compensatory storage will not be placed at the location of the proposed construction, the applicant's engineer shall demonstrate through a determination of flood discharges and water surface elevations that the compensatory storage is hydraulically equivalent.

tions, the ground would be too disturbed to prepare accurate topographic mapping.

This section requires compensatory storage in all SFHAs. Compensatory storage in the floodway is required by IDNR/OWR.

Compensatory storage in the flood fringe is recommended. If your community does not require compensatory storage in the fringe, it may be reflected in the floodway delineation in future mapping for your and adjacent communities. Contact IDNR/OWR to discuss the mapping repercussions before deciding to not enforce this provision.



70 points are provided in Section 431.f.2 of the *CRS Coordinator's Manual*.

The 1.25 factor is an SSMMA recommendation. This safety factor is intended to compensate for uncertainties in the estimation of the base flood elevation and in the determination of project impacts.

The project's total volume of compensatory storage must be at a ratio of least 1.25 :1. The development must have at least a 1:1 compensation for all lost storage below the 10-year flood level and for all lost storage above the 10-year level. The developer may choose where the additional 25% is taken.

If the location of the compensatory storage site is in the floodway, an IDNR/OWR permit is required.

Ordinance	Commentary
<p>13.4.6. All such excavations shall be constructed to drain freely and openly to the watercourse.</p>	
<p>13.4.7. <i>This compensatory storage requirement does not apply to small temporary structures (such as above ground swimming pools) where such projects are located on small lots with existing buildings where the site does not have sufficient space to provide compensating storage.</i></p>	<p>This optional language does not exempt larger structures, such as a garage or room addition, from the compensatory storage requirement. However, a builder can construct these so water flows into or under them and no floodwater storage is lost.</p> <p>Compensatory storage is not required for small storage sheds and other minor activities that are not considered “development.” See the definition of “development” in Section 3.</p>
<p>13.5. Protecting Buildings.</p>	
<p>13.5.1. All new buildings and improvements and repairs to buildings located within the SFHA shall be protected from flood damage below the FPE.</p>	
<p>13.5.2. This building protection requirement applies to the following situations:</p>	<p>See the definition of “building” in Section 3 Definitions.</p>
<p>(a) Construction or placement of a new building.</p>	
<p>(b) Remodeling or other activity that will result in a substantially improved building.</p>	<p>See the definition of “substantially improved” in Section 3 Definitions.</p>
<p>(c) An addition that will result in a substantially improved building.</p>	<p>Under (b), the entire building must be brought up to the flood protection requirements when it is substantially improved. This is an NFIP requirement.</p>
	<p>This is an NFIP requirement. If the addition does not alter the common wall and the improvements to the original building are minimal, then only the addition has to be elevated or otherwise protected from the base flood.</p>

- (d) An existing building that has been substantially damaged.
- (e) Installing a manufactured home on a new site or a new manufactured home on an existing site. This building protection requirements does not apply to returning a manufactured home to the same site it lawfully occupied before it was removed to avoid flood damage.
- (f) Installing a recreational vehicle or travel trailer on a site for more than 180 days.
- (g) *Construction of new buildings and substantial improvements in the 500-year floodplain,*

Many communities want to make sure that all additions are protected from flooding. Here is alternative language that would protect smaller additions.

An addition that will result in a substantially improved building *or that will increase the first floor area by more than 20 percent.*

An addition that will result in a substantially improved building *or that will increase the first floor area.*



The language in italics is recommended and can receive CRS credit under Sections 431.c.3 or d.6 of the *CRS Coordinator's Manual*.

See the definition of “substantially damaged” in Section 3. Definitions.

Under (d), the entire building must be brought up to the flood protection requirements when it is substantially damaged. This is an NFIP requirement.

This language is recommended because floods don't stop at lines drawn on maps. All buildings proposed at locations which are at or below the FPE should be protected. In situations where a community has identified a flood protection elevation which is higher than the base flood elevation (i.e., it has a freeboard requirement), its building protection requirements should, by definition, extend beyond the SFHA.

13.5.3. This building protection requirement may be met by the methods specified in Sections 13.6 – 13.9. Only nonresidential buildings may use the methods specified in section 13.9. Buildings are also subject to the other requirements of this ordinance, including the floodway restrictions in section 14.

13.5.4. A certification of occupancy shall not be issued for a building project until the permit applicant provides the [title of permit official] with a properly completed, signed and sealed as-built FEMA Elevation or Floodproofing Certificate.

13.6. Buildings on Fill. A residential or non-residential building may be constructed on permanent land fill in accordance with the following:

13.6.1. The lowest floor (including basement) of the building or addition shall be at or above the FPE.

13.6.2. The fill shall be placed in layers no greater than one foot deep before compacting and should extend at least ten feet beyond the foundation of the building before sloping below the base flood elevation.

13.6.3. The top of the fill shall be above the base flood elevation. However, the ten foot minimum may be waived if a structural engineer certifies an alternative method to protect the building from damage due to erosion, scour and other hydrodynamic forces.

13.6.4. The fill shall not adversely affect the flow or surface drainage from or onto neighboring properties.

13.7. Elevated Buildings. A residential or non-residential building may be elevated in accordance with the following:

The 500-year floodplain is shown as the shaded X Zone on the FIRM. 500-year flood elevations are provided in the Flood Insurance Study flood profiles.

If a building is built to these specifications and the lowest floor (including basement) of the building is at or above the FPE, then the owner may apply for a Letter of Map Revision (LOMR) based on fill to remove the property from the SFHA and the flood insurance purchase requirement. The purchase of flood insurance is still recommended.

These fill standards are not specifically mandated by the NFIP or State. However, they help protect the fill and the building it supports during a flood.



20 points are provided in Section 431.b.2 of the *CRS Coordinator's Manual*.

More information on elevating buildings can be found in FEMA's *Elevated Residential Structures*, FEMA-54, March 1984.Q

Ordinance	Commentary
<p>13.7.1. The lowest floor (including basement) and all electrical, heating, ventilating, plumbing, and air conditioning equipment and utility meters shall be located at or above the FPE.</p>	
<p>13.7.2. The building or improvements shall be elevated on crawlspace, stilts, piles, walls, or other foundation that is permanently open to flood waters and not subject to damage by hydrostatic pressures of the base flood.</p>	
<p>13.7.3. Water and sewer pipes, electrical and telephone lines, submersible pumps, and other water-proofed service facilities may be located below the FPE.</p>	
<p>13.7.4. The foundation and supporting members shall be anchored and aligned in relation to flood flows and adjoining buildings so as to minimize exposure to known hydrostatic and hydrodynamic forces such as uplift, current, waves, ice and floating debris.</p>	
<p>13.7.5. All areas below the FPE shall be constructed of materials resistant to flood damage.</p>	
<p>13.7.6. The areas below the FPE may only be used for the parking of vehicles, building access or storage of non-floatable and non-hazardous materials in an area other than a basement. The applicant shall be advised that equipment, machinery and fixtures not required for support of the building and contents located below the lowest floor are not covered by a flood insurance policy.</p>	<p>Elevating buildings at least eight feet and using the lower area as parking is encouraged for two reasons. First, the lowest floor will be well above the FPE, providing extra flood protection. Second, by putting parking under the building, less open space is used for impervious parking surface, reducing the amount of runoff from the site.</p>
<p>13.7.7. If the building is on a crawlspace or other design where the walls below the FPE are enclosed, the following requirements apply:</p> <p>(a) The walls shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must either be certified by a Licensed Professional Engineer or architect or meet or exceed the following mini-</p>	<p>The specifications in subsection (a) are a minimum requirement of the NFIP.</p>

Ordinance	Commentary
<p>mum criteria:</p> <p>(1) There shall be a minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding shall be provided.</p> <p>(2) The bottom of all openings shall be no higher than one foot above grade.</p> <p>(3) Openings may be equipped with screens, louvers, valves, or other coverings or devices provided that they permit the automatic entry and exit of floodwaters.</p> <p>(b) The floor of the crawlspace shall not be lower than the lowest grade adjacent to the building's exterior.</p> <p>(c) Gravity storm and sanitary sewer connections are prohibited in the enclosed area. If there are facilities in the enclosed area connected to storm and sanitary sewers, the connections must be to sumps, pumps and overhead sewer lines.</p> <p>(d) <i>If the lowest floor is more than five feet above the floor of the crawlspace, the owner shall sign a nonconversion agreement to assure that the enclosed lower area will not be improved, finished or converted to a use other than parking, building access or storage of materials.</i></p>	<p>This provision allows positive drainage from the crawlspace after it is flooded. If the crawlspace floor is lower than the outside grade level, the building will be rated at the more expensive "with basement" flood insurance rates.</p> <p>This language is required for communities within the jurisdiction of the Metropolitan Water Reclamation District of Greater Chicago.</p> <p>A sample nonconversion agreement is available from the South Suburban Mayors and Managers Association. It should be reviewed and approved by the municipal attorney before it is used.</p> <div> </div> <p>The language in italics is recommended and can receive 50 points under Section 431.h.2.b of the <i>CRS Coordinator's Manual</i>.</p>

Ordinance	Commentary
<p>13.8. Manufactured Homes and Recreational Vehicles</p> <p>13.8.1. In addition to the requirements of Sections 13.5 - 13.7, manufactured homes</p> <ul style="list-style-type: none"> (a) Shall have the lowest floor elevated to or above the FPE and (b) Shall be anchored to resist flotation, collapse, or lateral movement by being tied down in accordance with the Rules and Regulations for the Illinois Mobile Home Tie-Down Act issued pursuant to 77 Ill. Adm. Code Part 870. <p>13.8.2. Recreational vehicles or travel trailers shall be required to meet the above elevation and anchoring requirements for manufactured homes unless:</p> <ul style="list-style-type: none"> (a) They are on site for fewer than 180 consecutive days and (b) They are fully licensed and ready for highway use. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect type utility and service devices, and has no permanently attached additions. 	<p>This language is slightly more restrictive than the minimum NFIP requirement. The NFIP allows manufactured homes located in existing manufactured home or mobile home parks to be elevated three feet above grade regardless of the FPE. Because there are few such locations in south suburban floodplains with flood depths greater than three feet, this language is recommended to treat all manufactured homes similarly.</p> <p>More information on protecting manufactured housing can be found in FEMA's <i>Manufactured Home Installation in Flood Hazard Areas</i>, FEMA-85, September 1985.</p>
<p>13.9. Floodproofed Buildings. Only a non-residential building may be structurally dry floodproofed (in lieu of elevation) provided that:</p> <p>13.9.1. A Licensed Professional Engineer shall certify that the building has been structurally dry floodproofed below the FPE and that the building and attendant utility facilities are watertight and capable of resisting the effects of the base flood.</p>	<p>Floodproofing is the least dependable flood protection measure and is limited to nonresidential buildings.</p>

Ordinance	Commentary
<p>13.9.2. The building design shall take into account flood velocities, duration, rate of rise, hydrostatic and hydrodynamic forces, the effects of buoyancy, and impacts from debris or ice.</p>	<p>More information on floodproofing criteria can be found in FEMA's <i>Floodproofing Nonresidential Structures</i>, FEMA-102, May 1986 and the Corps' <i>Flood-Proofing Regulations</i>, US Army Corps of Engineers, EP 1165 3 314, 31 March 1992</p>
<p>13.9.3. Floodproofing measures shall be operable without human intervention and without an outside source of electricity (levees, berms, floodwalls and similar works are not considered floodproofing for the purpose of this subsection).</p>	
<p>13.10. Accessory Buildings. <i>Tool sheds and detached garages on an existing single-family platted lot, may be constructed with the lowest floor below the FPE provided the building meets the following requirements:</i></p>	<p>This section is optional.</p>
<p>13.10.1. <i>The building is not used for human habitation.</i></p>	<p>Tool sheds and detached garages can be constructed below the flood protection elevation if this section is included in the ordinance. Communities desiring a more restrictive use of the floodplain, should omit this section.</p>
<p>13.10.2. <i>The building shall meet the permanent opening criteria of section 13.7.7.</i></p>	
<p>13.10.3. <i>All areas below the FPE shall be constructed with waterproof material.</i></p>	
<p>13.10.4. <i>Service facilities such as electrical and heating equipment shall be elevated or floodproofed to the FPE.</i></p>	
<p>13.10.5. <i>The building shall be anchored to prevent flotation.</i></p>	<p>Before this language is adopted, the community should note that such buildings will increase the potential for flood damages to equipment, machinery vehicles and materials stored in them and that some stored materials may contribute to water quality contamination during a flood.</p>
<p>13.10.6. <i>The building shall be less than 500 square feet in floor size.</i></p>	
<p>13.10.7. <i>The building shall be less than \$7,500 in value.</i></p>	
<p>13.10.8. <i>The building shall be used only for the storage of vehicles or tools and may not contain other rooms, workshops, greenhouses or similar uses.</i></p>	

13.11. Critical Facilities.

13.11.1. Critical facilities are defined as:

- (a) Buildings or facilities that produce, use, or store highly volatile, flammable, explosive, toxic and/or water-reactive materials;
- (b) Hospitals, nursing homes, and housing likely to contain occupants who may not be sufficiently mobile to avoid death or injury during a flood;
- (c) Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers that are needed for flood response activities before, during, and after a flood;
- (d) Public and private utility facilities that are vital to maintaining or restoring normal services to flooded areas before, during, and after a flood.

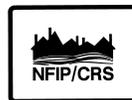
13.11.2. No critical facility shall be allowed in the SFHA.

13.12. Known Flood Hazards. The (Board of Trustees/City Council) shall take into account flood hazards, to the extent that they are known in all official actions related to land management, use and development.

There is no official definition of critical facilities, so each community should identify what it considers appropriate for extra protection. It could include facilities as varied as schools, suppliers of flood fighting supplies and bridges. The list should be prepared with input from the local emergency manager.

There is no NFIP or IDNR restriction on locating critical facilities, other than the IDNR floodway rules. Guidance on a variance to this restriction is in Section 6.4.6.

Alternatively, communities are encouraged to prohibit critical facilities from the 500-year floodplain or require them to be protected from the 500-year flood.



Up to 100 points are provided in Section 431.e.2 of the *CRS Coordinator's Manual*.

This section means that the community must protect new development from damage from any known source of flooding, even if it does not appear on the floodplain map. This is an NFIP requirement.

Ordinance	Commentary
<p>13.13. Major Developments.</p> <p>13.13.1. Subdivisions, annexation agreements, planned unit developments (PUDs), manufactured home parks and other major developments shall be reviewed to assure that the proposed developments are consistent with the provisions of this ordinance and the need to minimize flood damage.</p> <p>13.13.2. Streets, blocks, lots, parks and other public grounds shall be located and laid out in such a manner as to preserve and utilize natural streams and channels. Wherever possible, the floodplains shall be included within parks or other public grounds.</p> <p>13.13.3. The surface of all new arterial streets shall be at or above the base flood elevation. The surface of all new collector streets shall be at or above eight inches below the base flood elevation.</p>	<p>This is an NFIP requirement.</p> <p>See also the additional requirements for subdivision plats in Section 5.6.</p>

Section 14. Requirements in Floodways

14.1. Jurisdiction. This section applies to proposed development, redevelopment, site modification or building modification within a floodway.

14.1.1. Only those uses and buildings which meet the criteria in this section shall be permitted.

14.1.2. All floodway modifications shall be the minimum necessary to accomplish the purpose of the project.

14.1.3. All development projects shall also meet the requirements of section 13 of this ordinance.

14.2. Terminology.

14.2.1. The term “designated floodway” refers to floodways that have been mapped and designated by IDNR. These floodways are subject to the special requirements of 92 Ill. Adm. Code Part 3708.

14.2.2. The term “regulatory floodway” refers to floodways that have not been mapped and designated by IDNR but are determined by the developer pursuant to section 15.3 of this ordinance.

14.3. Smaller Development Projects in Designated Floodways. The following development projects may be permitted by the [title of permit official] provided there is no increase in flood levels. All other projects in the designated floodway are subject to the requirements of Sections 14.4 and 14.5.

14.3.1. Underground and overhead utilities that meet the following requirements.

(a) The utility shall not result in any increase in existing ground elevations.

(b) The project shall not require the placement of above ground structures in the floodway.

All parts of this section are required by the NFIP or Illinois State law unless otherwise noted.

The “designated floodway” is defined and adopted in section 12.5.

Local governments are encouraged to evaluate these exemptions and delete any which, based on local experience, should be subject to IDNR/OWR review. The community may want to identify some that are subject to a professional engineer's review.

- (c) In the case of underground stream crossings, the top of the pipe or encasement shall be buried a minimum of 3' below the existing streambed.
- (d) Overhead utility lines shall be constructed above the FPE or attached above the low chord of an existing bridge (with the permission of the bridge owner). Supporting towers shall not be placed in the watercourse and shall be designed so as to not catch debris during a flood.
- (e) Disturbance of streamside vegetation shall be kept to minimum during construction to prevent erosion and sedimentation. All disturbed floodway areas, including the stream banks shall be restored to their original contours and seeded or otherwise stabilized upon completion of construction.
- (f) A utility crossing carrying material which may cause water pollution as defined by the Environmental Protection Act 415 ILCS 5 shall be provided with shut-off valves on each side of the body of water to be crossed.
- (g) All Illinois Commerce Commission, National Electric Safety Codes, and federal requirements for clearance must be met.

14.3.2. Storm and sanitary sewer relief outfalls that:

- (a) Do not extend riverward or lakeward of the existing adjacent natural bank slope,
- (b) Do not result in an increase in ground elevation, and
- (c) Are designed so as not to cause stream erosion at the outfall location.

14.3.3. Construction of sidewalks, athletic fields (excluding fences), properly anchored playground equipment and patios at grade.

Ordinance	Commentary
<p>14.3.4. Construction of shoreline and streambank protection that:</p> <ul style="list-style-type: none"> (a) Does not exceed 1000 feet in length. (b) Materials are not placed higher than the existing top of bank. (c) Materials are placed so as not to reduce the cross-sectional area of the stream channel or bank of the lake. <p>14.3.5. Temporary stream crossings that meet the following requirements:</p> <ul style="list-style-type: none"> (a) The approach roads will be 1/2 foot or less above natural grade. (b) The crossing will allow stream flow to pass without backing up the water above the stream bank vegetation line or above any drainage tile or outfall invert. (c) The top of the roadway fill in the channel will be at least 2' below the top of the lowest bank. <i>Any fill in the channel shall be non-erosive material, such as rip-rap or gravel.</i> (d) All disturbed stream banks will be seeded or otherwise stabilized as soon as possible upon installation and again upon removal of construction. (e) The access road and temporary crossings will be removed within one year after authorization. 	<p>Stabilization activities involving 1000 feet or less of shoreline or streambank, and which utilize vegetative or soil bioengineering techniques, need not be subject to the review of a registered professional engineer. However, "artificial" methods, such as concrete lining or gabions, which are likely to increase conveyance and potentially exacerbate erosion and/or flooding downstream, should be subject to the review of a registered professional engineer.</p> <p>The italicized language is recommended.</p>
<p>14.4. Smaller Development Projects in Regulatory Floodways. Within all riverine SFHAs where the floodway has not been designated, the following standards shall apply:</p> <p>14.4.1. The requirements of section 15.3 shall be met.</p>	

14.4.2. Within the regulatory floodway, the following activities may be permitted by the [title of permit official] All other projects in the designated floodway are subject to the requirements of Sections 14.5 and 14.6.

- (a) All activities listed in section 14.3.
- (b) The construction of light poles, sign posts and similar structures.
- (c) The construction of properly anchored, un-walled, open structures such as playground equipment, pavilions, and carports built at or below existing grade that would not obstruct the flow of flood waters.
- (d) The placement of properly anchored buildings not exceeding seventy (70) square feet in size, nor ten (10) feet in any one dimension (e.g., animal shelters and tool sheds).
- (e) The construction of additions to existing buildings which do not increase the first floor area by more than twenty (20) percent, which are located on the upstream or downstream side of the existing building, and which do extend beyond the sides of the existing building that are parallel to the flow of flood waters.
- (f) Minor maintenance dredging of a stream channel where:
 - (1) The affected length of stream is less than 1000 feet.
 - (2) The work is confined to reestablishing flows in natural stream channels, or
 - (3) The cross-sectional area of the dredged channel conforms to that of the natural channel upstream and downstream of the site.

See the definition of "channel" in Section 3.

Ordinance	Commentary
<p>14.5. Work in Channels.</p> <p>14.5.1. If the proposed project involves a channel modification, the applicant shall submit the following information:</p> <ul style="list-style-type: none"> (a) A discussion of the purpose of and need for the proposed work; (b) A discussion of the feasibility of using alternative locations or methods to accomplish the purpose of the proposed work; (c) An analysis of the extent and permanence of the impacts each feasible would have on the physical and biological conditions of the body of water affected; and (d) An analysis of the impacts of the proposed project, considering cumulative effects on the physical and biological conditions of the body of water affected. <p>14.5.2. Construction of shoreline and streambank protection in the channel may be permitted by the [title of permit official] provided:</p> <ul style="list-style-type: none"> (a) The project does not exceed 1000 feet in length. (b) Materials are not placed higher than the existing top of bank. (c) Materials are placed so as not to reduce the cross-sectional area of the stream channel by more than 10 percent. <p>14.5.3. The flood carrying capacity within any altered or relocated watercourse shall be maintained.</p> <p>14.5.4. The [title of permit official] shall notify the appropriate offices of adjacent communities at least 30 days before issuing a permit on a project that will alter, relocate or modify a channel.</p>	<p>“Channel modifications” are defined in Section 3. They are of particular concern because of their potential impacts on erosion, water quality and habitat, as well as flood height and velocity. Therefore, specific additional information is required to assess their impacts.</p> <p>Certain activities involving fill in existing channels are also regulated by the US Army Corps of Engineers, which requires its own assessment of environmental impacts. Review of such activities should be coordinated with the Corps.</p> <p>See also the provisions in Sections 10.4 and 11.5.</p> <p>NFIP requirement</p> <p>NFIP requirement</p>

Ordinance	Commentary
<p>14.6. Larger Floodway Projects. All development proposals other than those permitted under sections 14.3, 14.4 and 14.5 require a permit from IDNR/OWR. The [title of permit official] shall not issue a permit for a proposed project until the applicant first obtains a permit or written documentation that a permit is not required from IDNR/OWR, issued pursuant to 615 ILCS 5/5 et seq.</p>	<p>Note: IDNR/OWR has a program to delegate its floodway permitting activities to interested and qualified communities. These communities agree to assume responsibility for the types of projects that this model ordinance defers to IDNR/OWR in this section.</p> <p>If your community has such delegated powers, this section should read:</p> <p style="padding-left: 40px;">“All development proposals other than those permitted under sections 14.3, 14.4 and 14.5 require a review by a Licensed Professional Engineer under the employ or contract of the (Village/City). The [title of permit official] shall not issue a permit for a proposed project until the review engineer provides written documentation that the project complies with the requirements of 615 ILCS 5/5 et seq.”</p> <p>If you are unsure of your community’s status, contact IDNR/OWR.</p>
<p>14.6.1. Application for an IDNR/OWR permit shall be submitted on a form according to procedures specified by IDNR/OWR.</p> <p>14.6.2. No development site shall be occupied, no certificate of occupancy shall be issued, and no subdivision or other development shall be accepted by the (City Council/Village Board of Trustees) unless and until all provisions of the IDNR/OWR permit are met.</p>	<p>The IDNR/OWR office is at:</p> <p style="padding-left: 40px;">201 West Center Court Schaumburg, IL 60196 847/705-4341</p> <p>Because this ordinance depends on IDNR/OWR permits to assure compliance with the community’s NFIP requirements, the community is responsible for ensuring that the project is constructed in conformance with IDNR/OWR permits.</p>
	<p>The local permit official should talk to the IDNR/OWR office to discuss how the project will be inspected. Many minor projects, such as room additions and garages, can be inspected by the community as part of the regular building inspection process. More complicated projects may need a site inspection by an engineer or IDNR/OWR staff to verify compliance.</p>

Ordinance	Commentary
<p>14.6.3. Only appropriate uses are allowed in a floodway. “Appropriate uses” are activities which:</p> <ul style="list-style-type: none"> (a) will not cause a rise in the base flood elevation, (b) will not create a damaging or potentially damaging increase in flood heights or velocity, (c) will not be a threat to public health and safety and welfare, and (d) will not impair the natural hydrologic and hydraulic functions of the floodway or channel, or permanently impair existing water quality or aquatic habitat. <p>14.6.4. The approved appropriate uses are as follows:</p> <ul style="list-style-type: none"> (a) Flood control structures, dikes, dams and other public works or private improvements relating to the control of drainage, flooding, erosion, or water quality or habitat for fish and wildlife. (b) Buildings, structures or other facilities relating to the use of, or requiring access to, the water or shoreline, such as in-stream aeration and similar treatment facilities, and facilities and improvements related to recreational boating, commercial shipping and other functionally water dependent use; (c) Storm and sanitary sewer relief outfalls; (d) Underground and overhead utilities; (e) Open space and recreational facilities such as playing fields and trail systems, including any related fencing (at least 50 percent open when viewed from any one direction) built parallel to the direction of flood flows; 	<p>The “appropriate use” approach is specified by state law for Northeastern Illinois. This list is taken from 17 Ill. Adm. Code Part 3708.</p> <p>The official responsible for administering this section should explain to permit applicants that these are the only things that IDNR/OWR or the community can allow in a floodway. In many cases, this should cause the applicant to revise his/her plans and/or avoid development in the floodway altogether.</p> <p>Toilet facilities and other potential obstructions to flows and/or sources of pollution should be discouraged in the floodway. If such facilities are necessary to serve a recreational use, they should be located outside the floodplain, or at least in the flood fringe.</p>

Ordinance	Commentary
<p>(f) Detached garages, storage sheds, or other non-habitable accessory buildings that will not block flood flows nor reduce floodway storage;</p> <p>(g) Bridges, culverts, roadways, sidewalks, railways, runways and taxiways and any modification thereto;</p> <p>(h) Parking lots built at or below existing grade where the surface of the parking lot shall be at or above nine inches below the base flood elevation.</p> <p>(i) Designated floodway regrading, without fill, to create a positive non-erosive slope toward a watercourse. Regrading or other modifications of the floodway for the convenience of site design for a private development is not considered an appropriate use.</p> <p>(j) Floodproofing activities to protect previously existing lawful buildings including dry floodproofing a building and the construction of floodwalls where the outside toe of the floodwall shall be no more than ten (10) feet away from the exterior wall of the existing building;</p> <p>(k) The replacement, reconstruction, or repair of a damaged building, provided that the outside dimensions are not increased.</p> <p>(l) Modifications to an existing building that will not increase the enclosed floor area of the building below the FPE and which will not block flood flows, including, but not limited to, fireplaces, bay windows, decks, patios and second story additions.</p>	<p>Garages, storage sheds and other non-habitable accessory buildings may be allowed if they are in the hydraulic shadow of an existing building and are designed to be wet floodproofed (see section 13.10).</p> <p>Undrained, depressional areas in a floodway function to retain floodwaters after a flood has passed, discharging it slowly to the channel or recharging groundwater. Regrading such areas should be discouraged.</p> <p>The project must still comply with the requirements of Section 13. If the building is substantially damaged, it must be protected from flood damage.</p> <p>The project must still comply with the requirements of Section 13. If the project is a substantial improvement, the building must be protected from flood damage.</p>

14.6.5. Appropriate uses do not include:

- (a) The construction or placement of any new buildings, fill or building additions;
- (b) Critical facilities or wastewater treatment plants;
- (c) Excavation or channel modifications done to accommodate otherwise non-appropriate uses in the floodway;
- (d) Fencing (including landscaping or planting designed to act as a fence);
- (e) Storage of materials except as specifically defined above as an appropriate use.

Section 15. Areas Without Regulatory Floodplain Data.

15.1. Jurisdiction. This section applies to proposed development, redevelopment, site modification or building modification in SFHAs and other regulated areas where base flood elevations have not been established and/or floodways have not been identified. Within these areas, all appropriate requirements of section 13 shall apply.

15.2. Base Flood Elevations. The base flood elevation shall be the best data available in the Illinois State Water Survey's Floodplain Information Repository. If the State Water Survey does not have data sufficient for regulatory purposes, the following procedures shall be used to obtain the base flood elevation for a site.

15.2.1. If the base flood elevation is needed for a level 2 or 3 development in a riverine SFHA, then the base flood elevation shall be determined using the "Quick – 2 Computer Program" or similar method described in *Managing Floodplain Development in Approximate Zone A Areas*, FEMA publication 265, and accepted by the State Water Survey.

15.2.2. If the base flood elevation is needed for a level 1 development project within a riverine SFHA, then:

- (a) The base flood elevation shall be determined from a backwater model, such as HEC-II, WSP-2, or a dynamic model such as HIP.
- (b) The flood flows used in the hydraulic models shall be obtained from a hydrologic model, that meets the requirements of Section 7.9 Design Methods.

(c) *Along any watercourses draining more than*

All parts of this section are required by the NFIP or Illinois State law unless otherwise noted.

If all of the SFHAs in your community *and* in areas likely to be annexed into your community have base flood elevations and floodways, then this section does not need to be included in your ordinance.

The State Water Survey's office is at

2204 Griffith Drive
Champaign, IL 61820
217/333-5482

See the definition for "level 2" and "level 3" development. This approach reduces the expense of conducting a detailed flood study for smaller development projects.

Managing Floodplain Development in Approximate Zone A Areas, FEMA publication 265, July 1995, is free and can be ordered by calling 800/480-2520. The "Quick – 2 Computer Program" is included with the publication.

The results of the study should be provided to the State Water Survey for its repository.

See the definition for "level 1 development."



CRS credit is provided in Section 411.a of the *CRS Coordinator's Manual*.

one square mile, the analyses shall be submitted to IDNR/OWR for approval. Once approved it must be submitted to the Illinois State Water Survey Floodplain Information Repository for filing.

15.2.3. For a non-riverine SFHA:

- (a) The base flood elevation shall be the highest historic flood recorded plus three feet, unless calculated by a detailed engineering study.
- (b) *In drainage areas greater than one square mile, the calculations shall be approved by IDNR/OWR.*

15.3. Designated Floodway. An applicant for a permit in an SFHA without a designated floodway may:

15.3.1. Treat the entire SFHA as the designated floodway.

15.3.2. Have an engineering study performed by a Licensed Professional Engineer to determine a regulatory floodway. The regulatory floodway may be submitted to IDNR/OWR for inclusion on IDNR/OWR's designated floodway list.

15.3.3. If the application is for a level 2 or 3 development project, treat the 90% of the floodplain closest to the channel as the regulatory floodway and the 10% of the floodplain farthest from the channel as fringe.

15.4. Level 1 Developments. Proposals for new level 1 developments:

15.4.1. Shall include base flood elevation data and floodway delineations. The applicant's engineer shall be responsible for calculating the needed data.

15.4.2. The applicant's engineer shall submit the data to IDNR/OWR for review and approval as best available regulatory data and then send it to the State Water Survey.

This provision does not differentiate between the three levels of developments. There are no methods of calculating a base flood elevation in a non-riverine floodplain short of a detailed engineering study.

NFIP requirement 44 CFR 60.3(b)(3) only requires base flood elevations to be shown for subdivisions greater than 5 acres or 50 lots.

Section 16. Enactment.

This Ordinance shall be in full force and effect from and after its passage and approval and publication, as required by law.

This section sets the date when this Ordinance goes into effect and contains sections which the authorized officials must sign to approve passage.

PASSED by the (Board of Trustees/City Council) of the (Village/City) of _____, Illinois, this ___ day of _____, 200__.

Clerk

APPROVED by me this _____ day of _____, 200__.

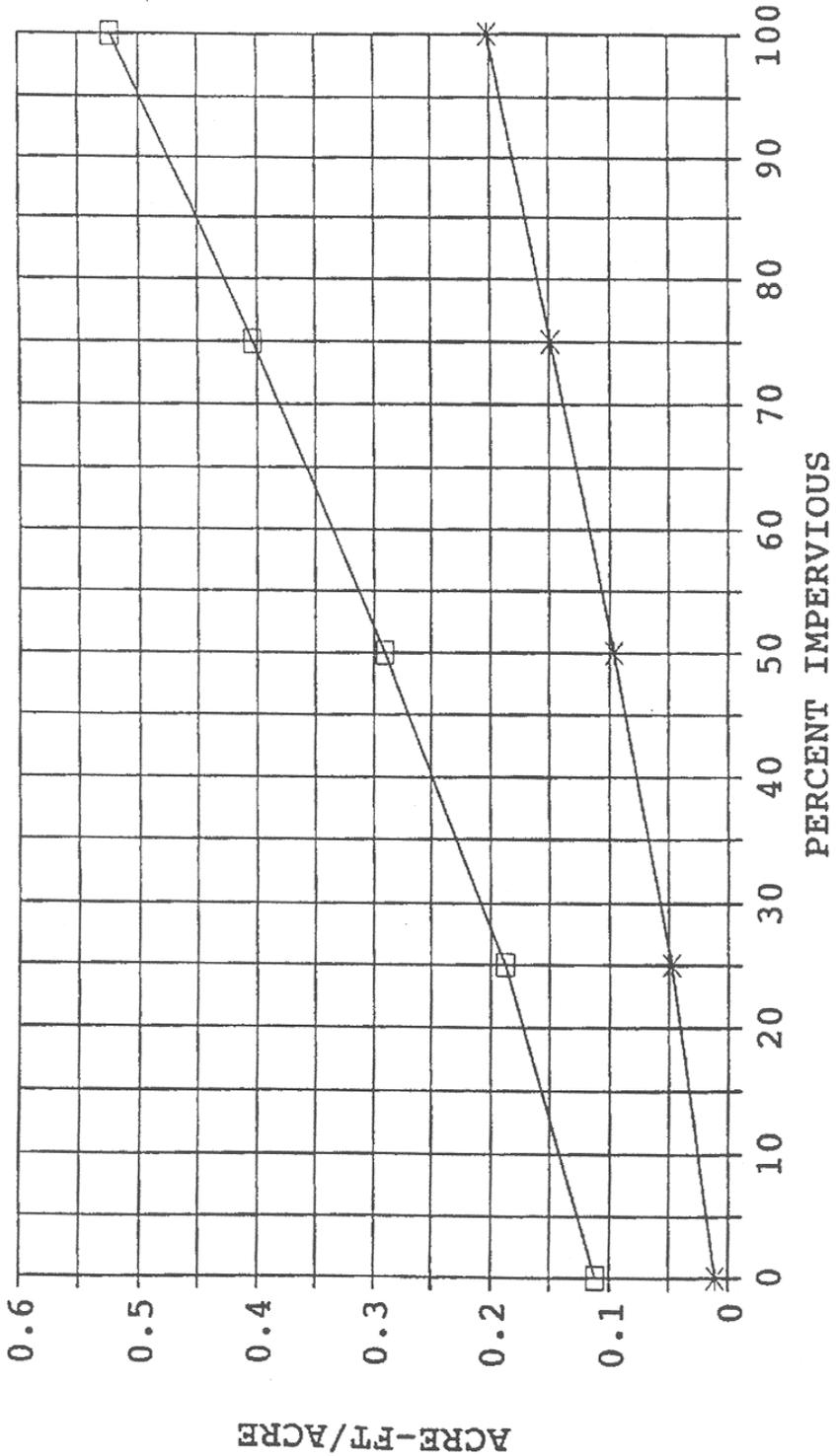
Mayor

ATTESTED and FILED in my office this _____ day of _____, 200__.

Clerk

Detention Volume Versus Impervious Area

DETENTION VOLUME VS PERCENT IMPERVIOUS 2-YEAR AND 100-YEAR UNIT AREA DETENTION



2-year release = 0.04 cfs/acre, 100-year release = 0.15 cfs/acre

*— 2-YEAR □— 100-YEAR

Reference: Northeastern Illinois Planning Commission, Investigation of Hydrologic Methods
for Urban Development in Northeastern Illinois

Naturalized Stormwater Management Facilities

Background

This guidance paper is taken from a Technical Policy Directive developed by the Village of Flossmoor, Illinois. It has been reviewed and recommended for use by the SSMMA Stormwater Management Ordinance Task Force. It may be revised and updated as needed to reflect new techniques and lessons learned.

Purpose

These criteria are intended to apply to projects involving the creation of wetland and prairie planting areas for the purpose of naturalizing stormwater facilities. The purpose is to ensure that the overall design intent for these facilities -- including detention basins, drainage swales, and filter strips - is achieved and maintained, particularly during the initial plant establishment period. The design intent for such facilities is to provide an aesthetic, healthy, diverse community of native vegetation to meet the objectives of soil stabilization, stormwater treatment, and wild-life habitat (where appropriate). Monitoring is required annually for a minimum period of three full growing seasons following planting.

If the planting incorporates existing wetland habitat that is subject to a Clean Water Act Section 404 permit, the developer will be subject to U.S. Army Corps of Engineers monitoring and performance standards, typically including the requirements for a five- year monitoring and approval period. A brief outline of typical Corps performance standards is attached to this document.

The purpose of this policy directive will be accomplished by the following actions:

1. Development and implementation of an effective landscape/planting plan.
2. Routine site inspection and monitoring of planting success.
3. Follow-up repair, reseeding, and/or replanting to meet performance criteria.
4. Routine monitoring and maintenance/remediation of shoreline and slope erosion, debris accumulation, and sediment accumulation.
5. Preparation of annual reports documenting monitoring results and maintenance and remedial activities.

Design Criteria

In order to maximize the success of native plantings, it is critical that 1) stable slopes are provided via site grading to minimize erosion potential, 2) a suitable growing medium is provided for seeding and/or planting, and 3) vegetation is selected based on its appropriateness to the expected soils and hydrologic regime, or wetness. In particular, stormwater facilities should be designed in recognition of expected significant fluctuations of water levels.

Slopes and grading: Stable slope criteria are provided below for detention basins, drainage swales, and filter strips.

Detention basins designed with conventional steep slopes (e.g., 3:1) are susceptible to erosion, particularly at elevations near the normal water level, and are difficult to vegetate. Therefore, shoreline slopes should be no steeper than 10: 1 (horizontal to vertical) from one foot above the normal pool stage to at least one foot below the normal pool stage. For *wet-bottom basins* (i.e., where the basin bottom is excavated to provide open water several feet deep), this slope will provide for a relatively flat underwater safety shelf with a minimum width of at least 10-feet around the periphery of the basin. The shelf will have an average depth of six inches and a maximum depth of 12 inches below the normal pool stage to facilitate the growth of emergent wetland vegetation. For *wetland-type basins* (i.e., where the basin bottom elevation is at or just slightly below the invert of the outlet structure), bottom slopes should be no steeper than 10: 1 in areas that are to be vegetated with wetland plants. Upper slopes of detention basins (higher than one foot above normal stage) should be no steeper than 4: 1. (Flatter slopes (i.e., 5: 1) are preferred to enhance plant establishment and to facilitate long-term maintenance.)

To facilitate the efficient trapping and removal of sediment, detention basins should be constructed with sediment basins or forebays at all major inlets to the basins. Such sedimentation basins should be at least 4 feet deep and designed to allow access for sediment removal equipment.

Drainage swales should be no steeper (longitudinally) than 10: 1 (horizontal to vertical). Where steeper slopes exist in the natural terrain, drop structures (or check dams) should be installed to reduce the effective slope to 10:1. The cross-sectional shape of swales should be trapezoidal or parabolic, not v-shaped. Side slopes of swales shall be no steeper than 4: 1, and preferably flatter.

Filter strips should be no steeper than 15 percent (6.5:1) longitudinally. Wherever practical, side slopes should be no steeper than 10: 1. Flatter slopes will minimize flow concentration and erosion and maximize effectiveness in infiltrating and treating stormwater.

Suitable growing medium - soils: A critical consideration in site preparation is the provision of an adequate growing medium for new plants. Because construction of stormwater facilities typically requires extensive grading, natural soils become highly disturbed and unsuitable for planting. Two design factors, as described in the *Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois* (NRCS et al, 1998), are critical. First, it is important to minimize soil compaction (i.e., to less than 275 psi) of both subsoil and topsoil. Where subsoil compaction cannot be avoided, it is desirable to disc the subsoil to a depth of 6 - 8 inches with a chisel plow before spreading topsoil. Second, it is important that suitable topsoil be provided. A minimum of one foot of uncompacted topsoil should be spread over the site in areas that will be vegetated with native plants. Coarse soil with minimal clay content is preferred because it minimizes the potential for compaction. Soils with a higher organic content are preferred in the bottom of wetland detention basins and along the shoreline and safety shelf of wet basins to promote the growth of wetland plants.

Vegetation selection: Native vegetation is the preferred landscaping material for detention facilities, drainage swales, and filter strips. However, it is critical that the selected plants and planting methods conform to the soils, hydrology, and water quality conditions present in such facilities. In general, plants selected for stormwater facility applications should be tolerant of highly variable hydrologic conditions and degraded water quality (e.g., high turbidity and salinity content).

Plant selection should conform to the guidance in the *Native Plant Guide*, which is hereby adopted by reference. The *Native Plant Guide* provides recommended plantings for three detention basin zones (emergent, saturated, and upland), for vegetated drainage swales, and for filter strips (use "upland buffers" recommendations for filter strips).

Guidance on plant and seed installation, including optimal time of year, also is provided in the *Native Plant Guide*. Ideally, the project should be planned to allow planting immediately after site preparation is completed. However, if grading is completed during dry summer conditions, for example, it may not be appropriate to immediately seed native upland plants.

Planting can be done with live plants and/or seeds. Use of live plants, tubers, or root stock is preferred in shoreline zones and shallow ponded areas of detention basins, and in other areas prone to frequent inundation, because it results in rapid establishment of stabilizing vegetative cover. It is desirable to install most live plants, tubers and root stock in the spring or early summer (i.e., before summer dry periods) to allow for effective root establishment before the following winter. Likewise, most trees and shrubs should be planted in spring or early summer, or can be planted in a dormant state in the fall.

Because most project budgets will allow for only limited use of live plants, seeding typically is used over the majority of the upland portions of the site. Where seeding is to be done on upland slopes, it is important to use a cover crop, such as wild rye or oats, to quickly establish a stable vegetative cover. Depending on the season, planting native vegetation seeds may be deferred until moisture and temperature conditions are appropriate. In general, most native plants should be seeded in the spring. As an alternative, dormant seeding may be done in the late fall or winter. The *Native Plant Guide* should be consulted as a reference for seeding times.

To prevent seeds and soil from washing away, several techniques should be considered. First, the seed should be raked or drilled into the ground. Erosion blanket should be installed in swales and on detention basin side slopes to maintain soil moisture and minimize erosion. On flat upland areas (i.e., slopes less than 10-15%) where inundation is infrequent, straw mulch is a less-expensive alternative to erosion blanket.

Finally, areas newly planted with live plants may need to be protected from predation, particularly by Canada geese. Protection in the form of "goose cages," or similar devices that fence out plant predators, is particularly important in emergent wetland zones and areas adjacent to significant open water.

Performance Criteria

The intention of this policy directive is to help establish native landscapes that are functional, aesthetic, and cost-effective. The performance criteria for such landscapes need not be as rigorous as for federally permitted wetland mitigation projects or ecologic restoration projects.

In naturalized detention basins, swales, and filter strips, the sideslopes should be maintained with a permanent vegetation cover at all times to minimize erosion. Erosion of upland slopes or open water edges negatively impacts both the stormwater facility and downstream water bodies. Areas of erosion are to be noted qualitatively during each site inspection. If rills or gullies are forming, or if a significant accumulation of sediment is collecting at the toe of the slope, remedial measures should be implemented immediately. If erosion is a problem, recommended management practices, such as spot dressing/repair, light mulching, and over-seeding or replanting, shall be required.

The success of natural landscaping in meeting the stated objectives can be affected by the appropriateness of the plant species selected, the effectiveness of the grading and installation, the quality of the plants and seeds, and the adequacy of early maintenance. The success of the project will be formally evaluated by the following vegetation performance standards monitored over time.

1st Season: By the end of the first full growing season, the planted areas should have complete vegetation cover. At least 75 percent of *the plugs, root stock and tubers*, and 90 percent of the *species* planted as plugs, root stock, and tubers, should be present and alive. No upland area (i.e., non-wetland) greater than 2.5 square feet shall be devoid of vegetation. However, if an area is designed as an aquatic or emergent system, it is anticipated that portions of the submerged area will be periodically exposed and without vegetation cover due to fluctuating water levels. If, by the end of the first full growing season, the basin emergent zones and/or side slopes fail to support the establishment of sufficient vegetation, then corrective measures to the fundamental design of the area and/or planting plan shall be required.

2nd Season: During the second growing season, a minimum of 25 percent of the permanent species planted in *seed form* should be evident. Ninety percent or more of species planted as plugs, root stock, and tubers shall have persisted into the second season. If this level of vegetation establishment fails to occur, a determination must be made as to why, and a remedial action plan shall be necessary. Remediation shall include overseeding and/or plugging of appropriate species. Finally, undesirable, invasive plant species shall not be prevalent in the stormwater facility. Specifically, none of the following shall be among the five most dominant plant species in the overall vegetative cover.

- Reed canary grass (*Phalaris arundinacea*)
- Common reed (*Phragmites australis*)
- Purple loosestrife (*Lythrum salicaria*)
- Buckthorn (*Rhamnus spp.*)
- Field thistle (*Cirsium arvense*)
- Sweet clover (*Melilotus spp.*)
- Kentucky bluegrass (*Poa pratensis*)
- Sandbar willow (*Salix interior.*)
- Honeysuckle (*Lonicera spp.*)
- Multiflora rose (*Rosa multiflora*)
- Box elder (*Acer negundo*)
- Teasel (*Dipsacus spp*)

3rd Season: At the end of the third full growing season, a minimum of 75 percent of the seeded permanent species and 90 percent or more of species planted as plugs, root stock, and tubers are expected to be established. (Alternatively, native perennial species that volunteer on the site, excluding undesirable invasive species, may also be counted in determining the preceding criteria.)

Commonly, if the planted species are not evident by the end of the third season, the likelihood of subsequent appearance is much reduced. Acceptable species defined as native to the region and not invasive (as listed in the *Native Plant Guide*), shall provide at least two-thirds of the relative aerial coverage. Also, the five most dominant species of the overall vegetative cover shall not include any of the undesirable species listed above under the 21 season performance standards.

If the identified level of species development fails to occur, a determination must be made as to why, and a remedial action plan must be prepared and submitted to the Village for approval. The approved remedial plan must be implemented and continued monitoring will be required beyond the third growing season until these Performance Criteria are met.

Long term: With ongoing landscape maintenance and management, the plant community should continue to improve over time. As a minimum, though, the site should continue to meet the vegetation performance standards of the 3rd season, as specified above, with regard to erosion control, vegetation coverage, species diversity, and control of invasive species.

Monitoring Guidelines

The following individual tasks shall be performed to address the various parameters to be monitored. To describe the degree of success of the project, three principal assessment protocols are recommended:

1. An inventory of all naturally landscaped areas of stormwater facilities (i.e., all detention basins, swales, and filter strips) to determine the extent to which species planted have become established and the extent of undesirable species;
2. The establishment of permanent photographic monitoring locations; and
3. Routine inspections to evaluate soil stability and other maintenance concerns.

The first two protocols shall be performed annually in late summer (August - September). Inspections to evaluate erosion and other maintenance concerns shall be performed four times per year, and more frequently during the initial construction and planting. Each protocol shall be performed for a minimum of three full growing seasons, or until it is evident that plant system development has stabilized and meets the Performance Criteria.

Inventory of all naturally landscaped areas: This inventory shall determine overall vegetative cover, the total number of seeded and planted species, and the prevalence of undesirable/invasive species, consistent with the specified "Performance Criteria." This inventory is critical to determine where follow-up seeding or planting are needed and to identify, locate, and remove undesirable plants on a yearly basis.

Establishment of permanent photographic monitoring locations: Photographs shall be taken to document the establishment of vegetative cover, erosion problems, and any other relevant maintenance concerns. The photographs must be of satisfactory quality and resolution to accomplish the intent of the Technical Policy Directive. For consistency, photographs of each vegetative community shall be taken from the same locations during each monitoring event. A detailed description of the camera/photo location (i.e., based on distance from a permanent structure), the orientation of the photo, and the vegetation zone being photographed shall be provided. Additional photos should be taken of problem areas and remedial activities.

Routine inspections to evaluate soil stability and other maintenance concerns: Notation of area's and type of erosion (e.g., rills, gullies, slumping accumulation) shall be depicted on a site plan. Other maintenance problems, including sediment or debris accumulation and obstructions of culverts or outlets also should be noted and remediated.

Further, sediment accumulation in sediment basins and forebays should be routinely monitored. Sediment removal should be initiated when one foot or more of sediment has accumulated in the basin bottom.

Reporting: An annual monitoring report will be submitted to the Village. This report will include the following items:

- Data on the status of vegetation, including an assessment of compliance with the Performance Criteria identified in Section IV.
- A description of vegetation maintenance activities, including overseeding, replanting, and control of undesirable species, undertaken during the previous 12 months, and an assessment of their effectiveness in meeting the Performance Criteria.
- Photographs, and accompanying descriptions, taken at permanent monitoring stations.
- A discussion of erosion control, sediment and debris removal, and other maintenance activities undertaken during the previous 12 months.
- A discussion of planned maintenance activities for the coming year.

Maintenance and Management Requirements and Guidelines

Maintenance activities should be based, in part, on problems identified in the annual monitoring effort. Although specific maintenance and management considerations will be determined in the field, based upon the individual characteristics and performance of the project, standard management protocols should include the following measures. The management guidelines correspond to the initial vegetation establishment period, as well as recommended long-term procedures.

1st Season: The naturalized stormwater facility area will be planted with a combination of native seed, tubers, rootstocks, and plant plugs, as described previously under Design Criteria.

A temporary cover crop must be planted on all slopes immediately upon completion of grading to prevent erosion. Soil stabilization and seedbed protection in the form of erosion blanket or straw mulch also must be installed, consistent with the "Design Criteria." Within 3 months, upland areas should have complete vegetation coverage. If the desired long-term slope vegetation is not planted with the temporary crop, it must then be planted in the first available growing season appropriate for each species. Use of a no-till drill to plant through the cover crop is recommended under these circumstances. If unusually dry conditions persist after planting or seeding, short-term irrigation may be necessary to prevent desiccation. Irrigation generally will not be necessary, however, if planting is done in the recommended seasons.

Under normal weather conditions, and given the proper habitat, it is anticipated that the plant plugs, tubers, and rootstocks will become nearly mature or fully established during the first full growing season. The seeded plants, depending on the germination and growth characteristics of specific species, may require two or three years to become established.

Control of undesirable plant species (as listed in the *Native Plant Guide* and under "Performance Criteria"), shall be done in a timely manner. Methods of control include hand pulling, mowing, spot herbicide application, or a combination of these methods. The appropriateness of a particular control method depends on the plant species present and their density or prevalence.

Hand pulling can be an effective method to control some undesirable species prior to the development and maturity of the plants. This method is most feasible when plants are present in small quantities and have shallow, immature root systems. If the entire root mass cannot be successfully removed, hand pulling may be ineffective. Recognizing that the timing of plant removal can be important in controlling invasive species, hand pulling should include the removal of all above-ground and below-ground stems, roots, and flower masses prior to the development of seeds. Care should be taken to disturb as little soil as possible during hand pulling to avoid exposure of additional weed seed in the soil layer.

Mowing is a recommended management option to control undesirable upland species, especially if they persist over a large area. Mowing is recommended during the first growing season on approximately a monthly frequency, with the mower set to a height of about 6 inches. Mowing is effective in reducing the shading effect of undesirable species on slow-growing native species and in preventing undesirable species (e.g., non-native clover) from going to seed. Advantages of mowing versus hand pulling include better soil stabilization and maintaining fuel for subsequent burns.

Under certain circumstances, selective herbiciding may be indicated. Systemic herbicides are generally used because they are absorbed through the plant tissues and work their way into the root system, effectively killing the plant. Wetland areas are usually treated with a herbicide such as Rodeo or a similar product specifically labeled for wetland use. A limited degree of graminoid (grass-like) weed growth may actually be desirable because it can contribute to the fuel requirement necessary for the initial burns.

If by the end of the first full growing season, there are significant failures in vegetation development in or near areas which were designed for occasional or routine shallow inundation, basin hydrologic design and other relevant factors (e.g., predation, turbidity) should be reevaluated before additional resources are deployed on vegetation replacement. Such areas should be re-designed and/or replanted, as appropriate.

2nd Season: During the second growing season, the native plant species will continue to develop root systems and it is anticipated that many native species should be more apparent. Weed growth in the second season may be treated by targeted herbiciding, hand pulling, or mowing. The appropriate protocol should be determined in the field.

If sufficient fuel is present, a controlled burn may be scheduled at the end of the second growing season. A controlled burn both stimulates the growth of native plants and effectively controls most undesirable species. Controlled burn management should be incorporated, where possible, as the primary long-term management tool in all created or restored native plant communities. Controlled burns should be conducted every two to four years, either in the fall or late winter/early spring, as conditions allow.

Controlled burns should be conducted only after receipt of all required permits and by trained individuals or contractors. The Village and neighboring property owners must be notified. Prior to any anticipated burn (preferably within 30 days) in accordance with local, state, and federal requirements for open burning. The Village also should be re-notified within 24 hours of a burn

once weather conditions become more certain. The site manager must be prepared to present evidence of a secured IEPA burn permit and a burn plan upon request before initiating the burn.

3rd Season: By the third growing season, it is anticipated that controlled burn management will serve as the primary form of plant community management. Selective woody plant removal, weeding, mowing, or herbiciding also may be incorporated, as necessary.

During the third growing season, the native grasses, as well as many of the seeded and planted forbs, should be relatively well established, particularly in areas subject to less frequent inundation. Weed growth should be declining significantly, and control measures should be continued on an as-needed basis.

Long Term: Continued maintenance shall be provided to maintain a diverse native plant community, consistent with the Performance Criteria; minimize the proliferation of weeds and undesired woody vegetation; and minimize erosion of slopes and shorelines. Long-term maintenance should consist primarily of controlled burn management every one to three years, as indicated by site conditions. Once the native plant communities are established, minimal spot weed control may be necessary.

Long term maintenance also shall include the routine removal of unsightly accumulation of trash or debris and the removal of obstructions from the basin outlet structure. Periodic removal of accumulated sediment (e.g., from swales, forebays, and settling basins) also shall be done to maintain the function and aesthetics of stormwater facilities. At a minimum, sediment shall be removed from forebays and sediment basins whenever one foot or more of sediment has accumulated in the basin bottom.

U.S. Army Corps of Engineers (COE)

Performance Standards and Monitoring Guidelines

If the project involves wetland mitigation, the specified performance standards and criteria for the COE Section 404 permit shall be evaluated and satisfied. All projects involving a Section 404 permit shall submit to the Village a copy of the permit and the COE-approved 5-year Monitoring and Maintenance Plan for the project. In addition to complying with the COE permit requirements, the project also shall conform to the *long term* maintenance requirements of this Technical Policy Directive as specified under "Management Requirements and Guidelines."

The COE permit will outline specific conditions and site-specific performance standards. Typically, however, based on new COE performance standard, mitigation wetlands must achieve the following standards:

1. A temporary cover crop must be planted on all slopes immediately upon completion of mitigation grading to prevent erosion. Within 3 months, at least 90% of the slopes, as measured by aerial coverage, will be vegetated. If the desired long-term slope vegetation is not planted with the temporary crop, it must then be planted in the first available growing season appropriate for each species. If a temporary cover crop is not planted immediately upon completion of grading, an erosion blanket must be installed to prevent erosion.
2. By the end of the fifth year, a native mean coefficient of conservatism value (native mean C value) of greater than or equal to 3.5 must be achieved, measured over the entire mitigation area. The native mean C value generally should increase each successive year after planting.

native plant species coefficients of conservatism are designated in Swink and Wilhelm (1994).

3. By the end of the fifth year, the native floristic quality index value (native FQI) must be greater than or equal to 20 as measured over the entire mitigation site. The native FQI must increase each successive year after planting. The floristic quality assessment method is also described in Swink and Wilhelm.
4. By the end of the fifth year, the native mean wetness coefficient (native mean W. -5 to +5) must be less than or equal to 0 in wetland plant communities. Coefficients of wetness (W) have been assigned by Wilhelm (1992, Technical Comments on the Proposed Revisions to the 1989 Wetland Delineation Manual, *Erigenia* 12:41-50) to the eleven wetland indicator categories, where: OBL = -5, FACW + = 4, FACW = -3, FACW = -2, FAC+ = -1, FAC 0, FAC = 1, FACU + = 2, FACU = 3, FACU = 4, UPL =5.

Wetness coefficients are derived from the five main National Wetland Indicator Categories given by Reed, Porter B., National List of Plant Species that Occur in Wetlands: North Central (Region 3), U.S. Fish Wildlife Service Rep. 8 (26.3, 1998): OBL = obligate, FACW = facultative wet, FAC = facultative, FACU = facultative upland, and UPI, = upland. These categories are given for local plants in Swink and Wilhelm (1994).

The National Wetland Indicator Categories define the estimated probability for which a species occurs in wetlands. Positive signs (+) and (-) signs attached to the three Facultative categories express exaggerated tendencies for those species.

The '+' sign denotes that the species generally has a greater estimated probability of occurring in wetlands than species having the general indicator category, but a less estimated probability of occurring in wetlands than those having the next wettest general indicator. The '-' sign denotes that the species generally has a lesser estimated probability of occurring in wetlands than the species having the general indicator status.

5. The relative importance value (RIV) of native plants should increase each successive year after planting.
6. By the end of the fifth year, no area over the entire mitigation site greater than 0.6 square meter should be devoid of vegetation, as measured by aerial coverage, unless specified on approved mitigation plans. This standard does not apply to emergent and aquatic communities.
7. By the end of the fifth year, none of the three most dominant plant species in any of the wetland community zones may be non-native species or weedy species, including but not limited to *Typha spp*, *Phragmites australis*, *Poa compressa*, *Poa pratensis*, *Lythrum salicariae*, *Salix Interior*, *Echinochloa crusgalli*, or *Phalens arundinacea*, unless otherwise indicated on the approved mitigation plan.
8. If the native mean C value, native FQI, and/or RIV have not increased from the previous year, necessary corrective actions might be indicated. It is in the permittee's best interest to take any necessary corrective measures early in the mitigation effort.
9. The above standards do not apply to aquatic communities. If aquatic or open water mitigation is to be evaluated, performance standards should be proposed by the applicant.

The Community Rating System

The materials in this chapter were taken from FEMA's *CRS Coordinator's Manual* and *CRS Credit for Outreach Projects*. More information on the CRS can be obtained from

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Background on the CRS

The National Flood Insurance Program (NFIP) provides federally backed flood insurance that encourages communities to enact and enforce floodplain regulations. Since its inception in 1968, the program has been very successful in helping flood victims get back on their feet. There are over 4 million policies in force. Since 1978, over 650,000 losses totaling more than \$8 billion have been paid.

To be covered by a flood insurance policy, a property must be in a community that participates in the NFIP. To qualify for the program, a community adopts and enforces a floodplain management ordinance to regulate development in flood hazard areas. The basic objective of the ordinance is to ensure that such development will not aggravate existing flooding conditions and that new buildings will be protected from flood damage. Today, over 19,000 communities participate in the NFIP.

The NFIP has been successful in requiring new buildings to be protected from damage by a 100-year flood. However, flood damage still results from floods greater than the 100-year flood and from flooding in unmapped areas. Under the Community Rating System (CRS), there is an incentive for communities to do more than just regulate construction of new buildings to minimum national standards. Under the CRS, flood insurance premiums are adjusted to reflect community activities that reduce flood damage to existing buildings, manage development in areas not mapped by the NFIP, protect new buildings beyond the minimum NFIP protection level, help insurance agents obtain flood data, and help people obtain flood insurance.

Objective

The objective of the CRS is to reward communities that are doing more than meeting the minimum NFIP requirements to help their citizens prevent or reduce flood losses. The CRS also provides an incentive for communities to initiate new flood protection activities. The goal of the CRS is to encourage, by the use of flood insurance premium adjustments, community and state activities beyond those required by the National Flood Insurance Program to:

- Reduce flood losses, i.e.,
 - protect public health and safety,
 - reduce damage to buildings and contents,
 - prevent increases in flood damage from new construction,

- reduce the risk of erosion damage, and
- protect natural and beneficial floodplain functions.

- Facilitate accurate insurance rating, and
- Promote the awareness of flood insurance.

Operation

There are 10 CRS classes: Class 1 requires the most credit points and gives the greatest premium reduction; Class 10 receives no premium reduction. A community that does not apply for the CRS, or does not obtain the minimum number of credit points, is a Class 10 community.

Community participation in the CRS is VOLUNTARY. Any community in full compliance with the rules and regulations of the NFIP may apply for a CRS classification better than Class 10. The applicant community submits the *CRS Application* along with documentation which shows that it is implementing the activities for which credit is requested. All CRS credit is verified according to the detailed discussion of the activities in the *Coordinator's Manual*.

The *Coordinator's Manual* identifies 18 creditable activities, organized under four categories labeled Sections 300 through 600: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness. The *Coordinator's Manual* assigns credit points based upon the extent to which an activity advances the three goals of the CRS. Communities are invited to propose alternative approaches to these activities in their applications.

Some CRS activities may be implemented by the state or a regional agency rather than at the community level. For example, some states have disclosure laws that are creditable under Activity 340 (Flood Hazard Disclosure). Any community in those states will receive those credit points when it applies for CRS credit and demonstrates that the law is effectively implemented within its jurisdiction.

An application for a CRS classification may be submitted at any time. The community's activities and performance are reviewed during a verification visit. FEMA sets the credit to be granted and notifies the community, the state, insurance companies, and other appropriate parties. The classification is effective on either April 1 or October 1, whichever comes first after the community's program is verified.

Each year the community must recertify or reverify that it is continuing to perform the activities that are being credited by the CRS. Recertification is an annual activity that includes progress reports for certain activities. The reverification takes place every few years and is conducted in the form of another verification visit to the community.

If a community is not properly or fully implementing the credited activities, its credit points, and possibly its CRS classification, will be revised. A community may add credited activities each year in order to improve its CRS classification.

The day to day work with communities is conducted by the Insurance Services Office, Inc. (ISO), for FEMA. Communities are encouraged to call on their ISO/CRS Specialist for assistance at any time. A week-long CRS course for local officials is offered free at FEMA's Emergency Management Institute.

Community Responsibilities

Once it has submitted its *CRS Application*, a community must continue to implement its credited activities to keep its classification. Specifically, a community is responsible for:

- cooperating with the ISO/CRS Specialist and the verification procedures,
- recertifying each year that it is continuing to implement its activities,
- submitting the appropriate documents with its recertification,
- advising FEMA and its ISO/CRS Specialist of modifications in its activities,
- maintaining elevation certificates, other permit records, and old Flood Insurance Rate Maps (FIRMs) forever,
- maintaining other records of its activities for five years, or until the next verification visit, whichever comes sooner, and
- participating in the reverification process.

Costs and Benefits

Communities should prepare and implement those activities which best deal with their local problems, whether or not they are creditable under the CRS. Few, if any, of the CRS activities will produce premium reductions equal to or in excess of their implementation costs. In considering whether to undertake a new floodplain management activity, a community must consider all of the benefits the activity will provide (not just insurance premium reductions) in order to determine whether it is worth implementing.

Costs. No fee is charged for a community to apply for participation in the CRS. The only costs the community incurs are those of implementing creditable floodplain management activities and the staff time needed to prepare the *CRS Application*.

Benefits. It is important to note that reduced flood insurance rates are only one of the rewards a community receives from participating in the CRS. There are several other benefits.

1. The CRS floodplain management activities provide enhanced public safety, a reduction in damage to property and public infrastructure, avoidance of economic disruption and losses, reduction of human suffering, and protection of the environment.
2. A community can evaluate the effectiveness of its flood program against a nationally recognized benchmark.
3. Technical assistance in designing and implementing some activities is available at no charge.
4. A CRS community's flood program benefits from having an added incentive to maintain its flood programs over the years. The fact that the community's CRS status could be affected by the elimination of a flood-related activity or a weakening of the regulatory requirements for new development, should be taken into account by the governing board when considering

such actions. A similar system used in fire insurance rating has had a strong impact on the level of support local governments give to their fire protection programs.

5. Implementing some CRS activities, such as floodplain management planning, can help a community qualify for certain federal assistance programs.

CRS Activities

There are 18 activities organized under 4 series. The following list summarizes the activities and the average number of points that communities have received for them. Each 500 points brings a better CRS class and an additional 5% premium rate reduction.

Public Information Activities (Series 300)

310 (Elevation Certificates) Maintain FEMA elevation certificates for all new construction after the date of CRS application. This is a minimum requirement for any CRS credit. (72)

320 (Map Information) Respond to inquiries to identify a property's FIRM zone and publicize this service. (138)

330 (Outreach Projects) Send information about the flood hazard, flood insurance, and flood protection measures to floodprone residents or all residents of the community. (81)

340 (Hazard Disclosure) Real estate agents advise potential purchasers of floodprone property about the flood hazard; or regulations require a notice of the flood hazard. (24)

350 (Flood Protection Library) The public library maintains references on flood insurance and flood protection. (22)

360 (Flood Protection Assistance) Give inquiring property owners technical advice on how to protect their buildings from flooding and publicize this service. (57)

Mapping and Regulatory Activities (Series 400)

410 (Additional Flood Data) Develop new flood elevations, floodway delineations, wave heights, or other regulatory flood hazard data for an area that was not mapped in detail by the flood insurance study; or have the flood insurance study's hydrology or allowable floodway surcharge based on a higher state or local standard. (148)

420 (Open Space Preservation) Guarantee that a portion of currently vacant floodplain will be kept free from development. (206)

430 (Higher Regulatory Standards) Require freeboard; require soil tests or engineered foundations; require compensatory storage; zone the floodplain for minimum lot sizes of 1 acre or larger; regulate to protect sand dunes; or have regulations tailored to protect critical facilities or areas subject to special flood hazards (e.g., alluvial fans, ice jams, or subsidence). (159)

440 (Flood Data Maintenance) Keep flood and property data on computer records; use better base maps; or maintain elevation reference marks. (78)

450 (Stormwater Management) Regulate new development throughout the watershed to ensure that post-development runoff is no worse than pre-development runoff. (122)

Flood Damage Reduction Activities (Series 500)

510 (Floodplain Management Planning) Prepare, adopt, implement, and update a comprehensive flood hazard mitigation plan using a standard planning process. (34)

520 (Acquisition and Relocation) Acquire and/or relocate floodprone buildings so that they are out of the floodplain. (177)

530 (Retrofitting) Document floodproofed or elevated pre-FIRM buildings. (66)

540 (Drainage System Maintenance) Conduct periodic inspections of all channels and retention basins and remove debris as needed. (236)

Flood Preparedness Activities (Series 600)

610 (Flood Warning Program) Provide early flood warnings to the public and have a detailed flood response plan keyed to flood crest predictions. (99)

620 (Levee Safety) Maintain levees that are not credited with providing base flood protection. (153)

630 (Dam Safety) All communities in a state with an approved dam safety program receive credit. (59 points in Illinois)

ORDINANCE #

AN ORDINANCE AMENDING ORDINANCE NO.
558,
THE DEVELOPMENT CODE,

THIS ORDINANCE PROVIDES FOR THE
CONTROL OF STORMWATER DRAINAGE AND
DETENTION, SOIL EROSION AND SEDIMENT
CONTROL WITHIN IN THE
VILLAGE OF CASEYVILLE, ILLINOIS

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Chapter 1.0 - Authority and Purpose; Other Relevant Permitting; Applicability; Exemptions; Exceptions; and Separability:

Section 1.0 - Authority and Purpose: This ordinance is enacted pursuant to the police powers granted to the Village of Caseyville, Illinois by the Illinois Compiled Statutes, 65 ILCS 5/1-2-1, 5/11-12-12, 5/11/30-2, and 5/11/31-2.

The purpose of this ordinance is to diminish threats to public health and safety, protect property, prevent damage to the environment and promote public welfare by guiding, regulating and controlling the design, construction, use and maintenance of any new development or redevelopment or other activity which disturbs or breaks the topsoil or otherwise results in the movement of earth and/or changes the stormwater drainage pattern and/or stormwater flows from that which would have occurred if the land had been left in its natural state. This stormwater runoff and resulting soil erosion could result in the inundation of damageable properties, the erosion and destabilization of downstream channels, and the pollution of valuable stream and lake resources. One cause of increases in stormwater runoff quantity or rate and impairment of quality, and loss of valuable topsoil is the new development or redevelopment of the land. This ordinance regulates these activities to minimize adverse impacts.

This ordinance is adopted to accomplish the following objectives:

- 1.) To assure that new development or redevelopment does not increase the drainage or flood hazards, or create unstable conditions susceptible to soil erosion;
- 2.) To protect new buildings and major improvements to buildings from flood damage due to increased stormwater runoff and soil erosion;
- 3.) To protect human life and health from the hazards of increased flooding and soil erosion on a watershed basis;
- 4.) To lessen the burden on the taxpayer for flood control projects, repairs to flood-damaged public facilities and utilities, correction of channel erosion problems, and flood rescue and relief operations caused by stormwater runoff and soil erosion quantities from new development or re-development;
- 5.) To protect, conserve, and promote the orderly development of land and soil, water, air, animal, and plant resources;
- 6.) To preserve the natural hydrologic and hydraulic functions of watercourses and flood plains and to protect water quality and aquatic habitats;

- 7.) To preserve the natural characteristics of stream corridors in order to manage flood and stormwater impacts, improve water and groundwater quality, reduce soil erosion, protect aquatic and riparian habitat, maintain quality forest resources, provide recreational opportunities, provide aesthetic benefits, enhance community and economic development.

Section 2.0 - Other Relevant Permitting: Before a Development Permit under this ordinance becomes effective, all required Federal, State, and Local permits will have been received for the site subject to new development or redevelopment. The acquisition of these permits shall be the sole responsibility of the applicant. These may include but are not limited to Section 404 of the Clean Waters Act, Section 106 of the National Historic Preservation Act, Section 10 of the Rivers and Harbors Act or permitting required by the Illinois Department of Natural Resources, Office of Water Resources in accordance with the Rivers, Lakes and Streams Act, 615 ILCS, the Soil and Water Conservation Districts Act, 70 ILCS, the Farmland Preservation Act, 505 ILCS the Illinois Groundwater Protection Act, 415 ILCS and the National Pollutant Discharge Elimination System Permit (NPDES) thru the Illinois Environmental Protection Agency, Division of Water Pollution Control. Compliance is also required with but not limited to the Development Code of the Village of Caseyville, Illinois.

Section 3.0 - Applicability: This ordinance shall apply to all new development or re-development in the Village of Caseyville, Illinois. Except as otherwise provided in this ordinance, no person, firm or corporation, public or private, the State of Illinois and its agencies or political subdivisions, the United States of America, and its agencies or political subdivisions, any agent, servant, officer or employee of any of the foregoing which meets the following provisions or is otherwise exempted in this ordinance, shall not commence any development activities without first having obtained a development permit from the Building and Zoning Administrator of the Village of Caseyville, Illinois.

3.1 - Any new development or re-development that will include an area that will meet or exceed ten thousand (10,000) square feet of total impervious surface (i.e., streets, roof, patio or parking area or any combination thereof); or

3.2 - Any land disturbing activity (i.e., clearing, grading, stripping, excavation, fill, or any combination thereof) that will affect an area that will meet or exceed of ten thousand (10,000) square feet or that will exceed 100 cubic yards; or

3.3 - Any land disturbing activity if the activity is within 25 feet of a river, lake, pond, stream, sinkhole, or wetland; and is done in conjunction with sections 3.1 or 3.2; or

3.4 - Any land disturbing activity on the sloping side of the slope disturbance line and is in conjunction with sections 3.1, 3.2, or 3.3; or

3.5 - Any tree cutting or mechanized land clearing where the tree, native to Southwestern Illinois, is in excess of eight (8) inches in diameter and is done in conjunction with Chapter 1.0, Sections 3.1, 3.2, 3.3 or 3.4.

Section 4.0 - Exemptions: A development permit shall not be required for the following:

- 1.) Any new development, re-development or other activity falling below the minimum standards as set forth in Chapter 1.0, Section 3.0.
- 2.) The agricultural use of land, including the implementation of conservation measures included in a farm conservation plan approved by the Soil and Water Conservation District, and including the construction of agricultural structures.
- 3.) The maintenance of any existing stormwater drainage/detention component or structure or any existing soil erosion/sediment control component or structure; including dredging, levee restoration, tree removal or other function which maintains the original design capacities of the above.
- 4.) The construction of, improvements to, or the maintenance of any street, road, highway or interstate highway performed by any unit of government whose powers grant such authority.

Section 5.0 - Exceptions: The Board of Appeals may, in accordance with the following procedures, authorize exceptions to any of the requirements and regulations set forth in this ordinance:

5.1 - Application for exception shall be made by a verified petition of the applicant for a development permit, stating fully the grounds of the petition and the facts relied upon by the applicant. Such petition shall be filed with the development permit application. In order for the petition to be granted, it shall be necessary that the Board of Appeals find all of the following facts with the respect to the land referred to in the petition:

1. That the land is of such shape or size or is affected by such physical conditions or is subject to such title limitations or record, that it is impossible or impractical for the applicant to comply with all of the requirements of this ordinance;
2. That the exception is necessary for the preservation and enjoyment of a substantial property right of the applicant; and
3. That the granting of the exception will not be detrimental to the public welfare, environment or injurious to other property in the vicinity of the subjects property.

5.2 - Each application for an exception shall be made to the Building and Zoning Administrator. The Administrator and the Village of Caseyville Engineer will review and transmit recommendations to the Board of Appeals, which shall review such recommendations prior to granting or denying the exception.

5.3 - The Board of Appeals shall hold a public hearing on each application for exception, within thirty (30) days after receiving the application, in the manner provided with respect to appeals. Within thirty (30) days after public hearing, the Board of Appeals shall either approve the site development permit application with the exceptions and conditions it deems necessary or it shall disapprove such development permit application and exception application or it shall take other such action as appropriate.

Section 6.0 - Separability: The provisions and sections of this ordinance shall be deemed to be separable, and the invalidity of any portion of this ordinance shall not affect the validity of the remainder.

Section 7.0 - Responsibility: The applicant shall not be relieved of responsibility for damage to persons or property otherwise imposed by law, and the Village of Caseyville, Illinois or its officers or agents will not be made liable for such damage, by (1) the issuance of a development permit under this ordinance, (2) compliance with the provisions of that development permit or conditions attached to it by the Building and Zoning Administrator, (3) failure of Village of Caseyville Officials to observe or recognize hazardous or unsightly conditions, (4) failure of Village of Caseyville Officials to recommend denial or to deny a development permit, or (5) exemptions from development permit requirements of this ordinance.

Chapter 2.0 - Definitions:

Section 2.0 - Definitions: For the purposes of this ordinance certain terms are defined and set forth below:

2.1 - Adverse Impacts: Any negative impact on plant, soil, air or water resources affecting their beneficial uses including recreation, aesthetics, aquatic habitat, quality, and quantity.

2.2 - Applicant: Any person, firm, or governmental agency who executes the necessary forms to procure official approval of a development or permit to carry out construction of a new development or re-development from the Village of Caseyville, Illinois.

2.3 - Base Flood Elevation: The elevation at all locations delineating the level of flooding resulting from the 100-year frequency flood event, which has a one (1) percent chance of occurring in any given year.

2.4 - Building Permit: A permit issued by the Village of Caseyville, Illinois for the construction, erection or alteration of a structure or building and the related ground and surface preparation prior to and after completion of construction, erection or alteration of a structure or building.

2.5 - Bypass Flows: Stormwater runoff from upstream properties tributary to a property's drainage system but not under its control.

2.6 - Certify or Certification: Formally attesting that the specific inspections and tests were performed, and that such inspections and tests comply with the applicable requirements of this ordinance.

2.7 - Channel: Any defined river, stream, creek, brook, branch, natural or artificial depression, ponded area, on-stream lake or impoundment, karst area (sinkhole), flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or manmade drainageway, which has a definite bed and bank or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

2.8 - Channel Modification: Alteration of a channel by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, riprapping (or other armoring), filling, widening, deepening, straightening, relocating, lining, and significant removal of bottom or woody rooted vegetation. Channel modification does not include the man-made clearing of debris or removal of trash.

2.9 - Clearing: Any activity which removes the natural vegetative ground cover.

2.10 - Compensatory Storage: An artificially excavated, hydraulically equivalent volume of storage within the floodplain used to balance the loss of natural flood storage capacity when fill or structure are placed within the floodplain.

2.11 - Conduit: Any channel, pipe, sewer or culvert used for the conveyance or movement of water, whether open or closed.

2.12 - Cubic Yard: A one (1) yard by one (1) yard by one (1) yard amount of material in excavation and/or fill.

2.13 - Detention Basin: A facility constructed or modified to provide for the temporary storage of stormwater runoff and the controlled release by gravity of this runoff at a prescribed rate during and after a flood or storm.

2.14 - Detention Time: The amount of time stormwater is held within a detention basin.

2.15 - Development: Any manmade change to real estate or property, including:

- 1.) The division or subdivision of any duly recorded parcel of property;
- 2.) Construction, reconstruction or placement of a building or any addition to a building;
- 3.) Installation of a manufactured home on a site, preparing a site for a manufactured home, or installing a travel trailer on a site for more than 180 days per year;
- 4.) Construction of roads, bridges, or similar projects;
- 5.) Redevelopment of a site;
- 6.) Filling, dredging, grading, clearing, excavating, paving or other non-agricultural alterations of a ground surface;
- 7.) Storage of materials or deposit of solid or liquid waste;
- 8.) Any other activity that might alter the magnitude, frequency, direction, or velocity of stormwater flows from a property.

2.16 - Drainage Plan: A plan, including engineering drawings and supporting calculations, which describes the existing stormwater drainage system and environmental features, including grading, as well as proposed alterations or changes to the drainage system and environment of a property.

2.17 - Dry Basin: A detention basin designed to drain after temporary storage of stormwater flows and to normally be dry over much of its bottom area.

2.18 - Erosion: The general process whereby soil or earth is moved by rainfall, flowing water, wind or wave action.

2.19 - Excavation: Any act by which organic matter, earth, sand, gravel, rock or any other similar material, is cut into, dug, quarried, uncovered, removed, displaced, re-located or bulldozed and shall include the conditions resulting from such actions.

2.20 - Excess Stormwater Runoff: The volume and rate of flow of stormwater discharged from a new development or re-development which is or will be in excess of that volume and rate which existed before development or re-development.

2.21 - Existing Grade: The vertical location of the existing ground surface prior to excavation or filling.

2.22 - Fill: Any act by which earth, sand, gravel, rock, or any other material, is deposited, placed, replaced, pushed, dumped, pulled, transported or moved by man to a new location and shall include the conditions resulting therefrom.

2.23 - Final Grade: The vertical location of the ground surface after grading work is completed in accordance with the engineering plans.

2.24 - Flood Fringe: That area as designated by the Federal Emergency Management Agency (FEMA) on either side of the floodway. This area is subject to inundation from the base flood but conveys little or no flow.

2.25 - Flood Hazard Boundary Map (FHBM): A very generalized map prepared by the Federal Emergency Management Agency (FEMA) which shows only where floodplains are located based on very basic data. FHBM's do not include base flood elevations.

2.26 - Flood Insurance Rate Map (FIRM): A map prepared by the Federal Emergency Management Agency (FEMA) that depicts the special flood hazard area (SFHA) within a community. This map includes insurance rate zones and regulatory floodplains and may or may not depict regulatory floodways.

2.27 - Floodplain: That land adjacent to a body of water with ground surface elevations at or below the base flood or the 100-year frequency flood elevation which is subject to inundation. The floodplain as designated by the Federal Emergency Management Agency (FEMA) is also known as the Special Flood Hazard Area (SFHA). This area is the collective combination of the regulatory floodway and the flood fringe.

2.28 - Floodway: The channel and that portion of the floodplain, including on-stream lakes, adjacent to a stream or watercourse which is needed to store and convey the anticipated existing and future 100-year frequency flood discharge with no more than a 0.1 foot increase in

stage due to any loss of flood conveyance or storage and no more than a ten percent (10%) increase in velocities.

2.29 - Grading: The excavation or fill or any combination thereof and shall include the conditions resulting from any excavation or fill.

2.30 - Hydrograph: A graph showing for a given location on a stream or conduit, the flow rate with respect to time.

2.31 - Hydrograph Method: This method estimates runoff volume and runoff hydrographs for the point of interest by generating hydrographs for individual subareas, combining them, and routing them through stream lengths and reservoir structures. Factors such as rainfall amount and distribution, runoff curve number, time of concentration, and travel time are included.

2.32 - Impervious Surface: That area of property that is covered by materials other than soil and vegetation and that has no intended capacity to absorb stormwater, such as parking lots, driveways, sidewalks, patios, tennis courts, roofs and other structures.

2.33 - Infiltration: The passage or movement of water into the soil surfaces.

2.34 - Loessal Soil: A sediment, commonly non-stratified and un-consolidated, composed predominately of silt sized particles with accessory clay and sand.

2.35 - Lot: An individual platted parcel in an approved subdivision.

2.36 - Major Drainage System: That portion of a drainage system needed to store and convey flows beyond the capacity of the minor drainage system.

2.37 - Minor Drainage System: That portion of a drainage system designed for the convenience of the public. It consists of street gutters, storm sewers, small open channels, and swales and, where manmade, is to be designed to handle the 10-year runoff event.

2.38 - Mitigation: Mitigation is when the prescribed controls are not sufficient and additional measures are required to offset the development, including those measures necessary to minimize the negative effects which stormwater drainage and development activities might have on the public health, safety and welfare. Examples of mitigation include, but are not limited to compensatory storage, soil erosion and sedimentation control, and channel restoration.

2.39 - Modified Rational Method: As described in the Illinois Department of Transportation "Drainage Manual" is based on the principal that the maximum rate of runoff from a given drainage area occurs at that point in time when all parts of the watershed are contributing to the flow. The rainfall generating the peak flow is assumed to be of uniform intensity for the entire watershed with a rainfall duration equal to the time of concentration.

2.40 - Natural: Conditions resulting from physical, chemical, and biological processes without intervention by man.

2.41 - Natural Drainage: Channels formed in the existing surface topography of the earth prior to changes made by unnatural causes.

2.42 - One Hundred-Year Event: A rainfall, runoff, or flood event having a one percent chance of occurring in any given year. A 24 hour storm duration is assumed unless otherwise noted.

2.43 - Parcel: All contiguous land in one ownership.

2.44 - Peak Flow: The maximum rate of flow of water at a given point in a channel or conduit.

2.45 - Permittee: Any person to whom a building permit is issued.

2.46 - Person: Any individual, firm or corporation, public or private, the State of Illinois and its agencies or political subdivisions, the United States of America, and its agencies or political subdivisions, and any agent, servant, officer or employee of any of the foregoing.

2.47 - Positive Drainage: Provision for overland paths for all areas of a property including depressional areas that may also be drained by storm sewer.

2.48 - Prime Farmland: Prime farmland is land that is best suited to food, feed, forage, fiber and oilseed crops. It may be cropland, pasture, woodland, or other land, but it is not urban and built up land or water areas. It is either used for food or fiber or is available for those uses. The soil qualities, growing season and moisture supply are those needed for a well managed soil to economically produce a sustained high yield of crops. Prime farmland produces the highest yields with minimum inputs of energy and economic resources, and farming it results in the least damage to the environment.

2.49 - Property: A parcel of real estate.

2.50 - Retention Basin: A facility designed to completely retain a specified amount of stormwater runoff without release except by means of evaporation, infiltration, emergency bypass or pumping.

2.51 - Sedimentation: The process that deposits soils, debris, and other materials either on other ground surfaces or in bodies of water or stormwater drainage systems.

2.52 - Site: A parcel of land, or a contiguous combination thereof, where grading work is performed as a single unified operation.

2.53 - Sinkhole, (Karst Areas): A Sinkhole or Karst topography is a land surface depression or blind valley which may or may not have surface openings to cavernous

underground areas and are the result of water movement through silts and jointed limestone. These conditions make such areas unstable and susceptible to subsidence and surface collapse. Fractures in the limestone may channel runoff water to public or private water supplies, making those sources especially susceptible to groundwater contamination.

2.54 - Slope Disturbance Line: The line which delineates relatively level building areas from areas where slopes exceed 8 percent (8%) and where special precautions must be taken.

2.55 - Stormwater Drainage System: All means, natural and manmade, used for conducting stormwater to, through or from a drainage area to the point of final outlet from a property. The stormwater drainage system includes but is not limited to any of the following: conduits and appurtenance features, canals, channels, ditches, streams, culverts, streets, storm sewers, detention basins, swales and pumping stations.

2.56 - Stormwater Runoff: The waters derived from melting snow or rain falling within a tributary drainage basin which are in excess of the infiltration capacity of the soils of that basin, which flow over the surface of the ground or are collected in channels or conduits.

2.57 - Storm Sewer: A closed conduit for conveying collected stormwater.

2.58 - Stream: Any river, creek, brook, branch, flowage, ravine, or natural or man-made drainageway which has a definite bed and banks or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

2.59 - Stripping: Any activity which removes the vegetative surface cover including tree removal, by spraying or clearing, and storage or removal of top soil.

2.60 - Ten-Year Event: A runoff, rainfall, or flood event having a ten percent (10%) chance of occurring in any given year. A 24 hour storm duration is assumed unless otherwise note.

2.61 - Time of Concentration: The elapsed time for stormwater to flow from the most hydraulically remote point in a drainage basin to a particular point of interest in that watershed.

2.62 - Tributary Watershed: All of the land surface area that contributes runoff to a given point.

2.63 - Two-Year Event: a runoff, rainfall, or flood event having a fifty percent (50%) chance of occurring in any given year. A 24 hour storm duration is assumed unless otherwise noted.

2.64 - Vacant: Land on which there are no structures or only structures which are secondary to the use or maintenance of the land itself.

2.65 - Watershed: All land area drained by, or contributing water to, the same stream, creek, ditch, lake, marsh, stormwater facility, groundwater or depressional area.

2.66 - Wet Basin: A detention basin designed to maintain a permanent pool of water after the temporary storage of stormwater runoff.

2.67 - Wetlands: Wetlands are defined by regulation as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." For general, but not inclusive locations of designated wetlands refer to mapping prepared jointly by the U.S. Department of Interior, Fish and Wildlife Service and the Illinois Department of Natural Resources, Office of Resource Conservation; National Wetlands Inventory Mapping, 1987. The applicant may be required to provide a field investigation by a qualified wetland delineator.

Chapter 3.0 - Stormwater Drainage and Detention:

Section 1.0 - Drainage Plan Submittal Requirements: Each applicant shall submit the following information, to ensure that the provisions of this ordinance are met. The submittal shall include sufficient information to evaluate the environmental characteristics of the property, the potential adverse impacts and benefits of the development on water resources both on-site and off-site, and the effectiveness of the proposed drainage plan in managing stormwater runoff, and meet the provisions of Chapter 1.0, Section 2.0. The applicant shall certify on the drawings that all clearing, grading, drainage, and construction shall be accomplished in strict conformance with the drainage plan. The following information shall be submitted for both existing and proposed property conditions for all new developments or re-developments that meet or exceed the minimum requirements of Chapter 1.0, Section 3.0.

1.1 - Drainage Plan Requirements: A topographic survey of the property at two-foot (2) contours unless otherwise specified or approved by Village of Caseyville, Engineer. The plan map shall be keyed to a consistent datum specified by the Village of Caseyville, Illinois. If the mapping is compiled using a digital format and the Global Positioning System (GPS), the applicant will provide both paper and digital copies including GPS points.

1.1.1 - Mapping and Descriptions: An existing drainage and proposed drainage plan for the property and one hundred (100) feet surrounding the property at a scale of not more than one hundred (100) feet to one (1) inch, and including the following:

- 1.) property boundary, dimensions, and approximate acreage;
- 2.) building setback lines;
- 3.) all existing and proposed structures and sizes;
- 4.) square feet of existing and proposed impervious surface;
- 6.) all existing, or proposed easements;
- 7.) all existing, abandoned, or proposed water or monitoring well head locations;
- 8.) all sanitary or combined sewer lines and septic systems;
- 9.) the banks and centerline of streams and channels;
- 10.) shoreline of lakes, ponds, and detention basins with normal water level elevation;
- 11.) farm drains and tiles;
- 12.) soils classifications;
- 13.) location, size and slope of stormwater conduits and drainage swales;
- 14.) depressional storage areas;
- 15.) detention facilities;
- 16.) roads, streets and associated stormwater inlets including finished grades;
- 17.) base flood elevation, flood fringe, and regulatory floodway;
- 18.) basis of design for the final drainage network components.
- 19.) a statement giving any applicable engineering assumptions and calculations;

- 20.) a vicinity map showing the relationship of the site to its general surroundings at a scale of not less than two thousand (2,000) feet to one (1) inch (1:24,000)
- 21.) title, scale, north arrow, legend, seal of Licensed Professional Engineer, date, and name of person preparing plans.
- 22.) cross-section data for open channel flow paths and designated overland flow paths;
- 23.) direction of storm flows;
- 24.) flow rates and velocities at critical points in the drainage system;
- 25.) a statement by the design engineer of the drainage system's provision for handling events greater than the 100-year, 24 hour runoff; and
- 26.) a statement of certification of all drainage plans, calculations, and supporting data by a Licensed Professional Engineer.

1.1.2 - Environmental Features: A depiction of environmental features of the property and immediate vicinity including the following:

- 1.) the limits of designated regulatory and non-regulatory wetland areas;
- 2.) the location and limits of sinkholes (karst areas);
- 3.) the location of trees greater than eight (8) inches in diameter
- 4.) any designated natural areas, prime farmland; and
- 5.) any proposed environmental mitigation features.

Section 2.0 - Minimization of Increases in Runoff Volumes and Rates: In the selection of a drainage plan for a new development or re-development, the applicant shall evaluate and implement site design features which minimize the increase in runoff volumes and rates from the site. The applicant's drainage plan submittal shall include evaluations of site design features which are consistent with the following hierarchy:

- 1.) Preservation of regulatory floodplains, flood prone and wetland areas;
- 2.) Minimize impervious surfaces on the property, consistent with the needs of the project;
- 3.) Attenuate flows by use of open vegetated swales and natural depressions and preserves the existing natural stream channel.
- 4.) Infiltration of runoff on-site
- 5.) Provide stormwater retention structures;
- 6.) Provide wet or wetland detention structures;
- 7.) Provide dry detention structures; and
- 8.) Construct storm sewers.

Section 3.0 - Water Quality and Multiple Uses: The drainage system should be designed to minimize adverse surface and groundwater quality impacts off-site and on the property itself. Detention basins shall incorporate design features to capture stormwater runoff pollutants. In particular, designers shall give preference to wet bottom and wetland type designs and all flows from the development shall be routed through the basin (i.e. low flows shall not be bypassed).

Detention of stormwater shall be promoted throughout the property's drainage system to reduce the volume of stormwater runoff and to reduce the quantity of runoff pollutants.

The drainage system should incorporate multiple uses where practicable. Uses considered compatible with stormwater management include open space, aesthetics, aquatic habitat, recreation (boating, fishing, trails, playing fields), wetlands and water quality mitigation.

Section 4.0 - Design Criteria, Standards, and Methods:

4.1 - Release Rates: The drainage system for new developments or re-developments shall be designed to control the peak rate of discharge from the property for the two year, 24-hour and 100-year, 24 hour events to levels which will not cause an increase in flooding or channel instability downstream when considered in aggregate with other developed properties and downstream drainage capacities. For new developments or re-developments meeting the provisions of Section Section 3.0 the Modified Rational Method of design as specified in the Illinois Department of Transportation (IDOT) "Drainage Manual" will be used to calculate release rates. The peak discharge rate from events less than or equal to the 2 year, 24 hour event and the peak discharge rate for the 100-year, 24 hour event shall be determined by the Village of Caseyville, Engineer.

4.1.1 - Detention Basin Outlet Design: Backwater on the outlet structure from the downstream drainage system shall be addressed when designing the outlet.

4.2 - Detention Storage Requirements: The design maximum storage to be provided in the detention basin shall be based on the runoff from the runoff difference before and after development from the 100-year, 24-hour event. All detention basin storage shall be computed using Hydrograph Methods utilizing reservoir routing (also called modified puls or level pool) or equivalent method.

4.3 - Drainage System Design and Evaluation: The following criteria should be used in evaluating and designing the drainage system. The design will provide capacity to pass the 2-year, 24 hour peak flow in the minor drainage system and an overload flow path for flows in excess of the design capacity. Whenever practicable, the stormwater systems shall not result in the interbasin transfer of drainage unless no other alternative exists.

4.3.1 - Design Methodologies: Major and minor conveyance systems as well as detention basins shall be designed as specified in Section 4.1.

4.3.2 - Positive Drainage: Whenever practicable, all developments must be provided an overland flow path that will pass the 100-year, 24 hour flow at a stage at least one (1) foot below the lowest foundation grade in the vicinity of the flow path. Overland flow paths designed to handle flows in excess of the minor drainage system capacity shall be provided drainage easements. Street ponding and flow depths shall not exceed curb heights.

4.4 - Rainfall: Unless a continuous simulation approach to drainage system hydrology is used, all design rainfall events shall be based on the Illinois State Water Survey's Bulletin 70.

The first quartile point rainfall distribution shall be used for the design and analysis of conveyance systems with critical durations less than or equal to 12 hours. The third quartile point rainfall distribution shall be used for the design and analysis of detention basins and conveyance system with critical durations greater than 12 and less than or equal to 24 hours. The fourth quartile distribution shall be used in the design and analysis of systems with durations greater than 24 hours. The first, third, and fourth quartile distributions described by Huff are presented in Table 37 of Bulletin 70. Refer to Table 13 of Bulletin 70 for rainfall depth, duration, and frequency. The NRCS Type II distribution may be used as an alternate to the Huff distributions.

4.5 - Antecedent Moisture: Computations of runoff hydrographs which do not rely on a continuous accounting of antecedent moisture conditions shall use wet antecedent moisture condition as a minimum.

4.6 - Wet Detention Basin Design: Wet detention basins shall be designed to remove stormwater pollutants, to be safe, to be aesthetically pleasing, and as much as feasible to be available for recreational use.

4.6.1 - Wet Basin Depths: Wet basins shall be at least three feet deep, excluding near-shore banks and safety ledges. If fish habitat is to be provided they shall be at least eight (8) feet deep over twenty-five (25%) percent of the bottom area to prevent winterkill.

4.6.2 - Wet Basin Shoreline Slopes: The side slopes of wet basins at the normal pool elevation shall not be steeper than three to one (3 to 1 horizontal to vertical). It is recommended that aquatic vegetation be established around the perimeter to provide protection from shoreline erosion.

4.6.3 - Permanent Pool Volume: The permanent pool volume in a wet basin at normal depth shall be equal to the runoff volume from its watershed for the 2-year, 24 hour event as a minimum.

4.6.4 - Wet Basin Inlet and Outlet Orientation: The distance between detention inlets and outlets shall be maximized. Inlets and outlets shall be at opposite ends of the basin providing that the orientation does not create undue hardship based on topography or other natural constraints. Designers are encouraged to use baffles or berms in the basin bottom to prevent short circuiting. There shall be no low flow bypass between the inlet and outlet. Paved low flow channels shall not be used. The minimum flow length shall be ten (10) feet with a recommended minimum ratio of two to one (2:1) for width.

4.7 - Dry Detention Basin Design: In addition to the other requirements of this ordinance, dry basins shall be designed to remove stormwater pollutants, to be safe, to be aesthetically pleasing and as much as feasible to be available for multiple uses.

4.7.1 - Dry Basin Drainage: Dry basins shall be designed so that eighty percent (80%) of their bottom area shall have standing water no longer than seventy-two (72) hours for any runoff event less than the 100-year, 24 hour event. Grading plans shall clearly distinguish the

wet portion of the basin bottom. Underdrains directed to the outlet may be used to accomplish this requirement.

4.7.2 - Velocity Dissipation: Velocity dissipation measures shall be incorporated into dry basin designs to minimize erosion at inlets and outlets and to minimize resuspension of pollutants.

4.7.3 - Dry Basin Inlet and Outlet Orientation: Shall be the same as Chapter 3.0, Section 4.6.4

4.7.4 - Temporary Stilling / Sedimentation Basin: A stilling / sedimentation basin shall be constructed at each major inlet to a dry basin during construction. The volume of the basin shall be a minimum of 500 ft.³ per acre of impervious surface in the drainage area. Side slopes shall be no steeper than three (3) feet to one (1) foot and basin depths shall be minimum of three (3) feet to minimize resuspension.

4.8 - Existing Depressional Areas: Existing depressional storage volume will be maintained and the volume of detention storage provided to meet the requirements of this ordinance shall be in addition to existing storage.

4.9 - Minimum Detention Outlet Size: Where a single pipe outlet or orifice plate is to be used to control discharge, it shall have a minimum diameter of twelve (12) inches. If this minimum orifice size permits release rates greater than those specified in this section, and regional detention is not a practical alternative, outlets, structures such as perforated risers, or flow control orifices shall be used.

4.10 - Detention in Flood Plains: The placement of detention basins within the flood plain is strongly discouraged because of questions about their reliable operation during flood events. However, the stormwater detention requirements of this ordinance may be fulfilled by providing detention storage within flood fringe areas on the project site provided the following provisions are met as well as compliance with Chapter 1.0, Section 2.0.

4.10.1 - Detention in Flood Fringe Areas: The placement of a detention basin in a flood fringe area shall require compensatory storage for 1.5 times the volume below the base flood elevation occupied by the detention basin including any berms. The release from the detention storage provided shall still be controlled consistent with the requirements of this section. The applicant shall demonstrate its operation for all stream-flow and flood plain backwater conditions. Excavations for compensatory storage along watercourses shall be opposite or adjacent to the area occupied by detention. All flood plain storage lost below the existing ten-year flood elevation shall be replaced below the existing ten-year elevation. All flood plain storage lost above the existing ten-year flood elevation shall be replaced above the existing ten-year flood elevation. All compensatory storage excavations shall be constructed to drain freely and openly to the watercourse and comply with Chapter 1.0, Section 2.0.

4.10.2 - Detention on Prime Farmland: The placement of detention basins shall avoid the utilization of prime farmland. All detention basin construction shall examine potential

impacts to adjacent agricultural land and shall address measures that will be implemented to eliminate such impacts and comply with Chapter 1.0, Section 2.0.

4.10.3 - Detention in Floodways: Detention basins shall be placed in the floodway only in accordance with Chapter 3.0, Section 4.10

4.10.4 - On-Stream Detention: On-stream detention basins are discouraged but allowable if they provide regional public benefits and if they meet the other provisions of this ordinance with respect to water quality and control of the two-year and 100-year, 24-hour events from the property. Further criteria are presented in Chapter 3.0, Section 5.0 of this ordinance. If on-stream detention is used in watersheds larger than one square mile, the applicant will use hydrographic modeling to demonstrate that the design will not increase the water level for any properties upstream or downstream of the property. Also, impoundment of the stream as part of on-stream detention:

- 1.) shall not prevent the migration of indigenous fish species, which require access to upstream areas as part of their life cycle, such as for spawning,
- 2.) shall not cause or contribute to the degradation of water quality or stream aquatic habitat,
- 3.) shall include a design calling for gradual bank slopes, appropriate bank stabilization measures, and a pre-sedimentation basin,
- 4.) shall not involve any stream channelization or the filling of wetlands,
- 5.) shall require the implementation of an effective non-point source management program throughout the upstream watershed which shall include as a minimum: runoff reduction "Best Management Practices" (BMP's) consistent with Chapter 3.0, Section 2.0; 2 year, 24 hour detention / sedimentation basins for all development consistent with Chapter 3.0, Section 4.10.4.
- 6.) shall not occur downstream of a wastewater discharge, and
- 7.) shall not contribute to the duration or flood frequency of any adjacent land.
- 8.) shall comply with Chapter 1.0, Section 2.0.

4.11 - Drainage Into Wetlands, Rivers, Streams, Lakes, Ponds, and Depressional Storage Areas: Wetlands, lakes, ponds and depressional storage areas shall be protected from damaging modifications and adverse changes in runoff quality and quantity associated with land developments. In addition to the other requirements of this ordinance, the following requirements shall be met for all developments whose drainage flows into wetlands, rivers, lakes, ponds or depressional storage areas:

4.11.1 -Detention in Wetlands, Rivers, Streams, Lakes, Ponds or Depressional Storage Areas: Existing wetlands, rivers, lakes, ponds or depressional storage areas shall not be modified for the purposes of stormwater detention unless it is demonstrated that the proposed modifications will maintain or improve its habitat and ability to perform beneficial functions and shall comply with Chapter 1.0, Section 2.0. Existing storage and release rate characteristics of wetlands, rivers, lakes, ponds or depressional storage areas shall be

maintained and the volume of detention storage provided to meet the requirements of this section shall be in addition to this existing storage.

4.11.2 - Sediment Control: The existing wetlands, rivers, lakes, ponds, or depressional storage areas shall be protected during construction and as further regulated in Chapter 4.0 of this ordinance, and shall not be filled.

4.11.3 - Alteration of Drainage Patterns: Site drainage patterns shall not be altered to substantially decrease or increase the existing area tributary to the wetlands, rivers, lakes, ponds or depressional storage areas.

4.11.4 - Detention/Sedimentation: All runoff from the development shall be routed through a preliminary detention/sedimentation basin designed to capture the two-year, 24-hour event and hold it for at least 24 hours, before being discharged to the wetland, river, lake, pond, or depressional storage area. This basin shall be constructed before property grading begins and shall be maintained throughout the construction process. In addition, the drainage hierarchy defined in Chapter 3.0, Section 1.0 should be followed to minimize runoff volumes and rates being discharged to the wetland, river, stream, lake, pond, or depressional storage area and as further regulated in Chapter 2.0 and Chapter 4.0 of this ordinance.

4.11.5 - Vegetated Buffer Strip: A buffer strip of at least 25 feet in width, preferably vegetated with native plant species, shall be maintained or restored around the periphery of a wetland, river, stream, lake, pond or depressional storage area.

4.11.6 - Loessal Soils: Care must be taken to avoid open flow discharges of stormwater over silt (loessal) soils due to high potential for erosion.

4.11.7 - Sinkholes, Karst Area: The following requirements apply for new developments or re-developments where sinkholes are determined to be present:

1. A stormwater detention basin shall not be placed in or over a sinkhole.
2. Stormwater detention basins shall not be located closer than one hundred (100) feet from the rim of a sinkhole
3. The outflow from a stormwater detention basin, channel, ditch or any stormwater runoff generated as a result of a new development or redevelopment shall not empty into or be directed, redirected by any means into or through any sinkhole.
4. If, after the review of the stormwater drainage plan, the City/Village/County Engineer may determine that more detailed information is required, a sinkhole evaluation may be required. A sinkhole evaluation which addresses the geologic, engineering and environmental factors resulting from a new development or redevelopment be performed by a professional with experience and expertise in karst topography, whom shall certify the results of the evaluation. This evaluation shall be the responsibility of the applicant and performed at no cost to the Village of Caseyville, Illinois. After a

review of this evaluation and with the consultation of the County Soil and Water Conservation District, the Village of Caseyville, Engineer may either approve or disapprove the drainage plan as submitted.

5. Whenever a new sinkhole appears or it becomes apparent that the sinkhole has not yet been identified, it shall be reported to the County Soil and Water Conservation District.
6. Shall comply with Chapter 1.0, Section 2.0

4.12 - Street Detention, Parking Lot Detention, and Culvert Drainage:

4.12.1 - Street Detention: If streets are to be used as part of the minor or major drainage system, ponding depths shall not exceed curb heights and shall not remain flooded for more than eight (8) hours for any event less than or equal to the 100-year, 24 hour event.

4.12.2 - Parking Lot Detention: The maximum stormwater ponding depth in any parking area shall not exceed six (6) inches for more than four (4) hours.

4.12.3 - Culvert, Road and Driveway Crossings: Sizing of culvert crossings shall consider entrance and exit losses as well as tailwater conditions on the culvert.

4.13 - Infiltration Practices: To effectively reduce runoff volumes, infiltration practices including basins, trenches, and porous pavement should be located in hydrologic soil groups "A" and "B" as designated by the U.S.D.A. Natural Resources Conservation Service. Infiltration basins and trenches designed to re-charge groundwater shall not be located within seventy-five (75) feet of a water supply well or building foundation and comply with Chapter 1.0, Section 2.0. A sediment settling basin shall be provided to remove coarse sediment from stormwater flows before they reach infiltration basins or trenches. Stormwater shall not be allowed to stand more than seventy-two hours over eighty percent of the dry basin's bottom area for the maximum design event to be ex-filtrated. The bottom of infiltration basins or trenches shall be a minimum of four feet above the seasonally high groundwater and bedrock level. Engineering calculations demonstrating infiltration rates shall be included with the application.

4.13.1 - Vegetated Filter Strips and Swales: To effectively filter stormwater pollutants and promote infiltration of runoff, sites should be designed to maximize the use of vegetated filter strips and swales. Whenever practicable, runoff from impervious surfaces should be directed onto filter trips and swales comprised of native grasses and forbs before being routed to a storm sewer or detention basin.

4.14 - Safety Considerations: The drainage system components, especially all detention basins, shall be designed to protect the safety of any children or adults coming in contact with the system during runoff events and shall comply with Chapter 1.0, Section 2.0.

4.14.1 - Side Slopes: The side slopes of all detention basins at 100-year, 24 hour capacity shall be as level as practicable to prevent accidental falls into the basin and for stability and ease of maintenance. Side slopes of detention basins and open channels shall not be steeper than three (3) to one (1) (horizontal to vertical).

4.14.2 - Safety Ledge: All wet detention basins shall have a level safety ledge at least four feet in width 2.5 to 3 feet below the normal water depth.

4.14.3 - Velocity: Velocities throughout the surface drainage system shall be controlled to safe levels taking into consideration rates and depths of flow.

4.14.4 - Overflow Structures: All stormwater detention basins shall be provided with an overflow structure capable of safely passing excess flows at a stage at least one foot below the lowest foundation grade in the vicinity of the detention basin. The design flow rate of the overflow structure shall be equivalent to the 100-year, 24 hour inflow rate.

4.15 - Maintenance Considerations: The stormwater drainage system shall be designed to minimize and facilitate maintenance. Turfed side slopes shall be designed to allow lawnmowing equipment to easily negotiate them. Wet basins shall be provided with alternate outflows which can be used to completely drain the pool for sediment removal. Pumping may be considered if drainage by gravity is not feasible. Pre-sedimentation basins shall be included, where feasible, for localizing sediment deposition and removal. Site access for heavy equipment shall be provided.

Section 5.0 - Accommodating Flows From Upstream Tributary Areas: Stormwater runoff from areas tributary to the property shall be considered in the design of the property's drainage system. Whenever practicable, flows from upstream areas that are not to be detained should be routed around the basin being provided for the site being developed.

5.1 - Upstream Areas Not meeting Ordinance Requirements: When there are areas not meeting the storage and release rates of this ordinance, tributary to the applicant's property, regionalized detention on the applicant's property shall be explored by the applicant. The following steps shall be followed:

- 1.) The applicant shall compute the storage volume needed for his property using the release rates of Chapter 3.0, Section 4.0, the applicant's property area, and the procedures described in Chapter 3.0, Section 3.0.
- 2.) Areas tributary to the applicant's property, not meeting the storage and release rate requirements of this ordinance, shall be identified.
- 3.) Using the areas determined above plus the applicant's property area, total storage needed for the combined properties shall be computed.

Allowable release rates shall be computed using the combined property areas. Storage shall be computed as described in Chapter 3.0, Section 4.0. If tributary areas are not developed, a reasonable fully developed land cover, based on local zoning, shall be used for the purposes of computing storage.

Once the necessary combined storage is computed the Village of Caseyville, Illinois may choose to pay for over-sizing the applicant's detention basin to accommodate the regional

flows. The applicant's responsibility will be limited to the storage for his property as computed above. If regional storage is selected by the Village of Caseyville, Illinois, then the design produced in Chapter 3.0, Section 3.0 shall be implemented. If regional storage is rejected by the Village of Caseyville, Illinois, the applicant shall bypass all tributary area flows around the applicant's basin whenever practicable. If the applicant must route upstream flows through his basin and the upstream areas exceed one-square mile in size, the applicant must meet the provision of Section 4.8.3 for on-stream basins.

5.2 - Upstream Areas Meeting Ordinance Requirements: When there are areas which meet the storage and release rate requirements of this ordinance, tributary to the applicant's property, the upstream flows shall be bypassed around the applicant's detention basin if this is the only practicable alternative. Storage needed for the applicant's property shall be computed as described in Chapter 3.0, Section 5.1. However, if the Village of Caseyville, Illinois decides to route tributary area flows through an applicant's basin, the final design stormwater releases shall be based on the combined total of the applicant's property plus tributary areas. It must be shown that at no time will the runoff rate from the applicant's property exceed the allowable release rate for his/her property alone.

Section 6.0 - Early Completion of Detention Facilities: Where detention, retention, or depressional storage areas are to be used as part of the drainage system for a property, they shall be constructed as the first element of the initial earthwork program. Any eroded sediment captured in these facilities shall be removed by the applicant on a regular basis and before project completion in order to maintain the design volume of the facilities.

Section 7.0 - Fee in Lieu of Detention: All new development or re-development not exceeding fifteen thousand (15,000) square feet of impervious surface may pay a fee of \$10,000 for each acre-foot of detention which would be required under this ordinance rather than installing detention facilities on the property, unless specifically directed to do otherwise by the appropriate local official. The Village of Caseyville, Illinois also shall have the option for new development or re-development exceeding fifteen thousand (15,000) square feet of impervious surface of requiring a fee of \$10,000 for each acre-foot of detention needed in lieu of the applicant building a basin on-site provided the property will discharge stormwater to the Village of Caseyville, Illinois storm sewer system if applicable.

In instances where regional benefits and economies of scale can be achieved, it will be permissible for adjacent properties to utilize a common regional detention basin. Applicants shall have the option of paying a fee of \$10,000 for each acre-foot of detention required so that the Village of Caseyville, Illinois can build regional facilities or they can jointly build the necessary facilities themselves.

Chapter 4.0 - SOIL EROSION AND SEDIMENT CONTROL:

Section 1.0 - Findings: The Village of Caseyville, Illinois hereby finds that:

1. The soil types found in the Village of Caseyville, Illinois are susceptible to erosion and if left unprotected could cause severe loss of soil with resultant damage to property;
2. The topography of the Village of Caseyville, Illinois contains areas with steep slopes upon which, if clearing of trees and/or inappropriate construction takes place, could result in severe erosion and slope stability problems which could result in damage to property;
3. Excessive quantities of soil may erode from areas undergoing development for certain non-agricultural uses including but not limited to the construction of dwelling units, commercial buildings and industrial plants, the building of roads and highways, the modification of stream channels and drainageways, and the creation of recreational facilities;
4. The washing, blowing, and falling of eroded soil across and upon roadways endangers the health and safety of users thereof, by decreasing vision and reducing traction of road vehicles;
5. Soil erosion necessitates the costly repairing of gullies, washed out fills, and embankments;
6. Sediment from soil erosion tends to clog sewers and ditches and to pollute and silt rivers, streams, lakes, sinkholes, wetlands, and reservoirs;
7. Sediment limits the use of water and waterways for most beneficial purposes, promotes the growth of undesirable aquatic weeds, destroys fish and other desirable aquatic life, and is costly and difficult to remove; and
8. Sediment reduces the channel capacity of waterways and the storage capacity of flood plains and natural depressions, resulting in increased chances of flooding at risk to public health and safety.

Section - 2.0 - General Principles: It is the objective of this ordinance to control soil erosion and sedimentation caused by development activities, including clearing, grading, stripping, excavating, and filling of land, in the Village of Caseyville, Illinois. Measures taken to control soil erosion and off-site sediment runoff shall be adequate to assure that sediment is not transported from the site by a storm event of ten-year, 24 hour frequency or less. The

following principles shall apply to all new development or redevelopment activities within the Village of Caseyville, Illinois and to the preparation of the submissions required under Chapter 4.0, Section 3.0 of this ordinance.

1. New development or redevelopment shall be related to the topography and soils of the site so as to create the least potential for erosion. Areas of steep slopes greater than eight percent (8%) where high cuts and fills may be required are to be avoided wherever possible, and natural contours should be followed as closely as possible.
2. Natural vegetation shall be retained and protected wherever possible. Areas immediately adjacent to natural watercourses, lakes, ponds, sinkholes, and wetlands are to be left undisturbed wherever possible. Temporary crossings of watercourses, when permitted, must include appropriate stabilization measures.
3. Special precautions shall be taken to prevent damages resultant from any necessary development activity within or adjacent to any stream, lake, pond, sinkhole or wetland. Preventive measures shall reflect the sensitivity of these areas to erosion and sedimentation.
4. The smallest practical area of land should be exposed for the shortest practical time during development.
5. Sediment basins or traps, filter barriers, diversions, and any other appropriate sediment or runoff control measures shall be installed prior to site clearing and grading and maintained to remove sediment from run-off waters from land undergoing development.
6. The selection of erosion and sediment control measures shall be based on assessment of the probable frequency of climatic and other events likely to contribute to erosion, and on evaluation of the risks, costs, and benefits involved.
7. In the design of erosion control facilities and practices, aesthetics and the requirements of continuing maintenance must be considered.
8. Provision shall be made to accommodate the increased run-off caused by changed soil and surface conditions during and after development. Drainageways should be designed so that their final gradients and the resultant velocities and rates of discharge will not create additional erosion on-site or downstream.
9. Permanent vegetation and structures shall be installed and functional as soon as practical during development.

10. Those areas being converted from agricultural purposes to other land uses shall be vegetated with an appropriate protective cover prior to development.
11. All waste generated as a result of site development activity shall be properly disposed of and shall be prevented from being carried off the site by either wind or water.
12. All construction sites shall provide measures to prevent sediment from being tracked onto public or private roadways.
13. All temporary soil erosion and sediment control practices shall be maintained to function as intended until the contributing drainage area has been permanently stabilized at which time they shall be removed.

Section 3.0 - Erosion and Sediment Control Plan Submittal Requirements: Each applicant shall submit the information depending on development size, as regulated to ensure that the provisions of this ordinance are met. The submittal shall include sufficient information to evaluate the environmental characteristics of the property, the potential adverse impacts of the development related to erosion both on-site and off-site, and the effectiveness of the proposed erosion and sediment control plan in reducing sediment loss and meet the provisions of Chapter 1.0, Section 2.0. The applicant shall certify on the drawing that all clearing, grading, drainage, and construction shall be accomplished in strict conformance with the erosion and sediment control plan. The following information shall be submitted for both existing and proposed property conditions; new developments or re-developments meeting the requirements of Chapter 1.0, Section 3.0.

3.1 - Erosion and Sediment Control Plan Requirements: Shall meet the requirements of Chapter 3.0, Section 1.1, Section 1.1.1, and Section 1.1.2.

3.1.1 - Mapping and Descriptions: The existing and proposed erosion and sediment control features of the property and immediate vicinity including:

- 1.) As required in Chapter 3.0, Section 1.1, Section 1.1.1, and Section 1.1.2;
- 2.) Location of the slope disturbance line;
- 3.) Location and description of the erosion and sediment control measures to be employed during construction;
- 4.) For any structures proposed to be located on the slope side of the slope disturbance line the map shall include the limits of disturbance including tree removal, erosion and sediment control measures during construction, cross section view of any proposed cut or fill, erosion and sediment control measures during construction, details of method(s) proposed for providing slope stability, permanent

stormwater control measures, and permanent erosion and sediment control measures all being certified by a registered professional engineer or a "Certified Professional Erosion Control Specialist."

- 5.) The predominant soil types on the site, their location, and their limitations for the proposed use as defined by the U.S.D.A. Natural Resources Conservation Service.
- 6.) The proposed use of the site, including present and planned development, areas of clearing, stripping, grading, excavation and filling; proposed contours, finished grades, and street profiles; the stormwater plan as required in Chapter 2.0; kinds and locations of utilities, areas and acreages proposed to be paved, sodded or seeded, vegetatively stabilized, or left undisturbed; and the location of trees over eight (8) inches in diameter and their type.
- 7.) The erosion and sediment control plan showing all measures necessary to meet the requirements of this ordinance throughout all phases of construction and those remaining permanently after completion of the development of the site, including:
 - a.) Location and description, including standard details, of all sediment control measures, runoff control measures, including diversions, waterways and outlets, and design specifics of sediment basins and traps including outlet details.
 - b.) Location and description of all soil stabilization and erosion control measures, including seeding mixtures and rates, types of sod, method of seedbed preparation, expected seeding dates, type and rate of lime and fertilizer application, kind and quantity of mulching for both temporary and permanent vegetative control measures, and types of non-vegetative stabilization measures.
 - c.) Location and description of methods to prevent tracking of sediment off-site including construction entrance details, as appropriate.
 - d.) Description of dust and traffic control measures.
 - e.) Locations of stockpiles and description of stabilization methods.
 - f.) Location of off-site fill or borrow volumes, locations and methods of stabilization.

- g.)** Provisions for maintenance of control measures, including type and frequency of maintenance, easements, and estimates of the cost of maintenance.
- h.)** The proposed phasing of development of the site, including stripping and clearing, rough grading and construction, and final grading and landscaping. Phasing should identify the expected date on which clearing will begin, the estimated duration of exposure of cleared area, and the sequence of installation of temporary sediment control measures (including perimeter controls), installation of stormwater drainage, paving streets and parking areas, final grading and the establishment of permanent vegetative cover, and the removal of temporary measures. It shall be the responsibility of the applicant to notify the Building and Zoning Administrator of any significant changes which occur in the site development schedule after the initial erosion and sediment control plan has been approved.

Section 4.0 - Design and Operation Standards and Requirements:

The preparation of soil erosion and sediment control plans shall follow the principles outlined in the "Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control", excepting Chapter six (6) published by the Urban Committee of the Association of Illinois Soil and Water Conservation Districts. The design criteria, standards, and methods shall be prepared in accordance with the requirements of this ordinance and the standards and specifications contained in "Illinois Urban Manual" prepared for the Illinois Environmental Protection Agency by the U.S.D.A. Natural Resources Conservation Service, which standards and methods are hereby incorporated into this ordinance by reference. In the event of conflict between the provisions of said manuals and of this ordinance, this ordinance shall govern.

4.1 - Erosion and Sediment Control Design Requirements: New developments or re-developments shall comply with Chapter 4.0, Section 3.0 and meet the following:

4.1.1 - Control measures shall be constructed to control runoff from the property to such an extent possible that sediment is retained on-site.

4.1.2 - Temporary on-site control measures required shall be constructed and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.

4.1.3 - Disturbed areas shall be stabilized with permanent measures within seven (7) calendar days following the end of active disturbance, or re-disturbance consistent with the following criteria:

- 1.** Appropriate permanent stabilization measures shall include seeding, mulching, sodding, with non-vegetative measures as a last resort.

2. Areas having slopes greater than 12% shall be stabilized with sod, mat, or blanket in combination with seeding or equivalent.

4.1.4 - All temporary and permanent erosion and sediment control practices must be maintained and repaired as needed to assure effective performance of their intended function.

4.1.5 - All temporary erosion and sediment control measures shall be disposed in a proper manner within thirty (30) days after final site stabilization is achieved with permanent soil stabilization measures. Trapped sediment and other disturbed soils resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.

4.1.6 - Site Development Requirements: On-site sediment control measures, as specified by the following criteria, shall be constructed as specified in the referenced handbooks, and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.

1. For new developments or re-developments less than one (1) acre, filter barriers (including filter fences, straw bales, or equivalent control measures) shall be constructed to control all on-site runoff. Vegetated filter strips, with a minimum width of twenty five (25) feet, may be used as an alternative only where runoff in sheet flow is expected.
2. For new developments or re-developments more than one (1) acre but less than five (5) acres, a sediment trap or equivalent control measure shall be constructed at the downslope point of the disturbed area.
3. For new developments or re-developments greater than five (5) acres, a sediment basin or equivalent control measure shall be constructed at the downslope point of the disturbed area.
4. Sediment basin and sediment trap designs shall provide for both "dry" detention and "wet" detention sediment storage. The detention storage shall be composed of equal volumes of "wet" detention storage and "dry" detention storage and each shall be sized as regulated in Chapter 3.0. The release rate of the basin shall be that rate as regulated in Chapter 3.0. The elevation of the outlet structure shall be placed such that it only drains the dry detention storage.
5. The sediment storage shall be sized to store the estimated sediment load generated from the site over the duration of the construction period with a minimum storage equivalent to the volume or sediment generated in one year. For construction periods exceeding one year, the 1-year sediment load and a sediment removal schedule may be substituted.

6. The alteration of sinkholes by filling, grading or excavation is prohibited, including an area within twenty five (25) feet from the rim.
7. To the extent possible or as otherwise regulated in this ordinance all desirable trees eight (8) inches in diameter and larger shall be protected for their present and future value for erosion protection and other environmental benefits. Trees that have been selected for preservation shall be marked prior to the beginning of any clearing, grading, stripping, excavation, or filling of the site. A "No" construction zone shall be established and marked at the perimeter of the dripline of each tree which is to be preserved.

4.1.7 - Stormwater conveyance channels, including ditches, swales, and diversions, and the outlets of all channels and pipes shall be designed and constructed as regulated in Chapter 3.0. All constructed or modified channels shall be stabilized within 48 hours, consistent with the following standards and as required in the referenced handbooks:

1. For grades up to 4 percent, seeding in combination with mulch, erosion blanket, or an equivalent control measure shall be applied. Sod or erosion blanket or mat shall be applied to the bottom of the channel.
2. For grades of 4 to 8 percent, sod or an equivalent control measure shall be applied in the channel.
3. For grades greater than 8 percent, rock, riprap, or an equivalent control measure shall be applied over filter fabric or other type of soil protection, or the grade shall be effectively reduced using drop structures.

4.1.8 Land disturbance activities in stream channels shall be avoided, where possible, or as regulated in Chapter 3.0. If disturbance activities are unavoidable, the following requirements shall be met.

1. Construction vehicles shall be kept out of the stream channel to the maximum extent practicable. Where construction crossings are necessary, temporary crossings shall be constructed of non-erosive material, such as riprap or gravel.
2. The time and area of disturbance of stream channels shall be kept to a minimum. The stream channel, including bed and banks, shall be stabilized within 48 hours after channel disturbance is completed, interrupted, or stopped.
3. Whenever channel relocation is necessary, the new channel shall be constructed under dry conditions and fully stabilized before flow is

diverted, incorporating meanders, pool and riffle sequence, and riparian planting.

4.1.9 - Storm sewer inlets and culverts shall be protected by sediment traps or filter barriers meeting accepted design standards and specifications.

4.1.10 - Soil storage piles containing more than 10 cubic yards of material shall not be located with a downslope drainage length of less than 25 feet to a roadway, drainage channel, or sinkhole. Filter barriers, including straw bales, filter fence, or equivalent, shall be installed immediately on the downslope side of the piles.

4.1.11 - If dewatering devices are used, discharge locations shall be protected from erosion. All pumped discharges shall be routed through appropriately designed sediment traps or basins, or equivalent and shall not be deposited into a sinkhole.

4.1.12 - Each site shall have graveled (or equivalent) entrance roads, access drives, and parking areas of sufficient length and width to prevent sediment from being tracked onto public or private roadways. Any sediment reaching a public or private road shall be removed by shoveling or street cleaning (not flushing) before the end of each workday and transported to a controlled sediment disposal area.

Section 5.0 - Maintenance of Control Measures: All soil erosion and sediment control measures necessary to meet the requirements of this ordinance shall be maintained periodically by the applicant or subsequent land owner during the period of land disturbance and development of the site in a satisfactory manner to ensure adequate performance.

Chapter 5.0 - Long Term Maintenance Responsibility:

Section 1.0 - Long Term Maintenance Responsibility: Maintenance of stormwater drainage, and erosion and sediment control facilities located on private property shall be the responsibility of the owner of that property. Before an appropriate permit is obtained from the Village of Caseyville, Illinois the applicant shall execute a maintenance agreement with the Village of Caseyville, Illinois of guaranteeing that the applicant and all future owners of the property will maintain its stormwater drainage and erosion and sediment control system. Such agreement shall be recorded with the Recorder of Deeds of the County. The maintenance agreement shall include a schedule for regular maintenance of each aspect of the property's stormwater drainage and erosion and sediment control system and shall provide for access to the system for inspection by authorized personnel of the Village of Caseyville, Illinois of. The maintenance agreement shall also stipulate that if the appropriate personnel of the Village of Caseyville, Illinois notify the property owner in writing of maintenance problems which require correction, the property owner shall begin such corrections within twenty four (24) hours and shall not extend beyond seven (7) calendar days of such notification. If the corrections are not made within this time period the Village of Caseyville, Illinois may have the necessary work completed and assess the cost to the property owner. The Village of Caseyville, Illinois has the option of requiring a bond to be filed by the property owner for maintenance of the stormwater drainage and erosion and sediment control system.

Chapter 6.0 - Inspections:

Section 1.0 - Inspections: The Building and Zoning Administrator shall make inspections as hereinafter required and shall either approve that portion of the work completed or shall notify the permittee wherein the work fails to comply with the stormwater drainage or erosion and sedimentation control plan as approved. Plans for grading, stripping, excavating, and filling work bearing the stamp of approval of the Building and Zoning Administrator shall be maintained at the site during progress of the work. In order to obtain inspections and to ensure compliance with this ordinance, the permittee shall notify the Building and Zoning Administrator within two (2) working days of the completion of the construction stages specified below:

1. Upon completion of installation of the stormwater drainage and erosion and sediment control measures (including perimeter controls and diversions), prior to proceeding with any other earth disturbance or grading,
2. After stripping and clearing,
3. After rough grading,
4. After final grading,
5. After seeding and landscaping deadlines, and
6. After final stabilization and landscaping, prior to removal of sediment controls.

If stripping, clearing, grading and/or landscaping are to be done in phases or areas, the permittee shall give notice and request inspection at the completion of each of the above work stages in each phase or area. If an inspection is not made and notification of the results given within five working days after notice is received by the Village of Caseyville, Illinois from the permittee, the permittee may continue work at his/her own risk, without presuming acceptance by the Village of Caseyville, Illinois. Notification of the results of the inspection shall be given in writing at the site.

Section 2.0 - Special Precautions: If at any stage of the grading of any development site the Building and Zoning Administrator determines by inspection that the nature of the site is such that further work authorized by an existing permit is likely to imperil any property, public way, stream, lake, wetland, or drainage structure, the Building and Zoning Administrator may require, as a condition of allowing the work to be done, that such reasonable special precautions to be taken as is considered advisable to avoid the likelihood of such peril. "Special precautions" may include, but shall not be limited to, a more level exposed slope, construction of additional drainage facilities, berms, terracing, compaction, or cribbing, installation of plant materials for erosion control, and recommendations of a

registered soils engineer and/or engineering geologist which may be made requirements for further work.

2.0.1 - Where it appears that storm damage may result because the grading on any development site is not complete, work may be stopped and the permittee required to install temporary structures or take such other measures as may be required to protect adjoining property or the public safety. On large developments or where unusual site conditions prevail, the Building and Zoning Administrator may specify the time of starting grading and time of completion or may require that the operations be conducted in specific stages so as to ensure completion of protective measures or devices prior to the advent of seasonal rains.

Section 3.0 - Amendment of Plans: Major amendments to stormwater drainage and detention or erosion and sediment control plans shall be submitted to the Building and Zoning Administrator and shall be processed and approved or disapproved in the same manner as the original plans. Field modification of a minor nature may be authorized by the Building and Zoning Administrator by written authorization to the permittee.

Chapter 7.0 - Permitting:

Section 1.0 - Application for Permit: Application for a development permit shall be made by the owner of the property or his authorized agent to the Building and Zoning Administrator on a form furnished for that purpose. Each application shall bear the name(s) and address(es) of the owner or developer of the site, the contractor(s) and of any consulting firm retained by the applicant together with the name of the applicant's principal contact at such firm, and shall be accompanied by a filing fee. Each application shall include certification that any land clearing, construction, or development involving the movement of earth shall be in accordance with the plans approved upon issuance of the permit.

Section 2.0 - Bond Required: The applicant for a development permit may be required to file with the Village of Caseyville, Illinois, a faithful performance bond or bonds, letter of credit, or other improvement security satisfactory to the Village of Caseyville, Illinois Attorney in an amount deemed sufficient by the Building and Zoning Administrator to cover all costs of improvements, landscaping, maintenance of improvements and landscaping, and soil erosion and sediment control measures for such period as specified by the Village of Caseyville, Illinois, and engineering and inspection costs to cover the cost of failure or repair of improvements installed on the site.

Section 3.0 - Review and Approval: Each application for a development permit shall be reviewed and acted upon according to the following procedures:

1. The Building and Zoning Administrator will review each application for a development permit to determine its conformance with the provisions of this ordinance. The Officer may also refer any application to the County Soil and Water Conservation District and/or any other local government or public agency within whose jurisdiction the site is located for review and comment. Within thirty (30) days after receiving an application, the Building and Zoning Administrator shall in writing:
 - a. Approve the permit application if it is found to be in conformance with the provisions of this ordinance, and issue the permit;
 - b. Approve the permit application subject to such reasonable conditions as may be necessary to secure substantially the objectives of this ordinance, and issue the permit subject to these conditions; or
 - c. Disapprove the permit application, indicating the deficiencies and the procedure for submitting a revised application and/or submission.

3.1 - No development permit shall be issued for an intended development site unless:

1. The development, including but not limited to subdivision or planned unit development, has been approved by the Village of Caseyville, Illinois in Illinois where applicable, or
2. such permit is accompanied by or combined with a valid building permit issued by the Village of Caseyville, Illinois, or
3. the proposed earth moving is coordinated with any overall development program previously approved by the Village of Caseyville, Illinois for the area in which the site is situated; and
4. all relevant federal and state permits have been received for the portion of the site subject to soil disturbance as noted in Chapter 1.0, Section 2.0.

3.2 - Failure of the Building and Zoning Administrator to act on an original or revised application within thirty (30) days of receipt shall authorize the applicant to proceed in accordance with the plans as filed and in compliance with the regulations contained herein, unless such time is extended by agreement between the Building and Zoning Administrator and the applicant. Pending preparation and approval of a revised plan, development activities shall be allowed to proceed in accordance with conditions established by the Building and Zoning Administrator.

Section 4.0 - Expiration of Permit: Every development permit shall expire and become null and void if the work authorized by such permit has not been commenced within one hundred and eighty (180) days, or if not completed by a date which shall be specified in the permit; except that the Building and Zoning Administrator may, if the permittee presents satisfactory evidence that unusual difficulties have prevented work being commenced or completed within the specified time limits, grant a reasonable extension of time if written application is made before the expiration date of the permit. The Building and Zoning Administrator may require modification of the erosion control plan to prevent any increase in erosion or off-site sediment runoff resulting from any extension.

Section 5.0 - Appeals: The applicant, or any person or agency which received notice of the filing of the application, may appeal the decision of the Building and Zoning Administrator to the Board of Appeals. Upon receipt of an appeal, the Board of Appeals shall schedule and hold a public hearing, after giving fifteen (15) days notice thereof. The Board shall render a decision within thirty (30) days after the hearing. Factors to be considered on review shall include, but need not be limited to, the effects of the proposed development activities on the surface water flow to tributary and downstream lands, any comprehensive watershed management plans, or the use of any retention facilities; possible saturation of fill and unsupported cuts by water, both natural and domestic; runoff surface waters that produce erosion and silting of drainageways; nature and type of soil or rock which when disturbed by the proposed development activities may create earth movement and produce slopes that

cannot be landscaped; and excessive and unnecessary scarring of the natural landscape through grading or removal of vegetation.

Section 6.0 - Retention of Plans: Plans, specifications, and reports for all site developments shall be retained in original form or on microfilm by the Building and Zoning Administrator.

Chapter 8.0 - Enforcement:

Section 1.0 - Stop-Work Order; Revocation of Permit: In the event any person holding a development permit pursuant to this ordinance violates the terms of the permit, or carries on-site development in such a manner as to materially adversely affect the health, welfare, environment, or safety of persons residing or working in the neighborhood of the development site or so as to be materially detrimental to the public welfare or injurious to property or improvements in the neighborhood, the Building and Zoning Administrator may suspend or revoke the development permit.

1.1 - Suspension of a permit shall be by a written stop-work order issued by the Building and Zoning Administrator and delivered to the permittee or his agent or the person performing the work. The stop-work order shall be effective immediately, shall state the specific violations cited, and shall state the conditions under which work may be resumed. A stop-work order shall remain in effect until the next regularly scheduled meeting of the Board of Appeals at which time the conditions of Chapter 7.0, Section 5.0 below can be met.

1.2 - No development permit shall be revoked until a hearing is held by the Board of Appeals. Written notice of such hearing shall be served on the permittee, either personally or by registered mail, and shall state:

1. The grounds for complaint or reasons for suspension or revocation, in clear and concise language; and
2. The time when and place where such hearing will be held.

Such notice shall be served on the permittee at least five (5) days prior to the date set for the hearing. At such hearing, the permittee shall be given an opportunity to be heard and may call witnesses and present evidence on his behalf. At the conclusion of the hearing the Board of Appeals shall determine whether the permit shall be revoked.

Section 2.0 - Violations and Penalties: No person shall construct, enlarge, alter, repair or maintain any grading, excavation or fill, or cause the same to be done, contrary to or in violation of any terms of this ordinance. Any person violating any of the provisions of this ordinance shall be deemed guilty of a misdemeanor, and each day during which any violation of any of the provisions of this ordinance is committed, continued, or permitted shall constitute a separate offense. Upon conviction of any such violation, such person, partnership, or corporation shall be punished by a fine of not more than One Thousand Dollars (\$1000) for each offense. In addition to any other penalty authorized by this section, any person, partnership, or corporation convicted of violating any of the provisions of this ordinance shall be required to restore the site to the condition existing prior to commission of the violation, or to bear the expense of such restoration.

Chapter 9.0 - Effective Date

This ordinance shall be in full force and effect from and after its passage and approval and publication, as required by law.

Passed by Village Board of the Village of Caseyville, Illinois, this 19th. day of August, 1998.

Passed: _____

Approved: _____

George Chance, Mayor

Attest:

Jack Piesbergen, Village Clerk

Appendix A
Stormwater Drainage and Detention

Appendix B
Soil Erosion and Sediment Control

Appendix C

Desirable Trees Native to Southwestern Illinois

Alder, Speckled, *Alnus rugosa*
Ash, Blue, *Fraxinus quadrangulata*
Ash, Green, *Fraxinus pennsylvanica*
Ash, White, *Fraxinus americana*
Baldcypress, *Taxodium distichum*
Birch, River or Red, *Betula nigra*
Buckeye, Ohio or Fetid, *Aesculus glabra*
Butternut, *Juglans cinerea*
Catalpa, Northern or Western, *Catalpa speciosa*
Catalpa, Southern, *Catalpa bignonioides*
Cherry, Black, *Prunus serotina*
Cherry, Choke, *Prunus virginiana*
Chestnut, American, *Castanea dentata*
Coffeetree, Kentucky, *Gymnocladus dioica*
Crabapple, *Malus*
Dogwood, Flowering, *Cornus florida*
Elm, American, *Ulmus americana*
Elm, Slippery or Red, *Ulmus rubra*
Hackberry, Common, *Celtis occidentalis*
Hackberry, Sugar, *Celtis laevigata*
Hawthorn, Cockspur, *Crataegus crus-galli*
Hawthorn, Dotted, *Crataegus punctata*
Hawthorn, Downy, *Crataegus mollis*
Hawthorn, Winter King, *Crataegus viridis* "Winter King"
Hickory, Bitternut, *Carya cordiformis*
Hickory, Kingnut, *Carya laciniosa*
Hickory, Mockernut, *Carya tomentosa*
Hickory, Overcup,
Hickory, Pignut, *Carya glabra*
Hickory, Shagbark, *Carya ovata*
Hickory, Sweet Pignut, *Carya ovalis*
Hornbeam, American (Blue Beech), *Carpinus caroliniana*
Horsechestnut, Common, *Aesculus hippocastanum*
Ironwood (Hophornbeam), *Ostrya virginiana*
Linden, American (Basswood), *Tilia americana*
Locust, Black, *Robinia pseudoacacia*
Maple, Red or Swamp, *Acer rubrum*
Maple, Silver, *Acer saccharinum*
Maple, Sugar or Rock, *Acer saccharum*
Mulberry, Red, *Morus rubra*
Oak, Black, *Quercus velutina*
Oak, Blackjack, *Quercus marilandica*
Oak, Bur, *Quercus macrocarpa*

Oak, Cherrybark, *Quercus falcata* var. *pagodaefolia*
Oak, Chestnut, *Quercus prinus*
Oak, Chinkapin, *Quercus muehlenbergii*
Oak, Pin or Swamp, *Quercus palustris*
Oak, Post, *Quercus stellata*
Oak, Overcup, *Quercus lyrata*
Oak, Red, *Quercus rubra*
Oak, Schumard, *Quercus shumardii*
Oak, Shingle, *Quercus imbricaria*
Oak, Swamp Chestnut, *Quercus michauxii*
Oak, Swamp White, *Quercus bicolor*
Oak, White, *Quercus alba*
Pawpaw, Common, *Asimina triloba*
Pecan, *Carya illinoensis*
Persimmon, Common, *Diospyros virginiana*
Plum, Wild, *Prunus americana*
Poplar, Cottonwood, *Populus deltoides*
Redbud, *Cercis canadensis*
Sassafras, Common, *Sassafras albidum*
Serviceberry, Shadblow, *Amelanchier arborea*
Sourgum (Black Tupelo), *Nyssa sylvatica*
Sweetgum, *Liquidambar styraciflua*
Sycamore, *Platanus occidentalis*
Tuliptree, *Liriodendron tulipifera*
Viburnum, Blackhaw, *Viburnum prunifolium*
Walnut, Black, *Juglans nigra*
Willow, Black, *Salix nigra*
Juniper, Eastern Redcedar, *Juniperus virginiana*
Pine, Eastern White, *Pinus strobus*

DIFFERENCES BETWEEN THE PEORIA, TAZEWELL AND WOODFORD COUNTY EROSION, SEDIMENT, AND STORM WATER CONTROL ORDINANCES

1. Tazewell County – p. 4, Sec. 7-7-2 (1)(d) excludes Tazewell County Road Departments from applicability of the Ordinance (they are not required to obtain a permit).
2. Peoria County – p.8, Sec. 7.5-66 (1)(d)(1) states that applicant must provide a map showing the drainage area boundaries, including off-site drainage areas that drain “into **or onto** the site,” whereas Tazewell and Woodford Ordinances state “into the site” only.
3. In Sec. 7.5-66(1)(d)(2) and (3) Peoria County uses the language “all drainage areas” and “drainage area” where Woodford and Tazewell Counties use “entire watershed” and “subwatershed”. Peoria County defines “drainage area” in its ordinance while Woodford and Tazewell do not.
4. Additional language in Tazewell County’s Ordinance (Sec. 7-7-12): “The provisions and sections of this ordinance shall be deemed separable and the invalidity of any portion of this chapter shall not effect the validity of the remainder”. This is not present in the Peoria or Woodford County Ordinances.
5. **FEES FOR GENERAL EROSION AND SEDIMENT CONTROL PERMITS ***
(The most significant difference between the ordinances)

	<u>Standard Plan Application</u>	<u>Site Specific Plan Application</u>
Peoria	\$100	\$150
Tazewell	\$50	\$100
Woodford	\$100	\$150

FEES FOR EROSION, SEDIMENT AND STORM WATER PERMITS *

Peoria	\$50/acre, \$250 minimum, \$2,000 maximum
Tazewell	\$50/acre, \$250 minimum, \$2,000 maximum
Woodford	\$25/acre, \$100 minimum, \$2,000 maximum

* These rates are from the original date of ordinance adoption. They may have increased.

6. Effective Dates

Peoria	4-1-96
Tazewell	4-15-96
Woodford	4-15-96

7. Each county has established an intergovernmental agreement with NRCS and the local SWCD. Responsibilities of signatory parties vary by county. Contact the County or local NRCS/SWCD Office for details.

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ARTICLE 1—AUTHORITY, PURPOSE AND DEFINITIONS**§ 100. Statutory authority**

(a) This ordinance shall be known, and may be cited, as the Kane County Stormwater Management Ordinance.

(b) The Kane County Board adopts this ordinance pursuant to its authority to regulate stormwater management and govern the location, width, course, and release rate of all stormwater runoff channels, streams, and basins in the County, in accordance with the Kane County Comprehensive Countywide Stormwater Management Plan. The statutory authority for this ordinance is contained in 55 ILCS 5/5-1041, 5-1042, 5-1049, 5-1062, 5-1063, 5-1104, 5-12003 and 5-15001 *et seq.*, and 415 ILCS 5/43, and other applicable authority, all as amended from time to time.

(c) As applicable, the municipalities within the County adopt and enforce this ordinance pursuant to 55 ILCS 5/5-1062, 65 ILCS 5/1-2-1, 11-12-12, 11-30-2, 11-30-8, and 11-31-2; and 615 ILCS 5/5, *et seq.*, including 5/18g.

§ 101. Kane County Comprehensive Countywide Stormwater Management Plan

The Kane County Comprehensive Countywide Stormwater Management Plan was recommended by the Kane County Stormwater Management Committee and adopted by the County Board, after review by the appropriate agencies and a public hearing, by Ordinance No. 98-251 on October 13, 1998. The Plan is available for public inspection in the office of the Kane County Clerk.

§ 102. Purposes of this ordinance

(a) The principal purpose of this ordinance is to promote effective, equitable, acceptable and legal stormwater management measures by establishing reasonable rules and regulations for development. Other purpose of this ordinance include—

(1) managing and mitigating the effects of urbanization on stormwater drainage throughout Kane County through planning, appropriate engineering practices and proper maintenance;

(2) protecting the public health and safety and reducing the potential for loss of human life and property from flood damage;

(3) protecting the public from the degradation of water quality on a watershed basis;

(4) preserving and enhancing the natural hydrologic and hydraulic functions and natural characteristics of watercourses and floodplains to protect water quality, aquatic habitats, reduce flood damage, reduce soil erosion, provide recreational and aesthetic benefits and enhance community and economic development;

(5) controlling sediment and erosion in and from stormwater facilities, developments, agricultural fields, and construction sites and reducing and repairing streambank erosion;

(6) requiring planning for development to provide for water resource management, taking into account natural features such as vegetation, wildlife, waterways, wetlands and topography in order to reduce the probability that new development will create unstable conditions susceptible to erosion or degrade the quality of ground and surface waters;

(7) protecting environmentally sensitive areas from deterioration or destruction by private or public actions;

(8) protecting and enhancing the quantity and quality of potable groundwater and potable surface water supplies;

(9) requiring appropriate and adequate provision for site runoff control, especially when the land is developed with a large amount of impervious surface;

(10) requiring the design and evaluation of each site stormwater management plan to be consistent with watershed capacities;

(11) encouraging the use of stormwater storage and infiltration of stormwater in preference to stormwater conveyance;

(12) lessening the taxpayers' burden for flood-related disasters, repairs to flood-damaged public facilities and utilities, and flood rescue and relief operations;

(13) meeting the IDNR-OWR floodway permitting requirements delineated in 615 ILCS 5/18g, (*An Act in Relation to the Regulation of the Rivers, Lakes, and Streams of the State of Illinois* (1992)), as amended from time to time;

(14) complying with the rules and regulations of the National Flood Insurance Program thereby making federally subsidized flood insurance available to persons throughout the County;

(15) minimizing conflicts and incompatibilities between agricultural and urban drainage systems and maintaining agriculture as a viable and productive land use;

(16) encouraging cooperation and consistency in stormwater management activities within and between units of government having floodplain and stormwater management jurisdiction;

(17) restricting development in the floodplain to facilities that will not adversely affect the potential for flood damage;

(18) protecting and improving surface water quality and promoting beneficial uses of ponds, lakes, wetlands, rivers and streams by reducing point source and non-point source discharges of pollutants;

(19) requiring regular, planned maintenance of stormwater management facilities;

(20) requiring control of stormwater quantity and quality at the most site-specific or local level and preventing unauthorized or unmitigated discharge of flow offsite;

(21) protecting the quantity and quality of wetlands;

(22) allowing the use of simple technologies whenever appropriate and realistic, but requiring the use of more sophisticated techniques when necessary to insure the adequacy of stormwater controls;

(23) providing a procedure by which communities throughout the County may petition the Committee for authority to implement and enforce the provisions of this ordinance; and

(24) requiring strict compliance with and enforcement of this ordinance.

(b) The purposes of this ordinance are consistent with and supersede the Plan.

§ 103. Reference to watershed plans

(a) This ordinance recognizes the integrated nature of the watershed system and the need to study certain flood control alternatives and other stormwater management functions on a watershed-wide basis.

(b) Individual watershed plans or interim watershed plans which recognize the unique attributes of each watershed may be prepared and periodically updated for the major watersheds to identify management projects and establish criteria for development.

(c) Watershed plans or interim watershed plans may be adopted which contain more or less stringent requirements than those of this ordinance. Watershed-specific requirements established in such watershed plans or interim watershed plans will be set forth in §§ 105 through 117 of this ordinance.

§ 104. Definitions

In this ordinance—

(1) **ADID** means advanced identification of wetlands and aquatic resources under a study authorized and funded by the United States Environmental Protection Agency and adopted by the County;

(2) **Administrator** means the person designated by the permitting authority to administer and enforce this ordinance;

(3) **agricultural land** means land predominantly used for agricultural purposes;

(4) **agricultural subsurface drainage** is a water management technique driven by economic and safety concerns, where the rate at which surplus groundwater should be removed is determined primarily by the moisture/air requirements of the vegetation;

(5) **applicable engineering practice** means procedures, methods or materials recommended in standard engineering textbooks or references as suitable for the intended purpose;

(6) **applicant** means any person who submits an application for a permit under this ordinance;

(7) **appropriate use** means a use of the regulatory floodway permitted under Article 4;

(8) **base flood** means the flood having a one percent probability of being equaled or exceeded in a given year;

(9) **BFE** or **base flood elevation** means the highest water surface elevation that can be expected during the base flood;

(10) **BMP** or **best management practices** means a measure used to control the adverse stormwater-related effects of development, and includes structural devices (for example, swales, filter strips, infiltration trenches, and site runoff storage basins), designed to remove pollutants, reduce runoff rates and volumes, and protect aquatic habitats, and nonstructural approaches, such as public education efforts to prevent the dumping of household chemicals into storm drains;

(11) **building** means a structure that is principally aboveground and is enclosed by walls and a roof; a building includes a gas or liquid storage tank, a manufactured home or prefabricated building;

(12) **buffer** means an area of predominantly deeply rooted native vegetated land adjacent to channels, wetlands, lakes or ponds for the purpose of stabilizing banks, reducing contaminants, including sediments, in stormwater that flows to such areas;

(13) **Bulletin 70** means *Frequency Distributions and Hydroclimatic Characteristics of Heavy Rainstorms in Illinois*, by Floyd Huff and James Angel of the Illinois State Water Survey (1989);

(14) **certified community** means a community certified under Article 11;

(15) **channel** means any river, stream, creek, brook, branch, natural or artificial depression, ponded area, flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or manmade drainageway which has a definite bed and bank or shoreline, in or into which surface, groundwater, effluent, or industrial discharges flow either perennially or intermittently;

(16) **channel modification** means alteration of a channel by changing the physical dimensions or materials of its bed or banks, and includes damming, riprapping (or other armoring), widening, deepening, straightening, relocating, lining, and significant removal of bottom or woody rooted vegetation, but does not include the clearing of debris or removal of trash or dredging to previously documented thalweg elevations and sideslopes;

(17) **commercial** means having the qualities associated with the transaction of business with the public at large where the traffic generated warrants construction of site improvements;

(18) **commercial redevelopment** means development on a site already devoted to a commercial use but specifically does not include additions to existing buildings and additions of new impervious surfaces after the effective date;

(19) **Committee** means the Kane County Stormwater Management Committee;

(20) **community** means the County or any municipality within the County;

(21) **compensatory storage** means an excavated, hydrologically and hydraulically equivalent volume of storage created to offset the loss of existing flood storage;

(22) **CLOMA** or **Conditional Letter of Map Amendment** means a FEMA comment letter on a development proposed to be located in, and affecting only that portion of, the area of floodplain outside the regulatory floodway and having no impact on the existing regulatory floodway or base flood elevations;

(23) **CLOMR** or **Conditional Letter of Map Revision** means a letter that indicates that FEMA will revise base flood elevations, flood insurance rate zones, flood boundaries or floodways as shown on an effective FIRM or FBFM, after the record drawings are submitted and approved;

(24) **COE** means the United States Army Corps of Engineers;

(25) **control structure** means a structure designed to control the rate of flow that passes through the structure given a specific upstream and downstream water surface elevation;

(26) **County** means Kane County, Illinois;

(27) **critical duration** means the duration of a storm event that results in the greatest peak runoff;

(28) **dam** means any obstruction, wall embankment, or barrier, together with any abutments and appurtenant works, constructed to store or divert water or to create a pool (not including underground water storage tanks);

(29) **Department** means the Kane County Department of Environmental Management;

(30) **depressional storage** means the volume contained below a closed contour on a one foot contour interval topographical map, the upper elevation of which is determined by the invert of a surface gravity outlet;

(31) **developer** means a person who creates or causes a development;

(32) **development** means any manmade change to the land and includes—

(A) the construction, reconstruction, repair, or replacement of a building or an addition to a building;

(B) the installation of utilities, construction of roads, bridges or similar projects;

(C) drilling and mining;

(D) the construction or erection of levees, walls, fences, dams, or culverts;

(E) channel modifications, filling, dredging, grading, excavating, paving, or other nonagricultural alterations of the ground surface;

(F) the storage of materials and the deposit of solid or liquid waste;

(G) the installation of a manufactured home on a site, the preparation of a site for a manufactured home, or the installation of a recreational vehicle on a site for more than 180 days;

(H) any wetland impact; and

(I) any other activity of man that might change the direction, height, or velocity of flood or surface water, including the extensive removal of vegetation;

development, however, does not include—

(J) maintenance of existing buildings and facilities such as re-roofing or resurfacing of roads where there is no increase in elevation;

(K) for agricultural uses, maintenance of existing drainage systems for the limited purpose of maintaining cultivated areas and crop production; or

(L) for agricultural uses, improvements undertaken pursuant to a written NRCS conservation plan;

(33) **Director** means the Director of the Department;

(34) **drainable water** means water that readily drains from soil under the influence of gravity;

(35) **drainage area** means the land area above a given point that may contribute runoff flow at that point from rainfall;

(36) **effective date** means January 1, 2002;

(37) **elevation certificate** means a form published by FEMA used to certify the base flood elevation and the lowest elevation of usable space to which a building has been constructed;

(38) **ephemeral stream** means a stream whose bed elevation does not intersect the groundwater table and carries flow only during and immediately after a runoff producing rainfall event;

(39) **erosion** means the process whereby soil is detached by the action of water or wind;

(40) **farmed wetlands** means wetlands that have been identified as farmed wetlands by NRCS in a Certified Wetland Determination;

(41) **FEMA** means the Federal Emergency Management Agency and its regulations at 44 CFR 59-79, effective September 29, 1989, as amended;

(42) **flood** means a general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal ways or the unusual and rapid accumulation of runoff of surface waters from any source;

(43) **FBFM** or **Flood Boundary and Floodway Map** means a floodplain management map published by FEMA that depicts, based on detailed analysis, the boundaries of the base flood, the 0.2% probability flood and the floodway;

(44) **flood frequency** means a frequency normally expressed as a period of years, based upon a percent chance of occurrence in any given year from statistical analysis, during which a flood of a stated

magnitude may be expected to be equaled or exceeded, as in the two-year flood frequency has a 50% chance of occurrence in any given year and the 100-year flood frequency has a 1% chance of occurrence in any given year;

- (45) ***flood fringe*** means that portion of the floodplain outside of the designated floodway;
- (46) ***FIRM*** or ***Flood Insurance Rate Map*** means a map published by FEMA on which FEMA has delineated both the special flood hazard areas and the risk premium zones applicable to a community;
- (47) ***FIS*** or ***Flood Insurance Study*** means a study of flood discharges and flood profiles for a community adopted and published by FEMA;
- (48) ***floodplain*** means that land typically adjacent to a body of water with ground surface elevations at or below the base flood or the 100-year frequency flood elevation and includes detached special flood hazard areas, ponding areas and the like;
- (49) ***FPE*** or ***Flood Protection Elevation*** means the BFE plus two feet of freeboard for structures within the plan limits of the BFE; outside the plan limits, the water table or 100-year design water surface elevation of any adjacent stormwater facility, whichever is higher, plus two feet of freeboard; along the Fox River and within its backwater zone the BFE plus three feet of freeboard;
- (50) ***floodproof*** means any combination of structural and nonstructural additions, changes or adjustments to structures or property which reduce or eliminate flood damage to real estate, water and sanitary facilities, structures and their contents;
- (51) ***Floodproofing Certificate*** means a form published by FEMA that is used to certify that a building has been designed and constructed to be structurally dry floodproofed to the FPE;
- (52) ***floodway*** or ***designated floodway*** means the channel, onstream lakes and that portion of the floodplain adjacent to a stream or channel which is needed to store and convey the critical duration 100-year frequency flood discharge with no more than a 0.1 foot increase in flood stage due to the loss of flood conveyance or storage, and no more than a 10% increase in velocities;
- (53) ***floodway conveyance*** means the measure of the flow carrying capacity of the floodway section and is defined using Manning's equation, $K=1.49 AR^2/n$, where "n" is Manning's roughness factor, "A" is the effective area of the cross-section, and "R" is the ratio of the wetted area to the wetted perimeter;
- (54) ***FQI*** or ***Floristic Quality Index*** means the parameter related to the number of native plant species present, as defined by Floyd Swink and Gerald Wilhelm in *Plants of the Chicago Region*, 4th Ed. (1994) or by Gerald Wilhelm and Linda Masters in *Floristic Quality Assessment and Application Computer Programs for the 22-County Chicago Region*, Conservation Design Forum (2000);
- (55) ***freeboard*** means an increment of height added to the BFE, groundwater table or 100-year design water surface elevation to provide a factor of safety for uncertainties in calculations, unknown local conditions, wave action and unpredictable effects such as those caused by ice or debris jams;
- (56) ***functional*** means that a facility performs its primary purpose but may not be completed;
- (57) ***groundwater*** means water that is located within soil or rock below the surface of the earth;
- (58) ***groundwater control system*** means a designed system which may consist of tiles, underdrains, French drains or other appropriate stormwater facilities whose purpose is to lower the groundwater table to a predictable elevation throughout the year;
- (59) ***historic structure*** means a structure or site that is (a) listed individually in the National Register of Historic Places, or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing in the National Register; (b) certified or preliminarily determined by the Secretary of the Interior as contributing to an historic district or a district preliminarily determined by the Secretary to qualify as a

registered historic district; (c) individually listed on the State Inventory of Historic Places by the Illinois Historic Preservation Agency; or (d) individually listed on a local inventory of historic places that has been certified by the Illinois Historic Preservation Agency;

(60) ***hemimarsh*** means an isolated wetland dominated on the edges by tall emergent vegetation with an interior area of shallow open water;

(61) ***hydraulics*** means the science and study of the mechanical behavior of water in physical systems and processes;

(62) ***hydraulically connected impervious area*** means those areas of concrete, asphalt and gravel that, along with building roof surfaces, convey flows directly to an improved drainage system consisting of storm sewers or paved channels and includes roadways drained by curb and gutter and storm sewers and driveways hydraulically connected to those roadways, but does not include roof surfaces which discharge to unpaved surfaces which absorb and filter stormwater runoff nor roadways whose primary conveyance is through open ditches and swales;

(63) ***hydraulically equivalent compensatory storage*** means compensatory storage either adjacent to the floodplain fill or not located adjacent to the development but which can be shown by hydrologic and hydraulic analysis to be equivalent to compensatory storage located adjacent to the development;

(64) ***hydrologically disturbed*** means an area where the land surface has been cleared, grubbed, compacted or otherwise modified that changes runoff, volumes, rates or direction;

(65) ***hydrology*** means the science of the behavior of water, including its dynamics, composition and distribution in the atmosphere, on the surface of the earth and underground;

(66) ***IDNR-OWR*** means the Illinois Department of Natural Resources, Office of Water Resources, or its duly authorized designee;

(67) ***industrial redevelopment*** means development on an improved site already devoted to an industrial use but does not include additions to existing buildings and the addition of new impervious surfaces after the effective date;

(68) ***interim watershed plan*** means a regional study of a watershed which does not address the entire range of purposes, goals and objectives outlined in the Plan;

(69) ***intermittent stream*** means a stream whose bed intersects the groundwater table for only a portion of the year on average or any stream that flows continuously for at least one month out of the year, but not the entire year;

(70) ***isolated wetland*** means a wetland that does not have an identifiable surface water connection to other Waters of the U.S.;

(71) ***LOMA*** or ***Letter of Map Amendment*** means the official determination by FEMA that a specific structure is not in a regulatory floodplain and amends the effective Flood Hazard Boundary Map, FBFM, or FIRM;

(72) ***LOMR*** or ***Letter of Map Revision*** means a letter from FEMA that revises BFE, flood insurance rate zones, flood boundaries or floodway as shown on an effective Flood Hazard Boundary Map, FBFM, or FIRM;

(73) ***lake*** means a body of water two or more acres in size which retains water throughout the year;

(74) ***lineal Waters of the U.S.*** means wetlands along creeks, streams, rivers, ponds, lakes, or impoundments that are hydraulically connected to surface water;

(75) **major stormwater system** means that portion of a stormwater facility needed to store and convey flows beyond the capacity of the minor stormwater system;

(76) **manufactured home** means a structure transportable in one or more sections which is built on a permanent chassis and is designated for use with or without a permanent foundation when attached to the required utilities and includes park trailers, travel trailers and other similar vehicles onsite for more than 180 consecutive days but does not include a recreational vehicle;

(77) **manufactured home park or subdivision** means a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale;

(78) **mass grading** means development in which the primary activity is a change in topography affected by the movement of earth materials;

(79) **minor stormwater system** means all infrastructure including curb, gutter, culverts, roadside ditches and swales, storm sewers and subsurface drainage systems intended to convey stormwater runoff at less than a 100-year flood frequency;

(80) **mitigation** means measures taken to offset negative impacts from development in waters of the U.S. including wetlands or the floodplain;

(81) **NFIP or National Flood Insurance Program** means the federal program codified in Title 44 of the Code of Federal Regulations;

(82) **net benefit in water quality** means the institution of best management practices as part of a development that when compared to the pre-development condition can be judged to reduce downstream sediment or pollutant loadings;

(83) **net watershed benefit** means a finding that, when compared to the existing condition, the development will substantially reduce (more than 10%) downstream peak discharges, will reduce downstream flood stages (more than 0.1 feet), or will reduce downstream damage to structures occurring in the pre-development condition and must be demonstrated by detailed hydrologic and hydraulic analysis of watersheds on a regional scale as approved by the Administrator;

(84) **non-riverine** means areas not riverine in character such as isolated depressional storage areas, ponds and lakes;

(85) **NRCS** means the United States Department of Agriculture, Natural Resources Conservation Service;

(86) **nuisance flow** means primarily a dry weather flow resulting from groundwater pumped by individual sump pumps and other human activities not directly related to rainfall events and surface runoff;

(87) **observation structures** are structures built on a field tile where the pipe inflow and outflow is visible upon removal of a lid;

(88) **open channel** means a conveyance system with a definable bed and banks carrying the discharge from field tiles and surface drainage, but does not include grassed swales within farm fields under agricultural production which are ephemeral in nature;

(89) **open water** means surface water in lakes, ponds, impoundments and wetlands devoid of vegetative cover;

(90) **OHWM or ordinary high water mark** means the point on the bank or shore up to which the presence and action of surface water is so continuous as to leave a distinctive mark, such as by erosion, destruction or prevention of terrestrial vegetation, predominance of aquatic vegetation, or other easily recognized characteristic;

(91) ***overland flow path*** means a design feature of the major stormwater system which carries flows in excess of the minor stormwater system design capacity in an open channel or swale, or as sheet flow or weir flow over a feature designed to withstand the particular erosive forces involved;

(92) ***parcel*** means a separate tract of land identified by its own legal description;

(93) ***perennial stream*** means a riverine watercourse whose thalweg intersects the groundwater table continuously and flows throughout the year;

(94) ***permitting authority*** means the community having jurisdiction under this ordinance to issue permits;

(95) ***person*** means an individual, partnership, corporation, limited liability company, unincorporated association, trust, municipal corporation, unit of local government or other government agency or authority, or any combination of any of the foregoing;

(96) ***Plan*** means the Kane County Comprehensive Countywide Stormwater Management Plan adopted by the County Board on October 13, 1998, as amended from time to time;

(97) ***plant communities*** means groups of plants with similar habitat requirements and planting regimes;

(98) ***pond*** means a body of water less than two acres in size which retains a normal water level year-round;

(99) ***primary gravity outlet*** means the outlet structure designed to meet the release rate requirements of this ordinance, the invert (lowest elevation) of which shall be considered the high water elevation for required stormwater retention;

(100) ***professional land surveyor*** means a land surveyor registered in the State of Illinois under the Illinois Land Surveyors Act (225 ILCS 330/1, *et seq.*, as amended);

(101) ***professional engineer*** means an engineer registered in the State of Illinois under the Illinois Professional Engineering Practice Act (225 ILCS 325/1, *et seq.*, as amended);

(102) ***public flood control project*** means a flood control project which will be operated and maintained by a public agency or entity to reduce flood damage to existing buildings and structures which includes a hydrologic and hydraulic study of the existing and proposed conditions of the watershed;

(103) ***public flood easement*** means an easement acceptable to the appropriate jurisdictional body that meets the regulations of IDNR-OWR, the Department and the community and provides legal assurances that all areas subject to flooding in the created backwater of the development will remain open to allow flooding;

(104) ***record drawings*** means drawings prepared, signed and sealed by a professional engineer or professional land surveyor representing the final record of the actual in-place elevations, locations of structures and topography;

(105) ***registered structural engineer*** means a person licensed under the laws of the State of Illinois as a structural engineer;

(106) ***regulatory floodplain*** means the floodplain depicted on maps recognized by IDNR-OWR for regulatory purposes;

(107) ***regulatory floodway*** means those portions of the floodplain depicted as floodway on maps recognized by IDNR-OWR for regulatory purposes;

- (108) **retention facility** means a facility which stores stormwater runoff without a gravity release;
- (109) **riverine** means related to, formed by or resembling a channel and includes creeks and rivers;
- (110) **runoff** means the waters derived from melting snow or rain falling within a tributary drainage basin that exceeds the infiltration capacity of the soils of that basin;
- (111) **seasonal high groundwater table** means the upper limits of the soil temporarily saturated with water, being usually associated with spring wetness conditions which may be indicated by soil mottles with a Munsell color of two chroma or less;
- (112) **sedimentation** means the process that deposits hydraulically moved soils, debris and other materials on other ground surfaces or in bodies of water or stormwater drainage systems;
- (113) **sedimentation trap** means a structure or area that allows for the temporary deposit and removal or disposal of sediment materials from stormwater runoff;
- (114) **seepage** means the movement of drainable water through soil and rock;
- (115) **site** means all of the land contemplated to be part of a coordinated development of one or more parcels;
- (116) **site runoff storage facility** means a manmade structure for the temporary storage of stormwater runoff with a controlled release rate;
- (117) **SFHA** or **Special Flood Hazard Area** means an area having special flood, mudslide or mudflow, or flood related erosion hazards and which is shown on an FHBM or FIRM as Zone A, AO, A1-30, AE, A99, AH, VO, V1-30, VE, V, M or E;
- (118) **special management area** means a floodplain, regulatory floodplain, wetland, wetlands mitigation area, stream, river, or other water body;
- (119) **stormwater facility** means all ditches, channels, conduits, bridges, culverts, levees, ponds, natural and manmade impoundments, wetlands, riparian environment, tile, swales, sewers or other natural or artificial structures or measures which serve as a means of draining surface water and groundwater from land;
- (120) **stormwater management permit** means the permit issued under Article 5;
- (121) **structure** means a manmade change to the land constructed on or below the ground, including the construction, reconstruction or placement of a building or any addition to a building;
- (122) **substantial improvement** means (a) an improvement made to a building the cost of which is greater than or equal to 50% of building's market value before the improvement; (b) reconstruction or repair of a building, the cost of which is greater than or equal to 50% of the building's market value before reconstruction or repair; or (c) an addition to a building the cost of which is greater than or equal to 50% of the building's market value before the addition or that increases the floor area by more than 20%;
- (123) **subsurface drainage** means the removal of excess soil water to control water table levels at predetermined elevations for structural, environmental or other reasons in areas already developed or being developed for agricultural, residential, industrial, commercial or recreational uses;
- (124) **Technical Manual** means the manual adopted by the County which refers to this ordinance and provides additional explanations and examples;
- (125) **thalweg** means a line along the lowest point in a channel;

(126) **transition section** means the reaches of the stream or floodway where water flows from a narrow cross-section to a wide cross-section, or vice versa;

(127) **usable space** means space used for dwelling, storage, utilities or other beneficial purposes and includes basements;

(128) **water table** means the upper limit of a free water surface in a saturated soil or underlying material;

(129) **Waters of the U.S.** is defined by COE in 33 CFR 328.3 and, for purposes of this ordinance, includes wetlands, lakes, rivers, streams, creeks, bogs, fens, ponds and isolated wetlands but does not include maintained stormwater facilities;

(130) **watershed** means all land drained by, or contributing water to the same stream, lake, stormwater facility, or draining to a point;

(131) **watershed characteristics** means the land use, physiology, habitat, climate, drainage system and community profile of a watershed;

(132) **watershed plan** means a study and evaluation of an individual drainage basin's stormwater management, floodplain management, water quality and flood control needs capabilities adopted by the County;

(133) **wetland** is defined by COE in the *1987 Corps of Engineers Wetland Delineation Manual, Technical Report Y-87-1*, U.S. Army Engineers Waterways Experiment Station, Vicksburg, Mississippi (the "1987 Manual"), or other federally recognized methodology;

(134) **wetland impact** means—

(A) the dredging or filling of any wetland having an FQI greater than 25; or

(B) the dredging or filling of any other wetland if—

(i) such cumulative wetland dredging or filling is 0.25 acres (10,890 sq. ft.) or more in size; and

(ii) such wetland is not then regulated by COE; or

(iii) such dredging or filling is not an approved impact under a conservation plan administered by any federal agency under the Food Security Act, as amended (16 U.S.C. § 3801, *et seq.*);

(135) **wetland mitigation** means the creation and long-term maintenance of wetlands to offset wetland impacts from development;

(136) **wetland mitigation facility** means a parcel in the County specifically dedicated for the creation and long-term maintenance of wetlands and other aquatic resources and includes any area designated as a compensatory storage facility when such area is used for wetland mitigation; and

(137) **wetland mitigation bank** means one or more parcels in the County approved by COE or the Director where wetlands and/or other aquatic resources are restored, created, enhanced or, in exceptional circumstances, preserved expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources.

(Sections 105 through 117 reserved)

ARTICLE 2—REQUIREMENTS FOR STORMWATER MANAGEMENT**§ 200. General information**

- (a) All developments shall meet the requirements of § 201, § 202 and Articles 3 and 6.
- (b) Developments shall comply with § 203 if—
 - (1) two or more one or two family residences are to be constructed on a site three or more acres in size;
 - (2) a single-family attached dwelling, apartment or condominium, attached townhome or other multifamily residential building comprised of more than two units is to be constructed on a site more than one acre in size;
 - (3) any non-residential land use is to be constructed on a site more than one acre in size;
 - (4) development after the effective date of this ordinance on a site one acre or more in size devoted to an existing multifamily or nonresidential land use exceeds in the aggregate 25,000 square feet; or
 - (5) road development after the effective date of this ordinance in rights-of-way under the ownership or control of a unit of local government exceeds in the aggregate one acre.
- (c) The developer of a commercial redevelopment or industrial redevelopment may ask that a fee-in-lieu of site runoff storage be approved under Article 13 if—
 - (1) the drainage plan will not increase existing flood damage; and
 - (2) the drainage plan provides a net benefit in water quality compared to the existing development.
- (d) The developer of a development consisting only of mass grading may ask that a fee-in-lieu of site runoff storage be approved under Article 13 if—
 - (1) there is no net increase in impervious surfaces;
 - (2) no structure is constructed, reconstructed or improved; and
 - (3) the quality of site runoff is improved.

§ 201. General stormwater requirements

- (a) No development shall—
 - (1) result in any new or additional expense to any person other than the developer for flood protection; or
 - (2) increase flood elevations or decrease flood conveyance capacity upstream or downstream of the site.
- (b) Analysis and design of all stormwater facilities required for a development shall—
 - (1) comply with the standards and criteria established in any applicable watershed plan or interim watershed plan; and
 - (2) be consistent with the Technical Manual.
- (c) Stormwater facilities shall be functional before any building permit is issued for any other construction on a site.

(2) Building permits may be issued but stormwater facilities shall be functional where practicable before any other construction begins on a site to be comprised when finished of only one parcel.

(d) All developments shall have an overland flowpath at the downstream limit of the site that will pass the base flood flow without increasing flood damage. If the upstream drainage area is less than 20 acres, a storm sewer pipe and inlet sized for the base flood may be constructed in lieu of providing an overland flowpath. Overland flowpaths internal to the site shall be considered part of the major stormwater system and shall be designed for conveyance of a minimum of one cfs per tributary acre without damage to structures.

(e) All usable space in new buildings or added to existing buildings hydraulically connected to a major stormwater system, site runoff storage facility or overland flowpath shall be elevated, floodproofed or otherwise protected to at least two feet above the 100-year design elevation or current FIS elevation, whichever is greater. The design elevation is the elevation associated with the design release rate as determined in § 202(c).

(f) The design of any development shall incorporate the following specific planning principles:

(1) Impervious surfaces are the minimum necessary to satisfy the intended design function. Where requirements of zoning ordinances conflict with this principle, consideration has been given to asking for a zoning variance.

(2) Where feasible, allow sufficient right-of-way and easement widths so that stormwater runoff may be conveyed in vegetated swales. Storm sewers may be used for conveyance of nuisance flows and where conveyance in vegetated swales is impractical.

(3) Existing open channels have been preserved and incorporated into the design.

(4) Best management practices have been used in the site drainage plan.

(5) Existing high-quality wetlands have been avoided, preserved or enhanced.

(6) Retention and infiltration of stormwater onsite have been enhanced to the extent practicable to reduce the volume of stormwater runoff and the quantity of runoff pollutants.

(g) The function of existing onsite depressional storage shall be preserved as an additional volume to required site runoff storage. When the depressional storage is removed it must be compensated for in the site runoff storage facility at a 1:1 ratio. Offsite areas tributary to the existing depressional storage shall be routed through the site runoff storage facility unless the existing depressional storage is reserved independently. This requirement is in addition to the site runoff storage requirements of § 203.

§ 202. Site runoff requirements

(a) Stormwater facilities shall be required and designed so that runoff exits the site at the point where it exited prior to development (unless a change is required and approved in writing by the Administrator) and in a manner so as not to increase flood damage downstream. Concentrated discharges from new developments must enter conveyance systems capable of carrying the design flow rate without increasing flood damage, erosion or maintenance costs downstream.

(b) Minor stormwater systems shall be sized to convey runoff from the tributary watershed under fully developed conditions consistent with the design requirements of the permitting authority.

(c) Major stormwater systems shall be sized to carry the base flood without causing additional flood damage.

(d) Stormwater systems shall properly incorporate and be compatible with existing subsurface and surface drainage systems including agricultural systems. Designs shall not cause damage to existing drainage systems or to existing adjacent or tributary agricultural land uses. The following principles and requirements shall be observed in the design:

(1) Offsite outfall: Agricultural subsurface and surface drainage systems shall be evaluated with regard to their capacity and capability to properly convey low flow groundwater and site runoff storage facility release without damage to downstream structures and land uses. If the outfall drain tile and surface drainage systems prove to be inadequate it will be necessary to modify the existing systems or construct new systems which will not conflict with the existing systems and will not impact existing land uses.

(2) Onsite: Agricultural drainage systems shall be evaluated in accordance with Article 5. All existing onsite agricultural drain tile not serving a beneficial use shall be abandoned by trench removal prior to other development and recorded on record drawings. If any existing drain tiles continue to upland watersheds the developer must maintain drainage service during construction until new storm sewers can be installed for a permanent connection.

(3) Offsite tributary: Existing drainage systems shall be evaluated with regard to existing capabilities and reasonable future expansion capacities. All existing tributary drain tiles shall be incorporated into the new stormwater system including observation structures located at the limits of the site and shall provide a free flow discharge. Agricultural tributary surface conveyance shall be accepted by the new development with consideration given to water quality and sediment filtering control.

(4) New roadway construction shall preserve existing subsurface systems within the right-of-way. Inspection wells shall be placed at the right-of-way and tiles found not to be flowing between inspection wells at the end of construction shall be replaced.

(e) Design runoff rates shall be calculated using event hydrograph methods. Acceptable event hydrograph methods are HEC-HMS, HEC-1 (SCS runoff method), TR-20 or TR-55 tabular method. Event methods must incorporate the assumptions contained in § 203(b). Design runoff rates for minor conveyance systems may be calculated using the Rational Method if the design watershed is less than 20 acres.

(f) Any design runoff rate calculation method shall use Bulletin 70 northeast sectional rainfall statistics and shall calculate flow from all tributary areas upstream of the point of design. Peak discharges for conveyance design purposes shall be based on the critical duration considering the appropriate rainfall distribution.

(g) Major and minor stormwater systems shall be located within easements or rights-of-way explicitly providing for public access or maintenance of such facilities. New facilities constructed offsite pursuant to § 202(d) need not comply with this requirement.

(h) Maximum flow depths for new transverse stream crossings shall not exceed one foot at the crown of the road during the base flood condition. The maximum flow depth on a roadway shall not exceed six inches at the crown for flow parallel to the roadway. For flow over a roadway or parallel to a roadway the product of the flow depth (in feet) and velocity (in feet per second) shall not exceed four for the base flood condition.

(i) Transfers of waters between watersheds (diversions) shall be prohibited except when such transfers will not violate the provisions of § 201(a) and are otherwise lawful. Watersheds for the purposes of this section shall be the major watershed divides shown in Appendix A of this ordinance.

(j) Developments shall incorporate all best management practices required under the Clean Water Act (33 U.S.C. § 1251, *et seq.*, as amended).

§ 203. Site runoff storage requirements (detention)

(a) The area of hydrological disturbance on the site shall be used to calculate the required site runoff storage volume. The tributary area of the site at the point of discharge shall be used to calculate the allowable release rate of the primary restrictor for the site runoff storage facility.

(b) Absent any applicable watershed plan or interim watershed plan, sufficient storage shall be provided such that the probability of the post-development release rate exceeding 0.1 cfs/acre of development shall be less than 1% per year. Design runoff volumes shall be calculated using event hydrograph methods.

(c) Event hydrograph routing methods such as HEC-1, HEC-HMS, TR-20 or TR-55 tabular method using SCS curve number methodology shall be used to calculate design runoff volumes for facilities with more than five acres of tributary area or when areas tributary to the facility extend offsite. For facilities with less than five acres of tributary area all onsite, the nomograph relating *%-Impervious to Unit Area Detention* developed by NIPC may be used to calculate the volume of site runoff storage required. Event methods shall incorporate the following assumptions:

(1) antecedent moisture condition equals two;

(2) appropriate Huff rainfall distribution except that SCS Type II distribution is acceptable with TR-55 tabular method only; and

(3) 24-hour duration storm with a 1% probability (100-year) of occurrence in any one year as specified by Bulletin 70 northeast sectional rainfall statistics.

(d) For sites where the undeveloped release rate is less than the maximum release rate in § 203(b), the developed release rate and corresponding site runoff storage volume shall be based on the existing undeveloped release rate for the development site.

(e) Hydraulic computations for the release structure must assume appropriate backwater conditions considering the likelihood of concurrent flood events on the site and receiving stream.

(f) Reserved.

(g) development shall be stored below the elevation of the primary gravity outlet (retention) of the site runoff storage facility. The facility may be designed to allow for evapotranspiration or infiltration of this volume into a subsurface drainage system and shall not be conveyed through a direct positive connection to downstream areas.

(2) The hydraulically connected impervious area used in the calculation of required retention volume may be reduced by the Administrator if the soils are undisturbed *in-situ* or prepared to maximize infiltration and deep-rooted grasses or other plants which help promote infiltration and transpiration are planted in areas appropriately dedicated. The reduction in hydraulically connected impervious area used in the calculation shall be equal to the area of the development meeting the above soils/planting requirement.

(3) Residential, industrial, commercial, institutional or multi-family developments where the downstream outlet is not directly connected to a new or municipal storm sewer outletting to an open channel will also be required to meet the retention requirement of this section, except that the area of new roadway impervious area shall be used as a minimum to calculate the required volume.

(4) Subsurface drainage systems may be designed as a component of the retention portion of the site runoff storage basin to assist in infiltration in accordance with the following criteria:

(A) The retention volume shall be discharged at a rate no greater than that required to empty the calculated retention volume within five days of the storm event.

(B) No such subsurface drainage pipe shall be located within ten feet of drainage pipes directly connected to the site runoff storage basin.

(C) For purposes of meeting the maximum subsurface drainage requirements, flow control orifices and weirs may be used.

(D) The design shall be consistent with the methodologies and intent of the Technical Manual.

(h) Storage facilities shall be designed and constructed with the following characteristics:

(1) Water surface depths two feet above the base flood elevation will not damage the storage facility.

- (2) The storage facilities shall be accessible and easily maintained.
- (3) All design site runoff storage volume shall be provided above the seasonal high groundwater table or the invert elevation of the groundwater control system.
- (4) Storage facilities shall facilitate sedimentation and catchment of floating material. Unless specifically approved by the Administrator, concrete lined low flow ditches shall not be used in site runoff storage basins.
- (5) Storage facilities shall minimize impacts of stormwater runoff on water quality by incorporating best management practices.
- (6) Storage facilities shall maximize the distance between site runoff storage inlets and outlets to the extent possible.
- (7) Storage facilities shall be designed such that the existing conditions pre-development peak runoff rate of the 100-year, critical duration rainfall will not be exceeded assuming the primary restrictor is blocked.
- (8) Storage facilities with single pipe outlets shall have a minimum inside diameter of twelve inches. If design release rates necessitate a smaller outlet, structures such as perforated risers or flow control orifices shall be used.
- (9) A mechanically opened outlet to draw down the permanent pool or retention area for maintenance purposes to the lowest available invert at the site boundary shall be provided.
 - (i) Storage facilities located within the regulatory floodplain shall (a) comply with Article 4; and (b) store the required amount of site runoff to meet the release rate requirement under all streamflow and backwater conditions up to the ten-year flood elevation on the adjacent receiving watercourse. The Administrator may approve designs which can be shown by detailed hydrologic and hydraulic analysis to provide a net watershed benefit not otherwise realized by strict application of the requirements set forth in (a) and (b) of this subsection.
 - (j) Storage facilities located within the regulatory floodway shall (a) meet the requirements for locating storage facilities in the regulatory floodplain; (b) be evaluated by performing hydrologic and hydraulic analysis consistent with the standards and requirements for watershed plans; and (c) provide a net watershed benefit.
 - (k) Site runoff storage facilities may be located offsite if (a) the offsite storage facility meets all of the requirements of this Article; (b) adequate storage capacity in the offsite facility is dedicated to the development; and (c) the development includes means to convey stormwater to the offsite storage facility.
 - (l) Site runoff storage volume provided by enlarging existing regulatory floodplain storage (onstream site runoff storage) will be allowed only as a variance. The applicant must demonstrate that flood damage will not be increased and the development will not increase flood flows for both the two-year and 100-year floods.
 - (m) Structures built across the channel to impound water to meet site runoff storage requirements shall be prohibited on any perennial stream unless part of a public flood control project with a net watershed benefit. Those streams appearing as blue on a USGS Quadrangle Map shall be assumed to be perennial unless better data is provided by the developer. In all cases it must be demonstrated that all such structures will not cause short-term or long-term stream instability. Where such facilities are approved the applicant must also comply with § 203(g).

ARTICLE 3—EROSION AND SEDIMENT CONTROL

§ 300. Erosion and sediment control

(a) Erosion and sediment control planning shall be part of the initial site planning process. In planning the development of the site, the applicant shall consider the sensitivity of existing soils to erosion and topographical features such as steep slopes, stream corridors and special management areas which must be protected to reduce the amount of erosion and sediment which occurs. Where appropriate, existing vegetation shall be protected from disturbance during construction by fencing or other means. In the planning process the applicant shall also address the following:

(1) For projects that involve phased construction, existing land cover for those areas not under current development shall be addressed. If existing land cover does not consist of an appropriate dense vegetation then these phases shall be planted temporarily to reduce erosion from idle land.

(2) In planning the erosion and sediment control strategy, preference shall be given to reducing erosion rather than controlling sediment. In order to accomplish this the plan must carefully consider the construction sequence of the phases so that the amount of land area exposed to erosive forces is the minimum consistent with completing construction.

(b) Standards and specifications for erosion and sediment control measures shall be in accordance with the *Illinois Urban Manual*, (1995, or current edition). Erosion and sediment control planning shall be in accordance with *Procedures and Standards for Urban Soil Erosion and Sedimentation Control in Illinois*, (revised, July, 1988) by the Urban Committee of the Association of Illinois Soil and Water Conservation Districts (the *Green Book*), Chapters 1-5. Where the *Illinois Urban Manual* conflicts with the *Green Book*, the *Illinois Urban Manual* shall prevail.

(c) The runoff from disturbed areas shall not leave the site without first passing through sediment control measures or devices. This requirement shall apply to all phases of construction and shall include an ongoing process of implementation of measures and maintenance of those measures during both the construction season and any construction shutdown periods.

(d) The condition of the construction site for winter shutdown shall be addressed early in the fall growing season so that slopes and other bare earth areas may be stabilized with temporary and/or permanent vegetative cover for proper erosion and sediment control. All open areas that are to remain idle throughout the winter shall receive temporary erosion control measures including temporary seeding, mulching and/or erosion control blanket prior to the end of the fall growing season. The areas to be worked beyond the end of the growing season must incorporate soil stabilization measures that do not rely on vegetative cover such as erosion control blanket and heavy mulching.

(e) In the hydraulic and hydrologic design of major erosion control measures (those whose tributary drainage area is greater than three acres) such as sediment basins and traps, diversions and the like, the design frequency shall be commensurate with the risk of the design event being exceeded. The following design frequencies shall be regarded as minimum design frequencies for the construction period:

(1) If development is estimated to be completed in less than six months, the storm event having a 50% chance (two-year event) of being exceeded in any year shall be used for design purposes.

(2) If development is estimated to be completed in more than six months but less than one year, the design frequency for major sediment basins shall be a rainfall event with a 20% (five-year event) chance of been exceeded in any one year.

(3) If development is estimated to take more than one year to complete, major sediment basins shall be designed for a rainfall event with a 10% (ten-year event) chance of been exceeded in any one year.

(4) All sediment basins shall be designed for a minimum residence time of ten hours for detained runoff and shall include a volume for sediment storage reflective of the clean out schedule for the basin.

(f) The erosion and sediment control plan shall designate a series of practices which shall be implemented either at the direction of the applicant or the applicant's representative onsite or at the direction of the Administrator should an inspection of the site indicate a deficiency in soil and sediment erosion control measures. At a minimum, these measures shall include (a) sedimentation basins; (b) sediment traps; (c) diversion swales; (d) silt fences; (e) temporary seeding; (f) mulching; and (g) erosion control blankets.

(g) The area of disturbance onsite at any one time shall be limited to 20 acres. An additional 20 acres (a maximum of 40 acres of disturbance at any one time) may be disturbed if necessary to balance cut and fill onsite. The Administrator may approve a larger area of disturbance pursuant to a plan for phased construction or after development has begun, if the developer adequately demonstrates the need therefor and the Administrator finds that adequate temporary and permanent erosion and sediment control measures can be maintained and that the developer is proposing an area of disturbance which at any one time is the smallest practical area consistent with the intent to limit disturbed area and minimize the risk of sediment being introduced into site runoff and being carried offsite. No additional area may be disturbed without the permission of the Administrator until the previously disturbed areas have been temporarily or permanently stabilized. All disturbed areas shall be stabilized within 14 days of final grading or when left idle for more than seven days. Maintained haul roads and the area of sediment basins, site runoff storage facilities, utility corridors having a maximum width of 20 feet, and any permanently stabilized areas are excluded from this limitation.

(h) Erosion and sediment control plans shall be in accordance with Article 5 and shall include the following:

(1) Detailed construction phasing plan identifying erosion and sediment control measures to be in place for each phase shall be submitted.

(2) Erosion and sediment control measures to be installed initially prior to stripping existing vegetation or mass grading shall be indicated on the plans.

(3) Permanent stabilization measures shall be indicated on a separate plan.

(4) The expected two-year and ten-year runoff rates from all offsite areas draining into the site shall be identified on the plan.

(5) Methods for conveying flows through the site during construction shall be indicated. These methods must include the temporary and permanent stabilization measures to be used to reduce velocity and erosion from flow through the construction zone.

(6) A maintenance schedule of each measure used shall be indicated on the plan. As a minimum, all erosion and sediment control measures onsite shall be inspected weekly or after a one-half inch or greater rainfall event and any required repairs shall be made to keep these measures functional as designed.

(7) Special management areas and any required buffers shall be indicated on the erosion and sediment control plan.

(i) To the extent practicable, proposed ditches and waterways which are to convey offsite flows through the site shall be stabilized upon construction. Where new waterways are constructed they shall be stabilized to the extent practicable prior to their use to convey flood flows.

(j) Stockpiles of soil and other building materials (sand, limestone, etc.) shall not be located in special management areas or required buffers. If a stockpile is to remain in place for more than three days, erosion and sediment control shall be provided.

(k) Storm sewer inlets shall be protected with sediment trapping and/or filter control devices during construction.

(l) Water pumped or which is otherwise discharged from the site during construction dewatering shall be filtered and a means provided to reduce erosion.

(m) Graveled roads, access drives, parking areas of sufficient width and length and vehicle wash-down facilities if necessary, shall be provided to prevent soil from being tracked onto public or private roadways. Any soil tracked onto a public or private roadway shall be removed before the end of each workday or sooner as directed by the authority maintaining the roadway.

(n) Temporary stream crossings of intermittent and perennial streams used only for and during construction shall be designed to convey a two-year flood (minimum), without overtopping unless a more frequent design event is allowed by the Administrator and will not obstruct the portion of the channel carrying the base flow. The entire crossing shall be designed to withstand hydrodynamic and erosive forces up to the base flood event without washing out. Ephemeral streams may be crossed at temporary at-grade crossings provided that the crossing point is stabilized with materials resistant to the erosive forces produced by runoff from the upstream drainage area and the design is approved by the Administrator. All temporary stream crossings shall be completely removed and the stream restored to its preconstruction condition upon completion of construction. Restoration shall incorporate appropriate native vegetation.

ARTICLE 4—PROTECTION OF SPECIAL MANAGEMENT AREAS

§ 400. Reserved

§ 401. Disclaimer

Nothing in this ordinance purports to alter or affect the regulatory program administered by IDNR-OWR. Anything in this ordinance to the contrary notwithstanding, if under the rules and regulations administered by IDNR-OWR a submittal need not be made to IDNR-OWR, or a review, approval or permit from IDNR-OWR need not be obtained, then nothing in this ordinance shall be construed to impose a requirement that such a submittal be made or that such a review, approval or permit be obtained from IDNR-OWR. Similarly, if IDNR-OWR has delegated its regulatory authority to another entity, then anything in this ordinance to the contrary notwithstanding, if required by such entity, such submittal shall be made or such review, approval or permit shall be obtained from such entity.

§ 402. Statewide and regional permits

Development that qualifies for any of the self-issuing statewide or regional permits administered by IDNR-OWR (Statewide Permits Nos. 1 through 14 and Regional Permit No. 3), are similarly permitted under this Article. The developer need only submit to the Administrator such information as shall show the Administrator that the development qualifies for the particular statewide or regional permit in question under the regulations established by IDNR-OWR for such permit and no further submittal need be made under this Article. All other provisions of this ordinance applicable to such development, however, continue to apply.

§ 403. Floodplain management

All development shall meet the requirements set forth in Table 403.

Table 403 - Summary of requirements for development in floodplains

	§ 404	§ 405	§ 406	§ 407	§ 408	§ 409	§ 410	§ 411	§ 412	§ 413
Floodplains	All	405(e) 405(f)	All	--	--	All	--	--	--	--
Regulatory Floodplains	All	All	All	All	All	--	All (Note 1)	--	--	--
Regulatory floodways	All	All	All	All (Note 2)	All	--	All	All	--	--
Riverine Regulatory Floodplains	All	All	All	All	All	--	--	--	All	--
Bridge and Culvert Crossings	All	All	--	--	--	--	All (Note 3)	--	--	All

Note 1. Riverine, floodplains only

Note 2. For buildings meeting appropriate use criteria

Note 3. See exclusion in § 413(c)

§ 404. Floodplain, regulatory floodplain, BFE and regulatory floodway locations

(a) The BFE shall be delineated on the site topography to establish the regulatory floodplain area limits for regulation under this ordinance. Regulatory floodplains shall be delineated on the site map from the current FEMA FIRM, FBFM or LOMR and include those areas of the SFHA which are not regulatory floodplains. A list of the current regulatory maps for Kane County to be consulted is maintained by the Director.

(b) insurance (c) The BFE shall be the elevation of the 100-year profile shown for the site on the current flood

FEMA. A public notice inviting public comment on the proposed change in the BFE or location of the regulatory floodway will be issued by IDNR/OWR or its designee before a CLOMR is issued. Filling, grading, dredging or excavating may take place upon issuance of a conditional approval from IDNR/OWR and the Administrator. No further development activities shall take place in the existing or proposed floodplain until a LOMR is issued by FEMA unless such activities meet all the requirements of §§ 403 through 413 of this ordinance. The Director shall be copied on all related correspondence.

(E) In the circumstances listed below and located in a regulatory floodway, at a minimum, the information set forth below shall be submitted to IDNR/OWR for its review and approval:

- (i) analysis of the flood profile due to a proposed bridge, culvert crossing or roadway approach;
- (ii) an engineer's determination that an existing bridge, culvert crossing or approach road is not a source of flood damage and the analysis indicating the proposed flood profile;
- (iii) alternative transition sections and hydraulically equivalent compensatory storage; and
- (iv) stormwater management permits issued to local units of government for regulatory floodway and floodplain development.
- (v) IDNR/OWR will issue permits for any IDNR/OWR, state, federal or community projects.

§ 405. General performance standards

The following general performance standards are applicable to all development in a regulatory floodplain. The standards of this section apply except when superseded by more stringent requirements in subsequent sections.

(a) No development shall be allowed in the regulatory floodplain that singularly or cumulatively creates any increase in flood stage or velocity offsite, or a damaging or potentially damaging increase in flood heights or velocity onsite or a threat to the public health, safety and welfare.

(b) For all projects involving a channel modification, fill, stream maintenance or a levee, the flood conveyance and storage capacity of the regulatory floodplain shall not be reduced.

(c) If the proposed development would result in a change in the regulatory floodplain or BFE the applicant shall obtain a LOMR from FEMA. No buildings may be built in the existing or proposed regulatory floodplain until the LOMR is obtained from FEMA unless the building meets all the building protection standards of § 407. Proposed changes to the regulatory floodway delineation and the BFE must be submitted to IDNR/OWR for approval.

(d) If the development is located in the Fox River a permit must also be received from IDNR/OWR.

(e) Prior to the commencement of any construction, modification or removal of a dam the developer shall obtain an IDNR/OWR Dam Safety Permit or letter indicating a permit is not required.

(f) For public flood control projects, §§ 403 through 413 will be deemed met if the applicant demonstrates to IDNR/OWR and the Committee—

(1) by hydraulic and hydrologic modeling that the proposed project will not singularly or cumulatively result in increased flood heights outside the project site or that any increases will be contained in easements for all flood events up to and including the base flood event;

(2) that the project will be operated and maintained by a public entity;

(3) that the project will reduce flood damage to an existing building or structure.

Nothing in this section precludes the design, engineering, construction or financing, in whole or in part, of a public flood control project by persons who are not public entities.

§ 406. Public health protection standards

(a) New and replacement water supply systems, wells and sanitary sewer lines may be permitted if all manholes or other above-ground openings located below the FPE are watertight.

(b) New onsite waste disposal systems, such as septic systems, shall not be constructed within the regulatory floodplain.

(c) New, substantially improved or replacement wastewater treatment plants shall have watertight openings for those openings located below the FPE. Such facilities should be located to avoid impairment to the facility or contamination of flood waters during the base flood.

§ 407. Building protection standards

This section applies to all buildings located in the regulatory floodplain. However, most new and replacement buildings are not appropriate uses of the regulatory floodway.

(a) The lowest floor including basements of all new residential structures, substantially improved structures and additions shall be elevated at least to the FPE. An attached garage for a structure must be elevated at least six inches above the BFE.

(1) If placed on fill, the top of the fill for a residential structure shall be above the FPE. The top of fill for an attached garage shall be at least six inches above the BFE. The fill shall be placed at that elevation for a distance of ten feet out from the building unless the building design is certified by a registered structural engineer to be protected from damage due to hydrostatic pressures. Additionally, the fill shall not settle below the FPE for a residential structure and not below six inches above the base flood for an attached garage, and shall be adequately protected against erosion, scour and differential settlement. A LOMR shall be obtained from FEMA removing the residential site from the floodplain.

(2) If elevated by means of walls, pilings, or other foundation, the building's supporting structure must be permanently open to flood waters and not subject to damage by hydrostatic pressures of the base flood. The permanent openings shall be no more than one foot above existing grade and consist of a minimum of two openings. The openings must have a total net area of not less than one square inch for every one square foot of enclosed area subject to flooding below the BFE. The lowest inside grade must match the lowest existing outside grade adjacent to the structure. The foundation and supporting members shall be anchored and aligned in relation to flood flows and adjoining structures so as to minimize exposure to known hydrodynamic forces such as current, waves, ice and floating debris. All areas below the FPE shall be constructed of materials resistant to flood damage. The lowest floor (including basement) for a residential structure and all electrical, heating, ventilating, plumbing and air conditioning equipment and utility meters shall be located at or above the FPE. An attached garage must be elevated at least six inches above the BFE. Water and sewer pipes, electrical and telephone lines, submersible pumps and other waterproofed service facilities may be located below the FPE. No area less than two feet above the BFE shall be used for storage.

(b) The lowest floor including the basement of all new or substantially improved non-residential buildings shall be elevated at least to the FPE as described above or be structurally dry floodproofed to at least the FPE. A non-residential building may be structurally dry floodproofed (in lieu of elevation) provided that a professional engineer or registered structural engineer shall certify that the building has been structurally dry floodproofed below the FPE and the structure and attendant utility facilities are watertight and capable of resisting the effects of the base flood. The building design shall take into account flood velocities, duration, rate of rise, hydrostatic and hydrodynamic forces, the effects of buoyancy and impacts from debris or ice. Floodproofing measures shall be operable without human intervention and without an outside source of electricity. Levees, berms, floodwalls and similar works are not considered floodproofing for the purpose of this subsection.

(c) Manufactured homes and recreational vehicles to be installed on a site for more than 180 days shall be at or above the FPE and shall be anchored to resist flotation, collapse or lateral movement in accordance with the Illinois Manufactured Home Tie-Down Code (77 Ill. Adm. Code 870 (1999), as amended).

(d) Accessory structures such as tool sheds and detached garages which are not substantial improvements on an existing single family lot, may be constructed with the lowest floor below the FPE in accordance with the following criteria:

(1) The building shall not be used for human habitation.

(2) All areas below the FPE shall be constructed with waterproof material. Structures located in a regulatory floodway shall meet the floodway standards of § 411.

(3) The structure shall be anchored to prevent flotation and movement.

(4) Service facilities such as electrical and heating equipment shall be elevated or floodproofed to the FPE.

(5) The building shall be no greater than 576 square feet in floor size and cost not more than \$12,000 to construct.

(6) The building shall meet the requirements of § 407(a)(2).

(7) The building shall be used only for the storage of vehicles or tools and may not contain other rooms, workshops, greenhouses or similar uses.

Accessory structures that do not meet all of the above criteria may be constructed if they are dry floodproofed or elevated at least six inches above the BFE.

(e) The lowest floor of an addition to an existing industrial use may be constructed at the BFE plus one foot provided this elevation is required by the industrial process as demonstrated by the applicant and the Administrator approves the elevation in writing.

§ 408. Non-conforming structures

A non-conforming structure damaged by flood, fire, wind or other disaster may be restored unless the damage is equal to or greater than 50% of its fair market value before it was damaged, in which case it shall conform to § 407.

§ 409. Lowest opening

For proposed structures located outside the regulatory floodplain, the lowest opening shall be above the FPE.

§ 410. Compensatory storage volume standards

The following standards apply within the regulatory floodplain:

(a) Hydraulically equivalent compensatory storage volume will be required for development in a riverine regulatory floodplain and shall be at least equal to the regulatory floodplain flood storage volume displaced multiplied by 1.5. The storage volume displaced below the existing ten-year frequency flood elevation must be replaced below the proposed ten-year frequency flood elevation. The storage volume displaced above the ten-year existing frequency flood elevation must be replaced above the proposed ten-year frequency flood elevation. The additional compensatory flood storage required beyond a 1:1 ratio may be placed above or below the ten-year flood elevation.

(b) Compensatory storage volume for development in a non-riverine regulatory floodplain area that is also adjacent to a lake shall be equal to the storage volume displaced.

(c) Compensatory storage volume requirements for development in a non-riverine regulatory floodplain that is not adjacent to a lake shall be replaced in accordance with the requirements for the loss of depressional storage in § 201(g).

(d) Compensatory storage areas shall be designed to drain freely and openly to the channel and shall be located adjacent to the development. This standard does not apply to non-riverine regulatory floodplain or the replacement of depressional storage.

(e) A recorded covenant running with the land is required to maintain the compensatory storage volume in areas modified to provide compensatory storage volume.

§ 411. Floodway standards

The only development in a regulatory floodway which will be allowed are appropriate uses which will not cause an increase in flood heights or velocities for all flood events up to and including the base flood. Only those appropriate uses listed below will be allowed in the regulatory floodway. Appropriate uses do not include the construction or placement of any new structures, fill, building additions, buildings on stilts, fencing (including landscaping or planting designed to act as a fence) and storage of materials except as specifically defined below as an appropriate use. If the development is proposed for the regulatory floodway portion of the regulatory floodplain, the following standards apply in addition to the standards for the regulatory floodplain:

(a) Only the construction, modification, repair or replacement of the following appropriate uses will be allowed in the regulatory floodway:

(1) public flood control structures and private improvements relating to the control of drainage and flooding of existing buildings, erosion, water quality or habitat for fish and wildlife;

(2) structures or facilities relating to functionally water dependent uses such as additions, modifications and improvements to existing wastewater treatment plants and facilities (not including new wastewater treatment plants or habitable structures at existing wastewater treatment plants) and improvements relating to recreational boating;

(3) storm and sanitary sewer outfalls;

(4) underground and overhead utilities if sufficiently floodproofed;

(5) recreational facilities such as playing fields, open pavilions, gazebos and trail systems including any related fencing (at least 50% open when viewed from any one direction) built parallel to the direction of flood flows;

(6) detached garages, storage sheds, boat houses or other non-habitable structures without sanitary facilities that are accessory to existing buildings and will not block flood flows nor reduce regulatory floodway storage;

(7) bridges, culverts and associated roadways, sidewalks and railways, required for crossing the regulatory floodway or for access to other appropriate uses in the regulatory floodway and any modification thereto;

(8) parking lots built at or below existing grade provided that either—

(A) the BFE is less than one foot above the proposed parking lot; or

(B) the parking lot is accessory to short-term outdoor recreational facilities and the owner agrees to restrict access during periods of inundation and agrees to accept liability for all damage caused by vehicular access during flooding events;

(9) regulatory floodway grading, without fill, to create a positive non-erosive slope toward a channel;

(10) floodproofing activities to protect previously existing lawful structures including the construction of watertight window wells, elevating structures or the construction of flood walls or berms around residential, commercial or industrial principal structures where the outside toe of the floodwall or berm is no more than ten feet away from the exterior wall of the existing structure and where such activities are not considered to be a substantial improvement to the structure;

(11) the repair, replacement or reconstruction of a damaged building, provided that none of the outside dimensions of the building are increased and such repair, replacement or reconstruction does not constitute a substantial improvement;

(12) modifications to an existing building such as fireplaces, bay windows, decks, patios and second story addition which do not constitute a substantial improvement, do not increase the enclosed floor area of the building below the BFE and do not block flood flows; no enclosed floor areas may be built on stilts.

(b) No change shall be made to the list of appropriate uses without the prior approval of IDNR-OWR and the Committee.

(c) All development in the regulatory floodway shall require a stormwater management permit and must be in accordance with all provisions of this ordinance.

(d) An appropriate use may be permitted if the proposed project meets the following engineering and mitigation criteria and is so stated in writing with supporting plans, calculations and data prepared and signed by a professional engineer.

(1) All effective regulatory floodway conveyance lost due to the development of appropriate uses, other than bridge or culvert crossings or onstream structures or dams, shall be replaced for all flood events up to and including the base flood.

(2) The following expansion and contraction ratios shall be used to determine transition sections in calculations of effective regulatory floodway conveyance:

(A) Flowing water will expand no faster than a rate of one foot horizontally for every four feet of the flooded stream's length.

(B) Flowing water will contract no faster than at a rate of one foot horizontally for every one foot of the flooded stream's length.

(C) Flowing water will not expand or contract faster than one foot vertically for every ten feet of flooded stream's length.

(D) All cross-sections used in the calculations shall be perpendicular to flood flows.

(E) Transition sections must be used to determine the effective conveyance areas on adjacent properties.

(3) Development of an appropriate use will not result in an increase in the average channel or regulatory floodway velocities or stage. However, in the case of bridges or culverts or onstream structures built for the purpose of backing up water in the stream during normal or flood flows, velocities may be increased at the structure site if scour, erosion and sedimentation will be avoided by the use of rip-rap or other design measures.

(4) In the case of onstream structures built for the purpose of backing up water during normal or flood flows, the increase in flood stage when compared to existing conditions for all storm events up to and including the base flood event shall be contained within recorded easements or the channel banks. A Dam Safety Permit or letter indicating a Dam Safety Permit is not required must be obtained from IDNR/OWR for such structures. If floodproofing construction is required beyond the outside dimensions of an existing habitable residential or

commercial building, the outside perimeter of the floodproofing construction shall be no further than ten feet from the building. Compensation for lost storage and conveyance will not be required for floodproofing within the ten-foot perimeter provided flood damage to other buildings is not increased.

(5) If floodproofing construction is required beyond the outside dimensions of an existing habitable residential or commercial building, the outside perimeter of the floodproofing construction shall be no further than ten feet from the building. Compensation for lost storage and conveyance will not be required for floodproofing within the ten-foot perimeter provided the probability of flood damage to other buildings is not increased.

(6) IDNR/OWR will issue permits for all IDNR/OWR, state, federal or community projects.

§ 412. Riverine Floodplain

These standards apply to riverine regulatory floodplains without a regulatory floodway. The applicant shall obtain approval from IDNR/OWR for all development, any portion of which is located within the regulatory floodplain (without a delineated regulatory floodway) with a tributary drainage area of 640 acres or more.

(a) The development shall not singularly or cumulatively result in an obstruction of flood flows or potential flood damages outside the site due to an increase in flood heights, velocities or loss of floodplain area storage.

(b) A professional engineer shall submit a study that—

(1) determines a floodway which meets the definition of a regulatory floodway and demonstrates that the proposed development meets the floodway standards in § 411; or

(2) determines a BFE and demonstrates that the proposed development will maintain the existing conditions conveyance, will not increase flood velocities, will not increase flood profiles and will compensate for any lost floodplain storage in accordance with § 410; or

(3) shows that the proposed development will meet the requirements for regulatory floodplains in §§ 406 and 407.

§ 413. Bridge and culvert standards

These standards are for the reconstruction, modification or new construction of bridges, culvert crossings and roadway approaches located in the regulatory floodplain.

(a) A proposed new structure shall not result in an increase of upstream flood stages greater than 0.1 foot when compared to the existing conditions for all flood events up to and including the base flood event unless contained within the channel banks or recorded easements. The evaluation must be submitted to IDNR-OWR for review and issuance of a permit.

(b) If the proposed new structure will increase upstream flood stages greater than 0.1 foot, the applicant must contact IDNR/OWR for a Dam Safety Permit or waiver. The Director shall be copied on all related correspondence.

(c) Lost regulatory floodplain storage must be replaced as required in § 410 except that artificially created storage lost due to a reduction in head loss behind an existing bridge or culvert crossing shall not be required to be replaced, provided no flood damage will be incurred downstream.

(d) Velocity increases must be mitigated by use of appropriate measures to avoid scour, erosion and sedimentation at the structure.

(e) For modification or replacement of existing structures in a regulatory floodway, the existing structure must first be evaluated in accordance with IDNR/OWR Rules (17 Ill. Adm. Code Part 3708) to determine if the existing structure is a source of flood damage. If the structure is a source of flood damage, the applicant's engineer shall justify allowing the damage to continue and evaluate the feasibility of relieving the structure's impact.

Modifications to or replacement of structures shall not increase flood stages (0.0 feet) compared to the existing condition for all flood events up to and including the base flood event. The evaluation must be submitted to IDNR/OWR for review and approval before a permit is issued. The Director shall be copied on all related correspondence.

(f) If any work is proposed in, near or over the Fox River, a permit or letter indicating a permit is not required must be obtained from IDNR/OWR.

(g) The hydraulic analysis for the backwater caused by the bridge showing the existing condition and proposed regulatory profile must be submitted to IDNR/OWR for concurrence that a CLOMR is not required.

(h) Construction vehicles shall cross streams by the means of existing bridges or culverts. Where an existing crossing is not available, a temporary crossing, for which a permit or waiver has been issued by IDNR-OWR, shall be constructed in which—

(1) the approach roads will be six inches or less above existing grade;

(2) the crossing will allow stream flow to pass without backing up the water above the stream bank vegetation line or above any drainage tile or outfall;

(3) the top of the roadway fill in the channel will be at least two feet below the top of the lowest bank;

(4) any fill in the channel shall be non-erosive material, such as rip-rap or gravel; and

(5) the access road and temporary crossings will be removed within one year after installation, unless an extension of time is granted by the Administrator

§ 414. Requirements for wetland delineation

(a) Before any development in or near Waters of the U.S., or in or near isolated wetlands or farmed wetlands, a written report identifying and evaluating the boundaries, location, limits, area and quality of all onsite wetlands shall be submitted. The presence and limits of wetland areas shall be determined by a wetland delineation conducted in accordance with the 1987 Manual. The presence of farmed wetlands shall be determined by NRCS.

(b) Before any development on agricultural land, in addition to the onsite delineation required under the previous paragraph, a Certified Wetland Determination shall be obtained from NRCS.

(c) The quality of the wetlands shall be evaluated based upon the FQI.

(d) Delineations for permitting purposes shall be performed only during the period beginning on the last Monday of March and ending on the third Friday of November.

(e) The approximate location, extent and relative quality of wetlands within 50 feet of the site shall be identified and included in the written report. The location and extent of such offsite wetlands shall be determined by using the first of the following documents or procedures pertaining at the time of development:

(1) site specific delineation according to the 1987 Manual. If such delineation is not available, then—

(2) wetlands identified in watershed plans or ADID studies. If such plans are not available, then—

(3) wetlands identified in interim watershed plans. If such plans are not available, then—

(4) wetlands identified on NRCS wetlands inventory maps.

§ 415. Mitigation to be local

All wetland mitigation required under a COE § 404 permit for wetland disturbances in Kane County shall be provided in Kane County.

§ 416. Threatened and endangered species consultation

Prior to the issuance of a stormwater management permit the applicant shall consult with IDNR and the United States Fish and Wildlife Service with respect to the presence of threatened or endangered species and shall obtain a “positive outcome” letter or other instrument of approval.

§ 417. Wetland preservation during development

Preserved wetlands shall be protected during development such that an FQI calculated two years after the commencement of development will not be more than 2 points less than the FQI originally calculated. The developer shall mitigate for any wetland not so preserved at the ratio required for the FQI originally calculated.

§ 418. Buffer requirements

The requirements of this section are not applicable to commercial or industrial redevelopment projects on sites adjacent to the main channel of the Fox River. The requirements of this section are also not applicable to isolated wetlands or Waters of the U.S. that, in either case, are below the threshold size limitations for mitigation requirements under the COE § 404 permit program (currently, less than 0.25 acres).

(a) Buffers shall be designated on development plans for all areas defined as Waters of the U.S. that are adjacent to protected Waters of the U.S. shall be shown to be within appropriate easements on all new plats. Additionally, the maintenance requirements for the buffer shall be noted on the plat or included as a covenant running with the land in any deed which conveys any portion of a buffer area.

(2) Buffer widths required as a part of a COE permit supersede the widths required in this section, unless the width required herein is greater. If a COE permit is obtained to permanently fill a portion of a wetland and no buffer is required, the buffer width required by this ordinance immediately adjacent to the area of impact does not apply. Immediately adjacent refers to the area within 15 feet of the area of impact. In no case shall additional wetland area be filled to provide buffer required by this ordinance.

(3) A jurisdictional Waters of the U.S., or wetland may not constitute buffer. Buffer widths are to be 50 feet wide unless otherwise determined using the criteria specified in §§ 418(a)(3)(A) and/or 418(a)(3)(B). Buffer width averaging is acceptable at the discretion of the Administrator. When using buffer width averaging, the width may not be more than 20% less, at the narrowest point, than the specified width. The buffer width may never be less than 15 feet, except in the case of Waters of the U.S. or wetlands with a calculated FQI of less than 7 where the buffer at its narrowest point may not be less than 12 feet in width.

(A) Linear buffers shall be designated along Waters of the U.S. and wetlands associated with water courses, i.e. swales, creeks, streams, rivers, etc. Refer to § 418(a)(3)(B) in cases where wetlands are adjacent to and not part of the main channel, i.e. floodplain wetland, backwater slough, oxbow, bordering wetland complex.

(i) When the lineal Waters of the U.S. have a drainage area greater than 640 acres, measured at the downstream property line, or is designated as ADID because of high biological value or an adjacent wetland has a calculated FQI greater than 16, the buffer shall be 50 feet.

(ii) When the lineal Waters of the U.S. have a drainage area less than 640 acres, measured at the downstream property line, the buffer width shall be determined utilizing the formula, $X = (A * 0.0547) + 15$, where X equals the buffer width in feet and A equals the drainage area in acres. The width calculated by this formula shall be rounded up to the nearest multiple of five. Figure 1 may be used to determine buffer widths provided the resultant width is increased to the nearest multiple of five.

(iii) If protective measures are installed along the perimeter of a buffer, the width may be reduced by up to 15% immediately adjacent to the protective measure. The reduction in width that may be applied due to installation of protective measures may not be applied where buffer width averaging has been used and the buffer would be more than 20% less than originally specified. Protective measures may consist of fencing, sediment basins, biological filter strips or other methods approved by the Administrator.

(iv) If lineal Waters of the U.S. are completely or partially relocated, the newly created portion must be constructed in a manner which will allow naturalizing to occur, for example, meandering, pools, riffles, and the like. Additionally, all disturbed areas must be replanted for stability with native vegetation where appropriate, appropriately managed and maintained and protected by an appropriately sized buffer.

(B) Water body buffers shall encompass non-linear bodies of water meeting the definition of Waters of the U.S., including wetlands.

(i) If protective measures are installed along the perimeter of a buffer, the width may be reduced by up to 15% immediately adjacent to the protective measure. The reduction in width that may be applied due to installation of protective measures may not be applied where buffer width averaging has been used and the buffer would be more than 20% less than originally specified. Protective measures may consist of fencing, sediment basins, biological filter strips or other methods approved by the Administrator.

(ii) For all non-linear water bodies or Waters of the U.S. designated as ADID or wetlands with an FQI greater than 16, a minimum buffer width must be established in accordance with Table 418(a)(3)(B)(ii).

(iii) For non-ADID wetlands with an FQI of 7 to 16 a minimum buffer width must be established in accordance with Table 418(a)(3)(B)(iii).

(iv) For non-ADID wetlands with an FQI of less than 7 a minimum buffer width must be established in accordance with Table 418(a)(3)(B)(iv).

(b) Buffers shall be replanted or reseeded using appropriate predominately native deep-rooted vegetation, appropriately managed and maintained following disturbance.

(c) The buffer area for all lineal and non-linear Waters of the U.S. except wetlands shall extend from the jurisdictional limits of the Waters of the U.S. ordinary high water mark. The buffer area for wetlands shall extend from the edge of the approved delineated wetland boundary. A site may contain buffer that originates from a Waters of the U.S. or wetland located on another property.

(d) Constructed stormwater management features shall not require a buffer and may constitute buffer. The total width of the buffer required may not be reduced by the installation of a stormwater management facility unless the facility can be considered a protective measure. If the facility can be considered to be a protective measure then the width of the buffer maybe reduced as specified in § 418(a)(3)(A)(iii).

(e) If a buffer area is disturbed by permitted activities during construction, the buffer strip shall be stabilized in accordance with § 300.

(f) Access through buffer areas shall be allowed when necessary for maintenance purposes. Unless otherwise dedicated for a public purpose, buffer areas shall remain private property and are not generally accessible to the public.

(g) The following are exempt from buffer requirements provided they do not meet the definition of Waters of the U.S.:

- (1) roadside drainage ditches;
- (2) channels;
- (3) conveyance systems between site runoff storage facilities;

- (4) excavated site runoff storage facilities, compensatory storage and sediment basins;
- (5) roadway crossings and their associated installations;
- (6) downspout and sump pump discharge; and
- (7) constructed stormwater management facilities.

(h) Undetained stormwater which has not passed through a site runoff storage facility shall discharge through an area or structure meeting the definition of best management practices or buffer before entering a jurisdictional Waters of the U.S. or wetland.

(i) All buffer areas once established shall be maintained free from development, except as follows:

(1) A buffer area may be used for passive recreation (e.g. birdwatching, walking, jogging, bicycling, horseback riding and picnicking) and it may contain pedestrian, bicycle or equestrian trails, provided that the created path is no wider than ten feet. If the path leads to a wetland, it must be a winding path to help prevent erosion.

(2) Non-habitable structures (i.e., tool shed) and impervious surfaces may occupy a maximum of 15% of the portion of the required buffer that extends onto or is part of an individual property.

(3) Utility maintenance, and maintenance of drainage facilities and drainage easements shall be allowed provided the maintenance activity meets all other federal, state and local regulations.

(4) Anchoring and placement of boat docks and piers shall be allowed provided the structure meets all other federal, state and local regulations.

BUFFER WIDTH CALCULATION TABLES

Table 418(a)(3)(B)(ii) - High Quality Wetlands - FQI > 16

BUFFER RATIO	WETLAND AREA (Acres)	BUFFER AREA (Acres)	BUFFER WIDTH (Feet)
0.5	0.25	0.125	15.0
0.5	0.5	0.25	20.0
0.5	0.75	0.375	25.0
0.5	1	0.5	30.0
0.5	1.25	0.625	30.0
0.5	1.5	0.75	35.0
0.5	1.75	0.875	35.0
0.5	2	1	40.0
0.5	2.25	1.125	40.0
0.5	2.5	1.25	45.0
0.5	2.75	1.375	45.0
0.5	3	1.5	50.0
0.5	3.25	1.625	50.0
0.5	3.5	1.75	50.0
0.5	3.75	1.875	50.0
0.5	4	2	50.0
0.5	4.25	2.125	50.0
0.5	4.5	2.25	50.0
0.5	4.75	2.375	50.0
0.5	5 or more	2.5	50.0

Buffer Ratio = % of total wetland area

Wetland Area = Total on and offsite area of the wetland = (%*Acres)

Buffer Area= Area of the buffer = (%*Acres)

Buffer Width = $[Area * 43560] / 4 / [\text{Sqrt}(Acres * 43560)]$

Table 418(a)(3)(B)(iii) - Medium Quality Wetlands - FQI > 7 <16

BUFFER RATIO	WETLAND AREA (Acres)	BUFFER AREA (Acres)	BUFFER WIDTH (Feet)
0.4	0.25	0.1	15.0
0.4	0.5	0.2	15.0
0.4	0.75	0.3	20.0
0.4	1	0.4	25.0
0.4	1.25	0.5	25.0
0.4	1.5	0.6	30.0
0.4	1.75	0.7	30.0
0.4	2	0.8	30.0
0.4	2.25	0.9	35.0
0.4	2.5	1	35.0
0.4	2.75	1.1	35.0
0.4	3	1.2	40.0
0.4	3.25	1.3	40.0
0.4	3.5	1.4	40.0
0.4	3.75	1.5	45.0
0.4	4	1.6	45.0
0.4	4.25	1.7	45.0
0.4	4.5	1.8	45.0
0.4	4.75	1.9	50.0
0.4	5 or more	2	50.0

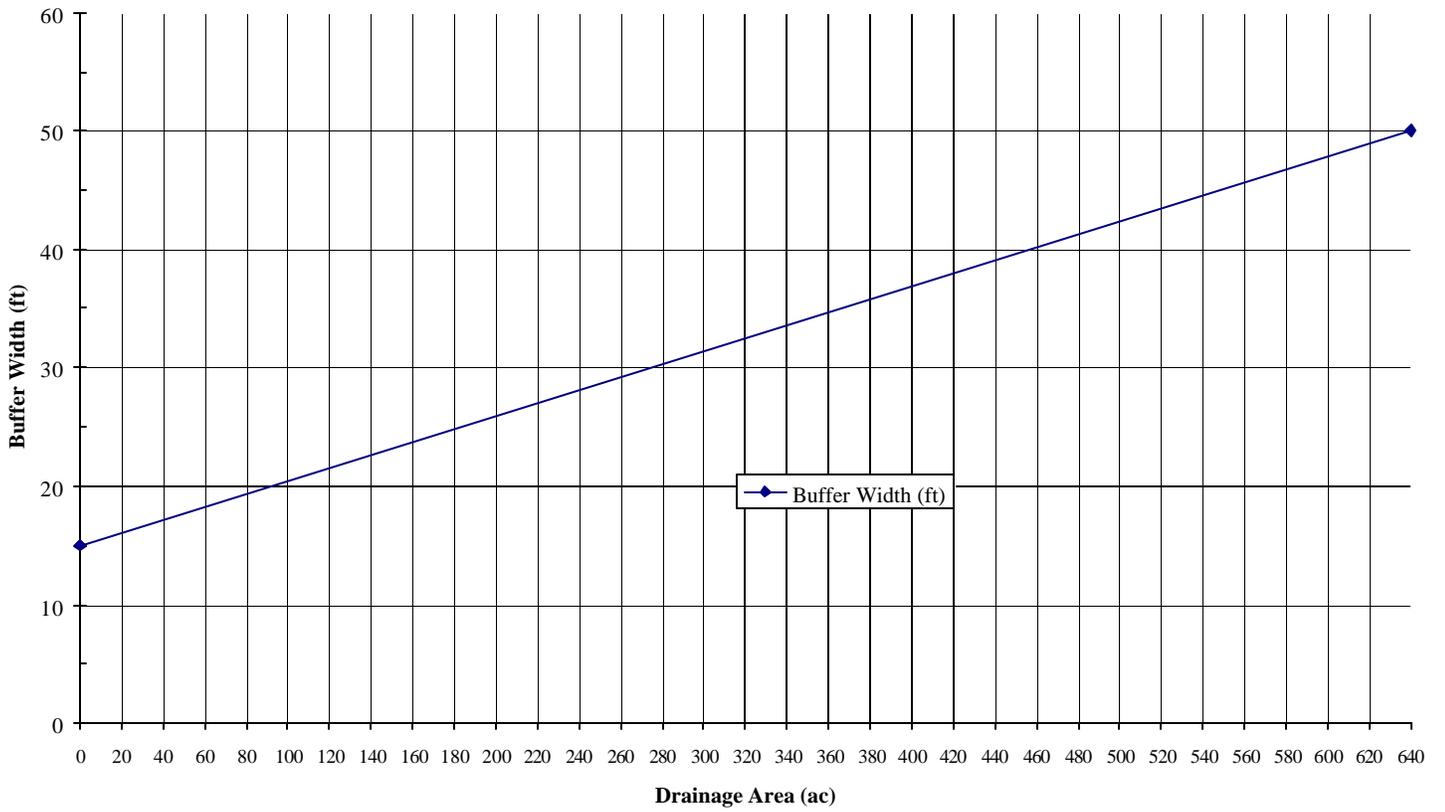
Buffer Ratio = % of total wetland area
 Wetland Area = Total on and offsite area of the wetland = (%*Acres)
 Buffer Area= Area of the buffer = (%*Acres)
 Buffer Width = $[Area * 43560) / 4] / [Sqrt (Acres * 43560)]$

Table 418(a)(3)(B)(iv) - Low Quality Wetlands - FQI < 7

BUFFER RATIO	WETLAND AREA (Acres)	BUFFER AREA (Acres)	BUFFER WIDTH (Feet)
0.3	0.25	0.075	15.0
0.3	0.5	0.15	15.0
0.3	0.75	0.225	15.0
0.3	1	0.3	20.0
0.3	1.25	0.375	20.0
0.3	1.5	0.45	20.0
0.3	1.75	0.525	25.0
0.3	2	0.6	25.0
0.3	2.25	0.675	25.0
0.3	2.5	0.75	25.0
0.3	2.75	0.825	30.0
0.3	3	0.9	30.0
0.3	3.25	0.975	30.0
0.3	3.5	1.05	30.0
0.3	3.75	1.125	35.0
0.3	4	1.2	35.0
0.3	4.25	1.275	35.0
0.3	4.5	1.35	35.0
0.3	4.75	1.425	35.0
0.3	5 or more	1.5	35.0

Buffer Ratio = % of total wetland area
 Wetland Area = Total on and offsite area of the wetland = (%*Acres)
 Buffer Area= Area of the buffer = (%*Acres)
 Buffer Width = $[Area * 43560] / 4 / [Sqrt (Acres * 43560)]$

Figure 1. Buffer Width Calculation Based on Drainage Area



ARTICLE 5—REQUIRED SUBMITTALS FOR STORMWATER MANAGEMENT PERMITS

§ 500. General requirements

(a) A stormwater management permit is required if—

- (1) the development is located in the regulatory floodplain;
- (2) a substantial improvement is to be located in the regulatory floodplain;
- (3) there is any regulatory floodplain within the site; or
- (4) the development disturbs more than 5,000 square feet of ground, unless the development consists solely of—

(A) the installation, renovation or replacement of a septic system, potable water service line or other utility serving an existing structure;

(B) the excavation or removal of vegetation in rights-of-way or public utility easements for the purpose of installing or maintaining utilities not including storm sewers;

(C) the maintenance, repair or at grade replacement of existing lawn areas not otherwise requiring a stormwater permit under this ordinance;

(D) the maintenance of an existing stormwater facility, not requiring other state or federal permits or approvals.

(b) All appropriate stormwater management related approvals and permits, including, without limitation, an IDNR-OWR Floodway/Floodplain Construction Permit, a COE 404 Permit and an IDNR-OWR Dam Safety Permit, if required, shall be obtained from all federal, state and regional authorities prior to the issuance of a stormwater management permit.

(c) All permit fees shall be paid at the time of application. Permit fees shall be established by separate ordinance. Fees may be established based upon all costs incurred by the permitting authority in the administration of the permit, including, without limitation, the costs of review and inspections both during and after construction within the period for the establishment of permanent cover.

(d) The design of stormwater facilities, calculations for the design of the regulatory floodplain and calculations of the impacts of development shall meet the standards of this ordinance and shall be prepared, signed, and sealed by a professional engineer. The signature and seal of such professional engineer shall stand as his or her opinion that the submittals which accompany the permit application meet the requirements of this ordinance.

(2) The submittal shall include evidence that the embankment design and construction specifications are adequate for the design conditions. This review shall include consideration of the existing foundation soils for the embankment, the materials from which the embankment is to be constructed, compaction requirements for the embankment and protection of the embankment from failure due to overtopping. Specifications for the construction and materials for all such embankments shall be included. When directed by the Administrator, or when the impounded water pressure differential exceeds three feet or when appropriate considering the volume impounded and water surface elevation differential to which the embankment is subjected, these calculations may be required to be reviewed, signed and sealed by a qualified geotechnical or registered structural engineer.

(B) For structures (not including earth embankments) that are subject to a differential water pressure greater than three feet the submittal shall, at a minimum, be reviewed by a professional engineer. Such reviews

shall include stability of the structure under design conditions considering the protection of downstream life and property in the event of a failure. When directed by the Administrator the calculations submitted for such structures shall be reviewed, signed and sealed by a registered structural engineer.

(3) A topographical map of the site, record drawings and other required drawings shall be prepared, signed, and sealed by a professional land surveyor or professional engineer and referenced to the National Geodetic Vertical Datum, 1929 adjustment, any FEMA benchmarks and, if the site is more than 20 acres, to the Kane County Survey Control Network. Plats for new subdivisions more than 20 acres in size shall be submitted to the Director in one of the electronic formats designated by the County.

§ 501. Duration and revision of permits

(a) Permits expire on December 31 of the third year following the date of their issuance.

(b) If the permitted activity has begun but is not complete by the expiration date of the permit, the permittee may submit a written request for an extension to the Administrator with a copy to the Director. Upon receipt of such request, the Administrator may extend the expiration date for up to three years for permitted activities outside special management areas. Expiration dates for permitted activities within special management areas may also be extended for up to three years provided the activity is in compliance with the then current requirements of this ordinance. An permittee may apply for any number of extensions.

(c) If the permittee revises the approved plans after issuance of the permit, the permittee shall submit the revised plans to the Administrator with a copy to the Director, along with a written request for approval. If the Administrator determines that the revised plans are in compliance with the then current requirements of this ordinance, an amended permit may be issued.

§ 502. Required submittals

(a) Refer to Table 502 for the submittals required to accompany the permit application based upon the type of development. The Administrator may, in his or her discretion, modify the submittal requirements on a case by case basis considering the size, complexity and likelihood that a development will affect the discharge of stormwater. Such modifications shall be requested and approved in writing. The Administrator’s response shall note the relevant findings and be specific as to what submittal requirements are changed. The Director shall be copied on all related correspondence. The Administrator may not modify submittal requirements for any aspect of the development requiring state or federal permits or approvals, nor for any application in which any variance is

Table 502 - Permit submittal requirements

Type of Development	Required Submittals (refer to sections noted for specific requirements)							
	Section No./Description							
	503	504	505	506	507	508	509	510
	Application and Project Overview	Plan Set Submittal	Stormwater Submittal	Floodplain Submittal	Wetland Submittal	Performance Security	Maintenance Schedule and Funding	Record Drawings
All requiring a permit	X	X				X	X	X
All on sites with floodplain	X	X		X		X	X	X
All on sites with or adjacent to waters of the United States	X	X			X	X	X	X
All applications for variances	X	X	X	If on site	If on site	X	X	X
All requiring site runoff storage	X	X	X			X	X	X

requested.

§ 503. Application and project overview

(a) The applicant shall at a minimum, provide the following information on forms or in a format approved by the Administrator:

- (1) the names and legal addresses of all owners of the site;
- (2) the names and legal addresses of the developer or developers responsible for completing the development according to the plans submitted, the terms and conditions of the permit and the requirements of this ordinance;
- (3) the common address, legal description and parcel identification number (PIN) of all parcels which comprise the site;
- (4) the name of the project, area of the site in acres and type of development;
- (5) a general narrative description of the development, existing and proposed conditions and project planning principles considered, including best management practices used;
- (6) a statement of opinion by a qualified person as to the presence of special management areas on the site;
- (7) copies of all other permits or permit applications as required;
- (8) a subsurface drainage investigation report; and
- (9) an engineer's estimate of probable construction cost of the stormwater facilities and the installation and maintenance of soil erosion and sediment control measures.

(b) The application shall be signed by all owners and developers identified in (a) (1) and (2) above and shall contain their attestation that they have read and understand the provisions of this ordinance and agree to bind themselves to the permitting authority to comply therewith. If at any time prior to completion and final inspection and approval of the development the identity of the persons required to be disclosed in (a)(1) and (2) above changes, an amended application containing the current information shall be filed and the permit shall be amended accordingly.

§ 504. Plan set submittal

All applicants for a stormwater permit shall provide the following basic plan exhibits: Site Topographical Map, General Plan View Drawing, Sediment/Erosion Control Plan and a Vicinity Topographical Map. Each exhibit may be on more than one drawing for clarity. The specific information to be included on each exhibit shall be as noted below.

- (a) Site Topographical Map:
- (1) map scales as 1 inch = 100 feet (or less) and accurate to +/- 0.5 feet;
 - (2) existing and proposed contours onsite (one foot maximum contour interval) and within 100 feet of the site;
 - (3) existing and proposed drainage patterns and watershed boundaries;
 - (4) delineation of pre-development regulatory floodplain and floodway limits;
 - (5) delineation of post-development regulatory floodplain and floodway limits;
 - (6) location of cross-sections and any other hydrologic or hydraulic computer modeled features;

- (7) location of all onsite drain tiles;
- (8) boundaries of all wetlands, lakes, ponds, etc. with normal water elevation noted; (show areas of wetlands to be impacted either under permit or otherwise if a permit is not required);
- (9) location of all existing buildings and those to remain on the site noted;
- (10) nearest base flood elevations;
- (11) FEMA and reference benchmarks used; and
- (12) all contours used in the calculation of depressional storage highlighted.

(b) General Plan View Drawing:

- (1) drawing at the same scale as the Site Topographical Map;
- (2) existing major and minor stormwater systems;
- (3) proposed major and minor stormwater systems;
- (4) design details for stormwater facilities (i.e. structure and outlet work detail drawings, etc.);
- (5) scheduled maintenance program for permanent stormwater facilities including BMP;
- (6) planned maintenance tasks and schedule;
- (7) identification of persons responsible for maintenance;
- (8) permanent public access maintenance easements granted or dedicated to, and accepted by, a government entity;
- (9) proposed regulatory floodplain and floodway location (with the base flood and flood protection elevations noted);
- (10) existing Waters of the U.S. including wetlands and required buffers;
- (11) areas of directly connected impervious areas and any off-setting landscaped areas as defined in § 203(g) indicated;
- (12) all plan areas at elevations below the 100-year high water elevation of site runoff storage facilities highlighted; and
- (13) where a 500-year regulatory flood profile is available, the plan limit of the 500 year floodplain.

(c) Sediment and Erosion Control Plan:

- (1) drawings at the same scale as the Site Topographical Map;
- (2) sediment and erosion control installation measures and schedule;
- (3) existing and proposed roadways, structures, parking lots, driveways, sidewalks and other impervious surfaces;
- (4) limits of clearing and grading;

- (5) special management areas located;
- (6) proposed buffer locations, existing soil types, vegetation and land cover conditions;
- (7) list of maintenance tasks and schedule for sediment and erosion control measures; and
- (8) the name, address and phone number at which the person responsible for erosion and sediment control may be reached on a 24-hour basis.

(d) Vicinity Topographical Map.

(1) vicinity topographical map identifying all offsite areas draining to the development and downstream to the receiving intermittent or perennial stream; (a two-foot contour map is preferred at a scale readable by the reviewer but a USGS Quadrangle map is acceptable);

(2) watershed boundaries for areas draining through or from the development;

(3) soil types related to hydrologic soils group, vegetation and land cover affecting runoff upstream of the site for any area draining through the site;

(4) location of site within the major watershed(s); and

(5) shows the overland flow path from the downstream end of the development to the receiving intermittent or perennial stream.

§ 505. Stormwater submittal

The stormwater submittal shall include a narrative discussion and calculations to support a finding by the qualified review specialist that the proposed development complies with the technical requirements of this ordinance. The submittal shall consist at a minimum of the following material:

(a) a narrative description of the existing and proposed site drainage patterns and conditions; include description of offsite conditions which help to identify stormwater issues considered in the design;

(b) a schedule for implementation of the site stormwater plan;

(c) onsite and offsite runoff calculations which address the following:

(1) documentation of the procedures and assumptions used to calculate hydrologic and hydraulic conditions for sizing major and minor systems;

(2) cross-section data for open channels;

(3) hydraulic grade line and water surface elevations under design flow conditions; and

(4) hydraulic grade line and water surface elevations under base flood flow conditions; and

(d) site runoff storage calculations, which address the following:

(1) calculation of hydraulically connected impervious area and corresponding retention volume;

(2) documentation of the procedures and assumptions used to calculate hydrologic and hydraulic conditions for determining the allowable release rate;

(3) documentation of the procedures and assumptions used to calculate onsite depressional storage;

(4) documentation of the procedures and assumptions used to calculate hydrologic and hydraulic conditions for determining the storage volume;

(5) elevation-area-storage data and calculations for site runoff storage; and

(6) elevation-discharge data and calculations specifically related to the outlet control structure depicted in the plan exhibits.

§ 506. Floodplain submittal

The applicant shall obtain approval from IDNR-OWR and FEMA when required for all new base flood and floodway determinations or as required in § 404. Documentation supporting a finding by the qualified review specialist that the proposed development is in compliance with § 403 shall be submitted with the application. At a minimum, the following material shall be submitted for approval with the application:

(a) regulatory floodplain boundary determination:

(1) provide source of flood profile information; and

(2) provide all hydrologic and hydraulic study information for site-specific floodplain studies, unnumbered Zone A area elevation determinations, and floodplain map revisions;

(b) floodway hydrologic and hydraulic analyses for the following conditions:

(1) existing conditions (land use and stream systems);

(2) proposed conditions (land use and stream systems);

(3) tabular summary of 100-year flood elevations and discharges for existing and proposed conditions;

(4) calculations used for model development; and

(5) hydraulic/hydrologic computer model input/output;

(c) floodplain fill and compensatory storage calculations for below and above ten-year flood elevation up to the base flood elevation:

(1) tabular summary for below and above ten-year flood elevation of fill, compensatory storage and compensatory storage ratios provided in proposed plan; and

(2) cross-sections used for the above calculations; and

(d) floodproofing measures:

(1) narrative discussion of floodproofing measures including material specifications, calculations, design details and operation summary; and

(2) flood easements when required by this ordinance.

(e) statewide and regional self-issuing permits (Statewide Permits Nos. 1 through 14 and Regional Permit No. 3):

(1) such information as shall show that the development qualifies for particular permit in question under the regulations established therefor by IDNR-OWR.

§ 507. Wetland submittal

(a) The applicant shall obtain a permit for all regulated activities involving Waters of the U.S. from the appropriate federal authorities. For any activities which will directly impact onsite Waters of the U.S. but are not regulated by federal authorities, a narrative description of the wetland size and relative quality shall be provided to the Administrator with a copy to the Director, accompanied by a written opinion from a qualified wetlands review specialist on the applicability of current federal permits and noting any special procedures which must be followed in connection with the proposed activity. The applicant shall indicate on the plan set the location of any onsite wetland mitigation required by a COE permit and, in narrative form, the location of all offsite mitigation.

(b) A wetland submittal in accordance with the detailed requirements of §§ 403, 414 and 415 shall be required. In general, the submittal will consist of the following material:

- (1) wetland delineation report (COE format);
 - (2) calculation of required buffer (including size and quality when calculated); and
 - (3) Wetland Delineation Plan View Drawing:
 - (A) all existing and proposed impacted or undisturbed onsite wetlands;
 - (B) location of buffers;
 - (C) planting plan for buffers; and
 - (D) identify all required wetland management activities.
 - (4) For all stream modifications, the following shall be submitted:
 - (A) a plan and profile of the existing and proposed channel; and
 - (B) supporting calculations for channel width, depth, sinuosity, riffle locations and the like.
- (c) If the development will have a wetland impact, the requirements of Article 15 shall be met.

§ 508. Performance security

Performance security in accordance with Article 12 shall be required prior to permit issuance.

§ 509. Maintenance schedule and funding

A completed maintenance schedule for the stormwater management facilities and special management areas in accordance with Article 6 shall be submitted along with identification of the persons responsible for maintenance and funding and back-up funding sources for maintenance in accordance with § 605.

§ 510. Record drawings

The permittee is required to submit record drawings of all permitted stormwater facilities. The record drawings shall be signed and sealed by a professional engineer or professional land surveyor who shall state that the project as constructed is substantially in conformance with the development as permitted.

§ 511. Terms of permit/denial—appeal

(a) Within 10 days after being served with the permit or notice that the permit has been denied, the applicant may appeal the terms or denial of the permit to the oversight committee. The appeal shall be made by filing a notice thereof with the oversight committee specifying the specific provisions appealed from and the grounds therefor. The oversight committee shall conduct a hearing on the appeal not more than 60 days after the filing of

the notice of appeal. The hearing shall be *de novo*. Notice of the hearing shall be served upon the applicant, the Administrator, the Director and upon all communities within the same watershed as the development to which the appeal relates. The hearing may be continued from time to time. The oversight committee may adopt rules for the taking of evidence and conduct of such hearings.

(b) Within 30 days of the conclusion of the hearing, the oversight committee shall decide whether to affirm or reverse, in whole or in part, the terms or denial of the permit. The decision of the oversight committee shall be in writing and shall include the specific findings and conclusions supporting its determination. A copy of the decision and order shall be served upon all parties entitled to notice in accordance with § 1006.

(c) Within 10 days of being served with the order of the oversight committee, the applicant may (and if the denial of the permit or any of the terms thereof have been reversed, in whole or in part, by the oversight committee, the Administrator shall), further appeal to the decision-making authority. The decision-making authority shall decide the appeal upon the record before the oversight committee. The decision-making authority shall decide the appeal within 45 days of its receipt thereof. The decision-making authority shall affirm the order of the oversight committee if it is supported by substantial evidence in the record. A copy of the decision and order of the decision-making authority shall be served upon all parties entitled to notice in accordance with § 1006.

(d) Within 10 days of being served with the order of the decision-making authority, the applicant may (and if the effect of the decision-making authority's decision is that the denial of the permit or any of the terms thereof have been reversed, in whole or in part, the Administrator shall), further appeal to the Committee. The Committee shall decide the appeal upon the record below. The Committee shall decide the appeal within 45 days of its receipt thereof. The Committee shall affirm the order of the decision-making authority if it is supported by substantial evidence in the record. A copy of the decision and order of the Committee shall be served upon all parties entitled to notice in accordance with § 1006.

(e) From a final order of the Committee, the applicant may appeal to the courts under the Illinois Administrative Review Law.

ARTICLE 6—LONG TERM MAINTENANCE**§ 600. Long-term maintenance**

Unless maintenance responsibility has been delegated to and accepted by another person under this section, the owner shall maintain that portion of a stormwater drainage system, including any special management areas, located upon his land. With the approval of the Administrator the stormwater drainage system and special management areas, or specified portions thereof, may be—

- (a) dedicated or otherwise transferred to and accepted by the permitting authority or other public entity; or
- (b) conveyed or otherwise transferred to and accepted by a homeowner's association, or similar entity, the members of which are to be the owners of all of the lots or parcels comprising the development; or
- (c) conveyed to one or more persons or in one or more undivided interests to one or more persons.

Except for those portions of the stormwater drainage system and special management areas to be dedicated or otherwise transferred to the permitting authority or other public entity, included in the application for a stormwater permit shall be a plan for the long term management, operation and maintenance of the stormwater drainage system and special management areas and a description of the sources of funding therefor. Amendments to the plan must be approved by the Administrator.

§ 601. Transfer to permitting authority or other public entity

If any portion of the stormwater drainage system or special management areas are to be dedicated or otherwise transferred to the permitting authority or other public entity under § 600(a), appropriate easements for ingress and egress to and maintenance of such portions shall be reserved for the benefit of such entity on the final plat.

§ 602. Transfer to homeowner's or similar association

If any portion of the stormwater drainage system or special management areas are to be conveyed or otherwise transferred to a homeowner's or similar association under § 600(b) then—

- (a) appropriate easements for ingress and egress to and maintenance of such portions shall be reserved for the benefit of such association and the permitting authority on the final plat;
- (b) the association shall be duly incorporated and a copy of the Certificate of Incorporation, duly recorded, and bylaws, and any amendment to either of them, shall be delivered to the Administrator;
- (c) the bylaws of the association shall, at a minimum, contain—
 - (1) a provision acknowledging and accepting the association's obligation to maintain those portions of the stormwater drainage system and special management areas conveyed or otherwise transferred to it under this ordinance;
 - (2) a mechanism for imposing an assessment upon the owners of all of the lots or parcels comprising the development sufficient, at a minimum, to provide for the maintenance of those portions of the stormwater drainage system and special management areas conveyed or otherwise transferred to it under this ordinance; and the payment of all taxes levied thereon;
 - (3) a provision adopting the plan of long term maintenance set forth in the application for a stormwater management permit, with approved amendments;
 - (4) a provision identifying the officer of the association responsible for carrying out the obligations imposed upon the association under this ordinance;

(5) a provision requiring the consent of the permitting authority to any amendment of the bylaws changing any of the provisions of the bylaws required by this ordinance; and

(6) a provision requiring the consent of the permitting authority to the dissolution of the association; and

(d) any conveyance or other instrument of transfer delivered under § 600(b) shall include a covenant affirmatively imposing upon the association the obligations set forth in this section and the association's affirmative acceptance thereof.

§ 603. Conveyance to one or more persons

If any portion of the stormwater drainage system or special management areas are to be conveyed to one or more persons under § 600(c), then—

(a) appropriate easements for ingress and egress to and maintenance of such portions shall be reserved for the benefit of the permitting authority on the final plat;

(b) the final plat shall contain a legend imposing the maintenance obligations of this section upon the grantee and his successors in interest as a covenant running with the land and incorporating by reference the plan of long term maintenance set forth in the application for a stormwater management permit, with approved amendments;

(c) the final plat shall contain a legend reserving the right of the permitting authority to enter upon the land to perform the maintenance required in this section if the owner does not do so and to place a lien against the land for the cost thereof; and

(d) any conveyance delivered under § 600(c), and any subsequent conveyance, shall include a covenant affirmatively imposing upon the grantee the obligations, restrictions and provisions set forth in this section and the grantee's affirmative acceptance thereof.

§ 604. Incorporation of maintenance obligations in stormwater management permit

The provisions of this section shall be incorporated by reference in the stormwater management permit and the applicant's acceptance of the permit shall be deemed to be the applicant's acceptance and assumption of the obligations imposed under this section. At the option of the Administrator, the stormwater management permit may be recorded.

§ 605. Funding of long-term maintenance of stormwater facilities

As a condition of approval of any application for a stormwater management permit, unless the maintenance responsibility for the stormwater drainage system and special management areas to be constructed, installed or preserved in connection therewith has been accepted by a public entity, the Administrator will require the establishment of a special service area pursuant to 35 ILCS 200/27-5, *et seq.*, either as the primary means of providing for the long term maintenance of the facilities, or as a backup vehicle in the event the person designated by the applicant as having primary maintenance responsibility fails to adequately carry out its duties. If the establishment of a special service area is required, the Administrator shall make a good faith estimate of the tax rate required to produce a tax to be levied upon all taxable property within the area, sufficient for the long term maintenance of the facilities and submit the same to the permitting authority which shall incorporate such rate into its enactment of the ordinances necessary for the establishment of the area. The ordinances to be enacted by the permitting authority shall be substantially in the form set forth in Appendix D. On or before August 1 of each year thereafter, the Administrator shall submit to the permitting authority a good faith estimate of the amount of tax required to be levied upon all taxable property within the area for the next fiscal year for the continued maintenance of the stormwater drainage system.

ARTICLE 7—ENFORCEMENT AND PENALTIES**§ 700. Inspection and maintenance authority**

Pursuant to the authority granted by 55 ILCS 5/5-1104 and 5-1062, the County may, upon 30 days' notice to the owner or occupant, enter upon any lands or waters within the County for the purpose of inspecting and/or maintaining any stormwater facilities or causing the removal of any obstruction to an affected watercourse.

§ 701. Required inspections

Any development constructed pursuant to a stormwater management permit may be periodically inspected by the Administrator or Director to ensure its conformity with this ordinance and the terms and conditions of its permit.

§ 702. Offenses

(a) Any person who violates, disobeys, omits, neglects, refuses to comply with, or resists the enforcement of any provision of this ordinance (*ordinance violation*), or any requirement or condition in any permit issued pursuant to this ordinance (*permit violation*), and, in the case of a permit violation, fails to correct such violation, omission or neglect, or cease such disobedience, refusal or resistance after notice and reinspection as provided below, shall be guilty of an offense under this ordinance.

(b) Whenever the Administrator or Director determines that a permit violation exists, he shall serve notice of the violation in the manner prescribed in § 1006 to the permittee. Such notice shall state the nature of the violation and fix a date not less than 10 days after the date of the notice when the site will be reinspected.

§ 703. Offenses - penalties; remedies

(a) Any person found guilty of an offense under this ordinance shall pay a civil fine in an amount not less than \$25 and not more than \$750. Each calendar day during which such violation continues to exist shall constitute a separate offense.

(b) In addition to any fine imposed under this section, the Administrator or the Director may revoke any stormwater management permit issued to such person.

(c) In addition to any fine imposed or permit revocation undertaken pursuant to this section, the Administrator or the Director may issue an order requiring the suspension of any further work on the site. Such stop-work order shall be in writing, shall indicate the reason for its issuance, and shall specify the action, if any, required to be taken in order to resume work. One copy of the stop-work order shall be posted on the site in a conspicuous place and one copy shall be served in the manner prescribed in § 1006 upon the permittee, if any, or if none, upon the person in whose name the site was last assessed for taxes as disclosed by the records of the Supervisor of Assessments.

(d) In addition to any fine imposed under this section, the Administrator or the Director may recover all costs and expenses, including reasonable attorney fees, incurred in the enforcement of this ordinance.

(e) In the enforcement of this ordinance, the Administrator or the Director may bring any action, legal or equitable, including an action for injunctive relief, as they deem necessary.

ARTICLE 8—GENERAL PROVISIONS**§ 800. Scope of Regulation**

This ordinance applies to all development within the County and to all development within the corporate boundaries of any certified community, including that under the control of any governmental entity, agency, or authority. Any person undertaking a development shall obtain a stormwater management permit from the permitting authority within whose boundaries the development is located. Any person undertaking a development having a wetland impact shall obtain a permit from the Director. Any certified community undertaking development in the regulatory floodway, or regulatory floodplain where no regulatory floodway has been designated, shall obtain a permit from IDNR-OWR if required prior to issuance of a stormwater management permit. All units of local government shall obtain stormwater management permits from the permitting authority within whose boundaries the development is located.

§ 801. Exemptions

(a) This ordinance does not apply to—

- (1) development which has been substantially completed before January 1, 2002;
- (2) development which has been determined to be exempt by the Committee; and
- (3) wetland impacts occurring before the effective date.

(b) Nonconforming structures shall not be replaced or enlarged in any manner unless such replacement or enlargement conforms to the requirements of this ordinance.

§ 802. Committees's determination of exemption

(a) Before January 1, 2002, each community shall submit to the Director a list of proposed exempt developments prepared and adopted in accordance with § 803. At its next regularly scheduled meeting occurring not less than 15 days after the Directors's receipt of the list, the Committee shall consider the developments listed therein. Any member of the Committee may remove from the list for further consideration, any development located within the zone represented by that member on the Committee. Additionally, the Committee, upon motion made and seconded and passed by a majority of those members present, may remove any development from the list for further consideration. After such removals, the developments remaining on the list shall be determined to be exempt from the provisions of this ordinance.

(b) With respect to those developments removed from the list, the Committee shall determine each development to be exempt from the provisions of this ordinance if—

- (1) substantial development has commenced; or
- (2) the stormwater plan for such development—
 - (A) provides site runoff storage which at a minimum meets a 0.15 cfs/acre release rate standard;
 - (B) includes a designed conveyance system for flow rates up to the base flood for offsite and onsite flows without damage to structures; and
 - (C) provides for soil erosion and sediment control in accordance with the *Illinois Urban Manual*.

(c) Notwithstanding the Committee's determination that a particular development is exempt from the provisions of this ordinance, all mitigable wetland impacts from any development occurring after the effective date shall be mitigated.

§ 803. Community's list of proposed exempt developments

- (a) A community may place a development on its list of proposed exempt developments only if—
- (1) a stormwater plan has been submitted and substantially approved by the community engineer; or
 - (2) a contractual agreement, specifically exempting the development from the stormwater regulations of the community, was entered into before January 1, 2001.
- (b) corporate authorities of the community. Prior to taking such action, the community shall publish in accordance with § 1007, a notice in substantially the following form:

On [date], at [time], the [corporate authorities] of the [type of community] of [community] will consider and take formal action with respect to the approval of the following list of developments proposed as exempt from the provisions of the Kane County Stormwater Management Ordinance, adopted by the Kane County Board on November 14, 2000. Any person wishing to do so, may attend the meeting and be heard prior to the [corporate authorities] taking such action.

[List of proposed exempt developments]

- (2) In addition to the published notice, not less than 15 days prior to taking any such action, the community shall place a sign in a conspicuous place at each of the developments on the list advising the public that the development is on the list of developments proposed as exempt from the provisions of this ordinance and of the date and time of the meeting at which formal action with respect to the approval of the list will be taken and of the public's right to appear to be heard prior to such approval.
- (c) Once submitted, the list may not be changed except that a developer of a development inadvertently omitted from the list by the community may apply directly to the Committee for a determination that the development meets all of the requirements of this Article for being exempt.

§ 804. Interpretation

- (a) This ordinance shall be liberally construed to protect the health, welfare, safety, and the environment of the residents of the County and to effectuate the purposes of this ordinance and the enabling legislation.
- (b) Nothing in this ordinance shall be deemed to consent to, license, permit to locate, construct, or maintain any structure, site, facility or operation, or to carry on any trade, industry, occupation, or activity.
- (c) When provisions of this ordinance differ from any other applicable law, statute, ordinance, rule or regulation, the more stringent provision shall apply.
- (d) The provisions of this ordinance are cumulative of all other laws, statutes, ordinances, rules and regulations which relate to the subject matter hereof and, except as otherwise expressly provided herein, nothing in this ordinance shall be construed as a limitation upon the application or enforcement of any such law, statute, ordinance, rule or regulation. To the greatest extent possible, the provisions of this ordinance shall be construed to be consistent with the provisions of such other laws, statutes, ordinances, rules or regulations, and with each other, to the end that all such provisions may be given their fullest application.

§ 805. Warning and disclaimer of liability

- (a) The degree of flood protection provided by this ordinance is considered reasonable for regulatory purposes and is based upon engineering experience and scientific methods of study. Increased flooding may result from causes beyond the control of any governmental authority. This ordinance does not, therefore, guarantee that areas outside the floodplain or permitted land uses within the floodplain will be free from flooding and associated damages.

(b) Nothing in this ordinance shall be construed or applied in any manner to create liability on the part of or a cause of action against the County, any municipality or other governmental authority, or any elected official, or any officer, agent, or employee of any of the foregoing, or any qualified engineer review specialist or qualified wetland review specialist for any flood damage resulting from reliance on the provisions of this ordinance.

§ 806. Choice of planning jurisdiction

Pursuant to 55 ILCS 5/5-1062 (b), a community that is located in more than one county may choose, at the time of the formation of the Committee, and based upon watershed boundaries, to participate in the stormwater management planning program of either or both of the counties. Unless the community, at the time of the formation of the Committee, has chosen to participate in the stormwater management planning program of another County, the Committee shall include such community within the scope of its planning and enforcement jurisdiction.

§ 807. Severability

(a) The provisions of this ordinance shall be severable in accordance with the following rules:

(1) If any court of competent jurisdiction shall adjudge any provision of this ordinance to be invalid, such judgment shall not affect any other provision of this ordinance.

(2) If any court of competent jurisdiction shall adjudge to be invalid the application of any provision of this ordinance to a particular parcel of land, a particular structure, or a particular development, such judgment shall not affect the application of said provision to any other land, structure or development.

§ 808. Repealer

This ordinance repeals the original ordinance or resolution which was adopted to meet the National Flood Insurance Program regulations, but is not intended to replace any ordinance or resolution passed in order to establish initial eligibility for the National Flood Insurance Program.

§ 809. Amendments

No amendment to this ordinance may be passed without a public hearing first being held before the Committee upon notice published as provided in § 1007.

§ 810. Effective date

After its passage, approval and publication according to law, this ordinance shall take effect on January 1, 2002.

ARTICLE 9—VARIANCES

§ 900. Purpose

In order to provide a narrowly circumscribed means by which relief may be granted when strict compliance with the requirements of this ordinance is impossible or impracticable, variances from the specific provisions of this ordinance may be granted according to the standards set forth in this Article.

§ 901. Application for variance

An application for a variance, signed by at least one of the persons identified in § 503(a)(1) and (2) with respect to the development to which it relates, shall be filed with the Administrator. No application for a variance will be accepted for filing unless it relates to a previously or contemporaneously filed application for a stormwater management permit. Applications for a variance shall be filed in such number of duplicate copies as the Administrator may designate by administrative order. No action will be taken on an application for a variance unless it and the corresponding application for a stormwater management permit to which it relates are complete as determined by the Administrator. The Administrator shall send a copy of the complete application to the Director and to all other communities within the same watershed. Applications for a variance need not be made upon any specific form, but shall contain the information set forth in **Table 901**

Table 901 - Application for variance

<p>An application for variance shall set forth—</p> <ol style="list-style-type: none"> 1. the common address(es) and legal description of the site; 2. the persons identified in § 503(a)(1) and (2); 3. the names and addresses of all consultants retained in connection with the application for a variance; 4. the names and addresses of all owners of record of land within 250 feet of the site; 5. the specific feature or features of the development that require a variance; 6. the specific provisions of this ordinance from which a variance is sought and the precise extent of the variance therefrom; 7. a statement of the characteristics of the development that prevent compliance with the provisions of this ordinance; 8. a statement that the variance requested is the minimum variance necessary to permit the development; 9. a statement as to how the variance requested satisfies the standards set forth in Section 904 of this ordinance.

§ 902. Application fee

With the filing of the application for a variance, the applicant shall pay a fee to be prescribed by separate ordinance.

§ 903. Public hearing

When the application is complete, the Administrator will so notify the applicant and will schedule a public hearing on the application before the oversight committee. Notice of the hearing shall be published as provided in § 1007 and served as provided in § 1006 upon the applicant, the Director, all owners of record of land within 250 feet of the site as disclosed in the application, and upon each community within the same watershed as the development. The notices given under the section shall set forth the common name, address and legal description of the development and a brief description of the variance is requested.

§ 904. Granting of variances

(a) The oversight committee shall not recommend nor shall the decision-making authority grant a variance from the provisions of this ordinance unless the variance is consistent with the purposes of this ordinance and meets the following standards based upon substantial evidence submitted at the hearing:

(1) The variance will not increase the probability of flood damage or create an additional threat to the public health, safety and welfare.

(2) The variance is the minimum required considering each of the following statements of policy underlying this ordinance and there are no means other than the requested variance by which the demonstrated

hardship can be avoided or remedied to a degree sufficient to permit the reasonable continuation of the development:

(A) Site runoff storage of stormwater shall also contribute to the improvement of the quality of stormwater runoff.

(B) The volume of site runoff storage provided in open-air vegetated facilities is maximized consistent with other site constraints on land use, including zoning requirements essential for the proposed development.

(C) Conveyance of stormwater shall not disproportionately absorb the design capacity of existing offsite conveyance facilities for any storm event from the two-year to the 100-year flood frequency.

(D) High quality natural areas shall be preserved on the site, including without limitation, stands of native trees, existing wetlands, natural floodplain storage or other valuable environmental and biological resources.

(3) The variance is not requested solely for the purpose of increasing the density of the development nor impervious areas on the site.

(4) The variance is not requested solely as a result of economic hardship.

(5) If applicable, the variance is required due to unique, natural topographical features of the site.

(6) The applicant's circumstances are not self-imposed.

(b) Variances requested in connection with the restoration of an historic structure may be granted using criteria more permissive than those set forth above provided that—

(1) the repair or rehabilitation is the minimum necessary to preserve the historic character and design of the historic structure; and

(2) the repair or rehabilitation will not result in the structure no longer meeting the definition of an historic structure under this ordinance.

(c) No variance shall be granted for any development in the regulatory floodway, regulatory wetlands or critical wetlands, the effect of which would be to create regulations less restrictive than the federal or state minimum standards applicable to development in such areas.

(d) When a variance would lessen the degree of protection to any structure, the Administrator shall notify the applicant that the variance, if granted, may result in increased rates for flood insurance.

§ 905. Recommendations

(a) The Administrator shall review the application for a variance and present his or her written recommendations to the oversight committee at the public hearing.

(b) Not more than 45 days after the close of the hearing, the oversight committee shall forward the application with its written recommendations to the decision-making authority. If the oversight committee fails to act within 45 days, it shall be deemed to have forwarded the application with no recommendation to the decision-making authority. The written recommendations of the oversight committee, when forwarded, shall be accompanied by written findings of fact with respect to each of the elements set forth in § 904 with citations to the evidence taken at the public hearing.

§ 906. Decision

The decision-making authority shall grant the variance, grant the variance with modifications or conditions, or deny the variance in writing within 45 days after receipt of the application from the oversight committee. The

failure of the decision-making authority to act within 45 days, absent the agreement of the applicant to any extension of the time, shall be deemed to be a decision approving the variance.

§ 907. Conditions

(a) A variance less than or different from that requested may be granted when the record supports the applicant's right to some relief, but not to the relief requested.

(b) In granting a variance, the decision-making authority may impose such specific conditions and limitations on the applicant concerning any matter relating to the purposes and objectives of this ordinance as may be necessary or appropriate.

(c) Whenever any variance is granted subject to any condition to be met by the applicant, upon meeting such condition, the applicant shall file evidence to that effect with the Administrator.

ARTICLE 10—ADMINISTRATION**§ 1000. Responsibility for administration**

(a) The oversight committee shall oversee the enforcement of this ordinance.

(b) The Director and Administrator shall administer this ordinance. In performing their duties, the Director and the Administrator may delegate routine responsibilities to any named designee.

(c) Each community shall remain solely responsible for its standing in the National Flood Insurance Program, including —

(1) the maintenance of all records and the submission of all reports required for eligibility in the program, including elevation certificates, floodproofing certificates, and lowest floor elevations; and

(2) the notification of the Director, FEMA, IDNR-OWR, COE, NRCS, the Soil and Water Conservation District, the United States Fish and Wildlife Service, the Illinois Environmental Protection Agency, and the United States Environmental Protection Agency of any proposed amendment to this ordinance.

§ 1001. Duties of Director

The Director shall —

(a) supervise the enforcement of this ordinance;

(b) supervise the development, revision and implementation of the Plan for approval by the Committee and the County;

(c) supervise the review of complex stormwater management permits for any community that requests such assistance;

(d) notify all of the communities in the County, FEMA, IDNR-OWR, COE, NRCS, the Soil and Water Conservation District, the United States Fish and Wildlife Service, the Illinois Environmental Protection Agency, and the United States Environmental Protection Agency of any amendments to the Plan or to this ordinance;

(e) administer the qualified engineer review specialist and qualified wetland review specialist programs;

(f) maintain a current list of all maps considered regulatory under this ordinance; and

(g) administer Article 15.

§ 1002. Duties of Administrator

The Administrator shall —

(a) ensure that all required stormwater related federal, state, regional and County permits and approvals are received prior to issuing any permit under this ordinance;

(b) ascertain whether any special management areas exist on any site which is the subject of an application for a permit under this ordinance;

(c) use qualified review specialists and qualified wetland review specialists for the review of permit applications and consider their recommendations in granting or denying any permit under this ordinance;

(d) ensure that the required notice of an application for a variance has been given and published in accordance with §§ 1006 and 1007;

- (e) notify an applicant for a variance that such variance may result in increased rates for flood insurance, if applicable;
- (f) notify the Director of an application for a CLOMR or LOMR;
- (g) provide for inspections of developments as required by this ordinance;
- (h) investigate complaints of violations of this ordinance within his or her community;
- (i) notify violators within regulatory floodplains that failure to comply with the provisions of the National Flood Insurance Program could make them ineligible to receive flood insurance;
- (j) initiate any proceeding necessary to enforce this ordinance within his or her community;
- (k) advise, consult and cooperate with other governmental agencies to promote the purposes of this ordinance;
- (l) maintain copies of all applications and submittals, federal and state permits, variances, CLOMR, LOMR, CLOMA, LOMA and all documentation associated with any of the foregoing for public inspection;
- (m) maintain documentation and data on the cost of any improvement to a structure in the floodplain in order to enforce the provisions of this ordinance pertaining to substantial improvements to such structures;
- (n) notify adjacent communities in writing 30 days prior to the issuance of a stormwater management permit involving the alteration or relocation of a watercourse; and
- (o) ensure that all wetland impacts have been mitigated.

§ 1003. Representative capacity

In all cases when any action is taken by the Director or the Administrator, or his or her duly appointed designee, to enforce the provisions of this ordinance, such action shall be taken either in the name of the County or the certified community, as the case may be, and neither the Director nor the Administrator, nor his or her designee, in so acting shall be rendered personally liable.

§ 1004. Oversight committee

The corporate authorities of each certified community within the County shall establish an oversight committee to oversee the implementation and enforcement of this ordinance within its jurisdiction and to perform the duties assigned to the oversight committee in this ordinance. The oversight committee may be comprised of the corporate authorities or any committee thereof, plan commission, zoning board of appeals, or other existing body, or the corporate authorities may, according to their own rules and procedures, establish a separate oversight committee. The Executive Committee of the County Board shall designate the oversight committee for the County. The oversight committee, when considering an appeal or request for a variance under this ordinance, may request an opinion from a qualified engineer review specialist or qualified wetland review specialist on technical issues.

§ 1005. Decision-making authority

The corporate authorities of each certified community within the County shall by separate resolution designate a decision-making authority to perform the duties assigned to the decision-making authority in this ordinance. The decision-making authority may be comprised of the corporate authorities or any committee thereof, plan commission, zoning board of appeals, or other existing body, or the corporate authorities may, according to their own rules and procedures, establish a separate decision making authority. The Development Committee of the County Board shall act as the decision-making authority for the County. The decision-making authority, when considering an appeal or request for a variance under this ordinance, may request an opinion from a qualified engineer review specialist or qualified wetland review specialist on technical issues.

§ 1006. Service

Unless otherwise provided herein, service of any notice or other instrument under this ordinance may be made upon any person—

(a) by first class mail, postage prepaid, addressed to address then on file for such person, if any, or if none, to such person's last known address; or

(b) by any method prescribed under the Illinois Code of Civil Procedure.

§ 1007. Publication

Unless otherwise provided herein, publication of any notice or other instrument under this ordinance shall be made by publishing such notice or other instrument once in a newspaper published within the community having jurisdiction over the matter to which the publication relates (or, if no newspaper is published within the community, then a newspaper published in the County and having a general circulation within the community), such publication being not less than 15 nor more than 30 days before the hearing or other event to which the publication relates.

ARTICLE 11—CERTIFIED COMMUNITY ENFORCEMENT**§ 1100. Enforcement authority**

Pursuant to Section 5-1062 of the Counties Code (55 ILCS 5/5-1062 (1996))—

(a) The County shall enforce all of the provisions of this ordinance within the unincorporated areas of the County, within any County right-of-way, within any portion of an uncertified community that lies within the County, and, pursuant to intergovernmental agreement, within any portion of an uncertified community that lies outside the County.

(b) The County shall enforce the provisions of Article 15 within that portion of any certified community that lies within the County and, pursuant to intergovernmental agreement, within that portion of any certified community that lies outside the County.

(c) A community certified under this Article shall enforce all of the provisions of this ordinance with the exception of Article 15 within the community.

§ 1101. Petition for certification and waiver of enforcement

Any community that wishes to enforce the provisions of this ordinance within its borders shall file a petition for certification and waiver of enforcement (*petition for certification*), on or before December 1, 2001. After December 1, 2001, petitions for certification may be filed during the month of June of each year.

§ 1102. Filing and contents of petition for certification

A petition for certification shall be filed with the Director. The petition need not be on any particular form but, at a minimum, shall set forth and be accompanied by—

(a) the agreement of the corporate authorities of the community to adopt, if certified, this ordinance by reference;

(b) the community's plan for the implementation and enforcement of this ordinance, including proposed staffing;

(c) the agreement of the corporate authorities of the community to include in any new annexation agreement a provision requiring every other party to the agreement to affirmatively agree to comply with the provisions of this ordinance, as amended from time to time;

(d) the agreement of the corporate authorities of the community that the community will follow the rules and procedures of the Committee in any proceeding concerning its certification and be bound by the decision of the Committee in granting or failing to grant, or suspending or revoking its certification and reasserting County jurisdiction over the enforcement of this ordinance within the boundaries of the community;

(e) if a portion of the community lies outside the County, the agreement of the corporate authorities of the community to enter into, if certified, an intergovernmental agreement with the County providing for the County's enforcement of the provisions of Article 15 within those portions of the community lying outside the County;

(f) evidence of the community's ability to comply with Article 14 pertaining to the use of qualified review specialists and qualified wetland review specialists;

(g) the list of projects to which this ordinance or some portion of this ordinance do not apply pursuant to the requirements of Article 8.

§ 1103. Committee consideration of petition for certification

The Committee shall consider each properly filed petition for certification at a regular or special meeting called for such purpose not later than 60 days after the filing of the petition. The meeting may be continued from time to time. The Committee may adopt rules for the taking of evidence and conduct of such meetings.

§ 1104. Standards for certification

Upon a finding of the committee that the community has complied with §§ 1101 and 1102, that the community's plan for the implementation and enforcement of this ordinance is reasonably feasible, and that the community has demonstrated the ability to comply with Article 14, the Committee shall grant the petition for certification. The Committee's decision shall be in writing, and shall specify the reasons for granting or denying the petition.

§ 1105. Certified community records

(a) Every certified community shall maintain adequate records of every stormwater management permit issued and every variance granted under this ordinance for development within its borders.

(b) Every certified community shall retain record drawings of all improvements made pursuant to a stormwater management permit issued or variance granted by such community.

(c) The records of each certified community maintained under this ordinance may be periodically inspected by the Department.

(d) Every certified community shall report annually to the Director on forms provided by the Department concerning stormwater management permits issued in the preceding year.

§ 1106. Committee review of enforcement by certified community

The Committee shall periodically review the implementation and enforcement of this ordinance by each certified community.

§ 1107. Investigations; compliance

(a) The Director upon his own initiative or at the request of any person may conduct an investigation into a certified community's implementation and enforcement of this ordinance. Such investigation may include, but is not limited to, an examination of all relevant records maintained by the community and field inspections of relevant developments, structures or stormwater facilities. If upon such investigation, the Director determines that the community has failed in some significant way, or has repeatedly failed, to implement or enforce this ordinance, then he shall prepare a report of his findings along with a complaint for the suspension, revocation or partial revocation of the community's certification and file them with the Committee. The complaint shall contain a short and plain statement describing how the certified community has failed in some significant way, or has repeatedly failed, to implement or enforce this ordinance.

(b) Upon receipt of a written complaint, the Committee shall serve a copy thereof along with a copy of the report of the Director upon the community named therein in accordance with § 1006. A copy of the complaint and report shall also be served upon IDNR-OWR, FEMA, all communities within the same watershed, and upon any person who has requested an investigation of the community's enforcement of this ordinance by the Director within six months immediately preceding the filing of the complaint. The community may file a written answer to the complaint within 30 days after being served.

§ 1108. Hearing on complaint

The Committee shall conduct a hearing on the complaint not less than 75 nor more than 120 days after service of the complaint upon the community. Notice of the hearing shall be served upon the community and all parties which received a copy of the complaint and published in accordance with § 1007. The hearing may be

continued from time to time. The Committee may adopt rules for the taking of evidence and conduct of such hearings.

§ 1109. Committee decision

Within 30 days of the conclusion of the hearing, the Committee shall decide whether or not to suspend or to revoke in whole or in part the certification of the community. The decision of the Committee shall be in writing and shall include the specific findings and conclusions supporting its determination. A copy of the decision and order shall be served upon the community and all parties which received a copy of the complaint in accordance with § 1006. The decision of the Committee to suspend or to revoke the certification of the community in whole or in part, is final and may not be appealed to any court. If the community's certification is suspended, the community shall automatically become re-certified upon the expiration of the period of suspension. If the community's certification is revoked in whole or in part, the community may reapply for certification at or after such time as the Committee shall specify in its order of revocation.

ARTICLE 12— PERFORMANCE SECURITY**§ 1200. General security requirements**

(a) To secure the performance of the developer's obligation to complete the construction of the stormwater facilities required by the stormwater management permit, and to pay all costs, fees and charges due under this ordinance, and to fully and faithfully comply with all of the provisions of this ordinance, the applicant shall, prior to the issuance of a stormwater management permit—

(1) post the security provided in § 1201; and

(2) post the security provided in § 1202 if an erosion and sediment control plan is required under this ordinance.

(b) The applicant shall bear the full cost and responsibility of obtaining and maintaining the security required by this Article.

§ 1201. Development security

(a) In all cases the applicant shall post—

(1) a schedule, agreed upon by the applicant and the Administrator for the completion of any stormwater facilities required by the permit;

(2) a statement of the estimated probable cost to complete the construction of any stormwater facilities required by the permit which estimate is subject to the approval of the Administrator; and

(3) an irrevocable letter of credit in favor of the permitting authority, or such other adequate security as the Administrator may approve, in an amount equal to 110% of the approved estimated probable cost to complete the construction of any required stormwater facilities.

(b) The security required by this section shall be maintained by the applicant in favor of the permitting authority until all stormwater facilities required by the permit have been completed, all conditions set forth in the permit have been satisfied and the applicant has complied with all of the provisions of this ordinance.

(c) The Administrator may approve periodic reductions in the amount of the security based upon the progress of construction. At no time, however, shall more than 90% of the security be released prior to approval of record drawings and final inspection. A minimum of 10% of the original amount of the security shall be retained for a period of one year after completion of all required stormwater facilities.

§ 1202. Erosion and sediment control security

(a) If an erosion and sediment control plan is required under this ordinance the applicant shall post—

(1) a statement of the estimated probable cost to install and maintain the erosion and sediment control measures required by the plan which estimate is subject to the approval of the Administrator; and

(2) an irrevocable letter of credit in favor of the permitting authority, or such other adequate security as the Administrator may approve, in an amount equal to 110% of the approved estimated probable cost to install and maintain the required erosion and sediment control measures.

(b) The security required by this section shall be maintained by the applicant in favor of the permitting authority until construction has been completed, vegetation had been established, sediment has been removed from all stormwater facilities and the development has been finally inspected and approved by the Administrator at which time it shall be released.

§ 1203. Wetland mitigation and performance security

(a) If a wetland mitigation is required under this ordinance and the applicant chooses to mitigate within a wetland mitigation facility, the applicant shall post—

(1) a statement of the estimated probable cost to install, monitor and maintain the wetland mitigation facility required by the plan for five years which estimate is subject to the approval of the Director; and

(2) An irrevocable letter of credit in favor of the County, or such other adequate security as the Director may approve, in an amount equal to 110% of the approved estimated probable cost.

(b) The security required by this section shall be maintained by the applicant in favor of the County until construction has been completed, vegetation has been established and the wetland mitigation facility has been evaluated by the Director and found to meet the performance standards of § 1506 at which time it shall be released.

§ 1204. Letters of credit

(a) Letters of credit posted pursuant to this Article shall be in a form satisfactory to the Administrator.

(b) Each letter of credit shall be drawn on an institution (1) acceptable to the Administrator; (2) having assets of at least \$10 million; (3) having an office in the Chicago metropolitan area; and (4) that is a member of the Federal Deposit Insurance Corporation.

(c) Each letter of credit shall provide that—

(1) it is irrevocable;

(2) the consent of the applicant is not required prior to its presentment for payment; and

(3) if at any time it will expire within 45 or any lesser number of days, and if it has not been renewed and the renewal submitted to the Administrator, and if any obligation of the applicant for which it stands as security remains uncompleted or is unsatisfactory, then the Administrator may, without notice and without being required to take any further action of any nature whatsoever, present the letter of credit for payment and thereafter either hold all proceeds as security for the satisfactory completion of all such obligations or employ the proceeds to complete all such obligations and reimburse the permitting authority for any and all costs and expenses, including legal fees and administrative costs, incurred by the permitting authority.

(d) If the Administrator at any time determines that the amount of the letter of credit is not, or may not be, sufficient to pay in full the remaining unpaid cost of the construction of all stormwater facilities or the installation and maintenance of all erosion and sediment control measures, then, within 10 days following a demand by the Administrator, the applicant shall increase the amount of the letter of credit to the amount determined by the Administrator to be sufficient to pay such unpaid costs. Failure to increase the amount of the letter of credit shall be grounds for the Administrator to present the letter of credit for payment.

(e) If at any time the Administrator determines that the bank issuing the letter of credit is without assets of at least \$10 million, is unable to meet any federal or state requirement for reserves, is insolvent, is in danger of becoming any of the foregoing, or is otherwise in danger of being unable to honor such letter of credit at any time during its term, or if the Administrator otherwise reasonably deems the permitting authority to be insecure, then the Administrator shall have the right to demand that the applicant provide a replacement letter of credit from a bank meeting the requirements of this section. Such replacement letter of credit shall be deposited with the Administrator not less than 10 days following such demand. Upon such deposit, the Administrator shall surrender the original letter of credit to the applicant.

(f) If the applicant fails or refuses to fully meet any of its obligations under this ordinance then the Administrator may, in his or her discretion, present the letter for payment and thereafter either hold all proceeds as security for the satisfactory completion of all such obligations or employ the proceeds to complete all such

obligations or otherwise mitigate the effects of such failure or refusal and may reimburse the permitting authority for any and all costs and expenses, including legal fees and administrative costs, incurred by the permitting authority. If as a result of such default, the remaining amount of the letter of credit is less than the amount otherwise required to be then maintained under this Article, then the applicant shall, upon demand of the Administrator therefor, immediately deposit with the Administrator such additional funds as the Administrator determines to be required to be then maintained.

ARTICLE 13—FEE-IN-LIEU OF SITE RUNOFF STORAGE AND WETLAND MITIGATION**§ 1300. Fee-in-lieu of site runoff storage**

(a) The Director or the Administrator may require, or in the limited circumstances prescribed in Article 2 an applicant may request approval of, the payment of a fee-in-lieu of site runoff storage to fulfill all or part of the site runoff storage requirement for a development. The fee to be paid in lieu of site runoff storage shall be the lesser of—

(1) the fee for each acre-foot or part thereof of storage otherwise required computed under a schedule adopted for such purpose by the permitting authority; or

(2) the verifiable cost of otherwise providing the required storage, including the value of the land required and all construction costs. For this purpose the land required shall be valued according to the use to which it will ultimately be put if not used to provide the required storage.

§ 1301. Procedures; use of funds

(a) An applicant's request for approval of the payment of a fee-in-lieu of site runoff storage shall be submitted to the Administrator with a copy to the Director. The Administrator shall grant or deny the request with 45 days, unless the applicant agrees to an extension.

(b) Fees paid in lieu of site runoff storage shall be deposited by the community in a separate fund created for such purpose. Provisions shall be made so that all receipts and disbursements of such funds may be accounted for according to the individual watershed in which the development for which they were paid was located.

(c) Fees paid in lieu of site runoff storage may be expended to plan, design, construct or improve stormwater management systems within the watershed in which the development for which they were paid was located if such expenditure is consistent with a watershed or interim watershed plan or floodplain study.

§ 1302. Fee-in-lieu of wetland mitigation

If a wetland mitigation is required under this ordinance and the applicant chooses to satisfy the mitigation requirement by paying a fee-in-lieu of mitigation, the applicant shall—

(a) prepare a statement of the estimated probable cost to acquire the land, install, monitor and maintain a wetland mitigation facility for five years (which estimate is subject to the approval of the Director), as if the applicant had chosen to satisfy the mitigation requirement by mitigating within a wetland mitigation facility; and

(b) if mitigation credits are available from any wetland mitigation bank, the applicant shall also prepare a statement of the estimated probable cost of satisfying the mitigation requirement through the purchase of credits from a wetland mitigation bank (which estimate is subject to the approval of the Director) as if the applicant had chosen to satisfy the mitigation requirement in such manner.

(c) The fee-in-lieu of wetland mitigation to be paid under this section shall be the lesser of (a) or (b) above.

§ 1303. Procedures; use of funds

(a) An applicant's statement of its intention to satisfy the wetland mitigation requirement by the payment of a fee-in-lieu of wetland mitigation shall be in writing and filed with the Director along with the estimates described in the preceding section.

(b) Fees paid in lieu of wetland mitigation shall be deposited by County in a separate fund created for such purpose. Provisions shall be made so that all receipts and disbursements of such funds may be accounted for according to the individual watershed in which the development for which they were paid was located.

(c) Fees paid in lieu of wetland mitigation shall be expended to plan, design, construct, improve, acquire, create or enhance wetlands within the County, wetland mitigation facilities and wetland mitigation banks.

ARTICLE 14— QUALIFIED REVIEW SPECIALISTS**§ 1400. General**

The review of an application for a stormwater management permit shall be performed by a qualified engineer review specialist and a qualified wetland review specialist. The qualified engineer review specialist and qualified wetland review specialist together with the Administrator shall determine whether the permit application meets the requirements of this ordinance. The Director shall maintain a list of qualified engineer review specialists and qualified wetland review specialists together with the categories of review in which they have obtained qualification. Review of wetland submittals by a qualified wetland review specialist may be waived if a COE permit is required.

§ 1401. Requirements for qualified engineer review specialists

In order to be included on the list of qualified engineer review specialists an applicant must—

- (a) be a professional engineer registered in Illinois;
- (b) have expertise either by training or significant experience in the following areas:
 - (1) design and permitting of stormwater management facilities;
 - (2) identification of floodplains and floodways, familiarity with FEMA and IDNR-OWR floodplain maps and their policies and procedures;
 - (3) erosion and sediment control practices and procedures; and
 - (4) construction practices and inspection procedures;
- (c) complete, sign, and professionally seal the Qualified Engineer Review Specialist Statement in the form included as Appendix B to this ordinance; and
- (d) file the Qualified Engineer Review Specialist Statement with the Department and pay a fee in an amount to be prescribed by separate ordinance.

§ 1402. Requirements for qualified wetland review specialists

In order to be included on the list of qualified wetland review specialists an applicant must—

- (a) complete a COE approved or other wetland delineation course approved by the Director; and
- (b) have a Bachelors's Degree in an earth science, biological science or engineering together with at least one of the following:
 - (1) three years (cumulative) full-time experience in the Upper Midwest Region engaged in consulting on wetland related projects; or
 - (2) the completion of 100 wetland delineations in the Upper Midwest Region; or
 - (3) six years (cumulative) full-time experience engaged in consulting on wetlands related projects; or
 - (4) 300 hours spent in field review of wetland indications in the Upper Midwest Region; and
- (c) have personally been involved with the design of at least 10 wetland mitigation areas; and
- (d) complete and sign the Qualified Wetland Review Specialist Statement in the form included as Appendix C to this ordinance; and

(e) file the Qualified Wetland Review Specialist Statement with the Department and pay a fee in an amount to be prescribed by separate ordinance.

§ 1403. Review of qualifications

(a) Within 30 days of filing of the application, the Director will notify the applicant of his or her inclusion on the list of qualified engineer review specialists and/or qualified wetland review specialists, as the case may be. If the applicant is not accepted for inclusion in the list, the Director shall specify the reasons for his decision. Within 30 days of his receipt of the decision of the Director, the applicant may appeal to the RSQC by filing a notice thereof with the Department. The RSQC shall conduct a hearing on the appeal in the manner prescribed by §§ 1406 and 1407 from which the applicant may further appeal in the manner prescribed by § 1408.

(b) Once accepted, the applicant, no later than January 1 of each year, shall resubmit the Qualified Engineer Review Specialist Statement and/or Qualified Wetland Review Specialist Statement together with an annual maintenance fee in an amount to be prescribed by separate ordinance in order to maintain his or her inclusion on the list.

§ 1404. Review Specialist Qualification Committee

There is hereby created a Review Specialist Qualification Committee (“*RSQC*”). The RSQC shall consist of three members, one of them designated as chairman, appointed by the Chairman of the County Board with the approval of the County Board. Each member shall be a qualified engineer review specialist or qualified wetland review specialist. One member of the committee shall serve for an initial term of one year, another for an initial term of two years and the third for an initial term of three years. The members shall decide which of them shall serve for a one, two or three year term by lot at the first meeting of the RSQC. Thereafter, each member of the committee shall serve for a term of three years. No member may serve for more than two consecutive terms.

§ 1405. Investigation; compliance

(a) The Director upon his own initiative or at the request of any person may conduct an investigation into the qualifications of a qualified engineer review specialist or qualified wetland review specialist, or such specialist’s performance of permit reviews under this ordinance. Such investigation may include, but is not limited to, an examination of all relevant records maintained by the community and field inspections of relevant developments, structures or stormwater facilities. If upon such investigation, the Director determines that the specialist has failed in some significant way, or has repeatedly failed to conduct such reviews in conformance with this ordinance, then he shall prepare a report of his findings along with a complaint for the suspension or revocation of the specialist’s certification and file them with the RSQC. The complaint shall contain a short and plain statement describing how the specialist has failed in some significant way, or has repeatedly failed to conduct such reviews in conformance with this ordinance.

(b) Upon receipt of a written complaint, the RSQC shall serve a copy thereof along with a copy of the report of the Director upon the specialist named therein in accordance with § 1006. A copy of the complaint and report shall also be served upon every community for whom the specialist has conducted permit reviews. The specialist may file a written answer to the complaint within 30 days after being served.

§ 1406. Hearing on complaint

The RSQC shall conduct a hearing on the complaint not less than 75 nor more than 120 days after service of the complaint upon the specialist. Notice of the hearing shall be served upon the specialist and upon any community which received a copy of the complaint and published in accordance with § 1007. The hearing may be continued from time to time. The RSQC may adopt rules for the taking of evidence and conduct of such hearings.

§ 1407. Decision of the RSQC

Within 30 days of the conclusion of the hearing, the RSQC shall decide whether or not to remove, either temporarily or permanently, the name of the specialist from the list of qualified review specialists. The decision of the RSQC shall be in writing and shall include the specific findings and conclusions supporting its determination. A copy of the decision and order shall be served upon the specialist and upon any community which received a copy of the complaint in accordance with § 1006. If the specialist's name is to be temporarily removed from the list, the specialist shall automatically become requalified upon the expiration of the designated period. If the specialist's name is to be permanently removed, the specialist may apply for qualification at or after such time as the RSQC shall specify in its order.

§ 1408. Appeals

(a) Within 30 days after being served with the order of the RSQC, the specialist may appeal to the Committee. The appeal shall be made by filing a notice thereof with the Department. The Committee shall conduct a hearing on the appeal not less than 75 nor more than 120 days after the filing of the notice of appeal. The hearing shall be *de novo*. Notice of the hearing shall be served upon all parties as for the hearing before the RSQC. The hearing may be continued from time to time. The Committee may adopt rules for the taking of evidence and conduct of such hearings.

(b) Within 30 days of the conclusion of the hearing, the Committee shall decide whether to affirm or reverse, in whole or in part, the order of the RSQC. The decision of the Committee shall be in writing and shall include the specific findings and conclusions supporting its determination. A copy of the decision and order shall be served upon all parties in accordance with § 1006 as for the hearing before the RSQC.

(c) From a final decision of the Committee, the specialist may appeal to the courts under the Illinois Administrative Review Law.

ARTICLE 15— WETLAND IMPACTS AND MITIGATION**§ 1500. General**

All developments having a wetland impact shall comply with this Article. A permit for any wetland impact shall be obtained from the Director.

§ 1501. Unmitigable wetlands—exceptions

(a) Wetlands identified as having an FQI greater than or equal to 25 shall not be filled or dredged as part of any development. The FQI shall be based solely on the wetland vegetation. Buffers and adjacent plant communities shall not be included in the calculation.

(b) If the application of this section would (i) have the effect of depriving the owner of all economically beneficial or productive use of the land; or (ii) make the construction or installation of an essential public improvement by a public entity impossible or highly impracticable the applicant may apply for a variance from the requirements of this section under Article 9. If such a variance is granted mitigation for the wetland impact allowed shall be made according to §§ 1503(a) and 1503(e).

§ 1502. Mitigation required

All mitigable wetland impacts shall be mitigated as described herein with the following exceptions:

(a) A wetland impact created by the dredging of a wetland with an FQI of less than 7 need not be mitigated.

(b) A wetland impact upon manmade wetlands created by excavation or other unfinished development activities in previously non-wetlands areas need not be mitigated.

(c) Wetland impacts upon wetlands created by irrigation which would revert to non-wetlands areas if irrigation were to cease need not be mitigated.

(d) Wetland impacts upon wetlands created by the construction of manmade stormwater management facilities in previously non-wetlands areas need not be mitigated. Proof may be required to verify the purpose and use of the facility.

(e) Wetland impacts created by the construction of manmade ponds in previously non-wetlands areas need not be mitigated.

(f) Wetland impacts occurring on agricultural land that has been enrolled in any program under the Food Security Act for the previous three years need not be mitigated.

§ 1503. Mitigation requirements

(a) For all mitigable wetland impacts—

- (1) mitigation may be made within a wetland mitigation facility;
- (2) mitigation may be made by the purchase of credits from a wetland mitigation bank;
- (3) mitigation may be made by the payment of a fee-in-lieu of mitigation under § 1302;

(b) Wetland impacts upon wetlands with an FQI of less than 7 shall be mitigated at a ratio of 1:1. The applicant may request permission to mitigate within the site runoff storage facility area. The applicant may earn wetland credits by enhancing preserved wetlands with an FQI of 5 or less at the ratio of one-quarter wetland credit per one acre of wetland enhanced. If this option is chosen the entire wetland shall be enhanced even if credit in excess of that required for the development is generated. The enhanced wetland shall meet the performance standards of § 1506.

(c) Wetland impacts upon wetlands with an FQI of 7 or more but less than 16 shall be mitigated at a ratio of 2:1.

(d) Wetland impacts upon wetlands with an FQI of 16 or more but less than 25 shall be mitigated at a ratio of 3:1.

(e) Wetland impacts upon wetlands with an FQI of more than 25 shall be mitigated at a minimum ratio of 10:1 plus one half for each point by which the FQI exceeds 25 rounded up to the nearest whole number. For example, a wetland having an FQI of 32 shall be mitigated at a ratio of 14:1 ($(32-25)/2 = 3\frac{1}{2}$ rounded up to the nearest whole number = 4); $10 + 4 = 14$).

(f) Wetland impacts upon wetlands inhabited by a threatened or endangered species shall be mitigated at a ratio of 3:1.

(g) Mitigation for wetland impacts upon more than one wetland within a site shall meet the standards applicable to the highest quality wetland impacted.

§ 1504. Wetland mitigation plan

(a) In addition to the requirements of Article 5, if wetland mitigation is required a wetland mitigation plan shall be submitted. At a minimum the plan shall contain—

(1) a narrative of the proposed plan including a description of the proposed hydrologic regime, soils and site geomorphology, where applicable;

(2) drawings depicting each wetland impacted and each wetland mitigation facility together with an individual listing contained in a summary table;

(3) specifications for rough and final grading, soil types, soils placement, plant procurement, water control structures and a planting plan that lists the plant materials by scientific and common name, seeding rate or spacing distance and special planting provisions; and

(4) maintenance and monitoring provisions including an annual work schedule describing each task in detail and time of year when it will be performed.

(b) The wetland mitigation plan shall be designed so that—

(1) every wetland mitigation facility shall contain at least two wetland plant communities (for example, wet prairie, emergent, floating vascular, forested wetland, sedge meadow, or hemi marsh); and

(2) open water shall not constitute more than 20% of the entire wetland mitigation facility.

§ 1505. Buffer requirements for wetland mitigation facilities

Wetland mitigation facilities shall be buffered according to the requirements of § 418. Reductions are allowed in accordance with § 418(a)(3)(B)(ii), 418(a)(3)(B)(iii) and 418(a)(3)(B)(iv). No buffer is required for that portion of a wetland mitigation facility which is adjacent to an existing preserved wetland.

§ 1506. Wetland mitigation performance standards

(a) All wetland mitigation facilities shall meet the following performance standards:

(1) They shall meet the definition of a wetland under this ordinance.

(2) All vegetated zones within any wetland mitigation facility shall achieve 85% cover.

- (3) The emergent community shall achieve 60% aerial coverage.
- (4) The floating vascular community shall meet 25% aerial coverage.
- (5) Open water shall have 0% vegetative coverage.

(b) A wetland mitigation facility designed to mitigate for impacts upon wetlands with an FQI of less than 7 shall achieve a minimum FQI 3 points greater than the FQI of the wetland impacted within the five-year monitoring period.

(c) A wetland mitigation facility designed to mitigate for impacts upon wetlands with an FQI of 7 or more but less than 25 shall achieve a minimum FQI 5 points greater than the FQI of the wetland impacted within the five-year monitoring period.

(d) A wetland mitigation facility shall not be dominated or contain cumulatively more than 25% cover of the following species: Buckthorn (*Rhamnus cathartica* or *frangula*), Reed-Canary Grass (*Phalaris arundinacea*), Purple Loosestrife (*Lythrum salicaria*), or Giant Reed (*Phragmites australii*).

§ 1507. Mitigation monitoring

The wetland mitigation facility shall be monitored and managed for five years beginning on the day the wetland planting is completed. The procedures for monitoring wetland mitigation facilities shall be those set forth in the current Chicago District protocol promulgated by COE. An annual report shall be filed with the Director by February 15 of each year for every wetland mitigation facility under permit. Once a wetland mitigation facility reaches its required FQI and meets the performance standards of § 1506, a request for the release of the performance security may be made to the Director. A release of the performance security may be requested of the Director as early as the end of the third full growing season. At the end of the five-year monitoring and management period, or upon acceptance by the Director, the wetland mitigation facility shall be maintained in accordance with Article 6.

§ 1508. Mitigation required for non-performing wetland

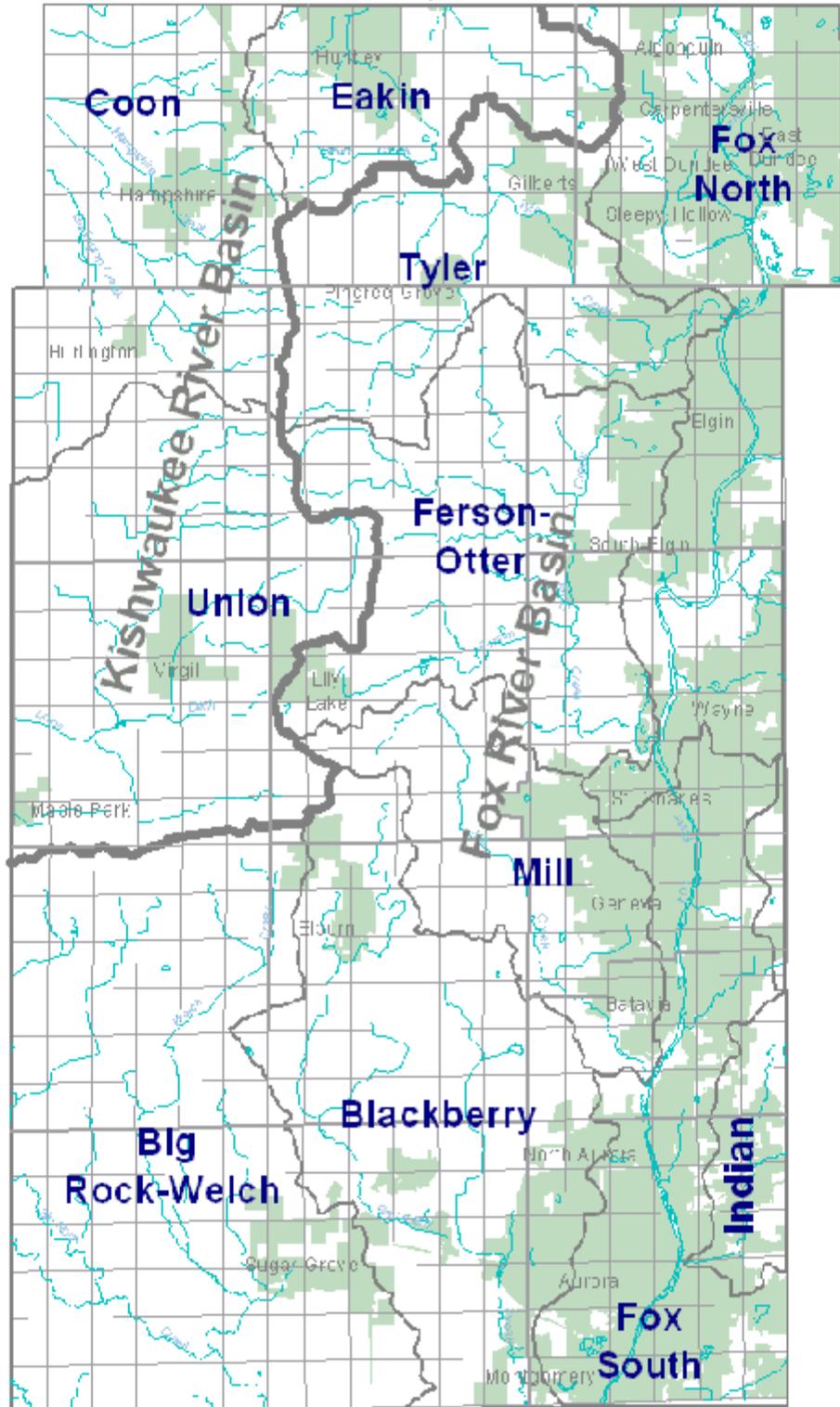
At the end of the five-year monitoring period or upon an earlier request for the release of the performance security, the Director shall evaluate the wetland mitigation facility for compliance with the performance standards of § 1506. If the Director determines that the facility meets the standards he shall release the performance security. If the Director determines that the facility does not meet the standards he shall make an estimate of the probable cost of mitigating for the shortfall in performance. The Director shall reduce so much of the performance security to cash as is required to mitigate for the shortfall in performance and shall release the remainder. The amount withheld for mitigation shall be deposited in the fund created under and expended in the manner described in § 1303.

§ 1509. Denial of permit—appeal

The denial of a permit under this Article may be appealed in the manner described in § 511.

APPENDIX A—WATERSHED BOUNDARIES

Appendix A. Watershed Boundaries for Major Watersheds Kane County, Illinois



APPENDIX B—QUALIFIED ENGINEER REVIEW SPECIALIST STATEMENT

I, _____, of _____, with professional licensure in the State of Illinois, do hereby state that I have read and understand the Kane County Stormwater Ordinance and the Technical Manual which accompanies it, and will obtain, read and abide by any amendments thereto. I affirmatively state that I meet the requirements set forth in § 1401 of the ordinance. I will review projects for compliance with the ordinance using my expertise in stormwater management system design and permitting, floodplain and floodway policies and procedures, soil erosion and sediment control procedures and practices, and construction practices and inspections. I will exercise professional judgment with respect to projects submitted for my review in accordance with the customary standard of care applicable to persons providing similar services in the same or similar communities in order to insure substantial conformance with the ordinance. I understand that failure to adequately discharge this obligation may, with due process, result in loss of this status. It is my responsibility to provide the Director with any changes to the information provided.

Signed

P. E. Registration Number Expiration Date

(Seal)

Telephone: _____

Fax: _____

Email: _____

Employer: _____

(Attach a one-page summary of your qualifications under § 1401 of the ordinance.)

APPENDIX C—QUALIFIED WETLAND REVIEW SPECIALIST STATEMENT

I, _____, of _____, do hereby state that I have read and understand the Kane County Stormwater Ordinance and the Technical Manual which accompanies it, and will obtain, read and abide by any amendments thereto. I affirmatively state that I meet the requirements set forth in § 1402 of the ordinance. I will review projects for compliance with those sections of the ordinance pertaining to wetlands, including, without limitation, wetland delineation and the calculation of buffer widths. I will use my expertise in wetland delineations or field identification of wetland indicators in the Upper Midwest. I understand that failure to adequately discharge this obligation may, with due process, result in loss of this status. It is my responsibility to provide the Director with any changes to the information provided.

Signed _____

Telephone: _____

Fax: _____

Email: _____

Employer: _____

(Attach a one-page summary of your qualifications under § 1402 of the ordinance.)

APPENDIX D—SAMPLE SPECIAL SERVICE AREA ORDINANCES

[CITY/VILLAGE] OF _____

ORDINANCE NO. _____

**AN ORDINANCE PROPOSING THE ESTABLISHMENT OF THE
_____ SPECIAL SERVICE AREA [or SPECIAL SERVICE AREA
NO. _____] OF _____, ILLINOIS
AND THE LEVY OF TAXES FOR THE PURPOSE OF PAYING THE COST
OF PROVIDING SPECIAL SERVICES IN AN FOR SUCH AREA**

**ADOPTED BY THE
[MAYOR AND CITY COUNCIL/PRESIDENT AND BOARD OF TRUSTEES]
OF THE
[CITY/VILLAGE] OF _____**

[DATE]

ORDINANCE NO. _____

AN ORDINANCE PROPOSING THE ESTABLISHMENT OF THE _____ SPECIAL SERVICE AREA [or SPECIAL SERVICE AREA NO. _____] OF _____, ILLINOIS AND THE LEVY OF TAXES FOR THE PURPOSE OF PAYING THE COST OF PROVIDING SPECIAL SERVICES IN AN FOR SUCH AREA

WHEREAS pursuant to the provisions of the 1970 Constitution of the State of Illinois (the *Constitution*), the [City/Village] of _____, Kane County, Illinois (the [*City/Village*]), is authorized to create special service areas in and for the [City/Village]; and

WHEREAS special service areas are established by non-home rule¹ units pursuant to Section 7(6) of Article VII of the Constitution, which provides that—

[M]unicipalities...which are not home rule units shall have...powers...to levy or impose additional taxes upon areas within their boundaries in the manner provided by law for the provision of special services to those areas and for the payment of debt incurred in order to provide those special services;

and are established “in the manner provided by law” pursuant to the provisions of “AN ACT to provide the manner of levying or imposing taxes for the provision of special services to areas within the boundaries of home rule units and non-home rule municipalities and counties,” approved September 21, 1973, as amended, and pursuant to the Revenue Act of 1939 of the State of Illinois, as amended; and

WHEREAS it is in the public interest that the establishment of the area hereinafter described as a special service area for the purposes set forth herein and to be designated as the _____ Special Service Area [or Special Service Area No. _____], of the [City/Village] (the *Area*) be considered; and

WHEREAS the Area is compact and contiguous, totally within the corporate limits of the [City/Village]; and

WHEREAS the Area will benefit specially from the municipal services to be provided by the [City/Village] (the *Services*), and the Services are unique and in addition to the services provided to the [City/Village] as a whole, and it is, therefore, in the best interests of the [City/Village] that the establishment of the Area be considered; and

WHEREAS it is in the public interest that the levy of a direct annual *ad valorem* tax upon all taxable property within the Area be considered for the purpose of paying the cost of providing the Services; and

WHEREAS the revenue from such tax shall be used solely and only for Services for which the [City/Village] is authorized under the provisions of the Illinois Municipal Code, as amended, to levy taxes or special assessments or to appropriate the funds of the [City/Village], all of the Services to be in and for the Area and all of the necessary construction and maintenance to be on property now owned or to be acquired by the [City/Village], or property in which the [City/Village] will obtain an interest sufficient for the provision of the Services; and

WHEREAS said direct annual *ad valorem* tax shall be levied upon all taxable property within the Area for an indefinite period of time beginning for the year _____ and shall not exceed an annual rate of _____ of the assessed valuation of each tax parcel within the Area and shall be in addition to all other taxes permitted by law; and

WHEREAS a public hearing will be held at _____, on the _____ day of _____, _____, in the [City/Village] Hall, _____, _____, Illinois _____ (the *Hearing*), to consider the establishment of the Area for the purpose of providing the Services and the levy of an

¹Home rule municipalities should alter this language accordingly.

additional direct annual *ad valorem* tax for the purpose of paying the cost thereof, all as described in the Notice of Public Hearing set forth in Section 2 hereof (the *Notice*); and

WHEREAS the Notice shall be given by publication and mailing. Notice by publication shall be given by publication on a date, such date being not less than 15 days prior to the Hearing, in a newspaper published within the [City/Village] [or, of general circulation within the [City/Village], there being no newspaper published therein]. Notice by mailing shall be given by depositing the Notice in the United States Mail addressed to the person or persons in whose name the general taxes for the last preceding year were paid on each lot, block, tract, or parcel of land lying within the Area. The Notice shall be mailed not less than 10 days prior to the time set for the Hearing. In the event taxes for the last preceding year were not paid, the Notice shall be sent to the person last listed on the tax rolls prior to that year as the owner of said property.

NOW, THEREFORE, Be it Ordained by the [Mayor and City Council/President and the Board of Trustees] of the [City/Village] of _____, Kane County, Illinois, as follows:

§1. Incorporation of preambles

The preambles of this ordinance are hereby incorporated into this text as if set out herein in full.

§2. Notice

The [Mayor and City Council/President and Board of Trustees] determine that the Notice is in the proper statutory form as set forth as follows:

NOTICE OF PUBLIC HEARING
[City/Village] OF _____, KANE COUNTY, ILLINOIS
_____ SPECIAL SERVICE AREA [or NO. _____]

NOTICE IS HEREBY GIVEN that on _____, at _____, in the [City/Village] Hall, _____, _____, Illinois, a public hearing (the *Hearing*) will be held by the [Mayor and City Council/President and Board of Trustees] of the [City/Village] of _____, Kane County, Illinois (the [City/Village]), to consider the establishment of the _____ Special Service Area [No. _____], (the *Area*), of the [City/Village], consisting of the following described territory:

SEE ATTACHED EXHIBIT A

Said territory consists of approximately ___ acres lying [insert general description of location]. An accurate map of said territory is on file in the office of the [City/Village] Clerk and is available for public inspection.

The purpose of the establishment of the Area is to provide the following special services (the *Services*) to the Area: the operation, maintenance, repair, rehabilitation, replacement and reconstruction of any storm water site runoff storage area, drainageway, ditch, swale, storm sewer or other stormwater facility; costs of design, engineering and other consulting services, surveying and permits, public liability insurance, and all administrative, legal and other costs or expenses incurred in connection therewith and with the administration of the Area, including the repayment of any loan or debt incurred for the provision of any of such Services, all of the Services to be in and for the Area.

All of the Services are to be on property now owned or to be acquired by the [City/Village], or property in which the [City/Village] will obtain an interest sufficient for the provision of the Services.

The levy of a direct annual *ad valorem* tax upon all taxable property within the Area for the purpose of paying the cost of the Services will also be considered at the Hearing. The tax shall be levied upon all taxable property within the Area for an indefinite period of time beginning for the year _____ and shall not exceed an annual rate of _____ of the assessed valuation of each tax parcel within the Area and shall be in addition to all other taxes permitted by law.

All interested persons affected by the establishment of the Area or tax levy, including all owners of real estate located within the Area, will be given an opportunity to be heard at the Hearing regarding the establishment of the Area and the tax levy and an opportunity to file objections to the establishment of the Area or the tax levy.

At the Hearing, any interested persons affected by the Area may file with the [City/Village] Clerk written objections to and may be heard orally in respect to any issues embodied in this notice. The [Mayor and City Council/President and Board of Trustees] shall hear and determine all protests and objections at the Hearing, and the Hearing may be adjourned to another date without further notice other than a motion to be entered upon the minutes fixing the time and place of its adjournment.

If a petition signed by at least 51% of the electors residing within the Area and by at least 51% of the owners of record of the land included within the boundaries of the Area is filed with the [City/Village] Clerk within 60 days following the final adjournment of the Hearing objecting to the creation of the Area or the levy or imposition of a tax for the provision of the Services to the Area, no such Special Service Area may be created or no tax may be levied or imposed.

By order of the [Mayor and City Council/President and Board of Trustees] of the [City/Village] of _____, Kane County, Illinois.

DATED this _____ day of _____, _____.

/s/

[City/Village] Clerk, [City/Village] of _____,
Kane County, Illinois

§3. Miscellaneous

The [City/Village] agrees to produce or file such forms, statements, proceedings and supporting documents as may be required and in a timely manner in order to establish the Area and levy the taxes and, if deemed necessary or advisable by its officers, to employ and pay fiscal agents, financial advisors, attorneys and other persons to assist the [City/Village] in these endeavors.

§4. Repealer; effective date

All ordinances, orders and resolutions and parts thereof in conflict herewith be and the same are hereby repealed, and this ordinance be in full force and effect forthwith upon its passage, approval and publication as provided by law.

DATED: _____.

<i>Alderman/Trustee</i>	<i>Aye</i>	<i>Nay</i>	<i>Absent</i>	<i>Abstain</i>
Totals				

Approved:

[Mayor/President]

Attested, Filed in my office, and published in pamphlet form on _____, 20__:

Clerk of the [City/Village] of _____,
Kane County, Illinois

[CITY/VILLAGE] OF _____

ORDINANCE NO. _____

AN ORDINANCE ESTABLISHING THE
_____ SPECIAL SERVICE AREA [OR NO. _____]
OF _____, ILLINOIS
AND PROVIDING FOR THE LEVY OF TAXES FOR THE PURPOSE OF
PAYING THE COST OF PROVIDING SPECIAL SERVICES
IN AND FOR SUCH AREA

ADOPTED BY THE
[MAYOR AND CITY COUNCIL/PRESIDENT AND BOARD OF TRUSTEES]
OF THE
[CITY/VILLAGE] OF _____

[DATE]

ORDINANCE NO. _____

AN ORDINANCE ESTABLISHING THE
_____ SPECIAL SERVICE AREA [or NO. ____] OF
_____, ILLINOIS
AND PROVIDING FOR THE LEVY OF TAXES FOR THE PURPOSE OF
PAYING THE COST OF PROVIDING SPECIAL SERVICES
IN AND FOR SUCH AREA

WHEREAS, pursuant to the provisions of the 1970 Constitution of the State of Illinois (the *Constitution*), the [City/Village] of _____, Kane County, Illinois (the [City/Village]), is authorized to create special service areas in and for the [City/Village]; and

WHEREAS, special service areas are established by non-home rule² units pursuant to Section 7(6) of Article VII of the Constitution, which provides that—

municipalities...which are not home rule units shall have only the powers granted to them by law and the powers...(6) to levy or impose additional taxes upon areas within their boundaries in the manner provided by law for the provision of special services to those areas and for the payment of debt incurred in order to provide those special services;

and

WHEREAS, special service areas are established “in the manner provided by law” pursuant to the provisions of “AN ACT to provide the manner of levying or imposing taxes for the provision of special services to areas within the boundaries of home rule units and non-home rule municipalities and counties,” approved September 21, 1973, as amended (the *Act*), and pursuant to the provisions of the Revenue Act of 1939 of the State of Illinois, as amended; and

WHEREAS, it is in the public interest that the area hereinafter described be established as the _____ Special Service Area [or No. _____] of the [City/Village] for the purposes set forth herein (the *Area*); and

WHEREAS, the Area is compact and contiguous and totally within the boundaries of the [City/Village]; and

WHEREAS, the Area will benefit specially from the services to be provided by the [City/Village] (the *Services*), and the Services are unique and in addition to the services provided to the [City/Village] as a whole, and it is, therefore, in the best interests of the [City/Village] that the Area be established; and

WHEREAS, the cost of providing the Services shall be paid by the levy of a direct annual *ad valorem* tax upon all taxable property within the Area; and

WHEREAS, said direct annual tax shall be levied upon all taxable property within the Area for an indefinite period of time beginning for the year _____ and shall not exceed an annual rate of _____ of the assessed valuation of each tax parcel within the Area and shall be in addition to all other taxes permitted by law; and

WHEREAS, the establishment of the Area was proposed by the [City Council/Board of Trustees] of the [City/Village] (the [Council/Board]) pursuant to Ordinance No. _____, entitled:

AN ORDINANCE proposing the establishment of the _____ Special Service Area [or No. _____] of _____, Illinois, and the levy of

²Home rule units should alter this language accordingly.

taxes for the purpose of paying the cost of providing special services in and for such Area.

(the *Proposing Ordinance*), duly adopted on _____, and was considered at a public hearing (the *Hearing*) held by the [Council/Board] on _____; and

WHEREAS, notice of the Hearing was given by publication at least once not less than 15 days prior to the Hearing in _____, the same being a newspaper published in the [City/Village] [or, of general circulation with the [City/Village], there being no newspaper published therein]; and

WHEREAS, mailed notice of the Hearing was given by depositing notice in the United States mails addressed to the person or persons in whose name the general taxes for the last preceding year were paid on each lot, block, tract or parcel of land lying within the Area not less than 10 days prior to the time set for the Hearing, and in the event taxes for the last preceding year were not paid, the notice was sent to the person or persons last listed on the tax rolls prior to that year as the owner or owners of said property; and

WHEREAS, said notice complied with all of the applicable provisions and requirements of the Act; and

WHEREAS, all interested persons affected by the establishment of the Area or the levy of the tax to pay the cost of providing the Services, including all owners of real estate located within the Area, were given an opportunity to be heard at the Hearing regarding the establishment of the Area and the levy of said tax and an opportunity to file objections to the establishment of the Area or the levy of said tax; and

WHEREAS, at the Hearing, all interested persons affected by the Area were permitted to file with the [City/Village] Clerk written objections to and to be heard orally in respect to any issue embodied in the notice given of the Hearing; and

WHEREAS, the Council/Board has determined and does hereby determine that it is in the public interest and in the interest of the [City/Village] and the Area that the Area be established;

NOW, THEREFORE, Be It Ordained by the [Mayor and City Council/President and Board of Trustees] of the [City/Village] of _____, Kane County, Illinois, as follows:

§1. Incorporation of preambles

The preambles of this ordinance are hereby incorporated into this text as if set out herein in full.

§2. Final adjournment of Hearing

The Hearing was finally adjourned on _____.

§3. Establishment of Area

(a) The _____ Special Service Area [or No. _____] of the [City/Village] is hereby established in and for the [City/Village] and shall consist of the territory legally described in Exhibit A attached.

(b) Said territory consists of approximately _____ acres lying [insert a general description of the location of the area] in the [City/Village]. An accurate map of the Area is attached hereto and made a part hereof.

§4. Purpose of the establishing the Area

The purpose of establishing the Area is to provide the Services to the Area, including the operation, maintenance, repair, rehabilitation, replacement and reconstruction of any site runoff storage area, drainageway, ditch, swale, storm sewer, or other stormwater facility; costs of design, engineering and other consulting services, surveying and permits, public liability insurance, and all administrative, legal and other costs or expenses incurred in connection therewith and with the administration of the Area, including the repayment of any loan or debt incurred for the provision of any of such Services, all of the Services to be in and for the Area and all of said

construction and improvements to be on property now owned or to be acquired by the [City/Village], or property in which the [City/Village] will obtain an interest sufficient for the provision of the Services.

§5. Tax Levy

The cost of the Services shall be paid by the levy of a direct annual *ad valorem* tax upon all taxable property within the Area for an indefinite period of time beginning for the year _____ and shall not exceed an annual rate of _____ of the assessed valuation of each tax parcel within the Area and shall be in addition to all other taxes permitted by law.

§6. Filing

The [City/Village] Clerk is hereby directed to file a certified copy of this ordinance, including an accurate map of the Area, in the office of the Kane County Clerk and in the office of the Kane County Recorder forthwith after its adoption and approval.

§7. Repealer

All ordinances, orders and resolutions and parts thereof in conflict herewith be and the same are hereby repealed, and this ordinance be in full force and effect forthwith upon its adoption.

DATED: _____.

<i>Alderman/Trustee</i>	<i>Aye</i>	<i>Nay</i>	<i>Absent</i>	<i>Abstain</i>
Totals				

Approved:

[Mayor/President]

Attested, Filed in my office and published in pamphlet form on _____, 20__:

Clerk of the [City/Village] of _____,
Kane County, Illinois

mitigation required under this ordinance for wetland impacts in any other county may be provided in such county or in the County.

§ 3. Section 800 is amended to read as follows:

§ 800. Scope of regulation

This ordinance applies to all development within the County and to all development within the corporate boundaries of any certified community, including that under the control of any governmental entity, agency, or authority. Any person undertaking a development shall obtain a stormwater management permit from the permitting authority within whose boundaries the development is located. Any person undertaking a development having a wetland impact shall obtain a permit from the Director (or Administrator in a community certified under this ordinance to administer Article 15). Any certified community undertaking development in the regulatory floodway, or regulatory floodplain where no regulatory floodway has been designated, shall obtain a permit from IDNR-OWR if required prior to issuance of a stormwater management permit. All units of local government shall obtain stormwater management permits from the permitting authority within whose boundaries the development is located.

§ 4. Section 1001 is amended to read as follows:

§ 1001. Duties of Director

The Director shall —

- (a) supervise the enforcement of this ordinance;
- (b) supervise the development, revision and implementation of the Plan for approval by the Committee and the County;
- (c) supervise the review of complex stormwater management permits for any community that requests such assistance;
- (d) notify all of the communities in the County, FEMA, IDNR-OWR, COE, NRCS, the Soil and Water Conservation District, the United States Fish and Wildlife Service, the Illinois Environmental Protection Agency, and the United States Environmental Protection Agency of any amendments to the Plan or to this ordinance;
- (e) administer the qualified engineer review specialist and qualified wetland review specialist programs;

(f) maintain a current list of all maps considered regulatory under this ordinance; and

(g) administer Article 15 **except in those communities certified under this ordinance to administer Article 15.**

§ 5. Sections 1100, 1101 and 1102 are amended to read as follows:

§ 1100. Enforcement authority

Pursuant to Section 5-1062 of the Counties Code (55 ILCS 5/5-1062 (1996))—

(a) The County shall enforce all of the provisions of this ordinance within the unincorporated areas of the County, within any County right-of-way, within any portion of an uncertified community that lies within the County, and, pursuant to intergovernmental agreement, within any portion of an uncertified community that lies outside the County.

(b) ~~{The}~~ **Unless such community has been certified under this Article to administer Article 15, the** County shall enforce the provisions of Article 15 within that portion of any certified community that lies within the County and, pursuant to intergovernmental agreement, within that portion of any certified community that lies outside the County.

(c) A community certified under this Article shall enforce all of the provisions of this ordinance ~~{with the exception of Article 15}~~ within the community **for which it has received certification.**

§ 1101. Petition for certification and waiver of enforcement

Any community that wishes to enforce the provisions of this ordinance within its borders shall file a petition for certification and waiver of enforcement (*petition for certification*), on or before ~~{December 1, 2001. After December 1, 2001}~~ **January 8, 2002.** **After January 8, 2002,** petitions for certification may be filed during the month of June of each year.

§ 1102. Filing and contents of petition for certification

A petition for certification shall be filed with the Director. The petition need not be on any particular form but, at a minimum, shall set forth and be accompanied by—

(a) the agreement of the corporate authorities of the community to adopt, if certified, this ordinance by reference;

(b) the community's plan for the implementation and enforcement of this ordinance, including proposed staffing;

(c) the agreement of the corporate authorities of the community to include in any new annexation agreement a provision requiring every other party to the agreement to affirmatively agree to comply with the provisions of this ordinance, as amended from time to time;

(d) the agreement of the corporate authorities of the community that the community will follow the rules and procedures of the Committee in any proceeding concerning its certification and be bound by the decision of the Committee in granting or failing to grant, or suspending or revoking its certification and reasserting County jurisdiction over the enforcement of this ordinance within the boundaries of the community;

(e) if a portion of the community lies outside the County **and the community has not requested, or if requested does not receive, certification to administer Article 15**, the agreement of the corporate authorities of the community to enter into, if certified **to administer the remaining provisions of this ordinance**, an intergovernmental agreement with the County providing for the County's enforcement ~~{of the provisions}~~ of Article 15 within those portions of the community lying outside the County;

(f) evidence of the community's ability to comply with Article 14 pertaining to the use of qualified review specialists and qualified wetland review specialists;

(g) if the community has requested certification to administer Article 15, evidence of the community's ability to do so;

(h) the list of projects to which this ordinance or some portion of this ordinance do not apply pursuant to the requirements of Article 8.

§ 6. Section 1203 is amended to read as follows:

§ 1203. Wetland mitigation and performance security

(a) If **mitigation for** a wetland ~~{mitigation}~~ **impact** is required under this ordinance and the applicant chooses to mitigate within a wetland mitigation facility, the applicant shall post—

(1) a statement of the estimated probable cost to install, monitor and maintain the wetland mitigation facility required by the plan for five years which estimate is subject to the approval of the Director (or Administrator in a community certified to administer Article 15); and

(2) An irrevocable letter of credit in favor of the County (or community in a community certified to administer Article 15), or such other adequate security as the Director (or Administrator in a community certified to administer Article 15), may approve, in an amount equal to 110% of the approved estimated probable cost.

(b) The security required by this section shall be maintained by the applicant in favor of the County (or community in a community certified to administer Article 15), until construction has been completed, vegetation has been established and the wetland mitigation facility has been evaluated by the Director (or Administrator in a community certified to administer Article 15), and found to meet the performance standards of § 1506 at which time it shall be released.

§ 7. Sections 1302 and 1303 are amended to read as follows:

§ 1302. Fee-in-lieu of wetland mitigation

If a wetland mitigation is required under this ordinance and the applicant chooses to satisfy the mitigation requirement by paying a fee-in-lieu of mitigation, the applicant shall—

(a) prepare a statement of the estimated probable cost to acquire the land, install, monitor and maintain a wetland mitigation facility for five years (which estimate is subject to the approval of the Director ~~†~~(or Administrator in a community certified to administer Article 15)), as if the applicant had chosen to satisfy the mitigation requirement by mitigating within a wetland mitigation facility; and

(b) if mitigation credits are available from any wetland mitigation bank, the applicant shall also prepare a statement of the estimated probable cost of satisfying the mitigation requirement through the purchase of credits from a wetland mitigation bank (which estimate is subject to the approval of the Director ~~†~~(or Administrator in a community certified to administer Article 15)) as if the applicant had chosen to satisfy the mitigation requirement in such manner.

(c) The fee-in-lieu of wetland mitigation to be paid under this section shall be the lesser of (a) or (b) above.

§ 1303. Procedures; use of funds

(a) An applicant's statement of its intention to satisfy the wetland mitigation requirement by the payment of a fee-in-lieu of wetland mitigation shall be in writing and filed with the Director (or Administrator in a community certified to administer Article 15), along with the estimates described in the preceding section.

(b) Fees paid in lieu of wetland mitigation shall be deposited by County (or community if certified to administer Article 15), in a separate fund created for such purpose. Provisions shall be made so that all receipts and disbursements of such funds may be accounted for according to the individual watershed in which the development for which they were paid was located.

(c) Fees paid in lieu of ~~wetland~~ mitigation for wetland impacts within the County shall be expended to plan, design, construct, improve, acquire, create or enhance wetlands within the County, or wetland mitigation facilities and wetland mitigation banks. Fees paid in lieu of mitigation for wetland impacts within any other county may be expended to plan, design, construct, improve, acquire, create or enhance wetlands within such county or within the County, or wetland mitigation facilities and wetland mitigation.

§ 8. Section 1500 is amended to read as follows:

§ 1500. General

All developments having a wetland impact shall comply with this Article. A permit for any wetland impact shall be obtained from the Director (or Administrator in a community certified to administer Article 15).

Passed by the Kane County Board this _____ day of _____, 2001.

Chairman, Kane County Board

County Clerk

County of Kendall

Stormwater Management Ordinance

Prepared by:

STRAND ASSOCIATES, INC.®
Excellence in Engineering Since 1946
2400 Glenwood Avenue, Suite 226
Joliet, IL 60435

September 2002



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APPENDIX A – PERMIT SUBMITTAL CHECKLIST

100.0 AUTHORITY AND PURPOSE

This ordinance is enacted pursuant to the police powers granted to Kendall County, Illinois, by the Illinois Compiled Statutes and the Kendall County Land Resource Management Plan.

The purpose of this ordinance is to diminish threats to public health, safety and welfare caused by excess stormwater runoff from new development and redevelopment. This ordinance seeks to establish stormwater management practices and promote sustainable planning and design to counter increases in stormwater runoff quantity and rate and the impairment of water quality from development and land improvement.

101.0 OBJECTIVES

This ordinance is adopted to accomplish the following objectives:

1. To assure that new development does not increase the drainage or flood hazards to others, or create unstable conditions susceptible to erosion;
2. To protect new buildings and major improvements to buildings from flood damage due to increased stormwater runoff;
3. To protect human life and health from the hazards of increased flooding;
4. To lessen the burden on the taxpayer for flood control projects, repairs to flood-damaged public facilities and utilities, correction of channel erosion problems, and flood rescue and relief operations caused by increased stormwater runoff quantities from new development;
5. To protect, conserve, and promote the orderly development of land and water resources;
6. To preserve the natural hydrologic and hydraulic functions of watercourses and floodplains and to protect water quality and aquatic habitats;
7. To preserve the natural characteristics of the land in order to moderate flood and stormwater impacts, improve water quality, reduce soil erosion, protect aquatic and riparian habitat, provide recreational opportunities, provide aesthetic benefits and enhance community and economic development.

200.0 DEFINITIONS

Adverse Impacts	Any deleterious impact on existing drainage characteristics, water resources, or wetlands affecting their capacity, quality, and beneficial uses including recreation, aesthetics, aquatic habitat.
Applicant	Any person, firm, or governmental agency who executes the necessary forms to procure official approval from Kendall County of a development or permit to carry out construction of a development.
Base Flood	The flood having a one percent probability of being equaled or exceeded in a given year.
Base Flood Elevation	The elevation at all locations delineating the level of flooding resulting from the base flood event.
Best Management Practice (BMP)	A measure used to control the adverse stormwater-related effects of development. BMPs include structural devices (e.g., swales, filter strips, infiltration trenches, and detention basins) designed to remove pollutants, reduce runoff rates and volumes, and protect aquatic habitats. BMPs also include non-structural approaches, such as public education efforts to prevent the dumping of household chemicals into storm drains.
Bulletin71	The document Rainfall Frequency Atlas of the Midwest, by Floyd Huff and James Angel of the Midwest Climate Center, Illinois State Water Survey (1992).
Bypass Flows	Stormwater runoff from upstream properties tributary to a property's drainage system but not under its control.
Channel	Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or manmade drainageway, which has a definite bed and bank or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.
Channel Modification	Alteration of a channel by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, rip rapping (or other armoring), widening, deepening, straightening, relocating, lining, and significant removal of bottom or woody rooted vegetation. Channel modification does not include the clearing of debris or removal of trash.
Compensatory Storage	An artificially excavated, hydraulically equivalent volume of storage created to balance the loss of existing flood storage capacity.

Conduit	Any channel, pipe, sewer or culvert used for the conveyance or movement of water, whether open or closed.
Control Structure	A structure designed to control the rate of flow that passes through the structure given a specific upstream and downstream water surface elevation.
Critical Duration	The duration of a storm event that results in the greatest peak runoff.
Depressional Storage	The volume contained below a closed contour on a one-foot contour interval topographic map. The upper elevation of depressional storage shall be determined by the high water elevation of a 100-year flood through the site in the pre-developed condition.
Detention Basin	A facility constructed or modified to provide for the temporary storage of stormwater runoff and the controlled release by gravity of this runoff at a prescribed rate during and after a flood or storm.
Detention Time	The mean residence time of stormwater in a detention basin.
Development	Any man-made change to real property, including: (a) Submittal to the County of a final plat of subdivision as of the effective date of this ordinance; (b) Construction, reconstruction, or placement of a building or any addition to a building, with the exception of agricultural structures and accessories thereto; (c) Installation of a manufactured home on a site, preparing a site for a manufactured home, or installing a travel trailer on a site for more than 180 days; (d) Drilling, mining, installing utilities, construction of roads, bridges, or similar projects; (e) Construction or erection of levees, walls, dams, or culverts; (f) Channel modification, filling, dredging, grading, clearing, excavating, paving, or other non-agricultural alterations of the ground surface; (g) Storage of materials or deposit of solid or liquid waste; (h) Any other activity that will alter the magnitude, frequency, deviation, direction, or velocity of stormwater or flood water flows from a property.
Drainage System	All means, natural or man-made, used for conducting stormwater to, through or from a drainage area to the point of final outlet from a property. The stormwater drainage system includes but is not limited to any of the following: conduits and appurtenance features, canals, channels, ditches, streams, culverts, streets, storm sewers, detention basins, swales and pumping stations.

Dry Basin	A detention basin designed to drain completely after temporary storage of stormwater flows and to normally be dry over the majority of its bottom area.
Dynamic Modeling	Continuous simulation hydraulic modeling that considers gradually varied, unsteady flow hydraulics.
Erosion	The general process whereby earth is removed by the action of water, wind, or other forces of nature.
Excess Stormwater Runoff	The volume and rate of flow of stormwater discharged from a developed area which is or will be in excess of that volume and rate which pertained before development.
Flood Frequency	Normally expressed as a period of years, based on a percent chance of occurrence in any given year from statistical analysis, during which a flood of a stated magnitude may be expected to be equaled or exceeded. For example, the 2-year flood frequency has a fifty percent chance of occurring in any given year, the 10-year flood frequency has a ten percent chance of occurring in any given year, and the 100-year flood frequency has a one percent chance of occurring in any given year.
Flood Fringe	That portion of the floodplain outside of the regulatory floodway.
Flood Plain	Land adjacent to a body of water with ground surface elevations at or below the base flood or the 100-year frequency flood elevation, including detached ponding areas, etc. The floodplain is also known as the <i>Special Flood Hazard Area (SFHA)</i> .
Floodway	The channel and that portion of the floodplain adjacent to a stream or watercourse which is needed to store and convey the anticipated existing and future 100-year frequency flood discharge with no more than a 0.1 foot increase in flood stage due to any loss of flood conveyance or storage and no more than a ten percent increase in velocities.
Freeboard	An increment of height added to the base flood elevation, groundwater table, or 100-year design water surface elevation to provide a factor of safety for uncertainties in calculations, unknown local conditions, wave action, and unpredictable effects.
Hydrograph	A graph showing, for a given location on a stream or conduit, the flow rates with respect to time.

Impervious Surface	That area of property that is covered by materials resulting in a surface highly resistant to water infiltration, such as parking lots, driveways, sidewalks, patios, roofs, roof extensions, and other structures, also including semi-impervious surfaces such as compacted gravel.
Infiltration	Passage or movement of water into the soil surfaces.
Major Drainage System	That portion of a drainage system needed to store and convey flows beyond the capacity of the minor drainage system. Where manmade, it is designed to handle the 100-year frequency runoff event.
Minor Drainage System	That portion of a drainage system designed for the convenience of the public. It consists of street gutters, driveway culverts, storm sewers, small open channels, and swales and, where manmade, is designed to handle the 10-year frequency runoff event. It also consists of cross-road culverts which shall be designed to handle the 30-year frequency event.
Mitigation	Measures necessary to minimize the negative effects which stormwater drainage and development activities might have on the public health, safety and welfare. Examples of mitigation include compensatory storage, soil erosion and sedimentation control, and channel restoration.
Natural	Conditions resulting from physical, chemical, and biological processes without intervention by man.
Overland Flow Path	A design feature of the major stormwater system which carries flows in excess of the minor stormwater system design capacity in an open channel or swale, or as sheet flow or weir flow over a feature designed to withstand the particular erosive forces involved.
Positive Drainage	Provision of overland paths for all areas of a property including depressional areas that may also be drained by storm sewer.
Peak Flow	The maximum rate of flow of water at a given point in a channel or conduit.
Previously Developed	For property to be considered as previously developed it must have been: (a) Developed prior to 1975 and have no known flooding conditions caused by the lack of a stormwater management plan; or

	(b) Developed after 1975, have on file with the County a building permit or site development permit covering the development, and have no known flooding conditions.
Property	A parcel or parcels of real estate.
Redevelopment	Any activity, alteration, or change in land use that is undertaken on previously developed land.
Regulatory Floodway	The channel, including on-stream lakes, and that portion of the flood plain adjacent to a stream or watercourse as designated by the Illinois Department of Natural Resources, Office of Water Resources (IDNR-OWR), which is needed to store and convey the existing and anticipated future 100-year frequency flood discharge with no more than a 0.1 foot increase in stage due to the loss of flood conveyance or storage, and no more than a 10% increase in velocities. To locate the regulatory floodway boundary on any site, the regulatory floodway boundary should be scaled off the regulatory floodway map and located on a site plan, using reference marks common to both maps. Where interpretation is needed to determine the exact location of the regulatory floodway boundary, the IDNR-OWR should be contacted for the interpretation.
Release Rate	The rate at which stormwater runoff flows from the property.
Retention Basin	A facility designed to completely retain a specified amount of stormwater runoff without release except by means of evaporation, infiltration, or emergency bypass.
Riparian Area	Land that borders a waterway and provides habitat for wildlife or vegetation dependant on the proximity of water.
Sedimentation	The process that deposits soils, debris, and other materials either on other ground surfaces or in bodies of water or stormwater drainage systems.
Special Flood Hazard Area (SFHA)	An area having special flood, mudslide or mudflow, or flood related erosion hazards, and which area is shown on an FHBM or FIRM as Zone A, AO, A1-30, AE, A99, AH, VO, V1-30, VE, V, M, or E.
Stormwater Manage-	

ment Plan	A plan, including engineering drawings and supporting calculations, which describes the existing stormwater drainage system, patterns, and environmental features, as well as the drainage system, patterns, and environmental features which are proposed after development of a property.
Stormwater Runoff	The waters derived from snow melt, rain fall, or other precipitation within a tributary drainage basin which are in excess of the infiltration capacity of the soils of that basin.
Storm Sewer	A closed conduit for conveying collected stormwater.
Time of Concentration	Elapsed time for stormwater to flow from the most hydraulically remote point in a drainage basin to a particular point of interest in that watershed.
Urban Runoff Pollutants	Contaminants commonly found in urban runoff which have been shown to adversely affect uses in receiving waterbodies. Pollutants of concern include sediment, heavy metals, petroleum-based organic compounds, nutrients, oxygen demanding organics (BOD), pesticides, salt, and pathogens.
Watershed	All of the land surface area drained by or contributing runoff to the same stream, lake, stormwater facility, or given point.
Wet Basin	A detention basin designed to maintain a permanent pool of water after the temporary storage of stormwater runoff.
Wetland	Areas inundated or saturated by surface water or ground water at a frequency or duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions.
Wetland Basin	A detention basin designed with all or a portion of its bottom area as a wetland.

300.0 APPLICABILITY

All development applications shall be accompanied by a Site Plan including required drawings, calculations, and supporting data as necessary to ensure that the provisions of this ordinance are met.

Content of the Site Plan shall be determined by the criteria listed in Section 301 and 302.

No site development permit, building permit, or final plat shall be issued or signed until the County has determined that the proposed development, development application, and Stormwater Management Plan meet all applicable requirements of this ordinance.

301.0 APPLICABILITY FOR STORMWATER RUNOFF DETENTION

All developments in unincorporated Kendall County meeting the following criteria shall provide stormwater runoff storage facilities in accordance with this ordinance.

1. The property being developed or redeveloped is a single-family detached residential development with five or more units and having an average lot size less than or equal to 3 acres; or
2. The property being developed or redeveloped is not a single-family detached residential development or is a non-residential land use, excluding agricultural uses, totals three acres or more in size, and results in 45,000 square feet or more of total development or 32,000 square feet or more of impervious area;
3. The property being developed or redeveloped is not a single-family detached residential development or is a non-residential land use, excluding agricultural uses, totals less than three acres in size, and results in an impervious surface area of 25% or more of the development site.

302.0 PLAN SUBMITTAL REQUIREMENTS

1. All development not subject to the criteria of Section 301.0 shall submit a Step 1 Site Plan.
2. Developments subject to the criteria of Section 301.0 and being 20 acres or less in size shall submit a Step 2 Stormwater Management Plan.
3. Developments subject to the criteria of Section 301.0 and being more than 20 acres in size shall submit a Step 3 Stormwater Management Plan.
4. Development proposed in a flood plain, flood fringe, flood way, or SFHA or development on a property having any portion located within a wetland shall submit a Step 3 Stormwater Management Plan.

Submittals shall include sufficient information to evaluate the environmental characteristics of the property, the potential adverse impacts of the development on water resources both on-site and downstream, and the effectiveness of the proposed Stormwater Management Plan in managing stormwater runoff.

Drawings or exhibits shall be dimensioned or shall be at a maximum scale of 1 inch = 100 feet. Exhibits may be on more than one drawing for clarity.

The applicant shall certify on the drawings that all clearing, grading, drainage, and construction shall be accomplished in strict conformance with Kendall County Ordinances and the approved Stormwater Management Plan.

302.1 Pre-Submittal Meeting

It is recommended that the petitioner schedule a pre-submittal meeting with the Kendall County Planning, Building, and Zoning Department to review the proposed project, discuss submittal requirements, and discuss questions the petitioner may have. Appendix A includes a permit submittal checklist for use with this Division. This ordinance shall take precedence over the checklist.

302.2 Step 1 Site Plan

The Step 1 Stormwater Management Plan shall provide the following:

1. A written description of the proposed development and the stormwater management practices being employed;
2. A location map or description providing township, range, and nearest roadways to accurately locate the development site;
3. Acreage and zoning of property area;
4. Property area lines and dimensions including rights-of-way, easements, and setback lines;
5. Existing and proposed site conditions including all buildings, roads, impervious surfaces, and ground elevations where site grading is proposed;
6. Proposed limits and restoration of disturbed areas;
7. Existing and proposed drainage features such as culverts, conduits, swales, streams, ponds, wetlands, etc.;
8. Location of subsurface drains and tiles within the development area only;
9. Location of wells, septic systems, water mains, and sanitary sewers;
10. Copies of other permit applications and final permits as required by other jurisdictions and agencies;

302.3 Step 2 Stormwater Management Plan

The Step 2 Stormwater Management Plan shall provide all items from the Step 1 Site Plan in addition to the following:

1. Property topography at one foot contours for the entire property extending to a minimum of one hundred feet beyond the property lines or as necessary to determine off-site impacts of the proposed Stormwater Management Plan;
2. Site contours shall be keyed to a USGS datum and state plane coordinate system;
3. Elevation of all building foundations and indications whether buildings have basements, lookouts, walkouts, or crawl spaces;
4. The property area's location within the major watershed;
5. Sub-watershed boundaries within and across the property area;
6. Soils inventory for the property area;
7. A tile survey within the proposed development area;
8. Delineation of upstream and downstream drainage features and watersheds which affect or are affected by the development including depressional areas and stormwater storage areas;
9. Delineation of proposed stormwater storage facilities, including ponds;
10. Design calculations and plans detailing existing and proposed stormwater runoff, storage, and drainage features;
11. Major and minor drainage system design plans and calculations including delineation of sub drainage areas for all conveyance features;
12. The top of banks and centerline elevations of streams and channels at maximum 100-foot intervals;
13. Cross section data and conveyance calculations for open channel and overland flow paths;
14. Delineation of flood plain, flood way, and base flood elevation and inventory of riparian areas within 100 feet of the property area;
15. Mapping and elevations of historical flooding records as available;
16. Delineation and description of designated conservation areas within 100 feet of the property area;

17. Delineation and inventory of wetlands within 100 feet of the property area;

302.4 Step 3 Stormwater Management Plan

The Step 3 Stormwater Management Plan shall provide all items from the Step 1 Site Plan and Step 2 Stormwater Management Plan in addition to the following:

1. Existing base flood elevation and profile for stream reach affected or modified by the proposed development.
2. Detailed environmental mitigation plans for disturbance of wetlands, riparian, or conservation areas
3. Flow rates and velocities at representative points in the drainage system;
4. A statement by the design engineer concerning the location and capacity of the complete drainage system's provisions for conveying the 100-year storm event runoff.
5. Phasing of project including expected start and completion dates, duration of exposure of disturbed areas, and expected dates for restoration.

303.0 DETERMINATION OF PROPERTY AREA

The following criteria shall be considered when determining the total area of property being developed or redeveloped and for "grandfathering" of previously developed property.

1. The County shall review the proposed total area of the property being developed or redeveloped in order to preclude inappropriate phasing of developments to circumvent the intent of this ordinance.
2. If a portion of the property area was previously developed, then the previously developed property area may be excluded from the total property area.
3. If a previously developed portion of a site is proposed to be redeveloped, it must be included in the total property area.

400.0 STORMWATER MANAGEMENT PLAN

The following division establishes the design features and the design criteria, standards, and methods to be used in developing a Stormwater Management Plan.

401.0 MINIMIZATION OF INCREASES IN RUNOFF VOLUMES AND RATES

In the selection of a stormwater management plan for a particular development, the applicant shall evaluate and implement site design features that most closely meet the goal of no change in runoff rate or volume from pre-development conditions.

The applicant's Stormwater Management Plan submittal shall include evaluations of site design features that are consistent with the following hierarchy:

1. Minimize impervious surfaces on the property and establish best management practices consistent with the needs of the project;
2. Preserve, establish, and/or restore native plantings and natural areas to increase and promote infiltration and evaporation;
3. Preserve natural resource features of the development site, including but not limited to flood plain, wetlands, prairies, and woodlands;
4. Attenuate flows by use of open vegetated swales and natural depressions;
5. Preserve, enhance, and incorporate existing natural stream channels and quality wetlands, stream channels and drainageways;
6. Infiltrate runoff on-site;
7. Provide stormwater retention facilities;
8. Provide stormwater detention facilities; and
9. Construct storm sewers.

402.0 WATER QUALITY AND MULTIPLE USES

In the selection of a stormwater management plan for a particular development, the following water quality and multiple use aspects shall be employed:

1. The stormwater management system shall be designed to minimize adverse water quality impacts downstream and on the property itself.
2. Stormwater conveyance and storage areas shall utilize native plantings to increase infiltration and evaporation.

3. Retention and infiltration of stormwater shall be promoted throughout the property's drainage system to reduce the volume of stormwater runoff and to reduce the quantity of runoff pollutants.
4. Stormwater storage areas shall incorporate design features to capture stormwater runoff pollutants.
5. All flows from the development shall be routed through the stormwater storage areas and receive the stormwater quality benefits of the facility (i.e., low flows shall not be bypassed).
6. Stormwater storage design shall give preference to wet bottom and wetland designs.
7. The drainage system shall incorporate multiple uses where practicable. Uses considered compatible with stormwater management include open space, aesthetics, aquatic habitat, recreation (boating, trails, playing fields), wetlands and water quality mitigation.
8. The applicant should avoid using portions of the property exclusively for stormwater management.

403.0 RELEASE RATES

Drainage systems for properties required to provide stormwater runoff storage facilities shall be designed to control the rate of discharge from the property for the two-year and 100-year critical duration events. The peak rate of discharge shall not cause an increase in flooding or channel instability downstream when considered in aggregate with other developed properties and downstream drainage capacities.

Release rates from a property shall be as follows:

1. The peak discharge from events less than or equal to the two-year event shall not be greater than 0.04 cfs per acre of property drained; and
2. The peak 100-year discharge shall not be greater than 0.15 cfs per acre of property drained.
3. Requests for variance from the above release rates must be presented to and approved by the Kendall County Board. A request for variance shall be accompanied by a hydrologic and hydraulic analysis of the property utilizing the methodologies of Section 407.0. The analysis must demonstrate that the proposed development will not change the runoff rate or volume of flow from the predevelopment conditions under all frequency of rainfall events.

404.0 DETENTION BASIN OUTLET DESIGN

The capacity of the downstream drainage system shall be evaluated to ensure the detention basin outlet design will not exceed this capacity. Stormwater storage outlets shall not discharge directly into existing storm sewers or drain tiles.

Backwater on the outlet structure from the downstream drainage system shall be evaluated and considered in the design of the outlet.

The outlet design shall not require manual intervention or mechanical means to control flow, except for wet basins for maintenance drawdown. Outlets shall be designed to allow for easy maintenance even during high runoff events. Where the outlet used to control discharge is less than 4 inches in diameter, alternative outlet designs shall be utilized, which avoid clogging of the outlet.

405.0 DETENTION STORAGE REQUIREMENTS

The design storage to be provided in a detention basin shall be based on the peak runoff from the 100-year storm event determined through a critical duration analysis. Detention storage shall be computed using hydrograph methods as described in this section.

The function of existing on-site depressional storage shall be preserved or compensated for at a ratio of 1 to 1 independently of storage required for the development.

406.0 DRAINAGE SYSTEM EVALUATION AND DESIGN

The following criteria shall be used in evaluating and designing the drainage system. The underlying objective is to provide capacity to pass the 10-year peak flow in the minor drainage system and an overland flow path for flows in excess of the design capacity to at least the 100-year storm event runoff.

406.1 Design Methodologies

1. For properties up to 20 acres, major and minor drainage systems may be designed using the rational formula.
2. For properties of 20 acres or more, minor drainage systems may be designed using the rational formula.
3. For properties of 20 acres or more, major drainage systems must be designed using runoff hydrograph methods as described in Section 407.0.
4. All detention basins must be designed using runoff hydrograph methods as described in Section 407.0.

406.2 Positive Drainage

1. All areas of the property must be provided an overland flow path that will pass the 100-year flow at a stage at least 2 feet below the lowest structure opening of structures hydraulically connected to the flow path.
2. Overland flow routes up to the 100-year flow level shall be placed in exclusive drainage easements.

406.3 Runoff Characteristics

1. In development areas, determination of ground surface runoff characteristics shall utilize soil types and hydrologic soil classifications one category lower (degraded) than those determined by the soils investigations.
2. Stormwater runoff from a property must exit the property at the point where it exited prior to development.
3. Diversion or transfer of water between watersheds shall be prohibited.

407.0 METHODS FOR GENERATING RUNOFF HYDROGRAPHS

Methods used for generating runoff hydrographs shall be either an appropriate Corps of Engineers HEC model, Soil Conservation Service TR-20, or TR-55 tabular method. The Planning, Building, and Zoning Department Director must approve alternative methods.

Runoff hydrographs shall be developed incorporating the following assumptions of rainfall amounts and antecedent moisture.

407.1 Rainfall

1. Unless a continuous simulation approach to drainage system hydrology is used, all design rainfall events shall be based on the Illinois State Water Survey's Bulletin 71 data and isohyetal or sectional data.
2. The first quartile point rainfall distribution shall be used for the design and analysis of drainage systems with critical durations less than or equal to 12 hours.
3. The third quartile point rainfall distribution shall be used for the design and analysis of detention basins and drainage systems with critical durations greater than 12 and less than or equal to 24 hours.
4. The fourth quartile distribution shall be used in the design and analysis of systems with durations greater than 24 hours.
5. The first, third, and fourth quartile distributions shall be as described by Huff Bulletin 71.
6. The SCS Type II distribution may be used as an alternate to the Huff distributions for use in TR-55 models.

407.2 Antecedent Moisture

Computations of runoff hydrographs that do not rely on a continuous accounting of antecedent moisture conditions shall assume an antecedent moisture condition of two.

408.0 WET DETENTION BASIN DESIGN

Wet detention basins shall be designed to remove stormwater pollutants, to be safe, to be aesthetically pleasing, and as much as feasible to be available for recreational use. Refer to Section 414.0 for additional requirements.

408.1 Wet Basin Depths

1. Wet basins shall be at least three feet deep, excluding near-shore banks and safety ledges.
2. If fish habitat is to be provided wet basins shall be at least ten feet deep over twenty-five percent of the bottom area to prevent winter freeze-out.

408.2 Wet Basin Shoreline and Slopes

1. The side slopes of wet basins from the normal pool elevation to the safety ledge shall not be steeper than 5 to 1 (horizontal to vertical).
2. Wet basins shall be provided with stabilized shorelines. Methods for stabilization such as deep-rooted vegetation, natural stone, or manufactured products shall be used as approved by the County.
3. A planting schedule shall be provided to the County for review and approval.

408.3 Pool Volume and Elevation

1. The permanent pool volume in a wet basin at normal depth shall be equal to the runoff volume from its watershed for the two-year critical duration storm event.
2. The peak 100-year pool elevation shall be at least two feet below the lowest structure opening of all structures hydraulically connected to the detention basin.

408.4 Inlet and Outlet Orientation

To the extent feasible, the distance between detention inlets and outlets shall be maximized. If possible, they should be at opposite ends of the basin.

409.0 WETLAND AND DRY DETENTION BASIN DESIGN

In addition to the other requirements of this ordinance, wetland and dry basins shall be designed to remove stormwater pollutants, to be safe, to be aesthetically pleasing and, as much as feasible, to be available for multiple uses.

409.1 Wetland and Dry Basin Drainage

1. Dry basins shall be designed so that the portion of their bottom area that is intended to be dry shall have standing water no longer than seventy-two hours for any runoff event less than or equal to the 100-year event. Underdrains may be used to meet this requirement. Low flow channels are prohibited.
2. Direct connections of detention basin inlets to basin outlets are prohibited.
3. The dry portion of the basin may be planted with either native, deep-rooted vegetation to promote infiltration or with turf grasses.
4. The peak 100-year detention elevation shall not be greater than 4 feet above the bottom of the outlet. If turf grasses are proposed, the basin depth from outlet to high water level shall not exceed 2 feet.
4. A planting schedule shall be provided to the County for review and approval.
5. The peak 100-year detention elevation shall be at least two feet below the lowest structure opening for all structures hydraulically connected to the detention pond.
6. Basin side slopes shall not exceed 4 feet horizontal to 1 foot vertical.

409.2 Velocity Dissipation

1. Velocity dissipation measures shall be incorporated into dry basin designs to minimize erosion at inlets and outlets and to minimize the re-suspension of pollutants and sediments.
2. A stilling basin shall be provided at each major inlet.

409.3 Inlet and Outlet Orientation

1. To the extent feasible, the distance between detention inlets and outlets shall be maximized. If possible, they should be at opposite ends of the basin.
2. There should be no low flow bypass between the inlet and outlet and paved low flow channels shall not be used.

409.4 Sedimentation Basins

A sedimentation basin shall be constructed at each inlet to a wetland to facilitate sediment removal and maintenance.

410.0 DETENTION IN FLOODPLAINS

The placement of detention basins within the floodplain is strongly discouraged because of questions about their reliable operation during flood events. However, the stormwater detention requirements of this ordinance may be fulfilled by providing detention storage within flood fringe areas on the project site provided the following provisions are met.

410.1 Detention in Flood Fringe Areas

1. The placement of a detention basin in a flood fringe area shall require compensatory storage for 1.5 times the volume below the base flood elevation occupied by the detention basin including any berms.
2. The release from the detention storage provided shall still be controlled consistent with the requirements of this ordinance.
3. The applicant shall demonstrate its operation for all streamflow and floodplain backwater conditions.
4. Excavations for compensatory storage along watercourses shall be opposite or adjacent to the area occupied by detention.
5. All floodplain storage lost below the ten-year flood elevation shall be replaced below the ten-year flood elevation. All floodplain storage lost above the existing ten-year flood elevation shall be replaced above the proposed ten-year flood elevation.
6. All compensatory storage excavations shall be constructed to drain freely and openly to the watercourse.

410.2 Detention in Floodways

Detention in floodways is prohibited.

410.3 On-stream Detention

On-stream detention basins are discouraged but allowable if they provide regional public benefits and meet the following requirements:

1. Comply with other provisions of this ordinance with respect to water quality and control of the two-year and 100-year critical duration storm events from the property.
2. The stream being impounded must not be within the regulatory floodplain.

3. Impoundment of the stream as part of on-stream detention shall not:
 - (a) Prevent the migration of indigenous fish species, which require access to upstream areas as part of their life cycle, such as for spawning,
 - (b) Cause or contribute to the degradation of water quality or stream aquatic habitat,
 - (c) Involve any stream channelization or the filling of wetlands,
 - (d) Occur downstream of a wastewater discharge, and
4. Impoundment of the stream as part of on-stream detention shall:
 - (a) Include a design calling for gradual bank slopes, appropriate bank stabilization measures, and a pre-sedimentation basin,
 - (b) Require the implementation of an effective non-point source management program throughout the upstream watershed,
 - (c) Comply with Illinois Combined Statutes and the floodplain ordinance of Kendall County.
5. For watersheds larger than one square mile, it is recommended that the applicant use dynamic modeling to demonstrate that the design will not increase stage for any properties upstream or downstream of the property.
6. Further criteria are presented in Division 6 of this ordinance.

411.0 PROTECTION OF WETLANDS AND DEPRESSIONAL STORAGE AREAS

Wetlands and other depressional storage areas shall be protected from damaging modifications and adverse changes in runoff quality and quantity associated with land developments. In addition to the other requirements of this ordinance, the following requirements shall be met for all developments whose drainage flows into wetlands and depressional storage areas:

411.1 Detention in Wetlands and Depressional Storage Areas

1. Existing wetlands shall not be modified for the purposes of stormwater detention unless it is demonstrated that the existing wetland is low in quality and the proposed modifications will maintain or improve its habitat and ability to perform beneficial functions.
2. Existing storage and release rate characteristics of wetlands and other depressional storage areas shall be maintained and the volume of detention storage provided to meet the requirements of this section shall be in addition to this existing storage.

411.2 Sediment Control

The existing wetland shall be protected during construction by appropriate soil erosion and sediment control measures and shall not be filled.

411.3 Alteration of Drainage Patterns

Site drainage patterns shall not be altered to substantially decrease or increase the existing area tributary to the wetland.

411.4 Detention/Sedimentation

All runoff from the development shall be routed through a preliminary detention/sedimentation basin designed to provide a minimum 24-hour hydraulic detention time, before being discharged to the wetland. This basin shall be constructed before property grading begins.

411.5 Vegetated Buffer Strip

A buffer strip of at least 25 feet in width, preferably vegetated with native plant species, shall be maintained or restored around the periphery of the wetland.

412.0 STREET, PARKING LOT, AND CULVERT DRAINAGE

This section sets requirements where streets, parking lots, and culverts are proposed to be used for stormwater detention or conveyance.

412.1 Streets

1. If streets are to be used as part of the minor drainage system, a maximum 3 feet of spread onto the traveled roadway may be allowed and inlet spacing must be sufficient to collect the entire street runoff based on a 10-year storm event.
2. If streets are to be used as part of the major drainage system, ponding depths shall not exceed three inches at the street centerline and shall not remain flooded for more than eight hours for the 100-year event.

412.2 Parking Lots

1. The maximum stormwater ponding depth in any parking area shall not exceed six inches.
2. The maximum duration of ponding in any parking area shall not exceed eight hours.

412.3 Underground Detention

Use of underground detention shall be reviewed and approved on a case by case basis. Underground detention systems shall provide for easy access and low maintenance.

412.4 Culvert Road and Driveway Crossings

1. All culverts, including driveway culverts, shall be sized to convey the minor drainage system using Federal Highway Administration culvert nomographs or more sophisticated backwater models.
2. Sizing of culvert crossings shall consider entrance and exit losses as well as tailwater conditions on the culvert.

413.0 INFILTRATION PRACTICES

1. To effectively reduce runoff volumes, infiltration practices should be located on soils in hydrologic soil groups "A" or "B" as designated by the U.S. Soil Conservation Service.
2. Sites should be designed to maximize the use of vegetated filter strips and swales.
3. Wherever practicable, runoff from impervious surfaces should be directed onto filter strips and swales before being routed to a storm sewer or detention basin.
4. Infiltration basins and trenches designed to recharge groundwater shall not be located within seventy-five feet of a water supply well or a building foundation. For well drained sand and gravel soils this separation shall be extended to 100 feet.
5. A sediment settling basin shall be provided to remove coarse sediment from stormwater flows before they reach infiltration basins or trenches.
6. Stormwater shall not be allowed to stand more than seventy-two hours over eighty percent of a dry basin's bottom area for the maximum design event to be ex-filtrated.
7. The bottom of infiltration facilities shall be a minimum of four feet above seasonally high groundwater and bedrock.
8. Reference the Illinois Urban Drainage Manual for determining feasibility and sizing of infiltration facilities.

414.0 SAFETY CONSIDERATIONS

1. The drainage system components, especially all detention basins, shall be designed to protect the safety of any children or adults coming in contact with the system during runoff events.
2. The use of restrictive fences shall be kept to a minimum and used only as a last resort when no other method is feasible.

414.1 Side Slopes

1. The side slopes of all detention basins at one hundred year capacity shall be a maximum six to one (horizontal to vertical) to prevent accidental falls into the basin and for stability and ease of maintenance.
2. Side slopes of detention basins and open channels shall not be steeper than four to one (horizontal to vertical).
3. Dry detention pond bottom slopes and turf slopes in general shall be a minimum of 2% (fifty to one).

414.2 Safety Ledge

All wet detention basins shall have a level safety ledge at least eight feet in width a maximum of two feet below the normal water depth.

414.3 Velocity

With the exception of existing drainageways being left undisturbed, velocities throughout the surface drainage system shall be controlled to safe levels taking into consideration rates and depths of flow. Velocities shall not exceed the product of velocity, in feet per second, times depth, in feet, equal to four.

414.4 Overflow Structures

1. All stormwater detention basins shall be provided with an overflow structure capable of safely passing excess flows at a stage at least 2 feet below the lowest structure opening for all structures hydraulically connected to the detention basin.
2. The design flow rate of the overflow structure shall be equivalent to the peak 100-year inflow rate based on a critical duration analysis.
3. All detention ponds and overflow structures shall comply with IDNR Dam Safety requirements where applicable.

415.0 MAINTENANCE CONSIDERATIONS

1. The stormwater drainage system shall be designed to minimize and facilitate maintenance.
2. Outlet control structures shall be designed as simply as possible and shall require little or no attention for proper operation. Moveable restrictors to meet draw down times are prohibited.
3. Turfed side slopes shall be designed to allow lawn mowing equipment to easily negotiate them.

4. Wet basins shall be provided with alternate outflows that can be used to completely drain the pool for sediment removal. (Pumping may be considered if drainage by gravity is not feasible.)
5. Pre-sedimentation basins shall be included, where feasible, for localizing sediment deposition and removal.
6. Access for heavy equipment shall be provided and located within an ingress and egress or maintenance easement.

500.0 FLOWS FROM UPSTREAM TRIBUTARY AREAS

Stormwater runoff from areas tributary to the property shall be considered in the design of the property's drainage system. Whenever practicable, flows from upstream areas that are not to be detained should be routed around the basin being provided for the site being developed.

501.0 UPSTREAM AREAS NOT MEETING ORDINANCE REQUIREMENTS

When upstream property tributary to the applicant's property does not meet the stormwater runoff storage and release requirements of this ordinance, regionalized detention on the applicant's property shall be explored by the applicant. The following steps shall be followed.

1. The applicant shall compute the storage volume needed for his property based on the applicant's property area and the release rates and procedures described in Division 4.
2. Areas tributary to the applicant's property, not meeting the storage and release rate requirements of this ordinance, shall be identified.
3. The applicant shall compute the storage volume needed for the areas determined in 501.2 above plus the applicant's property area based on the combined properties and the release rates and procedures described in Division 4.
4. If the tributary areas are not currently developed, a reasonable fully developed land cover, based on anticipated zoning, shall be assumed for the purposes of computing storage.
5. Once the necessary combined storage is computed, the County may choose to pay for increasing the size of the applicant's detention basin to accommodate the regional flows. The applicant's responsibility will then be limited to the storage for his property as computed in 501.1 above.
6. If regional storage is selected by the County then the design produced in 501.3 above shall be implemented.
7. If regional storage is rejected by the County the applicant shall bypass all tributary area flows around the applicant's basin whenever practicable as determined by the County.
8. If the County determines that the applicant may route upstream flows through his basin, the applicant must comply with the requirements of 502.3 and 502.4.
9. If the upstream areas being routed through the applicant's basin are conveyed by drainageways identified on USGS mapping, the applicant must meet the provisions of Section 410.3 for on-stream basins.

502.0 UPSTREAM AREAS MEETING ORDINANCE REQUIREMENTS

When upstream property tributary to the applicant's property meets the storage and release requirements of this ordinance, the upstream flows shall be handled in the following hierarchy:

1. Upstream flows shall be bypassed around the applicant's detention basin, unless the applicant justifies to the County that bypassing of flows is not feasible.
2. Upstream flows shall be routed through the applicant's detention basin if the County determines that this is the only feasible alternative.
3. Storage needed for the applicant's property shall be computed as described in 501.1. However, if the County decides to route tributary area flows through an applicant's basin, the final design stormwater releases shall be based on the combined total of the applicant's property plus tributary areas.

600.0 ADMINISTRATION

This division details the administration aspects of this ordinance, including scheduling and maintenance.

601.0 EARLY COMPLETION OF DETENTION FACILITIES

Soil erosion and sedimentation controls shall be established concurrent with the start of earthwork. Where detention, retention, or other storage areas are to be used as part of the drainage system for a property, they shall be constructed as the first element concurrent with the initial earthwork program.

Any eroded sediment captured in these facilities shall be removed by the applicant before project completion in order to maintain the design volume of the facilities.

602.0 MAINTENANCE RESPONSIBILITY

1. Maintenance of stormwater drainage facilities located on private property shall be the responsibility of the owner of that property.
2. Before a site development permit, building permit, or final plat is issued or signed by the County the applicant shall execute a maintenance agreement with Kendall County guaranteeing that the applicant and all future owners of the property will maintain the property's stormwater drainage system.
3. The maintenance agreement shall also specifically authorize representatives or subcontractors of Kendall County to enter onto the property for the purpose of inspections and maintenance of the drainage system.
4. The maintenance agreement shall include a schedule for regular maintenance of each aspect of the property's stormwater drainage system and shall provide for access to the system for inspection by authorized personnel of Kendall County.
5. The maintenance agreement shall stipulate that if the Kendall County Planning, Building, and Zoning Department notifies the property owner in writing of maintenance problems that require correction, the property owner shall make such corrections within thirty calendar days of such notification.
6. If the corrections are not made within this time period the County may have the necessary work completed and assess the cost to the property owner.
7. Such maintenance agreement shall be recorded with the Recorder of Deeds of Kendall County.
8. Kendall County has the option of requiring a bond to be filed by the property owner for maintenance of the stormwater drainage system.

603.0 INSPECTIONS

603.1 Inspections During Construction

1. A Kendall County Planning, Building, and Zoning Department representative shall conduct periodic inspections and surveys of the work in progress to be certain that the drainage system is being built as designed.
2. If any violations of the provisions or requirements of this ordinance are noted during such inspections, the Kendall County Planning, Building, and Zoning Department shall notify the property owner in writing of the items needing correction.
3. The property owner shall have ten calendar days to make such corrections unless given a specific extension of time in writing by the Kendall County Planning, Building, and Zoning Department.
4. Failure to complete such corrections within the specified time period shall constitute a violation of this ordinance.

603.2 Final Inspection

1. Upon notification by the applicant that the drainage system is completed, a Kendall County Planning, Building, and Zoning Department representative shall conduct a final inspection.
2. If the drainage system is found to contain deficiencies which require correction the Kendall County Planning, Building, and Zoning Department representative shall notify the property owner of the necessary corrections.
3. The property owner shall correct such deficiencies within ten calendar days unless given a specific extension of time in writing by the Kendall County Planning, Building, and Zoning Department.
4. Failure to make necessary corrections within the specified time shall constitute a violation of this ordinance.
5. Upon completion of the drainage system and all noted deficiencies, the petitioner shall perform a site survey and submit as built plans and revised stormwater management calculations to the County. A Registered Professional Engineer shall certify the as-built plans and calculations.
6. The project Letter of Credit for stormwater related facilities shall not be reduced until the as-built plans and calculations have been reviewed and approved by the County.
5. Upon finding that the drainage system and as-builts meets the provisions and requirements of this ordinance the Kendall County Planning, Building, and Zoning

Department shall issue in writing a notice of drainage system completion to the property owner.

603.3 Routine Inspections

1. All privately owned drainage systems may be inspected by representatives of the Kendall County Planning, Building, and Zoning Department.
2. A written report shall be filed of the results of any inspection and a copy sent to the property owner detailing any problems that need correction.

604.0 ENFORCEMENT

The administration and enforcement of this ordinance shall be the responsibility of the Kendall County Planning, Building, and Zoning Department.

605.0 VARIANCES AND APPEALS

1. Where the Planning, Building, and Zoning Department Director finds that extraordinary hardships may result from the strict compliance with this Ordinance, he may, after written application and documentation by the developer, recommend in writing to the Planning, Building, and Zoning Committee variations or exceptions to the regulations. Recommendation may be subject to specific conditions, so that substantial justice may be done and the public interest secured, provided that such variations or exceptions shall not have the effect of nullifying the intent and purpose of this Ordinance.
2. From the Planning, Building, and Zoning Committee, the recommendations shall be communicated to the County Board in writing with reasons therefore. The County Board may approve the variations from these regulations in specific cases, which in their opinion do not affect the general plan or the spirit of the Ordinance.
3. The Planning, Building, and Zoning Department Director shall not recommend variations or exceptions to the regulations of this Ordinance unless he shall make findings based on the evidence presented to him in each specific case, that:
 - (a) Because of the particular physical surroundings, shape, or topographic conditions of the specific property involved a particular hardship to the owner would result as distinguished from a mere inconvenience, if the strict letter of the regulations was carried out.
 - (b) The conditions upon which the request for a variation is based are unique to the property for which the variation is sought and are not applicable, generally, to other property, and have not been created by any person having an interest in the property.
 - (c) The purpose of the variation is not based upon economic feasibility.
 - (d) The granting of the variation will not be detrimental to the public safety, health, or welfare, or injurious to other property or improvements in the locale in which the property is located.

4. All appeals to the Kendall County Planning, Building, and Zoning Department Director decisions regarding the interpretation of this ordinance shall be heard by the Kendall County Planning, Building, and Zoning Committee.

606.0 SEVERABILITY

If any section, clause, provision or portion of this ordinance is judged unconstitutional or invalid by a court of competent jurisdiction, the remainder of this ordinance shall remain in force and not be affected by such judgement.

607.0 PENALTIES

Any person convicted of violating any of the provisions or requirements of this ordinance shall be guilty of a misdemeanor and shall be subject to a fine of not more than One Thousand Dollars (\$1,000.00). Each day the violation continues shall be considered a separate offense.

608.0 EFFECTIVE DATE

This ordinance shall be in full force and effect from and after its passage and approval and publication, as required by law.

Passed by the County Board of Kendall County, Illinois, this ____ day of _____, ____.

Clerk

APPROVED by me this _____ day of _____, 19__.

Kendall County Board President

ATTESTED and FILED in my office this _____ day of _____, 19__.

Clerk

**LAKE COUNTY
WATERSHED DEVELOPMENT ORDINANCE**

OF

LAKE COUNTY, ILLINOIS

ORIGINAL EFFECTIVE DATE
October 18, 1992

Approved as Amended
By the
Lake County Board
July 12, 1994
August 10, 1999
October 10, 2000
August 14, 2001

LAKE COUNTY WATERSHED DEVELOPMENT ORDINANCE

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Lake County Watershed Development Ordinance

INTRODUCTION

This Ordinance is one part of the adopted Lake County Comprehensive Stormwater Management Plan. It sets forth the minimum requirements for the stormwater management aspects of development in Lake County. The Lake County Stormwater Management Commission is the corporate enforcement authority for the Ordinance. Illinois Compiled Statutes Chapter 55, Act 5, Section 5-1062 (55 ILCS 5/5-1062) states, "The purpose of this Section is to allow management and mitigation of the effects of urbanization on stormwater drainage... by consolidating the existing stormwater management framework into a united, countywide structure..." The Lake County Comprehensive Stormwater Management Plan, adopted by Ordinance on June 11, 1990 states, "... that the regulations be uniformly and consistently enforced throughout the County by all agencies." While local conditions may sometimes require extraordinary regulatory measures, the Lake County Stormwater Management Commission (SMC) has determined that uniform and consistent enforcement will be enhanced by municipalities adopting the standards of the Watershed Development Ordinance. In those instances where the requirements of this Ordinance are not stipulated in a municipal ordinance or do not meet the minimum requirements herein, this Ordinance shall prevail. It is recognized that a community has an individual right to enact standards beyond the minimum standards presented in this Ordinance. The SMC has developed a Technical Reference Manual which is a recommended guide for users of this Watershed Development Ordinance (WDO).

ARTICLE I: AUTHORITY AND PURPOSE

A. AUTHORITY

This Ordinance is enacted pursuant to the police powers granted to Lake County by 55 ILCS 5/5-1062 (County) by 65 ILCS 5/1-2-1, 11-12-12, 11-30-8, 11-30-2, 11-31-2, and 615 ILCS 55 & 18g. The administration and enforcement of this Ordinance shall be performed by (a) Certified Communities, within their respective jurisdictions and (b) the Stormwater Management Commission and its agents or employees in all other areas of Lake County.

B. PURPOSE

The purpose of this Ordinance is to establish reasonable rules and regulations for development in order to:

1. Meet the requirements of the Rivers, Lakes and Streams Act, 615 ILCS 5/18g effective November 18, 1987.
2. Prevent additional harm due to periodic flooding including loss of life and property and threats and inconveniences to public health, safety and welfare;
3. Assure that development does not increase flood and drainage hazards to others, or create unstable conditions susceptible to erosion;

ARTICLE I: AUTHORITY AND PURPOSE

4. Create no new financial burden on the taxpayer for flood control projects, repairs to flood damaged public facilities and utilities, and for flood rescue and relief operations;
5. Protect, conserve and promote the orderly development of land and water resources;
6. Protect buildings and improvements to buildings from flood damage to the greatest extent possible;
7. Conserve the natural hydrologic, hydraulic, water quality and other beneficial functions of flood-prone areas, Regulatory Floodplains and wetlands;
8. Prevent additional disruption of the economy and governmental services due to stormwater and flood drainage;
9. Maintain eligibility for the County and its municipalities in the National Flood Insurance Program by equaling or exceeding its requirements and thus make federally subsidized flood insurance available at reduced rates. Comply with the rules and regulations of the National Flood Insurance Program codified as 44 CFR 59-79, as amended.

ARTICLE II: ORDINANCE ENFORCEMENT

- A. In Certified Communities, the appropriate development regulations officer shall be the Enforcement Officer for the Ordinance. In all other areas of Lake County, the SMC Chief Engineer shall be the Enforcement Officer. One of the primary duties of the Enforcement Officer shall be to review all watershed development applications and issue permits for those projects that are in compliance with the provisions of this Ordinance. The Enforcement Officer shall be responsible for the administration and enforcement of the Ordinance.

Included as part of this Ordinance as Appendix E is a delineation of requirements and duties required of and accepted by a community and its designated Enforcement Officer. Certain requirements or duties specified by FEMA and IDNR/OWR in Appendix E relate only to the intergovernmental relationship between a community and FEMA or IDNR/OWR for the purposes of that community obtaining or maintaining eligibility for the National Flood Insurance Program (NFIP) and delegation of state permit authority.

ARTICLE III: COMMUNITY CERTIFICATION

A municipality or the County may be certified by SMC to enforce the provisions of this Ordinance. Upon certification, the community's designated Enforcement Officer shall enforce all provisions of this Ordinance within the community's jurisdiction. The criteria and process for certification follow:

A. **CRITERIA**

1. The community is participating in the regular phase of the National Flood Insurance Program.

ARTICLE III: COMMUNITY CERTIFICATION

2. The community has adopted and is enforcing the provisions of this Ordinance.
3. The community forwards appropriate portions of the Regulatory Floodway Development applications to SMC for transmittal to IDNR/OWR or its designee for concurrent review and approval.
4. The community maintains records and provides SMC with certain portions of these records as described in Appendix E (L).
5. The community will require all engineering information and plans prepared by a Registered Professional Engineer, to be reviewed under the supervision of a Registered Professional Engineer under the employ or contract of the community for conformance with this Ordinance prior to permit issuance.

B. PROCESS

1. Communities desiring certification may submit a letter of intent to petition for Certification.
2. A petition for Standard Certification or for Isolated Wetland Certification shall be submitted to the SMC indicating how the community meets the criteria for certification. A copy of the community's adopted ordinance shall be included with the petition.
3. Within 60 days of receipt of the petition and in conjunction with a scheduled SMC meeting, the staff recommendation shall be presented.
4. The SMC shall approve the petition as submitted, shall approve the petition with conditions or shall deny the petition. A notice of the SMC action shall be submitted to the petitioning community.
5. Certified Communities shall petition for recertification every three (3) years.
6. Within the three (3) year certification period, the SMC Director shall periodically review the community's Ordinance enforcement records and performance and make remedial recommendations to the community, if necessary. Review findings will be used in the assessment of petitions for recertification from Certified Communities.
7. If a Certified Community knowingly or consistently issues permits not in accordance with the Watershed Development Ordinance, or is no longer a participant in the National Flood Insurance Program, the SMC shall after notice and a public hearing held in conjunction with a regularly scheduled SMC meeting, have the authority to rescind the community's certification.
8. The SMC shall rescind a community's certification for the following reasons:
 - a. The community is no longer a participant in the National Flood Insurance Program.

ARTICLE III: COMMUNITY CERTIFICATION

- b. The community adopts a Watershed Development Ordinance or amends its ordinance so that its ordinance is less restrictive than the SMC Watershed Development Ordinance.
9. If the community issues a Regulatory Floodway development permit not in accordance with Article IV, Section C.3. SMC shall rescind the community's authority to administer the IDNR/OWR Regulatory Floodway permit program for Appropriate Uses.
10. Fee-in-lieu-of detention ordinances and procedures used by Certified Communities shall be reviewed and approved by the SMC as part of the regular certification process.
11. To be qualified to act as an Enforcement Officer, the person shall pass the Lake County Enforcement Officer's Exam. Once the exam is available, community Enforcement Officers shall have six (6) months to pass the exam. After this six (6) month period, a community shall be required to have a named Enforcement Officer that has passed the exam, in order to remain certified. If a community Enforcement Officer vacates that position, the person filling the vacancy shall have six (6) months to pass the exam in order for the community to remain certified.
12. Communities with Isolated Wetland Certification authority shall have a Certified Wetland Specialist or Provisional Certified Wetland Specialist either as an employee or contracted to perform wetland related services as specified in the Ordinance. SMC will perform Certified Wetland Specialist duties for communities in the interim period between WDO adoption and certification of those communities desiring Isolated Wetland Certification.

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

A. GENERAL

1. Regulated Development

No person, firm, corporation or governmental agency shall commence any development regulated by this Ordinance on any lot or parcel of land without first obtaining a Watershed Development Permit from the Stormwater Management Commission or, if applicable, the Certified Community. A permit shall be issued if the proposed development meets the requirements of this Ordinance or its Certified Community equivalent. A Watershed Development Permit is required for any development, including finalization of a plat, replat, Planned Unit Development (PUD) or Manufactured Home Park site plan, which:

- a. Is located in a Regulatory Floodplain; or
- b. Is located in a flood-prone area with 100-acres of tributary drainage area or more; or
- c. Is located in a depressional storage area with a storage volume of 0.75 acre-feet or more for the base flood; or
- d. Creates a wetland impact within an area defined as Waters of the U.S. or Isolated Waters of Lake County; or
- e. Modifies the flood-prone area of a channel where the tributary drainage area is twenty (20) or more acres; or

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

- f. Includes the total land area of an ownership parcel, that results in:
 - (1) more than 1-acre of new impervious surface area; or
 - (2) more than (3) acres of hydrologically disturbed area, unless the total new impervious surface area is less than 0.5 acre; or
 - (3) An impervious surface area ratio of 50 percent or greater, unless the total new impervious surface area is less than 0.5 acre.

The term “new” in this article refers to impervious surface area created after the original effective date of this Ordinance (10/18/92). Redevelopment of previously developed sites shall maintain existing storage volume and shall not increase the rate of runoff from the site. The applicant shall provide supporting data and calculations to the satisfaction of the Enforcement Officer to ensure the site design either provides a watershed benefit or meets the requirements of Article IV, Section B.1.c.(3). New development on partially developed sites shall meet the release rate criteria in Article IV, Section B.1.c.(1) for the new development, if the new development exceeds the thresholds in f. (1) or (2) or (3) above; or

- g. Any public road development resulting in one and one-half (1.5) acres or more of additional impervious surface per mile, for linear or nonlinear projects; or
- h. Any development which hydrologically disturbs 5,000 square feet or more. This development activity shall at a minimum meet the soil erosion and sediment control performance standards of Article IV, Section B.1.j., with associated application requirements. Public road developments are required to meet the soil erosion and sediment control standards only for those projects which require permits according to Article IV, Section A.1.a.,b.,c.,d.,e.,g., above.

2. Exempted Development

All development shall meet the minimum state, federal and local regulations. No development is exempt from the floodplain, floodway, wetland and soil erosion and sediment control provisions of this Ordinance.

Upon review and verification by the Enforcement Officer, that a. or b. or c. below are met, the following are exempt from specific ordinance performance standards:

- a. Annexation agreements, final plats, site development permits or current building permits approved prior to October 18, 1992 if the stormwater management systems are installed, functioning and in compliance with all applicable stormwater regulations then in effect.

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

- b. Preliminary plats, Annexation Agreements, Final plats, Planned Unit Developments, site development permits or current building permits approved between October 18, 1992 and [August 10, 1999] if the approved plans and designs are in conformance with the pre [August 10, 1999] ordinance provisions. That portion of any preliminary plat, annexation agreement, final plat, planned unit development, site development permit or current building permit which is amended after the effective date of this Ordinance and which affects the stormwater management system is not exempt from the provisions of this Ordinance.
- c. Re-subdivision of commercial or industrial subdivisions identified under a. above, provided that the stormwater management systems are installed and functioning and there is no increase in impervious surface area permitted. Re-subdivision of commercial or industrial subdivisions identified under b. above, provide there is no increase in impervious surface area beyond that which was originally approved.

If eligible under a. or b. or c. above, the applicant may submit a written request to the Enforcement Officer for an exemption from specific performance standards of this Ordinance. The applicant's exemption request shall itemize each Ordinance provision that is requested for exemption.

3. Development Classification

All activities requiring a Watershed Development Permit shall be classified as a minor, major, or public road development. The definition for each classification follows:

a. Minor Development

A minor development is defined as any development that:

- (1) Is not located in a depressional storage area which has a volume larger than 0.75 acre-foot or is not located in any other portion of a Regulatory Floodplain, and
- (2) Does not create a wetland impact of one quarter (1/4) or more acre of Waters of the United States or Isolated Waters of Lake County, and
- (3) Modifies a channel where the tributary drainage area is less than 100-acres, and
- (4) Consists of:
 - (a) Single family detached residential development of less than ten (10) acres; or
 - (b) Single family detached residential development of ten (10) acres or less with a gross density of less than 0.5 unit per acre, and an impervious cover area of less than fifteen (15) percent; or

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

- (c) Multi family, non-residential and other developments of less than three (3) acres requiring a Watershed Development Permit.

- b. Public Road Development

Any Development activity which takes place in a public right-of-way or part thereof that is administered and funded by a public agency under its respective roadway jurisdiction. Rehabilitative maintenance and in-kind replacement are considered to be a public road development if located in a Regulatory Floodplain. A public road development located within a Regulatory Floodway and which has been approved by the IDOT-Division of Highways, Bureau of Local Roads and Streets is exempt from this Ordinance.

- c. Major Development

A major development is defined as all other development.

- 4. Approvals Prior to Permitting

Prior to the issuance of a Watershed Development Permit, the applicant may request a Conditional Approval or an Earth Change Approval.

- a. Conditional Approval

Conditional Approval of the Regulatory Floodplain and Regulatory Floodway delineation, overland flow path, wetland delineation, runoff volume reduction hierarchy, and the detention and bypass computations for a development may be granted by the Enforcement Officer. The Conditional Approval will be based on conformance with the performance standards, and the submittal of the appropriate application requirements as listed in Article IV, Sections B, C, D, E, and F. A letter will be sent to the applicant stating the results of the review and the conditions placed on any approvals.

- b. Earth Change Approval

If all the performance standards and application requirements in Article IV, Section B, C, D, E, and F have been met, except for obtaining all the required local, state and federal approvals, a request for the commencement of grading activities may be made on a site prior to the issuance of a Watershed Development Permit. The proposed grading activity may commence with written approval from the Enforcement Officer of the earth change approval plan that delineates the activities specifically allowed. The written approval will state the conditions and limitations of the proposed grading activities. No development activity may occur in those portions of the site for which state and federal permits are required, except for IEPA sewer and water extension permits. Earth change approvals may not be granted for any development within a Regulatory Floodplain.

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

5. Permit Fees and Application Review Times

A schedule of fees in accordance with the provisions of this Ordinance shall be established by separate resolution of the SMC. A separate fee schedule shall be developed and implemented by Certified Communities. Permit applications shall be reviewed within 30 days of receipt. Amended permit applications shall be reviewed within 60 days of receipt. The Enforcement Officer shall approve, deny or provide remedial recommendations within 60 days. If no action has been taken by the Enforcement Officer within 90 days after receipt of an application, or within a longer time period if requested in writing by the applicant, the application shall be deemed denied.

6. Contiguous Property

In order to preclude inappropriate phasing of developments to circumvent the intent of this Ordinance, when a proposed development activity will occur on a lot or parcel of land that has contiguous lots or parcels of lands owned by the same property owner, then the criteria as defined in this section will be applied to the total land area compiled from aggregate ownership parcels. If this aggregate ownership parcel area is greater than the minimum area requirements defined in Article IV, Section A.1, then a Watershed Development Permit will be required.

7. Permit Extensions and Terminations

Among the causes for terminating a permit during its term or for denying a permit extension include, but are not limited to the following:

- a. Noncompliance with any condition of the permit; or
- b. The Permittee's failure to disclose fully all relevant facts in the application process or the permittee's misrepresentation of any relevant facts at any time; or
- c. If the authorized work is not commenced within three years after issuance of the permit or, if the authorized work is suspended or abandoned, for a period of twelve months after the time of commencing the work, unless an extension has been granted in writing by the Enforcement Officer. The extension should be requested of the Enforcement Officer in writing no sooner than 90 days prior to the termination of the permit.

B. ALL DEVELOPMENT

The following performance standards, application requirements and other provisions apply to all development requiring a permit. Subsequent sections include additional provisions for development in a Regulatory Floodplain, wetlands and public roads.

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

1. Performance Standards
 - a. Plats and Site Plans
 - (1) The performance standards for all development (Article IV) shall be considered in site planning and appropriately addressed in the drainage plan component of subdivisions, annexation agreements, preliminary plats, final plats, re-plats, manufactured home parks and Planned Unit Developments (PUD).
 - (2) In addressing Article IV, Section B.1.d “Runoff Volume Reduction Hierarchy” streets, blocks, lots, easements, covenants, parks and other public grounds shall be located and lined out in such a manner as to preserve and utilize natural streams, wetlands, and flood-prone areas whenever possible.
 - (3) Subdivisions, annexation agreements, plats, re-plats, manufactured home parks and PUDs shall show the Base Flood Elevation (BFE) and Regulatory Floodway limits. The plats, re-plats, manufactured home parks, PUD, or engineering plans and studies shall include a signed statement by a Registered Professional Engineer that accounts for changes in the drainage of surface waters in accordance with the Plat Act (765 ILCS 205/2).
 - (4) All plats and subdivisions which border on or include public bodies of water as defined by IDNR/OWR and listed in Appendix F of the Watershed Development Ordinance shall be submitted by the applicant to IDNR/OWR for review and approval.
 - (5) Stormwater management systems shall be functional before building permits are issued for residential and non-residential developments.
 - (6) Soil erosion and sediment control measures and stormwater management systems shall be functional before general construction begins. Where development of a site is to proceed in phases, the soil erosion and sediment control measures and the stormwater management systems needed for each phase shall be functional before the construction of that phase begins.
 - (7) A community's planning commission or corporate authority shall not approve any preliminary PUD or plat of subdivision located inside or outside its corporate limits unless such PUD or Plat is, at a minimum, subject to meeting the performance standards of the Lake County Watershed Development Ordinance.

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

- (8) A community's planning commission or corporate authority shall not approve any final PUD or Plat of subdivision located inside or outside its corporate limits unless such PUD or Plat, at a minimum, meets the performance standards of the Lake County Watershed Development Ordinance.
- (9) Pursuant to State law, a property owner of a parcel being subdivided adjacent to a state or county road right of way shall notify the proper highway authority in writing of the proposed subdivision, and request that the proper highway authority provide, at the cost of the highway authority or otherwise provided by law, the amount of additional capacity in any stormwater detention facility to be constructed in the subdivision for the future availability of the highway authority for meeting stormwater detention requirements of any future public construction on the highway.
- (10) All stormwater management systems shall be located and described within a deed or plat restriction. Stormwater management systems that service a single parcel (or two parcels) of property may be excused from this requirement upon approval of the Enforcement Officer.
- (11) Modifications to a deed or plat restriction for the stormwater management system shall be approved by the Enforcement Officer.

b. Runoff Calculations

- (1) For tributary drainage areas 100-acres or greater, and for the determination of detention and depressional storage requirements, an SMC approved hydrograph-producing runoff calculation method shall be used. Appendix K of this Ordinance may also be used, when appropriate and upon approval of the Enforcement Officer, for determination of detention storage volumes.
- (2) The Rational Method may be used to calculate discharges for areas of less than 100-acres. The Rational Method shall not be used to determine detention or depressional storage requirements.
- (3) Rainfall data as presented in Appendix I of this Ordinance shall be used for rainfall volume, storm distribution, return frequency and event duration.
- (4) Runoff calculations for all off-site drainage area may be based on anticipated future land use conditions or existing land use conditions. Anticipated future land use conditions will be based on future land use and existing storage facilities. Future detention facilities may be used for anticipated future land use conditions if approved by the

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

SMC Chief Engineer or for tributary drainage areas less than 100-acres in a Certified Community, the Enforcement Officer. Existing land use conditions will be based on existing land use and existing storage facilities. For each frequency storm event, runoff calculations will be based on the critical duration, for all durations presented in Appendix I.

- (5) Existing depressional storage volume shall be maintained and the volume of detention storage provided to meet the requirements of this Ordinance shall be in addition to the existing storage.

c. Release Rates and Discharges

- (1) Unless otherwise specified in an SMC adopted Basin Plan or floodplain study, release rates shall not exceed 0.04 cubic feet per second per acre for the 2-year, 24-hour storm event nor 0.15 cubic feet per second per acre for the 100-year, 24-hour storm event. The release rate requirement shall apply to the hydrologically disturbed area of the ownership parcel unless otherwise approved by the Enforcement Officer. The release rate requirements shall only apply to developments listed in Article IV, Section A.1.f., and Article IV, Section A.1.g.
- (2) Watershed specific release rates are tabulated in Appendix J of this Ordinance.
- (3) All concentrated stormwater discharges leaving a site must be conveyed into an existing channel, storm sewer, or overland flow path with adequate downstream stormwater capacity (as defined in Appendix A) and will not result in increased flood and drainage hazard.
- (4) The design of stormwater management systems shall not result in the interbasin transfer of drainage, unless no reasonable alternative exists and there is no legal restraint preventing such transfer.

d. Runoff Volume Reduction Hierarchy

- (1) An applicant shall choose a strategy to meet the release rate requirements that minimizes the increase in runoff volumes and rates from the development and addresses the water quality treatment requirements in Article IV, Section B.1.h., of this Ordinance. The applicant shall use appropriate best management practices as presented in the Technical Reference Manual and the following hierarchy in preparing a drainage plan:
 - (a) Preservation of natural resource features of the development site (e.g. floodplains, wetlands, Isolated Waters of Lake County, prairies and woodlands);

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

- (b) Preservation of the existing natural streams, channels and drainageways;
 - (c) Minimizing impervious surfaces created at the site (e.g., narrowing road width, minimizing driveway length and width, clustering homes and shared driveways);
 - (d) The use of open vegetated channels to convey stormwater runoff;
 - (e) Preservation of the natural infiltration and storage characteristics of the site (e.g., disconnection of impervious cover and on-lot bioretention facilities);
 - (f) Structural measures that provide water quality and quantity control;
 - (g) Structural measures that provide only quantity control and conveyance.
- e. Detention Facilities
- (1) All stormwater infiltration, retention and detention facilities shall be provided with an emergency overflow structure capable of passing the base flood inflow rate without damages to structures or property.
 - (2) Single pipe outlets shall have a minimum inside diameter on 12 inches. If design release rates call for smaller outlet, a design that minimizes the possibility of clogging shall be used. Minimum outlet restrictor size shall be four (4) inches in diameter provided there is adequate downstream capacity. Detention volume for a development shall be dictated by adherence to the release rates specified in Article IV, Section B.1.c.
 - (3) Stormwater infiltration, retention and detention facilities required to meet a development's discharge requirements shall be designed to by-pass offsite tributary flow from streams and channels unless approved by the Enforcement Officer.
 - (4) Any development involving the construction, modification or removal of a dam as defined in Appendix A per 17 IL Adm. Code 3702 (Rules for Construction of Dams) shall obtain an Illinois Division of Water Resources Dam Safety permit or a letter stating no permit is required prior to the start of such activity. Reference Appendix G for IDNR/OWR Dam Safety permitting guidelines.

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

- (5) Stormwater retention and detention facilities shall not be constructed in a Regulatory Floodplain unless approved by the Enforcement Officer. If a retention or detention facility is constructed in a Regulatory Floodplain, the development must meet the requirements of Article IV, Section C., of this Ordinance.
- (6) On-Stream Detention
 - (a) All on-stream detention shall provide a Detention Volume Safety Factor as follows:
 - (i) The Detention Volume Safety Factor applies to the volume of on-stream detention necessary to meet this Ordinance's site requirements.
 - (ii) The Detention Volume Safety Factor is equal to one (1) plus 0.05 times the ratio of offsite tributary drainage area to on-site tributary drainage area.
 - (iii) The maximum Detention Volume Safety Factor shall be 1.5.
 - (b) No on-stream detention shall be allowed with an off-site to on-site tributary drainage area ratio greater than 10:1 except for development providing a watershed benefit.
 - (c) On-stream detention shall not be permissible if the tributary drainage area is greater than 640-acres except for detention that provides a watershed benefit.
 - (d) The release rate shall be 0.04 cubic feet per second per acre of the total tributary drainage area (on-site and off-site) at the elevation created by impoundment of the on-site 2-year storm volume plus the Detention Volume Safety Factor, and 0.15 cubic feet per second per acre of the total tributary drainage area (on-site and off-site) at the elevation created by impoundment of the on-site 100-year storm volume plus the Detention Volume Safety Factor and the required compensatory storage. The release rate and on-site detention volume shall be calculated using the 24-hour storm event. This release rate calculation shall be used unless other site conditions warrant further analysis and modification from this standard or unless watershed specific release rates have been adopted.

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

- (e) On-stream detention shall provide water quality treatment. One of the following two methods shall be used:
 - (i) A wet detention facility with a minimum permanent pool volume equal to the calculated sediment volume accumulated over a one-year period for the entire upstream watershed and an average normal water depth of at least four feet. The facility shall also have a live storage volume that, at a minimum, equals the Water Quality treatment standards of Article IV, Section B.1.h., of this Ordinance for the development site.
 - (ii) A separate off-line sediment basin with a volume meeting the Water Quality treatment standards of Article IV, Section B.1.h., of this Ordinance for the tributary drainage area to the sediment basin.
 - (f) Impoundment of the stream as part of on-stream detention shall not prevent the migration of indigenous fish species, which require access to upstream areas as part of their life cycle, and shall not cause or contribute to the degradation of water quality or stream aquatic habitat. These fish species may be present or potentially present.
 - (g) Compensatory storage requirements shall be satisfied and shall be in addition to detention volume requirements.
 - (h) No on-stream detention shall be allowed in areas designated as an exceptional functional value wetland.
- (7) The placement of a detention basin in a floodplain area shall require compensatory storage per WDO Article IV, Section C.2.d. The volume of detention storage required to meet the standards of this Ordinance shall be in addition to the floodplain compensatory storage required for the development.
- (8) Impounding berms for stormwater retention and detention facilities shall be designed and constructed to withstand all expected forces, including but not limited to, erosion, pressure and uplift. Impounding berms designed greater than 3 feet in height above existing grade shall be signed and sealed by a Registered Professional Engineer.

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- f. Fee-in-lieu of On-Site Stormwater Storage
- (1) The SMC may require, as part of an adopted basin plan or floodplain study, the payment of a fee-in-lieu of on-site stormwater storage to fulfill all or part of the on-site stormwater storage requirement for a development. The adoption of a floodplain study or basin plan is per Appendix E (D) of this Ordinance.
 - (2) The following fee-in-lieu of stormwater storage procedures apply to communities with adopted procedures for requiring and collecting fee-in-lieu of revenues for stormwater storage requirements in this Ordinance:
 - (a) The Enforcement Officer may require, or the applicant may submit, a written request for the payment of a fee-in-lieu of on-site stormwater storage to fulfill all or part of the on-site detention requirement below the detention threshold minimum limit set by this Ordinance Article IV, Section A.1.f. and g. and for compensatory storage requirements for streambank and shoreline restoration fills of less than 200 cubic yards. A request for fee-in-lieu of on-site stormwater storage shall be either rejected or approved within forty five (45) days of the written request unless additional engineering studies are required.
 - (b) Approval of a request for fee-in-lieu of on-site stormwater storage on a development site below the detention threshold in this Ordinance Article IV, Section A.1.f. and g. and for compensatory storage requirements for streambank and shoreline restoration fills of less than 200 cubic yards shall be determined by the Enforcement Officer.
 - (c) Fee-in-lieu of on-site stormwater storage shall be the lesser of: 1) the fee computed for each acre- foot or cubic yard or part thereof of stormwater storage approved in accordance with the procedures and schedules as approved by the SMC for Non-Certified Communities or the community elected board of officials in a Certified Community or 2) the estimated construction cost as approved by the SMC for Non-Certified Communities or the community elected board of officials in a Certified Community of the applicant's proposed and approved on-site stormwater storage, including land costs.
 - (d) A fund will be maintained by the Certified Community or the SMC for Non-Certified Communities for each of the four major Lake County watersheds for the purpose of identifying and controlling all revenues and expenditures resulting from fee-in-lieu of on-site

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stormwater storage approvals. All fee-in-lieu of on-site stormwater storage revenues received from each watershed shall be deposited in these funds for use within that watershed. A Certified Community may opt to allow SMC to administer fee-in-lieu-of revenues and expenditures through execution of an Intergovernmental Agreement specifying that arrangement.

- (e) The following requirements must be met before a fee-in-lieu of on-site stormwater storage will be approved:
 - (i) The downstream stormwater management system has “adequate downstream stormwater capacity” (see definitions); and
 - (ii) The SMC for Non-Certified Communities or the community elected board of officials in a Certified Community has an adopted fee-in-lieu of stormwater storage program.
- (f) Fee-in-lieu of on-site stormwater storage revenues may be used to plan, design or construct an upgrade to existing or future stormwater management systems if the upgrade is consistent with a basin plan, floodplain study or stormwater system improvement that has been approved by the SMC for Non-Certified Communities or the community elected board of officials in a Certified Community.

g. Stormwater Conveyance Systems

(1) Storm Sewers and Swales

- (a) The 10-year design storm shall be used as a minimum for the design of storm sewers, swales and appurtenances. Storm sewers shall have a minimum diameter of 12 inches with the exception that storm sewers servicing a single parcel may be excused from this requirement upon approval of the Enforcement Officer.
- (b) Development shall not connect to sanitary sewers or existing agricultural stormwater management systems (tiles) as an outflow for the stormwater management system. Field tile systems disturbed during the process of development shall be reconnected by those responsible for their disturbance unless the approved drainage plan includes provisions for these.

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- (c) All storm sewers shall be located in a public road right-of-way or maintenance easement of sufficient size to maintain or re-construct the sewer.
- (d) All on-site stormwater conveyance systems shall be designed and constructed to withstand the expected velocity of flow from all events up to the base flood without erosion. Stabilization adequate to prevent erosion shall be provided at the inlets and outlets for all pipes transitions and paved channels.
- (e) Swales being used as part of the stormwater management system for a development shall be located within a deed or plat restricted area of sufficient size to maintain or reconstruct the swale.

(2) Streams and Channels

The following items are general performance standards for streams and channels and do not excuse development from meeting all other requirements of this Ordinance.

- (a) Natural streams and channels are to be conserved.
- (b) Removal of streamside (riparian) vegetation shall be limited to one side of the channel.
- (c) Clearing of channel vegetation shall be limited to that which is essential for construction of the channel.
- (d) If a stream or channel meeting the definition of Waters of the United States or Isolated Waters of Lake County is modified, a stream or channel mitigation plan shall be submitted for review and approval to the Enforcement Officer. The plan shall show how the physical characteristics of the modified channel shall meet the existing channel length, cross-section, slope, sinuosity and carrying capacity of the original channel. The plan shall also re-establish vegetation within the channel modification using the Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois, NRCS, et al., (as amended) as a minimum standard for the re-vegetation plan.
- (e) All disturbed areas associated with a channel modification shall be seeded or otherwise stabilized immediately according to Article IV, Section B.1.j.1.d.

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- (f) If channels are modified, an approved and effective means to reduce sedimentation and degradation of downstream water quality must be installed before excavation begins and must be maintained throughout the construction period.
- (g) New or relocated channels shall be built in the dry and all items of construction, including vegetation, shall be completed prior to diversion of water into the new channel.
- (h) Streams and channels shall be expected to withstand all events up to the base flood without increased erosion. The use of armoring of banks using bulkheads, rip-rap and other materials shall be avoided. Armoring shall only be used where erosion cannot be prevented in any other way such as use of vegetation or gradual slopes. Such armoring shall have minimal impact on other properties, and the existing land configuration.
- (i) A minimum maintenance easement of 12-feet from top of bank is required along one side of all channels draining 20 or more acres. All drainage easements shall be accessible to vehicular equipment; however, linear accessibility for vehicular equipment is not required.
- (j) Construction vehicles shall cross streams by the means of existing bridges or culverts. Where an existing crossing is not available, a temporary crossing shall be constructed in which:
 - (i) The approach roads will be 0.5 feet or less above natural grade.
 - (ii) The crossing will allow stream flow to pass without backing up the water above the stream bank vegetation line or above any drainage tile or outfall.
 - (iii) The top of the roadway fill in the channel will be at least 2 feet below the top of the lowest bank. Any fill in the channel shall be non-erosive material, such as rip-rap or gravel.
 - (iv) All disturbed stream banks will be seeded or otherwise stabilized as soon as possible in accordance with Article IV, Section B.1.j.1.d. upon installation and again upon removal of construction crossings.

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- (v) The access road and temporary crossings will be removed within one year after installation, unless an extension of time is granted by the Enforcement Officer.

(3) Overland Flow Paths

The following items are general performance standards for overland flow paths and do not excuse development from meeting all other requirements of this Ordinance.

- (a) All areas of development must be provided with an overland flow path that will pass the base flood flow without damage to structures or property. If the upstream drainage area is less than 20-acres, the storm sewer pipe and inlet systems sized for the base flood can be constructed in lieu of providing an overland flow path.
- (b) The flow rate for a base flood shall be used to establish overland flow path limits, and it shall include all on-site and off-site tributary areas in accordance with Article IV, Section B.1.b.
- (c) The overland flow path shall be protected from any activity, such as fencing, landscaping, or storage shed placement, which could impair its function. This protection shall be established through a deed or plat restriction.
- (d) For overland flow paths with less than 20-acres tributary drainage area, all structures in parcels containing or adjoining to an overland flow path or other high water level designation shall have a lowest adjacent grade a minimum of one half (0.5) foot above the design high water elevation.
- (e) For overland flow paths with greater than or equal to 20-acres tributary drainage area but less than 100 acres, all structures in parcels containing or adjoining to an overland flow path or other high water level designation shall have a lowest adjacent grade a minimum of one (1.0) foot above the design high water elevation.

h. Water Quality Treatment

- (1) The water quality treatment requirements of this ordinance shall apply to any development within the total land area of the ownership parcel that results in creation of more than 0.5 acres of new impervious area, where "new" is defined in Article IV.A.1.f. of this ordinance.

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- (2) Prior to discharging to Waters of the United States, Isolated Waters of Lake County or adjoining property, all development shall divert and detain at least the first 0.01 inches of runoff for every 1% of impervious surface for the development with a minimum volume equal to 0.2 inches of runoff (e.g. 20% or less impervious = 0.2", 50% impervious = 0.5", 90% impervious = 0.9"); or provide a similar level of treatment of runoff as approved by the Enforcement Officer and consistent with the Best Management Practices guidance contained in the Technical Reference Manual.

- i. Buffer Areas

- (1) Buffer areas shall be required for all areas defined as either Waters of the United States or Isolated Waters of Lake County. Buffer areas are divided into two types, linear buffers and water body buffers.

Waters of the United States is a defined term (Appendix A) in this Ordinance and refers to areas that are under the jurisdictional authority and regulated by the United States Army Corps of Engineers. Isolated Waters of Lake County are under the jurisdictional authority of this ordinance and is a defined term in Appendix A.

- (a) Linear buffers shall be designated along both sides of all channels meeting the definition of Waters of the United States or Isolated Waters of Lake County. The buffer width shall be determined as follows:
 - (i) When the channel has a watershed greater than 20-acres but less than one square mile, the minimum buffer shall be 50 feet on each side of the channel.
 - (ii) When the channel has a watershed greater than one square mile, the minimum buffer shall be 30 feet on each side of the channel.
 - (iii) Linear high quality aquatic resources and streams with an Index of Biotic Integrity (IBI) greater than 40 shall have a minimum buffer width of 100 feet on each side of the channel. (Initial IBI based on IEPA Illinois Water Quality Report, biannual. A site-specific IBI assessment may override this report.)
- (b) Water body buffers shall encompass all non-linear bodies of water meeting the definition of either Waters of the United States or Isolated Waters of Lake County. The buffer width shall be determined as follows:

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- (i) For all water bodies or wetlands with a total surface area greater than one third (1/3) acre but less than one (1) acre, a minimum buffer width of thirty (30) feet shall be established.
 - (ii) For all water bodies or wetlands with a total surface area greater than one (1) acre but less than two and one half (2 ½) acres, a minimum buffer width of forty (40) feet shall be established.
 - (iii) For all water bodies or wetlands with a total surface area greater than two and one half (2½) acres, a minimum buffer width of fifty (50) feet shall be established.
- (2) Non-linear high quality aquatic resources shall have a minimum buffer width of one hundred (100) feet.
- (3) In areas where state or federal threatened and endangered species are present or for an Illinois Natural Area Inventory Site, buffer widths may be modified upon approval of the Enforcement Officer. Any modification requires approval by the Enforcement Officer following consultation with the Illinois Department of Natural Resources or United States Fish and Wildlife Service.
- (4) Buffer areas for water bodies meeting the definition of Waters of the United States or Isolated Waters of Lake County shall extend from the ordinary high water mark. Buffer areas for wetlands shall extend from the edge of the delineated wetland. A property may contain a buffer area that originates from Waters of the United States or Isolated Waters of Lake County on another property.
- (5) Features of the stormwater management system approved by SMC or certified community may be within the buffer area of a development.
- (6) Access through buffer areas shall be provided, when necessary, for maintenance purposes.
- (7) All roadside drainage ditches, existing excavated detention facilities (as of the amended date of this Ordinance, August 10, 1999), borrow pits, quarries and improvements to existing public road developments or alignments are exempt from buffer requirements.
- (8) Stormwater discharges that enter a buffer shall have appropriate energy dissipation measures to prevent erosion and scour.

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- (9) All buffer areas shall be maintained free from development including disturbance of the soil, dumping or filling, erection of structures and placement of impervious surfaces except as follows:
- (a) A buffer area may be used for passive recreation (e.g., bird watching, walking, jogging, bicycling, horseback riding and picnicking) and it may contain pedestrian, bicycle or equestrian trails.
 - (b) Structures and impervious surfaces (including trails, paths) may occupy a maximum of twenty (20) percent of the buffer surface area provided the runoff from such facilities is diverted away from the Waters of the United States or Isolated Wetlands of Lake County or such runoff is directed to enter the buffer area as unconcentrated flow.
 - (c) Utility maintenance, construction of stormwater facilities and maintenance of stormwater facilities shall be allowed.
 - (d) Boat docks, boathouses and piers shall be allowed and the provisions of (9) (b) above shall apply.
 - (e) Buffer areas hydrologically disturbed by allowing construction or as part of a revegetation plan shall be revegetated using the Native Plant Guide for Streams and Stormwater Facilities in Northeastern Illinois, NRCS, et al., (as amended) as a minimum standard.
- (10) A buffer shall be established between design normal and high water levels around constructed water quality treatment basins to enhance treatment effectiveness.
- (11) Buffer Averaging: The buffer width for a development site may be varied to a minimum of ½ of the buffer width required, upon approval of the Enforcement Officer, provided that the total buffer area required is achieved adjacent to the Waters of the United States or Isolated Waters of Lake County being buffered. The consultation process of the IDNR or U.S. Fish & Wildlife Service may override the ability to average buffer areas upon approval of the Enforcement Officer.
- (12) Preservation of buffer areas shall be provided by deed or plat restrictions.
- (13) The buffer area of a development site may be subtracted from the water quality volume calculation performed for the site.

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j. Soil Erosion and Sediment Control

- (1) Soil erosion and sediment control related measures are required for any land disturbance activity permitted under Article IV, Section A. The following requirements shall be met:
 - (a) Soil disturbance shall be conducted in such a manner as to minimize erosion. Areas of the development site that are not to be graded shall be protected from construction traffic or other disturbance until final seeding is performed. Soil stabilization measures shall consider the time of year, site conditions and the use of temporary or permanent measures.
 - (b) Properties and channels adjoining development sites shall be protected from erosion and sedimentation. At points where concentrated flow leaves a development site, energy dissipation devices shall be placed at discharge locations and along the length of any outfall channel as necessary to provide a non-erosive velocity of flow from the structure to the watercourse so that the natural physical and biological characteristics and functions are maintained and protected.
 - (c) Soil erosion and sediment control features shall be constructed prior to the commencement of hydrologic disturbance of upland areas.
 - (d) Disturbed areas shall be stabilized with temporary or permanent measures within fourteen (14) calendar days following the end of active hydrologic disturbance, or redisturbance, consistent with the following criteria or using an appropriate measure as approved by the Enforcement Officer.
 - (i) Appropriate temporary or permanent stabilization measures shall include seeding, mulching, sodding, and/or non-vegetative measures.
 - (ii) Areas or embankments having slopes greater than or equal to 3H:1V shall be stabilized with staked in place sod, mat or blanket in combination with seeding.
 - (iii) Erosion control blanket shall be required on all interior detention basin side slopes between normal water level and high water level.

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- (iv) The fourteen (14) day stabilization requirement may be precluded by snow cover or where construction activity will resume within 21 days from when the active hydrologic disturbance ceased, then stabilization measures do not have to be initiated on that portion of the site by the 14th day after construction activity temporarily ceased given that portion of the site has appropriate soil erosion and sediment controls.
- (e) Land disturbance activities in streams shall be avoided, where possible. If disturbance activities are unavoidable, the following requirements shall be met:
 - (i) Where stream construction crossings are necessary, temporary crossings shall be constructed of non-erosive material.
 - (ii) The time and area of disturbance of a stream shall be kept to a minimum. The stream, including bed and banks, shall be restabilized within 48 hours after channel disturbance is completed or interrupted.
- (f) Soil erosion and sediment control measures shall be appropriate with regard to the amount of tributary drainage area as follows:
 - (i) Disturbed areas draining greater than 5000-ft² but less than 1-acre shall, at a minimum, be protected by a filter barrier (including filter fences, straw bales, or equivalent control measures) to control all off-site runoff. Vegetated filter strips, with a minimum width of 25-feet, may be used as an alternative only where runoff in sheet flow is expected.
 - (ii) Disturbed areas draining more than 1 but fewer than 5-acres shall, at a minimum, be protected by a sediment trap or equivalent control measure at a point downslope of the disturbed area.
 - (iii) Disturbed areas draining more than 5-acres, shall, at a minimum, be protected by a sediment basin with a perforated filtered riser pipe or equivalent control measure at a point downslope of the disturbed area.

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- (iv) Sediment basins shall have both a permanent pool (dead storage) and additional volume (live storage) with each volume equal to the runoff amount of a 2-year, 24-hour event over the on-site hydrologically disturbed tributary drainage area to the sediment basin. 2-year storm runoff volumes versus site runoff curve numbers are shown in Appendix K of this Ordinance. The available sediment volume below normal water level, in addition to the dead storage volume shall be sized to store the estimated sediment load generated from the site over the duration of the construction period. For construction periods exceeding 1-year, the 1-year sediment load and a sediment removal schedule may be submitted.

If the detention basin for the proposed development condition of the site is used for sediment basin, the above volume requirements will be explicitly met. Until the site is finally stabilized, the basin permanent pool of water shall meet the above volume requirements and have a filtered perforated riser protecting the outflow pipe.

- (g) All storm sewers that are or will be functioning during construction shall be protected by an appropriate sediment control measure.
- (h) If dewatering services are used, adjoining properties and discharge locations shall be protected from erosion. Discharges shall be routed through an effective sediment control measure (e.g., sediment trap, sediment basin or other appropriate measure).
- (i) All temporary soil erosion and sediment control measures shall be removed within 30 days after final site stabilization is achieved or after the temporary measures are no longer needed. Trapped sediment and other disturbed soil areas shall be permanently stabilized.
- (j) A stabilized mat of aggregate underlain with filter cloth (or other appropriate measure) shall be located at any point where traffic will be entering or leaving a construction-site to or from a public right-of-way, street, alley or parking area. Any sediment or soil reaching an improved public right-of-way, street, alley or parking area shall be removed by scraping or street cleaning as accumulations warrant and transported to a controlled sediment disposal area.

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The Enforcement Officer may require additional stabilized construction entrance methods.

- (k) Earthen embankments shall be constructed with side slopes no steeper than 3H:1V. Steeper slopes may be constructed with appropriate stabilization as approved by the Enforcement Officer.
- (l) Stormwater conveyance channels, including ditches, swales, and diversions, and the outlet of all channels and pipes shall be designed and constructed to withstand the expected flow velocity from the 10-year frequency storm without erosion. All constructed or modified channels shall be stabilized within 48-hours.
- (m) Temporary diversions shall be constructed as necessary to direct all runoff from hydrologically disturbed areas to the appropriate sediment trap or basin.
- (n) Soil stockpiles shall not be located in a flood-prone area or a designated buffer protecting Waters of the United States or Isolated Waters of Lake County. Soil stockpiles are defined as having greater than 100 yd² of soil and will remain in place for more than 7 days. Soil stockpile locations shall be shown on the soil erosion and sediment control plan and shall have the appropriate measures to prevent erosion of the stockpile.
- (o) Handbooks: Standards and specifications contained in The Illinois Urban Manual, as amended, and the planning procedures sections of the Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control, as amended, are referenced in this Ordinance as guidance for presenting soil erosion and sediment control plan specifications and delineating procedures and methods of operation under site development for soil erosion and sediment control. In the event of conflict between provisions of said manuals and this Ordinance, this Ordinance shall govern.

2. Application Requirements

All the following application requirements shall be submitted when applicable to the development as determined by the Enforcement Officer.

a. Application Requirements for Minor Developments

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- (1) Name and legal address of the applicant. Common address and legal description of the site and the parcel identification number where the development will take place. Mailing address of property owner and the signature of the applicant or applicant's agent.
- (2) A general description of the existing and proposed stormwater management system including all discharge points, collection, conveyance, and storage facilities.
- (3) A grading plan showing proposed and existing contours.
- (4) A site drainage plan locating drainage features, overland flow paths, stormwater management system components, flood-prone areas, Regulatory Floodplains, wetlands boundaries, buffer areas, existing or proposed septic systems and wells
- (5) An area drainage plan locating the proposed development in the watershed.
- (6) A description and depiction of measures to be taken to control erosion. (soil erosion and sediment control plan)
- (7) A description of the anticipated dates of initiation and completion of activity.
- (8) Provide an exhibit(s) for review which displays all deed or plat restrictions of record or to be recorded for the stormwater management system.
- (9) The federal, state and local permit requirements of Article IV.B.2.b.(13) and (14) are required when applicable to the development site and Article IV.B.2.b.(9) and (10) shall be required when requested by the Enforcement Officer.
- (10) A wetland submittal if required under Article IV.E. of this ordinance.

b. Application requirements for Major Developments

In addition to the requirements for minor developments, major development applications require the following information:

- (1) Name and legal address of the applicant, and common address of the location where the development will take place, mailing address of the property owner and the signature of the applicant or the applicant's agent.
- (2) A topographic map of the existing conditions of the development site showing the location of all roads, all drainageways, the boundaries of predominate soil types, the boundaries of predominate vegetation, and the location of

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any drainage easements, detention or retention basins, including their inflow and outflow structures, if any. The map shall also include the location, size, and flowline elevations of all existing storm or combined sewers and other utility lines within the site. The map shall be prepared using a minimum 2-foot contour interval and shall be prepared at an appropriate scale for the type of project and shall include specifications and dimensions of any proposed channel modifications, location and orientation of cross-sections, if any, north arrow, and a graphic or numerical scale. All elevations shall be referenced to National Geodetic Vertical Datum NGVD (1929 adjusted).

- (3) Include cross-section views for the stormwater management system showing existing and proposed conditions including principal dimensions of the work, and existing and proposed elevations, normal water and calculated base flood elevations, and overland flow depth and path.
- (4) A vicinity map shall be included along with the parcel identification numbers of all parcels comprising the proposed development.
- (5) A report describing the hydrologic and hydraulic analysis performed for the project. The report shall include the name of stream or body of water affected, a statement of purpose of proposed activity, and a detailed determination of the runoff for the project site under existing and developed conditions. This includes documentation of the design volumes and rates of the proposed runoff for each portion of the watershed tributary to the stormwater management system and receiving channel and high water elevations. Runoff calculations shall include all discharges entering the site from upstream areas.
- (6) A section in the hydrologic and hydraulic analysis report describing how the Runoff Volume Reduction Hierarchy clauses (as described in Article IV, Section B.1.d.) were evaluated in designing and determining the stormwater management needs of the site.
- (7) For detention facilities, a section in the hydrologic and hydraulic analysis report that includes a plot or tabulation of storage volumes and water surface areas with corresponding water surface elevations, stage-discharge or outlet rating curves, and design hydrographs of inflow and outflow for the 2-year, 24-hour and the 100-year, 24-hour storm events under existing and developed conditions.

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- (8) A soil erosion and sediment control plan showing all measures appropriate for the development as approved by the Enforcement Officer, to meet the objectives of this Ordinance throughout all phases of construction and permanently after completion of development of the site, including:
- (a) Location and description, including standard details, of all sediment control measures and design specifics of sediment basins and traps, including outlet details. The drainage area tributary to each sediment control measure shall be delineated on the soil erosion and sediment control plan.
 - (b) Location and description of all soil stabilization and erosion control measures, including seeding mixtures and rates, types of sod, method of seedbed preparation, expected seeding dates, type and rate of lime and fertilizer application, kind and quantity of mulching for both temporary and permanent vegetative control measures, and types of non-vegetative stabilization measures.
 - (c) Location and description of all runoff control measures, including diversions, waterways, and outlets.
 - (d) Location and description of methods to prevent tracking of sediment off-site, including construction entrance details, as appropriate.
 - (e) Description of dust and traffic control measures.
 - (f) Locations of stockpiles and description of stabilization methods.
 - (g) Description of off-site fill or borrow volumes, locations, and methods of stabilization.
 - (h) Provisions for maintenance of control measures, including type and frequency of maintenance, easements, and estimates of the cost of maintenance.
 - (i) Identification (name, address, and telephone) of the person(s) or entity which will have legal responsibility for maintenance of erosion control structures and measures during development and after development is completed.

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- (j) A written narrative description of the proposed phasing (construction sequencing) of development of the site, including stripping and clearing, rough grading and construction, and final grading and landscaping. Phasing should identify the expected date on which clearing will begin, the estimated duration of exposure of cleared areas, and the sequence of installation of temporary sediment control measures (including perimeter controls), clearing and grading, installation of temporary soil stabilization measures, installation of storm drainage, paving streets and parking areas, final grading and the establishment of permanent vegetative cover, and the removal of temporary measures. It shall be the responsibility of the applicant to notify the Enforcement Officer of any significant changes which occur in the site development schedule after the initial soil erosion and sediment control plan has been approved.
 - (k) Bonds: The applicant may be required to file with the Enforcement Officer a faithful performance bond or bonds, letter of credit, or other improvement security satisfactory to the Enforcement Officer in an amount deemed sufficient by the Enforcement Officer to cover all costs of improvement, landscaping, maintenance of improvements and landscaping, and soil erosion and sediment control measures for such period as specified by the Enforcement Officer, and engineering and inspection costs to cover the cost of failure or repair of improvements installed on the site.
- (9) A maintenance plan for the ongoing maintenance of all stormwater management system components including wetlands is required prior to plan approval. The plan shall include:
- (a) Maintenance tasks.
 - (b) The party responsible for performing the maintenance tasks.
 - (c) A description of all permanent public or private access maintenance easements and overland flow paths, and compensatory storage areas.
 - (d) A description of dedicated sources of funding for the required maintenance.
- (10) The Application shall meet the requirements of this Ordinance and shall be certified and sealed by a Registered Professional Engineer.

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- (11) Public trail and park facility project's which do not involve the placement of structures or fill can be submitted without the certification or seal of a Registered Professional Engineer.
- (12) A description of the anticipated dates of initiation and completion of activity.
- (13) A copy of the Natural Resources Inventory (NRI) shall be submitted by the applicant to the Enforcement Officer, for development that is required to obtain a NRI performed by the Lake County Soil and Water Conservation District pursuant to state statute 70 ILCS 405/22.02a.
- (14) For all development sites requiring a National Pollutant Discharge Elimination System (NPDES) permit, the applicant shall submit a Notice of Intent to the IEPA to comply with the NPDES Permit. The approved soil erosion and sediment control plan created pursuant to the requirements of this Ordinance shall fulfill the plan requirements in the NPDES permit.
- (15) If the soil mapping submitted for the development indicates the presence of the soils listed below, then the applicant shall provide site specific soil mapping performed by a certified soil classifier for the development. No buildings shall be constructed on these soils unless appropriate building methods, such as pilings, caissons or removal and replacement of unsuitable soils, as approved by the Enforcement Officer, are used to provide and protect a suitable building foundation.
 - (a) Soils classified as a hydric soil (USDA/NRCS Soil Classification) in its very poorly drained condition or the following three soil classification in any condition;
 - (i) Houghton Muck (W103)
 - (ii) Houghton Peat (W97)
 - (iii) Peotone Silty Clay Loam (W330)

Development that is exempted from this requirement is any development activity not resulting in the construction of a building.

- (16) A copy of the consultation application to the IDNR/Division of Natural Resource Review and Coordination shall be submitted by the applicant to the Enforcement Officer for development that is required to comply with the consultation process of the Illinois Endangered Species Protection Act [520 ILCS 10/11].

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- (17) Subsurface Drainage (Drain Tiles): The applicant shall submit a subsurface drainage inventory. The inventory shall locate existing farm and storm drainage tiles by means of slit trenching and other appropriate methods performed by a qualified subsurface drainage consultant. All existing drain tile lines damaged during the investigation shall be repaired and functional.
- (a) The applicant shall provide a topographical boundary map location these lines showing:
- (i) Location of each slit trench and identified to correspond with the tile investigation report and field staked at no less than 50 foot intervals;
 - (ii) Location of each drain tile with a flow direction arrow, tile size and any connection to adjoining properties; A summary of the tile investigation report showing trench identification number, tile size, material and quality, percentage of the tile filled with water, percentage of restrictions caused by silting, depth of ground cover, and soil texture at grade;
 - (iii) Name, address and phone number of person or firm conducting tile location investigation.
- (b) Information collected during the drainage investigation shall be used to design and develop a stormwater management system that will provide drainage that is appropriate for the development and connecting tile lines on adjoining properties.
- (18) A wetland submittal if required under Article IV.E. of this ordinance.
- c. The applicant shall obtain and provide a copy of an IDNR/OWR Dam Safety Permit or a letter stating that a Dam Safety Permit is not required if the development includes a dam before the applicant requests or obtains a Watershed Development Permit. Reference Appendix G for IDNR/OWR Dam Safety permitting guidelines.
- d. The applicant shall obtain and provide copies of any and all required federal, state and local permits for development in the Regulatory Floodplain before the applicant requests or obtains a Watershed Development Permit. Reference Appendix H for a partial list of permits that may be applicable.

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- e. The applicant shall submit the data required to SMC, IDNR/OWR, and FEMA for proposed revisions to the base flood elevation of a Regulatory Floodplain study or relocation of a Regulatory Floodway boundary.
- f. The applicant shall provide, when applicable to the development: an affidavit or documentation to prove where the development was above the Base Flood Elevation (BFE) prior to the effective date of the first Regulatory Floodplain map; certification that the ground elevation existed prior to the effective date of the first Regulatory Floodplain map.

C. REGULATORY FLOODPLAINS AND FLOODWAYS

- 1. Location of Regulatory Floodplain, Base Flood Elevation (BFE) and Regulatory Floodway
 - a. The Regulatory Floodplain is delineated within a development by projecting the BFE onto the site topography.
 - b. The BFE shall be as delineated by the 100-year flood profiles, as indicated on the floodplain studies noted below;
 - (1) SMC Regulatory Floodplain profiles, approved by the SMC for regulatory use after a 60-day public review and comment period and approved by IDNR/OWR and FEMA for SMC regulatory use, as listed in Appendix B; or
 - (2) Should no SMC approved Regulatory Floodplain profile exist for the site, the FEMA Flood Insurance Study and profiles, as listed in Appendix C; or
 - (3) In the case of FEMA delineated "AH Zones" the elevation noted on the map shall be the BFE. In the case of FEMA delineated "AO Zones" the BFE shall be the depth number shown on the map added to the highest adjacent grade, or at least two feet above the highest adjacent grade if no depth number is provided; or
 - (4) When no base flood elevation information exists, the BFE shall be determined by a Registered Professional Engineer using an appropriate model or technique as approved by the SMC or IDNR/OWR. For riverine flood-prone areas with greater than 100-acres of tributary drainage area, non-riverine flood-prone areas with greater than 20-acres of tributary drainage area, and all mapped Special Flood Hazard Areas regardless of drainage area, the BFE determination shall be submitted to SMC for approval prior to issuance of a Watershed Development Permit. The BFE determination for non-riverine depressional floodplains with less than 20-acres of tributary drainage area shall be reviewed and approved by the Enforcement Officer. BFE determinations shall be based on the critical duration event.

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- (a) Where a channel has a tributary drainage area of 640-acres or more, the above analyses shall be submitted to SMC for approval by IDNR/OWR.
 - (b) For a non-riverine Regulatory Floodplain, the historic flood of record (as determined by the Enforcement Officer according to Article IV, Section C.1.b.4. above) plus three feet may be used for the BFE instead of performing a detailed hydrologic and hydraulic study.
- c. The location of the Regulatory Floodway shall be as delineated on the maps referenced in Appendix C. Where Interpretation is needed to determine the exact location of the Regulatory Floodway boundary, IDNR/OWR should be contacted.
 - d. Nothing contained herein shall prohibit the application of these regulations to land that can be demonstrated by engineering survey to lie within any Regulatory Floodplain. Conversely, any lands (except for those located in a Regulatory Floodway) that can be demonstrated by a topographic survey certified by a Registered Professional Engineer or Registered Land Surveyor to lie beyond the Regulatory Floodplain, and show to the satisfaction of the Enforcement Officer, to have been higher than the BFE as of the effective date of the first floodplain mapping denoting the site to be in a Special Flood Hazard Area, shall not be subject to the regulations of this section.

In the case of a site located in the Regulatory Floodway that is higher than the BFE, it is subject to the regulations of this section until such time as a letter of map revision is received for the IDNR/OWR and FEMA.

2. Performance Standards Applicable to all Regulatory Floodplain Development

The standards of this section apply to all Regulatory Floodplain development except when superseded by more stringent requirements in the subsequent sections.

- a. Modification and disturbance of natural riverine Regulatory Floodplains shall be avoided to protect existing hydrologic and environmental functions. Such disturbances shall be minimized and all negative impacts mitigated as described in a mitigation plan.
- b. No development shall be allowed in the Regulatory Floodplain that shall singularly or cumulatively create a damaging or potentially damaging increase in flood heights or velocity or threat to public health, safety and welfare or impair the natural hydrologic functions of the Regulatory Floodplain or channel.

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- c. For all projects involving channel modification, fill, stream maintenance, or levees, the flood carrying capacity of the Regulatory Floodplain shall be maintained.
- d. Compensatory storage is required for all storage lost or displaced in a Regulatory Floodplain due to development.
 - (1) Hydraulically equivalent compensatory storage requirements for fill or structures in a riverine Regulatory Floodplain shall be at least equal to 1.2 times the volume of Regulatory Floodplain storage lost or displaced. Such compensation areas shall be designed to drain freely and openly to the channel and located opposite or adjacent to fill areas. A recorded covenant running with the land is required to prohibit any modification to the compensation area. The Regulatory Floodplain storage volume lost below the existing 10-year frequency flood elevation must be replaced below the proposed 10-year frequency flood elevation. The Regulatory Floodplain storage volume lost above the 10-year existing frequency flood elevation must be replaced above the proposed 10-year frequency elevation.
 - (2) Hydraulically equivalent compensatory storage requirements for fill or structures in a non-riverine Regulatory Floodplain shall be at least equal to 1.0 times the volume of Regulatory Floodplain storage lost or displaced. Non-riverine floodplain storage may be replaced at or below the existing elevation but not below the Normal Water Level.
 - (3) Upon approval of the Enforcement Officer, shorelines or streambanks that have experienced erosion may be restored to their condition as of the effective date of the first FIRM in that community without the need to provide compensatory storage or pay a fee-in-lieu of for the fill used to restore the eroded area according to the following criteria.
 - (a) The restoration fill shall meet existing grades and within riverine areas the current effective regulatory floodplain and regulatory floodway conveyance shall be maintained
 - (b) The amount of eroded property being restored shall be documented and submitted by the applicant as part of the permit process. Proper documentation shall be either field survey information or photo documentation of the erosion that has occurred for the property being restored.

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(c) For rivers, lakes and streams where no floodway has been designated, no documentation of past shoreline erosion is required if the applicant does not exceed 1 cubic yard of fill per lineal foot for a maximum of 200 feet. In this case, the placing of the fill shall not significantly alter the alignment of the shoreline with adjacent properties as determined by the Enforcement Officer. Non-documentable fills are a one-time allowance on a per property basis and all fills exceeding 200 cubic yards shall be regulated as specified in Articles IV.B.1.f. and IV.C.2.d. of this ordinance.

e. Public Health Protection Standards

- (1) No developments in the Regulatory Floodplain shall include locating or storing chemicals, explosives, buoyant materials, animal waste, fertilizers, flammable liquids, pollutants, or other hazardous or toxic materials below the Flood Protection Elevation (FPE).
- (2) New and replacement water supply systems, wells, and sanitary sewer lines may be permitted providing all manholes or other above-ground openings located below the FPE are watertight.
- (3) On-site waste disposal systems shall be designed to avoid inundation by the base flood.

f. Building Protection Requirements

- (1) The lowest floor including basements of all new residential structures shall be elevated up to at least the Flood Protection Elevation (FPE). An attached garage for a new structure must be elevated up to at least $\frac{1}{2}$ of one foot above the base flood elevation (BFE).
 - (a) If placed on compacted fill, the top of the fill for residential structure shall be above the FPE. The top of fill for an attached garage shall be $\frac{1}{2}$ of one foot above the BFE. The fill pad shall be placed at the appropriate elevation and designed to extend a minimum of 10-feet out from the building's designed footprint unless the building is certified by a Registered Structural Engineer to be protected from damages due to hydrostatic pressures. Additionally, the fill pad shall meet 95% of Standard Proctor Density in order to be demonstrated not to settle below the FPE for the residential structure and not below $\frac{1}{2}$ of one foot above the BFE for an attached garage, and to be adequately protected against erosion, scour and differential settlement. Foundation excavations shall not exceed more than

5-feet beyond the foundation footprint. Backfill for the over excavated area does not need to meet the compaction requirements.

- (b) If elevated by means of walls, pilings, or other foundation, the building's supporting structure must be permanently open to flood waters and not subject to damage by hydrostatic pressures of the base flood. The permanent openings shall be no more than one foot above lowest adjacent grade and below the BFE, and consist of a minimum of two openings. The openings must have a total net area of not less than one square inch for every one square foot of enclosed area subject to flooding below the BFE. The foundation and supporting members shall be anchored and aligned in relation to flood flows and adjoining structures so as to minimize exposure to known hydrodynamic forces such as current, waves, ice and floating debris. All areas below the FPE shall be constructed materials resistant to flood damage. The lowest floor (including basement) for the residential structure and all electrical, heating, ventilation, plumbing, and air conditioning equipment and utility meters shall be located at or above the FPE. An attached garage must be elevated to at least $\frac{1}{2}$ of one foot above the BFE. Water and sewer pipes, electrical and telephone lines, submersible pumps and other waterproofed service facilities may be located below FPE. No area less than one foot above the BFE shall be used for storage of items or materials.
- (2) The lowest floor, including basements, of an existing structure with a substantial improvement shall be elevated in order to be not less than one foot above the BFE. The requirements above in Article IV, Section C.2.f.1. a & b shall also apply to this section.
 - (3) The lowest floor including the basements of all new or substantially improved non-residential buildings shall be elevated at least to the FPE in accordance with Article IV, Section C.2.f.1. a & b or be structurally dry flood-proofed to at least the FPE. A non-residential building may be structurally dry flood-proofed (in lieu of elevation) provided that a Registered Professional Engineer or Registered Structural Engineer shall certify that the building has been structurally dry flood-proofed below the FPE and the structure and attendant utility facilities are watertight and capable of resisting the effects of the base flood. The building design shall take into account flood velocities, duration, rate of rise, hydrostatic and hydrodynamic forces, the effects of buoyancy and impacts from debris or ice.

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Flood-proofing measures shall be operable without human intervention and without an outside source of electricity. (Levees, berms, floodwalls and similar works are not considered flood-proofing for the purpose of this subsection.)

- (4) Manufactured homes and recreational vehicles to be installed on a site for more than 180 days, shall be elevated to or above the FPE and shall be anchored to resist flotation, collapse, or lateral movement by being tied down in accordance with the Rules and Regulations for the Illinois Mobile Home Tie-Down Act issued pursuant to 77 Ill. Adm. Code 870.
- (5) Tool sheds, detached garages, and attached garages which are not substantial improvements on an existing single-family platted lot, may be constructed with the lowest floor below the FPE in accordance with the following:
 - (a) The building shall not be used for human habitation.
 - (b) All areas below the BFE shall be constructed with waterproof material. Structures located in a Regulatory Floodway shall be constructed and placed on a building site so as not to block the flow of flood waters and shall also meet the Appropriate Use criteria of Article IV, Section C.3. In addition, all other requirements of this Ordinance must be met.
 - (c) The structure shall be anchored to prevent flotation.
 - (d) Service facilities such as electrical and heating equipment shall be elevated or flood-proofed to the FPE.
 - (e) The building shall be valued at less than \$12,500 (1998 costs) and be no greater than 576 square feet in floor size.
 - (f) The building shall be used only for the storage of vehicles or tools and may not contain other rooms, workshops, greenhouses or similar uses.
- (6) A non-conforming structure damaged by flood, fire, wind or other natural or man-made disaster may be restored unless the damage meets or exceeds fifty percent (50%) of its market value before it was damaged, in which case it shall conform to the above provisions of Article IV, Section C.2.f.(2).

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- g. If the proposed development would result in a change in the mapped Regulatory Floodplain or BFE on a site, the applicant shall submit sufficient data to FEMA and SMC to obtain a Letter of Map Revision (LOMR). Proposed changes to Regulatory Floodplain and Regulatory Floodway delineation and BFE shall be submitted to SMC. IDNR/OWR concurrence is required for changes to the BFE and floodway delineation.
 - h. If the development is located in a public body of water, as defined by IDNR/OWR, a permit must also be received from IDNR/OWR.
 - i. Any work involving construction or modification or removal of a dam or an on-stream structure to impound water shall obtain an Illinois Division of Water Resources Dam Safety Permit or letter indicating a permit is not required prior to the start of development activity. Reference Appendix G for IDNR/OWR Dam Safety Permitting guidelines.
 - j. If flood-proofing construction is required beyond the outside dimensions of an existing habitable, residential or commercial building, the outside perimeter of the flood-proofing construction shall be placed no further than 10-feet from the outside of the building. Compensation of lost storage and conveyance will not be required for flood-proofing activities.
 - k. For public flood control projects, the permitting requirements of Article IV, Section C. will be considered met if the applicant can demonstrate to IDNR/OWR through hydraulic and hydrologic calculation that the proposed project will not singularly or cumulatively result in increased flood heights outside the project right-of-way or easements for all flood events up to and including the base flood event.
3. Additional Performance Standards for the Regulatory Floodway (IDNR/OWR Regulations)

The only development in a Regulatory Floodway which will be allowed are Appropriate Uses which will not cause an increase in flood heights for all flood events up to and including the base flood. Only those Appropriate Uses listed below and in 17 IL Adm. Code Part 3708 will be allowed in the Regulatory Floodway. Appropriate uses do not include the construction or placement of any new structures, fill, building additions, buildings on stilts, fencing (including landscaping or planting designed to act as a fence) and storage of materials except as specifically defined below as an Appropriate Use. If the development is proposed for the Regulatory Floodway portion of the Regulatory Floodplain the following standards apply in addition to the previously stated standards for the Regulatory Floodplain:

- a. Only the construction, modification, repair or replacement of the following Appropriate Uses will be allowed in the Regulatory Floodway:

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- (1) Public flood control structures and private improvements relating to the control of drainage, flooding of existing buildings, erosion, water quality or habitat for fish and wildlife;
- (2) Structures or facilities relating to functionally water dependant uses such as facilities and improvements relating to recreational boating and as modifications or additions to existing wastewater treatment facilities;
- (3) Storm and sanitary sewer outfalls;
- (4) Underground and overhead utilities of sufficiently flood-proofed;
- (5) Recreational facilities such as playing fields and trail systems including any related fencing (at least 50% open when viewed from any one direction) built parallel to the direction of flood flows, and including open air pavilions;
- (6) Detached garages, storage sheds, or other non-habitable structures without toilet facilities, accessory to existing buildings that will not block flood flows nor reduce Regulatory Floodway storage.
- (7) Bridges, culverts and associated roadways, sidewalks and railways, necessary for crossing over the Regulatory Floodway or for providing access to other Appropriate Uses in the Regulatory Floodway and any modification thereto;
- (8) Parking Lots
 - (a) Parking Lots (where the existing depth of flooding for the base flood event is less than one foot) and aircraft parking aprons both built at or below ground elevation and any modifications thereto.
 - (b) The depth of flooding can be greater than one (1) foot for parking lots used for short term outdoor recreational use facilities where the applicant agrees to restrict access during overbank flooding events and agrees to accept liability for all damage caused by vehicular access during all overbank flooding events.
- (9) Regulatory Floodway re-grading, without fill, to create a positive non-erosive slope toward a channel.
- (10) Flood-proofing activities to protect previously existing lawful structures including the construction of water-tight window wells, elevating structures, or the construction of flood walls around residential, commercial or industrial principal structures where the outside toe of the floodwall shall be no

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more than ten (10) feet away from the exterior wall of the existing structure, and, which are not considered to be substantial improvements to the structure.

(11) The replacement, reconstruction or repair of a damaged building, provided that the outside dimension of the building are not increased and, provided that the building is not damaged to 50% or more of the building's market value before it was damaged. When damage is 50% or more, the activity shall conform to Article IV, Section C.2.f.(2).

(12) Modifications to an existing building, which are not substantial improvements, that would not increase the enclosed floor area of the building below the base flood elevation, and which will not block flood flows including but not limited to, fireplaces, bay windows, decks, patios, and second story additions. No enclosed floor areas may be built on stilts.

b. Additions to the above list of Appropriate Uses are not allowed.

c. All Appropriate Uses shall require a permit from the SMC or Certified Community and must be in accordance with all provisions of this Ordinance.

d. Construction of an Appropriate Use will be considered permissible provided that the proposed project meets the following engineering and mitigation criteria and that of Article IV, Sections C.1 and C.2 and is so stated in writing with supporting plans, calculations and data prepared by a Registered Professional Engineer.

(1) All effective Regulatory Floodway conveyance lost due to the development of Appropriate Uses, other than bridge or culvert crossings or on-stream structures or dams, shall be replaced for all flood events up to and including the base flood. In calculating effective Regulatory Floodway conveyance, the following factors shall be taken into consideration:

(a) Regulatory Floodway conveyance,

$$K = (1.486/n) AR^{2/3}$$

where "n" is Manning's roughness coefficient, "A" is the effective area of the cross-section, and "R" is the ratio of the area to the wetted perimeter.

(b) The same Manning's n-value shall be used for both existing and proposed conditions unless a recorded maintenance agreement with a federal, state, or local unit of government can ensure the proposed conditions will be maintained or the land cover changing from a vegetative to a non-vegetative land cover.

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- (2) Transition sections shall be provided and used in calculations of effective Regulatory Floodway conveyance, in the design of excavations in the Regulatory Floodway, between cross-sections with rapid expansions and contractions, and when meeting the Regulatory Floodway delineation on adjacent properties. The following expansion and contraction ratios shall be used.
 - (a) Water will expand no faster than at a rate of one-foot horizontal for every four-feet of the flooded stream's length.
 - (b) Water will contract no faster than at a rate of one-foot horizontal for every one-foot of the flooded stream's length.
 - (c) Water will not expand or contract faster than one-foot vertical for every ten-feet of flooded stream length.
 - (d) All cross-sections used in the calculations shall be located perpendicular to flood flows.
 - (e) In the design of excavations in the Regulatory Floodway, erosion/scour protection shall be provided on land upstream and downstream of proposed transition sections.
- (3) The development of all Appropriate Uses shall not result in an increase in the average channel or Regulatory Floodway velocities or stage, for all flood events up to and including the base flood event. However, in the case of bridges or culverts or on stream structures built for the purpose of backing up water in the stream during normal or flood flows, velocities may be increased at the structure site if scour, erosion and sedimentation will be avoided by the use of rip-rap or other design measures.
- (4) In the case of on-stream structures built for the purpose of backing up water, an increase in upstream stage when compared to existing conditions for all flood events up to and including the base flood event shall be contained within recorded easements. A permit or letter indicating a permit is not required must be obtained from IDNR/OWR, Dam Safety Section for a Dam Safety permit or waiver for any structure built for the purpose of backing up water in the stream during normal of flood flow.
- (5) General criteria for analysis of flood elevations.
 - (a) The flood profiles, flows and Regulatory Floodway data in the Regulatory Floodway study, referenced in Article IV, Section C.1, must be used for analysis of the base conditions.

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If the study data appears to be in error or conditions have changed, IDNR/OWR shall be contacted for approval and concurrence on the appropriate base conditions data to use.

- (b) If the BFE at the site of the proposed development is affected by backwater from a downstream receiving stream with a larger drainage area, the proposed development shall be shown to meet the requirements of this section for the base elevations of the Regulatory Floodway conditions and conditions with the receiving stream at normal water elevations. Additional receiving stream elevations may be considered for design if appropriate and approved by SMC or IDNR/OWR.
 - (c) If the applicant is informed by IDNR/OWR, local governments, or a private owner that a downstream or upstream restrictive bridge or culvert is scheduled to be removed, reconstructed, modified, or a regional flood control project is scheduled to be built, removed, constructed or modified within the next five years, the proposed development shall be analyzed and shown to meet the requirements of this section for both the existing conditions and the expected flood profile conditions when the bridge, culvert or flood control project is built.
- (6) If the Appropriate Use will result in a change in the Regulatory Floodway location or a change in the BFE the applicant shall submit to SMC the information required to be issued a Conditional Letter of Map Revision (CLOMR) from IDNR/OWR and FEMA. A public notice inviting public comment on the proposed change in the BFE or location in the Regulatory Floodway will be issued by IDNR/OWR or its designee before a CLOMR is issued. The application will not be considered complete until the CLOMR is received. No filling, grading, dredging or excavating shall take place until a conditional approval is issued. No further development activities shall take place until a final Letter of Map Revision (LOMR) is issued by IDNR/OWR and FEMA.
- e. For those circumstances listed below and located in a Regulatory Floodway, the following information shall be submitted to IDNR/OWR or SMC:
 - (1) Analysis of the flood profile due to a proposed bridge, culvert crossings and roadway approaches.
 - (2) An engineer's determination that an existing bridge or culvert crossing or approach road is not a source of flood damage and the analysis indicating the proposed flood profile.

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- (3) Alternative transition sections and hydraulically equivalent storage.
 - (4) IDNR/OWR will retain permit authority for any IDNR/OWR projects, dams, etc., all other state, federal or SMC projects.
 - (5) SMC will issue permits to local units of government for Regulatory Floodway development.
4. Special Considerations for the Construction of New Bridges or Culvert Crossings and Roadway Approaches or the Reconstruction or Modification of Existing Bridges, Culvert Crossings or Roadway Approaches.
 - a. A proposed new structure shall not result in an increase of upstream flood stages greater than 0.1-foot when compared to the existing conditions for all flood events up to and including the base flood event unless contained within the channel banks, or recorded easements. The evaluation must be submitted to the SMC for review and concurrence before a permit is issued.
 - b. If the proposed development will increase upstream flood stages greater than 0.1-feet, the applicant must contact IDNR/OWR, Dam Safety Section for a Dam Safety Permit or waiver.
 - c. Lost Regulatory Floodway storage must be compensated for per the Regulatory Floodplain performance standards of this Ordinance except that artificially created storage lost or displaced due to a reduction in head loss behind a bridge shall not be required to be replaced, provided no flood damage will be incurred downstream.
 - d. Velocity increases must be mitigated per the Regulatory Floodway performance section of this Ordinance except that in the case of bridges or culverts or on stream structures built for the purpose of backing up water in the stream during normal or flood flows, velocities may be increased at the structure site if scour, erosion and sedimentation will be avoided by the use of appropriate measures.
 - e. For modifications or replacement of existing structures, the existing structure must first be evaluated in accordance with Department of Transportation Rules 92 Ill. Adm. Code Part 708 to determine if the existing structure is a source of flood damage. If the structure is a source of flood damage, the applicant's engineer shall submit justification to allow the damage to continue and evaluate the feasibility of relieving the structure's impact. Modifications or replacement structures shall not increase flood stages compared to the existing condition for all flood events up to and including the base flood event. The evaluation must be submitted to IDNR/OWR or its designee for review and concurrence before a permit is issued.
 - f. If the crossing is proposed over a public body of water, an IDNR/OWR permit must be obtained.

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- g. The hydraulic analysis for the backwater caused by the bridge showing the existing condition and proposed regulatory profile must be submitted to IDNR/OWR for concurrence that a CLOMR is not required.

5. Regulatory Floodplains without Regulatory Floodways

The applicant, through SMC, shall obtain approval from IDNR/OWR for all development with a tributary drainage area of 640-acres or more located within the Regulatory Floodplain without a delineated Regulatory Floodway. The development shall not singularly or cumulatively result in an obstruction of flood flows or potential flood damages outside the development due to increased flood heights, velocities, or loss of floodplain storage. The applicant shall meet the requirements of Article IV, Section C of this Ordinance according to the following criteria:

- a. Submit to SMC an engineering study performed by a Registered Professional Engineer which will determine a floodway which meets the definition of a Regulatory Floodway and show that the proposed development will meet the requirements of Article IV, Section C of this Ordinance, or
- b. Submit to SMC an engineering study performed by a Registered Professional Engineer which will determine a base flood elevation and demonstrate that the proposed development will maintain the existing conditions conveyance, will not increase flood velocities, will not increase flood profiles, and will compensate for all lost flood storage at a ratio of 1.2:1 in a manner that is hydraulically equivalent, or
- c. Submit to SMC an engineering study performed by a Registered Professional Engineer which will demonstrate that for a range of flood elevations (which would conservatively exceed the expected 100-year flood elevation) that the proposed development will maintain the existing conditions conveyance, will not increase flood velocities, will not increase flood profiles, and will compensate for all lost flood storage at a ration of 1.2:1 in a manner that is hydraulically equivalent.

6. Application Requirements for Development in the Regulatory Floodplain.

If the development is located in a Regulatory Floodplain, the applicant shall provide the following additional information:

- a. Site location of the property, drawn to scale on the Regulatory Floodway map.
- b. A plan view of the project showing:
 - (1) The Regulatory Floodway limit, Regulatory Floodplain limit and for work in public bodies of water as defined by IDNR/OWR, the navigation channels.

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- (2) Cross-section views of the project for the impacted reach showing existing and proposed conditions including principal dimensions of the work as shown in plan view, existing and proposed elevations, normal water elevation, 10-year frequency flood elevation, 100-year frequency flood elevation, and graphic or numerical scales (horizontal and vertical).
 - (3) A copy of the Regulatory Floodway map with the project site delineated and marked to reflect any proposed change in the Regulatory Floodway location.
- c. A listing of all local, state and federal permits or approval letters that may be required for this type of development. The applicant shall obtain and provide copies of any and all required federal, state and local permits for development in the Regulatory Floodplain before the applicant requests or obtains a Watershed Development Permit. Reference Appendix H for a partial list of permits that may be applicable.
 - d. Engineering calculations and supporting data showing that the proposed work will meet the performance standards of this Ordinance.
 - e. All changes in grade resulting from any proposed excavation or filling; and existing and proposed Regulatory Floodplain and Regulatory Floodway limits; the location and dimension of all buildings and additions to buildings; and the elevation of the lowest floor (including basement) of all proposed buildings subject to the requirements of this Ordinance.
 - f. Elevation certificates of the lowest floor elevation (including basements and attached garages) or the elevation to which a non-residential building has been flood-proofed using a flood-proofing certificate for all buildings in the Regulatory Floodplain.

D. FLOOD – PRONE AREAS

The standards of this section apply to development located in flood-prone areas with drainage areas less than 640 acres or in depressional storage areas, as specified.

1. Flood-carrying Capacity.

The flood-carrying capacity shall be maintained for channels with flood-prone areas draining a tributary area of 20-acres or more. (Article IV, Section B.1.g)

2. Flood-prone Area Conveyance, Velocities, Flood Profiles, and Flood Storage

For all development within a flood-prone area where the tributary drainage area is 100-acres or more, the applicant shall meet the requirements of Article IV, Sections C.2. e & f of this Ordinance according to the following criteria:

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- a. Submit to SMC an engineering study performed by a Registered Professional Engineer which will determine a floodway which meets the definition of a Regulatory Floodway and show that the proposed development will meet the requirements of Articles IV, Section C, of this Ordinance; or
- b. Submit to SMC an engineering study performed by a Registered Professional Engineer which will determine a base flood elevation and demonstrate that the proposed development will maintain the existing conditions conveyance, will not increase flood velocities, will not increase flood profiles, and will compensate for all lost flood storage at a ratio of 1.2:1 in a manner that is hydraulically equivalent, or
- c. Submit to SMC an engineering study performed by a Registered Professional Engineer which will demonstrate that for a range of flood elevations (which would conservatively exceed the expected 100-year flood elevation) that the proposed development will maintain the existing conditions conveyance, will not increase flood velocities, will not increase flood profiles, and will compensate for all lost flood storage at a ratio of 1.2:1 in a manner that is hydraulically equivalent.

E. WETLAND PROVISIONS

1. Applicability

A Watershed Development Permit is required for any regulated development as defined in Article IV Section A.1, that:

- a. Creates a wetland impact within an area defined as a Waters of the U.S.; or
- b. Creates a wetland impact within an area defined as Isolated Waters of Lake County; or
- c. Occurs in buffer areas adjoining to Waters of the U. S. or Isolated Waters of Lake County.

2. Wetland Permit Submittal Requirements

In addition to all other WDO provisions, wetland permit submittal requirements depend upon whether the development is within Waters of the U. S. or Isolated Waters of Lake County as provided below.

- a. The applicant shall provide a statement of wetland determination as to which wetlands on the development site are Isolated Waters of Lake County or Waters of the U. S. to the U. S. Army Corps of Engineers (Corps) for jurisdictional determination. A copy shall be sent to SMC.
- b. Wetland impacts to Waters of the U. S.: The following information is required:

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- (1) Wetland delineation and wetland determination report as specified in Article IV Section E.3 of this ordinance.
 - (2) A U.S. Army Corps permit for the proposed development or a letter from the Corps stating that the proposed development does not require Corps authorization.
 - (3) Buffer Area requirements as specified in Article IV Section B.1.i. of this ordinance.
 - (4) All wetland impacts occurring in Lake County that exceed the mitigation threshold of the Corps regulatory program shall be mitigated for in Lake County at the mitigation ratio specified by the Corps for that development impact.
- c. Wetland impacts to Isolated Waters of Lake County: The following information is required:
- (1) A cover letter signed by a Certified Wetland Specialist or Provisional Certified Wetland Specialist, that provides a clear project purpose and need statement, a description of the proposed activity, area (in acres) of wetland impact and a statement on the permit category to be used as follows:
 - (a) Category-I: Wetland impacts less than or equal to 1 acre and does not impact high quality aquatic resources;
 - (b) Category-II: Wetland impacts greater than 1 acre and less than 2 acres and does not impact high quality aquatic resources;
 - (c) Category-III: Wetland impacts greater than or equal to 2 acres or impacts high quality aquatic resources; and,
 - (d) Category-IV: Wetland impacts for the restoration, creation and enhancement of wetlands provided that there are net gains in aquatic resource function. Category-IV activities include shoreline and streambank erosion restoration described in Article IV. Section C.2.d.3.
 - (2) A completed Watershed Development Permit Application;
 - (3) A delineation of the wetlands consistent with the requirements provided in Article IV Section E.3 of this Ordinance;
 - (4) A statement on the occurrence of any high quality aquatic resource on or adjoining the development;
 - (5) Documentation that the development is in compliance with the Illinois Department of Natural Resource's Endangered Species Consultation Program and the Illinois Natural Areas Preservation Act [520 ILCS 10/11 and 525 ILCS 30/17];

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

- (6) Documentation that the development is in compliance with the U. S. Fish and Wildlife Service's consultation program under the Endangered Species Act;
- (7) A mitigation plan meeting the requirements of Article IV.E.4 of this Ordinance;
- (8) A copy of the Natural Resources Information Report (NRI) for development that is required to obtain a NRI performed by the Lake County Soil and Water Conservation District pursuant to state statute 70 ILCS 405/22.02a;
- (9) A narrative of the alternative measures taken to avoid, minimize, or mitigate for wetland impacts to Isolated Waters of Lake County (Category-II requirement only);
- (10) Category-III Wetland Impacts:
 - (a) A narrative of the measures taken, in sequence, to avoid and minimize wetland impacts to Isolated Waters of Lake County before mitigation is considered.
 - (b) Upon concurrence of the Enforcement Officer and the Certified Wetland Specialist or Provisional Wetland Specialist that a watershed development permit application meets the wetland permit submittal requirements of this ordinance, the Enforcement Officer shall issue a Technical Notification to USACE, IDNR, IEPA, USFWS and the SMC requesting comments with respect to the proposed wetland impacts and request comments with 15 working days. The Enforcement Officer shall receive the comments and copies of the comments shall be forwarded to the applicant for response. Full consideration of the comments and applicant's response shall be evaluated by the Enforcement Officer prior to permit issuance.
 - (c) The SMC shall review and issue permits for all interjurisdictional Category III wetland impacts.
- (11) Category-IV Wetland Impacts:
 - (a) A narrative on the benefits to the aquatic environment of the proposed development.
 - (b) Shoreline and streambank erosion restoration that meet the requirements contained in Article IV. Section C.2.d.3 are exempt from submittal requirements contained in this section.

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

3. Requirements for Wetland Delineation

- a. The applicant shall identify the boundaries, extent, function, and quality of all wetland areas on the development site and prepare a Wetland Determination Report. The presence and extent of wetland areas shall be determined by, or under supervision of, a Certified Wetland Specialist or Provisional Certified Wetland Specialist using an on-site wetland procedure within three (3) years of the initial permit application date in accordance with the methodology contained in the 1987 Corps of Engineers wetland delineation manual or as otherwise noted below.
- b. Wetland Determination Report

The following are minimum requirements for the Wetland Determination Report:

- (1) A plan showing the exact location of wetlands within the development boundaries. The wetland boundary shall be flagged in the field and surveyed;
- (2) An aerial photograph delineating the wetland and the development boundary;
- (3) A copy of the following maps (most recent) delineating the development boundary:
 - (a) U.S.G.S. quadrangle map;
 - (b) Lake County Wetland Inventory map;
 - (c) FEMA floodplain map;
 - (d) Lake County soil survey; and,
 - (e) Hydrologic Atlas.
- (4) U. S. Army Corps of Engineers data sheets with representative color photographs provided for each data point;
- (5) A written description of the wetland(s) that includes a Floristic Quality Assessment as determined by methodology contained in Swink, F. and G. Wilhelm's Plants of the Chicago Region (1994. 4th Edition, The Morton Arboretum, Lisle, Illinois). Floristic quality assessments shall generally be conducted during the growing season (between May 15 and October 1). Non-growing season assessments may require additional sampling during the growing season to satisfy this requirement;
- (6) The approximate location, extent, and relative quality of off-site wetlands on properties adjoining the development shall be identified by using the first of the following documents or procedures pertaining at the time of development:
 - (a) Site-specific delineation according to the 1987 Federal wetland delineation manual. If such delineation is not available, use Paragraph (b) below.

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

(b) Wetlands identified in Lake County Wetland Inventory maps (most current LCWI map).

(7) A report for the development site indicating the presence of cropland wetlands as defined by the National Food Security Act manual (most recent edition).

4. Wetland Mitigation Requirements

- a. Mitigation is required within Lake County for wetland impacts greater than or equal to $\frac{1}{4}$ (0.25) acres to Isolated Waters of Lake County.
- b. Mitigation shall provide for the replacement of the wetland environment lost to development at the following proportional rates (i.e., creation acreage to wetland impact acreage):
 - (1) A minimum of 1.5:1 for wetland impacts under Categories I, II and III that are not high quality aquatic resources, except 1:1 for approved and fully certified wetland mitigation bank credits;
 - (2) A minimum of 3:1 for wetland impacts that are high quality aquatic resources;
 - (3) A minimum of 6:1 for wetland impacts that are forested wetlands as defined in Appendix L.
- c. Mitigated wetlands shall be designed to duplicate or improve the hydrologic and biologic features of the original wetland impacted.
- d. A project mitigation document (PMD) shall be submitted for all mitigation projects in conformance with the U. S. Army Corps of Engineers Chicago District's Mitigation Guidelines and Requirements latest version. The guidelines contain requirements for performance standards, monitoring, and completion standards.
- e. Creation of wetlands for the mitigation of development wetland impacts shall take place only within areas not currently comprised of wetlands or forested areas. Enhancement of farmed wetlands meeting the size criterion in Article IV Section E.5.a. of this ordinance may be used for up to 80% of the mitigation requirement.
- f. Enhancement of existing non-farmed wetlands may be credited at up to 25% of the enhanced wetland acreage completed, provided that the wetland impact acreage created on-site is at a minimum 1:1 ratio.
- g. A five-year wetland mitigation surety for 110% of mitigation cost shall be submitted prior to obtaining a permit.
- h. A wetland mitigation management and monitoring plan indicating the legally responsible parties for long-term operation and maintenance and dedicated funding sources;

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

- i. The developer shall provide annual monitoring reports on the status of the constructed mitigation measures. The developer shall undertake all necessary remedial action to bring the area into compliance with the wetland mitigation plan.
- j. Wetland impacts occurring prior to issuance of a WDO permit shall presume the wetland disturbed was a high quality aquatic resource requiring mitigation at a minimum rate of 3:1, except 6:1 for wetland impacts that are forested wetlands as defined in Appendix L.

5. Mitigation Hierarchy

a. Size Requirements:

- (1) If the required mitigation acreage is less than 1.5 acres, mitigation requirements shall follow the mitigation hierarchy 2 through 4 below. If on-site mitigation increases an existing on-site wetland size to greater than or equal to 1.5 acres, the applicant may use mitigation hierarchy 1.
- (2) If the required mitigation acreage is 1.5 acres or greater, mitigation requirements shall follow mitigation hierarchy 1 through 4.

b. Hierarchy – All mitigation shall occur in Lake County. Mitigation shall use the following hierarchy. Allowance to the next lower step is permitted only when justified through sequencing specified in Article IV Section E.2.c.9 and 10 or when the higher step is not available:

- (1) On-site wetland mitigation meeting the requirements of the project mitigation document;
- (2) In the same watershed as wetland impact: A U.S. Army Corps Approved Wetland Mitigation Bank; or a SMC Approved Wetland Mitigation Bank; or Off-site wetland mitigation meeting the requirements of the project mitigation document.
- (3) Outside of the watershed (at double the required mitigation acreage): A U.S. Army Corps Approved Wetland Mitigation Bank; or a SMC Approved Wetland Mitigation Bank; or Off-site wetland mitigation meeting the requirements of the project mitigation document.
- (4) SMC Wetland Restoration Fund.

6. Detention in Isolated Waters of Lake County

Detention shall only be allowed in farmed wetlands currently in farm production or when the existing vegetated wetland acreage is covered by a minimum 85% of one or more of the following species:

- a. reed canary grass (*Phalaris arundinacea*)
- b. purple loosestrife (*Lythrum salicaria*)
- c. common reed (*Phragmites australis*) or
- d. buckthorn (*Rhamnus* spp.)

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

7. Wetland Hydrology:

The following hydrology threshold requirements shall be met by the development activity. If the development activity exceeds the hydrology threshold limits, a wetland impact to Isolated Waters of Lake County shall be assumed, and the mitigation requirements of Article IV Section E.4. of this ordinance shall apply.

The design shall maintain between 80% and 150% of the existing condition storm event runoff volume to the wetland up through the 2 year-24 hour storm event. The design shall meet the total off-site release rate requirements in Article IV, Section B.1.c of this ordinance, or the minimum orifice diameter of four (4) inches of Article IV, Section B.1.e.2 of this ordinance.

F. PUBLIC ROADWAY DEVELOPMENT PERMIT

1. Authority and Enforcement

- a. The SMC shall be responsible for the review, enforcement, and issuance of all Public Road Development Permits.
- b. The performance standards of this Ordinance shall apply to all Public Road Developments. The release rate performance standard of Article IV, Section B.1.c. shall apply only to additional impervious surface areas or in the case of new road construction, the hydrologically disturbed areas. This release rate requirement shall be used unless watershed specific release rates have been adopted or it is determined by the Enforcement Officer that other site conditions, including analysis of adequate downstream capacity, warrant further analysis and modification from this standard. Detention requirements shall be applied only to those projects described in Article IV, Section A.1.g.
- c. The fee-in-lieu of on-site detention option shall be authorized for all public road developments on existing alignments provided the downstream drainage system has adequate stormwater capacity and that it will not result in negative impacts to the drainage system.

2. Application Requirements

- a. A copy of any applicable IDNR/OWR Permit application.
- b. A copy of any applicable U.S. Army Corps of Engineers permit application.
- c. A copy of the proposed Stormwater Management System, including the location and size of all existing and proposed drainage improvements including plan, section, and profile views of storm sewers, field tiles, culverts, channels, and detention areas.

ARTICLE IV: WATERSHED DEVELOPMENT PERMITS

- d. A copy of all calculations supporting the stormwater management system. Materials should be consistent with the submittal requirements of Article IV, Section B.2.b. (5) and the engineering requirements of Article IV, Section B.1.
- e. A Soil erosion and sediment control plan consistent with Article IV, Section B.1.j.
- f. A Wetland Determination Report and Mitigation Plan consistent with Article IV, Section E, if applicable.

G. PERFORMANCE STANDARDS FOR FLOOD TABLE LAND DEVELOPMENT

For all development within the flood table lands, the applicant shall meet the requirements of Article IV, Sections C.2.e.,f.(1), f.(3), f.(4) and f.(5) of this Ordinance.

This requirement applies to new construction only and not to additions or substantial improvements to structures within flood table lands built before the effective date of this Ordinance Amendment (August 10, 1999).

New residential structures built within flood table lands may have the lowest floor below the FPE if structurally dry flood-proofed to at least the flood protection elevation in accordance with Article IV, Section C.2.f.(3) of this Ordinance.

ARTICLE V: VARIANCES AND APPEALS

A. VARIANCES

The Enforcement Officer upon application, after hearing, and subject to the process and standards that follow, may grant variances to the provisions of this Ordinance as will not cause detriment to the public good, safety or welfare nor be contrary to the spirit, purpose and intent of this Ordinance where, by reason of unique and exceptional physical circumstances or condition of a particular property, the literal enforcement of the provisions of this Ordinance would result in an unreasonable hardship.

- 1. In Certified Communities, the Certified Community's Enforcement Officer shall administer the variance provisions.
- 2. In Non-Certified Communities and for Public Road Developments, the SMC Chief Engineer shall administer the variance provisions.
- 3. A public notice will be issued inviting public comment on all proposed variances to major development performance standards. In a Certified Community a copy of the public notice shall be sent a minimum of 30 days before the ruling to the SMC Chief Engineer to allow for SMC comment on the variance being issued.
- 4. Variances shall be granted only upon:
 - a. Showing of good and sufficient cause; and

ARTICLE V: VARIANCES AND APPEALS

- b. A determination that the variance is the minimum necessary to afford relief, considering the flood hazard and water quality; and
 - c. A finding that failure to grant the variance would result in exceptional hardship to the applicant; and
 - d. A finding that the granting of a variance would not result in increased flood heights, additional threats to public safety, or extraordinary public expense, nor create nuisances, cause fraud or victimization of the public, nor conflict with existing local laws or ordinances and that all buildings will be protected by methods that minimize flood damage during the base flood elevation; and
 - e. A finding that the development activity can not be located outside the Regulatory Floodplain; and
 - f. A determination that the activity is not in a Regulatory Floodway. No variances shall be granted to any development located in a Regulatory Floodway. No variance shall be granted pertaining to Articles IV, C.3, IV,C.4, and IV.C.5; and
 - g. The applicant's circumstances are unique and do not represent a general problem; and
 - h. The granting of the variance will not alter the essential character of the area involved including existing stream uses.
5. Upon consideration of the factors noted above and the intent of the Ordinance, the Enforcement Officer may attach such conditions to the granting of a variance deemed necessary to further the purposes and objectives herein.
6. Variances requested in connection with restoration of a historic site or building listed on the National Register of Historical Places or documented as worthy of preservation by the Illinois Historic Preservation Agency may be granted using criteria more permissive than the requirements contained in this Article.
7. The Enforcement Officer shall notify an applicant in writing that a variance from the requirements of Article IV, Section C.2.f. that would lessen the degree of protection to a building will result in increased premium rates for flood insurance up to amounts as high as \$25 for \$100 of insurance coverage, increase the risks to life and property, and require that the applicant will acknowledge in a signed exception to title the assumption of the risks and liability and will pay upon approval of the variance a recording fee above and beyond the usual permit review fee.
8. In a Regulatory Floodplain without a Regulatory Floodway where the tributary drainage area is 640-acres or more, a variance may not be granted that will result in a loss of the Regulatory Floodplain storage of greater than 10% of the existing Regulatory Floodplain storage on the site.

ARTICLE V: VARIANCES AND APPEALS

9. Variances requested in connection with the redevelopment of previously developed sites, that will further the public policy goals of downtown redevelopment and neighborhood revitalization, may be granted a variance provided the variance would not result in an increase in the pre-redevelopment runoff rate or volume and there will exist adequate downstream stormwater capacity. No variance shall be granted pertaining to Article IV, Section C.
10. Due to the unique nature of Public Road Developments occurring in a narrow R.O.W. instead of an expansive tract of land, variances requested in connection with public road developments that will further the public policy of minimizing the condemnation of private or public property may be granted using criteria more permissive than the requirements of Article V, Section A.4 to the minimum extent necessary to achieve the minimal amount of condemnation. No variances shall be granted pertaining to Articles IV.C.3, IV.C.4, and IV.C.5.
11. Written findings shall be made public for all variances and shall be on file with the SMC.

B. APPEALS

1. Any person aggrieved by an ordinance based decision, by a Certified Community's Enforcement Officer may request review thereof by the Certified Community's board of elected officials or the appropriate body.
2. Any person aggrieved by an ordinance based decision, by the SMC Chief Engineer may request review thereof by the SMC Director.
3. Any person aggrieved by an ordinance based decision, by the SMC Director may appeal it to the SMC by written notice filed with the SMC Director within 30 days of the determination.

ARTICLE VI: INSPECTIONS AND ACCESS

Representatives of the SMC and of any federal, state and local unit of government are authorized to enter upon any land or water to inspect development activity and to verify the existing conditions of a development site that is currently under permit review.

- A. Inspection: The Enforcement Officer may inspect site development at any stage in the construction process. Recommended inspection intervals are listed below. For major developments, the Enforcement Officer shall conduct site inspections, at a minimum, at the end of the construction stages 1. and 7. listed below. Construction plans approved by the Enforcement Officer shall be maintained at the site during progress of the work.
 1. Upon completion of installation of sediment and runoff control measures (including perimeter controls and diversions), prior to proceeding with any other earth disturbance or grading,
 2. After stripping and clearing,

ARTICLE VI: INSPECTIONS AND ACCESS

3. After rough grading,
4. After final grading,
5. After seeding and landscaping deadlines,
6. After every seven (7) calendar days or storm event with greater than 0.5-inches of rainfall,
7. After final stabilization and landscaping, prior to removal of sediment controls.

If a wetland mitigation area is constructed as part of the watershed development permit, it is recommended that a Certified Wetland Specialist or Provisional Wetland Specialist at a minimum perform the following inspections:

8. After final grading and before seeding or plant installation.
9. After seeding and plant installation.
10. Annual inspections during the 5-year monitoring and maintenance period.

If stripping, clearing, grading and/or landscaping are to be done in phases or areas, the permittee shall plan for appropriate erosion control measures to be in place after each stage listed above and for each phase of construction.

B. Special Precautions

1. If at any stage of the grading of any development site the Enforcement Officer determines that the nature of the site is such that further work authorized by an existing permit is likely to imperil any property, public way, stream, lake, wetland, or drainage structure, the Enforcement Officer may require, as a condition of allowing the work to be done, that such reasonable special precautions to be taken as is considered advisable to avoid the likelihood of such peril. Special Precautions may include, but shall not be limited to, a more level exposed slope, construction of additional drainage facilities, berms, terracing, compaction, or cribbing, installation of plant materials for erosion control, and recommendations of a licensed soils engineer and/or engineering geologist which may be made requirements for further work.
2. Where the Enforcement Officer determines that storm damage may result or has resulted because the grading on any development site is not complete, work may be stopped and the permittee required to install temporary structures or take such other measures as may be required to protect adjoining property or the public safety. On large developments or where unusual site conditions prevail, the Enforcement Officer may require that the operations be conducted in specific stages so as to insure completion of protective measures or devices prior to the advent of seasonal rains.

ARTICLE VII: PENALTIES AND LEGAL ACTIONS

ARTICLE VII: PENALTIES AND LEGAL ACTIONS

- A. Whenever an Enforcement Officer finds a violation of this Ordinance, or of any permit or order issued pursuant thereto, within their respective jurisdiction, the Enforcement Officer may issue a stop work order on all development activity on the subject property or on the portion of the activity in direct violation of the Ordinance. In every case, the Enforcement Officer shall issue an order that (1) describes the violation (2) specifies the time period for remediation and (3) requires compliance with this Ordinance prior to the completion of the activity in violation.
- B. Failure to comply with any of the requirements of this Ordinance shall constitute a violation, and any person convicted thereof shall be fined not more than five hundred (\$500.00) dollars for each offence. Each day the violation continues shall be considered a separate offence.
- C. The SMC of Certified Community may also take any other legal action necessary to prevent or remedy any violation including appropriate equitable or injunctive relief and, if applicable, an assessment to the violator for the removal, correction, or termination of any adverse effects upon any property resulting from any unauthorized activity for which legal action under this section may have been brought.
- D. SMC or the Certified Community may record a notice of violation on the title to the property at the Lake County Recorder of Deeds Office.
- E. The Enforcement Officer shall inform the owner that any such violation is considered a willful act to increase flood damages and, therefore, may cause coverage by a Standard Flood Insurance Policy to be suspended.

ARTICLE VIII: DISCLAIMER OF LIABILITY

It is recognized that although the degree of flood protection required by this Ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations, on occasions greater floods can and will occur, and flood heights may be increased by man-made or natural causes. These provisions do not imply that land outside the flood-plain areas or that uses permitted within such areas will be free from flooding or flood damages. These provisions shall not create liability on the part of the Stormwater Management Commission nor any Certified Community nor any officer or employee thereof for any claims, damages or liabilities that result from reliance on this Ordinance or any administrative decision lawfully made thereunder.

ARTICLE IX: SEPARABILITY

The provisions of this Ordinance shall be deemed separable and the invalidity of any portion of this Ordinance shall not affect the validity of the remainder.

ARTICLE VII: ABROGATIONS AND GREATER RESTRICTIONS

ARTICLE X: ABROGATION AND GREATER RESTRICTIONS

This Ordinance is not intended to repeal, abrogate or impair any existing easements, covenants, or deed restrictions. Where this Ordinance and other ordinance, easements, covenants, or deed restrictions conflict or overlap, whichever imposes the more stringent restrictions shall prevail. This Ordinance is intended to repeal the original Ordinance or resolution which was adopted to meet the National Flood Insurance Program regulations, but is not intended to repeal the resolution which the community passed in order to establish initial eligibility for the program.

ARTICLE XI: EFFECTIVE DATE

The effective date of this Ordinance shall be October 18, 1992.
Approved as amended by the Lake County Board, July 12, 1994
Approved as amended by the Lake County Board, August 10, 1999
Approved as amended by the Lake County Board, October 10, 2000
Approved as amended by the Lake County Board, August 14, 2001

Official: _____ Date: _____

Attest: _____ Date: _____

APPENDIX A - DEFINITIONS

adequate downstream stormwater capacity: A stormwater management system shall be considered to have adequate downstream stormwater capacity if the system can be shown to accommodate up to and including the 100-year stormwater runoff without increasing property damage to the adjacent property or to a point downstream known to the Enforcement Officer to be a restriction causing significant backwater.

applicant: Any person, firm or governmental agency who owns property or the duly appointed representative that wishes to develop that property and one who executes the necessary forms to procure permit to carry out such development from the SMC or Certified Community.

Appropriate Use: Only uses of the Regulatory Floodway that are permissible and will be considered for permit issuance. The only uses that will be allowed are as specified in Article VI, Section C.3.

base flood: The flood having a one percent probability of being equaled or exceeded in any given year. The base flood is also known as the 100-year frequency flood event. Application of the base flood elevation at any location is as defined in Article IV, Section C.1. of this Ordinance.

Base Flood Elevation (BFE): The elevation delineating the level of flooding resulting from the 100-year flood frequency elevation.

basement: Any area of a building having its floor subgrade (below grade level) on all sides.

basin plan: A study and evaluation of an individual drainage basin's stormwater management and flood control needs.

building: A structure that is principally above ground and is enclosed by walls and a roof. The term includes a gas or liquid storage tank, a manufactured home, mobile home or a prefabricated building. This term also includes recreational vehicles and travel trailers to be installed on a site for more than 180 days.

buffer: An area of predominantly vegetated land to be left open, adjacent to drainageways, wetland, lakes, ponds or other surface waters for the purpose of eliminating or minimizing adverse impacts to such areas.

by-pass: To route tributary drainage area runoff around and not through a stormwater control structure.

Certified Community: A community which has petitioned the SMC and has been found by the SMC to be capable of enforcing an ordinance (or Ordinances) which contain stormwater and Regulatory Floodplain management rules and regulations which are consistent with, or at least as stringent, as these of this Lake County Watershed Development Ordinance.

Certified Wetland Specialist: Persons meeting the minimum requirements of a, b and c, as follows:

- a. Provide a one-page statement of qualifications in the areas noted below. The signed statement will be considered as evidence of qualifications.
- b. Pass the Certified Wetland Specialist Exam.
- c. Completion of a SMC-approved wetland delineation course and meet the requirements of one of the following:

APPENDIX A - DEFINITIONS

1. Registered Professional Wetland Scientist (PWS) from the Society of Wetland Scientists;
2. Minimum of a Bachelor's Degree in an Earth Science or Biologic Science and at least one of the following: Three years (cumulative) full-time experience in the Upper Midwest Region on wetland related projects; or the completion of 100 wetland delineations in the Upper Midwest; or, a minimum of 300 hours spent in field review of wetlands in the Upper Midwest.
3. Six years (cumulative) full-time experience in the Upper Midwest Region on wetlands related projects.

channel: Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, lakes, flowage, slough, ditch, conduit, culvert, gully, ravine, swale, wash, or natural or man-made drainage way, in or into which surface or groundwater flows, either perennially or intermittently.

channel modification: Alteration of a channel by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, rip-rapping or other armoring, widening, deepening, straightening, relocating and lining and significant removal of bottom or woody vegetation of the channel. Channel modification does not include the clearing of dead or dying vegetation, debris, or trash from the channel.

community: Any municipality, as defined at 65 ILCS 5/1-1-2, or the unincorporated county within Lake County acting as a unit of local government.

compensatory storage: An excavated, hydraulically equivalent volume of storage used to offset the loss of natural flood storage capacity when artificial fill or structures are placed within a Regulatory Floodplain.

conditional approval Regulatory Floodway map change: Pre-construction approval by IDNR/OWR and the Federal Emergency Management Agency of a proposed change to the Regulatory Floodway map and/or BFE. This pre-construction approval, pursuant to this Part, gives assurance to the property owner that once an Appropriate Use is constructed according to permitted plans, the Regulatory Floodway map and/or BFE can be changed, as previously agreed, upon review and acceptance of as built plans.

Conditional Letter of Map Revision (CLOMR): A letter which indicated that the Federal Emergency Management Agency will revise base flood elevations, flood insurance rate zones, flood boundaries or Regulatory Floodway and/or BFE as shown on an effective Flood Hazard Boundary Map or Flood Insurance Rate Map, once the as-built plans are submitted and approved.

control structure: A structure designed to control the rate of flow that passes through the structure, given a specific upstream and downstream water surface elevation.

dam: All obstructions, wall embankments or barriers, together with their abutments and appurtenant works, if any, constructed for the purpose of storing or diverting water or creating a pool. Underground water storage tanks are not included.

damage: Measurable rise in flood heights on buildings currently subject to flooding, flooding of buildings currently not subject to flooding and increases in volume or velocity to the point where the rate of land lost to erosion and scour is substantially increased.

deed or plat restriction: Easements, covenants, deed restricted open spaces, outlots dedicated to a public entity, reserved plat areas, conservation easements, or public road right of ways that contain any part of the stormwater management system of a development.

APPENDIX A - DEFINITIONS

depressional storage areas: Non-riverine depressions where stormwater collects.

design storm: A selected storm event, described in terms of the probability of occurring once within a given number of years, for which stormwater or flood control improvements are designed and built.

detention facility: A man made structure for the temporary storage of stormwater runoff with controlled release during or immediately following a storm.

detention volume safety factor: A multiplication factor applied to a development's detention volume when the detention facility is constructed on-stream.

development: Completion of a final plat, replat, or man-made change to real estate by private or public agencies including:

- A. Construction, reconstruction, repair, or placement of a building or any addition to a building;
- B. Installation of a manufactured home on a site, preparation of a site for a manufactured home, or the placement of a recreational vehicle on a site for more than 180 days;
- C. Drilling, mining, installation of utilities, construction of roads, bridges, or similar projects;
- D. Clearing of land as an adjunct of construction;
- E. Construction or erection of levees, walls, fences, dams, or culverts; channel modification; filling, dredging, grading, excavating, paving, or other alterations of the ground surface; storage of materials; deposit of solid or liquid waste;
- F. Any other activity that might change the direction, height, volume or velocity of flood or surface water, including the drainage of wetlands and removal of vegetation to the extent such that the wetland would no longer meet the criteria of supporting hydrophytic vegetation as defined in this ordinance except that which would be considered appropriate for management purposes.

Development does not include maintenance of existing buildings and facilities such as resurfacing of roadways when the road elevation is not increased, or gardening, plowing, and similar agriculture practices that do not involve filling, grading, or construction of levees. Nor does development include agriculture practices outside of the Regulatory Floodplain involving filling or grading as part of a Natural Resources Conservation Service designed and approved conservation project (i.e., terraces, grass waterways). Additionally, development does not include fence installation, pole placement, drilling or other minor auxiliary construction activity which does not effect stormwater runoff rates or volumes as long as the development activity is not located in a Regulatory Floodplain, wetland or channel.

dominant: For the purpose of this ordinance, a dominant plant species is one that comprises greater than 50% of the total vegetated wetland acreage.

drainage area: The land area above a given point that contributes stormwater to that point.

dry detention facility: A dry detention facility is a detention facility designed to drain completely after temporary storage of stormwater flows and to normally be dry over the majority of its bottom area.

APPENDIX A - DEFINITIONS

elevation certificates: A form published by the Federal Emergency Management Agency that is used to certify the elevation to which a building has been constructed.

emergency overflow: The structure in a stormwater management system designed to protect the system in event of a malfunction of the primary flow structure or a storm event greater than the system design. The emergency overflow capacity initiates at the facility design high water level or base flood elevations.

Enforcement Officer: The SMC Chief Engineer for Non-Certified Communities or a development regulations officer designated by a Certified Community.

erosion: The process whereby soil is removed by flowing water or wave action.

farmed wetland: wetlands that are farmed currently, or have been farmed within 5 years previous to the permit application date, as defined in 7 CFR Part 12 (61 FR 47025).

fee-in-lieu of on-site stormwater storage: A fee assessed to a permit applicant used to contribute to the cost of a basin plan or floodplain study components; or other stormwater system improvements, "in-lieu-of" constructing on-site detention or for compensatory storage requirements for streambank and shoreline restoration fills of less than 200 cubic yards.

FEMA: Federal Emergency Management Agency and its regulations codified as 44 CFR 59-79 effective as of October 1, 1986. This incorporation does not include any later editions or amendments.

flood: A general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal waves, or the unusual and rapid accumulation of runoff of surface waters from any source.

flood frequency: A period of years, based on a statistical analysis, during which a flood of a stated magnitude may be expected to be equaled or exceeded.

Flood Insurance Rate Maps (FIRM): A map prepared by the Federal Emergency Management Agency or HUD that depicts the special flood hazard area (SFHA) within a community. This map includes insurance rate zones and Regulatory Floodplains and may or may not depict Regulatory Floodways.

floodplain (regulatory): See Regulatory Floodplain.

floodplain management: An overall program of corrective and preventive measures for avoiding or reducing future flood damage.

floodplain study: A study that has been formally adopted by the SMC that analyzes the hydraulic and hydrologic characteristics of a specific watershed area.

flood-prone area: Any area inundated by the base flood.

Flood Protection Elevation (FPE): The elevation of the base flood elevation plus 2 feet of freeboard.

flood-proofing: Any combination of structural and non-structural additions, changes or adjustments to structures or property which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.

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flood-proofing certificates: A form published by the Federal Emergency Management Agency that is used to certify that a building has been designed and constructed to be structurally dry flood-proofed to the flood protection elevation.

flood table land: The land area immediately adjacent to flood-prone areas with greater than 100-acres of tributary drainage area, the elevation of which is greater than the base flood elevation by two (2) feet or less.

floodway (regulatory): See Regulatory Floodway

freeboard: An increment of height added to the base flood elevation to provide a factor of safety for uncertainties in calculations, unknown local conditions, wave actions and unpredictable effects such as those caused by ice or debris jams.

functional assessment: An assessment of a wetlands flood storage, water quality and other beneficial functions.

High-quality aquatic resources (HQAR): Waters of the United States or Isolated Waters of Lake County that are determined to be critical due to their uniqueness, scarcity, function and/or value as defined in Appendix L of this Ordinance.

historic structure: A "Historic Structure" is any structure that is:

- A. Listed individually in the National Register of Historic Places or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;
- B. Certified or preliminarily determined by the Secretary of the Interior as contributing to the historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;
- C. Individually listed on the State inventory of historic places by the Illinois Historic Preservation Agency; or
- D. Individually listed on a local inventory of historic places that has been certified by the Illinois Historic Preservation Agency.

hydraulically equivalent compensatory storage: Compensatory storage placed between the proposed normal water elevation and the proposed 100-year flood elevation. All storage lost or displaced below the existing 10-year flood elevation is replaced below the proposed 10-year flood elevation. All storage lost or displaced above the existing 10-year flood elevation is replaced above the proposed 10-year flood elevation.

hydrologic and hydraulic calculations: Engineering analysis which determines expected flood flows and flood elevations based on land characteristics and rainfall events.

hydric soil: A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part.

hydrologically disturbed: An area where the land surface has been cleared, grubbed, compacted, or otherwise modified to alter stormwater runoff, volumes, rates, flow direction or inundation duration.

hydrophytic vegetation: Plant life growing in water, soil or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

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IDNR/OWR: Illinois Department of Natural Resources, Office of Water Resources (also IDNR/OWR) previously known as IDOT/DWR.

Illinois Urban Manual: The Natural Resources Conservation Service Illinois Urban Manual. A technical manual designed for urban ecosystem protection and enhancement. This manual contains design guidance for a development site to meet the Watershed Development Ordinance performance standards for soil erosion and sediment control.

impervious surface: Any hard-surfaced, man made area that does not readily absorb or retain water, including but not limited to building roofs, parking and driveway areas, graveled areas, sidewalks and paved recreation areas.

in-kind replacement (culvert): An in-kind culvert replacement has an equivalent cross-sectional area, shape, roughness coefficient, and inlet and outlet elevations; or the replacement may be shown to have an equivalent hydraulic capacity using appropriate engineering calculations.

inspect: To visit, or to review plans, or to oversee a site visit or plan review per generally accepted engineering practices.

Isolated Waters of Lake County: All waters such as lakes, ponds, streams (including intermittent streams), farmed wetlands, and wetlands that are not under U. S. Army Corps of Engineers jurisdiction.

- A. The limits of the Isolated Waters of Lake County extend to the ordinary high water mark or the delineated wetland boundary.
- B. Isolated Waters of Lake County exclude permitted excavations created for such purposes as: stormwater conveyance, detention/retention areas constructed as part of a stormwater management system, recreation, stock watering, irrigation, settling basins or wastewater treatment systems and roadside ditches. Also excluded are areas created by incidental construction grading that are exempt per Article IV Section A.2. of this ordinance.
- C. Compensatory wetland mitigation created to meet the requirements of this Ordinance or Section 404 of the Clean Water Act is not excluded.

lake: A natural or artificial body of water encompassing an area of two (2) or more acres which retains water throughout the year.

Letter of Map Amendment (LOMA): Official determination by FEMA that a specific structure is not in a Special Flood Hazard Area; amends the effective Flood Hazard boundary Map (FHBM) or Flood Insurance Rate Map (FIRM).

Letter of Map Revision (LOMR): Letter issued by FEMA or IDNR/OWR that revises base flood elevations, flood insurance rate zones, flood boundaries or Regulatory Floodways as shown on an effective FHBM or FIRM.

low opening elevation: The elevation at which water could enter a structure through any non-watertight opening such as a doorway threshold, a window sill, or a basement window well.

lowest adjacent grade: The lowest finished grade adjacent to a structure, not including the bottom of window wells.

lowest floor: Lowest floor of the lowest enclosed area, including basement.

APPENDIX A - DEFINITIONS

manufactured home: A structure, transportable in one or more sections, which is built on a permanent chassis and is designated for use with or without a permanent foundation when connected to the required utilities. The term manufactured homes also include park trailers, recreational vehicles and other similar vehicles installed on-site for more than 180 consecutive days.

manufactured home park or subdivision: A parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

mitigation: Measures taken to eliminate or minimize damage from development activities, such as construction in wetlands or Regulatory Floodplain filling, by replacement of the resource.

NGVD: National Geodetic Vertical Datum of 1929.

natural: When used in reference to streams and channels means those streams and channels formed by the existing surface topography of the earth prior to changes made by man. A modified stream and channel which has regained natural characteristics over time as it meanders and reestablishes vegetation may be considered natural.

non-riverine Regulatory Floodplain: Regulatory Floodplains not associated with streams, creeks or rivers, such as isolated depressional storage areas or lakes.

on-stream detention: Any detention facility that has off-site tributary drainage area.

ordinary high water mark: The point on the bank or shore at which the presence and movement of surface waters are continuous so as to leave a distinctive mark, such as by erosion, destruction or prevention of terrestrial vegetation, predominance of aquatic vegetation, or other such recognized characteristics.

overland flow path: An area of land which conveys stormwater for all events up to and including the base flood event. The overland flow path can be estimated using readily available topographic information and shall take into account all on-site and off-site tributary areas in accordance with Article IV, Section B.1.b.(4).

ownership parcel: Any legally described parcel of land. This includes contiguous lots or parcels of land, owned in whole, or in part, by the same property owner.

Parcel Identification Number (PIN): Permanent index number used to identify properties for tax assessment.

pond: A natural or artificial body of water of less than two acres which retains water year round.

Provisional Certified Wetland Specialist: Persons meeting the minimum requirements of a Certified Wetland Specialist, but who have not passed or completed the Certified Wetland Specialist Exam or who have not completed an SMC approved wetland delineator course. The Provisional Certified Wetland Specialist shall have passed the Certified Wetland Specialist Exam and SMC approved wetland delineator course by August 14, 2002 or will lose provisional certification.

public body of water: All open public rivers, streams, and lakes specifically designated by IDNR/OWR in Appendix F of this ordinance that are capable of being navigated by water craft, in whole or in part, for commercial uses and purposes, or which in their natural condition were capable of being improved and made navigable, or that are connected with or discharged their

APPENDIX A - DEFINITIONS

waters into navigable lakes or rivers within, or upon, the borders of the State of Illinois, together with all bayous, sloughs, backwaters, lakes that are open to the main channel or body of water and directly accessible thereto.

public flood control project: A flood control project which will be operated and maintained by a public agency to reduce flood damages to existing buildings, or structures. The project includes a hydrologic and hydraulic study of the existing and proposed conditions of the watershed. Nothing in this definition shall preclude the design, engineering, construction or financing, in whole or in part, of a flood control project by persons or parties who are not public agencies.

public road development: Any development activities which takes place in a public right-of-way or part thereof that is administered and funded, in whole or in part, by a public agency under its respective roadway jurisdiction. Rehabilitative maintenance and in-kind replacement are considered to be a public road development if located in a Regulatory Floodplain. A public road development located within a Regulatory Floodway and which has been approved by the Illinois Department of Transportation, Division of Highways (IDOT/DOH), Bureau of Local Roads and Streets is exempt from the hydraulic analysis requirements off this Ordinance. Individual recreation trail systems being constructed that are not part of another development project and linear railroad development projects shall be considered public road developments with respect to the requirements of this ordinance.

reconstruction: The act of rebuilding a structure.

record drawings: Construction drawings revised to show significant changes made during the construction process, usually based on marked-up prints, drawings and other data furnished by the contractor to the Enforcement Officer.

Registered Professional Engineer: An engineer registered in the State of Illinois, under the Professional Engineer Practice Act of 1989, 225 ILCS 325/1-49.

Regulatory Floodplain: Regulatory Floodplains may be either riverine or non-riverine depressional areas. Floodplain boundaries shall be delineated by projecting the base flood elevation onto the best available topography. A flood-prone area is a Regulatory Floodplain if it meets any of the following descriptions:

- A. Any riverine area inundated by the base flood where there is at least 640 acres of tributary drainage area.
- B. Any non-riverine area with a storage volume of 0.75 acre-foot or more when inundated by the base flood.
- C. Any area indicated as a Special Flood Hazard Area on the FEMA Flood Insurance Rate Map and located with the best available topography to be inundated by the base flood.

Regulatory Floodway: The channel, including on-stream lakes, and that portion of the Regulatory Floodplain adjacent to a stream or channel as designated by the Illinois Department of Natural Resource, Office of Water Resources, which is needed to store and convey the existing and anticipated future 100-year frequency flood discharge with no more that a 0.1 foot increase in stage due to the loss of flood conveyance or storage, and no more than a 10% increase in velocities. The location of the Regulatory Floodway shall be as delineated on the maps listed in Appendix C. Where interpretation is needed to determine the exact location of the Regulatory Floodway boundary, the IDNR/OWR should be contacted for the interpretation.

APPENDIX A - DEFINITIONS

- rehabilitative maintenance (roadway): Rehabilitative maintenance is repair or maintenance that does not increase the traffic lanes and does not involve changes to the roadway elevation.
- repair, remodeling or maintenance: Activities which do not result in any increases in the outside dimensions of a building or any changes to the dimensions of a structure.
- retention facilities: A facility designed to completely retain a specified amount of stormwater runoff without release except by means of evaporation, infiltration or pumping.
- riverine: Relating to, formed by, or resembling a stream (including creeks and rivers).
- roadside ditches: drainage ditches within 25-feet from the edge of the outside travel lane.
- sedimentation: The process that deposit soils, debris, and other materials either on other ground surfaces or in bodies of water or watercourses.
- SMC-approved wetland bank: A wetland mitigation bank approved by SMC that conforms with Appendix M of this ordinance.
- SMC Chief Engineer: A Registered Professional Engineer representing the Lake County Stormwater management Commission as the Enforcement Officer of the Watershed Development Ordinance.
- Special Flood Hazard Area (SFHA): Any area subject to inundation by the base flood from a river, creek, stream, or any other identified channel or ponding and shown on the Regulatory Floodplain map as listed in Appendices B and C.
- stormwater management: A set of actions taken to control stormwater runoff with the objectives of providing controlled surface drainage, flood control and pollutant reduction in runoff.
- Stormwater Management Commission (SMC): The Lake County Stormwater Management Commission established and existing under 55 ILCS 5/5-1062 for the purposes of developing, revising and implementing a countywide stormwater management plan.
- stormwater management system: The collection of natural features and man-made facilities which define the stormwater management for a development.
- stream: A course of running water flowing in a channel (includes creeks and rivers).
- structure: The results of a man-made change to the land constructed on or below the ground, including the construction, reconstruction or placement of a building or any addition to a building; installing a manufactured home on a site; preparing a site for a manufactured home or installing a recreational vehicle on a site for more than 180 days.
- substantial improvement: Any repair, reconstruction or improvement of a structure, the cost of which equals or exceeds 50% of the market value of the structure either, a) before the improvements of repair is started, or b) if the structure has been damaged, and is being restored, before the damage occurred. For the purposes of this definition "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. The term does not, however, include either 1) any project for improvement of a structure to comply with existing state or local health, sanitary, or safety code specifications which are solely necessary to assure safe living conditions, or 2) any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.
- swale: A vegetated channel, ditch or low-lying or depressional tract of land that is periodically inundated by conveying stormwater from one point to another.

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Technical Reference Manual (TRM): The Lake County Stormwater Management Commission Technical Reference Manual. This manual contains design guidance for a development site to meet the Watershed Development Ordinance performance standards.

transition section: Reaches of the stream or Regulatory Floodway where water flows from a narrow cross-section to a wide cross-section or vice-versa.

water dependent: Structures or facilities relating to the use of, or requiring access to, the water or shoreline. Examples of water dependent uses include but are not limited to pumping facilities, wastewater treatment facilities, facilities and improvements related to recreation boating or commercial shipping.

watershed: The land area above a given point on a channel that contributes stormwater to that point. In Lake County the four major watersheds are officially defined as: the Lake Michigan Watershed, the North Branch of the Chicago River Watershed, the Des Plaines River Watershed, and the Fox River Watershed.

watershed benefit: A decrease in flood damages to structures upstream or downstream of the development site created by installation of the stormwater management system. The benefit must be beyond the benefit provided by meeting the minimum Watershed Development Ordinance standards and TRM guidance.

Watershed Development Permit: A permit established by this ordinance and issued, through the SMC or Certified Communities, prior to the approval of a building permit signifying conformance with provisions of this ordinance.

Waters of the United States: For the purpose of this Ordinance the term Waters of the United States refers to those water bodies and wetland areas that are under the U. S. Army Corps of Engineers jurisdiction.

wet detention facility: A wet detention facility designed to maintain a permanent pool of water after the temporary storage of stormwater runoff.

wetland: Wetlands are land that is inundated or saturated by surface or ground water at a frequency and duration sufficient to support, under normal conditions, a prevalence of vegetation adapted for life in saturated soil conditions (known as hydrophytic vegetation). A wetland is identified based upon the three attributes: 1) hydrology, 2) soils and 3) vegetation as mandated by the current Federal wetland determination methodology.

wetland impact: Isolated Waters of Lake County or Waters of the U. S. that are hydrologically disturbed or otherwise adversely affected by flooding, filling, excavation, or drainage which results from implementation of a development activity.

APPENDIX B

SMC REGULATORY FLOODPLAIN MAPS AND PROFILES

Community	Waterway	Map Type	Map Date	Description
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APPENDIX C
FEMA FLOOD INSURANCE STUDY MAPS AND PROFILES

COMMUNITY NAME	COMMUNITY MEMBER	DATE OF CURRENT EFFECTIVE MAP (OR MAP INDEX)	LAKE COUNTY DFIRM PANEL NUMBERS	EFFECTIVE FIS STUDY DATE
ANTIOCH	170358#	SEP 03, 1997	17097C0010 F	SEP 03, 1997
		SEP 03, 1997	17097C0026 F	SEP 03, 1997
		SEP 03, 1997	17097C0027 F	SEP 03, 1997
		SEP 03, 1997	17097C0028 F	SEP 03, 1997
		SEP 03, 1997	17097C0029 F	SEP 03, 1997
		SEP 03, 1997	17097C0032 F	SEP 03, 1997
		SEP 03, 1997	17097C0034 F	SEP 03, 1997
		SEP 03, 1997	17097C0035 F	SEP 03, 1997
BANNOCKBURN	170359#	SEP 03, 1997	17097C0259 F	SEP 03, 1997
		SEP 07, 2000	17097C0267 G	SEP 07, 2000
		SEP 03, 1997	17097C0278 F	SEP 03, 1997
BARRINGTON HILLS	170058B	SEP 03, 1997	17097C0215 F	SEP 03, 1997
		SEP 03, 1997	17097C0216 F	SEP 03, 1997
		SEP 03, 1997	17097C0217 F	SEP 03, 1997
BARRINGTON	170057#	SEP 03, 1997	17097C0216 F	SEP 03, 1997
		SEP 03, 1997	17097C0217 F	SEP 03, 1997
		NOV 06, 2000	17097C0219 G	SEP 03, 1997
		SEP 03, 1997	17097C0236 F	SEP 03, 1997
		NOV 06, 2000	17097C0238 G	SEP 03, 1997
BEACH PARK	171022#	SEP 07, 2000	17097C0059 G	SEP 07, 2000
		SEP 07, 2000	17097C0067 G	SEP 07, 2000
		SEP 07, 2000	17097C0069 G	SEP 07, 2000
		SEP 03, 1997	17097C0078 F	SEP 03, 1997
		SEP 03, 1997	17097C0079 F	SEP 03, 1997
		SEP 03, 1997	17097C0085 F	SEP 03, 1997
		SEP 07, 2000	17097C0086 G	SEP 07, 2000
		SEP 07, 2000	17097C0087 F	SEP 07, 2000
		SEP 03, 1997	17097C0088 F	SEP 03, 1997
		SEP 03, 1997	17097C0089 F	SEP 03, 1997
		SEP 03, 1997	17097C0095 F	SEP 03, 1997
BUFFALO GROVE	170068#	SEP 03, 1997	17097C0253 F	SEP 03, 1997
		SEP 03, 1997	17097C0254 F	SEP 03, 1997
		SEP 03, 1997	17097C0261 F	SEP 03, 1997
		SEP 03, 1997	17097C0262 F	SEP 03, 1997
		NOV 06, 2000	17097C0263 H	SEP 07, 2000
		NOV 06, 2000	17097C0264 G	SEP 03, 1997
		SEP 07, 2000	17097C0266 G	SEP 07, 2000
		SEP 07, 2000	17097C0270 G	SEP 07, 2000
DEERFIELD	170361C	SEP 07, 2000	17097C0267 G	SEP 07, 2000
		SEP 03, 1997	17097C0278 F	SEP 03, 1997
		SEP 03, 1997	17097C0286 F	SEP 03, 1997
		SEP 03, 1997	17097C0287 F	SEP 03, 1997
		NOV 06, 2000	17097C0288 G	SEP 03, 1997
		NOV 06, 2000	17097C0289 G	SEP 03, 1997
DEER PARK	171028#	SEP 03, 1997	17097C0217 F	SEP 03, 1997
		SEP 03, 1997	17097C0236 F	SEP 03, 1997
		SEP 03, 1997	17097C0237 F	SEP 03, 1997
		NOV 06, 2000	17097C0238 G	SEP 03, 1997
		SEP 03, 1997	17097C0241 F	SEP 03, 1997
		SEP 03, 1997	17097C0270 F	SEP 03, 1997
FOX LAKE	170362#	SEP 07, 2000	17097C0005 G	SEP 07, 2000
		SEP 03, 1997	17097C0010 F	SEP 03, 1997
		SEP 07, 2000	17097C0015 G	SEP 07, 2000
		SEP 03, 1997	17097C0019 F	SEP 03, 1997
		SEP 03, 1997	17097C0020 F	SEP 03, 1997
		SEP 07, 2000	17097C0110 H	SEP 07, 2000
FOX RIVER VALLEY GARDENS	170478#	SEP 03, 1997	17097C0205 F	SEP 03, 1997
		SEP 03, 1997	17097C0206 F	SEP 03, 1997
GRAYSLAKE	170363#	SEP 03, 1997	17097C0043 F	SEP 03, 1997
		SEP 07, 2000	17097C0127 G	SEP 07, 2000
		SEP 03, 1997	17097C0129 F	SEP 03, 1997
		SEP 07, 2000	17097C0131 G	SEP 07, 2000
		SEP 07, 2000	17097C0132 G	SEP 07, 2000
		SEP 03, 1997	17097C0133 F	SEP 03, 1997
		SEP 03, 1997	17097C0134 F	SEP 03, 1997
		SEP 07, 2000	17097C0141 G	SEP 07, 2000
		SEP 03, 1997	17097C0153 F	SEP 03, 1997
GREEN OAKS	170364#	SEP 07, 2000	17097C0158 G	SEP 07, 2000
		SEP 07, 2000	17097C0166 G	SEP 07, 2000
		SEP 03, 1997	17097C0167 F	SEP 03, 1997

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FEMA FLOOD INSURANCE STUDY MAPS AND PROFILES

COMMUNITY NAME	COMMUNITY MEMBER	DATE OF CURRENT EFFECTIVE MAP (OR MAP INDEX)	LAKE COUNTY DFIRM PANEL NUMBERS	EFFECTIVE FIS STUDY DATE
GURNEE	170365#	SEP 07, 2000	17097C0168 G	SEP 07, 2000
		SEP 03, 1997	17097C0044 F	SEP 03, 1997
		SEP 03, 1997	17097C0063 F	SEP 03, 1997
		SEP 07, 2000	17097C0064 G	SEP 07, 2000
		SEP 07, 2000	17097C0068 G	SEP 07, 2000
		SEP 07, 2000	17097C0069 G	SEP 07, 2000
		SEP 07, 2000	17097C0132 G	SEP 07, 2000
		SEP 03, 1997	17097C0153 F	SEP 03, 1997
		SEP 07, 2000	17097C0154 G	SEP 07, 2000
		SEP 07, 2000	17097C0155 G	SEP 07, 2000
		SEP 07, 2000	17097C0156 G	SEP 07, 2000
		SEP 07, 2000	17097C0157 G	SEP 07, 2000
HAINESVILLE	171005#	SEP 07, 2000	17097C0127 F	SEP 07, 2000
		SEP 03, 1997	17097C0129 F	SEP 03, 1997
		SEP 07, 2000	17097C0131 F	SEP 07, 2000
		SEP 03, 1997	17097C0133 F	SEP 03, 1997
HAWTHORN WOODS	170366#	SEP 03, 1997	17097C0139 F	SEP 03, 1997
		SEP 03, 1997	17097C0140 F	SEP 03, 1997
		SEP 03, 1997	17097C0143 F	SEP 03, 1997
		SEP 03, 1997	17097C0226 F	SEP 03, 1997
		SEP 03, 1997	17097C0227 F	SEP 03, 1997
		SEP 03, 1997	17097C0228 F	SEP 03, 1997
		SEP 03, 1997	17097C0229 F	SEP 03, 1997
		SEP 03, 1997	17097C0231 F	SEP 03, 1997
		SEP 03, 1997	17097C0232 F	SEP 03, 1997
		SEP 03, 1997	17097C0233 F	SEP 03, 1997
		SEP 03, 1997	17097C0234 F	SEP 03, 1997
HIGHLAND PARK	170367#	SEP 03, 1997	17097C0278 F	SEP 03, 1997
		SEP 03, 1997	17097C0279 F	SEP 03, 1997
		SEP 03, 1997	17097C0283 F	SEP 03, 1997
		SEP 03, 1997	17097C0286 F	SEP 03, 1997
		SEP 03, 1997	17097C0287 F	SEP 03, 1997
		NOV 06, 2000	17097C0289 G	SEP 03, 1997
		SEP 03, 1997	17097C0291 F	SEP 03, 1997
		SEP 03, 1997	17097C0293 F	SEP 03, 1997
		SEP 03, 1997	17097C0295 F	SEP 03, 1997
HIGHWOOD	171033#	SEP 03, 1997	17097C0277 F	SEP 03, 1997
		SEP 03, 1997	17097C0279 F	SEP 03, 1997
		SEP 03, 1997	17097C0283 F	SEP 03, 1997
		SEP 03, 1997	17097C0285 F	SEP 03, 1997
INDIAN CREEK	170369#	SEP 03, 1997	17097C0251 F	SEP 03, 1997
ISLAND LAKE	170370#	SEP 03, 1997	17097C0112 F	SEP 03, 1997
		SEP 03, 1997	17097C0114 F	SEP 03, 1997
		SEP 03, 1997	17097C0116 F	SEP 03, 1997
		SEP 03, 1997	17097C0118 F	SEP 03, 1997
KILDEER	170371#	SEP 03, 1997	17097C0233 F	SEP 03, 1997
		SEP 03, 1997	17097C0234 F	SEP 03, 1997
		SEP 03, 1997	17097C0237 F	SEP 03, 1997
		SEP 03, 1997	17097C0241 F	SEP 03, 1997
		SEP 03, 1997	17097C0251 F	SEP 03, 1997
LAKE BARRINGTON	170372#	SEP 03, 1997	17097C0205 F	SEP 03, 1997
		SEP 03, 1997	17097C0206 F	SEP 03, 1997
		SEP 03, 1997	17097C0207 F	SEP 03, 1997
		SEP 03, 1997	17097C0208 F	SEP 03, 1997
		SEP 03, 1997	17097C0209 F	SEP 03, 1997
		SEP 03, 1997	17097C0215 F	SEP 03, 1997
LAKE BLUFF	170373#	SEP 03, 1997	17097C0169 F	SEP 03, 1997
		SEP 07, 2000	17097C0186 G	SEP 07, 2000
		SEP 03, 1997	17097C0188 F	SEP 03, 1997
		SEP 03, 1997	17097C0190 F	SEP 03, 1997
LAKE COUNTY UNINCORPORATED AREAS	170357#	DFIRM PANEL NUMBERS LISTED SEPARATELY AT END OF APPENDIX		
LAKE FOREST	170374#	SEP 03, 1997	17097C0169 F	SEP 03, 1997
		SEP 03, 1997	17097C0188 F	SEP 03, 1997
		SEP 03, 1997	17097C0190 F	SEP 03, 1997
		SEP 03, 1997	17097C0257 F	SEP 03, 1997
		SEP 03, 1997	17097C0259 F	SEP 03, 1997
		SEP 03, 1997	17097C0276 F	SEP 03, 1997
		SEP 03, 1997	17097C0277 F	SEP 03, 1997
		SEP 03, 1997	17097C0278 F	SEP 03, 1997

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FEMA FLOOD INSURANCE STUDY MAPS AND PROFILES

COMMUNITY NAME	COMMUNITY MEMBER	DATE OF CURRENT EFFECTIVE MAP (OR MAP INDEX)	LAKE COUNTY DFIRM PANEL NUMBERS	EFFECTIVE FIS STUDY DATE
		SEP 03, 1997	17097C0279 F	SEP 03, 1997
		SEP 03, 1997	17097C0285 F	SEP 03, 1997
LAKE VILLA	170375#	SEP 03, 1997	17097C0029 F	SEP 03, 1997
		SEP 03, 1997	17097C0035 F	SEP 03, 1997
		SEP 03, 1997	17097C0036 F	SEP 03, 1997
		SEP 03, 1997	17097C0037 F	SEP 03, 1997
		SEP 03, 1997	17097C0038 F	SEP 03, 1997
		SEP 03, 1997	17097C0039 F	SEP 03, 1997
		SEP 03, 1997	17097C0041 F	SEP 03, 1997
LAKE ZURICH	170376#	SEP 03, 1997	17097C0228 F	SEP 03, 1997
		SEP 03, 1997	17097C0229 F	SEP 03, 1997
		SEP 03, 1997	17097C0233 F	SEP 03, 1997
		SEP 03, 1997	17097C0236 F	SEP 03, 1997
		SEP 03, 1997	17097C0237 F	SEP 03, 1997
		SEP 03, 1997	17097C0241 F	SEP 03, 1997
LAKEMOOR	170915#	SEP 07, 2000	17097C0105 H	SEP 07, 2000
		SEP 07, 2000	17097C0110 H	SEP 07, 2000
LIBERTYVILLE	170377#	SEP 03, 1997	17097C0134 F	SEP 03, 1997
		SEP 03, 1997	17097C0142 F	SEP 03, 1997
		SEP 03, 1997	17097C0161 F	SEP 03, 1997
		SEP 07, 2000	17097C0162 G	SEP 07, 2000
		SEP 03, 1997	17097C0163 F	SEP 03, 1997
		SEP 07, 2000	17097C0164 G	SEP 07, 2000
		SEP 07, 2000	17097C0166 G	SEP 07, 2000
		SEP 07, 2000	17097C0168 G	SEP 07, 2000
		SEP 07, 2000	17097C0252 G	SEP 07, 2000
LINCOLNSHIRE	170378#	SEP 03, 1997	17097C0254 F	SEP 03, 1997
		SEP 07, 2000	17097C0258 G	SEP 07, 2000
		SEP 03, 1997	17097C0259 F	SEP 03, 1997
		SEP 03, 1997	17097C0262 F	SEP 03, 1997
		SEP 07, 2000	17097C0266 G	SEP 07, 2000
LINDENHURST	170379#	SEP 03, 1997	17097C0041 F	SEP 03, 1997
		SEP 03, 1997	17097C0042 F	SEP 03, 1997
		SEP 03, 1997	17097C0044 F	SEP 03, 1997
LONG GROVE	170380#	SEP 03, 1997	17097C0144 F	SEP 03, 1997
		SEP 03, 1997	17097C0231 F	SEP 03, 1997
		SEP 03, 1997	17097C0232 F	SEP 03, 1997
		SEP 03, 1997	17097C0233 F	SEP 03, 1997
		SEP 03, 1997	17097C0234 F	SEP 03, 1997
		SEP 03, 1997	17097C0241 F	SEP 03, 1997
		SEP 03, 1997	17097C0242 F	SEP 03, 1997
		SEP 03, 1997	17097C0251 F	SEP 03, 1997
		SEP 03, 1997	17097C0253 F	SEP 03, 1997
		SEP 03, 1997	17097C0254 F	SEP 03, 1997
		SEP 03, 1997	17097C0261 F	SEP 03, 1997
		NOV 06, 2000	17097C0263 H	SEP 07, 2000
METTAWA	170381#	SEP 07, 2000	17097C0164 G	SEP 07, 2000
		SEP 07, 2000	17097C0168 G	SEP 07, 2000
		SEP 03, 1997	17097C0169 F	SEP 03, 1997
		SEP 07, 2000	17097C0252 G	SEP 07, 2000
		SEP 07, 2000	17097C0256 G	SEP 07, 2000
		SEP 03, 1997	17097C0257 F	SEP 03, 1997
MUNDELEIN	170382#	SEP 03, 1997	17097C0139 F	SEP 03, 1997
		SEP 03, 1997	17097C0141 F	SEP 03, 1997
		SEP 03, 1997	17097C0142 F	SEP 03, 1997
		SEP 03, 1997	17097C0143 F	SEP 03, 1997
		SEP 03, 1997	17097C0144 F	SEP 03, 1997
		SEP 03, 1997	17097C0161 F	SEP 03, 1997
		SEP 3, & DEC 17, 1997	17097C0163 F	SEP 3, & DEC 17, 1997
No map panel revision issued		SEP 3, & DEC 17, 1997	17097C0232 F	SEP 3, & DEC 17, 1997
No map panel revision issued		SEP 3, & DEC 17, 1997	17097C0251 F	SEP 3, & DEC 17, 1997
No map panel revision issued		SEP 3, & DEC 17, 1997	17097C0251 F	SEP 3, & DEC 17, 1997
NORTH BARRINGTON	170383#	SEP 03, 1997	17097C0207 F	SEP 03, 1997
		SEP 03, 1997	17097C0208 F	SEP 03, 1997
		SEP 03, 1997	17097C0209 F	SEP 03, 1997
		SEP 03, 1997	17097C0217 F	SEP 03, 1997
		SEP 03, 1997	17097C0226 F	SEP 03, 1997
		SEP 03, 1997	17097C0228 F	SEP 03, 1997
		SEP 03, 1997	17097C0236 F	SEP 03, 1997
NORTH CHICAGO	170384#	SEP 03, 1997	17097C0159 F	SEP 03, 1997
		SEP 03, 1997	17097C0167 F	SEP 03, 1997

APPENDIX C
FEMA FLOOD INSURANCE STUDY MAPS AND PROFILES

COMMUNITY NAME	COMMUNITY MEMBER	DATE OF CURRENT EFFECTIVE MAP (OR MAP INDEX)	LAKE COUNTY DFIRM PANEL NUMBERS	EFFECTIVE FIS STUDY DATE
		SEP 03, 1997	17097C0180 F	SEP 03, 1997
		SEP 07, 2000	17097C0186 G	SEP 07, 2000
		SEP 03, 1997	17097C0190 F	SEP 03, 1997
OLD MILL CREEK	170385#	SEP 03, 1997	17097C0034 F	SEP 03, 1997
		SEP 03, 1997	17097C0042 F	SEP 03, 1997
		SEP 03, 1997	17097C0044 F	SEP 03, 1997
		SEP 07, 2000	17097C0055 G	SEP 07, 2000
		SEP 03, 1997	17097C0061 F	SEP 03, 1997
		SEP 07, 2000	17097C0062 G	SEP 07, 2000
		SEP 03, 1997	17097C0063 F	SEP 03, 1997
PARK CITY	170386#	SEP 07, 2000	17097C0156 G	SEP 07, 2000
		SEP 07, 2000	17097C0157 G	SEP 07, 2000
		SEP 03, 1997	17097C0159 F	SEP 03, 1997
RIVERWOODS	170387#	SEP 03, 1997	17097C0259 F	SEP 03, 1997
		SEP 07, 2000	17097C0266 G	SEP 07, 2000
		SEP 07, 2000	17097C0267 G	SEP 07, 2000
		SEP 07, 2000	17097C0270 G	SEP 07, 2000
		SEP 03, 1997	17097C0286 F	SEP 03, 1997
ROUND LAKE BEACH	170389#	SEP 03, 1997	17097C0038 F	SEP 03, 1997
		SEP 03, 1997	17097C0039 F	SEP 03, 1997
		SEP 03, 1997	17097C0043 F	SEP 03, 1997
		SEP 03, 1997	17097C0126 F	SEP 03, 1997
		SEP 07, 2000	17097C0127 G	SEP 07, 2000
		SEP 07, 2000	17097C0131 G	SEP 07, 2000
ROUND LAKE HEIGHTS	170390#	SEP 03, 1997	17097C0038 F	SEP 03, 1997
ROUND LAKE PARK	170391#	SEP 07, 2000	17097C0127 G	SEP 07, 2000
		SEP 03, 1997	17097C0129 F	SEP 03, 1997
		SEP 03, 1997	17097C0133 F	SEP 03, 1997
		SEP 03, 1997	17097C0137 F	SEP 03, 1997
		SEP 07, 2000	17097C0141 G	SEP 07, 2000
		SEP 03, 1997	17097C0142 F	SEP 03, 1997
ROUND LAKE	170388#	SEP 07, 2000	17097C0110 H	SEP 07, 2000
		SEP 03, 1997	17097C0126 F	SEP 03, 1997
		SEP 07, 2000	17097C0127 G	SEP 07, 2000
		SEP 03, 1997	17097C0128 F	SEP 03, 1997
		SEP 03, 1997	17097C0129 F	SEP 03, 1997
THIRD LAKE	170392#	SEP 03, 1997	17097C0044 F	SEP 03, 1997
		SEP 07, 2000	17097C0132 G	SEP 07, 2000
		SEP 07, 2000	17097C0155 G	SEP 07, 2000
TOWER LAKES	170393#	SEP 03, 1997	17097C0206 F	SEP 03, 1997
		SEP 03, 1997	17097C0207 F	SEP 03, 1997
VERNON HILLS	170394#	SEP 03, 1997	17097C0163 F	SEP 03, 1997
		SEP 07, 2000	17097C0164 G	SEP 07, 2000
		SEP 03, 1997	17097C0251 F	SEP 03, 1997
		SEP 07, 2000	17097C0252 G	SEP 07, 2000
		SEP 03, 1997	17097C0253 F	SEP 03, 1997
		SEP 03, 1997	17097C0254 F	SEP 03, 1997
		SEP 07, 2000	17097C0256 G	SEP 07, 2000
		SEP 07, 2000	17097C0258 G	SEP 07, 2000
VOLO		SEP 07, 2000	17097C0105 G	SEP 07, 2000
		SEP 07, 2000	17097C0110 H	SEP 07, 2000
		SEP 03, 1997	17097C0116 F	SEP 03, 1997
		SEP 03, 1997	17097C0117 F	SEP 03, 1997
WADSWORTH	170395#	SEP 07, 2000	17097C0055 G	SEP 07, 2000
		SEP 07, 2000	17097C0056 G	SEP 07, 2000
		SEP 07, 2000	17097C0057 G	SEP 07, 2000
		SEP 07, 2000	17097C0058 G	SEP 07, 2000
		SEP 07, 2000	17097C0059 G	SEP 07, 2000
		SEP 07, 2000	17097C0062 G	SEP 07, 2000
		SEP 07, 2000	17097C0064 G	SEP 07, 2000
		SEP 07, 2000	17097C0066 G	SEP 07, 2000
		SEP 07, 2000	17097C0067 G	SEP 07, 2000
WAUCONDA	170396#	SEP 03, 1997	17097C0116 F	SEP 03, 1997
		SEP 03, 1997	17097C0117 F	SEP 03, 1997
		SEP 03, 1997	17097C0118 F	SEP 03, 1997
		SEP 07, 2000	17097C0119 G	SEP 07, 2000
		SEP 03, 1997	17097C0140 F	SEP 03, 1997
		SEP 03, 1997	17097C0207 F	SEP 03, 1997
WAUKEGAN	170397#	SEP 07, 2000	17097C0066 G	SEP 07, 2000
		SEP 07, 2000	17097C0067 G	SEP 07, 2000

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COMMUNITY NAME	COMMUNITY MEMBER	DATE OF CURRENT EFFECTIVE MAP (OR MAP INDEX)	LAKE COUNTY DFIRM PANEL NUMBERS	EFFECTIVE FIS STUDY DATE
		SEP 07, 2000	17097C0068 G	SEP 07, 2000
		SEP 07, 2000	17097C0069 G	SEP 07, 2000
		SEP 07, 2000	17097C0086 G	SEP 07, 2000
		SEP 07, 2000	17097C0087 G	SEP 07, 2000
		SEP 03, 1997	17097C0088 F	SEP 03, 1997
		SEP 03, 1997	17097C0089 F	SEP 03, 1997
		SEP 03, 1997	17097C0095 F	SEP 03, 1997
		SEP 07, 2000	17097C0154 G	SEP 07, 2000
		SEP 07, 2000	17097C0156 G	SEP 07, 2000
		SEP 07, 2000	17097C0157 G	SEP 07, 2000
		SEP 07, 2000	17097C0158 G	SEP 07, 2000
		SEP 03, 1997	17097C0159 F	SEP 03, 1997
		SEP 07, 2000	17097C0166 G	SEP 07, 2000
		SEP 03, 1997	17097C0177 F	SEP 03, 1997
		SEP 03, 1997	17097C0180 F	SEP 03, 1997
WINTHROP HARBOR	170398#	SEP 03, 1997	17097C0076 F	SEP 03, 1997
		SEP 03, 1997	17097C0077 F	SEP 03, 1997
		SEP 03, 1997	17097C0078 F	SEP 03, 1997
		SEP 03, 1997	17097C0079 F	SEP 03, 1997
		SEP 03, 1997	17097C0081 F	SEP 03, 1997
WHEELING	170173#	NOV 06, 2000	17097C0264 G	SEP 03, 1997
ZION	170399#	SEP 07, 2000	17097C0057 G	SEP 07, 2000
		SEP 07, 2000	17097C0059 G	SEP 07, 2000
		SEP 03, 1997	17097C0076 F	SEP 03, 1997
		SEP 03, 1997	17097C0077 F	SEP 03, 1997
		SEP 03, 1997	17097C0078 F	SEP 03, 1997
		SEP 03, 1997	17097C0079 F	SEP 03, 1997
		SEP 03, 1997	17097C0081 F	SEP 03, 1997
		SEP 03, 1997	17097C0085 F	SEP 03, 1997
		SEP 07, 2000	17097C0086 G	SEP 07, 2000
		SEP 07, 2000	17097C0087 G	SEP 07, 2000
LAKE COUNTY UNINCORPORATED AREAS	170357#	SEP 07, 2000	17097C0005 G	SEP 07, 2000
	170357#	SEP 03, 1997	17097C0010 F	SEP 03, 1997
	170357#	SEP 07, 2000	17097C0015 G	SEP 07, 2000
	170357#	SEP 03, 1997	17097C0019 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0020 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0026 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0027 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0028 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0029 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0032 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0034 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0035 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0036 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0037 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0038 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0039 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0041 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0042 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0043 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0044 F	SEP 03, 1997
	170357#	SEP 07, 2000	17097C0055 G	SEP 07, 2000
	170357#	SEP 07, 2000	17097C0056 G	SEP 07, 2000
	170357#	SEP 07, 2000	17097C0057 G	SEP 07, 2000
	170357#	SEP 07, 2000	17097C0058 G	SEP 07, 2000
	170357#	SEP 07, 2000	17097C0059 G	SEP 07, 2000
	170357#	SEP 03, 1997	17097C0061 F	SEP 03, 1997
	170357#	SEP 07, 2000	17097C0062 G	SEP 07, 2000
	170357#	SEP 03, 1997	17097C0063 F	SEP 03, 1997
	170357#	SEP 07, 2000	17097C0064 G	SEP 07, 2000
	170357#	SEP 07, 2000	17097C0066 G	SEP 07, 2000
	170357#	SEP 07, 2000	17097C0067 G	SEP 07, 2000
	170357#	SEP 07, 2000	17097C0068 G	SEP 07, 2000
	170357#	SEP 07, 2000	17097C0069 G	SEP 07, 2000
	170357#	SEP 03, 1997	17097C0076 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0077 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0078 F	SEP 03, 1997

APPENDIX C
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COMMUNITY NAME	COMMUNITY MEMBER	DATE OF CURRENT EFFECTIVE MAP (OR MAP INDEX)	LAKE COUNTY DFIRM PANEL NUMBERS	EFFECTIVE FIS STUDY DATE	
LAKE COUNTY UNINCORPORATED AREAS	170357#	SEP 03, 1997	17097C0079 F	SEP 03, 1997	
	170357#	SEP 07, 2000	17097C0086 G	SEP 07, 2000	
	170357#	SEP 03, 1997	17097C0088 F	SEP 03, 1997	
	170357#	SEP 07, 2000	17097C0105 G	SEP 07, 2000	
	170357#	SEP 07, 2000	17097C0110 H	SEP 07, 2000	
	170357#	SEP 03, 1997	17097C0112 F	SEP 03, 1997	
	170357#	SEP 03, 1997	17097C0114 F	SEP 03, 1997	
	170357#	SEP 03, 1997	17097C0116 F	SEP 03, 1997	
	170357#	SEP 03, 1997	17097C0117 F	SEP 03, 1997	
	170357#	SEP 03, 1997	17097C0118 F	SEP 03, 1997	
	170357#	SEP 07, 2000	17097C0119 G	SEP 07, 2000	
	170357#	SEP 03, 1997	17097C0126 F	SEP 03, 1997	
	170357#	SEP 07, 2000	17097C0127 G	SEP 07, 2000	
	170357#	SEP 03, 1997	17097C0128 F	SEP 03, 1997	
	170357#	SEP 03, 1997	17097C0129 F	SEP 03, 1997	
	170357#	SEP 07, 2000	17097C0131 G	SEP 07, 2000	
	170357#	SEP 07, 2000	17097C0132 G	SEP 07, 2000	
	170357#	SEP 03, 1997	17097C0133 F	SEP 03, 1997	
	170357#	SEP 03, 1997	17097C0134 F	SEP 03, 1997	
	LAKE COUNTY UNINCORPORATED AREAS	170357#	SEP 03, 1997	17097C0137 F	SEP 03, 1997
170357#		SEP 03, 1997	17097C0139 F	SEP 03, 1997	
170357#		SEP 03, 1997	17097C0140 F	SEP 03, 1997	
170357#		SEP 07, 2000	17097C0141 G	SEP 07, 2000	
170357#		SEP 03, 1997	17097C0142 F	SEP 03, 1997	
170357#		SEP 03, 1997	17097C0142 F	SEP 03, 1997	
170357#		SEP 03, 1997	17097C0143 F	SEP 03, 1997	
170357#		SEP 03, 1997	17097C0144 F	SEP 03, 1997	
170357#		SEP 03, 1997	17097C0153 F	SEP 03, 1997	
170357#		SEP 07, 2000	17097C0154 G	SEP 07, 2000	
170357#		SEP 07, 2000	17097C0155 G	SEP 07, 2000	
170357#		SEP 07, 2000	17097C0156 G	SEP 07, 2000	
170357#		SEP 07, 2000	17097C0157 G	SEP 07, 2000	
170357#		SEP 07, 2000	17097C0158 G	SEP 07, 2000	
170357#		SEP 03, 1997	17097C0159 F	SEP 03, 1997	
170357#		SEP 03, 1997	17097C0161 F	SEP 03, 1997	
170357#		SEP 07, 2000	17097C0162 G	SEP 07, 2000	
No map panel revision issued		170357#	SEP 3, & DEC 17, 1997	17097C0163 F	SEP 3, & DEC 17, 1997
170357#		SEP 07, 2000	17097C0164 G	17097C0164 G	SEP 07, 2000
170357#		SEP 07, 2000	17097C0166 G	17097C0166 G	SEP 07, 2000
170357#	SEP 03, 1997	17097C0167 F	17097C0167 F	SEP 03, 1997	
170357#	SEP 07, 2000	17097C0168 G	17097C0168 G	SEP 07, 2000	
170357#	SEP 03, 1997	17097C0169 F	17097C0169 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0180 F	17097C0180 F	SEP 03, 1997	
170357#	SEP 07, 2000	17097C0186 G	17097C0186 G	SEP 07, 2000	
LAKE COUNTY UNINCORPORATED AREAS	170357#	SEP 03, 1997	17097C0188 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0190 F	17097C0190 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0205 F	17097C0205 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0206 F	17097C0206 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0207 F	17097C0207 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0208 F	17097C0208 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0209 F	17097C0209 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0215 F	17097C0215 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0216 F	17097C0216 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0217 F	17097C0217 F	SEP 03, 1997	
170357#	NOV 06, 2000	17097C0219 G	17097C0219 G	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0226 F	17097C0226 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0227 F	17097C0227 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0228 F	17097C0228 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0229 F	17097C0229 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0231 F	17097C0231 F	SEP 03, 1997	
No map panel revision issued	170357#	SEP 3, & DEC 17, 1997	17097C0232 F	SEP 3, & DEC 17, 1997	
170357#	SEP 03, 1997	17097C0233 F	17097C0233 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0234 F	17097C0234 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0236 F	17097C0236 F	SEP 03, 1997	
LAKE COUNTY UNINCORPORATED AREAS	170357#	SEP 03, 1997	17097C0237 F	SEP 03, 1997	
170357#	SEP 03, 1997	17097C0241 F	17097C0241 F	SEP 03, 1997	

APPENDIX C
FEMA FLOOD INSURANCE STUDY MAPS AND PROFILES

COMMUNITY NAME	COMMUNITY MEMBER	DATE OF CURRENT EFFECTIVE MAP (OR MAP INDEX)	LAKE COUNTY DFIRM PANEL NUMBERS	EFFECTIVE FIS STUDY DATE
No map panel revision issued	170357#	SEP 03, 1997	17097C0242 F	SEP 03, 1997
	170357#	SEP 3, & DEC 17, 1997	17097C0251 F	SEP 3, & DEC 17, 1997
	170357#	SEP 07, 2000	17097C0252 G	SEP 07, 2000
	170357#	SEP 03, 1997	17097C0254 F	SEP 03, 1997
	170357#	SEP 07, 2000	17097C0256 G	SEP 07, 2000
	170357#	SEP 03, 1997	17097C0257 F	SEP 03, 1997
	170357#	SEP 07, 2000	17097C0258 G	SEP 07, 2000
	170357#	SEP 03, 1997	17097C0259 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0261 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0262 F	SEP 03, 1997
	170357#	NOV 06, 2000	17097C0263 H	SEP 07, 2000
	170357#	NOV 06, 2000	17097C0264 G	SEP 03, 1997
	170357#	SEP 07, 2000	17097C0266 G	SEP 07, 2000
	170357#	SEP 07, 2000	17097C0267 G	SEP 07, 2000
	170357#	SEP 07, 2000	17097C0270 G	SEP 07, 2000
	170357#	SEP 03, 1997	17097C0278 F	SEP 03, 1997
	170357#	SEP 03, 1997	17097C0286 F	SEP 03, 1997
LAKE COUNTY UNINCORPORATED AREAS	170357#	NOV 06, 2000	17097C0288 G	SEP 03, 1997

APPENDIX D

RESERVED

APPENDIX E - ENFORCEMENT OFFICER DUTIES

This Appendix, as a part of this duly adopted Ordinance, delineates requirements or duties required of and accepted by a community and its designated Enforcement Officer. Certain requirements or duties specified by FEMA or IDNR/OWR are for the purposes of that community obtaining or maintaining eligibility for participation in the National Flood Insurance Program and delegation of state permit authority. These certain requirements or duties relate to only to the intergovernmental relationship between a community and FEMA or IDNR/OWR, and they do not and are not intended to create any third party beneficial rights in or for applicants, property owners, or others.

- A. In Certified Communities, the appropriate development regulations officer shall be the Enforcement Officer for this Ordinance. In all other areas of Lake County, the SMC Chief Engineer shall be this Enforcement Officer. One of the primary duties of the Enforcement Officer shall be to review all Watershed Development Applications and issue permits for those projects that are in compliance with the provisions of the Ordinance. The Enforcement Officer shall be responsible for the administration and enforcement of this Ordinance. If the Enforcement Officer is contracted by a Certified Community, then the contract scope shall be comprehensive enough to cover all specified duties herein or the duties shall be shared with a Co-Enforcement Officer who is an Employee of the Certified Community.
- B. The Enforcement Officer shall determine for each development if it is in a Special Flood Hazard Area (SFHA) using the criteria specified in Article IV, Section C.1. of this Ordinance. If a site is in a SFHA, a determination is required as to whether it is in a Regulatory Floodway, or a Regulatory Floodplain on which a detailed study has not been conducted, or a flood-prone area with a tributary drainage area equal to or greater than 640-acres, greater than 100-acres, or greater than 20-acres.
- C. The Enforcement Officer shall ensure that an IDNR/OWR Dam Safety permit is obtained or a letter stating that no Dam Safety permit is required if the development includes a dam before the issuance of a Watershed Development Permit. Reference Appendix G for IDNR/OWR Dam Safety Permitting guidelines.
- D. Adopted Basin Plans and floodplain studies may be the basis for more specific regulations. These additional or more specific regulations will apply only in the specific study area of the Basin Plan or floodplain study and supersede those of this Ordinance only upon amendment to the Watershed Development Ordinance and formal adoption of the basin plan or floodplain study by SMC.
- E. The Enforcement Officer may require deed restrictions, performance bonds or sureties, as-built certification or maintenance guarantees as stipulated in this Ordinance to assure projects are built and maintained according to permitted plans. If such performance bond or sureties or other such adequate security as the Enforcement Officer may approve is required, the amount shall be equal to 110% of the estimated cost to complete construction of the stormwater management system required by the Watershed Development Permit, which estimated probable cost shall be approved by the Enforcement Officer. If a performance bond or surety is required by another community, that includes the cost of the stormwater management system of the development, additional performance bonding or surety shall not be required.
- F. A Registered Professional Engineer in the employ or under contract with SMC or Certified Community shall review any plans, calculations or analyses submitted by a Registered Professional Engineer pursuant to the requirements of this Ordinance.

APPENDIX E - ENFORCEMENT OFFICER DUTIES

- G. Proposed amendments to this Ordinance and appendices must be done in accordance with applicable state or federal law and approved by IDNR/OWR and FEMA.
- H. Prior to the issuance of a Watershed Development Permit, and based on the reliance that the application requirements of Article IV, Section B.2., have been met, the Enforcement Officer shall further ensure that the applicant has obtained and provided copies of any and all required federal, state and local permits for all development in the Regulatory Floodplain. Reference Appendix H for a partial list of permits that may be applicable.
- I. The Enforcement Officer shall inspect (as defined in Appendix A of this Ordinance) all development projects before, during and upon completion of construction to ensure proper elevation of the structure and to ensure compliance with the provisions of this Ordinance. The Enforcement Officer may require a pre-construction meeting as a condition of issuing a permit.
- J. IDNR/OWR or SMC has retained permit review and approval authority over the following:
 - 1. Illinois Department of Natural Resources projects, dams or impoundment structures as defined in Appendix A.
 - 2. All other state, federal, County or local unit of government development located in the Regulatory Floodplain.
 - 3. Determination that an existing bridge or culvert crossing is not a source of flood damage and the analysis indicating the proposed flood profile, per Article IV, Section C.4.
 - 4. An analysis of flood profile as indicated in Article IV, Section C.4.
 - 5. Alternative transition sections and hydraulically equivalent compensatory storage as indicated in Article IV, Section C.3.d.
 - 6. Permit issuance for development within or over Public Waters.
 - 7. Any changes in the Base Flood Elevation or Regulatory Floodway locations.
 - 8. Base Flood Elevation determinations where none now exist.
 - 9. Determination that the development is a public flood control project.
- K. The Enforcement Officer shall submit the data required to SMC, IDNR/OWR, and the Federal Emergency Management Agency (FEMA) for proposed revisions to the Base Flood Elevation of a Regulatory Floodplain study or a relocation of a Regulatory Floodway boundary.

The Enforcement Officer shall submit reports as required for the National Flood Insurance Program.
- L. The adopted Lake County Comprehensive Stormwater Management Plan states the SMC should “maintain a repository of stormwater management data for the county”. Toward that end, the Enforcement Officer shall:

APPENDIX E - ENFORCEMENT OFFICER DUTIES

1. Maintain records of every Watershed Development Permit application, permit, variance, hydrologic and hydraulic data, and enforcement action and shall allow periodic inspections of the records by SMC, FEMA, or IDNR/OWR personnel.
 2. Maintain an Elevation Certificate and flood-proofing certificate file to certify the elevation of the lowest floor (including basement) of a residential or non-residential building or the elevation to which a non-residential building has been flood-proofed, for all buildings constructed in the Regulatory Floodplain.
 3. Maintain for public inspection and provide copies upon request of: base flood data and maps, variance documentation, Conditional Letters of Map Revision, Letters of Map Revision, Letters of Map Amendment, elevation and flood-proofing certificates, other Watershed Development permit related materials, elevation and flood-proofing record drawings for all buildings requiring flood-proofing or constructed subject to the elevation criteria provisions of this Ordinance, and record drawings of the stormwater management system required by this Ordinance for each development.
 4. Copy to SMC, at agreed-upon intervals, but no later than a 5-year period, specified portions of the watershed development permit records.
- M. The Enforcement Officer shall notify adjacent upstream and downstream communities, the SMC, and IDNR/OWR in writing 30 days prior to the issuance of a permit for the alteration or relocation of a channel in a Regulatory Floodplain.

APPENDIX F

PUBLIC BODIES OF WATER IN LAKE COUNTY

The Following public bodies of water were navigable in their natural condition or were improved for navigation and opened to public use. The entire length and surface area in Illinois, including all backwater lakes and sloughs open to the main channel or body of water at normal flows or stages, are open to the public.

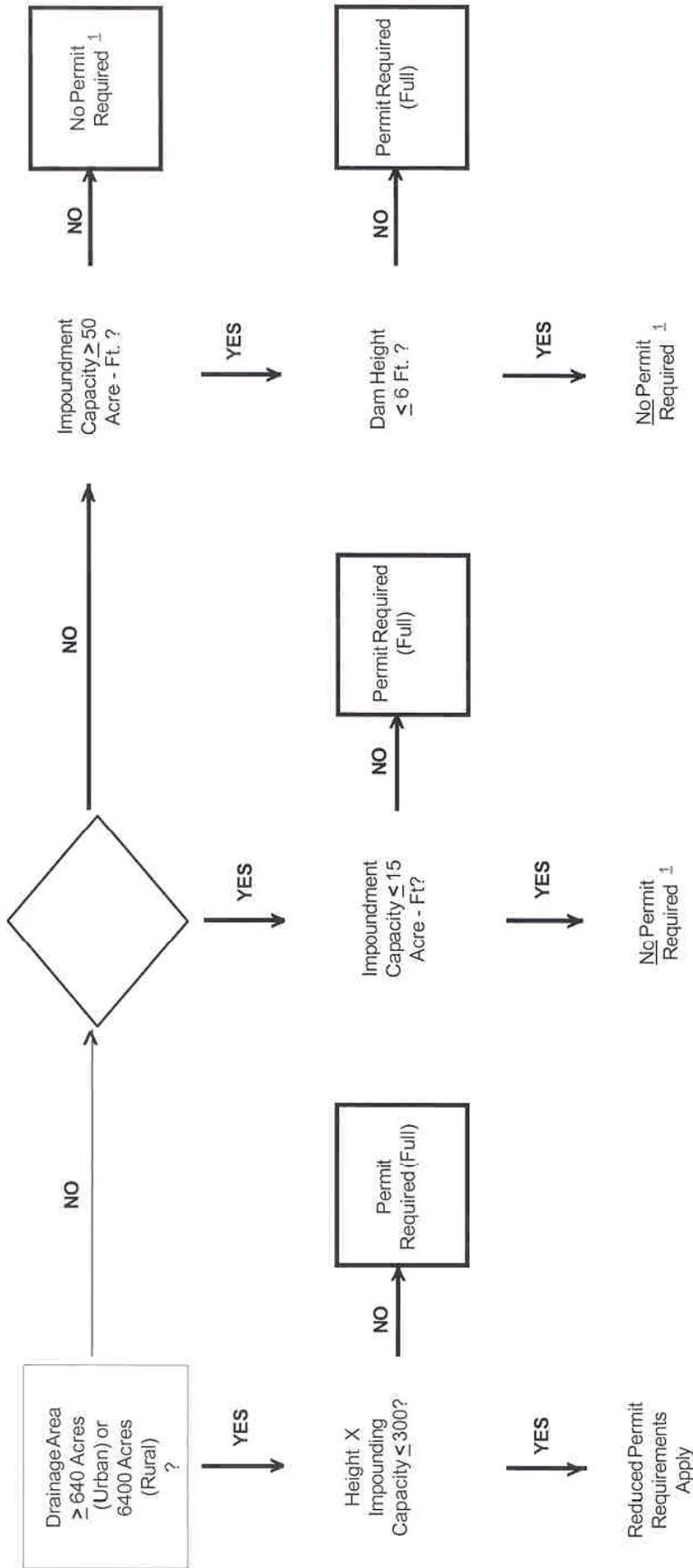
- 1) Lake Michigan
- 2) Fox River (Illinois River Basin)
- 3) Fox Chain-O-Lakes (Lake and McHenry Counties): Bluff Lake, Lake Catherine, Channel Lake, Fox Lake, Grass Lake, Lake Marie, Nippersink Lake, Dunns Lake, Pistakee Lake. Lake Jerilyn, Lac Louette, Redhead Lake;

The following public bodies of water are navigable waters that were dedicated to public use. This list is incomplete. It is believed there are numerous channels and slips in subdivisions on the margins of public bodies of water which have been dedicated by plat. Additional channels and slips have been dedicated by common law.

- 1) Petite Lake, Spring Lake and connecting channels between Bluff Lake and Fox Lake in Lake County.

APPENDIX G IDOT/DWR DAM SAFETY PERMITTING GUIDELINES

CLASS III, SMALL SIZE DAMS



REDUCED PERMIT REQUIREMENTS

- a) a completed "Application for Permit" form,
- b) construction plans and documents that are sealed, signed and dated by an engineer or other qualified personnel,
- c) information describing the downstream flood plain for a distance of two miles,
- d) calculations for the reservoir's 100-year flood pool elevation,
- e) proof of flooding rights (fee simple ownership or flood easement) of all lands within the reservoir's,

- f) right of access authorization for the State to inspect the dam site and immediate vicinity before, during and after construction for the life of the dam and its appurtenances, and
- g) agreement to submit record ("as-built") plans and specifications upon completion of the project.

¹ Unless known potential exists downstream for flood related structural damage which would result from dam failure.

APPENDIX H

PARTIAL LIST OF PERMITS REQUIRED (WHEN APPLICABLE) FOR DEVELOPMENT IN LAKE COUNTY

United States Army Corps of Engineers

Illinois Department of Natural Resources, Office of Water Resources

Illinois Department of Natural Resources, Department of Natural Heritage

Illinois Department of Transportation, Division of Highways, District 1

Illinois Environmental Protection Agency

Lake County Soil and Water Conservation District

Lake County Health Department

Lake County Division of Transportation

Community / County Building Permits

Illinois Historical Preservation Agency

United States Fish and Wildlife Service

APPENDIX I

Rainfall Depth-Duration Frequency Tables for Lake County Rainfall is in inches

Duration	1 year	2 year	5 year	10 year	25 year	50 year	100 year	*Mult. factor
5 min	0.28	0.34	0.41	0.47	0.57	0.66	0.78	0.12
10 min	0.49	0.59	0.71	0.81	1.00	1.16	1.37	0.21
15 min	0.63	0.76	0.92	1.05	1.28	1.49	1.76	0.27
30 min	0.87	1.04	1.26	1.44	1.76	2.04	2.41	0.37
1 hour	1.10	1.32	1.60	1.82	2.23	2.59	3.06	0.47
2 hour	1.36	1.62	1.97	2.25	2.76	3.19	3.77	0.58
3 hour	1.50	1.79	2.18	2.48	3.04	3.52	4.16	0.64
6 hour	1.76	2.10	2.55	2.91	3.56	4.13	4.88	0.75
12 hour	2.04	2.44	2.96	3.38	4.13	4.79	5.66	0.87
18 hour	2.21	2.63	3.20	3.65	4.47	5.17	6.11	0.94
24 hour	2.35	2.80	3.40	3.88	4.75	5.50	6.50	1.00
48 hour	2.54	3.02	3.67	4.19	5.13	5.94	7.02	1.08
72 hour	2.73	3.25	3.94	4.50	5.51	6.38	7.54	1.16
120 hour	3.25	3.93	4.91	5.70	6.93	8.04	9.96	**6 county
240 hour	4.12	4.95	6.04	6.89	8.18	9.38	11.14	**6 county

References: IDNR / OWR Floodplain Map Revision Manual March 1996 Bulletin 70 1988

*Multiplication Factor - Average ratios of X-hour/24-hour rainfall for Illinois, 1989 Bulletin 70.

**6 County - A multiplicative factor is not available for these storm events. Therefore, the 6-county Bulletin 70 data is used for regulatory studies.

HUFF RAINFALL DISTRIBUTIONS

The Huff quartiles represent the typical rainfall distribution for 4 different storm duration ranges. The First quartile applies to storms less than or equal to 6 hours long. Second is for storms greater than 6 hours and less than or equal to 12 while the third Huff quartile is for storms greater than 12 hours and less than or equal to 24 hours. Fourth quartile storms apply to storm durations greater than 24 hours.

HUFF QUARTILE DISTRIBUTIONS												
CUMUL. STORM PERCENT	AREA < 10 SM				AREA > 10 & AREA < 50				AREA > 50 & AREA < 400			
	HUFF QUARTILE				HUFF QUARTILE				HUFF QUARTILE			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
05	16	03	03	02	12	03	02	02	08	02	02	02
10	33	08	06	05	25	06	05	04	17	04	04	03
15	43	12	09	08	38	10	08	07	34	08	07	05
20	52	16	12	10	51	14	12	09	50	12	10	07
25	60	22	15	13	62	21	14	11	63	21	12	09
30	66	29	19	16	69	30	17	13	71	31	14	10
35	71	39	23	19	74	40	20	15	76	42	16	12
40	75	51	27	22	78	52	23	18	80	53	19	14
45	79	62	32	25	81	63	27	21	83	64	22	16
50	82	70	38	28	84	72	33	24	86	73	29	19
55	84	76	45	32	86	78	42	27	88	80	39	21
60	86	81	57	35	88	83	55	30	90	86	54	25
65	88	85	70	39	90	87	69	34	92	89	68	29
70	90	88	79	45	92	90	79	40	93	92	79	35
75	92	91	85	51	94	92	86	47	95	94	87	43
80	94	93	89	59	95	94	91	57	96	96	92	54
85	96	95	92	72	96	96	94	74	97	97	95	75
90	97	97	95	84	97	97	96	88	98	98	97	92
95	98	98	97	92	98	98	98	95	99	99	99	97

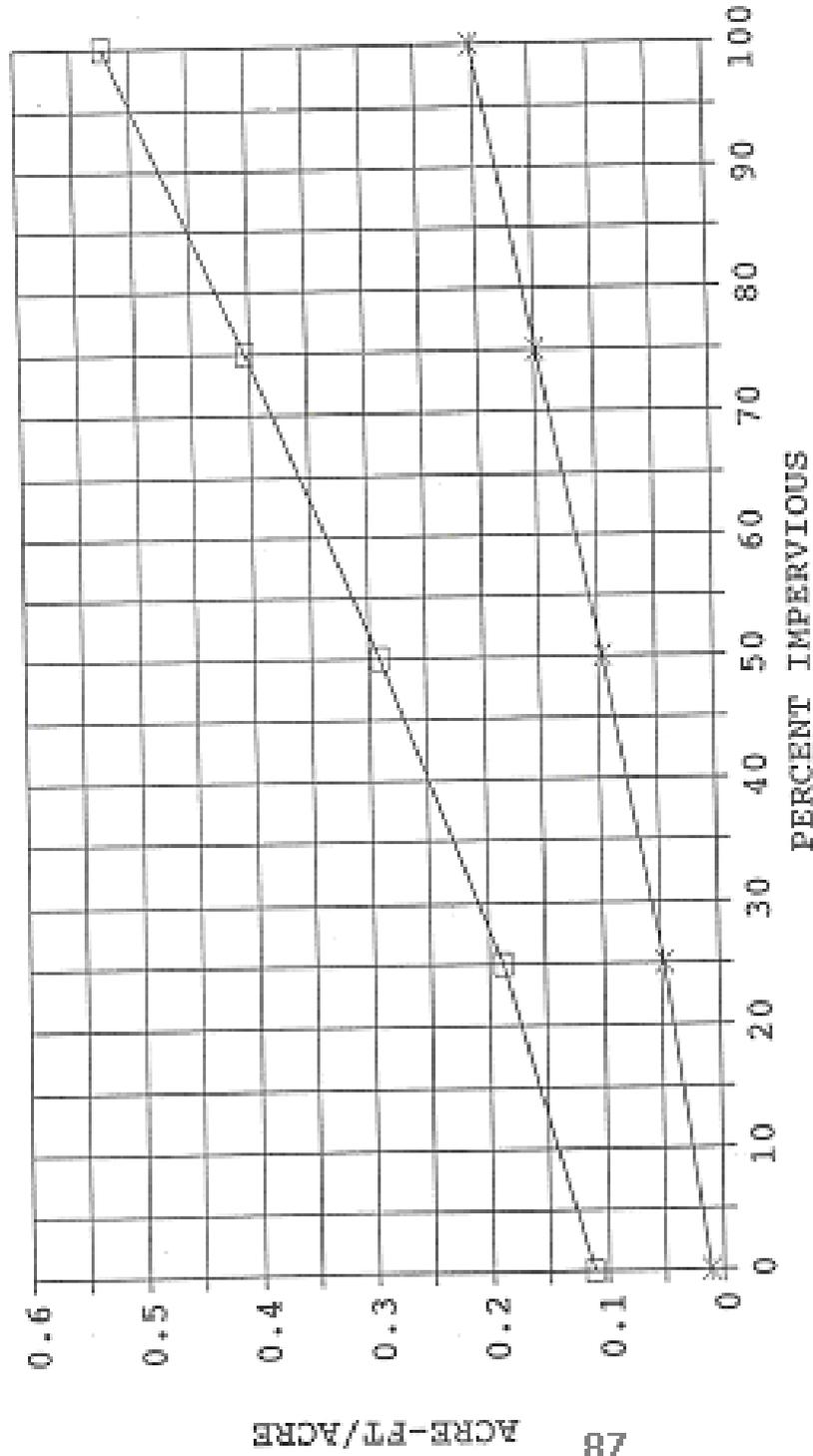
References: Floyd A. Huff and James R. Angel, 1989 "Frequency Distributions and Hydroclimatic Characteristics of Heavy Rainstorms in Illinois", Illinois State Water Survey, Bulletin 70.

APPENDIX J
Watershed Specific Release Rates

WATERSHED		Release Rates (cfc/acre)		
		100 Year	2 Year	
MAJOR TRIBUTARIES		Storm Event	Storm Event	Comments ^{1/}
MINOR TRIBUTARIES		Storm Event	Storm Event	Comments ^{1/}
FOX RIVER				
Fox River Mainstem		0.150	0.040	WDO Maximum Allowable
	Flint Creek	0.150	0.040	WDO Maximum Allowable
	Honey Lake Drain	0.150	0.040	WDO Maximum Allowable
	Mutton Creek	0.150	0.040	WDO Maximum Allowable
	Sequoit Creek	0.150	0.040	WDO Maximum Allowable
	Slocum Lake Drain	0.150	0.040	WDO Maximum Allowable
	Bang's Lake Drain	0.150	0.040	WDO Maximum Allowable
	Squaw Creek Mainstem	0.090	0.020	Watershed Average Rate Based on 8/1/96 SMC adoption of the 11/3/82 FIS flow rate analysis.
	Fish Lake Drain	0.090	0.020	Watershed Average Rate Based on 8/1/96 SMC adoption of the 11/3/82 FIS flow rate analysis.
	Round Lake Drain	0.090	0.020	Watershed Average Rate Based on 8/1/96 SMC adoption of the 11/3/82 FIS flow rate analysis.
	Eagle Creek	0.090	0.020	Watershed Average Rate Based on 8/1/96 SMC adoption of the 11/3/82 FIS flow rate analysis.
	Tower Lake Drain	0.150	0.040	WDO Maximum Allowable
DES PLAINES RIVER				
Des Plaines River Mainstem		0.150	0.040	WDO Maximum Allowable
	Aptakistic Creek	0.150	0.040	WDO Maximum Allowable
	Buffalo Creek Mainstem	0.150	0.040	WDO Maximum Allowable
	Tributary B to Buffalo Creek	0.150	0.040	WDO Maximum Allowable
	Bull Creek Mainstem	0.150	0.040	WDO Maximum Allowable
	Bull Creek Tributary	0.150	0.040	WDO Maximum Allowable
	Gurnee Tributary	0.150	0.040	WDO Maximum Allowable
	Indian Creek Mainstem	0.150	0.040	WDO Maximum Allowable
	South Branch Indian Creek	0.150	0.040	WDO Maximum Allowable
	West Branch Indian Creek	0.150	0.040	WDO Maximum Allowable
	Forest Lake Drain	0.150	0.040	WDO Maximum Allowable
	Seavey Creek	0.150	0.040	WDO Maximum Allowable
	Diamond Lake Drain	0.150	0.040	WDO Maximum Allowable
	Mill Creek Mainstem	0.150	0.040	WDO Maximum Allowable
	North Mill Creek	0.150	0.040	WDO Maximum Allowable
	Hastings Creek	0.150	0.040	WDO Maximum Allowable
	Newport Drainage Ditch	0.150	0.040	WDO Maximum Allowable
	Suburban Country Club Tributary	0.150	0.040	WDO Maximum Allowable
LAKE MICHIGAN				
	Bluff/Ravine	0.150	0.040	WDO Maximum Allowable
	Dead River	0.150	0.040	WDO Maximum Allowable
	Bull Creek	0.150	0.040	WDO Maximum Allowable
	Kellogg Creek	0.150	0.040	WDO Maximum Allowable
	Pettibone Creek	0.150	0.040	WDO Maximum Allowable
	Waukegan River	0.150	0.040	WDO Maximum Allowable
NORTH BRANCH CHICAGO RIVER				
	Middle Fork	0.150	0.040	WDO Maximum Allowable
	Skokie River	0.150	0.040	WDO Maximum Allowable
	West Fork	0.150	0.040	WDO Maximum Allowable

^{1/} Individual Communities within these watershed boundaries may have more restrictive release rates.

FIGURE 3-10
DETENTION VOLUME VS PERCENT IMPERVIOUS
2-YEAR AND 100-YEAR UNIT AREA DETENTION



2-year release = 0.04 cfs/acre, 100-year release = 0.15 cfs/acre

—*— 2-YEAR —□— 100-YEAR

Reference: Northeastern Illinois Planning Commission, Investigation of Hydrologic Methods for Urban Development in Northeastern Illinois

APPENDIX L
HIGH-QUALITY AQUATIC RESOURCES

The following are descriptions of high-quality aquatic resources:

1. Advanced Identification (ADID) sites: Aquatic sites that have been identified by the U. S. Army Corps of Engineers, Chicago District and U.S. Environmental Protection Agency (U. S. Environmental Protection Agency. 1992. Advanced Identification (ADID) Study, Lake County, Illinois. Chicago, Illinois) or latest ADID study.
2. Bog: A low nutrient peatland, usually in a glacial depression, that is acidic in the surface stratum and often dominated at least in part by the genus *Sphagnum*.
3. Ephemeral pool: A seasonally inundated depression within a forested wetland or upland community, usually located on a moraine, glacial outwash plain, or in an area shallow to bedrock; also known locally as a “vernal pool.” These areas may not be permanently vegetated.
4. Fen: A peatland, herbaceous (including calcareous floating mats) or wooded, with calcareous groundwater flow.
5. Forested wetland: A wetland dominated by native woody vegetation by at least one of the following species or genera: *Carya* spp., *Cephalanthus occidentalis*, *Cornus alternifolia*, *Fraxinus nigra*, *Juglans cinerea*, and *Quercus* spp.
6. Sedge meadow: A wetland dominated by at least one of the following genera: *Carex*, *Calamagrostis*, *Cladium*, *Deschampsia*, *Eleocharis*, *Rhynchospora*, *Scleria*, or *Eriophorum*.
7. Seep: A wetland, herbaceous or wooded, with saturated soil or inundation resulting from the diffuse flow of groundwater to the surface stratum.
8. Streams shown on the most recent USGS quadrangle map as a perennial (solid blue line) or intermittent (dashed blue line) that are not determined to be a Waters of the U. S. If a site specific Index of Biological Integrity (IBI) assessment is lower than 35, this stream reach shall not be considered a HQAR.
9. Streamside marsh: An Isolated Waters of Lake County wetland that is within a 10-year riverine floodplain and dominated by herbaceous species.
10. Wet prairie: A wetland dominated by native graminoid species with a diverse indigenous forb component that is seasonally saturated and/or temporarily inundated.
11. Wetlands supporting Federal or Illinois endangered or threatened species: For current state-listed species, reference Illinois Endangered Species Protection Board’s “Checklist of Endangered and Threatened Animals and Plants of Illinois” and/or contact the Illinois Department of Natural Resources. For Federally-listed species, reference the U.S. Fish and Wildlife Service’s “Endangered and Threatened Wildlife and Plants” list (latest edition) and/or contact the U.S. Fish and Wildlife Service.
12. Wetlands with a Floristic Quality Index of 20 or greater or a mean C-value of 3.5 or greater: Reference Plants of the Chicago Region (F. Swink and G. Wilhelm, 4th edition, Indianapolis: Indiana Academy of Science, 1994).
13. Wetlands that are within a designated Illinois Natural Areas Inventory Site (INAI).

APPENDIX M - LCSMC APPROVED WETLAND MITIGATION BANKING REQUIREMENTS

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APPENDIX M - LCSMC APPROVED WETLAND MITIGATION BANKING REQUIREMENTS

SECTION 1. PURPOSE

This appendix includes the criteria for establishing, owning and operating wetland mitigation banks. It further sets out the criteria for authorizing applicants (e.g., individuals, corporations, units of government) to withdraw credits from a mitigation bank to offset unavoidable wetland impacts that would result from the applicant's proposed activity.

SECTION 2. GOALS

Mitigation banks are a form of regional mitigation, which encourage the development of large-scale wetland complexes that can be professionally managed and maintained in perpetuity for the benefit of the general public. The consolidation of multiple small mitigation projects allows for economies of scale in planning, implementation, and maintenance, and can produce wetlands of greater value because of their size and a high level of commitment to long-term management. The expected benefits include water quality management, wildlife habitat restoration and creation, flood control, conservation of biological diversity, education, recreation, and aesthetics. Further, this action will reduce administrative costs and delays in issuing permits for proposed activities that qualify for use of a mitigation bank.

Mitigation banking is intended to be a means of creating or restoring wetlands and generating bank credits in advance of the filling of wetlands for specific projects. As an interim measure, and as a way to encourage the initial development and implementation of banks, the sale of bank credits and the issuance of permits prior to the generation of bank credits at the bank site shall be allowed under conditions described elsewhere in this document.

SECTION 3. DEFINITIONS

1. Creation. Conversion of a non-wetland site into a wetland site by excavation, diking and flooding, or conversion of a deepwater site by filling.
2. Credit Certification. A formal determination by the SMC that mitigation bank credits have been generated. Certified credits result from fully meeting all certification standards (see Section 15, Mitigation Bank Credits and Certification Standards). Conditionally certified credits are those credits that are based on reasonable progress towards becoming certified credits. Uncertified credits are those credits that are based on full approval of the bank charter, and initial construction of the bank, including demonstration of wetland hydrology and planting. A maximum of 30% of the total potential credits may be sold upon approval of bank charter alone. An additional 20% of the total credits may be sold upon the demonstration of wetland hydrology. Upon completion of the approved planting plan, an additional 20% of the total credits may be sold. Using this formula, 70% of the total credits available from the bank may be sold as uncertified credits.
3. Reserved
4. Designated Service Area. The designated service area of an SMC-approved mitigation bank is Lake County.
5. Enhancement. Altering the physical characteristics of an existing wetland such that it permanently improves one or more specific wetland functions and values. Because impacts associated with individual projects that propose to use bank credits will, in virtually all cases, be permanent, only enhancement that results in permanent improvement of a wetland's functions and values will generate credits.
6. Growing Season. The period between May 1 and October 10. This growing season definition is for the purposes of this appendix alone, and is used to establish performance periods for determining compliance with revegetation standards. It does not establish the growing season for purposes of wetland delineation.
7. Ledger. Document to be used in the accounting of credits and debits. The ledger will be maintained by the bank sponsor and reviewed by the SMC.
8. Management. Actions taken within mitigation bank wetlands to establish and maintain desired habitat conditions. Representative management actions include water level manipulations, herbiciding, mechanical plant removal, and prescribed burning.

APPENDIX M - LCSMC APPROVED WETLAND MITIGATION BANKING REQUIREMENTS

9. Mitigation Bank. A system of accounting for wetland loss and compensation, which can include one or more wetland mitigation sites. The minimum acreage requirements in this ordinance shall apply to each site.

10. Mitigation Bank Charter. A written document which contains specifications pertaining to establishment, operation and maintenance of a wetland mitigation bank, codification of the goals, objectives, procedures of the bank, and incorporating the relevant terms and conditions of this ordinance. Principal types of banking charters are a legally binding agreement or a Watershed Development Permit.

11. Mitigation Bank Credits. The unit of measure of bank credit will be acres by wetland type.

12. Reserved

13. Mitigation Bank Site. The geographic location of created, restored, and enhanced wetlands, which serve as the physical resource used to generate bank credits.

14. Monitoring. A specific program of data collection which documents the physical, chemical, and biological characteristics of the mitigation bank wetlands, for the purpose of determining compliance with performance standards contained in the mitigation bank charter.

15. Phased mitigation bank. The construction of a mitigation bank in discrete steps, as authorized or agreed to in advance by the SMC. The bank prospectus must clearly describe each phase of the bank, and list the order in which the phases would be constructed.

16. Reserved

17. Prospectus. A preliminary plan for a wetland mitigation bank prepared by a prospective sponsor and submitted for consideration to SMC.

18. Restoration. Re-establishing wetland conditions in areas that were wetland in historical times, but which have been modified such that they are now considered non-wetland. Restoration converts previous wetland sites back to functional wetlands.

19. Site Development Plan. A plan for each bank site that identifies all actions that will be undertaken to generate bank credits. Representative elements of the site development plan include plans for site grading, revegetation, erosion control, structures, management, and monitoring.

20. Sponsor. The legally responsible individual or entity, proposing establishment of a wetland mitigation bank.

21. Reserved

22. Reserved

23. Wetland mitigation. Replacement of wetlands, and wetlands functions and values, for the purposes of compensating for wetland impacts. The replacement of the wetland functions and values is generally accomplished through wetland restoration, creation, and enhancement.

SECTION 4, RESERVED

SECTION 5. CONSIDERATIONS IN ESTABLISHMENT AND USE OF MITIGATION BANKS

Charters of mitigation banks, mitigation sites, and associated wetland credits shall be subject to approval by the SMC. Every mitigation bank shall have as its primary purpose the creation, restoration, enhancement, and long-term protection and maintenance of wetland resources. All existing property rights remain in effect.

In all cases of a proposed bank, the SMC will issue a public notice describing the project. The public comment period for submittal of relevant comments on the bank prospectus will be a minimum of 30 days. The watershed development permit that is needed in order to construct, restore, or enhance wetlands on the bank site will follow normal permit processing procedures.

APPENDIX M - LCSMC APPROVED WETLAND MITIGATION BANKING REQUIREMENTS

Operation and maintenance procedures approved by the SMC shall be employed to maintain the wetland resources in the bank in as high a qualitative state as is technically practicable. Management of the mitigation bank shall be based on a monitoring plan approved by the SMC. Monitoring shall include, but shall not necessarily be limited to, monitoring of the water, soil and plants comprising the wetland assets of the bank. The bank sponsor shall strive to manage the assets to provide multiple wetland benefits such as water quality management, flood control, biological conservation, and educational and recreational opportunities. In general, mitigation banks should be planned and designed such that little or no management or maintenance other than prescribed burning is necessary once the plant communities are established.

SECTION 6. GENERAL GUIDELINES

Using normal review procedures prescribed by this ordinance, the SMC will conduct project evaluations and will determine the level of mitigation required, and whether a project is eligible to use a mitigation bank.

1. Ideally, mitigation banks should be a way of restoring and creating wetlands in advance of development projects that result in wetland losses. However, to promote the establishment of mitigation banks, this ordinance provides for limited, incremental sales of uncertified credits, and for the issuance of watershed development permits based on uncertified credits according to the guidelines found in SECTION 16, MITIGATION BANK CREDIT SALES. This provision is considered necessary to increase the economic viability of mitigation banks. Because the development plan for any given bank site may require the sale of a minimum number of credits before wetlands may be restored or constructed, it is recognized that a temporary deficit of wetlands may result. To address this possibility, the SMC will require a higher mitigation ratio for the use of uncertified and conditionally certified credit, and for funds to be maintained in an appropriate financial security to ensure construction of the bank's wetlands. This ordinance also limits the number of credits that can be sold prior to construction, and prior to conditional certification. It also establishes a maximum amount of time that may elapse before pre-construction credit sales are converted to conditionally certified or fully certified credits.
2. Emphasis will be on the replacement of wetland acreage and type. Therefore, the preferred method of generating wetland bank credits will be the restoration of former wetlands or the creation of new wetlands, which will result in a net gain in wetland acreage on the bank site. Permanent wetland enhancement as a means of generating bank credits can be performed as specified in Section 14, Establishing Credits. Appropriate functional value assessment methodologies and credit ratios will be determined for each site by the SMC.
3. Mitigation banks generally shall be held to a higher standard of performance than conventional wetland mitigation sites. These standards are detailed in Section 19, PERFORMANCE STANDARDS.
4. Permit applications for wetland impacts to high quality aquatic resources generally will not be considered for mitigation banking, until the applicant has shown compliance with the avoidance and minimization requirements of this ordinance.
5. The mitigation bank, once established, must be dedicated to maintaining the wetland functions and values to the exclusion of other conflicting uses, as determined by the SMC.

MITIGATION BANK ESTABLISHMENT

SECTION 7. SITE SELECTION CRITERIA

The bank site will be reviewed with respect to the following site selection criteria. Failure to meet any of these criteria may be, depending on circumstances, grounds for rejection of a bank site. The site shall:

1. Be owned and/or under the full control of the bank;
2. Contain a majority of drained or hydrologically modified hydric soils, recognizing that restoration of former wetlands is a preferred form of mitigation;
3. Have no high quality aquatic resources that would be adversely affected by the construction or restoration work.

APPENDIX M - LCSMC APPROVED WETLAND MITIGATION BANKING REQUIREMENTS

4. Contain adequate perimeter upland areas to buffer the wetlands from potentially incompatible land uses on adjacent parcels and meet the buffer requirements of this ordinance;
5. Be so situated that adequate hydrology can be ensured (e.g., be located on a floodplain or possess a high groundwater table);
6. Be proximate or adjacent to public land holdings so as to create contiguous, large-scale habitat areas;
7. Be part of an adopted or accepted open space plan, watershed plan, conservancy district, protected riparian corridor, or other local or regional conservation land use plan. This criterion has been established in order to help implement local and regional conservation plans, and to ensure maximum consistency and compatibility with future surrounding land uses;
8. Contain no known hazardous waste, which must be confirmed by an environmental assessment conducted by a qualified person or firm.
9. Have a minimum size of 10 acres or 5 acres if within the Lake Michigan Watershed.

SECTION 8. BANK OWNERSHIP

A mitigation bank may be either publicly or privately owned. The bank may be incorporated as for-profit or not-for-profit. If the bank is incorporated, it must be incorporated in the State of Illinois. Publicly owned refers to ownership of the bank site by any federal, state, regional or local unit of government.

All land, including associated uplands, which are part of the mitigation bank shall be protected in perpetuity from future development by an appropriate deed or plat restriction. This deed or plat restriction must be recorded with the Lake County Recorder of Deeds Office, attached to the abstract of title, with a certified copy of the registration provided to the SMC prior to the SMC authorizing the bank. The mitigation bank charter should also identify the entity responsible for the ownership and long-term management of the site. In addition, the bank sponsor is responsible for securing adequate funds for the operation and maintenance of the bank during its operational life, as well as for long-term management of the site. Bank sponsors are strongly encouraged to establish agreements for long-term management with public or private conservation organizations.

Transfer or sale of the mitigation bank may occur to a party willing and financially able to abide by the terms and conditions of the Mitigation Bank Charter entered into by the SMC and the bank owner. Any such transfer must be approved by the SMC.

SECTION 9. INITIAL PLANNING

The individual or entity proposing to sponsor establishment of a mitigation bank will initially hold informal discussions with the SMC. The purpose of these discussions will be to acquaint the sponsor with the legal, regulatory, and ecological background relevant to banking and to provide procedural guidance to the prospective applicant.

During this discussion the prospective bank sponsor will be informed that a formal request for the establishment of a bank must be made to the SMC. The formal request will include a prospectus and a watershed development permit application, if required. The bank sponsor and the SMC shall develop an authorizing document for the bank that shall be signed by all parties. The authorizing document should outline the responsibilities of the bank sponsor, and contain the necessary information outlined in this ordinance governing the operation of the bank.

SECTION 10. PROSPECTUS DEVELOPMENT

The purpose of the prospectus is to provide sufficient information to allow the SMC to determine if the general considerations and site evaluation criteria outlined in this ordinance are likely to be met if the proposed bank is established. It is understood that the prospectus will become the basis of the mitigation bank charter. The prospectus should contain:

1. The bank location and size;

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2. A delineation of any wetlands or other jurisdictional areas that may exist at the proposed bank location;
3. The type of real estate interest in bank property;
4. A legal description of the property;
5. The type of bank (i.e., single client, general use, market oriented, etc.);
6. The method of credit production (i.e., restoration, creation, enhancement) the number of proposed credits by each method, and the rationale for crediting;
7. A statement as to compliance with this document;
8. A general site plan showing the location of all existing and proposed wetland and upland habitats, roads, trails, structures, utilities, and any other existing or proposed site improvements;
9. An outline of management and maintenance responsibilities;
10. A preliminary construction plan and schedule of completion, preliminary planting plan, and preliminary administrative, management, monitoring, and financial plans, and;
11. A charter of incorporation for the mitigation bank, if appropriate.

SECTION 11. FINANCIAL ASSURANCES

The bank sponsor is responsible for securing sufficient funds or other financial assurances to cover contingency actions in the event of bank default or failure. In addition, the bank sponsor is responsible for securing adequate funding to monitor and maintain the bank throughout its operational life, and to make provision for long-term management through financial assurances or through agreements with land management organizations or agencies. Total funding requirements should reflect realistic cost estimates for monitoring, long-term maintenance, contingency and remedial actions. Financial assurances may be in the form of performance bonds, irrevocable letters of credit, irrevocable trusts, escrow accounts, casualty insurance or other approved sureties. Such assurances may be phased out or reduced once it has been demonstrated that the bank is functionally mature and/or self-sustaining in accordance with the approved performance standards. The financial plan must demonstrate that the bank and its wetlands can be maintained in perpetuity whether through continual ownership or by conveyance to a public or private agency that will assume the responsibilities of the bank.

SECTION 12. MITIGATION BANK APPLICATION PROCESS

The sponsor must submit a watershed development permit application and a prospectus for the initial development of the bank. Upon receipt of these items the SMC shall begin a public interest review on the prospectus with input from government agencies and the general public. The public will be notified of all proposed banks by a public notice issued by the SMC for a 30-day comment period. Copies of all comments received during the public notice comment period will be given to the bank sponsor. Full consideration will be given to all comments received in evaluating the bank proposal. The bank sponsor and the SMC shall develop an authorizing document for the bank. The authorizing document should outline the responsibilities of the bank sponsor, and contain the necessary information outlined in this ordinance governing the operation of the bank. Additionally, the details of the bank sponsor's responsibilities shall be noted in any watershed development permit in which the permittee's mitigation responsibilities are met through the use of the mitigation bank.

SMC shall make a site inspection of the bank area. A written response to the banking prospectus indicating the prospective bank's feasibility would then be prepared by the SMC based upon observations made during the site visit. An indication of feasibility in the letter should be interpreted as general acceptability of conceptual bank plans and either probable issuance of a watershed development permit, or probable signatory approval of a Mitigation Bank Charter upon completion of detailed plans.

The formal request to the SMC for establishment of a bank shall include:

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1. A watershed development permit application to conduct the proposed work that is necessary to establish the bank.
2. A copy of the previously described prospectus; and
3. A plan that details the goals, objectives, and success criteria for creating wetlands, including wetland types and their respective acreages.

SECTION 13. DETAILED PLANNING STAGE

This is the final planning stage leading to issuance of a watershed development permit for authorization, implementation and operation of a bank. The preparation of detailed plans should be closely coordinated with the SMC and other local authorities as appropriate.

Each mitigation bank shall have a site development plan that must be approved by the SMC. This plan shall identify and incorporate the following, to the extent practicable and appropriate:

1. Diverse aquatic and supporting landscapes (e.g., shallow open water, riparian wetlands, deep and shallow marshes, floodplain forests, wet meadows and prairies, upland buffers, etc.), which are interrelated, one to the other, so as to maximize wetland functions and values;
2. Diverse wildlife habitats and associated edge conditions;
3. Associated upland buffer areas contiguous to the wetlands to protect the wetlands from potential adverse effects of adjacent land uses, specifying the width and area of all such zones;
4. Wetland functions which will be created or enhanced by maximizing vegetative diversity and abundance, structuring specific wildlife habitats, optimizing wetland hydrology, and providing public access;
5. Species native to the area;
6. The use of native soils on the site;
7. The means for establishing the appropriate hydrology, and;
8. The mitigation bank shall be designed to be as self-sufficient as possible and minimize maintenance.

BANK OPERATION

SECTION 14. ESTABLISHING MITIGATION BANK CREDITS

The units of wetland credit shall be acres of wetland.

Mitigation bank credits shall be generated as wetlands are created, restored, or enhanced on the bank site, resulting in an increase in wetland acreage and/or quality on the bank site. Banking credits may be generated as follows: Full credit will be given for wetland creation from upland and for restoration of former wetlands. Partial credit (25% of the enhanced wetland acreage) can be given for permanent enhancement (e.g., re-establishment of hydrology) of degraded wetlands. A maximum of 30% of the total potential credits generated by the bank may consist of enhanced wetlands or enhanced uplands.

SECTION 15. CREDIT CERTIFICATION

Mitigation bank credits shall be certifiable by the SMC when the bank credits conform to the criteria outlined in Section 19, PERFORMANCE STANDARDS . Credits may be certifiable at any time, but the standards for certification shall be met no later than five years from the date of planting unless otherwise specified in the bank charter and approved by the SMC . After the second full growing season following creation or restoration of wetlands, the SMC may conditionally certify the credits of the bank based on reasonable progress toward achieving the performance standards. Conditional certification shall be based on degree of conformance with the standards for conditional certification in Section 21 , and on any interim corrective measures recommended by the SMC.

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At the end of five years, if any of the above conditions are not met, the authorized agent of the bank shall submit a plan to the SMC outlining corrective measures to be taken based on the ecological conditions of the site. Management activities shall continue until the standards are met, as verified by the SMC.

Certain types of enhancement of existing wetland can be an acceptable way of generating credits if the enhancement actions are scientifically sound and result in a substantial, measurable, and permanent increase in the level of wetland function. The types of enhancement that will be acceptable include the following:

1. Restoration of wetland hydrology at sites that have been significantly modified through tile drainage or ditch drainage;
2. Restoration of diverse native plant communities where the original plant community has been totally destroyed, and the site is currently farmed or has revegetated with aggressive and/or exotic species such as reed canarygrass, cattails, purple loosestrife, phragmites, buckthorn or other species. Restoration goals would include the removal of the exotic or aggressive species, and the introduction and establishment of a diverse assemblage of native species appropriate for the site considering geographic location, soils, hydrology, and other factors. Selective removal of exotic species in otherwise healthy native plant communities will normally not be considered eligible for credit.
3. Restoration of deep marsh habitat through shallow impoundment, where the purpose is to create hemimarsch conditions suitable for nesting by target wetland bird species of concern. This approach is appropriate at sites that have been significantly altered through partial drainage, and consist largely of dense monotypic stands of cattails or other aggressive species. It is not appropriate for sites that have existing biodiversity or habitat values that would be adversely affected by the proposed actions or where the level of benefit would be minimal.

The prospectus must specifically state which aspects of wetland function would be increased as a result of the enhancement actions, the level to which they would be increased, and the scientific basis for expecting the increase. It must also include a narrative description of how the enhancement would be accomplished, a schedule of completion, explicit performance standards, and performance milestones for enhancement actions to be carried out over an extended period of time.

Performance standards for enhancement work will be approved as part of the watershed development permit. Actions such as the restoration of hydrology can be implemented in a very short time, and can be measured through immediate water level responses. Plant community restoration is a lengthier process, requiring sustained effort over a period of time. In such cases, interim performance milestones may be established, and credits resulting from such work would be included in the final 30% increment of credit released from the bank.

Credit ratios will be determined based on specific circumstances for each bank. Restoration of a historic wetland area or creation of a wetland from an upland area would receive a credit ratio of 100%. Actions that restore a very degraded wetland to a high degree of function, such as restoring normal hydrology to a drained wetland, or restoring a high level of species diversity to a monotypic plant community, shall receive credit at a maximum ratio of 25% of the credit values awarded to restored or created wetlands.

The wetland mitigation bank shall meet the buffer requirements of this ordinance. All high quality aquatic resources existing on the mitigation bank site shall, at a minimum, meet the buffer requirements for high quality aquatic resources, all other existing enhanced, created or restored wetland areas shall, at a minimum, meet the standard buffer requirements of this ordinance. The inclusion of upland and deepwater environments within a wetland mitigation bank may be inadvertent (i.e., due to topographic reasons and real estate considerations) or planned (i.e., to realize or enhance certain wetland functions). In the latter case, upland areas may be either naturally occurring or be artificially created and, depending on their basic purpose, may occur along the periphery of the bank or be dispersed throughout. Enhanced upland areas or enhanced wetland edges used to meet the buffer requirements of this ordinance for the mitigation bank shall be credited at 25% of the enhanced acreage completed. Created or restored wetland edges used to meet the buffer requirements of this ordinance for the mitigation bank shall be credited at 75% of the acreage created or restored.

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Conditional certification will allow for a reduction of the posted financial security to a level sufficient to assure full certification. Corrective measures will be approved by the SMC prior to implementation. These measures should ensure that the mitigation standard is met at the end of the five-year management period from the day the planting is completed.

During construction of the mitigation wetlands, qualified personnel must make periodic inspections of the site to ensure that soil erosion control measures are employed and functioning properly. Inspection reports shall be submitted to the SMC on a monthly basis.

SECTION 16. MITIGATION BANK CREDIT SALES

Upon authorization of the mitigation bank, through a watershed development permit, the sale of wetland credits and the creation or restoration of wetlands and buffers may commence. The mitigation bank credits may be sold for mitigation purposes in accordance with the following conditions:

1. Certified credits and conditionally certified credits may be sold provided that adequate funds, as approved by the SMC, are established through an escrow account, performance bond, irrevocable letter of credit, or other financial surety for the generation of certified credits and long-term maintenance of the bank site;
2. If an approved bank has only uncertified credits, then those uncertified credits may be sold for mitigation purposes, provided that adequate funds, as approved by the SMC, are established through an escrow account, performance bond, irrevocable letter of credit or other financial surety for the generation of credits and long-term maintenance of the required bank site.
3. The SMC has sole authority to determine the number of credits available for withdrawal from the mitigation bank.
4. All mitigation bank credit sales shall require prior approval by the SMC to confirm credit availability and compliance with all other provisions of this ordinance.

In every event, the mitigation bank sponsor shall establish in a performance bond, escrow account, irrevocable letter of credit or other financial surety, adequate funds to ensure the construction, planting, and long-term monitoring, management, and maintenance of the mitigation bank wetlands and associated uplands. The amount of the financial surety shall be based upon the calculated per acre cost of completing the approved plan, including grading and planting of the site. Cost estimates for the construction and/or planting and maintenance for all restored, created or enhanced wetlands in the bank must be presented. A proposed schedule of release of the financial surety following completion of specific tasks associated with the establishment of the bank must also be submitted for approval. Construction estimates shall include an estimate of the cubic yards of earth to be moved during the grading of the site, as well as an estimated cost per cubic yard for the earthwork.

The interest on all such escrow accounts may be used by the bank sponsor for monitoring, management, and maintenance purposes only. The financial sureties must be maintained until all credits have been certified and sold or the SMC has determined the mitigation bank is self-sustaining. The amount of the financial surety will be reviewed annually based on the results of the monitoring report.

For all mitigation banks, credit sales may commence upon approval of the bank's charter. A maximum of 30% of the total potential credits may be sold prior to construction, based on approval of the bank's charter and the posting of adequate financial surety. Upon acceptance by the SMC that appropriate wetland hydrology has been demonstrated throughout all proposed wetlands at the site, an additional 20% of the total credits may be sold. Upon acceptance by the SMC that the site has been planted according to the approved plan, and after wetland hydrology has been demonstrated, another 20% of the total credits may be sold. The final 30% of the total credits may be sold upon full certification.

Incremental demonstration of wetland hydrology, and incremental planting of the site may also be awarded credit. For example; piezometer data from a 50-acre wetland restoration area shows that 37 acres of the planned wetland meets the wetland hydrology criterion of the 1987 Federal Wetland Delineation manual.

APPENDIX M - LCSMC APPROVED WETLAND MITIGATION BANKING REQUIREMENTS

These 37 acres represent 74% of the proposed wetland area. By applying this 74% factor to the allowable 20% increment of credits awarded for demonstrating wetland hydrology, the allowable increment of new

credits for the bank would equal 14.8% of the proposed wetland on the site ($0.74 \times .20 = 0.148$, or 14.8%). The same method would be used for calculating credits due to incremental planting. In the event that the bank sponsor sells more than the number of credits approved by the SMC, the SMC reserves the right to deduct the amount of the oversale from the total potential credits available from the bank. These credits will not be restored, even if future development of the bank results in the certification of additional credit sales.

No watershed development permits will be granted to applicants proposing to use a mitigation bank unless credits are available in the bank, as specified in this ordinance.

The initial physical and biological improvements at the bank site (including, but not limited to, grading, planting, and restoration of wetland hydrology) must be completed no later than the end of the (third full growing season following the sale of the first mitigation bank credit).

The bank sponsor shall keep a ledger of all available credits, whether purchased or unpurchased, and of all credits sold or otherwise debited including individual sale prices. This ledger shall be made available to the SMC upon request. In addition, the bank sponsor must provide the SMC an updated ledger containing a list of all transactions, including sale prices at a given bank to date at the conclusion of every credit sale.

SECTION 17. MONITORING, MANAGEMENT, AND REPORTING

Monitoring shall occur for a period of five years from the date of the completion of the approved planting plan. Management shall proceed on a continuing basis from the completion of planting through the end of the monitoring period. Management shall proceed as needed to reconcile current conditions with functional goals. Any required remedial measures will be based on information contained in monitoring reports and/or from SMC site inspections.

The monitoring results of the mitigation bank shall be provided to the SMC on an annual basis during the monitoring period. Following this, no report shall be required, but the SMC shall retain the right to inspect the mitigation bank as deemed appropriate. The SMC shall hold on file copies of any reports. The SMC will establish an annual compliance monitoring schedule that assures that all mitigation bank sites are inspected for compliance with the approved bank plan.

The mitigation bank sponsor shall be responsible for all monitoring, management, and reporting. However, the work may be done by bank employees, subcontractors, or public or private organizations.

The operational life of a bank shall consist of the period during which the terms and conditions of the mitigation bank charter are in effect. With the exception of arrangements for the long-term management and protection in perpetuity of the wetlands and/or other aquatic resources and associated uplands, the operational life of a mitigation bank terminates at the point when;

1. Wetland mitigation credits have been exhausted or banking activity is voluntarily terminated with written notice from the bank sponsor to the SMC, or;
2. The SMC has determined that the debited bank is functionally mature and/or self-sustaining to the degree specified in the mitigation bank charter and associated documents, including the performance standards outlined in this ordinance.

SECTION 18. LOSS OF BANK CHARTER

Should a bank not meet the terms of its charter, for whatever reason, the SMC shall inform the bank sponsor and shall specify a reasonable period of time in which to comply. Should any modifications to the charter be required, recommended changes shall be approved by the SMC. Continued non-performance of the bank shall result in revocation of the charter and forfeiture of financial securities.

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SECTION 19. PERFORMANCE STANDARDS

The following performance standards are established to ensure that mitigation banks create wetlands, which compare favorably with moderate to high quality natural wetlands with respect to diversity, abundance and distribution of plant species, and also to ensure that the created wetlands exhibit the hydrologic regimes of natural wetlands. These standards will be used to measure the performance of mitigation banks unless otherwise stated in the mitigation bank charter. The bank sponsor may propose other standards if native plant restoration is not the primary goal of the mitigation bank. For example, wildlife habitat enhancement goals may require the development of alternative standards based on habitat structure such as the interspersions of open water and cattails, or the seasonal establishment of mud flats. Justification for alternative standards must be provided in the bank prospectus. The SMC retains approval authority for any performance standards proposed which are different from those contained in this ordinance .

Species composition: Species selected for the planting shall be native to Lake County (ref. Swink and Wilhelm, *Plants of the Chicago Region*, 1994), and shall be appropriate for the hydrologic zone to be planted. A minimum number of native perennial species proposed for establishment must be present within each plant community to meet certification standards, as follows:

Marsh- minimum of 15 native perennial species

Sedge meadow/wet prairie- minimum of 35 native perennial species

Mesic Prairie (buffer)- minimum of 25 native perennial species

In addition, at least 50% of the required minimum number of species must occur at a 10% frequency or greater.

Species dominance: The following dominance standards are for wetland mitigation banking purposes only. Dominance shall be determined by calculating importance values, with at least two parameters, frequency and cover, used to calculate species importance. Cattails (*Typha* spp.), reed canary grass (*Phalaris arundinacea*) and non-native species shall cumulatively comprise not more than 5% of the total dominance measure for each community for which credit is granted.

The native perennial species within each wetland plant community shall represent at least 80% of the total dominance measure.

Wetland hydrology: Wetland hydrology must be independently demonstrated within each wetland for which credit is sought from data gathered from piezometers placed throughout the bank site. Piezometer placement must be approved by the SMC prior to approval of the bank.

Conditional certification: Credits shall be conditionally certified not sooner than the second full growing season after planting, based upon achieving the following standards:

75% of the minimum number of native perennial species required for full certification shall be present in each plant community

The total of native perennial species within each plant community shall represent at least 15% of the total dominance measure.

**PEORIA COUNTY, ILLINOIS
EROSION, SEDIMENT, AND STORM WATER
CONTROL ORDINANCE**

Section 7.5-61. DEFINITIONS

[For the purposes of this article, the following words, terms and phrases shall have the meanings respectively ascribed to them in this section, unless the context clearly indicates otherwise.]

Adjacent lands: At a minimum is an area within fifty (50) feet of the project area, and includes all surrounding land that may either impact a site, or be impacted by potential soil erosion, sediment and/or storm water run-off as a result of land disturbing activities conducted on a site.

Appeals Board: The Erosion, Sediment and Storm Water Control Appeals Board.

Areas of concentrated flow or bodies of water: Any area where water may accumulate or flow, whether continual or as the result of a storm event, including but not limited to lakes, rivers, streams, creeks, ponds, ditches, swales, gullies, ravines, street gutters and other similar features.

Commission: The Tri-County Regional Planning Commission.

Control Measure: Any proposed temporary or permanent measures to be installed to control erosion, sediment and storm water run-off from a project area.

County: The County of Peoria, Illinois.

Department: The Peoria County Department of Planning and Zoning.

Development: The division of a parcel of land into two or more parcels; the construction, reconstruction, conversion, structural alteration, relocation, or enlargement of any structure; any mining, excavation, landfill, or land disturbance; and any use or extension of the use of land.

Disturbed Area: Any area of land on which the pre-development ground surface will be affected or altered by the development activities. This includes but is not limited to grading, clearing, stock piling, tracking and other similar activities.

Drainage area: From any point where water leaves the site, it is the land over which water flows toward the point.

Erosion Control Administrator: The person appointed by the Peoria County Board to administer this ordinance.

Flood Insurance Rate Maps (FIRM): Maps prepared by the Federal Emergency Management Agency (FEMA) that depict the special flood hazard areas (SFHA) within a community. These maps include insurance rate zones and floodplains and may or may not depict floodways.

Five year frequency storm event: The storm event rainfall depth during a 24 hour period which is exceeded, on the average, once every five (5) years.

Institutional use: A religious, or public use, such as a church, library, public or private school, hospital, or government owned or operated building, structure, or land used for public purpose.

Land disturbing activity: Any change in land, which may result in soil erosion from water or wind and the movement of sediments into State or County waters or on to lands in the County, or a change in the amount and/or intensity of storm water run-off, including but not limited to, the covering with an impervious surface, stockpiling, clearing, grading, excavating, rehabilitating, transporting, depositing or filling of land.

Normal agricultural practices: Activities associated with the preparation and tilling of land for the purposes of growing crops, or raising livestock, which may include, but are not limited to, the construction of conservation measures, plowing, disking, and cultivating.

Perimeter Control: Any control measure installed between the down slope side of the disturbed area and the property line and/or between the down slope side of the disturbed area and any area of concentrated flow.

Preproject condition: A condition that impacts erosion, sediment, or storm water run-off characteristics of a site prior to start of construction activity. The pre-project condition shall be based on the predominant land use for the past five (5) years. For example, if a site has been cropland for four (4) of the past five (5) years and in grass just prior to development, the land use would be cropland for the pre-project condition.

Project: Any development involving modification to land which involves a land disturbing activity.

Regional storm water management system: A system which is designed, constructed and maintained to provide storm water control for multiple land owners.

Road: Any right-of-way that has been improved for the purposes of providing a surface for vehicular traffic, including any Federal, State, County, township, and municipal controlled facilities.

Single family dwelling: A building designed for or occupied by one family.

Site: The lot or parcel on which the project is to be developed.

Site Specific plan: A general erosion and sediment control permit required for projects where slope is greater than ten percent (10%) and/or the site contains areas of concentrated flow or bodies of water. Slope shall be determined by the maximum slope indicated on the site according to the USDA Soil Survey or topographic survey as prepared by an Illinois Registered Surveyor.

Standards: The Illinois Environmental Protection Agency's Illinois Urban Manual, A Technical Manual Designed for Urban Ecosystem Protection and Enhancement published in 1995 and Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control published in 1988 by the Urban Committee of the Association of Illinois Soil and Water Conservation Districts now in effect, or as hereafter amended which is incorporated by reference herein, the Peoria County standards for Stormwater Design Analyses, found at Appendix "A" of this article, and the erosion and sediment control criteria and specifications found in Appendix "B" of this ordinance.

Standard plan: A general erosion and sediment control permit for projects where slope is less than ten percent (10%) and there are no areas of concentrated flow or bodies of water on or immediately adjacent to the site. Slope shall be determined by the maximum slope indicated on the site according to the USDA Soil Survey or topographic survey as prepared by an Illinois Registered Surveyor.

Substantial completion: The point at which all exterior work is completed and the site can be used for the use intended.

Twenty-five year frequency storm event: The storm event rainfall depth during a twenty-four (24) hour period which is exceeded, on the average, once every twenty-five (25) years.

Two-family dwelling: A building designed for or occupied by two families.

Two year frequency storm event: The storm event rainfall depth during a 24 hour period which is exceeded, on the average, once every two (2) years.

Utility Service Line: The means by which utility service is provided to service users, such as electric, telephone, television cable; gas, water and sewer pipes.

Working day: Shall not include Saturday, Sunday or any holiday when the Peoria County Courthouse is closed.

Section 7.5-62. APPLICABILITY OF ARTICLE

This article shall apply to:

1. All projects within the boundaries and jurisdiction of the County. No land surface shall be disturbed unless an erosion and sediment control permit, or an erosion, sediment and storm water control permit has first been issued for that project, except as follows:
 - a. Land disturbing activities which do not involve the construction of any new single or two-family dwellings and for which the disturbed area is less than 5,000 square feet;
 - b. Normal agricultural practices; or
 - c. Routine maintenance of roads, access ways and utility service lines.

The Erosion Control Administrator reserves the right to require any non-agricultural, construction development activity, regardless of disturbed area or type of activity, to comply with this article if it is determined to be the cause of or a contributor to an existing or potential erosion, sediment, or storm water impact.
2. Any land within the boundaries and jurisdiction of the County on which there is located a permanent storm water control measure, which was installed pursuant to this ordinance.

Section 7.5-63. STANDARDS FOR DESIGN AND MAINTENANCE OF CONTROL MEASURES FOR SOIL EROSION, SEDIMENT AND STORM WATER

(a) EROSION AND SEDIMENT CONTROL MEASURES. All control measures required under this ordinance shall conform to the design criteria, standards, and specifications provided in the applicable standards now in effect or as hereafter amended. All control measures installed shall be sufficient to prevent sediment from leaving the permit site during a five (5)-year frequency storm event. Measures shall be taken to prevent sediment from leaving the site. When sediment does leave the site, the owner, developer or contractor shall remove the sediment within four hours or by no later than the end of the workday. For example, installing a rock construction drive, or cleaning tires could be used to minimize tracking of sediment onto public roads.

(b) PERMANENT STORM WATER CONTROL MEASURES. All storm water controls shall be designed so that the peak discharge rate from the permitted area resulting from the two-year and twenty-five year frequency storm events for the postproject condition do not exceed the corresponding storm event peak discharges for the preproject condition. Evaluation of submitted plans shall be based on the Storm Water Design Analysis Standards in Appendix "A" at the end of this article.

(c) **REGIONAL STORM WATER CONTROL SYSTEMS.** To allow for the beneficial development and maintenance of regional storm water management systems, where they are available and they are appropriate, an applicant may submit a design dependent on such a system. The applicant shall submit documentation of the approval for the use of the regional storm water management facility from the governmental agency having jurisdiction over it. The applicant shall submit evidence showing that there will be no adverse flooding impact to any receiving stream between the point of discharge and the regional storm water facility. If the applicant is approved to use the regional storm water management system, the applicant may request exemption from the requirements in this section for permanent on site storm water controls from the Erosion Control Administrator. Such exemption shall not apply to any temporary storm water control measures required by this article.

Section 7.5-64. MAINTENANCE OF CONTROL MEASURES

(a) **EROSION, SEDIMENT, AND TEMPORARY STORM WATER CONTROL MEASURES.** On-site sediment control measures shall be constructed and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.

Sediment control measures and temporary storm water control measures are to be maintained so they are operating effectively until permanent ground surface protection and permanent storm water control measures are established in a manner specified in the applicable permit issued pursuant to this article.

Fully functioning temporary sediment control measures (including, but not limited to perimeter sediment controls) shall remain in place until the ground is stabilized with permanent ground cover. The intent of the article is to keep the sites protected at all times until the ground is permanently stabilized. In cases where it is not practical to leave the temporary sediment control measures in place prior to establishing permanent ground cover (for example, when control measures need to be removed in order to grade the area or install pavement or sod), an exception will be made only if one of the conditions listed below will be met. In no way does adhering to one of the conditions below relieve the owner of responsibility to clean-up or repair any damages caused from sediment or storm water run-off leaving the site.

1. Permanent ground cover shall be established with pavement, aggregate or sod within three days of the removal of sediment barriers.
2. Permanent vegetation shall be established by seeding with anchored mulch within three days of removal of sediment barriers during the spring or fall seeding periods. However, on project areas with slopes not exceeding five (5%) percent, permanent vegetation shall be established by seeding within three days of the removal of sediment barriers during the spring or fall seeding periods. Summer seeding is acceptable on project areas which shall be watered. This does not apply to concentrated flow areas.

(b) **ADDITIONAL CONTROL MEASURES.** The Erosion Control Administrator may require additional control measures pursuant to the Standards if determined as necessary after site inspection and prior to issuing the permit.

Section 7.5-65. GENERAL EROSION AND SEDIMENT CONTROL PERMITS

Before commencing any project involving construction of any new single or two-family dwelling or commencing any project with an area of 5,000 square feet or greater, the owner of the land, or his representative, shall be required to file an application for a General Erosion and Sediment Control Permit, as either a Standard Plan or a Site Specific plan, except as otherwise provided in Section 7.5-62 and Section 7.5-66.

(1) APPLICATION. The applicant shall file the application with the Department on forms provided by the Department. The fee for a Standard plan application shall be in the amount of \$150.00 for each permit, and the fee for a Site Specific plan application shall be \$200.00 for each permit. However, no fee shall be required for any project the purpose of which is agricultural, or initiated by a local unit of government. There shall be no refund of any fees paid and no application shall be accepted for filing unless the fee has been paid in full.

(2) APPLICATION REVIEW. Review of a General Erosion and Sediment Control Permit application shall be limited to verifying that the required information and permit fee have been provided and that it meets the standards. The Erosion Control Administrator shall issue or deny an application by: a) approving the permit for a standard plan within two (2) working days of the filing of a completed application; or b) initiate the review process for a site-specific plan and approve the same within five (5) working days of the filing of a complete application. If the permit is denied, it shall be returned to the applicant with a written explanation of its denial. The application shall be deemed approved if no response is made within the time frames provided above.

(3) DURATION. The general erosion and sediment control permit shall be issued for a period not exceeding two (2) years.

(4) CONTENT OF GENERAL EROSION AND SEDIMENT CONTROL PERMIT. The General Erosion and Sediment Control permit shall contain at a minimum the following general conditions:

- a. That written approval be obtained from the Erosion Control Administrator prior to making any modification to the erosion and sediment control plan as set forth in the application; and
- b. That all control measures identified in the application shall be installed; and
- c. That all control measures shall be maintained during construction; and
- d. Such other conditions as the Erosion Control Administrator deems appropriate to ensure compliance with the specific requirements and intent of this article.

(5) PERMANENT GROUND SURFACE COVER. Under all circumstances, temporary control measures shall be maintained in accordance with Section 7.5-64. Without exception, all disturbed areas must have permanent ground cover within six months of project completion, or within six months of occupancy, whichever comes first.

Section 7.5-66. EROSION, SEDIMENT, AND STORM WATER CONTROL PERMITS

Before commencing any commercial, institutional, multi-family or industrial project with an area of more than one-half (1/2) acre; or a project requiring subdivision approval by a unit of local government with an area of more than one-half (1/2) acre, the owner of the land, or his representative, shall be required to file an application for an Erosion, Sediment, and Storm Water Control Permit.

(1) APPLICATION. The applicant shall file the application with the Department on forms provided by the Department. The applicant shall supply the number of copies of application documents as provided in the application. Each application shall be accompanied by the following information:

- a. Existing site conditions map. A map of existing site conditions on a scale, of at least one inch equals one hundred (100) feet, showing the project area and immediately adjacent areas and the locations of the following site information:
 1. Site boundaries and adjacent lands which accurately identify site location;
 2. Lakes, streams, wetlands, channels, ditches, and other water courses on and immediately adjacent to the site;
 3. Floodways and/or Zone A of the Floodplain as determined on the Flood Insurance Rate Map (FIRM), and indicating the map panel number;
 4. All off-site drainage onto or through the project site;
 5. Location and dimensions of storm water management components on or adjacent to site;
 6. Locations and dimensions of structures, roads, highways, easements and paved areas; and
 7. Site topography: show contours at vertical intervals as follows:
 - (i) Slope of six per cent (6%) or less, two-foot interval.
 - (ii) Slope of over six per cent(6%) but less than fifteen per cent(15%), five-foot interval.
 - (iii) Slope of over fifteen per cent, (15%) ten- or twenty-foot intervals.
- b. Plan of final site conditions. A plan of final site conditions drawn to the same scale as the existing site map submitted pursuant to subsection (1) a, and which includes information to accurately depict post-construction appearance of site, e.g., paved areas, building, landscaping, and other changes to the site, along with other predominate site features, e.g., open areas, bodies of water.
- c. Sediment and Erosion control practices. A site construction plan including:
 1. Locations and dimensions of all proposed land disturbing activities;
 2. Locations and dimensions of all temporary soil and aggregate stockpiles;
 3. Location, dimension and construction details of all construction site management control measures necessary to meet the requirements of this article and including proposed revegetation of disturbed areas;

4. Statement regarding provisions for maintenance and maintenance requirements of the construction site management control measures during construction;
- d. Storm water management plans and controls. Design calculations and information related to the permanent storm water management system for any project with a net increase of impervious area greater than one-half (1/2) of an acre. For the purposes of this section, the net increase is the cumulative change since the implementation of this article, April 1, 1996. For example, in year 1, a commercial site increases the parking lot by 20,000 square feet. In year 2, the same commercial site adds a building with an area of 20,000 square feet. In year 1, no permanent storm water control measures (or calculations) are required by the ordinance. In year 2, storm water calculations shall be submitted and shall be based on the total increase of 40,000 square feet of impervious area. The following information shall also be provided by the applicant:
1. A map showing the drainage area boundaries, including off-site drainage areas that drain into or onto the site;
 2. Location and identification of soil types for all drainage areas;
 3. Location and identification of vegetative cover for all drainage areas;
 4. Run-off curve number calculations for both pre-and post-project conditions for all each drainage area;
 5. Time of concentration calculations for both pre-and post-project conditions for each drainage area, and include a map showing hydraulic flow lengths used;
 6. Peak flow-rate calculations for 2 year and 25 year storms for both pre-and post-project conditions;
 7. Design calculations for detention basin outlets for both 2 year and 25 year storms, include stage-storage table and discharge rating curve data or outflow calculations (refer to optional form in Appendix A);
 8. Location dimensions, and construction details of proposed detention basins and outlets;
 9. Detention volume calculations;
 10. Summary of peak flow-rates for pre-, post- and proposed conditions with detention showing that the requirements of the ordinance are met (refer to optional form in Appendix A); and
- e. Schedule or sequence of development or installation of the elements of the site management control measures proposed above.
- f. A detailed estimate of quantities and estimated costs, prepared by a registered professional engineer, of all control measures required under this section.
- g. A plan of the continued management and maintenance of such permanent control measures.

- h. Application fee. An application fee shall be submitted at the time of application. The fee shall be in the amount of seventy-five dollars (\$75.00) per acre with a minimum fee of five hundred dollars (\$500.00) and a maximum fee of \$3,000.00. However, no fee shall be required for any project the purpose of which is agricultural.

A fractional acre shall be rounded to the nearest whole acre. There shall be no refund of any fees paid and no application shall be accepted for filing unless the fee has been paid in full.

(2) APPLICATION REVIEW. Within five (5) working days of submittal of the application, the Erosion Control Administrator shall respond in writing to the sediment and erosion control practices portion. Within twenty (20) working days of submittal of the application, the Erosion Control Administrator shall respond to the storm water management plans and control portion of the application by either issuing a permit, issuing a request for additional information, or issuing a statement denying the permit with an explanation of cause. The application shall be deemed approved if no response is made within the time frames stipulated above.

(3) FINANCIAL SECURITY AGREEMENT. Before any Erosion, Sediment and Storm Water Control Permit is issued, the applicant shall deliver to the Erosion Control Administrator a surety bond, irrevocable letter of credit or executed escrow agreement in the name of Peoria County for one hundred percent (100%) of the applicant's engineer's estimated cost for all control measures required under this section. If the control measures are necessitated by construction which is also subject to Chapter 20 of The Peoria County Code, the applicant may submit one surety bond, irrevocable letter of credit or executed escrow agreement to cover one hundred percent (100%) of both the Control Measures required pursuant to this section and the improvements governed by Chapter 20, Section 20-24. A signed contractor's bid that meets the specifications of the engineer's estimate for the work can be used to establish the amount of security required, if such estimate is accepted by the Erosion Control Administrator.

(4) DURATION. The Erosion, Sediment and Storm Water Control Permit shall be issued for a period not exceeding two years.

(5) PERMIT CONDITIONS. The Erosion, Sediment and Storm Water Control Permit shall contain at a minimum the following general conditions:

- a. That written approval be obtained from the Erosion Control Administrator prior to making any modification to the approved erosion and sediment control plan as set forth in the permit;
- b. That all control measures required in the permit shall be installed;
- c. That all control measures shall be maintained during construction;
- d. Such other conditions as the Erosion Control Administrator deems appropriate.

(6) PERMANENT GROUND SURFACE COVER. Without exception, all disturbed areas must have permanent ground cover within six months of project completion, or within six months of occupancy, whichever comes first.

(7) FINAL INSPECTION; NOTICE OF PERMANENT STORM WATER CONTROL MEASURES. Within fourteen (14) days after completion of construction, the applicant shall notify the Erosion Control Administrator that the permanent storm water control measures are ready for final inspection. If the inspection shows that the control measures and maintenance plan comply with the Standards in Appendix “A” of this article, the Erosion Control Administrator shall issue a Notice of Permanent Storm Water Control Measures. The owner shall record the Notice with the Peoria County Recorder of Deeds within fifteen (15) days after the Notice is issued.

Section 7.5-67, MAINTENANCE OF PERMANENT STORM WATER CONTROL MEASURES.

Anyone owning property with a permanent storm water control measure existing thereon and installed pursuant to this ordinance shall maintain the control measure so that it functions in compliance with the Standards.

Section 7.5-68 ENFORCEMENT AND STOP WORK ORDER FEE.

This chapter shall be administered and enforced by the Erosion Control Administrator, who shall make or cause to be made, periodic inspections of all work authorized by permits issued in accordance with this ordinance to insure that said construction is in compliance with the provisions of the same; he shall make or cause to be made, investigations of violations of this chapter and shall cause any violations to be corrected.

Any permit issued pursuant to this ordinance shall be revoked by the Erosion Control Administrator when he finds from personal inspection or from competent evidence that the rules, regulations or standards under which said permit was issued are being violated. To defray costs of administering stop work orders posted by the field inspectors as a result of a violation of any of the terms of the ordinance, a fee of one hundred fifty dollars (\$150.00) plus ten dollars (\$10.00) per day that violation exists per stop work order will be charged.

Section 7.5-69. PENALTY.

The violation of any of the terms of the ordinance shall constitute an offense punishable by a fine not to exceed five hundred dollars (\$500.00), with each day the violation remains uncorrected constituting a separate offense. Such fine is in addition to any other remedy provided by law.

Section 7.5-70. APPEALS BOARD.

The Appeals Board shall consider and decide upon appeals of any decision, order, or requirement of the Erosion Control Administrator made pursuant to this article.

- (1). The Appeals Board is hereby authorized to be established. Said Appeals Board shall consist of five (5) members. Each County Board Chairman of the counties adopting this ordinance shall appoint one member, the Soil & Water Conservation Districts shall collectively appoint one member, and the Chairman of the Tri-County Regional Planning Commission shall appoint one member. The members shall be: professional engineers, licensed architects, licensed landscape architects, landscape contractors, earthmoving contractors, home builders, or citizens who have extensive experience in control of storm water and soil erosion. The five (5) members on the first Appeals Board shall draw lots to establish terms of 1, 2, 3, 4, and 5 years, respectively. Thereafter, as terms expire, each appointment shall be for five (5) years.
- (2). The chairman of the Appeals Board shall be elected at the beginning of each calendar year from among the members by a majority of the members.
- (3). All decisions of the Appeals Board must receive the support of a majority of its members. A majority of the members of the Appeals Board shall constitute a quorum for the transaction of business; and all questions, which shall arise at meetings, shall be determined by the votes of the majority of members present. The Appeals Board shall keep minutes of its proceedings showing the vote of each member upon every question or if absent or failing to vote, indicating such facts, and shall keep records of its examinations and other official actions. Every rule, and every order, requirement, decision, or determination of the Appeals Board shall immediately be filed in the office of the Board and shall be a public record. The concurring vote of three (3) members of Appeals Board shall be necessary to reverse any order, requirement, decision or determination of the Erosion Control Administrator. The Appeals Board shall adopt its own rules of procedure not in conflict with State law or this chapter.

Section 7.5-71. APPEALS TO APPEALS BOARD.

Any person directly aggrieved by any decision, order, requirement, or determination of the Erosion Control Administrator made pursuant to this article shall have the right to appeal such action to the Appeals Board. Such appeal shall be made within thirty-five (35) days from the date of the action appealed from, shall be filed in writing, and shall include a short, concise statement of why the action is being appealed. The fee for such an appeal shall be forty-five dollars (\$45.00) payable to the Commission and is due with the application. In addition, the person filing the appeal shall pay all required publication costs associated with the appeal.

Upon receipt of a notice of appeal, the Commission shall set a date for a public hearing before the Appeals Board. Such public hearing shall commence not sooner than fifteen (15) days nor more than thirty (30) days after the date of receipt of the notice of appeal. At least fifteen (15) days notice of the time and place of such hearing shall be published in a newspaper of general circulation in the County. The Appeals Board shall decide the appeal within seven (7) days after the conclusion of the public hearing. The Appeals Board may affirm, modify or reverse any appealed action.

Section 7.5-72. APPEALS TO COURT.

Appeals from the Appeals Board shall be made in conformity with the provisions of the Illinois Administrative Review Act, 735 ILCS 5/3-101 et seq. Copies of any orders or proceedings ordered by the appellant shall be furnished to him at his own cost.

Section 7.5-73. EFFECTIVE DATE.

Upon adoption by the Peoria County Board, these amendments shall be in full force and effect on April 1, 1996.

ST. CLAIR COUNTY
SOIL AND WATER CONSERVATION
DISTRICT ORDINANCE
FOR
STORMWATER MANAGEMENT
AND
EROSION CONTROL

CHAPTER 1 OVERVIEW

Section 1.0 - Purpose

The purpose of this Ordinance is to diminish threats to public health and safety, to protect property, to prevent damage to the environment, and to promote public welfare by guiding, regulating and controlling the design, construction, use and maintenance of any new development or redevelopment or other activity which disturbs or breaks the topsoil or otherwise results in the movement of earth and/or changes in the stormwater drainage pattern and/or stormwater flows from that which would have occurred if the land had been left in its natural state. This stormwater runoff and resulting soil erosion could result in an inundation that damages properties, the erosion and destabilization of downstream channels, and the pollution of valuable stream and lake resources. Because development and redevelopment of land causes increases in stormwater runoff quantity and rate and can cause impairment of water quality and loss of valuable topsoil, this Ordinance regulates these activities to minimize adverse impacts to these vital natural resources. This Ordinance is adopted to accomplish the following objectives:

- (a) To assure that development or redevelopment does not increase drainage or flood hazards, or create unstable conditions susceptible to soil erosion;
- (b) To protect new buildings and major improvements to buildings from flood damage due to increased stormwater runoff and soil erosion;
- (c) To protect human life and health from the hazards of increased flooding and soil erosion on a watershed basis;
- (d) To lessen the burden on the taxpayer for flood control projects, repairs to flood-damaged public facilities and utilities, correction of channel erosion problems, and flood rescue and relief operations caused by stormwater runoff and soil erosion from development and redevelopment;
- (e) To protect, conserve, and promote the orderly development of land and soil, water, air, animal, and plant resources;
- (f) To preserve the natural hydrologic and hydraulic functions of watercourses and flood plains and to protect water quality and aquatic habitats;
- (g) To preserve the natural characteristics of stream corridors in order to manage flood and stormwater impacts, improve water and groundwater quality, reduce soil erosion, protect aquatic and riparian habitat, maintain quality forest resources, provide recreational opportunities, provide aesthetic benefits, and enhance community and economic development.
- (h) To encourage and approve new and innovative approaches that decrease impervious surfaces, increase absorption, and reduce the need for retention basins and stormwater handling structures.

Section 1.1 - Findings

The St. Clair County Soil and Water Conservation District hereby finds as follows:

- (a) The soil types found in St. Clair County, Illinois are susceptible to erosion and, if left unprotected, could cause severe loss of soil with resultant damage to property, public safety, and the environment;

- (b) The topography of St. Clair County, Illinois contains areas with steep slopes upon which, if clearing of trees and/or inappropriate construction takes place, could result in severe erosion and slope stability problems which could result in damage to property;
- (c) Excessive quantities of soil may erode from areas undergoing development for certain land use changes, including but not limited to, the construction of dwelling units, commercial buildings and industrial plants, the building of roads and highways, the modification of stream channels and drainage ways, and the creation of recreational facilities;
- (d) The washing, blowing, and deposition of eroded soil across and upon roadways endangers the health and safety of users thereof, by decreasing vision and reducing traction of road vehicles;
- (e) Soil erosion necessitates the costly repairing of gullies, washed-out fills, and embankments;
- (f) Sediment from soil erosion tends to clog sewers and ditches and to pollute and silt rivers, streams, lakes, sinkholes, wetlands, and reservoirs;
- (g) Sediment limits the use of water and waterways for most beneficial purposes, promotes the growth of undesirable aquatic weeds, destroys fish and other desirable aquatic life, and is costly and difficult to remove; and
- (h) Sediment deposition reduces the channel capacity of watercourses and the storage capacity of floodplains and natural depressions, resulting in increased risk to public health and safety from flooding.

Section 1.2 - Authority

This Ordinance is enacted by the St. Clair County Soil and Conservation District in accordance with the Soil and Water Conservation Districts Act as found at 70 ILCS 405/1 et al and specifically pursuant to the authority specified in Section 23 of that Act entitled "Adoption of land-use regulations" and codified at 70 ILCS 405/23.

Section 1.3 - Applicability

Except as otherwise provided in this Ordinance, no person shall commence any development or redevelopment activities without first obtaining a Stormwater Management and Erosion Control Permit from the Soil and Water Conservation District Office. This Ordinance shall apply to all development and redevelopment in St. Clair County, Illinois as set forth herein:

- (a) Any development or redevelopment that will include an area that will meet or exceed ten thousand (10,000) square feet of total impervious surface (i.e., streets, roof, patio or parking area or any combination thereof) or that involves one acre or more of land;
- (b) Any land disturbing activity (i.e., clearing, grading, stripping, excavating, filling, or any combination thereof) that will affect an area that will meet or exceed ten thousand (10,000) square feet;
- (c) Any land disturbing activity if the activity is located within 25 feet of any channel as defined in this Ordinance including but not limited to any river, lake, pond, stream, sinkhole, or wetland;
- (d) Any land disturbing activity on the sloping side of the slope disturbance line;

Section 1.4 - Exemptions

Being exempt from this Ordinance does not eliminate the requirement of obtaining approval for individual sediment and erosion control site plans from the appropriate local jurisdiction. A Stormwater Management and Erosion Control Permit shall not be required for the following:

- (a) Any development, redevelopment, or other activity not falling within the specifications set forth in Section 1.3 of this Ordinance.
- (b) Soil disturbing activities associated with agricultural crop production including the implementation of conservation measures specified in a Farm Conservation Plan approved by the Soil and Water Conservation District. For the purposes of this Ordinance, levees, berms, and channel modification are considered stormwater appurtenances and are not agricultural use of land. Any man-made changes to agricultural land, other than activities associated with growing agricultural crops, installing and maintaining conservation practices, or best management practices constructed to reduce erosion or control stormwater runoff on agricultural land, are not considered agricultural use of land for purposes of this Ordinance and are not exempt from the applicability provision specified in Section 1.3 of this Ordinance.
- (c) The maintenance of any existing stormwater drainage/detention component or structure or any existing soil erosion/sediment control component or structure, including dredging, levee restoration, tree removal, or other function which maintains original or appropriate design capacities.
- (d) Development that has been approved by the appropriate authority through the preliminary plat stage before the date of approval of this Ordinance.

Section 1.5 - Responsibility

- (a) The applicant shall not be relieved of responsibility for damage to persons or property otherwise imposed by law. The applicant shall be entitled to a letter from the District certifying compliance with the provisions of its permit upon proof of compliance being established and confirmed. The St. Clair County Soil and Water Conservation District, St. Clair County, municipalities adopting a resolution making this Ordinance applicable within their jurisdictions, and their respective officers and agents shall be immune from liability for any damage, caused or allegedly caused by:
 - (1) the issuance of a Stormwater Management and Erosion Control Permit under this Ordinance,
 - (2) compliance with the provisions of that Stormwater Management and Erosion Control Permit or conditions attached to it by the Permit Reviewer or the Soil and Water Conservation District,
 - (3) failure of the District to observe or recognize hazardous or unsightly conditions, (4) failure of the District to recommend denial or to deny a Stormwater Management and Erosion Control Permit, or (5) granting or denying exemptions from the Stormwater Management and Erosion Control Permit requirements of this Ordinance.
- (b) Upon receipt of the notification of the completion of the requirements of the Stormwater Management and Erosion Control Permit from the Applicant as required by this Ordinance, the District shall within 30 days notify the Applicant of any non-compliance issues or shall issue a letter certifying compliance with the permit and the Ordinance. If no letter is issued within 30 days of receiving the notification, the project will be deemed properly completed.

Section 1.6 - Other Relevant Permitting

Applicants may seek required Federal, State, and Local permits concurrently with the application for the Stormwater Management and Erosion Control Permit. The applicant shall be solely responsible for acquiring other necessary permits. These other permits may include but are not limited to:

- (a) permits in accordance with Section 404 of the Clean Water Act, 33 U.S.C. Section 1251, including any joint permit application requirements (i.e. Floodway Construction Permit from DNR);
- (b) any permits required under Section 10 of the Rivers and Harbors Act, 33 U.S.C. Section 426;
- (c) permits required by the Illinois Department of Natural Resources ("DNR"), Office of Water Resources in accordance with the Rivers, Lakes and Streams Act, 615 ILCS 5/18, 23, 23(a) and 29(a), and consistent with any applicable regulations including those found at 17 Ill. Adm. Code Parts 3700, 3702, and 3704;
- (d) any permits required by the Farmland Preservation Act, 505 ILCS 75/6;
- (e) any permits that may be required by the Illinois Environmental Protection Act (415 ILCS 5/12 et al) and any regulations adopted thereunder including any permits that may be required under the National Pollutant Discharge Elimination System Permit (NPDES) through the Illinois Environmental Protection Agency, Division of Water Pollution Control, 415 ILCS 5/12(f); and
- (f) any permits required by any other applicable stormwater discharge laws that may be adopted. Compliance with all applicable local ordinances and codes shall also be required.

Section 1.7 - Separability/Severability

The provisions and Sections of this Ordinance shall be deemed to be severable in accordance with the following:

- (a) If any Court of competent jurisdiction shall adjudge any provision of this ordinance to be invalid, such judgment shall not affect the validity of any other provision of this Ordinance.
- (b) If any Court of competent jurisdiction shall adjudge the application of this Ordinance or any provision thereof to be invalid or inapplicable to a particular parcel of land, a particular structure, or a particular development, such judgment shall not affect the application of said provision to any other land, structure, or development.

Section 1.8 - Non-conforming Uses

Non-conforming structures and uses shall not be replaced or enlarged in any manner unless such replacement or enlargement conforms to the requirements of this Ordinance and has been approved by the local government having jurisdiction. Prior development not conforming to the standards of this Ordinance, while developed under the standards of the time, may have inadequate detention/retention capabilities and may be significantly contributing to current stormwater runoff problems. Remediation of these existing problems is encouraged through joint efforts on the part of government and private owners and developers.

Section 1.9 - Violations

- (a) Consistent with Sections 1.3 and 7.2 of this Ordinance, it shall be unlawful for any person to undertake any development without first securing a Stormwater Management and Erosion Control Permit in accordance with this Ordinance.
- (b) It shall be unlawful for any person to violate any provision of this Ordinance or any condition of any Stormwater Management and Erosion Control Permit issued pursuant to this Ordinance.
- (c) Injunctive relief is specifically authorized for enforcement of the provisions of this Ordinance.

CHAPTER 2 DEFINITIONS

Section 2.0 - Definitions

For the purposes of this Ordinance certain terms are defined and set forth below:

2.1 - Adverse Impacts: Any negative impact on plant, soil, air or water resources affecting their beneficial uses including recreation, aesthetics, aquatic habitat, quality, and quantity.

2.2 - Applicant: Any person, business entity, governmental agency, or other entity who executes the necessary forms to procure official approval of a Stormwater Management and Erosion Control Permit to carry out construction of a new development or redevelopment or to engage in any land clearing activities as defined in subsection (b) of Section 1.3 of this Ordinance in St. Clair County.

2.3 - Base Flood Elevation: The elevation in relation to mean sea level of the crest of the base or 100 year frequency flood event. The elevation at all locations delineating the level of flooding resulting from the 100-year frequency flood event, which has a one (1) percent chance of occurring in any given year.

2.4 - Board: The St. Clair County Soil and Water Conservation District Board which may also be referred to as the District Board.

2.5 - Building Permit: A permit that authorizes the construction, erection, or alteration of a structure or building and the related ground and surface preparation prior to and after completion of construction, erection or alteration of a structure or building which is issued by the local government having jurisdiction for the construction, erection or alteration of a structure or building.

2.6 - Bypass Flows: Stormwater runoff from upstream properties that are tributary to a property's drainage system but not under its control.

2.7 - Certify or Certification: Formally attesting that specific inspections and tests were performed, and that such inspections and tests comply with the applicable requirements of this Ordinance.

2.8 - Channel: Any defined river, stream, creek, brook, branch, natural or artificial depression, ponded area, on-stream lake or impoundment, karst area (sinkhole), flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or manmade drainage way, which has a definite bed and bank or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

2.9 - Channel Modification: Alteration of a channel by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, rip-rapping (or other armoring), filling, widening, deepening, straightening, relocating, lining, and significant removal of bottom or woody rooted vegetation. Channel modification does not include the clearing of unnatural debris or removal of trash.

2.10 - Clearing: Any activity which removes the natural vegetative ground cover.

2.11 - Compensatory Storage: An artificial excavation which provides a hydraulically equivalent volume of storage within the floodplain, used to balance the loss of natural flood storage capacity when fill or structure are placed within the floodplain.

2.12 - Conduit: Any channel, pipe, sewer or culvert used for the conveyance or movement of water, whether open or closed.

2.13 - Cubic Yard: A one yard by one yard by one yard (1x1x1) amount of material in excavation and/or fill.

2.14 - Detention Basin: A facility constructed or modified to provide for the temporary storage of stormwater runoff and the controlled release by gravity of this runoff at a prescribed rate during and after a flood or storm.

2.15 - Detention Time: The amount of time stormwater is held within a detention basin.

2.16 - Development: Any man-made change to real estate or property, including:

- (a) the division or subdivision of any tract or parcel of property;
- (b) construction, alteration, reconstruction or placement of a building or structure or any addition to a building or structure;
- (c) installation of a manufactured home on a site, preparing a site for a manufactured home, or installing a travel trailer on a site for more than 180 days per year;
- (d) construction of roads, bridges, or similar projects;
- (e) redevelopment of a site;
- (f) filling, dredging, grading, clearing, excavating, paving or other non-agricultural alterations of a ground surface;
- (g) storage of materials or deposit of solid or liquid waste;
- (h) any other activity that might alter the magnitude, frequency, direction, or velocity of stormwater flows from a property.

2.17 - District: The St. Clair County Soil and Water Conservation District.

2.18 - Drainage Plan: A plan, including engineering drawings and supporting calculations, which describes the existing stormwater drainage system and environmental features, including topography, and which describes proposed alterations or changes to the drainage system and environment of a property including any proposed grading.

2.19 - Dry Basin: A detention basin designed to drain after temporary storage of stormwater flows and to normally be dry over much of its bottom area.

2.20 - Erosion: The general process whereby soil or earth is moved by rainfall, flowing water, wind or wave action.

2.21 - Excavation: Any act by which organic matter, earth, sand, gravel, rock or any other similar material, is cut into, dug, quarried, uncovered, removed, displaced, relocated or bulldozed and shall include the conditions resulting from such actions.

2.22 - Excess Stormwater Runoff: The volume and rate of flow of stormwater discharged from a new development or redevelopment which is or will be in excess of that volume and rate which existed before development or redevelopment.

2.23 - Existing Grade: The vertical elevation of the existing ground surface prior to excavation or filling.

2.24 - Fill: Any act by which organic matter, earth, sand, gravel, rock, or any other material, is deposited, placed, replaced, pushed, dumped, pulled, transported or moved by man to a new location and shall include the resulting conditions.

2.25 - Final Grade: The vertical elevation of the ground surface after grading work is completed in accordance with the engineering plans.

2.26 - Flood Fringe: That area as designated by the Federal Emergency Management Agency (FEMA) as that portion of the floodplain outside of the floodway. This area is subject to inundation from the base flood but conveys little or no flow.

2.27 - Flood Hazard Boundary Map (FHBM): A very generalized map prepared by the Federal Emergency Management Agency (FEMA) which shows only where floodplains are located based on very basic data. FHBM's do not include base flood elevations.

2.28 - Flood Insurance Rate Map (FIRM): A map prepared by the Federal Emergency Management Agency (FEMA) that depicts the special flood hazard area (SFHA) within a community. This map includes insurance rate zones and regulatory floodplains and may or may not depict regulatory floodways.

2.29 - Floodplain: That land adjacent to a body of water with ground surface elevations at or below the base flood or the 100-year frequency flood elevation which is subject to inundation. The floodplain as designated by the Federal Emergency Management Agency (FEMA) is also known as the Special Flood Hazard Area (SFHA) and is generally identified on the Flood Insurance Rate Map (FIRM), Flood Boundary and Floodway Map, or the Flood Hazard Boundary Map (FHBM) of the community. This area is the collective combination of the regulatory floodway and the flood fringe.

2.30 - Floodway: The channel and that portion of the floodplain, including on-stream lakes, adjacent to a stream or watercourse which is needed to store and convey the anticipated existing and future 100-year frequency flood discharge with no more than a 0.1 foot increase in stage due to any loss of flood conveyance or storage and no more than a ten percent (10%) increase in average velocities. Floodway are designated by FEMA on some Flood Insurance Rate Maps and Flood Boundary and Floodway maps. However, there are floodways on all streams whether mapped by FEMA or not.

2.31 - Grading: The excavation or fill or any combination thereof and shall include the conditions resulting from any excavation or fill.

2.32 - Hydrograph: A graph showing for a given location on a stream or conduit, the flow rate with respect to time.

2.33 - Hydrograph Method: This method estimates runoff volume and runoff hydrographs for the point of interest by generating hydrographs for individual sub-areas, combining them, and routing them through stream lengths and reservoir structures. Factors such as rainfall amount and distribution, runoff curve number, time of concentration, and travel time are included.

2.34 - Impervious Surface: That area of property that is covered by materials other than soil and vegetation and that has no intended capacity to absorb stormwater, such as parking lots, driveways, sidewalks, patios, tennis courts, roofs and other structures.

2.35 - Infiltration: The passage or movement of water into the soil surfaces.

2.36 - Loess Soil or Loess: A sediment, commonly non-stratified and unconsolidated, composed predominately of silt sized particles with accessory clay and sand.

2.37 - Lot: An individual platted parcel in an approved subdivision.

2.38 - Major Drainage System: That portion of a drainage system needed to store and convey flows beyond the capacity of the minor drainage system.

2.39 - Minor Drainage System: That portion of a drainage system designed for the convenience of the public. It consists of street gutters, storm sewers, small open channels, and swales and, where man-made, is to be designed to handle the 10-year runoff event.

2.40 - Mitigation: When the prescribed controls are not sufficient and additional measures are required to offset the development, including those measures necessary to minimize the negative effects which stormwater drainage and development activities might have on the public health, safety and welfare. Examples of mitigation include, but are not limited to compensatory storage, soil erosion and sedimentation control, and channel restoration.

2.41 - Modified Rational Method: As described in the Illinois Department of Transportation "Drainage Manual" this method is based on the principal that the maximum rate of runoff from a given drainage area occurs at that point in time when all parts of the watershed are contributing to the flow. The rainfall generating the peak flow is assumed to be of uniform intensity for the entire watershed with a rainfall duration equal to the time of concentration.

2.42 - Natural: Conditions resulting from physical, chemical, and biological processes without intervention by man.

2.43 - Natural Drainage: Channels formed in the existing surface topography of the earth prior to changes being made by unnatural causes.

2.44 - One Hundred-Year Event: A rainfall, runoff, or flood event having a one percent chance of occurring in any given year. A 24 hour storm duration is assumed unless otherwise noted.

2.45 - Parcel: All contiguous land in one ownership.

2.46 - Peak Flow: The maximum rate of flow of water at a given point in a channel or conduit.

2.47 - Permittee: Any person to whom a Stormwater Management and Erosion Control Permit is issued.

2.48 - Person: Any individual, business entity, or other entity, public or private, the State of Illinois and its agencies or political subdivisions, the United States of America, and its agencies or political subdivisions, and any agent, servant, officer or employee of any of the foregoing.

2.49 - Positive Drainage: Provision for overland paths for all areas of a property including depressional areas that may also be drained by storm sewer.

2.50 - Prime Farmland: Land that is best suited to food, feed, forage, fiber and oilseed crops. It may be cropland, pasture, woodland, or other land, but it is not urban and built up land or water areas. It is either used for food or fiber or is available for those uses. The soil qualities, growing season and moisture supply are those needed for a well managed soil to economically produce a sustained high yield of crops. Prime farmland produces the highest yields with minimum inputs of energy and economic resources, and farming it results in the least damage to the environment.

2.51 - Property: A parcel of real estate.

2.52 - Redevelopment: Any man-made change to property as described in Section 2.16 of this Ordinance that is being made to property already having man-made changes.

2.53 - Retention Basin: A facility designed to completely retain a specified amount of stormwater runoff without release except by means of evaporation, infiltration, emergency bypass or pumping.

2.54 - Sedimentation: The process that deposits soils, debris, and other materials either on other ground surfaces or in bodies of water or stormwater drainage systems.

2.55 - Site: A parcel of land, or a contiguous combination of parcels of land, where grading is performed as a single unified operation.

2.56 - Sinkhole, (Karst Areas): Land surface depression or blind valley which may or may not have surface openings to cavernous underground areas and are the result of water movement through silts and jointed limestone. These conditions make such areas unstable and susceptible to subsidence and surface collapse. Fractures in the limestone may channel runoff water to public or private water supplies, making those sources especially susceptible to groundwater contamination.

2.57 - Slope Disturbance Line: The line which delineates relatively level building areas from areas where slopes exceed eight percent (8%) and where special precautions must be taken for development, re-development, or other land disturbing activities.

2.58 - Stormwater Drainage System: All means, natural and man-made, used for conveying stormwater to, through or from a drainage area to the point of final outlet from a property. This system includes but is not limited to any of the following: conduits and appurtenance features, canals, channels, ditches, streams, culverts, streets, storm sewers, detention basins, swales and pumping stations.

2.59 - Stormwater Management and Erosion Control Permit (or SMEC Permit): The Permit required by this Ordinance before commencement of any development, re-development, or land disturbing activities as described in Section 1.3 of this Ordinance, which is issued by the St. Clair County Soil and Water Conservation District.

2.60 - Stormwater Runoff: The waters derived from melting snow or rain falling within a tributary drainage basin which are in excess of the infiltration capacity of the soils of that basin, which flow over the surface of the ground or are collected in channels or conduits.

2.61 - Storm Sewer: A closed conduit for conveying collected stormwater.

2.62 - Stream: Any river, creek, brook, branch, flowage, ravine, or natural or man-made drainage way which has a definite bed and banks or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

2.63 - Stripping: Any activity which removes the vegetative surface cover, including tree removal, by spraying or clearing, and the storage or removal of top soil.

2.64 - Ten-Year Event: A runoff, rainfall, or flood event having a ten percent (10%) chance of occurring in any given year. A 24-hour storm duration is assumed unless otherwise noted.

2.65 - Time of Concentration: The elapsed time for stormwater to flow from the most hydraulically remote point in a drainage basin to a particular point of interest in that watershed.

2.66 - Tributary Watershed: All of the land surface area that contributes runoff to a given point.

2.67 - Two-Year Event: A runoff, rainfall, or flood event having a fifty percent (50%) chance of occurring in any given year. A 24-hour storm duration is assumed unless otherwise noted.

2.68 - Vacant: Land on which there are no structures or only structures which are secondary to the use or maintenance of the land itself.

2.69 - Watershed: All land area drained by, or contributing water to, the same stream, creek, ditch, lake, marsh, stormwater facility, groundwater or depressional area.

2.70 - Wet Basin: A detention basin designed to maintain a permanent pool of water after the temporary storage of stormwater runoff.

2.71 - Wetlands: Defined by regulation as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." For general, but not inclusive locations of designated wetlands refer to mapping prepared jointly by the Fish and Wildlife Service, a division of the U.S. Department of Interior and the Office of Resource Conservation, a division of the Illinois Department of Natural Resources or the National Wetlands Inventory Mapping, 1987. The applicant may be required to provide a field investigation by a qualified wetland delineator.

2.72 - FEMA: Federal Emergency Management Agency

CHAPTER 3 PERMIT PROCEDURES

Section 3.0 - Application for Permit

Application for a Stormwater Management and Erosion Control Permit shall be made by the owner of the property or his authorized agent to the Soil and Water Conservation District on a form furnished for that purpose. Each application shall bear the name(s) and addresses of the owner(s) or developer(s) of the site, the contractor(s) and of any consulting firm retained by the applicant together with the name of the applicant's principal contact at such firm, and shall be accompanied by a filing fee. Each application shall

include certification that any land clearing, construction, or development involving the movement of earth shall be in accordance with the plans approved upon issuance of the permit. Application fees shall be paid in accordance a fee schedule approved by 2/3 vote of the Board.

Section 3.1 - Bond Required

- (a) The applicant for a Stormwater Management and Erosion Control Permit shall be required to file with the District, a performance bond, letter of credit, cash escrow, or other improvement security obtained for the development showing an amount sufficient to cover the costs of soil erosion and sediment control measures and landscaping as required by this Ordinance and any permit issued thereunder for not less than one year with a renewal provision. The bond or other security devise shall be released when the Certificate of Completion is issued.
- (b) No specific or separate bond is required under this Ordinance if the Applicant submits a copy of a general performance bond for the entire development that meets the general requirements of this Section and demonstrates coverage of all improvements required by this Ordinance.
- (c) The Bond shall conform to the following requirements:
 - (1) The surety company issuing the bond shall be licensed by the Illinois Department of Insurance pursuant to the Illinois Insurance Code, 215 ILCS 5/1 et. seq.
 - (2) The bond must guarantee that the Permittee will comply with the issued permit and will meet all permit conditions.
 - (3) The surety will become liable on the bond obligation (or cash escrow will be forfeited) when, during the term of the bond, the Permittee fails to perform as guaranteed by the bond. The Permittee fails to perform when:
 - (A) He abandons the project;
 - (B) He is adjudicated bankrupt;
 - (C) He fails to comply with the terms of the stormwater management and erosion control permit;
 - (D) He fails to perform work as ordered to do so by written notice of the District or by a court of competent jurisdiction; or
 - (4) The sum of the bond shall be one hundred percent (100%) of the cost estimate certified by a Professional Engineer or other soil and water conservation professional or by providing a detailed bid proposal or in some cases a contractor's estimate using objective criteria with cost estimates based upon the types and sizes of development, size of retention basins needed, cost to develop and implement stormwater management techniques as specified in the permit, the acreage of the project, and any other criteria deemed appropriate by the Board. Any cost estimates submitted as part of the permit application shall be reviewed and relied upon to the extent that they accurately reflect reasonable and customary costs for like items and work.

- (5) The bond must be issued for the time it will take to complete the development project and shall be for a term of at least one year and must not be cancelable during the term. The bond shall be renewed if the development activity is not completed within the year.
- (6) The bond shall be on the form provided in Appendix D herein except as provided in subsection (b) of this Section.
- (7) Any payments made under the bond will be placed in a special fund designated by the Board.
- (8) The District shall release the surety if, after the surety becomes liable on the bond, the permittee or another person provides immediate compliance with the permit no later than 30 days after notice is sent from the District.
- (9) After required work has been completed, the District shall refund any unspent money which was paid to the District by the surety.

Section 3.2 - Review and Approval of Permit Applications

- (a) The District Permit Reviewer will review each application for a Stormwater Management and Erosion Control Permit to determine its conformance with the provisions of this Ordinance. The Permit Reviewer may also refer any application to any other local government or public agency within whose jurisdiction the site is located for review and comment.
- (b) Within Thirty (30) days after receiving an application, the District Permit Reviewer shall in writing:
 - (1) Approve the permit application if it is found to be in conformance with the provisions of this Ordinance, and issue the permit;
 - (2) Approve the permit application subject to such reasonable conditions as may be necessary to secure substantially the objectives of this Ordinance, and issue the permit subject to these conditions;
 - (3) Disapprove the permit application, indicating the deficiencies and the procedure for submitting a revised application and/or submission; or
 - (4) Request an additional 30 days for review because of the nature and complexity of the proposed project and the application.
- (c) Failure of the District to act on an original or revised application within thirty (30) days of receipt shall authorize the applicant to proceed in accordance with the permit application and attachments as filed and in compliance with the provisions of this Ordinance, unless such time is extended by agreement between the District and the applicant. If the District has not acted on a permit application within 60 days of receipt, the permit shall be deemed granted consistent with the application and the provisions of this Ordinance. If there is a conflict between the provisions of this Ordinance and the permit application, the Ordinance shall prevail.
- (d) Pending preparation and approval of a revised permit, development activities may be allowed to proceed in accordance with an approved permit or in accordance with such agreed to conditions established by the District.

Section 3.3 - Expiration of Permit

Every Stormwater and Erosion Control Permit shall expire and become null and void if the work authorized by such permit has not been commenced and actively pursued within **one hundred and eighty (180) days**, or if not completed by a date which shall be specified in the permit, except that the District Permit Reviewer may, if the permittee presents satisfactory evidence that unusual difficulties have prevented work being commenced or completed within the specified time limits, grant a reasonable extension of time if written application is made before the expiration date of the permit. The District may require modification of the erosion control plan to prevent any increase in erosion or off-site sediment runoff resulting from any extension.

Section 3.4 - Appeals to the Soil and Water Conservation District Board

- (a) The applicant may appeal the decision of the District Permit Reviewer to the District Board. Upon receipt of an Appeal, the Board shall schedule and hold a public hearing, after giving fifteen (15) days notice thereof. The Board shall render a decision by the next Board meeting or within thirty (30) days after the hearing, whichever is greater.
- (b) Factors to be considered on appeal include, but need not be limited to, the effects of the proposed development activities on the surface water flow to tributary and downstream lands, any comprehensive watershed management plans, or the use of any retention facilities; possible saturation of fill and unsupported cuts by water, both natural and domestic; runoff surface waters that produce erosion and silting of drainage ways; nature and type of soil or rock which when disturbed by the proposed development activities may create earth movement and produce slopes that cannot be landscaped; and excessive and unnecessary scarring of the natural landscape through grading or removal of vegetation.

Section 3.5 - Amendment of Permit

Major amendments to the Stormwater Management and Erosion Control Permit shall be submitted to the District Permit Reviewer and shall be processed and approved or disapproved in the same manner as the original permit. Field modification of a minor nature may be authorized in writing by the District Inspector to the permittee.

Section 3.6 - Exceptions Allowed

The Soil and Water Conservation District Board of Directors may, by vote of at least 4 members voting in person or by proxy, authorize exceptions to any of the requirements and regulations set forth in this Ordinance in accordance with the following requirements:

- (a) Application for exception shall be made by a Verified Petition for Exception from the Applicant for a Stormwater Management and Erosion Control Permit, stating fully the grounds of the Petition and the facts relied upon by the Applicant. Such Petition shall be filed with the Permit Application.
- (b) In order for the Verified Petition for Exception to be granted, the Soil and Water Conservation District Board must find that all of the following facts exist with respect to the land referred to in the Petition:

- (1) That the land is of such shape or size or is affected by such physical conditions or is subject to such title limitations of record, that it is impossible or impractical for the Applicant to comply with all of the requirements of this Ordinance;
 - (2) That the exception is necessary for the preservation and enjoyment of a substantial property right of the Applicant; and
 - (3) That the granting of the exception will not be detrimental or injurious to the public welfare, environment, or to other property in the vicinity of the subject property.
- (c) Each Verified Petition for Exception shall be reviewed by the Permit Reviewer of the Soil and Water Conservation District. The Permit Reviewer shall make written recommendations upon review of the application. These written recommendations shall be filed with the Board within 30 days of receiving an application that includes a Verified Petition for Exception. The Board shall review such recommendations prior to granting or denying any requested exceptions.
- (d) The Board shall hold a public hearing on each Verified Petition for Exception within forty-five (45) calendar days of receiving the recommendations of the Permit Reviewer or at the next regularly scheduled Board Meeting, whichever is sooner. The next regularly scheduled Board Meeting shall be considered to be one that occurs at least one week after receiving the Permit Reviewer recommendations. No later than the next Board Meeting or thirty (30) calendar days after the public hearing, whichever is later, the Board shall either approve the Petition for Exception with the exceptions and conditions it deems necessary and appropriate or it shall disapprove the Petition for Exception or it shall take such other action as appropriate. Failure of the Board to act as described herein shall constitute approval of the Verified Petition for Exception. Failure of the Board to have a quorum at a particular meeting (after the public hearing) shall not be considered the next regularly scheduled meeting for purposes of granting a Verified Petition for Exception since no vote on the issue can be taken. A Petitioner may agree to continuances of these deadlines.

Section 3.7 - Retention of Permit Application and Attachments

Plans, specifications, and reports for all site developments shall be retained in original form or on microfilm by the District.

CHAPTER 4 STORMWATER MANAGEMENT AND EROSION CONTROL PERMIT REQUIREMENTS

Section 4.0 - Stormwater Drainage and Detention Plan Requirements

Each applicant shall submit complete information as specified in this Chapter of the Ordinance to ensure that the provisions of this Ordinance are met. The submittal shall include sufficient information to evaluate the environmental characteristics of the property, the potential adverse impacts and benefits of the development on water resources both on-site and off-site, and the effectiveness of the proposed drainage plan in managing stormwater runoff. The applicant shall certify on the drawings that all clearing, grading, drainage, and construction shall be accomplished in strict conformance with the drainage plan. The information required in this Chapter of the Ordinance shall be submitted for both existing and proposed property conditions for all developments and redevelopments subject to this Ordinance.

Section 4.1 - Drainage Plan Requirements/Topographic Survey

The Drainage Plan shall include a topographic survey of the property at two-foot (2) contours of all areas to be disturbed unless otherwise specified or approved by the Municipal Engineer of the Municipality where the property is or by the County Engineer if not within any Municipality. The plan map shall be keyed to a consistent datum specified by the St. Clair County Soil and Water Conservation District. If the mapping is compiled using a digital format and the Global Positioning System (GPS), the applicant will provide both paper and digital copies including GPS points.

Section 4.2 - Mapping and Descriptions

The Drainage Plan shall include an existing drainage and proposed drainage plan for the property and one hundred(100) feet surrounding the property at a scale of not more than one hundred (100) feet to one (1) inch, and shall include the following information:

- (a) property boundary, dimensions, and approximate acreage;
- (b) building setback lines;
- (c) all existing and proposed structures and sizes;
- (d) area in square feet of existing and proposed impervious surface;
- (e) all existing, or proposed easements and covenants;
- (f) all existing, abandoned, or proposed water or monitoring well head locations;
- (g) all sanitary or combined sewer lines and septic systems;
- (h) the banks and centerline of streams and channels;
- (i) shoreline of lakes, ponds, and detention basins with normal water level elevation;
- (j) farm drains and tiles, if available or known;
- (k) soils classifications;
- (l) location, size and slope of stormwater conduits and drainage swales;
- (m) depressional storage areas;
- (n) detention facilities showing inlet and outlet control facilities;
- (o) roads, streets and associated stormwater inlets including finished grades;
- (p) base flood elevation, floodplain, and regulatory floodway;
- (q) basis of design for the final drainage network components.

- (r) a statement giving any applicable engineering assumptions and calculations;
- (s) a vicinity map showing the relationship of the site to its general surroundings at a scale of not less than two thousand (2,000) feet to one (1) inch (1:24,000)
- (t) title, scale, north arrow, legend, seal of Licensed Professional Engineer, date, and name of person preparing plans.
- (u) cross-section data for open channel flow paths and designated overland flow paths;
- (v) direction of storm flows;
- (w) flow rates and velocities at critical points in the drainage system;
- (x) a statement by the design engineer of the drainage system's provision for handling events greater than the 100-year, 24 hour runoff; and
- (y) a statement of certification of all drainage plans, calculations, and supporting data by a Licensed Professional Engineer.

Section 4.3 - Environmental Features

A depiction of environmental features of the property and immediate vicinity shall be included in the permit application including the following:

- (a) the estimated limits of designated regulatory and non-regulatory wetland areas;
- (b) the location and limits of sinkholes (karst areas);
- (c) the location of tree clusters, tree lines, and areas of serious tree density and the identification and location of trees with unique characteristics in areas where land disturbance will take place;
- (d) any designated natural areas and prime farmland; and
- (e) any proposed environmental mitigation features.

Section 4.4 - Minimization of Increases in Runoff Volumes and Rates

In the selection of a drainage plan for a development or redevelopment, the applicant shall evaluate and implement site design features which minimize the increase in runoff volumes and rates from the site. The applicant's drainage plan submittal shall include evaluations of site design features which are consistent with the following hierarchy:

- (a) preservation of regulatory floodplains, flood prone areas and wetland areas;
- (b) minimization of impervious surfaces on the property, consistent with the needs of the project including the use of innovative materials;
- (c) attenuation of flows by use of open vegetated swales and natural depressions that preserve the existing natural stream channel;

- (d) infiltration of runoff on-site;
- (e) providing stormwater retention structures;
- (f) providing wet or wetland detention structures;
- (g) providing dry detention structures; and
- (h) construction of storm sewers.

Section 4.5 - Water Quality

The drainage system of the development or redevelopment shall be designed to minimize adverse surface and groundwater quality impacts off-site and on the property itself. Detention basins shall incorporate design features to capture stormwater runoff pollutants. In particular, designers shall give preference to wet bottom and wetland type designs and all flows from the development shall be routed through the basin (i.e. low flows shall not be bypassed). Detention of stormwater shall be promoted throughout the property's drainage system to reduce the volume of stormwater runoff and to reduce the quantity of runoff pollutants.

Section 4.6 - Multiple Uses / Green Space / Protection of Trees

- (a) The drainage system should incorporate multiple uses where practicable. Uses considered compatible with stormwater management include but are not limited to open space, aesthetics, swales, aquatic habitat, recreation (boating, fishing, trails, playing fields), wetlands and water quality mitigation areas.
- (b) Municipalities that adopt this Ordinance by Resolution are encouraged to incorporate such compatible areas into any existing or future green space requirements.
- (c) Developers and owners are encouraged to incorporate "tree friendly" practices including protection of trees, especially the preservation of well-established trees and the properly routing of trucks and other larger vehicles so as not to run over or park where tree roots are.

Section 4.7 - Rainfall

Unless a continuous simulation approach to drainage system hydrology is used, all design rainfall events shall be based on the Illinois State Water Survey's Circular 172 and 173 (See Appendix). The first quartile point rainfall distribution shall be used for the design and analysis of detention basins and conveyance systems with critical durations less than 6 hours. The second quartile point rainfall distribution shall be used for the design and analysis of detention basins and conveyance systems with critical durations of 6.1 hours to 12 hours. The third quartile point rainfall distribution shall be used for the design and analysis of detention basins and conveyance systems with critical durations greater from 12.1 hours to 24 hours. The fourth quartile distribution shall be used in the design and analysis of detention basins and conveyance systems with durations greater than 24-hours. The quartile distributions are presented in Table 3 of Circular 173. Refer to Table 1 of Circular 172 for rainfall depth based on rainfall duration and frequency. The NRCS Type II distribution may be used as an alternate to the distributions in Circular 173.

Section 4.8 - Release Rates

- (a) The drainage system for developments or redevelopments shall be designed to control the peak rate of discharge from the property for the two year, 24-hour storm event and for the 100-year, 24-hour storm event to levels which will not cause an increase in flooding or channel instability downstream when considered in aggregate with other developed properties and downstream drainage capacities. This shall include consideration of the timing of the peak discharge on the receiving stream when such information is developed or available.
- (b) Until watershed specific information is readily available, release rates shall be as follows:
 - (1) Until watershed specific information is available, the drainage and stormwater management system shall be designed to limit peak discharge leaving the site to no more than .04 cfs/acre [or .06 cfs/acre] at a 2 year, 24-hour storm event and .15 cfs/acre [or .20 cfs/acre] at a 100 year, 24-hour storm event. ("cfs" stands for cubic feet per second). Acceptable release rates may vary from the standards specified herein as hydrologic models are completed per watershed. This data shall be made available by the District.
 - (2) In lieu of the release rate standards specified in subsection (b)(1) of this Section, the applicant may opt to do a complete hydrologic analysis in order to evaluate the effect of the proposed land use change on the overall discharge leaving a sub-drainage basin. In using this option, the applicant shall use the following event programs (or the equivalent as approved by the Soil and Water Conservation District Permit Reviewer): TR-20, TR-55, HEC-1, or HEC-HMS. If the development is under 2 acres or the impervious surface of the development is under 1 acre, the Rational Method may be used. If any of these options are chosen, the applicant must demonstrate that the post-development discharge from the site shall not exceed the pre-development discharge from the site. Stormwater storage shall start at the 2 year, 24-hour rainfall event. If the Permit Reviewer determines that such a demonstration has not been made, the applicant shall comply with subsection (a) of this Section.
- (c) As timing of peak discharge on the receiving stream is vitally important for flood protection, detailed hydrologic models of the entire watershed of St. Clair County shall be developed by the District. These models and the information within the models, when developed, shall be utilized for determining pre-development and post-development runoff from a proposed development site instead of utilizing release rates as specified in subsection (b) of this Section.

Section 4.9 - Detention Basin Outlet Design

Backwater on the outlet structure from the downstream drainage system shall be addressed by the applicant in designing the outlet.

Section 4.10 - Detention Storage Requirements

The minimum design storage to be provided in the detention basin shall be based on the runoff difference before and after development from the 100-year, 24-hour event. All detention basin storage shall be computed using Hydrograph Methods utilizing reservoir routing (also called modified puls or level pool) or by means of an equivalent method. Major and minor conveyance systems as well as detention basins shall be designed as specified in this Section of the Ordinance.

Section 4.11 - Drainage System Design and Evaluation

The following criteria shall be used in evaluating existing conditions and designing the drainage system. The design shall provide capacity to pass the 2-year, 24-hour peak flow in the minor drainage system and an overload flow path for flows in excess of the design capacity. The stormwater systems shall not result in the interbasin transfer of drainage unless no other practicable alternative exists.

Section 4.12 - Positive Drainage

Whenever practicable, all developments must be provided an overland flow path that will pass the 100-year, 24-hour flow at a stage at least one (1) foot below the lowest foundation grade in the vicinity of the flow path. Overland flow paths designed to handle flows in excess of the minor drainage system capacity shall be provided drainage easements. Street ponding and flow depths shall not exceed curb heights.

Section 4.13 - Antecedent Moisture

Computations of runoff hydrographs which do not rely on a continuous accounting of antecedent moisture conditions shall use antecedent moisture condition II (normal) as a minimum.

Section 4.14 - Wet Detention Basin Design and Depth

Wet detention basins shall be designed to remove stormwater pollutants, to be safe, to be aesthetically pleasing, and as much as feasible to be available for recreational use. Wet basins shall be at least three feet deep, excluding near-shore banks and safety ledges. If fish habitat is to be provided, said basins shall be at least eight (8) feet deep for over twenty-five (25%) percent of the bottom area to prevent winterkill.

Section 4.15 - Wet Basin Shoreline Slopes

The side slopes of wet basins at the normal pool elevation shall not be steeper than a three-to-one ratio (3:1 or 3 feet horizontal to 1 foot vertical). It is recommended that aquatic vegetation be established around the perimeter to provide protection from shoreline erosion.

Section 4.16 - Permanent Pool Volume

The permanent pool volume in a wet basin at normal depth shall be equal to the runoff volume from its watershed for the 2-year, 24-hour event as a minimum.

Section 4.17 - Wet Basin Inlet and Outlet Orientation

The distance between detention inlets and outlets shall be maximized. Inlets and outlets shall be at opposite ends of the basin providing that the orientation does not create undue hardship based on topography or other natural constraints. Designers are encouraged to use baffles or berms in the basin bottom to prevent short circuiting. There shall be no low flow bypass between the inlet and outlet. Paved low flow channels shall not be used. The minimum flow length shall be ten (10) feet with a recommended minimum ratio of two-to-one (2:1) length to width.

Section 4.18 - Dry Detention Basin Design

In addition to the other requirements of this Ordinance, dry basins shall be designed to remove stormwater pollutants, to be safe, to be aesthetically pleasing and as much as feasible to be available for multiple uses.

Section 4.19 - Dry Basin Drainage

Dry basins shall be designed so that eighty percent (80%) of their bottom area shall have standing water no longer than seventy-two (72) hours for any runoff event less than the 100-year, 24-hour event. Grading plans shall clearly distinguish the wet portion of the basin bottom. Underdrains directed to the outlet may be used to accomplish this requirement.

Section 4.20 - Velocity Dissipation

Velocity dissipation measures shall be incorporated into dry basin designs to minimize erosion at inlets and outlets and to minimize re-suspension of sediment.

Section 4.21 - Dry Basin Inlet and Outlet Orientation

Dry basin inlet and outlet orientation shall be the same as that specified in Section 4.17 of this Ordinance.

Section 4.22 - Temporary Stilling / Sedimentation Basin

A stilling / sedimentation basin shall be constructed at each major inlet to a dry basin during construction. The volume of the basin shall be a minimum of 500 cubic feet per acre of impervious surface in the drainage area. Side slopes shall be no steeper than a three feet to one foot ratio and basin depths shall be a minimum of three feet in order to minimize re-suspension of sediment and pollutants.

Section 4.23 - Existing Depressional Areas

Existing depressional storage volume will be maintained and the volume of detention storage provided to meet the requirements of this Ordinance shall be in addition to existing storage.

Section 4.24 - Minimum Detention Outlet Size

Where a single pipe outlet or orifice plate is to be used to control discharge, it shall have a minimum diameter of twelve (12) inches. If this minimum orifice size permits release rates greater than those specified in this Section, and regional detention is not a practical alternative, outlets, structures such as perforated risers, or flow control orifices shall be used.

Section 4.25 - Detention in Flood Plains

The placement of detention basins within the flood plain is strongly discouraged because of questions about their reliable operation during flood events. However, the stormwater detention requirements of this Ordinance may be fulfilled by providing detention storage within flood fringe areas on the project site provided the following provisions in this Chapter are met as well and compliance with Section 1.6 of this Ordinance is shown.

Section 4.26 - Detention in Flood Fringe Areas

The placement of a detention basin in a flood fringe area shall require compensatory storage for 1.5 times the volume below the base flood elevation occupied by the detention basin including any berms. The applicant shall demonstrate its operation for all stream-flow and floodplain backwater conditions. Excavations for compensatory storage along watercourses shall be opposite or adjacent to the area occupied by detention. All floodplain storage lost below the existing ten-year flood elevation shall be replaced below the existing ten-year elevation. All flood plain storage lost above the existing ten-year flood elevation shall be replaced above the existing ten-year flood elevation. All compensatory storage excavations shall be constructed to drain freely and openly to the watercourse and to comply with Section 1.6 of this Ordinance.

Section 4.27 - Detention on Prime Farmland

The placement of detention basins shall avoid the utilization of prime farmland whenever feasible. All detention basin construction shall examine potential impacts to adjacent agricultural land and shall address measures that will be implemented to eliminate such impacts.

Section 4.28 - Detention in Floodways

Detention basins shall not be placed in the floodway. Not all floodways are mapped. If the drainage area of the waterway at the proposed construction location is one square mile or greater, the applicant shall contact the Illinois Department of Natural Resources, Office of Water Resources for a determination as to State permit requirements.

Section 4.29 - On-Stream Detention

On-stream detention basins are discouraged but allowable if they provide regional public benefits and if they meet the other provisions of this Ordinance with respect to water quality and control of the two-year and 100-year, 24-hour events from the property. If on-stream detention is used in watersheds larger than one square mile, the applicant will use hydrographic modeling to demonstrate that the design will not increase the water level for any properties upstream or downstream of the property.

- (a) Impoundment of the stream as part of on-stream detention SHALL:
 - (1) require the implementation of an effective non-point source management program throughout the upstream watershed which shall include as a minimum:
 - (a) Best Management Practices (BMPs) for runoff reduction consistent with all reference documents listed in the appendix and in Section 4.49 of this Ordinance; and
 - (b) Two year, 24-hour detention / sedimentation basins for all development consistent with the provisions of this Ordinance.
 - (2) include a design calling for gradual bank slopes, appropriate bank stabilization measures, and a pre-sedimentation basin; and
 - (3) comply with all applicable provisions of this Ordinance.
- (b) Impoundment of the stream as part of on-stream detention SHALL NOT:

- (1) prevent the migration of indigenous fish species, which require access to upstream areas as part of their life cycle, such as for spawning;
- (2) cause or contribute to the degradation of water quality or stream aquatic habitat;
- (3) involve any stream channelization or the filling of wetlands;
- (4) occur downstream of a wastewater discharge;
- (5) contribute to the duration or flood frequency of any adjacent land.

Section 4.30 - Drainage Into and Detention In Wetlands, Rivers, Streams, Lakes, Ponds, and Depressional Storage Areas

Wetlands, rivers, streams, lakes, ponds and depressional storage areas shall be protected from damaging modifications and adverse changes in runoff quality and quantity associated with land development. In addition to the other requirements of this Ordinance, the following requirements shall be met for all developments whose drainage flows into wetlands, rivers, lakes, ponds or depressional storage areas:

- (a) Existing wetlands, rivers, streams, lakes, ponds or depressional storage areas shall not be modified for the purposes of stormwater detention unless it is demonstrated that the proposed modifications will maintain or improve the habitat and ability to perform beneficial functions and is in compliance with Section 1.6 of this Ordinance.
- (b) Existing storage and release rate characteristics of wetlands, rivers, streams, lakes, ponds or depressional storage areas shall be maintained and the volume of detention storage provided to meet the requirements of this Section shall be in addition to this existing storage.
- (c) Existing wetlands, rivers, lakes, ponds, or depressional storage areas shall be protected during all phases of development and as further regulated in this Ordinance. Filling in wetland areas is discouraged and no wetland area shall be filled without obtaining appropriate permits under the Clean Water Act.
- (d) Site drainage patterns shall not be altered to substantially decrease or increase the existing area tributary to the wetlands, rivers, streams, lakes, ponds or depressional storage areas.
- (e) All runoff from the development shall be routed through a preliminary detention sedimentation basin designed to capture the two-year, 24-hour event and hold it for at least 24-hours, before being discharged to the wetland, river, lake, pond, or depressional storage area. This basin shall be constructed before property grading begins and shall be maintained throughout the construction process. In addition, the drainage hierarchy defined in Section 4.4 should be followed to minimize runoff volumes and rates being discharged to the wetland, river, stream, lake, pond, or depressional storage area and as further regulated in this Ordinance.
- (f) A buffer strip of at least 25 feet in width, preferably vegetated with native plant species, shall be constructed or restored around the periphery of a wetland, river, stream, lake, pond or depressional storage area.

Section 4.31 - Loess Soils

Care must be taken to avoid open flow discharges of stormwater over silt (loess) soils due to high potential for erosion. Most of the soils in St. Clair are loess.

Section 4.32 - Sinkholes, Karst Area

The following requirements apply to developments or redevelopments where sinkholes are determined to be present:

- (a) A stormwater detention basin shall not be placed in or over a sink-hole;
- (b) Stormwater detention basins shall not be located closer than one hundred (100) feet from the rim of a sinkhole;
- (c) The outflow from a stormwater detention basin, channel, ditch or any stormwater runoff generated as a result of a development or redevelopment shall not empty into or be directed or redirected by any means into or through any sinkhole; and
- (d) If, after review of the stormwater drainage plan, the District Permit Reviewer determines that more detailed information is required, a sinkhole evaluation shall be required. A sinkhole evaluation which addresses the geologic, engineering, and environmental factors resulting from a development or redevelopment shall then be performed by a professional with experience and expertise in karst topography. The results of the evaluation shall be certified by a professional engineer with adequate knowledge and experience in the field of erosion, sediment control, and soils or by a Certified Professional in Erosion and Sediment Control. This evaluation shall be the responsibility of the applicant and performed at no cost to the St. Clair County Soil and Water Conservation District. After a review of this evaluation, the District Permit Reviewer may either approve or disapprove the drainage plan as submitted.
- (e) Whenever a new sinkhole appears or whenever it becomes apparent that a sinkhole has not yet been identified on St. Clair County resource maps, it shall be reported to the Soil and Water Conservation District.

Section 4.33 - Street Detention, Parking Lot Detention, and Culvert Drainage

The following standards shall be complied with:

- (a) Street Detention: If streets are to be used as part of the minor or major drainage system, ponding depths shall not exceed curb heights and shall not remain flooded for more than eight (8) hours for any event less than or equal to the 100-year, 24-hour event.
- (b) Parking Lot Detention: The maximum stormwater ponding depth in any parking area shall not exceed six (6) inches for more than four (4) hours.
- (b)Culvert, Road and Driveway Crossings: Sizing of culvert crossings shall be determined by giving consideration to entrance and exit losses as well as tailwater conditions on the culvert.

Section 4.34 - Infiltration Practices

To effectively reduce runoff volumes, infiltration practices including basins, trenches, and porous pavement shall be located in hydrologic soil groups "A" and "B" as designated by the U.S.D.A. Natural Resources Conservation Service. Infiltration basins and trenches designed to re-charge groundwater shall not be located within seventy-five (75) feet of a water-supply well or building foundation. A sediment settling basin shall be provided to remove coarse sediment from stormwater flows before they reach infiltration basins or trenches. Stormwater shall not be allowed to stand more than seventy-two hours over eighty percent of the dry basin's bottom area for the maximum design event to be ex-filtrated. The bottom of infiltration basins or trenches shall be a minimum of four feet above the seasonally high groundwater and bedrock level. Engineering calculations demonstrating infiltration rates shall be included with the application.

Section 4.35 - Vegetated Filter Strips and Swales

To effectively filter stormwater pollutants and promote infiltration of runoff, sites should be designed to maximize the use of vegetated filter strips and swales. Whenever practicable, runoff from impervious surfaces should be directed onto filter strips and swales comprised of native grasses and forbs before being routed to a storm sewer or detention basin.

Section 4.36 - Safety Considerations

The drainage system components, especially all detention basins, shall be designed to protect the safety of any children or adults coming in contact with the system during runoff events.

Section 4.37 - Side Slopes

The side slopes of all detention basins at 100-year, 24-hour capacity shall be as level as practicable to prevent accidental falls into the basin and for stability and ease of maintenance. Side slopes of detention basins and open channels shall not be steeper than a three-to-one ratio (3:1) horizontal to vertical.

Section 4.38 - Safety Ledge

All wet detention basins shall have a level safety ledge at least four feet in width located two and a half to three feet below the normal water depth.

Section 4.39 - Velocity

Velocities shall be controlled to safe levels taking into consideration rates and depths of flow. Velocities throughout the surface drainage system shall not exceed permissible velocities as described in Chapter 7 of the USDA NRCS Engineering Field Manual. (See Appendix). Generally, these maximum velocities will be less than four feet per second.

Section 4.40 - Overflow Structures

All stormwater detention basins shall be provided with an overflow structure capable of safely passing excess flows at a stage at least one foot below the lowest foundation grade in the vicinity of the detention basin. The design flow rate of the overflow structure shall be equivalent to the 100-year, 24-hour inflow rate.

Section 4.41 - Maintenance Considerations / Protection of Trees

The stormwater drainage system shall be designed to minimize and facilitate maintenance. Turfed side slopes shall be designed to allow lawnmowing equipment to easily negotiate them. Wet basins shall be provided with alternate outflows which can be used to completely drain the pool for sediment removal. Pumping may be considered if drainage by gravity is not feasible. Pre-sedimentation basins shall be included, where feasible, for localizing sediment deposition and removal. Site access for heavy equipment shall be provided. Vehicles and heavy equipment shall not run over the roots of established trees.

Section 4.42 -Accommodating Flows From Upstream Tributary Areas

Stormwater runoff from areas tributary to the property shall be considered in the design of the property's drainage system. Whenever practicable, flows from upstream areas that are not to be detained shall be routed around the basin being provided for the site being developed.

Section 4.43 - Upstream Areas Not Meeting Ordinance Requirements

As it is likely that there are upstream areas tributary to the applicant's property that do not meet the storage and release rates of this Ordinance, regionalized detention on the applicant's property shall be reasonably explored by the applicant and the results shall be reported to the District in the permit application and shall be supplied to the municipality having jurisdiction over the property or to the County if no municipality has jurisdiction.

- (a) In such a case, the following steps shall be followed:
 - (1) The applicant shall compute the storage volume needed for his property using the release rates of Section 4.8 of this Ordinance.
 - (2) The applicant shall identify and describe areas tributary to the applicant's property that do not meet the storage and release rate requirements of this Ordinance.
 - (3) Using the areas determined above in subsections (a)(1) and (2) of this Section plus the applicant's property area, the applicant shall compute the total storage needed for the combined properties.
 - (4) Allowable release rates shall also be computed using the combined property areas. Storage shall be computed as described in Section 4.8 of this Ordinance. If tributary areas are not developed, a reasonable developed land cover based on local zoning shall be used for the purposes of computing storage.
- (b) Once the necessary combined storage is computed, any municipality having jurisdiction over the property or the Soil and Water Conservation District Board may choose to pay for over-sizing the applicant's detention basin to accommodate the regional flows. The applicant's responsibility shall be limited to the storage for his property as computed in accordance with this Ordinance. If regional storage is selected by any municipality, the County, or the District, then the design to be implemented shall comply with all of the provisions of this Ordinance. If regional storage is rejected after due consideration, the applicant shall bypass all tributary area flows around the applicant's basin whenever practicable. If the applicant must route upstream flows through his

basin and the upstream areas exceed one square mile in size, the applicant must meet the provision of Section 4.29 for on-stream basins.

Section 4.44 - Upstream Areas Meeting Ordinance Requirements

When there are upstream areas tributary to the applicant's property that meet the storage and release rate requirements of this Ordinance that are tributary to the applicant's property, the upstream flows may be by-passed around the applicant's detention basin if this is the only practicable alternative. Storage needed for the applicant's property shall be computed as described in Section 4.8 of this Ordinance. However, if the District or the municipality having jurisdiction over the property, decides to route tributary area flows through an applicant's basin, the final design of stormwater releases shall be based on the combined total of the applicant's property plus tributary areas. It must be shown that at no time will the runoff rate from the applicant's property exceed the allowable release rate for his/her property alone.

Section 4.45 - Early Completion of Detention Facilities

Where detention, retention, or depressional storage areas are to be used as part of the drainage system for a property, they shall be constructed as the first element of the initial earthwork program. Any eroded sediment captured in these facilities shall be removed by the applicant on a regular basis and before project completion in order to maintain the design volume of the facilities.

Section 4.46 - Fee in Lieu of Detention

- (a) In watersheds where detailed hydrologic modeling has been completed and regional detention facilities have been identified and analyzed, a fee in lieu of detention may be allowed. Determination of fees to be paid in lieu of detention shall be based on projected development costs of the facility including engineering and design cost and land acquisition but in no case shall fees in lieu of detention be less than described in subsections (b) and (c) of this Section.
- (b) In instances where regional benefits and economies of scale can be achieved, it will be permissible for adjacent properties to utilize a common regional detention basin. Applicants shall have the option of paying a fee of \$10,000 for each acre-foot of detention required so that the District can build regional facilities, or they can jointly build the necessary facilities themselves.
- (c) The \$10,000 fee for each acre foot is based on the value of \$10,000 in the year 2001. Said fee may be increased by the District from time to time based on inflation as determined by the Consumer Price Index so that this amount will increase over time. In lieu of using the Consumer Price Index, an amount of not more than two percent per year may be used to increase the fee.

Section 4.47 - Soil Erosion and Sediment Control

It is the objective of this Ordinance to control soil erosion and sedimentation caused by development activities, including clearing, grading, stripping, excavating, and filling of land in St. Clair County, Illinois. Measures taken to control soil erosion and off-site sediment runoff shall be adequate to assure that sediment is not transported from the site by a storm event of ten-year, 24-hour frequency or less. The following principles shall apply to all development or redevelopment activities within St. Clair County and to the preparation of the submissions required under this Ordinance:

- (a) Development or redevelopment shall be related to the topography and soils of the site so as to create the least potential for erosion. Areas of steep slopes greater than eight percent (8%) where

high cuts and fills may be required are to be avoided wherever possible, and natural contours should be followed as closely as possible.

- (b) Natural vegetation shall be retained and protected wherever possible. Areas immediately adjacent to natural watercourses, lakes, ponds, sink-holes, and wetlands are to be left undisturbed wherever possible. Temporary crossings of watercourses, when permitted, must include appropriate stabilization measures.
- (c) Special precautions shall be taken to prevent damages resultant from any necessary development activity within or adjacent to any channel or wetland. Preventive measures shall reflect the sensitivity of these areas to erosion and sedimentation.
- (d) The smallest practical area of land should be exposed for the shortest practical time during development.
- (e) Sediment basins or traps, filter barriers, diversions, and any other appropriate sediment or runoff control measures shall be installed prior to site clearing and grading and maintained to remove sediment from runoff waters from land undergoing development.
- (f) The selection of erosion and sediment control measures shall be based on assessment of the probable frequency of climatic and other events likely to contribute to erosion, and on evaluation of the risks, costs, and benefits involved.
- (g) In the design of erosion control facilities and practices, aesthetics and the requirements of continuing maintenance must be considered.
- (h) Provision shall be made to accommodate the increased runoff caused by changed soil and surface conditions during and after development. Drainage ways should be designed so that their final gradients and the resultant velocities and rates of discharge will not create additional erosion on site or downstream.
- (i) Permanent vegetation and structures shall be installed and functional as soon as practical during development.
- (j) Those areas being converted from agricultural purposes to other land uses shall be vegetated with an appropriate protective cover prior to development.
- (k) All waste generated as a result of site development activity shall be properly disposed of and shall be prevented from being carried off the site by either wind or water. No waste materials may be burned. Landscape waste may be burned by proper use of an Illinois EPA permitted air curtain destructor.
- (l) Measures shall be implemented at all construction sites in order to prevent sediment from being tracked onto public or private roadways and to control fugitive dust from traveling off-site.
- (m) All temporary soil erosion and sediment control practices shall be maintained to function as intended until the contributing drainage area has been permanently stabilized at which time they shall be removed.

Section 4.48 - Erosion and Sediment Control Plan Requirements

Each applicant shall submit sufficient information to evaluate the environmental characteristics of the property, the potential adverse impacts of the development related to erosion both on-site and off-site, and the effectiveness of the proposed erosion and sediment control plan in reducing sediment loss. The applicant shall certify on the drawings that all clearing, grading, drainage, excavation, and construction shall be accomplished in strict conformance with the erosion and sediment control plan. The following information shall be submitted for both existing and proposed property conditions:

- (a) Mapping and Descriptions as specified in Section 4.2 of this Ordinance.
- (b) Existing and proposed erosion and sediment control features of the property and immediate vicinity including:
 - (1) Location and description of the erosion and sediment control measures to be employed during construction;
 - (2) Location of the slope disturbance line;
 - (3) For any structures proposed to be located on the slope side of the slope disturbance line, the map shall include the limits of disturbance including tree removal, erosion and sediment control measures during construction, cross-section view of any proposed cut or fill, erosion and sediment control measures during construction, details of method(s) proposed for providing slope stability, permanent stormwater control measures, and permanent erosion and sediment control measures all being certified by a registered professional engineer with adequate knowledge and experience in the field of erosion, sediment control, and soils, or by a Certified Professional in Erosion and Sediment Control;
 - (4) The predominant soil types on the site, their location, and their limitations for the proposed use as defined by the U.S.D.A. Natural Resources Conservation Service;
 - (5) The proposed use of the site, including present and planned development, areas of clearing, stripping, grading, excavation and filling; proposed contours, finished grades, and street profiles; the stormwater plan; types and locations of utilities, areas and acreage proposed to be paved, sodded or seeded, vegetatively stabilized, or left undisturbed; and the location of well-established and unique trees and tree lines or tree clusters;
 - (6) The erosion and sediment control plan showing all measures necessary to meet the requirements of this Ordinance throughout all phases of construction and those remaining permanently after completion of the development of the site, including:
 - (A) Location and description, including standard details, of all sediment control measures, runoff control measures, including diversions, waterways and outlets, and design specifics of sediment basins and traps including outlet details;
 - (B) Location and description of all soil stabilization and erosion control measures, including seeding mixtures and rates, types of

sod, method of seedbed preparation, expected seeding dates, type and rate of lime and fertilizer application, kind and quantity of mulching for both temporary and permanent vegetative control measures, and types of non-vegetative stabilization measures;

- (C) Location and description of methods to prevent tracking of sediment off-site including construction entrance details, as appropriate;
- (D) Description of dust and traffic control measures;
- (E) Locations of stockpiles and description of stabilization methods;
- (F) Location of off-site fill or borrow volumes, locations and methods of stabilization;
- (G) Provisions for maintenance of control measures, including type and frequency of maintenance, easements, and estimates of the cost of maintenance; and
- (H) The proposed phasing of development of the site, including stripping and clearing, rough grading and construction, and final grading and landscaping. Phasing should identify the expected date on which clearing will begin, the estimated duration of exposure of cleared area, and the sequence of installation of temporary sediment control measures (including perimeter controls), installation of stormwater drainage, paving streets and parking areas, final grading and the establishment of permanent vegetative cover, and the removal of temporary measures. It shall be the responsibility of the applicant to notify the Permit Reviewer of any significant changes which occur in the site development schedule after the initial erosion and sediment control plan has been approved.

Section 4.49 - Design and Operation Standards and Requirements / Technical Handbooks

The preparation of soil erosion and sediment control plans shall follow the principles outlined in the "Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control", excepting Chapter Six published by the Urban Committee of the Association of Illinois Soil and Water Conservation Districts. (See Appendix). The design criteria, standards, and methods shall be prepared in accordance with the requirements of this Ordinance and the standards and specifications contained in "Illinois Urban Manual" (A Technical Manual Designed for Urban Ecosystem Protection and Enhancement), prepared for the Illinois Environmental Protection Agency by the U.S.D.A. Natural Resources Conservation Service, which standards and methods are hereby incorporated into this Ordinance by reference. In the event of conflict between the provisions of said manuals and of this Ordinance, this Ordinance shall govern.

Section 4.50 - Erosion and Sediment Control Design Requirements

Developments or redevelopments shall also meet the following:

- (a) Control measures shall be constructed to control runoff from the property so that to the extent possible sediment is retained on-site.
- (b) Temporary on-site control measures required shall be constructed and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.
- (c) Disturbed areas shall be stabilized with permanent measures within seven calendar days following the end of active disturbance, or re-disturbance consistent with the following criteria:
 - (1) Appropriate permanent stabilization measures shall include seeding, mulching, sodding, with non-vegetative measures as a last resort.
 - (2) Areas having slopes greater than eight percent (8%) shall be stabilized with sod, mat, or blanket in combination with seeding or an equivalent, as approved by the Permit Reviewer.
- (d) All temporary and permanent erosion and sediment control practices must be maintained and repaired as needed to assure effective performance of their intended function.
- (e) All temporary erosion and sediment control measures shall be disposed of in a proper manner within thirty (30) days after final site stabilization is achieved with permanent approved soil stabilization measures. Trapped sediment and other disturbed soils resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.
- (f) Site Development Requirements include on-site sediment control measures, as specified by the following criteria and shall be constructed as specified in the handbooks referenced in Section 4.49 of this Ordinance, and shall be functional prior to initiating clearing, grading, stripping, excavating or filling activities on the site.
 - (1) For developments or redevelopments less than or equal to one acre in total area, filter barriers (including filter fences, straw bales, or equivalent control measures) shall be constructed to control all on-site runoff. Vegetated filter strips, with a minimum width of twenty-five (25) feet, may be used as an alternative only where runoff in sheet flow is expected.
 - (2) For developments or re-developments more than one acre but less than five acres, a sediment trap or equivalent control measure shall be constructed at the downslope point of the disturbed area.
 - (3) For developments or redevelopments greater than or equal to five acres, a sediment basin or equivalent control measure shall be constructed at the downslope point of the disturbed area.
 - (4) Sediment basin and sediment trap designs shall provide for both "dry" detention and "wet" detention sediment storage. The detention storage shall be composed of equal volumes of "wet" detention storage and "dry" detention storage and each

shall be sized as regulated in this Ordinance. The release rate of the basin shall be that rate as regulated in Chapter 3.0. The elevation of the outlet structure shall be placed such that it only drains the dry detention storage.

- (5) The sediment storage shall be sized to store the estimated sediment load generated from the site over the duration of the construction period with a minimum storage equivalent to the volume or sediment generated in one year. For construction periods exceeding one year, the one year sediment load and a sediment removal schedule may be substituted.
 - (6) The alteration of sinkholes by filling, grading or excavation is prohibited, including an area within twenty-five (25) feet from the rim.
 - (7) To the extent possible and as otherwise regulated in this Ordinance, all native trees eight inches in diameter and larger shall be protected for their present and future value for erosion protection and other environmental benefits. Trees that have been selected for preservation shall be marked prior to the beginning of any clearing, grading, stripping, excavation, or filling of the site. A "No" construction zone shall be established and marked at the perimeter of the drip-line of each tree which is to be preserved. Planting of trees for erosion control is also encouraged.
- (g) Stormwater conveyance channels, including ditches, swales, and diversions, and the outlets of all channels and pipes shall be designed and constructed as regulated in this Ordinance. All constructed or modified channels shall be stabilized within 48 hours, consistent with the following standards and as required in the handbooks referenced in Section 4.49 of this Ordinance:
- (1) For grades up to four percent (4%), seeding in combination with mulch, erosion blanket, or an equivalent control measure approved by the Permit Reviewer shall be applied. Sod or erosion blanket or mat shall be applied to the bottom of the channel.
 - (2) For grades of four to eight percent (4% to 8%), sod or an equivalent control measure shall be applied in the channel.
 - (3) For grades greater than eight percent (8%), rock, rip-rap, or an equivalent control measure shall be applied over filter fabric or other type of soil protection as approved by the Permit Reviewer, or the grade shall be effectively reduced using drop structures.
- (h) Land disturbance activities in stream channels shall be avoided, where possible. If disturbance activities are unavoidable, the following requirements shall be met.
- (1) Construction vehicles shall be kept out of the stream channel to the maximum extent practicable. Where construction crossings are necessary, temporary crossings shall be constructed of non-erosive material, such as rip-rap or gravel.
 - (2) The time and area of disturbance of stream channels shall be kept to a minimum. The stream channel, including bed and banks, shall be stabilized within 48 hours after channel disturbance is completed, interrupted, or stopped.

- (3) Whenever channel relocation is necessary, the new channel shall be constructed under dry conditions and fully stabilized before flow is diverted, incorporating meanders, pool and riffle sequence, and riparian planting.
- (i) Storm sewer inlets and culverts shall be protected by sediment traps or filter barriers meeting accepted design standards and specifications.
- (j) Soil storage piles containing more than ten cubic yards of material shall not be located with a downslope drainage length of less than twenty-five (25) feet to a roadway, drainage channel, or sinkhole. Filter barriers, including straw bales, filter fence, or an equivalent approved by the Permit Reviewer, shall be installed immediately on the downslope side of the piles.
- (k) If dewatering devices are used, discharge locations shall be protected from erosion. All pumped discharges shall be routed through appropriately designed sediment traps or basins, or their equivalent and shall not be deposited into a sinkhole.
- (l) Each site shall have graveled (or equivalent) all weather entrance roads, access drives, and parking areas of sufficient length and width to prevent sediment from being tracked onto public or private roadways. Any sediment reaching a public or private road shall be removed by shoveling or street cleaning (not flushing) before the end of each workday and transported to a controlled sediment disposal area.

Section 4.51 - Maintenance of Control Measures

All soil erosion and sediment control measures necessary to meet the requirements of this Ordinance shall be maintained periodically by the Permittee and/or subsequent land owners during the period of land disturbance and development of the site in a satisfactory manner to ensure adequate performance. Subsequent land owners includes individual lot owners within a permitted development even when an individual lot is under an acre or does not meet the applicability requirements of this Ordinance. The Permittee shall be responsible to ensure that all provisions of the permit are complied with for all lots in any subdivision or development project during all land disturbing activities and development even when other owners, builders, or entities may be engaging in the development and land disturbing activities. This may be achieved by placing covenants on the deeds including for the care of common areas.

Chapter 5 - Long-Term Maintenance Responsibility

Section 5.0 - Long-Term Maintenance Responsibility

- (a) Developers shall provide for maintenance of engineered stormwater controls including stormwater retention or detention basins and other erosion control and stormwater management structures by setting up a home owner's association with appropriate covenants and deed restrictions or by providing a binding contract for the purpose of maintenance or by petitioning the Soil and Water Conservation District for an election to set up a watershed subdistrict. If the Developer is the only owner of the property to be in the subdistrict, his vote alone shall be considered a majority of property owners for purposes of referendum vote.

- (b) At such time as the District has authority to provide funding for long-term maintenance through tax revenues or some other source, it may waive (or reinstate) the requirement in subsection (a) of this Section by 2/3 vote of the Board at a regularly scheduled meeting.
- (c) The District may as an alternative to subsection (a) of this Section create an alternative perpetual-type fund for purposes of long-term maintenance of structural measures whereby an up front payment would be made by the permit applicant to the District to be used to cover future expenses for long-term maintenance costs of structures developed for stormwater management and erosion and sediment control by 2/3 vote. Public notice shall be given at least 30 days prior to a vote on this issue.

Chapter 6 Inspections

Section 6.0 - Inspections

- (a) The Soil and Water Conservation District Inspector and/or an inspector from the County or the respective municipalities adopting this Ordinance by Resolution within their jurisdictions may make inspections at any time to determine compliance with an issued permit and this Ordinance and may either approve that portion of the work completed or shall notify the permittee wherein the work fails to comply with the Stormwater Management and Erosion Control Permit as approved. Copies of all issued permits shall be kept on site during progress of work. Inspectors may but are not required to inspect at each stage of development but shall spot check development activities in the County.
- (b) In order to obtain inspections and to ensure compliance with this Ordinance, the permittee shall notify the District Inspector or the appropriate County or Municipal Inspector within two (2) working days of the completion of the construction stages specified below:
 - (1) Prior to any grading (including stripping and clearing);
 - (2) Upon completion of installation of the stormwater drainage and erosion and sediment control measures (including perimeter controls and diversions), prior to proceeding with any other earth disturbance or grading;
 - (3) After rough grading and temporary seeding;
 - (4) After final grading;
 - (5) After final stabilization and landscaping, prior to removal of sediment controls.
- (c) The District shall set up a self-certification process for developers so as to reduce the need for regular inspections at each stage of development and may set up a pre-construction meeting with each or any developer as needed.

Section 6.1 - Special Precautions

If at any stage of the grading of any development site, a District Inspector determines by inspection that the nature of the site is such that further work authorized by an existing permit is likely to imperil any property, public way, stream, lake, wetland, or drainage structure, a District Inspector may require, as a condition of allowing the work to continue, that such reasonable special precautions to be taken as is considered advisable to avoid the likelihood of such peril. "Special precautions" may include, but shall not be limited to, a more level exposed slope, construction of additional drainage facilities, berms,

terracing, compaction, or cribbing, installation of plant materials for erosion control, and obtaining and following recommendations of registered professional engineer with adequate knowledge and experience in the field of erosion, sediment control, and soils or by a Certified Professional in Erosion and Sediment Control for further work.

Section 6.2 - Work Stoppage

Whenever it appears that storm damage may result because the grading on any development site is not complete, work may be stopped by written order of the District Inspector and the permittee shall be required to install temporary structures or take such other measures as may be required to protect adjoining property or the public safety. On large developments or where unusual site conditions prevail, a District Inspector may specify the time of starting grading and time of completion or may require that the operations be conducted in specific stages so as to ensure completion of protective measures or devices prior to the advent of seasonal rains.

Chapter 7 ENFORCEMENT

Section 7.0 - Strict Enforcement

The terms of this Ordinance and the terms of any Stormwater Management and Erosion Control Permit issued pursuant to this Ordinance shall be strictly enforced either administratively by the District as set forth herein or by the filing of a civil or criminal case for the purpose of enforcing this Ordinance. Nothing in this Ordinance abridges the rights of affected private parties to sue for injunctive relief and damages. Enforcement shall include the seeking of injunctive relief which is specifically authorized herein and in accordance with 55 ILCS 5/5-12017 or such enforcement may include the bringing of criminal charges. The District may seek enforcement by referring any case to the St. Clair County State's Attorney, the Illinois Attorney General, or by hiring its own Counsel for the purpose of enforcement.

Section 7.1 - Stop-Work Orders and Revocation of Permits

In the event any person holding a permit issued pursuant to this Ordinance violates the terms of the permit, or carries on site development in such a manner as to materially adversely affect the health, welfare, environment, or safety of persons residing or working in the neighborhood of the development site or so as to be materially detrimental to the public welfare or injurious to property or improvements in the neighborhood, the District may suspend or revoke the Stormwater Management and Erosion Control Permit as follows:

- (a) Suspension of a permit shall be by a written Stop Work Order issued by the District Inspector and delivered to the permittee or his agent or the person performing the work. The Stop Work Order shall become effective immediately, shall state the specific violations cited, and shall state the conditions under which work may be resumed. A Stop Work Order shall remain in effect until the next regularly scheduled meeting of the District Board at which time it shall be taken up for discussion at the request of the permittee and may be overruled or modified by 2/3 vote of the Board members present.
- (b) No permit shall be revoked until a hearing is held by the District Board. Written notice of such hearing shall be served on the permittee, either personally or by registered mail, at least seven (7) days prior to the date set for the hearing and shall state:

- (1) The grounds for complaint or reasons for suspension or revocation, in clear and concise language; and
 - (2) The time and place where such hearing will be held.
- (c) At such hearing, the permittee may be represented by an attorney and shall be given an opportunity to be heard and may call witnesses and present evidence on his behalf. At the conclusion of the hearing the District Board shall determine whether the permit shall be revoked (and may take the matter under advisement until the next regularly scheduled Board meeting).

Section 7.2 - Violations and Penalties

- (a) No person shall construct, enlarge, alter, repair or maintain any grading, excavation or fill, or cause the same to be done, contrary to or in violation of any provisions of this Ordinance. Any person violating any of the provisions of this Ordinance shall be deemed guilty of a misdemeanor, and each day during which any violation of any of the provisions of this Ordinance is committed, continued, or permitted shall constitute a separate offense.
- (b) Upon civil finding of violation or upon criminal conviction of any violation of this Ordinance or of any provision of an issued permit, such person shall be liable for a fine up to the maximum authorized by criminal law or in the case of civil enforcement, of not more than Five Thousand Dollars (\$5000.00) for each offense. Each day constitutes a separate offense.
- (c) In addition to any other penalty authorized by this Section, any person found to be in violation of any provision of this Ordinance or any permit issued pursuant to this Ordinance shall be required to restore the site to the condition existing prior to commission of the violation, or to bear the expense of such restoration.

Effective Date

This Ordinance shall be in full force and effect from and after its passage and approval by referenda vote of 3/4 of the property owners voting in the referendum election as required by law and approved thereafter by a majority of the Soil and Water Conservation District Board.

Passed by Referendum vote and adopted by the St. Clair County Soil and Water Conservation District, this _____ day of _____, 2002.

Passed: _____

Approved: _____

Attestation

APPENDIX SECTIONS

reference books section

referenced documents including Circular 172 and 173

required qualifications for engineers

TAZEWELL COUNTY, ILLINOIS
EROSION, SEDIMENT AND STORM WATER
CONTROL ORDINANCE

Revisions Approved: March 27, 1996
Implementation Date: April 15, 1996

Revision 1 (Fees): March 1, 2000

**TAZEWELL COUNTY, ILLINOIS
EROSION, SEDIMENT AND STORM WATER
CONTROL ORDINANCE**

Sec. 7-7-1. DEFINITIONS

"Adjacent lands": Surrounding land that may either impact a site, or be impacted by potential soil erosion, sediment and/or storm water run-off as a result of land disturbing activities conducted on a site, and at a minimum is an area within fifty (50) feet of the site.

"Appeals Board": The Erosion, Sediment and Storm Water Control Appeals Board.

"Areas of concentrated flow or bodies of water": Any area where water may accumulate or flow, whether continual or as the result of a storm event, including but not limited to lakes, rivers, streams, creeks, ponds, ditches, swales, gullies, ravines, street gutters and other similar features.

"Commission": The Tri-County Regional Planning Commission

"Control measure": Any proposed temporary or permanent measures to be installed to control erosion, sediment and storm water run-off from a project area.

"County": The County of Tazewell, Illinois.

"Department": The Tazewell County Planning and Zoning Department.

"Development": The division of a parcel of land into two or more parcels; the construction, reconstruction, conversion, structural alteration, relocation, or enlargement of any structure; any mining, excavation, landfill, or land disturbance; and any use or extension of the use of land.

"Disturbed Area": Any area of land on which the pre-development ground surface will be affected or altered by the development activities. This includes but is not limited to grading, clearing, stock piling, tracking and other similar activities.

"Erosion Control Administrator": The person appointed by the Tazewell County Board to administer this ordinance.

"Five year frequency storm event": The storm event rainfall depth during a twenty-four (24) hour period which is exceeded, on the average, once every five (5) years.

"Flood Insurance Rate Maps (FIRM)": Maps prepared by the federal emergency management agency (FEMA) that depict the special flood hazard areas (SFHA) within a community. These maps include insurance rate zones and floodplains any may or may not depict floodways.

"Institutional use": A religious, or public use, such as a church, library, public or private school, hospital, or government owner or operated building, structure or land use for public purpose.

"Land disturbing activity": Any change in land, which may result in soil erosion from water or wind and the movement of sediments into state or County waters or onto lands in the County, or a change in the amount and/or intensity of storm water run-off, including but not limited to, the covering with an impervious surface, stockpiling, clearing, grading, excavating, rehabilitating, transporting, depositing or filling of land.

"Normal agricultural practices": Activities associated with the preparation and tilling of land for the purposes of growing crops, or raising livestock, which may include, but are not limited to, the construction of conservation measures, plowing, disking and cultivating.

"Perimeter Control": Any control measure installed between the down slope side of the disturbed area and the property line and/or between the down slope side of the disturbed area and any area of concentrated flow.

"Pre-project condition": A condition that may impact erosion, sediment, or storm water run-off characteristics of a site prior to start of construction activity. The pre-project condition shall be based on the predominant land use for the past five (5) years. For example, if a site has been cropland for four (4) of the past five (5) years, and in grass just prior to development, the land use would be cropland for the pre-project condition.

"Project": Any development involving modification to land which involves a land disturbing activity.

"Regional storm water management system": A system which is designed, constructed, and maintained to provide storm water control for multiple land owners.

"Road": Any right-of-way that has been improved for the purposes of providing a surface for vehicular traffic, including any federal, state, county, township, and municipal controlled facilities.

"Single family dwelling": A building designed for or occupied by one family.

"Site": The lot or parcel on which the project is to be developed.

"Site Specific plan": A general erosion and sediment control permit required for projects where slope is greater than 10% and/or the site contains areas of concentrated flow or bodies of water. Slope shall be determined by the maximum slope indicated on the site according to the USDA Soil Survey or topographic survey as prepared by an Illinois Registered Surveyor.

"Standards": The Illinois Environmental Protection Agency's Illinois Urban Manual, A Technical Manual designed for Urban Ecosystem Protection and Enhancement published in 1995 and Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control published in 1988 by the Urban Committee of the Association of Illinois Soil and Water Conservation District now in effect or as hereafter amended, which is incorporated by reference herein, and the Tazewell County standards for Stormwater Design Analysis, found at Appendix "A" of this article, and the erosion and sediment control criteria and specifications found in Appendix "B" of this ordinance.

"Standard plan": A general erosion and sediment control permit for projects where slope is less than 10%, and there are no areas of concentrated flows or bodies of water on or water on or immediately adjacent to the site. Slope shall be determined by the maximum slope indicated on the site according to the USDA Soil Survey or topographic survey as prepared by an Illinois Registered Surveyor.

"Substantial completion": The point at which all exterior work is completed and the site can be used for the use intended.

"Twenty-five year frequency storm event": The storm event rainfall depth during a twenty-four (24) hour period which is exceeded, on the average, once every twenty-five (25) years.

"Two-family dwelling": A building designed for or occupied by two families.

"Two year frequency storm event": The storm event rainfall depth during a twenty-four (24) hour period which is exceeded, on the average, once every two (2) years.

"Utility Service Line" Means by which utility service is provided to service users, such as electric, telephone and television cable, or gas, water and sewer pipes.

"Working day": Shall not include Saturday, Sunday or any holiday when the Tazewell County Offices are closed.

Sec. 7-7-2. APPLICABILITY OF ARTICLE

This article shall apply to:

1. All projects within the boundaries and jurisdiction of the County. No land surface shall be disturbed unless an erosion and sediment control permit, or an erosion sediment and storm water control permit, has first been issued for that project, except as follows:
 - a. Land disturbing activities which do not involve the construction of any new single or two-family dwellings, and for which the disturbed area is less than 5,000 square feet;
 - b. Normal agricultural practices; or
 - c. Routine maintenance of roads and utility service lines.
 - d. Tazewell County Road Departments

The Erosion Control Administrator reserves the right to require any non-agricultural, construction development activity, regardless of disturbed area or type of activity, to comply with this ordinance if it is determined to be the cause of, or a contributor to an existing or potential erosion, sediment, or storm water impact.

2. Any land within the boundaries and jurisdiction of the County on which there is located a permanent storm water control measure which was installed pursuant to this ordinance.

Sec. 7-7-3. STANDARDS FOR DESIGN AND MAINTENANCE OF CONTROL MEASURES FOR SOIL EROSION, SEDIMENT AND STORM WATER

(a) EROSION AND SEDIMENT CONTROL MEASURES

All control measures required under this ordinance shall conform to the design criteria, standards, and specifications provided in the applicable standards, referenced in Appendix B, now in effect or as hereafter amended. All control measures installed shall be sufficient to prevent sediment from leaving the permit site during a 5-year frequency storm event. Measures shall be taken to prevent sediment from leaving the site. When sediment does leave the site, the owner, developer or contractor shall remove the sediment within four (4) hours, or by no later than the end of the work day. For example, installing a rock construction drive, or cleaning tires could be used to minimize tracking of sediment onto public roads.

(b) PERMANENT STORM WATER CONTROL MEASURES

All storm water controls shall be designed so that the peak discharge rate from the permitted area resulting from the 2-year and 25-year frequency storm events for the post-project condition do not exceed the corresponding storm event peak discharges for the pre-project condition. Evaluation of submitted plans shall be based on the Stormwater Design Analyses Standards in Appendix "A", at the end of this ordinance.

(c) REGIONAL STORM WATER CONTROL SYSTEMS

To allow for the beneficial development and maintenance of regional storm water management systems, where they are available and they are appropriate, an applicant may submit a design dependent on such a system. The applicant may submit documentation of the approval for the use of the regional storm water management facility from the governmental agency having jurisdiction over it. The applicant shall submit evidence showing that there will be no adverse flooding impact to any receiving stream between the point of discharge and the regional storm water facility. If the applicant is approved to use the regional storm water management system, the applicant may request exemption from the requirements in this section for permanent on site storm water controls from the Erosion Control Administrator. Such exemption shall not apply to any temporary storm water control measures required by this ordinance.

Sec. 7-7-4. MAINTENANCE OF CONTROL MEASURES

(a) EROSION, SEDIMENT, AND TEMPORARY STORM WATER CONTROL MEASURES

On-site sediment control measures shall be constructed and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.

Sediment control measures and temporary storm water control measures are to be maintained so they are operating effectively until permanent ground surface protection and permanent storm water control measures are established in a manner specified in the applicable permit issued pursuant to this ordinance.

Fully functioning temporary sediment control measures (including but not limited to perimeter sediment controls) shall remain in place until the ground is stabilized with permanent ground cover. The intent of the article is to keep the sites protected at all times until the ground is permanently stabilized. In cases where it is not practical to leave the temporary sediment control measures in place prior to establishing permanent ground cover (for example when control measures need to be removed in order to grade the area or install pavement or sod) an exception will be made only if one of the conditions listed below will be met. In no way does adhering to one of the conditions below relieve the owner of responsibility to clean-up or repair any damages caused from sediment or storm water run-off leaving the site.

1. Permanent ground cover shall be established with pavement, aggregate or sod within three (3) days of the removal of sediment barriers.
2. Permanent vegetation shall be established by seeding with anchored mulch within three (3) days of removal of sediment barriers during the spring or fall seeding periods. However, on project areas with sloped not exceeding five (5) percent, permanent vegetation shall be established by seeding within three (3) days of the removal of sediment barriers during the spring or fall seeding periods. Summer seeding is acceptable on project areas which shall be watered. This does not apply to concentrated flow areas.

(b) **ADDITIONAL CONTROL MEASURES**

The Erosion Control Administrator may require additional control measures pursuant to the Standards if determined as necessary after site inspection, and prior to issuing the permit.

Sec. 7-7-5. GENERAL EROSION AND SEDIMENT CONTROL PERMITS

Before commencing any project involving construction of any new single or two-family dwelling or commencing any project with an area of 5,000 square feet or greater, the owner of the land, or his representative, shall be required to file an application for a General Erosion and Sediment Control Permit, as either a Standard or Site Specific plan, except as otherwise provided in Section 7-7-2 and 7-7-6.

(1) APPLICATION

The applicant shall file the application with the Department on forms provided by the Department. The fee for a Standard plan application shall be in the amount of \$100.00 for each permit, and the fee for a Site Specific plan application shall be \$175.00 for each permit. However, no fee shall be required for any project the purpose of which is agricultural, or initiated by a local unit of government. There shall be no refund of any fees paid and no application shall be accepted for filing unless the fee has been paid in full.

(2) APPLICATION REVIEW

Review of a General Erosion and Sediment Control Permit application shall be limited to verifying that the required information and permit fee have been provided and that it meets the standards. The Erosion Control Administrator shall issue or deny an application by: a) approving the permit for a standard plan within two (2) working days of the filing of a complete application; or b) initiate the review process for a site specific plan and approve the same within five (5) working days of the filing of a complete application. If the permit is denied, it shall be returned to the applicant with a written explanation of its denial. The application shall be deemed approved if no response is made within the time frames provided above.

(3) DURATION

The general erosion and sediment control permit shall be issued for a period not exceeding two (2) years.

(4) CONTENT OF GENERAL EROSION AND SEDIMENT CONTROL PERMIT

The General Erosion Control permit shall contain at a minimum the following general conditions:

1. That written approval be obtained from the Erosion Control Administrator prior to making any modification to the erosion and sediment control plan as set forth in the application; and
2. That all control measures identified in the application shall be installed; and
3. That all control measures shall be maintained during construction; and
4. Such other conditions as the Erosion Control Administrator deems appropriate to ensure compliance with the specific requirements and the intent of this ordinance.

(5) PERMANENT GROUND SURFACE COVER

Under all circumstances, temporary control measures shall be maintained in accordance with Section 7-7-4. Without exception, all disturbed areas must have permanent ground cover within six months of project completion, or within six months of occupancy, whichever comes first.

Sec. 7-7-6. EROSION, SEDIMENT, AND STORM WATER CONTROL PERMITS

Before commencing any commercial, institutional, multi-family or industrial or industrial project with an area of more than one-half (½) acre; or a project requiring subdivision approval by a unit of local government with an area of more than one-half (½) acre, the owner of the land, or his representative, shall be required to file an application for an Erosion, Sediment, and Storm Water Control Permit.

(1) APPLICATION

The applicant shall file the application with the Department on forms provided by the Department. The applicant shall supply the number of copies of application documents as provided in the application. Each application shall be accompanied by the following information:

- a. Existing site conditions map. A map of existing site conditions on a scale of at least one- inch equals one hundred (100) feet, showing the site and immediately adjacent areas and the locations of the following site information:
 1. Site boundaries and adjacent lands which accurately identify site location;
 2. Lakes, streams, wetlands, channels, ditches, and other water courses on and immediately adjacent to the site;
 3. Floodways and/or Zone A of the Floodplain as determined on the Flood Insurance Rate Map (FIRM), and indicating the map panel number;
 4. All off-site drainage onto or through the project site;
 5. Location and dimensions of storm water management systems on or adjacent to site;
 6. Locations and dimensions of structures, roads, highways, easements and paved areas; and
 7. Site topography: show contours at vertical intervals as follows:
 - (a) Slope of six (6) percent or less, two (2) foot intervals.
 - (b) Slope of over six (6) percent but less than fifteen (15) per cent, five (5) foot intervals.
 - (c) Slope of over fifteen (15) percent, ten (10) or twenty (20) foot intervals.
- b. Plan of final site conditions. A plan of final site conditions drawn to the same scale as the existing site map submitted pursuant to Section 7-7-6(1)a, and which includes information to accurately depict post-construction appearance of site, e.g., paved areas, buildings, landscaping, and other changes to the site, along with other predominate site features, e.g., open areas, bodies of water.
- c. Sediment and Erosion control practices. A site construction plan including:
 1. Locations and dimensions of all proposed land disturbing activities;
 2. Locations and dimensions of all temporary soil and aggregate stockpiles;
 3. Location, dimensions and construction details of all construction site management control measures necessary to meet the requirements of this ordinance, and including proposed revegetation of disturbed areas;

4. Statement regarding provisions for maintenance and maintenance requirements of the construction site management control measures during construction;
- d. Storm water management plans and controls. Design calculations and information related to the permanent storm water management system for any project with a net increase of impervious area greater than one-half ($\frac{1}{2}$) of an acre. For the purposes of this section, the net increase is the cumulative change since the implementation of this ordinance, April 15, 1996. For example, in year 1, a commercial site increases the parking lot by 20,000 square feet. In year 2, the same commercial site adds a building with an area of 20,000 square feet. In year 1, no permanent storm water control measures (or calculations) are required by the ordinance. In year 2, storm water calculations shall be submitted and shall be based on the total increase of 40,000 square feet of impervious area. The following information shall also be provided by the applicant:
 1. A map showing the drainage area divides, including off-site drainage areas that drain into the site.
 2. Location and identification of soil types for entire watershed;
 3. Location and identification of vegetative cover for entire watershed;
 4. Run-off curve number calculations for both pre- and post-project conditions for all subwatersheds;
 5. Time of concentration calculations for both pre- and post-project conditions for all subwatersheds, and include a map showing hydraulic flow lengths used;
 6. Peak flow-rate calculations for 2 year and 25 year storms for both pre- and post-project conditions;
 7. Design calculations for detention basin outlets for both 2 year and 25 year storms, include stage-storage table and discharge rating curve data or outflow calculations (refer to optional form in Appendix A);
 8. Location dimensions, and construction details of proposed detention basins and outlets;
 9. Detention volume calculations;
 10. Summary of peak flow-rates for pre-, post- and proposed conditions with detention showing that the requirements of the ordinance are met (refer to optional form in Appendix A); and
 - e. Schedule or sequence of development or installation of the elements of the site management control measures proposed above.
 - f. A detailed estimate of quantities and estimated costs, prepared by a registered professional engineer, of all control measures required under this section.
 - g. A plan of the continued management and maintenance of such permanent control measures.
 - h. Application fee. An application fee shall be submitted at the time of application. The fee shall be in the amount of \$75.00 per acre with a minimum fee of \$300.00 and a maximum fee of \$3,000.00. However, no fee shall be required for any project the purpose of which is agricultural.

A fractional acre shall be rounded to the nearest whole acre. There shall be no refund of any fees paid and no application shall be accepted for filing unless the fee has been paid in full.

(2) APPLICATION REVIEW

Within five (5) working days of submittal of the application, the Erosion Control Administrator shall respond in writing to the sediment and erosion control practices portion. Within twenty (20) working days the Erosion Control Administrator shall respond to the storm water management plans and control portion of the application by either issuing a permit, issuing a request for additional information, or issuing a statement denying the permit with an explanation of cause. The application shall be deemed approved if no response is made within the time frames stipulated above.

(3) FINANCIAL SECURITY AGREEMENT

Before any Erosion Sediment and Storm Water Control Permit is issued, the applicant shall deliver to the Erosion Control Administrator a surety bond, irrevocable letter of credit, or executed escrow agreement in the name of Tazewell County for one hundred (100) percent of the applicant's engineer's estimated cost for all control measures required under this section. If the control measures are necessitated by construction which is also subject to Title 7, Chapter 2 of The Tazewell County Code, the applicant may submit one surety bond, irrevocable letter of credit, or executed escrow agreement to cover one hundred (100) percent of both the Control Measures required pursuant to this section and the improvements governed by Title 7, Chapter 2, Section 41(d). A signed contractor's bid that meets the specifications of the engineer's estimate for the work can be used to establish the amount of security required, if such estimate is accepted by the Erosion Control Administrator.

(4) DURATION

The Erosion Sediment and Storm Water Control Permit shall be issued for a period not exceeding two years.

(5) PERMIT CONDITIONS

The Erosion Sediment and Storm Water Control Permit shall contain at a minimum the following general conditions:

- a. The written approval shall be obtained from the Erosion Control Administrator prior to making any modification to the approved erosion and sediment control plan as set forth in the permit;
- b. That all control measures required in the permit shall be installed;
- c. That all control measures shall be maintained during construction;
- d. Such other conditions as the Erosion Control Administrator deems appropriate.

(6) PERMANENT GROUND SURFACE COVER

Without exception, all disturbed areas must have permanent ground cover within six months of project completion, or within six (6) months of occupancy, whichever comes first.

(7) FINAL INSPECTION-NOTICE OF PERMANENT STORM WATER CONTROL MEASURES

Within fourteen (14) days after completion of construction, the applicant may notify the Erosion Control Administrator that the permanent storm water control measures are ready for final inspection. If the inspection shows that the control measures and maintenance plan comply with the Standards in Appendix "A", the Erosion Control Administrator shall issue a Notice of Permanent Storm Water Control Measures. The owner shall record the Notice with the Tazewell County Recorder of Deeds within fifteen (15) days after the Notice is issued.

Sec. 7-7-7. MAINTENANCE OF PERMANENT STORM WATER CONTROL MEASURES

Anyone owning property with a permanent storm water control measure existing thereon and installed pursuant to this ordinance, shall maintain the control measures so that it functions in compliance with the Standards.

Sec. 7-7-8. ENFORCEMENT AND STOP WORK ORDER FEE

This chapter shall be administered and enforced by the Erosion Control Administrator, who shall make or cause to be made, periodic inspections of all work authorized by permits issued in accordance with this ordinance to insure that said construction is in compliance with the provisions of the same; he shall make or cause to be made, investigations of violations of this chapter and shall cause any violations to be corrected.

Any permit issued pursuant to this ordinance shall be revoked by the Erosion Control Administrator when he finds from personal inspection or from competent evidence that the rules, regulations, or standards under which said permit was issued are being violated. To defray costs of administering stop work orders posted by the field inspectors as a result of a violation of any of the terms of this ordinance, a fee of one hundred and fifty dollars (\$150.00) per violation will be charged and an additional ten dollars (\$10.00) will be charged per day as the violation exists.

Sec. 7-7-9. PENALTY

The violation of any of the terms of the ordinance shall constitute an offense punishable by a fine not to exceed five hundred dollars (\$500.00), with each day the violation remains uncorrected constituting a separate offense. Such fine is in addition to any other remedy provided by law.

Sec. 7-7-10. APPEALS BOARD

The Appeals Board shall consider and decide upon appeals of any decision, order, or requirement of the Erosion Control Administrator made pursuant to this ordinance.

- (1) The Appeals Board is hereby authorized to be established. Said Appeals Board shall consist of 5 members. Each County Board Chairman of the counties adopting this ordinance shall appoint one member, the Soil & Water Conservation Districts shall collectively appoint one member, and the Chairman of the Tri-County Regional Planning Commission shall appoint one member. The members shall be: professional engineers, licensed architects, licensed landscape architects, landscape contractors, earthmoving contractors, home builders, or citizens who have extensive experience in control of storm water and soil erosion. The 5 members on the first Appeals Board shall draw lots to establish terms of 1, 2, 3, 4, and 5 years, respectively. Thereafter, as terms expire, each appointment shall be for 5 years.
- (2) The Chairman of the Appeals Board shall be elected at the beginning of each calendar year from among the members by a majority of the members.
- (3) All decisions of the Appeals Board must receive the support of a majority of its members. A majority of the members of the Appeals Board shall constitute a quorum for the transaction of business; and all questions which shall arise at meetings shall be determined by the votes of the majority of members present. The Appeals Board shall keep minutes of its proceedings showing the vote of each member upon every question or if absent or failing to vote, indicating such facts, and shall keep records of its examinations and other official actions. Every rule, and every order, requirement, decision, or determination of the Appeals Board shall

immediately be filed in the office of the Board and shall be a public record. The concurring vote of three (3) members of Appeals Board shall be necessary to reverse any order, requirement, decision or determination of the Erosion Control Administrator. The Appeals Board shall adopt its own rules of procedure not in conflict with state law or this chapter.

Sec. 7-7-11. APPEALS TO APPEALS BOARD

Any person directly aggrieved by any decision, order, requirement, or determination of the Erosion Control Administrator made pursuant to this ordinance shall have the right to appeal such action to the Appeals Board. Such appeal shall be made within thirty-five (35) days from the date of the action appealed from, shall be filed in writing, and shall include a short, concise statement of why the action is being appealed. The fee for such an appeal shall be \$45.00 payable to the Commission and is due with the application. In addition, the person filing the appeal shall pay all required publication costs associated with the appeal.

Upon receipt of a notice of appeal, the Commission shall set a date for a public hearing before the Appeals Board. Such public hearing shall commence not sooner than 15 days nor more than 30 days after the date of receipt of the notice of appeal. At least 15 days notice of the time and place of such hearing shall be published in a newspaper of general circulation in the County. The Appeals Board shall decide the appeal within seven (7) days after the conclusion of the public hearing. The Appeals Board may affirm, modify or reverse any appealed action.

Sec. 7-7-12. APPEALS TO COURT

Appeals from the Appeals Board shall be made in conformity with the provisions of the Illinois Administrative Review Act, 735 ILCS 5/3-101 et seq. Copies of any orders or proceedings ordered by the appellant shall be furnished to him at his own cost.

The provisions and sections of this ordinance shall be deemed separable and the invalidity of any portion of this chapter shall not affect the validity of the remainder.

Upon adoption by the Tazewell County Board, this ordinance shall be in full force and effective on April 15, 1996.

WOODFORD COUNTY, ILLINOIS
EROSION, SEDIMENT AND STORM WATER
CONTROL ORDINANCE

Adopted: April 9, 1996
Effective: April 15, 1996

**WOODFORD COUNTY, ILLINOIS
EROSION, SEDIMENT, AND STORM WATER
CONTROL ORDINANCE**

Sec. 7.5-61. DEFINITIONS

[For the purposes of this article, the following words, terms and phrases shall have the meanings respectively ascribed to them in this section, unless the context clearly indicates otherwise.]

Adjacent lands: Surrounding land that may either impact a site, or be impacted by potential soil erosion, sediment and/or storm water run-off as a result of land disturbing activities conducted on a site and at a minimum is an area within fifty (50) feet of the site.

Appeals Board: The Erosion, Sediment and Storm Water Control Appeals Board.

Areas of concentrated flow or bodies of water: Any area where water may accumulate or flow, whether continual or as the result of a storm event, including but not limited to lakes, rivers, streams, creeks, ponds, ditches, swales, gullies, ravines, street gutters and other similar features.

Commission: The Tri-County Regional Planning Commission.

Control Measure: Any proposed temporary or permanent measures to be installed to control erosion, sediment and storm water run-off from a project area.

County: The County of Woodford, Illinois.

Department: The Woodford County Department Zoning.

Development: The division of a parcel of land into two or more parcels; the construction, reconstruction, conversion, structural alteration, relocation, or enlargement of any structure; any mining, excavation, landfill, or land disturbance; and any use or extension of the use of land.

Disturbed Area: Any area of land on which the pre-development ground surface will be affected or altered by the development activities. This includes but is not limited to grading, clearing, stock piling, tracking and other similar activities.

Erosion Control Administrator: The person appointed by the Woodford County Board to administer this ordinance.

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Flood Insurance Rate Maps (FIRM): Maps prepared by the federal emergency management agency (FEMA) that depict the special flood hazard areas (SFHA) within a community. These maps include insurance rate zones and floodplains and may or may not depict floodways.

Five year frequency storm event: The storm event rainfall depth during a 24 hour period which is exceeded, on the average, once every five (5) years.

Institutional use: A religious, or public use, such as a church, library, public or private school, hospital, or government owned or operated building, structure, or land used for public purpose.

Land disturbing activity: Any change in land, which may result in soil erosion from water or wind and the movement of sediments into State or County waters or on to lands in the County, or a change in the amount and/or intensity of storm water run-off, including but not limited to, the covering with an impervious surface, stockpiling, clearing, grading, excavating, rehabilitating, transporting, depositing or filling of land.

Normal agricultural practices: Activities associated with the preparation and tilling of land for the purposes of growing crops, or raising livestock, which may include, but are not limited to, the construction of conservation measures, plowing, disking, and cultivating.

Perimeter Control: Any control measure installed between the down slope side of the disturbed area and the property line and/or between the down slope side of the disturbed area and any area of concentrated flow.

Preproject condition: A condition that may impact erosion, sediment, or storm water run-off characteristics of a site prior to start of construction activity. The pre-project condition shall be based on the predominant land use for the past five years. For example, if a site has been cropland for four of the past five years and in grass just prior to development, the land use would be cropland for the pre-project condition.

Project: Any development involving modification to land which involves a land disturbing activity.

Regional storm water management system: A system which is designed, constructed and maintained to provide storm water control for multiple land owners.

Road: Any right-of-way that has been improved for the purposes of providing a surface for vehicular traffic, including any federal, state, county, township, and municipal controlled facilities.

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Single family dwelling: A building designed for or occupied by one family.

Site: The lot or parcel on which the project is to be developed.

Site Specific plan: A general erosion and sediment control permit required for projects where slope is greater than 10% and/or the site contains areas of concentrated flow or bodies of water. Slope shall be determined by the maximum slope indicated on the site according to the USDA Soil Survey or topographic survey as prepared by an Illinois Registered Surveyor.

Standards: The Illinois Environmental Protection Agency's Illinois Urban Manual, A Technical Manual Designed for Urban Ecosystem Protection and Enhancement published in 1995 and Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control published in 1988 by the Urban Committee of the Association of Illinois Soil and Water Conservation Districts now in effect, or as hereafter amended which is incorporated by reference herein, ~~and~~ the Woodford County standards for Stormwater Design Analyses, found at Appendix "A" of this article, and the erosion and sediment control criteria and specifications found in Appendix "B" of this ordinance.

Standard plan: A general erosion and sediment control permit for projects where slope is less than 10% and there are no areas of concentrated flow or bodies of water on or immediately adjacent to the site. Slope shall be determined by the maximum slope indicated on the site according to the USDA Soil Survey or topographic survey as prepared by an Illinois Registered Surveyor.

Substantial completion: The point at which all exterior work is completed and the site can be used for the use intended.

Twenty-five year frequency storm event: The storm event rainfall depth during a 24 hour period which is exceeded, on the average, once every twenty-five (25) years.

Two-family dwelling: A building designed for or occupied by two families.

Two year frequency storm event: The storm event rainfall depth during a 24 hour period which is exceeded, on the average, once every two (2) years.

Utility Service Line: The means by which utility service is provided to service users, such as electric, telephone, television cable; gas, water and sewer pipes.

Working day: Shall not include Saturday, Sunday or any holiday when the Woodford County Courthouse is closed.

Sec. 7.5-62. APPLICABILITY OF ARTICLE

This article shall apply to:

1. All projects within the boundaries and jurisdiction of the County. No land surface shall be disturbed unless an erosion and sediment control permit, or an erosion, sediment and storm water control permit has first been issued for that project, except as follows:
 - a. Land disturbing activities which do not involve the construction of any new single or two-family dwellings and for which the disturbed area is less than 5,000 square feet;
 - b. Normal agricultural practices; or
 - c. Routine maintenance of roads, access ways and utility service lines.

The Erosion Control Administrator reserves the right to require any non-agricultural, construction development activity, regardless of disturbed area or type of activity, to comply with this article if it is determined to be the cause of or a contributor to an existing or potential erosion, sediment, or storm water impact.

2. Any land within the boundaries and jurisdiction of the County on which there is located a permanent storm water control measure, which was installed pursuant to this ordinance.

Sec. 7.5-63. STANDARDS FOR DESIGN AND MAINTENANCE OF CONTROL MEASURES FOR SOIL EROSION, SEDIMENT AND STORM WATER

(a) EROSION AND SEDIMENT CONTROL MEASURES. All control measures required under this ordinance shall conform to the design criteria, standards, and specifications provided in the applicable standards now in effect or as hereafter amended. All control measures installed shall be sufficient to prevent sediment from leaving the permit site during a 5-year frequency storm event. Measures shall be taken to prevent sediment from leaving the site. When sediment does leave the site, the owner, developer or contractor shall remove the sediment within four hours or by no later than the end of the workday. For example, installing a rock construction drive, or cleaning tires could be used to minimize tracking of sediment onto public roads.

(b) PERMANENT STORM WATER CONTROL MEASURES. All storm water controls shall be designed so that the peak discharge rate from the permitted area resulting from the two-year and twenty-five year frequency storm events for the postproject condition do not exceed the corresponding storm event peak discharges for the preproject condition. Evaluation of submitted plans shall be based on the Storm Water Design Analysis Standards in Appendix "A" at the end of this article.

(c) REGIONAL STORM WATER CONTROL SYSTEMS. To allow for the beneficial development and maintenance of regional storm water management systems, where they are available and they are appropriate, an applicant may submit a design dependent on such a system. The applicant shall submit documentation of the approval for the use of the regional storm water management facility from the governmental agency having jurisdiction over it. The applicant shall submit evidence showing that there will be no adverse flooding impact to any receiving stream between the point of discharge and the regional storm water facility. If the applicant is approved to use the regional storm water management system, the applicant may request exemption from the requirements in this section for permanent on site storm water controls from the Erosion Control Administrator. Such exemption shall not apply to any temporary storm water control measures required by this article.

Sec. 7.5-64. MAINTENANCE OF CONTROL MEASURES

(a) EROSION, SEDIMENT, AND TEMPORARY STORM WATER CONTROL MEASURES. On-site sediment control measures shall be constructed and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.

Sediment control measures and temporary storm water control measures are to be maintained so they are operating effectively until permanent ground surface protection and permanent storm water control measures are established in a manner specified in the applicable permit issued pursuant to this article.

Fully functioning temporary sediment control measures (including, but not limited to perimeter sediment controls) shall remain in place until the ground is stabilized with permanent ground cover. The intent of the article is to keep the sites protected at all times until the ground is permanently stabilized. In cases where it is not practical to leave the temporary sediment control measures in place prior to establishing permanent ground cover (for example, when control measures need to be removed in order to grade the area or install pavement or sod), an exception will be made only if one of the conditions listed below will be met. In no way does adhering to one of the conditions below relieve the owner of responsibility to clean-up or repair any damages caused from sediment or storm water run-off leaving the site.

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1. Permanent ground cover shall be established with pavement, aggregate or sod within three days of the removal of sediment barriers.
2. Permanent vegetation shall be established by seeding with anchored mulch within three days of removal of sediment barriers during the spring or fall seeding periods. However, on project areas with slopes not exceeding five (5%) percent, permanent vegetation shall be established by seeding within three days of the removal of sediment barriers during the spring or fall seeding periods. Summer seeding is acceptable on project areas which shall be watered. This does not apply to concentrated flow areas.

(b) ADDITIONAL CONTROL MEASURES. The Erosion Control Administrator may require additional control measures pursuant to the Standards if determined as necessary after site inspection and prior to issuing the permit.

Sec. 7.5-65. GENERAL EROSION AND SEDIMENT CONTROL PERMITS

Before commencing any project involving construction of any new single or two-family dwelling or commencing any project with an area of 5,000 square feet or greater, the owner of the land, or his representative, shall be required to file an application for a General Erosion and Sediment Control Permit, as either a Standard Plan or a Site Specific plan, except as otherwise provided in Section 7.5-62 and Section 7.5-66.

(1) APPLICATION. The applicant shall file the application with the Department on forms provided by the Department. The fee for a Standard plan application shall be in the amount of \$100.00 for each permit, and the fee for a Site Specific plan application shall be \$150.00 for each permit. However, no fee shall be required for any project the purpose of which is agricultural, or initiated by a local unit of government. There shall be no refund of any fees paid and no application shall be accepted for filing unless the fee has been paid in full.

(2) APPLICATION REVIEW. Review of a General Erosion and Sediment Control Permit application shall be limited to verifying that the required information and permit fee have been provided and that it meets the standards. The Erosion Control Administrator shall issue or deny an application by: a) approving the permit for a standard plan within two (2) working days of the filing of a completed application; or b) initiate the review process for a site-specific plan and approve the same within five (5) working days of the filing of a complete application. If the permit is denied, it shall be returned to the applicant with a written explanation of its denial. The application shall be deemed approved if no response is made within the time frames provided above.

(3) DURATION. The general erosion and sediment control permit shall be issued for a period not exceeding two (2) years.

(4) CONTENT OF GENERAL EROSION AND SEDIMENT CONTROL

PERMIT. The General Erosion and Sediment Control permit shall contain at a minimum the following general conditions:

- a. That written approval be obtained from the Erosion Control Administrator prior to making any modification to the erosion and sediment control plan as set forth in the application; and
- b. That all control measures identified in the application shall be installed; and
- c. That all control measures shall be maintained during construction; and
- d. Such other conditions as the Erosion Control Administrator deems appropriate to ensure compliance with the specific requirements and intent of this article.

(5) PERMANENT GROUND SURFACE COVER. Under all circumstances, temporary control measures shall be maintained in accordance with Section 7.5-64. Without exception, all disturbed areas must have permanent ground cover within six months of project completion, or within six months of occupancy, whichever comes first.

Sec. 7.5-66. EROSION, SEDIMENT, AND STORM WATER CONTROL PERMITS

Before commencing any commercial, institutional, multi-family or industrial project with an area of more than one-half (1/2) acre; or a project requiring subdivision approval by a unit of local government with an area of more than one-half (1/2) acre, the owner of the land, or his representative, shall be required to file an application for an Erosion, Sediment, and Storm Water Control Permit.

(1) APPLICATION. The applicant shall file the application with the Department on forms provided by the Department. The applicant shall supply the number of copies of application documents as provided in the application. Each application shall be accompanied by the following information:

- a. Existing site conditions map. A map of existing site conditions on a scale, of at least one inch equals one hundred (100) feet, showing the site and immediately adjacent areas and the locations of the following site information:
 1. Site boundaries and adjacent lands which accurately identify site location;
 2. Lakes, streams, wetlands, channels, ditches, and other water courses on and immediately adjacent to the site;
 3. Floodways and/or Zone A of the Floodplain as determined on the Flood Insurance Rate Map (FIRM), and indicating the map panel number;
 4. All off-site drainage onto or through the project site;
 5. Location and dimensions of storm water management components on or adjacent to site;
 6. Locations and dimensions of structures, roads, highways, easements and paved areas; and

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7. Site topography: show contours at vertical intervals as follows:
 - (I) Slope of six (6) per cent or less, two-foot interval.
 - (II) Slope of over six (6) per cent but less than fifteen (15) per cent, five-foot interval.
 - (III) Slope of over fifteen (15) per cent, ten- or twenty-foot intervals.

- b. Plan of final site conditions. A plan of final site conditions drawn to the same scale as the existing site map submitted pursuant to subsection (1)a, and which includes information to accurately depict post-construction appearance of site, e.g., paved areas, building, landscaping, and other changes to the site, along with other predominate site features, e.g., open areas, bodies of water.

- c. Sediment and Erosion control practices. A site construction plan including:
 1. Locations and dimensions of all proposed land disturbing activities;
 2. Locations and dimensions of all temporary soil and aggregate stockpiles;
 3. Location, dimension and construction details of all construction site management control measures necessary to meet the requirements of this article and including proposed revegetation of disturbed areas;
 4. Statement regarding provisions for maintenance and maintenance requirements of the construction site management control measures during construction;

- d. Storm water management plans and controls. Design calculations and information related to the permanent storm water management system for any project with a net increase of impervious area greater than one-half (1/2) of an acre. For the purposes of this section, the net increase is the cumulative change since the implementation of this article, April 15, 1996. For example, in year 1, a commercial site increases the parking lot by 20,000 square feet. In year 2, the same commercial site adds a building with an area of 20,000 square feet. In year 1, no permanent storm water control measures (or calculations) are required by the ordinance. In year 2, storm water calculations shall be submitted and shall be based on the total increase of 40,000 square feet of impervious area. The following information shall also be provided by the applicant:
 1. A map showing the drainage area divides, including off-site drainage areas that drain into the site;
 2. Location and identification of soil types for entire watershed;
 3. Location and identification of vegetative cover for entire watershed;

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4. Run-off curve number calculations for both pre- and post-project conditions for all subwatersheds;
 5. Time of concentration calculations for both pre-and post-project conditions for all subwatersheds, and include a map showing hydraulic flow lengths used;
 6. Peak flow-rate calculations for 2 year and 25 year storms for both pre-and post-project conditions;
 7. Design calculations for detention basin outlets for both 2 year and 25 year storms, include stage-storage table and discharge rating curve data or outflow calculations (refer to optional form in Appendix A);
 8. Location dimensions, and construction details of proposed detention basins and outlets;
 9. Detention volume calculations;
 10. Summary of peak flow-rates for pre-, post- and proposed conditions with detention showing that the requirements of the ordinance are met (refer to optional form in Appendix A); and
- e. Schedule or sequence of development or installation of the elements of the site management control measures proposed above.
 - f. A detailed estimate of quantities and estimated costs, prepared by a registered professional engineer, of all control measures required under this section.
 - g. A plan of the continued management and maintenance of such permanent control measures.
 - h. Application fee. An application fee shall be submitted at the time of application. The fee shall be in the amount of twenty-five dollars (\$25.00) per acre with a minimum fee of one hundred dollars (\$100) and a maximum fee of \$2,000.00. However, no fee shall be required for any project the purpose of which is agricultural.

A fractional acre shall be rounded to the nearest whole acre. There shall be no refund of any fees paid and no application shall be accepted for filing unless the fee has been paid in full.

(2) APPLICATION REVIEW. Within five (5) working days of submittal of the application, the Erosion Control Administrator shall respond in writing to the sediment and

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erosion control practices portion. Within twenty (20) working days of submittal of the application, the Erosion Control Administrator shall respond to the storm water management plans and control portion of the application by either issuing a permit, issuing a request for additional information, or issuing a statement denying the permit with an explanation of cause. The application shall be deemed approved if no response is made within the time frames stipulated above.

(3) FINANCIAL SECURITY AGREEMENT. Before any Erosion, Sediment and Storm Water Control Permit is issued, the applicant shall deliver to the Erosion Control Administrator a surety bond, irrevocable letter of credit or executed escrow agreement in the name of Woodford County for one hundred (100) percent of the applicant's engineer's estimated cost for all control measures required under this section. If the control measures are necessitated by construction which is also subject to Chapter 20 of The Woodford County Code, the applicant may submit one surety bond, irrevocable letter of credit or executed escrow agreement to cover one hundred (100) percent of both the Control Measures required pursuant to this section and the improvements governed by Chapter 20, Section 20-24. A signed contractor's bid that meets the specifications of the engineer's estimate for the work can be used to establish the amount of security required, if such estimate is accepted by the Erosion Control Administrator.

(4) DURATION. The Erosion, Sediment and Storm Water Control Permit shall be issued for a period not exceeding two years.

(5) PERMIT CONDITIONS. The Erosion, Sediment and Storm Water Control Permit shall contain at a minimum the following general conditions:

- a. That written approval be obtained from the Erosion Control Administrator prior to making any modification to the approved erosion and sediment control plan as set forth in the permit;
- b. That all control measures required in the permit shall be installed;
- c. That all control measures shall be maintained during construction;
- d. Such other conditions as the Erosion Control Administrator deems appropriate.

(6) PERMANENT GROUND SURFACE COVER. Without exception, all disturbed areas must have permanent ground cover within six months of project completion, or within six months of occupancy, whichever comes first.

(7) FINAL INSPECTION; NOTICE OF PERMANENT STORM WATER CONTROL MEASURES. Within fourteen (14) days after completion of construction, the applicant shall notify the Erosion Control Administrator that the permanent storm water control measures are ready for final inspection. If the inspection shows that the control measures and maintenance plan comply with the Standards in Appendix "A" of this article, the Erosion Control Administrator shall issue a Notice of Permanent Storm Water Control Measures. The owner

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shall record the Notice with the Woodford County Recorder of Deeds within fifteen (15) days after the Notice is issued.

Sec. 7.5-67, MAINTENANCE OF PERMANENT STORM WATER CONTROL MEASURES.

Anyone owning property with a permanent storm water control measure existing thereon and installed pursuant to this ordinance shall maintain the control measure so that it functions in compliance with the Standards.

Sec. 7.5-68 ENFORCEMENT AND STOP WORK ORDER FEE.

This chapter shall be administered and enforced by the Erosion Control Administrator, who shall make or cause to be made, periodic inspections of all work authorized by permits issued in accordance with this ordinance to insure that said construction is in compliance with the provisions of the same; he shall make or cause to be made, investigations of violations of this chapter and shall cause any violations to be corrected.

Any permit issued pursuant to this ordinance shall be revoked by the Erosion Control Administrator when he finds from personal inspection or from competent evidence that the rules, regulations or standards under which said permit was issued are being violated. To defray costs of administering stop work orders posted by the field inspectors as a result of a violation of any of the terms of the ordinance, a fee of one hundred dollars (\$100) per stop work order will be charged.

Sec. 7.5-69. PENALTY.

The violation of any of the terms of the ordinance shall constitute an offense punishable by a fine not to exceed five hundred dollars (\$500.00), with each day the violation remains uncorrected constituting a separate offense. Such fine is in addition to any other remedy provided by law.

Sec. 7.5-70. APPEALS BOARD.

The Appeals Board shall consider and decide upon appeals of any decision, order, or requirement of the Erosion Control Administrator made pursuant to this article.

- (1) The Appeals Board is hereby authorized to be established. Said Appeals Board shall consist of 5 members. Each County Board Chairman of the counties adopting this ordinance shall appoint one member, the Soil & Water Conservation Districts shall collectively appoint one member, and the Chairman of the Tri-County Regional Planning Commission shall appoint one

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member. The members shall be: professional engineers, licensed architects, licensed landscape architects, landscape contractors, earthmoving contractors, home builders, or citizens who have extensive experience in control of storm water and soil erosion. The 5 members on the first Appeals Board shall draw lots to establish terms of 1, 2, 3, 4, and 5 years, respectively. Thereafter, as terms expire, each appointment shall be for 5 years.

The chairman of the Appeals Board shall be elected at the beginning of each calendar year from among the members by a majority of the members.

All decisions of the Appeals Board must receive the support of a majority of its members. A majority of the members of the Appeals Board shall constitute a quorum for the transaction of business; and all questions, which shall arise at meetings, shall be determined by the votes of the majority of members present. The Appeals Board shall keep minutes of its proceedings showing the vote of each member upon every question or if absent or failing to vote, indicating such facts, and shall keep records of its examinations and other official actions. Every rule, and every order, requirement, decision, or determination of the Appeals Board shall immediately be filed in the office of the Board and shall be a public record. The concurring vote of three (3) members of Appeals Board shall be necessary to reverse any order, requirement, decision or determination of the Erosion Control Administrator. The Appeals Board shall adopt its own rules of procedure not in conflict with State law or this chapter.

Sec. 7.5-71. APPEALS TO APPEALS BOARD.

Any person directly aggrieved by any decision, order, requirement, or determination of the Erosion Control Administrator made pursuant to this article shall have the right to appeal such action to the Appeals Board. Such appeal shall be made within thirty-five (35) days from the date of the action appealed from, shall be filed in writing, and shall include a short, concise statement of why the action is being appealed. The fee for such an appeal shall be \$45.00 payable to the Commission and is due with the application. In addition, the person filing the appeal shall pay all required publication costs associated with the appeal.

Upon receipt of a notice of appeal, the Commission shall set a date for a public hearing before the Appeals Board. Such public hearing shall commence not sooner than 15 days nor more than 30 days after the date of receipt of the notice of appeal. At least 15 days notice of the time and place of such hearing shall be published in a newspaper of general circulation in the County. The Appeals Board shall decide the appeal within seven (7) days after the conclusion of the public hearing. The Appeals Board may affirm, modify or reverse any appealed action.

Sec. 7.5-72. APPEALS TO COURT.

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Appeals from the Appeals Board shall be made in conformity with the provisions of the Illinois Administrative Review Act, 735 ILCS 5/3-101 et. seq. Copies of any orders or proceedings ordered by the appellant shall be furnished to him at his own cost.

Sec. 7.5-73. EFFECTIVE DATE.

Upon adoption by the Woodford County Board, these amendments shall be in full force and effect on April 15, 1996.

City of Belvidere
Section 151.45. Erosion and sediment control requirements
excerpted from
Chapter 151 Subdivisions Ordinance
Article III. Improvement, Reservation and Design Requirements

Sec. 151.45. Erosion and sediment control requirements.

The following abbreviations or acronyms will be used in this section: The City Of Belvidere will henceforth be the city; the Belvidere Department of Public Works will be BDPW; the Belvidere Building Department will be BBD; and the Boone County Soil and Water Conservation District will be BCSWCD.

Handbooks adopted by reference. The standards and specifications contained in the latest editions of the "Illinois Urban Manual - A Technical Manual for Urban Ecosystem Protection and Enhancement" and the "Procedures and Standards for Urban Soil Erosion and Sedimentation Control," commonly known as the green book, are hereby incorporated into this section and made a part hereof by reference for the purpose of delineating procedures and methods of operation under site development and erosion and sediment control plans.

(a) *Objective.* It is the objective of this section to control soil erosion and sediment caused by development activities, including clearing, grading, striping, excavating, and filling of land in the city. Measures taken to control soil erosion and offsite sediment runoff shall be adequate to assure that sediment is not transported from the site by a storm event of ten-year frequency or less. The following principles shall apply to all regulated development activities within the city and to the preparation of the submissions required of this section:

- (1) Plan the development to fit the particular topography, soils, drainage patterns, and natural vegetation of the site.
- (2) Preserve and protect areas of natural vegetation on the site.
- (3) Take special precautions to prevent damages which could result from development activity adjacent to watercourses, lakes, and wetlands.
- (4) Minimize the extent and duration of the area exposed at one time.
- (5) Apply temporary erosion control practices as soon as possible to stabilize exposed soils and prevent on-site damage.
- (6) Install sediment basins or traps, filter barriers, diversions, and perimeter control prior to site clearing and grading to protect disturbed areas from off-site and on-site runoff, and to prevent sediment damage to areas located downslope of the development site.
- (7) Keep runoff velocities low and provide for retention of runoff on the site.
- (8) Provide measures to prevent sediment from being tracked onto public or private roadways.

- (9) Implement final grading and install permanent vegetation on disturbed areas as soon as possible.
- (10) Implement through inspection, maintenance and follow-up program.

(b) *Site development.* Except as otherwise provided in this section, no person shall commence or perform any clearing, grading, stripping, excavating, or filling of land which meets the following provisions without having first obtaining approval for a complete set of construction plans, including a detailed erosion and sediment control plan from the BDPW and BCSWCD.

- (1) Any land disturbing activity (i.e., clearing, grading, stripping, excavation, fill or any combination thereof) that will affect an area in excess of 5,000 square feet.
- (2) Any land disturbing activity that will affect an area in excess of 500 square feet if the activity is within 100 feet of a lake, pond, stream, or wetland; or
- (3) Excavation, fill, or any combination thereof that will exceed 100 cubic yards.
- (4) The BPWD and/or the BBD, in consultation with the BCSWCD, reserves the right to require any non-agricultural, construction development activity, regardless of disturbed area or type of activity, to comply with this section if it is determined to be the cause of or a contributor to an existing or potential erosion, sediment, or stormwater impact.
 - a. Erosion and sediment control planning for individual home sites may utilize an erosion and sediment control planning "kit" provided by the BCSWCD.

(5) Exceptions:

- a. Agricultural use of land, including the implementation of conservation measures included in a farm conservation plan approved by the Boone County Soil and Water Conservation District (BCSWCD), and including the construction of agricultural structures;
- b. Installation, renovation, or replacement of a septic system to serve an existing dwelling or structure.

(c) *Application for approval of an erosion and sediment control plan.* Shall be made by the owner of the property or his/her authorized agent to the BDPW. Each application shall bear the name(s) and address(es) of the owner or developer of the site and of any consulting firm retained by the applicant together with the name of the applicant's principal contact at such firm, and shall be accompanied by a filing fee as indicated in the fee schedule on file at the BPWD. Each application shall require the signature of a licensed professional engineer as an assurance that the development will take place in accordance with the approved plans. Each application shall include certification that any land clearing, construction, or development involving the movement of earth shall be in accordance with the plans approved upon issuance of the permit.

- (1) *Submissions:* Each application for an approved erosion and sediment control plan shall be accompanied by the following information:

- a. Name and address of applicant, common address and legal description of the site where the development will take place, mailing address of property owner and the signature of the applicant or the applicant's agent.
- b. A vicinity map in sufficient detail to enable easy location in the field of the site for which the plan approval is sought, and including the boundary line and approximate acreage of the site, and a legend and scale. The legend shall describe or explain any and all map symbols, abbreviations, or acronyms used on the map.

The BPWD or BBD, in consultation with the BCSWCD, may waive specific requirements for the content of submissions upon finding that the information submitted is sufficient to show that the work will comply with the objectives and principles of this section.

- (c) A development plan of the site showing:
 1. Existing topography of the site and adjacent land within approximately 100 feet of the boundaries, drawn at no greater than two-foot contour intervals and clearly portraying the conformation and drainage pattern of the area. All topographic information drawn or shown on any map shall represent elevations acquired from site specific survey work, not a reproduction of United States Geologic Survey topographic maps or similar product. The scale of such maps shall not exceed one inch of map distance equaling 100 feet of ground distance. All elevations shall be referenced to National Geodetic Vertical Datum (NGVD) 1929 adjusted.
 2. The location of existing buildings, structures, utilities, streams, lakes, floodplains, wetlands, and depressions, drainage facilities, vegetative cover, paved areas, and other significant natural or man-made features on the site and adjacent land within 100 feet of the boundary.
 3. A general description of the predominant soil types on the site, their location, and their limitations for the proposed use. Such data shall be taken from the USDA Soil Survey of Boone County and/or the criteria established by local ordinance. The applicant may utilize a Natural Resource Information (NRI) report prepared by the Boone County Soil and Water Conservation District (BCSWCD) for this information.
 4. Proposed use of the site, including present development and planned utilization; areas of clearing, stripping, grading, excavation, and filling; proposed contours, finished grades, and street profiles; provisions for storm drainage, including storm sewers, swales, detention basins, and any other measures to control the rate of runoff, with a drainage area map indications of flow directions, and computations; kinds and locations of utilities; and areas and acreage proposed to be paved, covered, sodded or seeded, vegetatively stabilized, or left undisturbed. Any map

used to portray this information shall be prepared at the same scale as the topographic map referenced above.

- d. An erosion and sediment control plan, including a narrative, shall be submitted showing all measures necessary to meet the objectives of this section throughout all phases of construction. The development of a soil erosion and sediment control plan shall follow the requirements of this section and the procedures in the latest edition of the "Illinois Procedures and Standards for Urban Soil Erosion and Sediment Control" (commonly known as the green book), which is hereby incorporated into this section by reference. The BDPW, in consultation with the BCSWCD, may waive specific requirements for the content of submissions upon finding that the information submitted is sufficient to show that the work will comply with the objectives and principles of this section. Permanent erosion and sediment control features needed at the completion of any development site shall be included in the submittal. The submitted erosion and sediment control plan shall include:
1. Location and description, including standard details, of all sediment control measures and design specifics of sediment basins and traps, including outlet details.
 2. Location and description of all soil stabilization and erosion control measures, including seeding mixtures and rates, types of sod, method of seedbed preparation (type and extent of tillage, weed control, planting equipment, etc.), expected seeding dates, type, method and rate of lime and fertilizer application (soil fertility testing required), kind and quantity of mulching for both temporary and permanent vegetative control measures, and types of nonvegetative stabilization measures.
 3. Location and description of all runoff control measures, including diversions, waterways, and outlets.
 4. Location and description of methods to prevent tracking of sediment offsite, including construction entrance details, as appropriate.
 5. Description of dust and traffic control measures.
 6. Locations of stockpiles and description of stabilization methods.
 7. Description of offsite fill or borrow volumes, locations, and methods of stabilization.
 8. Provisions for maintenance of control measures, including type and frequency of maintenance, easements, and estimates of the cost of maintenance.

9. Identification (name, address, and telephone) of the person(s) or entity which will have legal responsibility for maintenance of erosion control structures and measures during development and after development is completed.
- e. The proposed phasing of development of the site, shall include stripping and clearing, rough grading, and construction, and final grading and landscaping. Phasing shall identify the expected date on which clearing will begin, the estimated duration of exposure of cleared areas, and the sequence of installation of temporary sediment control measures (including perimeter controls), clearing and grading, installation of storm drainage, paving streets and parking areas, final grading and the establishment of permanent vegetative cover, and the removal of temporary measures. It shall be the responsibility of the applicant to notify the city's public works department and/or their authorized review agent of any changes which occur in the site development schedule after the initial erosion and sediment control plan has been approved.

(d) *Bonds.* The applicant is required to file with the city a performance bond, letter of credit, or other improvement security satisfactory to the city's attorney in an amount deemed sufficient by the BDPW to cover all costs of improvements, landscaping, maintenance of improvements and landscaping, and soil erosion and sediment control measures for such period as specified by the city, and engineering and inspection costs to cover the cost of failure or repair of improvements installed on the site.

(e) *Review and approval.* Each application for an approved erosion and sediment control plan shall be reviewed and acted upon according to the following procedures:

- (1) As a condition of this section the BDPW shall require the applicant or designated agent to consult with the BCSWCD on soil erosion and sediment control plans. The applicant shall submit all required items to the district the same day that the application is made to BDPW.

The BCSWCD shall:

- a. Review the applicants soil erosion and sediment control plans and provide written evaluation to the BDPW regarding the adequacy (effectiveness) to address the provisions of this section. The BCSWCD shall retain the services of a certified professional in erosion and sediment control (CPESC) to perform the services outlined in this section. The BCSWCD may assess a fee to be paid by the applicant for performing these services.
- b. Attend a preconstruction meeting with the applicant or designated agent to review implementation of erosion and sediment control plans.
- c. Conduct on-site inspections during the active construction phases of land development projects to determine whether site development is in compliance with the approved erosion and sediment control plans, and determine adjustments needed to the approved plans. After construction has been completed, determine whether permanent site stabilization has been achieved and identify operation and maintenance needs.

- d. Prepare correspondence as needed regarding the effectiveness (or corrective measures needed) or adequacy of soil erosion and sediment control measures.
 - e. Consult with land developers, consultants, and contractors concerning the design criteria, installation and maintenance procedures and other information regarding conservation practices recommended under the provisions of this section.
- (2) The BDPW shall:
- a. After review of the application and required submissions if it is found to be in conformance with the provisions of this section, approve the erosion and sediment control plan.
 - b. Approve the erosion and sediment control plan subject to such reasonable conditions as may be necessary to secure substantially the objectives of this section, and issue the approval subject to these conditions; or
 - c. Disapprove the erosion and sediment control plan, indicating the deficiencies and the procedure for submitting a revised application and/or submission.
- (3) No approval for an erosion and sediment control plan shall be issued for an intended development site unless one or more of the following have been obtained:
- a. The development, including but not limited to subdivisions and planned unit development, has been approved by the city where applicable; or
 - b. Such permit is accompanied by or combined with a valid building permit issued by the city building inspector; or
 - c. The proposed earth moving is coordinated with any overall development program previously approved by the city for the area in which the site is situated; and
 - d. All relevant federal and state permits including, but not limited to: NPDES, 404, 401, NRI's, etc.) have been received for the portion of the site subject to soil disturbance;
 - e. Expiration of permit/appeals process.
- (f) *Design and operation standards and requirements.*
- (1) All clearing, grading, stripping, excavating, and filling which is subject to the approval requirements of this section shall be subject to the applicable standards and requirements set forth and/or referenced in this section.
- (2) Responsibility. The permittee shall not be relieved of responsibility for damage to persons or property otherwise imposed by law, and the city or its officers or agents, including the directors and staff of the BCSWCD will not be made liable for such damage, by:

- a. The issuance of a permit under this section;
 - b. Compliance with the provisions of that permit or with conditions attached to it by the city;
 - c. Failure of the city officials to observe or recognize hazardous or unsightly conditions;
 - d. Failure of the city officials to recommend denial of or to deny a permit; or
 - e. Exemptions from the permit requirements of this section.
- (3) Site design requirements. Practice standards and specifications for measures outlined in the soil erosion and sediment control plan shall follow criteria in the latest edition of the "Illinois Urban Manual: A Technical Manual Designed for Urban Ecosystem Protection and Enhancement", which is hereby incorporated into this section by reference.

The BDPW, in consultation with the BCSWCD, may waive specific requirements upon finding that the objectives and principles of this section have been met.

Onsite sediment control measures, as specified by the following criteria, shall be constructed and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.

- a. For disturbed areas draining less than one acre, filter barriers (including filter fences (heavy duty fabric only) or equivalent control measures shall be constructed to control all offsite runoff as specified in the referenced handbooks. Vegetated filter strips, with a minimum width of 35 feet, may be used as an alternative only where runoff is expected to be sheet flow (vegetated filter strips must be established prior to land disturbing activities).
- b. Filter barriers are appropriate sediment control measures for small drainage areas where concentrated flow is not present or expected.
- c. For disturbed areas draining more than one but less than five acres, a sediment trap or equivalent control measure shall be constructed at the downslope point(s) of the disturbed area(s). Sediment barriers such as silt fences are ineffective and unreliable in such situations. In particular, they are subject to undercutting and blowout due to high water velocities.
- d. For disturbed areas draining more than five acres, a sediment basin or equivalent control measure shall be constructed at the downslope point(s) of the disturbed area(s).
- e. Sediment basins and sediment traps designs shall provide for both detention storage and sediment storage. The detention storage shall be composed of equal volumes of "wet" detention storage and "dry" detention storage and each shall be sized for 25-year, 24-hour runoff from the site under maximum runoff conditions during construction. The release

rate of the basin shall be that rate required to achieve minimum detention times of at least ten hours. The elevation of the outlet structure shall be placed such that it only drains the dry detention storage.

- f. The sediment storage shall be sized to store the estimated sediment load generated from the site over the duration of the construction period with a minimum storage equivalent to the volume of sediment generated in one year. For construction periods exceeding one year, the one-year sediment load and a sediment removal schedule may be substituted.
- (4) Stormwater conveyance channels, including ditches, swales, and diversions, and the outlets of all channels and pipes shall be designed to withstand the expected flow velocity from the 100-year frequency storm without erosion. All constructed or modified channels shall be stabilized within 48 hours, consistent with the following standards:
- a. For grades up to four percent, seeding in combination with mulch, erosion blanket, or an equivalent control measure shall be applied. Sod or erosion blanket or mat shall be applied to the bottom of the channel.
 - b. For grades of four to eight percent, sod or an equivalent control measure shall be applied in the channel.
 - c. For grades greater than eight percent, rock, riprap, or an equivalent control measure shall be applied, or the grade shall be effectively reduced using drop structures.
- (5) Disturbed areas shall be stabilized with temporary or permanent measures within ten days following the end of active disturbance, or redisturbance, consistent with the following criteria:
- a. Temporary or permanent stabilization measures shall include seeding, mulching, sodding, and/or non-vegetative measures.
 - b. Areas having slopes greater than 12 percent shall be stabilized with sod, mat or blanket in combination with seeding. The use of any stabilization mat, blanket, or sod shall require the implementation of approved standards and specifications for installation procedures.
 - c. Whenever channel relocation is necessary, the new channel shall be constructed in the dry and be fully stabilized before flow is diverted.
- (6) Storm sewer inlets and culverts shall be protected by sediment traps or filter barriers meeting accepted design standards and specifications.
- (7) Soil storage piles containing more than ten cubic yards of material shall not be located with a downslope drainage length of less than 25 feet to a roadway or drainage channel. Filter barriers, including silt fence, or equivalent, shall be installed immediately around the perimeter of the soil storage pile(s).

- (8) If dewatering devices are used, discharge locations shall be protected from erosion. All pumped discharges including discharge water from basement sump pumps, shall be routed through appropriately designed sediment traps or basins or equivalent.
- (9) Each site shall have graveled (or equivalent) entrance roads, access drives, and parking areas of sufficient length and width to prevent sediment from being tracked onto public or private roadways. Any sediment reaching a public or private roadway shall be removed by shoveling or street cleaning (not flushing with water) before the end of each workday and transported to a controlled sediment disposal area.
- (10) All temporary and permanent erosion and sediment control practices shall be maintained and repaired as needed to assure effective performance of their intended function.
- (11) All temporary erosion and sediment control measures shall be disposed of within 30 days of final site stabilization is achieved with permanent soil stabilization measures. Trapped sediment and other disturbed soils resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.

(g) *Maintenance of control measures.* All soil erosion and sediment control measures installed to meet the requirements of this section shall be maintained by the applicant or subsequent land owner during the period of land disturbance and development of the site in a satisfactory manner to ensure adequate performance. The applicant or the contractor responsible for maintaining the erosion and sediment control practices shall inspect all such practices at least once every seven days or immediately following a precipitation event equal to or exceeding 1/2 inch of rainfall in a 24-hour period of time.

(h) *Inspections.* The BCSWCD shall make inspections as hereinafter required and shall either approve that portion of the work completed or shall notify the permittee wherein the work fails to comply with the site development or erosion and sediment control plan as approved. Plans for grading, stripping, excavating, and filling work bearing the stamp of approval of the city and BCSWCD shall be maintained at the site during progress of the work. In order to obtain inspections and to ensure compliance with the approved erosion and sediment control plan, the grading or building permit, and this section, the permittee shall notify the city and the BCSWCD within two (2) working days of the completion of the construction stages specified below:

- (1) Upon completion of installation of sediment and runoff control measures (including perimeter controls and diversions), prior to proceeding with any other earth disturbance or grading;
- (2) After stripping and clearing;
- (3) After rough grading;
- (4) After final grading;
- (5) After seeding and landscaping deadlines; and
- (6) After final stabilization and landscaping, prior to the removal of temporary sediment controls.

If stripping, clearing, grading, and/or landscaping are to be done in phases or areas, the permittee shall give notice and request inspection at the completion of each of the above work stages in each phase or area. If an inspection is not made and notification of the results given within five working days after notice is received by the city from the permittee, the permittee may continue work at his/her own risk, without presuming acceptance by the city. Notification of the results of the inspection shall be given in writing at the site. A duplicate copy shall be kept by the enforcing agency and/or the BCSWCD.

(i) *Special precautions.*

(1) If at any stage of the grading of any development site the city determines by inspection that the nature of the site is such that further work authorized by an existing permit is likely to imperil any property, public way, stream, lake, wetland, or drainage structure, the city may require, as a condition of allowing the work to be done, that such reasonable special precautions to be taken as are considered advisable to avoid the likelihood of such peril. "Special precautions" may include, but are not limited to, a more level exposed slope, construction of additional drainage facilities, berms, terracing, compaction, or cribbing, installation of plant materials for erosion control, and recommendations of a registered soils engineer, certified professional erosion and sediment control specialist, or licensed professional geologist which may be made requirements for further work.

(2) Where it appears that storm damage may result because the grading on any development site is not complete, work may be stopped and the permittee required to install temporary structures or take such other measures as may be required to protect adjoining property or the public safety. On large developments or where unusual site conditions prevail, the city may specify the time of starting grading or completion of, or may require that the operations be conducted in specific stages so as to insure completion of protective measures or devices prior to the advent of seasonal rains.

(j) *Amendments of plans.* Major amendments of the site development or erosion and sediment control plans shall be submitted to the BDPW and BCSWCD and shall be processed and approved or disapproved in the same manner as the original plans. Field modifications of a minor nature may be authorized by the BCSWCD by written authorization to the permittee.

(k) *Enforcement.*

(1) Stop-work order. In the event any person holding an approved erosion and sediment control plan pursuant to this section violates the terms of such approval, or carries on site development in such a manner as to materially, adversely affect health, welfare, or safety of persons residing or working in the neighborhood of the development site or so as to be materially detrimental to the public welfare or injurious to property or improvements in the neighborhood, the BPWD or BBD may suspend or revoke approved construction activity including, but not limited to: building permits, grading activity, road construction, or other construction related activities until such time that the approved erosion and sediment control plan is satisfactorily implemented and/or maintained.

- (2) Enforcement of violations of an approved plan shall be by a written stop-work order issued by the BDPW or the BBD and delivered to the permittee or his/her agent or the person performing the work. The stop-work order shall be effective immediately, shall state the specific violations cited, and shall state the conditions under which work may be resumed. Failure to follow an approved erosion and sediment control plan may be just cause to permanently suspend or revoked authorized construction activity or building permit until a hearing is held by the city's public works committee. Written notice of such hearing shall be served on the permittee, either personally or by registered mail at least five days prior to the date set for the hearing, and shall state:
- a. The grounds for complaint or reasons for suspension or revocation, in clear and concise language; and
 - b. The time when and place where such hearing will be held.

At such hearing, the permittee shall be given an opportunity to be heard and may call witnesses and present evidence on his or her behalf. At the conclusion of the hearing the public works committee shall determine whether the approved plan shall be suspended or revoked.

- (3) Violations and penalties. No person shall construct, enlarge, alter, repair, or maintain any grading, excavation or fill, or cause the same to be done, contrary to or in violation of any terms of this section. Any person violating any of the provisions of this section shall be deemed guilty of a misdemeanor, and each day during which any violation of any of the provisions of this section is committed, continued, or permitted shall constitute a separate offense. Upon conviction of any such violation, such person, partnership, or corporation shall be punished by a fine of not more than \$500.00 for each offense. In addition to any other penalty authorized by this section, any person, partnership, or corporation convicted of violating any of the provisions of this section shall be required to restore the site to the condition existing prior to the commission of the violation, or to bear the expense of such restoration.

(Code 1982, § 151.45; Ord. No. 788F, § 1, 5-17-93; Ord. No. 273G, § 1, 1-4-99)

Soil Erosion and Sediment Control Plan Review Boone County Soil and Water Conservation District

For Office Use Only	
Date Application was Received: / /	Was Application Complete: Yes / No
BCSWCD File Number: _____ - _____ - _____	
Plan Meets Technical Standards: Yes / No	<u>Comments:</u>
Erosion and Sediment Control Plan Reviewed By: _____	

	Applicant (Owner/Developer)	Erosion Control Consultant or Project Engineer
Name		
Address		
City/State/Zip		
Phone		
Fax		

Job site contact person: _____ Phone: (____) _____ - _____

Total Acreage of Site: _____ acres

Construction Start Date: Month: _____ Day: _____ Year: _____

Pre-Construction Conference Date: _____ / _____ / _____

Project Name: _____

Location for Access to Project Site: _____

The applicant agrees to the following conditions:

- 1) Submit all required information identified on the Erosion and Sediment Control Checklist or this ordinance.
- 2) Pay the applicable fee.
- 3) Notify representatives of the BCSWCD of the preconstruction meeting
- 4) Allow representatives of the BCSWCD the right to conduct on-site investigations throughout all active construction phases to determine whether erosion and sediment control practices are in compliance with the plan.
- 5) Upon commencement of earthwork or construction activity, the applicant will accurately document site inspections of erosion and sediment control practices, noting date and time of inspection, condition of all practices, and a description of any needed maintenance of practices.
- 6) Comply with the BCSWCD's written and verbal recommendations regarding: a) the erosion and sediment control plan or changes or corrections made thereto; b) installation and maintenance requirements.
- 7) If any changes occur to the plans, schedules, etc., the applicant shall be responsible for notifying the BCSWCD.

Applicant's Signature: _____ Date: _____ / _____ / _____

Erosion and Sediment Control Plan Checklist

The soil erosion and sediment control plan consists of a detailed drawing or set of drawings that identify the type and location of specific erosion and sediment control practices. An erosion and sediment control plan also includes a written narrative that describes the procedures, practices, standards, schedule, and methods of implementing the practices detailed on the maps or drawings as well as who is responsible for the implementation and maintenance of the practices. All details, plans, drawings, maps, methods and procedures shall be completed according to the ordinance in effect at the time of submittal. *(For development activity that is limited to construction of a single home, building, small commercial building or other non-agricultural construction activity, the applicant may utilize an erosion and sediment control planning kit provided by the BCSWCD.)*

An erosion and sediment control plan will not be accepted for review until all of the following information is submitted for each phase of any regulated land disturbance activity:

I. Information detailed on scaled drawings or site maps:

A. Existing site conditions and natural resources present, including:

- A vicinity map.
- Site boundaries and adjacent lands which accurately identify site location
- The location of all buildings, structures, roads, and utilities or utility easements, streams, lakes, floodplains, wetlands, depressions, drainage facilities (including grassed waterways, gullies or similar feature), vegetative cover, paved areas, and other significant natural, or man-made features on the site **and** such features located on adjacent land within 100 feet of the site boundaries.
- Show the limits of expected grading activity.
- Existing topography; drainage patterns; sub-watershed boundaries; critical erosion areas; and the location, size, type, and condition of any subsurface drainage tiles.
- Predominant soils or soil types as depicted by USDA-NRCS Soil Survey Map data.
- The location and dimension of any existing or planned onsite wastewater treatment systems (septic systems).
- A map legend that includes north arrow, scale, and description of all symbols, abbreviations, and acronyms detailed or used on the drawings or maps submitted.

B. Detailed erosion and sediment control plan, including:

- The location or placement of all permanent and temporary erosion and sediment control practices. Topographic and soils data are essential details. The practices need to be detailed on a map that includes topographic contours or, the topographic contours and drainage data shall be included on a mylar at the same scale as the map detailing the erosion and sediment control practices.
- Detailed drawings, installation or construction plans for all permanent and temporary erosion and sediment control practices. (these may be included as part of the accompanying narrative)
- The location and dimension of all temporary soil and aggregate stockpiles.
- The grading plan for the site area, showing all areas to be disturbed.
- Final site conditions, including: an accurate description of final grade (topographic depiction at a 1 to 2 foot contour interval); location, dimension, cross-sections and elevations of all (temporary and permanent stormwater management facilities (including sediment basins), plus all inlet and outlet locations; surface flow direction, including sheet flow and concentrated flow direction.

II. Information detailed in the narrative:

A. Narrative description, including standards and specifications, for all erosion and sediment control practices detailed on the erosion and sediment control plan, including:

- A brief narrative describing the number of planned construction phases. Include the expected length of time needed to complete each phase (number of weeks and days); the expected date that construction activity will begin; etc.
- A narrative description of all temporary and permanent erosion and sediment control practices planned for the site, and the appropriate installation and maintenance requirements for each practice. The appropriate information for most erosion and sediment control practices is found in the standards and specifications found in *section four* of the Illinois Urban Manual.

Include a specific reference to each detailed drawing or installation scheme (usually taken from the Illinois Urban Manual) for each erosion and sediment control practice identified in the erosion and sediment control plan. Any practices that are not referenced to the Illinois Urban Manual or local approved handbooks need to be explained and illustrated with detailed drawings.

- A narrative describing temporary and permanent seeding information, including: rates, species, planting dates, fertilization, and other relevant information.
- A narrative description detailing the methods and practices used to permanently stabilize the site after all construction is complete.
- Detailed calculations for design of temporary sediment basins.
- Stormwater runoff calculation, include pre-development and post-development calculations. Will the development site cause an increase in peak runoff rates? If applicable, will the increase cause streambank erosion or channel degradation downstream? Describe the strategy to control stormwater runoff.

B. **Implementation and maintenance schedule:**

- A schedule detailing when, how, and by whom the erosion and sediment control practices will be implemented.
- A narrative description of the inspection and maintenance schedule for all erosion and sediment control practices. This description shall indicate who is responsible for periodic inspection and maintenance of these practices.
- A complete cost estimate for implementing the erosion and sediment control plan including: erosion and sediment control materials; seeding establishment (both temporary and permanent seeding); installation costs; routine maintenance and inspection costs; etc. A detailed inventory listing the type and quantity of materials needed to implement the plan must accompany the cost estimate.

C. **Critical Areas, including:**

- A brief narrative describing any on-site or off-site areas that are sensitive to the effects of erosion or sedimentation. Such areas may include, but are not limited to: adjacent or onsite existing residential areas; slopes that exceed 8 percent in grade; slopes longer than 200 feet; waterways, streams, wetlands, or similar feature; side hill seeps, etc.

FEE SCHEDULE

Fee is based on acreage of the site

Base Fee: \$75 (One acre or less)

*Round acres to nearest whole number 160+ acres = 3\$ for each additional acre

Erosion and Sediment Control Program Fee Schedule															
Acres	Fee	Acres	Fee	Acres	Fee	Acres	Fee	Acres	Fee	Acres	Fee	Acres	Fee	Acres	Fee
1	75	21	820	41	1785	61	2085	81	2380	101	2580	121	2775	141	2875
2	90	22	870	42	1800	62	2100	82	2390	102	2590	122	2780	142	2880
3	105	23	920	43	1815	63	2115	83	2400	103	2600	123	2785	143	2885
4	120	24	970	44	1830	64	2130	84	2410	104	2610	124	2790	144	2890
5	135	25	1020	45	1845	65	2145	85	2420	105	2620	125	2795	145	2895
6	160	26	1070	46	1860	66	2160	86	2430	106	2630	126	2800	146	2900
7	185	27	1120	47	1875	67	2175	87	2440	107	2640	127	2805	147	2905
8	210	28	1170	48	1890	68	2190	88	2450	108	2650	128	2810	148	2910
9	240	29	1220	49	1905	69	2205	89	2460	109	2660	129	2815	149	2915
10	270	30	1270	50	1920	70	2220	90	2470	110	2670	130	2820	150	2920
11	320	31	1320	51	1935	71	2235	91	2480	111	2680	131	2825	151	2925
12	370	32	1370	52	1950	72	2250	92	2490	112	2690	132	2830	152	2930
13	420	33	1420	53	1965	73	2265	93	2500	113	2700	133	2835	153	2935
14	470	34	1470	54	1980	74	2280	94	2510	114	2710	134	2840	154	2940
15	520	35	1520	55	1995	75	2295	95	2520	115	2720	135	2845	155	2945
16	570	36	1570	56	2010	76	2310	96	2530	116	2730	136	2850	156	2950
17	620	37	1620	57	2025	77	2325	97	2540	117	2740	137	2855	157	2955
18	670	38	1670	58	2040	78	2340	98	2550	118	2750	138	2860	158	2960
19	720	39	1720	59	2055	79	2355	99	2560	119	2760	139	2865	159	2965
20	770	40	1770	60	2070	80	2370	100	2570	120	2770	140	2870	160	2970

SEND REQUIRED INFORMATION WITH FEE PAYABLE TO:

Boone County Soil and Water Conservation District
P.O. Box 218
8108 Appleton Road
Belvidere, Illinois 61008

Hours: M-F 8:00 a.m. - 4:30 p.m.
Phone: (815) 544-2677
Fax: (815) 544-4281
E-mail: bcsxcd@sltic.com

This review will be issued on a non-discriminatory basis without regard to race, color, religion, national origin, age gender, handicap or marital status. The Boone County Soil and Water Conservation District is a nonprofit organization.

STORMWATER DRAINAGE
AND DETENTION, SOIL EROSION
AND SEDIMENT CONTROL CODE
FOR THE
VILLAGE OF
CARBON CLIFF, ILLINOIS

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ARTICLE I

Authority and Purpose; Other Relevant Permitting; Applicability; Exemptions; Exceptions; and Separability:

Section 10 - Authority and Purpose: This ordinance is enacted pursuant to the police powers granted to the Village of Carbon Cliff, Illinois, by the Illinois Compiled Statutes, 65 ILCS 5/1-2-1, 5/11-12-12, 5/11/30-2, and 5/11/31-2.

The purpose of this ordinance is to diminish threats to public health and safety, protect property, prevent damage to the environment and promote public welfare by guiding, regulating, and controlling the design, construction, use, and maintenance of any new development or redevelopment or other activity which disturbs or breaks the topsoil or otherwise results in the movement of earth and/or changes the stormwater drainage pattern and/or stormwater flows from that which would have occurred if the land had been left in its natural state. This stormwater runoff and resulting soil erosion could result in the inundation of damageable properties, the erosion and destabilization of downstream channels, and the pollution of valuable stream and lake resources. One cause of increases in stormwater runoff quantity or rate and impairment of quality, and loss of valuable topsoil is the new development or redevelopment of the land. This ordinance regulates these activities to minimize adverse impacts.

This ordinance is adopted to accomplish the following objectives:

- a.) To assure that new development or redevelopment does not increase the drainage or flood hazards, or create unstable conditions susceptible to soil erosion;
- b.) To protect new buildings and major improvements to buildings from flood damage due to increased stormwater runoff and soil erosion;
- c.) To protect human life and health from the hazards of increased flooding and soil erosion on a watershed basis;
- d.) To lessen the burden on the taxpayer for flood control projects, repairs to flood-damaged public facilities and utilities, correction of channel erosion problems, and flood rescue and relief operations caused by stormwater runoff and soil erosion quantities from new development or redevelopment;
- e.) To protect, conserve, and promote the orderly development of land and soil, water, air, animal, and plant resources;
- f.) To preserve the natural hydrologic and hydraulic functions of watercourses, wetlands and flood plains for protecting water quality, and enhance stormwater management and aquatic habitats;
- g.) To preserve the natural characteristics of stream corridors in order to manage flood and stormwater impacts, improve water and groundwater quality, reduce soil

erosion, protect aquatic and riparian habitat, maintain quality forest resources, provide recreational opportunities, provide aesthetic benefits, enhance community and economic development.

Section 11 - Other Relevant Permitting: Before a Development Permit under this ordinance becomes effective, all required Federal, State, and Local permits will have been received for the site subject to new development or redevelopment. The acquisition of these permits shall be the sole responsibility of the applicant. These may include but are not limited to Section 404 of the Clean Waters Act; Section 106 of the National Historic Preservation Act; Section 10 of the Rivers and Harbors Act; or permitting required by the Illinois Department of Natural Resources, Office of Water Resources in accordance with the Rivers, Lakes and Streams Act, 615 ILCS; the Soil and Water Conservation Districts Act, 70 ILCS; the Farmland Preservation Act, 505 ILCS; the Illinois Groundwater Protection Act, 415 ILCS; and the National Pollutant Discharge Elimination System Permit (NPDES) and Section 401 of the Clean Water Act thru the Illinois Environmental Protection Agency, Division of Water Pollution Control; and the Threatened and Endangered Species Act, 16 USC 1531 ET. SEQ. Compliance is also required with but not limited to the Zoning Ordinance of the Village of Carbon Cliff, Illinois, and the Uniform Building Code, most recent edition adopted by the Village, Chapter on Excavation and Grading.

Section 12 - Applicability: This ordinance shall apply to all new development or redevelopment in the Village. Except as otherwise provided in this ordinance, no person, firm or corporation, public or private, the State of Illinois and its agencies or political subdivisions, the United States of America, and its agencies or political subdivisions, any agent, servant, officer or employee of any of the foregoing which meets the following provisions or is otherwise exempted in this ordinance, shall not commence any development activities without first having obtained a development permit from the Zoning Officer.

12.01 - Any new development or redevelopment that will include an area that will meet or exceed ten thousand (10,000) square feet of total impervious surface (i.e., streets, roof, patio or parking area or any combination thereof); or

12.02 - Any land disturbing activity (i.e., clearing, grading, stripping, excavation, fill, or any combination thereof) that will affect an area that will meet or exceed ten thousand (10,000) square feet or that will exceed 100 cubic yards; or

12.03 - Any land disturbing activity greater than 500 square feet if the activity is within 100 feet of a river, lake, pond, stream, abandoned mine, or wetland; and is done in conjunction with sub sections 12.01 or 12.02; or

12.04 - Any land disturbing activity on the sloping side of the slope disturbance line and is in conjunction with sections 12.01, 12.02, or 12.03; or

12.05 - Any tree cutting or mechanized land clearing where the tree, native to Northwestern Illinois, is in excess of eight (8) inches in diameter and is done in conjunction with Article I, Sections 12.01, 12.02, 12.03 or 12.04.

12.06 - The construction of one single family dwelling that is not constructed as part of a residential development shall not be subject to the provisions of this ordinance regarding permanent stormwater control measures.

12.07 – The Village in consultation with the Rock Island County Soil and Water Conservation District (RISWCD), reserves the right to require any non-agricultural, construction development activity, regardless of disturbed area or type of activity, to comply with this ordinance if it is determined to be the cause of or a contributor to an existing or potential erosion, sediment, or stormwater impact.

- a.) Soil erosion and sediment control planning for individual home sites may utilize a soil erosion and sediment control planning “kit” provided by the Rock Island County Soil and Water Conservation District.

Section 13 - Exemptions: A development permit shall not be required for the following:

- a.) Any new development, redevelopment or other activity falling below the minimum standards as set forth in Article I, Section 12.
- b.) The agricultural use of land, including the implementation of conservation measures included in a farm conservation plan approved by the Natural Resources Conservation Service, and including the construction of agricultural structures.
- c.) The maintenance of any existing stormwater drainage/detention component or structure or any existing soil erosion/sediment control component or structure; including dredging, levee restoration, tree removal or other function which maintains the original design capacities of the above.
- d.) The construction of, improvements to, or the maintenance of any street, road, highway or interstate highway performed by any unit of government whose powers grant such authority.

Section 14 - Variances: The Board of Appeals, after a public hearing, may determine and vary the requirements and regulations of this ordinance in harmony with its general purpose and intent, where the Board of Appeals make written findings of fact in accordance with the standards herein after prescribed and further, find that there are practical difficulties or particular hardships in the way of carrying out the strict letter of requirements and regulations of this ordinance.

14.01 - Application for variance shall be made by a verified petition of the applicant for a development permit, stating fully the grounds of the petition and the facts relied upon by the applicant. Such petition shall be filed with the development permit application. Each application for a variance shall be made in writing and filed with the Zoning Officer. The Zoning Officer and the Village Engineer will review and transmit recommendations to the Board of Appeals, which shall review such recommendations prior to granting or denying the variance.

14.02 – Standards for variance. The Board of Appeals shall not vary the requirements and regulations of this ordinance, as authorized in this section, unless there is evidence presented to it in each specific case:

14.021 - The land is of such shape or size or is affected by such physical conditions or is subject to such title limitations of record, that it is impossible or impractical for the applicant to comply with all of the requirements of this ordinance;

14.022 - The variance is necessary for the preservation and enjoyment of a substantial property right of the applicant; and

14.023 - The granting of the variance will not be detrimental to the public welfare, environment or injurious to other property in the vicinity of the subject's property.

14.03 - The Board of Appeals shall hold a public hearing on each application for variance, in accordance with Article XV subsection 157.022 of the Village of Carbon Cliff Zoning Ordinance. Within thirty (30) days after the public hearing, the Board of Appeals shall either approve the site development permit application with the variances and conditions it deems necessary or it shall disapprove such development permit application and variance application or it shall take other such action as appropriate.

Section 15 - Responsibility: The applicant shall not be relieved of responsibility for damage to persons or property otherwise imposed by law, and the Village or its officers or agents, including the directors and staff of the Rock Island County SWCD will not be made liable for such damage, by (1) the issuance of a development permit under this ordinance, (2) compliance with the provisions of that development permit or conditions attached to it by the Zoning Officer (3) failure of the Village of Carbon Cliff Officials to observe or recognize hazardous or unsightly conditions, (4) failure of the Village officials to recommend denial or to deny a development permit, or (5) exemptions from development permit requirements of this ordinance.

Article II - Definitions:

Section 20 - Definitions: For the purposes of this ordinance certain terms are defined and set forth below:

20.01 - Abandoned Mine: An abandoned mine is a large excavation in the earth that is no longer being used. These conditions make such areas unstable and susceptible to subsidence and surface collapse. Subsurface excavations and fractures in the bedrock may channel runoff water to public or private water supplies, making those sources especially susceptible to groundwater contamination.

20.02 - Adverse Impacts: Any negative impact on plant, soil, air or water resources affecting their beneficial uses including recreation, aesthetics, aquatic habitat, quality, and quantity.

20.03 - Applicant: Any person, firm, or governmental agency who executes the necessary forms to procure official approval of a development or permit to carry out construction of a new development or re-development from the Village of Carbon Cliff, Illinois.

20.04 - Base Flood Elevation: The elevation at all locations delineating the level of flooding resulting from the 100-year frequency flood event, which has a one percent (1%) probability of being equaled or exceeded in any given year. The base flood elevation at any location is defined in Article III, Section 38.03. of Ordinance No. 85-35, The Village of Carbon Cliff Zoning Ordinance.

20.05 – Board of Appeals: “ Board of Appeals” shall mean the Zoning Board of Appeals of the Village of Carbon Cliff, Illinois, with the jurisdiction as set forth in Article XV, Section 152, of ordinance No. 85-35, “Village of Carbon Cliff Zoning Ordinance.”

20.06 – Building Official: Is the officer or other designated authority charged with the administration and enforcement of the Uniform Building Code for the Village of Carbon Cliff, Illinois.

20.07 - Building Permit: A permit issued by the Village of Carbon Cliff, Illinois, for the construction, erection or alteration of a structure or building and the related ground and surface preparation prior to and after completion of construction, erection or alteration of a structure or building.

20.08 - Bypass Flows: Stormwater runoff from upstream properties tributary to a property's drainage system but not under its control.

20.09 - Certify or Certification: Formally attesting that the specific inspections and tests were performed, and that such inspections and tests comply with the applicable requirements of this ordinance.

20.10 - Channel: Any defined river, stream, creek, brook, branch, natural or artificial depression, ponded area, on-stream lake or impoundment, abandoned mine, flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or manmade drainageway, which has a definite bed and bank or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

20.11 - Channel Modification: Alteration of a channel by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, riprapping (or other armoring), filling, widening, deepening, straightening, relocating, lining, and significant removal of bottom or woody rooted vegetation. Channel modification does not include the man-made clearing of debris or removal of trash.

20.12 - Clearing: Any activity, which removes the natural vegetative ground cover.

20.13 - Compensatory Storage: An artificially excavated, hydraulically equivalent volume of storage within the floodplain used to balance the loss of natural flood storage capacity when fill or structure are placed within the floodplain.

20.14 - Conduit: Any channel, pipe, sewer or culvert used for the conveyance or movement of water, whether open or closed.

20.15 – County: County of Rock Island, Illinois.

20.16 - Cubic Yard: A one- (1) yard by one (1) yard by one (1) yard amount of material in excavation and/or fill.

20.17 - Detention Basin: A facility constructed or modified to provide for the temporary storage of stormwater runoff and the controlled release by gravity of this runoff at a prescribed rate during and after a flood or storm.

20.18 - Detention Time: The amount of time stormwater is held within a detention basin.

20.19 - Development: Any manmade change to real estate or property, including:

- a.) The division or subdivision of any duly recorded parcel of property;
- b.) Construction, reconstruction or placement of a building or any addition to a building valued at more than one thousand dollars (\$1,000);
- c.) Installation of a manufactured home on a site, preparing a site for a manufactured home, or installing a travel trailer on a site for more than 180 days per year;
- d.) Construction of roads, bridges, or similar projects;
- e.) Redevelopment of a site;
- f.) Filling, dredging, grading, clearing, excavating, paving drilling, mining or other non-agricultural alterations of a ground surface;
- g.) Storage of materials or deposit of solid or liquid waste;
- h.) Any other activity that might alter the magnitude, frequency, direction, or velocity of stormwater flows from a property.

20.20 - Drainage Plan: A plan, including engineering drawings and supporting calculations, which describes the existing stormwater drainage system and environmental features, including grading, as well as proposed alterations or changes to the drainage system and environment of a property.

20.21 - Dry Basin: A detention basin designed to drain after temporary storage of stormwater flows and to normally be dry over much of its bottom area.

20.22 - Erosion: The general process whereby soil or earth is moved by rainfall, flowing water, wind or wave action.

20.23 - Excavation: Any act by which organic matter, earth, sand, gravel, rock or any other similar material, is cut into, dug, quarried, uncovered, removed, displaced, re-located or bulldozed and shall include the conditions resulting from such actions.

20.24 - Excess Stormwater Runoff: The volume and rate of flow of stormwater discharged from a new development or re-development, which is or will be in excess of that volume and rate which existed before development or re-development.

20.25 - Existing Grade: The vertical location of the existing ground surface prior to excavation or filling.

20.26 - Fill: Any act by which earth, sand, gravel, rock, or any other material, is deposited, placed, replaced, pushed, dumped, pulled, transported or moved by man to a new location and shall include the conditions resulting therefrom.

20.27 - Final Grade: The vertical location of the ground surface after grading work is completed in accordance with the engineering plans.

20.28 - Flood Fringe: That area as designated by the Federal Emergency Management Agency (FEMA) on either side of the floodway. This area is subject to inundation from the base flood but conveys little or no flow.

20.29 - Flood Hazard Boundary Map (FHBM): A very generalized map prepared by the Federal Emergency Management Agency (FEMA) which shows only where floodplains are located based on very basic data. FHBM's do not include base flood elevations.

20.30 - Flood Insurance Rate Map (FIRM): A map prepared by the Federal Emergency Management Agency (FEMA) that depicts the special flood hazard area (SFHA) within a community. This map includes insurance rate zones and regulatory floodplains and may or may not depict regulatory floodways.

20.31 - Floodplain: That land adjacent to a body of water with ground surface elevations at or below the base flood or the 100-year frequency flood elevation which is subject to inundation. The floodplain as designated by the Federal Emergency Management Agency (FEMA) is also known as the Special Flood Hazard Area (SFHA). This area is the collective combination of the regulatory floodway and the flood fringe.

20.32 - Floodway: The channel and that portion of the floodplain, including on-stream lakes, adjacent to a stream or watercourse which is needed to store and convey the anticipated existing and future 100-year frequency flood discharge with no more than a 0.1 foot increase in stage due to any loss of flood conveyance or storage and no more than a ten percent (10%) increase in velocities.

20.33 - Grading: The excavation or fill or any combination thereof and shall include the conditions resulting from any excavation or fill.

20.34 - Hydrograph: A graph showing for a given location on a stream or conduit, the flow rate with respect to time.

20.35 - Hydrograph Method: This method estimates runoff volume and runoff hydrographs for the point of interest by generating hydrographs for individual subareas, combining them, and

routing them through stream lengths and reservoir structures. Factors such as rainfall amount and distribution, runoff curve number, time of concentration, and travel time are included.

20.36 - Impervious Surface: That area of property that is covered by materials other than soil and vegetation and that has no intended capacity to absorb stormwater, such as parking lots, driveways, sidewalks, patios, tennis courts, roofs and other structures.

20.37 - Infiltration: The passage or movement of water into the soil surfaces.

20.38 - Loessal Soil: A sediment, commonly non-stratified and unconsolidated, composed predominately of silt sized particles with accessory clay and sand.

20.39 - Lot: An individual platted parcel in an approved subdivision.

20.40 - Major Drainage System: That portion of a drainage system needed to store and convey flows beyond the capacity of the minor drainage system.

20.41 - Minor Drainage System: That portion of a drainage system designed for the convenience of the public. It consists of street gutters, storm sewers, small open channels, and swales and, where manmade, is to be designed to handle the 10-year runoff event.

20.42 - Mitigation: Mitigation is when the prescribed controls are not sufficient and additional measures are required to offset the development, including those measures necessary to minimize the negative effects which stormwater drainage and development activities might have on the public health, safety and welfare. Examples of mitigation include, but are not limited to compensatory storage, soil erosion and sedimentation control, and channel restoration.

20.43 - Natural: Conditions resulting from physical, chemical, and biological processes without intervention by man.

20.44 - Natural Drainage: Channels formed in the existing surface topography of the earth prior to changes made by unnatural causes.

20.45 - One Hundred-Year Event: A rainfall, runoff, or flood event having a one percent (1%) probability of equaled or exceeded in any given year. A 24-hour storm duration is assumed unless otherwise noted.

20.46 - Parcel: All contiguous land in one ownership.

20.47 - Peak Flow: The maximum rate of flow of water at a given point in a channel or conduit.

20.48 - Permittee: Any person to whom a building permit or a development permit is issued.

20.49 - Person: Any individual, firm or corporation, public or private, the State of Illinois and its agencies or political subdivisions, the United States of America, and its agencies or political subdivisions, and any agent, servant, officer or employee of any of the foregoing.

20.50 - Plan Commission: Plan Commission shall mean the Plan Commission of the Village of Carbon Cliff, Illinois, as created and with the jurisdiction as set forth in Article XV, Section 153, of ordinance No. 85-35, "Village of Carbon Cliff Zoning Ordinance."

20.51 - Positive Drainage: Provision for overland paths for all areas of a property including depressional areas that may also be drained by storm sewer.

20.52 - Prime Farmland: Prime farmland is land that is best suited to food, feed, forage, fiber and oilseed crops. It may be cropland, pasture, woodland, or other land, but it is not urban and built up land or water areas. It is either used for food or fiber or is available for those uses. The soil qualities, growing season and moisture supply are those needed for a well-managed soil to economically produce a sustained high yield of crops. Prime farmland produces the highest yields with minimum inputs of energy and economic resources, and farming it results in the least damage to the environment.

20.53 - Property: A parcel of real estate.

20.54 - Retention Basin: A facility designed to completely retain a specified amount of stormwater runoff without release except by means of evaporation, infiltration, emergency bypass or pumping.

20.55 – Rock Island County SWCD/RICSWCD: Rock Island County Soil & Water Conservation District.

20.56 - Sedimentation: The process that deposits soils, debris, and other materials either on other ground surfaces or in bodies of water or stormwater drainage systems.

20.57 - Site: A parcel of land, or a contiguous combination thereof, where grading work is performed as a single unified operation.

20.58 - Slope Disturbance Line: The line which delineates relatively level building areas from areas where slopes exceed 7 percent (7%) and where special precautions must be taken.

20.59 - Stormwater Drainage System: All means, natural and manmade, used for conducting stormwater to, through or from a drainage area to the point of final outlet from a property. The stormwater drainage system includes but is not limited to any of the following: conduits and appurtenance features, canals, channels, ditches, streams, culverts, streets, storm sewers, detention basins, swales and pumping stations.

20.60 - Stormwater Runoff: The waters derived from melting snow or rain falling within a tributary drainage basin which are in excess of the infiltration capacity of the soils of that basin, which flow over the surface of the ground or are collected in channels or conduits.

20.61 - Storm Sewer: A closed conduit for conveying collected stormwater.

20.62 - Stream: Any river, creek, brook, branch, flowage, ravine, or natural or man-made drainageway which has a definite bed and banks or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

20.63 - Stripping: Any activity which removes the vegetative surface cover including tree removal, by spraying or clearing, and storage or removal of topsoil.

20.64 – Ten-Year Event: A runoff, rainfall, or flood event having a ten percent (10%) chance of occurring in any given year. A 24 hour storm duration is assumed unless otherwise note.

20.65 - Time of Concentration: The elapsed time for stormwater to flow from the most hydraulically remote point in a drainage basin to a particular point of interest in that watershed.

20.66 - Tributary Watershed: All of the land surface area that contributes runoff to a given point.

20.67 – Two-Year Event: A runoff, rainfall, or flood event having a fifty percent (50%) chance of occurring in any given year. A 24-hour storm duration is assumed unless otherwise noted.

20.68 - Vacant: Land on which there are no structures or only structures which are secondary to the use or maintenance of the land itself.

20.69 – Village: Village of Carbon Cliff, Illinois.

20.70 – Village Attorney: Attorney for the Village of Carbon Cliff, Illinois.

20.71 – Village Engineer: Engineer for the Village of Carbon Cliff, Illinois.

20.72 - Watershed: All land area drained by, or contributing water to, the same stream, creek, ditch, lake, marsh, stormwater facility, groundwater or depressional area.

20.73 - Wet Basin: A detention basin designed to maintain a permanent pool of water after the temporary storage of stormwater runoff.

20.74 - Wetlands: Wetlands are defined by regulation as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." For general, but not inclusive locations of designated wetlands refer to mapping prepared jointly by the U.S. Department of Interior, Fish and Wildlife Service and the Illinois Department of Natural Resources, Office of Resource Conservation; National Wetlands Inventory Mapping, 1987. More specific wetland information is published in the Rock River Wetlands Special Area Management Plan, by the Bi-State Regional Commission in cooperation with the Natural Resources Conservation Service (NRCS), the US Fish and Wildlife Service and the US Army Corps of Engineers. The applicant may be required to provide a field investigation by a qualified wetland delineator.

20.75 – Zoning Officer: Zoning Officer for the Village of Carbon Cliff, Illinois, with the powers and duties as set forth in Article XV, Section 151, of Ordinance No. 85-35, "Village of Carbon Cliff Zoning Ordinance."

Article III- Stormwater Drainage and Detention:

Section 30 - Drainage Plan Submittal Requirements: Each applicant shall submit the following information, to ensure that the provisions of this ordinance are met. The submittal shall include sufficient information to evaluate the environmental characteristics of the property, the potential adverse impacts and benefits of the development on water resources both on-site and off-site, and the effectiveness of the proposed drainage plan in managing stormwater runoff, and meet the provisions of Article I, Section 11. The applicant shall certify on the drawings that all clearing, grading, drainage, and construction shall be accomplished in strict conformance with the drainage plan. The following information shall be submitted for both existing and proposed property conditions for all new developments or re-developments that meet or exceed the minimum requirements of Article I, Section 12.

30.01 - Drainage Plan Requirements: A topographic survey of the property at two-foot (2) contours unless otherwise specified or approved by the Village Engineer. The plan map shall be keyed to a consistent datum specified by the Village. If the mapping is compiled using a digital format and the Global Positioning System (GPS), the applicant will provide both paper and digital copies including GPS points.

30.011 - Mapping and Descriptions: An existing drainage and proposed drainage plan for the property and one hundred (100) feet surrounding the property at a scale of not more than one hundred (100) feet to one (1) inch, and including the following: Unless otherwise specified by the Village Engineer

- a.) Property boundary, dimensions, and approximate acreage;
- b.) Building setback lines;
- c.) All existing and proposed structures and sizes;
- d.) Square feet of existing and proposed impervious surface;
- e.) All existing, or proposed easements;
- f.) All existing, abandoned, or proposed water or monitoring wellhead locations;
- g.) All sanitary or combined sewer lines and septic systems;
- h.) The banks and centerline of streams and channels;
- i.) Shoreline of lakes, ponds, and detention basins with normal water level elevation;
- j.) Farm drains and tiles;
- k.) Soils classifications;

- l.) Location, size and slope of stormwater conduits and drainage swales;
- m.) Depressional storage areas;
- n.) Detention facilities;
- o.) Roads, streets and associated stormwater inlets including finished grades;
- p.) Base flood elevation, flood fringe, and regulatory floodway;
- q.) Basis of design for the final drainage network components;
- r.) A statement giving any applicable engineering assumptions and calculations;
- s.) A vicinity map showing the relationship of the site to its general surroundings at a scale of not less than two thousand (2,000) feet to one (1) inch (1:24,000);
- t.) Title, scale, north arrow, legend, seal of Licensed Professional Engineer, date, and name of person preparing plans;
- u.) Cross-section data for open channel flow paths and designated overland flow paths;
- v.) Direction of storm flows;
- w.) Flow rates and velocities at critical points in the drainage system;
- x.) A statement by the design engineer of the drainage system's provision for handling events greater than the 100 year, 24 hour runoff;
- y.) A statement of certification of all drainage plans, calculations, and supporting data by a Licensed Professional Engineer;
- z.) Abandoned mine location and type; and
- aa.) Subwatershed boundaries within the property.

30.012 - Environmental Features: A depiction of environmental features of the property and immediate vicinity including the following:

- a.) The limits of designated regulatory and non-regulatory wetland areas;
- b.) The location and limits of abandoned mining activity;
- c.) The location of trees greater than eight (8) inches in diameter;
- d.) Any designated natural areas, prime farmland; and

- e.) Any proposed environmental mitigation features.

Section 31 - Minimization of Increases in Runoff Volumes and Rates: In the selection of a drainage plan for a new development or redevelopment, the applicant shall evaluate and implement site design features which minimize the increase in runoff volumes and rates from the site and addresses the water quality treatment requirements of this ordinance. The applicant's drainage plan submittal shall include evaluations of site design features which are consistent with the following hierarchy:

- a.) Preservation of regulatory floodplains, flood prone and wetland areas;
- b.) Minimize impervious surfaces on the property, consistent with the needs of the project;
- c.) Attenuate flows by use of open vegetated swales and natural depressions and preserves the existing natural stream channel;
- d.) Infiltration of runoff on-site;
- e.) Provide stormwater retention structures;
- f.) Provide wet or wetland detention structures;
- g.) Provide dry detention structures; and
- h.) Construct storm sewers.

Section 32 - Water Quality and Multiple Uses: The drainage system should be designed to minimize adverse surface and groundwater quality impacts off-site and on the property itself. Detention basins shall incorporate design features to capture stormwater runoff pollutants. In particular, designers shall give preference to wet bottom and wetland type designs and all flows from the development shall be routed through the basin (i.e. low flows shall not be bypassed). Detention of stormwater shall be promoted throughout the property's drainage system to reduce the volume of stormwater runoff and to reduce the quantity of runoff pollutants.

The drainage system should incorporate multiple uses where practicable. Uses considered compatible with stormwater management include open space, aesthetics, aquatic habitat, recreation (boating, fishing, trails, playing fields), wetlands and water quality mitigation.

Section 33 - Design Criteria, Standards, and Methods:

33.01 - Release Rates: The drainage system for new developments or redevelopments shall be designed to control the peak rate of discharge from the property for the 2 year, 24 hour and 100 year, 24 hour events to pre project levels which will not cause an increase in flooding or channel instability downstream when considered in aggregate with other developed properties and downstream drainage capacities. The peak discharge rate from events less than or equal to the 2

year, 24 hour event and the peak discharge rate for the 100-year, 24 hour event shall be determined by the Village Engineer.

33.011 - Detention Basin Outlet Design: Backwater on the outlet structure from the downstream drainage system shall be addressed when designing the outlet.

33.02 - Detention Storage Requirements: The design maximum storage to be provided in the detention basin shall be based on the runoff from the runoff difference before and after development from the 100 year, 24 hour event. All detention basin storage shall be computed using Hydrograph Methods utilizing reservoir routing (also called modified pulse or level pool) or equivalent method as described in Section 33.04.

33.03 - Drainage System Design and Evaluation: The following criteria should be used in evaluating and designing the drainage system. The design will provide capacity to pass the 10 year, 24 hour peak flow in the minor drainage system and an overload flow path for flows in excess of the design capacity. Whenever practicable, the stormwater systems shall not result in the interbasin transfer of drainage unless no other alternative exists.

33.031 - Design Methodologies: Major and minor conveyance systems for areas up to 10 acres, may be designed using the Rational Formula. The Rational Formula may also be used in sizing the minor drainage system for larger sites up to 100 acres. Runoff hydrograph methods as described in Section 33.04 must be used for major drainage system design for all systems with greater than 10 acres of drainage area and for the design of all detention basins.

33.032 - Positive Drainage: Whenever practicable, all developments must be provided an overland flow path that will pass the 100 year, 24 hour flow at a stage at least one (1) foot below the lowest foundation grade in the vicinity of the flow path. Overland flow paths designed to handle flows in excess of the minor drainage system capacity shall be provided drainage easements. Street ponding and flow depths shall not exceed curb heights.

33.04 - Methods for generating runoff hydrographs: Runoff hydrographs shall be developed incorporating the following assumptions of rainfall amounts and antecedent moisture.

33.041 - Rainfall: Unless a continuous simulation approach to drainage system hydrology is used, all design rainfall events shall be based on the Illinois State Water Survey's Bulletin 70. The first quartile point rainfall distribution shall be used for the design and analysis of conveyance systems with critical durations less than or equal to 12 hours. The third quartile point rainfall distribution shall be used for the design and analysis of detention basins and conveyance system with critical durations greater than 12 and less than or equal to 24 hours. The fourth quartile distribution shall be used in the design and analysis of systems with durations greater than 24 hours. The first, third, and fourth quartile distributions described by Huff are presented in Table 37 of Bulletin 70. Refer to Table 13 of Bulletin 70 for rainfall depth, duration, and frequency. The NRCS Type II distribution may be used as an alternate to the Huff distributions.

33.042 - Antecedent Moisture: Computations of runoff hydrographs, which do not rely on a continuous accounting of antecedent moisture conditions, shall use wet antecedent moisture condition as a minimum.

33.05 - Agriculture Tiles and Sanitary Sewers: Connections to sanitary sewers or existing agricultural stormwater management system (tiles) shall not be permitted for new developments. However, in exceptional circumstances and with the approval of the Village Engineer, connections to existing agricultural stormwater management systems may be allowed if the applicant demonstrates that the existing system, has adequate hydraulic capacity, and structural integrity. Additionally, development meeting the criteria in Section 33 shall either obtain a maintenance agreement or deed or plat restriction covering the entire downstream drain tile in accordance to be determined of this ordinance before a connection to that system is permitted. Field tile systems disturbed during the process of land development must be reconnected by those responsible for their disturbance unless the approved drainage plan incorporates the tiles in the land development design.

33.06 - Wet Detention Basin Design: Wet detention basins shall be designed to remove stormwater pollutants, to be safe, to be aesthetically pleasing, and as much as feasible to be available for recreational use.

33.061 - Wet Basin Depths: Wet basins shall be at least three feet deep, excluding near-shore banks and safety ledges. If fish habitat is to be provided they shall be at least ten (10) feet deep over twenty-five (25%) percent of the bottom area to prevent winterkill.

33.062 - Wet Basin Shoreline Slopes: The side slopes of wet basins at the normal pool elevation shall not be steeper than five to one (5 to 1 horizontal to vertical). It is recommended that native aquatic vegetation be established around the perimeter to provide protection from shoreline erosion.

33.063 - Permanent Pool Volume: The permanent pool volume in a wet basin at normal depth shall be equal to the runoff volume from its watershed for the 2 year, 24-hour event as a minimum.

33.064 - Wet Basin Inlet and Outlet Orientation: The distance between detention inlets and outlets shall be maximized. Inlets and outlets shall be at opposite ends of the basin providing that the orientation does not create undue hardship based on topography or other natural constraints. Designers are encouraged to use baffles or berms in the basin bottom to prevent short-circuiting. There shall be no low flow bypass between the inlet and outlet. Paved low flow channels shall not be used. The minimum flow length shall be ten (10) feet with a recommended minimum ratio of two to one (2:1) for width.

33.07 - Dry Detention Basin Design: In addition to the other requirements of this ordinance, dry basins shall be designed to remove stormwater pollutants, to be safe, to be aesthetically pleasing and as much as feasible to be available for multiple uses.

33.071 - Dry Basin Drainage: Dry basins shall be designed so that eighty percent (80%) of their bottom area shall have standing water no longer than seventy-two (72) hours for any runoff event less than the 100-year, 24 hour event. Grading plans shall clearly distinguish the wet portion of the basin bottom. Underdrains directed to the outlet may be used to accomplish this requirement.

33.072 - Velocity Dissipation: Velocity dissipation measures shall be incorporated into dry basin designs to minimize erosion at inlets and outlets and to minimize resuspension of pollutants.

33.073 - Dry Basin Inlet and Outlet Orientation: Shall be the same as Article III, Section 33.064.

33.074 - Temporary Sediment Trap: A sediment trap shall be constructed at each major inlet to a dry basin during construction. The temporary sediment trap should be designed in accordance with criteria in the Illinois Urban Manual.

33.08 - Existing Depressional Areas: Existing depressional storage volume will be maintained and the volume of detention storage provided to meet the requirements of this ordinance shall be in addition to existing storage.

33.09 - Minimum Detention Outlet Size: Where a single pipe outlet or orifice plate is to be used to control discharge, it shall have a minimum diameter of twelve (12) inches. If design release rates call for smaller outlets, a design that minimizes the possibility of clogging shall be used. Minimum outlet restrictor size shall be 4" provided there is adequate downstream capacity. Detention volumes for a development shall be dictated by adherence to the release rates specified in Section 33.01.

33.10 - Detention in Flood Plains: The placement of detention basins within the flood plain is strongly discouraged because of questions about their reliable operation during flood events. However, the stormwater detention requirements of this ordinance may be fulfilled by providing detention storage within flood fringe areas on the project site provided the following provisions are met as well as compliance with Article I, Section 11.

33.1001 - Detention in Flood Fringe Areas: The placement of a detention basin in a flood fringe area shall require compensatory storage for 1.5 times the volume below the base flood elevation occupied by the detention basin including any berms. The release from the detention storage provided shall still be controlled consistent with the requirements of this section. The applicant shall demonstrate its operation for all stream-flow and flood plain backwater conditions. Excavations for compensatory storage along watercourses shall be opposite or adjacent to the area occupied by detention. All flood plain storage lost below the existing ten-year flood elevation shall be replaced below the existing ten-year elevation. All flood plain storage lost above the existing ten-year flood elevation shall be replaced above the existing ten-year flood elevation. All compensatory storage excavations shall be constructed to drain freely and openly to the watercourse and comply with Article I, Section 11.

33.1002 - Detention on Prime Farmland: The placement of detention basins shall avoid the utilization of prime farmland. All detention basin construction shall examine potential impacts to adjacent agricultural land and shall address measures that will be implemented to eliminate such impacts and comply with Article I, Section 11.

33.1003 - Detention in Floodways: Detention basins shall be placed in the floodway only in accordance with Article III, Section 33.1004.

33.1004 - On-Stream Detention: On-stream detention basins are discouraged but allowable if they provide regional public benefits and if they meet the other provisions of this ordinance with respect to water quality and control of the 2 year and 100 year, 24 hour events from the property. Further

criteria are presented in Article III, Section 34 of this ordinance. If on-stream detention is used in watersheds larger than one square mile, the applicant will use hydrographic modeling to demonstrate that the design will not increase the water level for any properties upstream or downstream of the property. Also, impoundment of the stream as part of on-stream detention:

- a.) Shall not prevent the migration of indigenous fish species, which require access to upstream areas as part of their life cycle, such as for spawning;
- b.) Shall not cause or contribute to the degradation of water quality or stream aquatic habitat;
- c.) Shall include a design calling for gradual bank slopes, appropriate bank stabilization measures, and a pre-sedimentation basin;
- d.) Shall not involve any stream channelization or the filling of wetlands;
- e.) Shall require the implementation of an effective non-point source management program throughout the upstream watershed which shall include as a minimum: runoff reduction "Best Management Practices" (BMP's) consistent with Article III, Section 31; 2 year, 24 hour detention / sedimentation basins for all development consistent with Article III, Section 33.074;
- f.) Shall not occur downstream of a wastewater discharge;
- g.) Shall not contribute to the duration or flood frequency of any adjacent land, and
- h.) Shall comply with Article I, Section 11.

33.11 - Drainage Into Wetlands, Rivers, Streams, Lakes, Ponds, and Depressional Storage Areas: Wetlands, lakes, ponds and depressional storage areas shall be protected from damaging modifications and adverse changes in runoff quality and quantity associated with land developments. In addition to the other requirements of this ordinance, the following requirements shall be met for all developments whose drainage flows into wetlands, rivers, lakes, ponds or depressional storage areas:

33.1101 -Detention in Wetlands, Rivers, Streams, Lakes, Ponds or Depressional Storage Areas: Existing wetlands, rivers, lakes, ponds or depressional storage areas shall not be modified for the purposes of stormwater detention unless it is demonstrated that the proposed modifications will maintain or improve its habitat and ability to perform beneficial functions and shall comply with Article I, Section 11. Existing storage and release rate characteristics of wetlands, rivers, lakes, ponds or depressional storage areas shall be maintained and the volume of detention storage provided to meet the requirements of this section shall be in addition to this existing storage.

33.1102 - Sediment Control: The existing wetlands, rivers, lakes, ponds, or depressional storage areas shall be protected during construction and as further regulated in Article IV of this ordinance, and shall not be filled.

33.1103 - Alteration of Drainage Patterns: Site drainage patterns shall not be altered to substantially decrease or increase the existing area tributary to wetlands, rivers, lakes, ponds or depressional storage areas. Drainage patterns shall not be altered by development to direct runoff offsite to other than natural drainage outlets existing prior to development.

33.1104 - Detention/Sedimentation: All runoff from the development shall be routed through a preliminary detention/sedimentation basin designed to capture the two-year, 24-hour event and hold it for at least 24 hours, before being discharged to the wetland, river, lake, pond, or depressional storage area. This basin shall be constructed before property grading begins and shall be maintained throughout the construction process. In addition, the drainage hierarchy defined in Article III, Section 30 should be followed to minimize runoff volumes and rates being discharged to the wetland, river, stream, lake, pond, or depressional storage area and as further regulated in Article II and Article IV of this ordinance.

33.1105 - Vegetated Buffer Strip: A buffer strip of at least 25 feet in width, preferably vegetated with native plant species, shall be maintained or restored around the periphery of a wetland, river, stream, lake, pond or depressional storage area.

33.1106 - Loessal Soils: Care must be taken to avoid open flow discharges of stormwater over silt (Loessal) soils due to high potential for erosion.

33.1107 - Abandoned Mines: The following requirements apply for new developments or re-developments where abandoned mines are determined to be present:

- a.) A stormwater detention basin shall not be placed in or over an abandoned mine;
- b.) Stormwater detention basins shall not be located closer than one hundred (100) feet from the opening of an abandoned mine;
- c.) The outflow from a stormwater detention basin, channel, ditch or any stormwater runoff generated as a result of a new development or redevelopment shall not empty into or be directed, redirected by any means into or through any abandoned mine;
- d.) If, after the review of the stormwater drainage plan, the Village Engineer may determine that more detailed information is required, a abandoned mine evaluation may be required. A abandoned mine evaluation which addresses the geologic, engineering and environmental factors resulting from a new development or redevelopment be performed by a professional with experience and expertise in abandoned mine topography, whom shall certify the results of the evaluation. This evaluation shall be the responsibility of the applicant and performed at no cost to the Village. After a review of this evaluation and with the consultation of the Rock Island Soil and Water Conservation District, the Village Engineer may either approve or disapprove the drainage plan as submitted;
- e.) Whenever an abandoned mine is discovered or it becomes apparent that the abandoned mine has not yet been identified, it shall be reported to the Rock Island Soil and Water Conservation District; and

f.) Shall comply with Article I, Section 11.

33.12 - Street Detention, Parking Lot Detention, and Culvert Drainage:

33.1201 - Street Detention: If streets are to be used as part of the minor or major drainage system, ponding depths shall not exceed curb heights and shall not remain flooded for more than eight (8) hours for any event less than or equal to the 100 year, 24 hour event.

33.1203 - Parking Lot Detention: The maximum stormwater ponding depth in any parking area shall not exceed six (6) inches for more than four (4) hours.

33.1203 - Culvert, Road and Driveway Crossings: Sizing of culvert crossings shall consider entrance and exit losses as well as tailwater conditions on the culvert.

33.13 - Infiltration Practices: To effectively reduce runoff volumes, infiltration practices including basins, trenches, and porous pavement and shall follow criteria in the Illinois Urban Manual with Article I, Section 11. An appropriate sediment control device shall be provided to remove coarse sediment from stormwater flows before they reach infiltration basins or trenches. Stormwater shall not be allowed to stand more than seventy-two hours over eighty percent of the dry basin's bottom area for the maximum design event to be ex-filtrated. The bottom of infiltration basins or trenches shall be a minimum of three feet above the seasonally high groundwater and bedrock level. Engineering calculations demonstrating infiltration rates shall be included with the application.

33.1301 - Vegetated Filter Strips and Swales: To effectively filter stormwater pollutants and promote infiltration of runoff, sites should be designed to maximize the use of vegetated filter strips and swales, shall be designed to follow criteria in the Illinois Urban Manual. Whenever practicable, runoff from impervious surfaces should be directed onto filter trips and swales comprised of native grasses and forbs before being routed to a storm sewer or detention basin.

33.14 - Safety Considerations: The drainage system components, especially all detention basins, shall be designed to protect the safety of any children or adults coming in contact with the system during runoff events and shall comply with Article I, Section 11.

33.1401 - Side Slopes: The side slopes of all detention basins at 100 year, 24 hour capacity shall be as level as practicable to prevent accidental falls into the basin and for stability and ease of maintenance. Side slopes of detention basins and open channels shall not be steeper than three (3) to one (1) (horizontal to vertical).

33.1402 - Safety Ledge: All wet detention basins shall have a level safety ledge at least four feet in width 2.5 to 3 feet below the normal water depth.

33.1403 - Velocity: Velocities throughout the surface drainage system shall be controlled to safe levels taking into consideration rates and depths of flow.

33.1404 - Overflow Structures: All stormwater detention basins shall be provided with an overflow structure capable of safely passing excess flows at a stage at least one foot below the

lowest foundation grade in the vicinity of the detention basin. The design flow rate of the overflow structure shall be equivalent to the 100 year, 24-hour inflow rate.

33.15 - Maintenance Considerations: The stormwater drainage system shall be designed to minimize and facilitate maintenance. Turfed side slopes shall be designed to allow lawn-mowing equipment to easily negotiate them. Wet basins shall be provided with alternate outflows, which can be used to completely drain the pool for sediment removal. Pumping may be considered if drainage by gravity is not feasible. Pre-sedimentation basins shall be included, where feasible, for localizing sediment deposition and removal. Site access for heavy equipment shall be provided. Use of native vegetation is strongly encouraged to reduce maintenance, increase wildlife habitat, and to provide other benefits.

33.1501 - A maintenance plan for the ongoing maintenance of all stormwater management system components including wetlands is required prior to plan approval. The plan shall include:

- a.) Maintenance tasks;
- b.) The party responsible for performing the maintenance tasks;
- c.) A description of all permanent public or private access maintenance easements and overland flow paths, and compensatory storage areas; and
- d.) A description of dedicated sources of funding for the required maintenance.

Section 34 - Accommodating Flows From Upstream Tributary Areas: Stormwater runoff from areas tributary to the property shall be considered in the design of the property's drainage system. Whenever practicable, flows from upstream areas that are not to be detained should be routed around the basin being provided for the site being developed.

34.01 - Upstream Areas Not meeting Ordinance Requirements: When there are areas not meeting the storage and release rates of this ordinance, tributary to the applicant's property, regionalized detention on the applicant's property shall be explored by the applicant. The following steps shall be followed:

- a.) The applicant shall compute the storage volume needed for his property using the release rates of Article III, Section 33, the applicant's property area, and the procedures described in Article III, Section 32;
- b.) Areas tributary to the applicant's property, not meeting the storage and release rate requirements of this ordinance, shall be identified; and
- c.) Using the areas determined above plus the applicant's property area, total storage needed for the combined properties shall be computed.

Allowable release rates shall be computed using the combined property areas. Storage shall be computed as described in Article III, Section 33. If tributary areas are not developed, a reasonable

fully developed land cover, based on local zoning, shall be used for the purposes of computing storage.

Once the necessary combined storage is computed the Village may choose to pay for over-sizing the applicant's detention basin to accommodate the regional flows. The applicant's responsibility will be limited to the storage for his property as computed above. If regional storage is selected by the Village then the design produced in Article III, Section 32 shall be implemented. If regional storage is rejected by the Village the applicant shall bypass all tributary area flows around the applicant's basin whenever practicable. If the applicant must route upstream flows through his basin and the upstream areas exceed one-square mile in size, the applicant must meet the provision of Section 33.1004 for on-stream basins.

34.02 - Upstream Areas Meeting Ordinance Requirements: When there are areas which meet the storage and release rate requirements of this ordinance, tributary to the applicant's property, the upstream flows shall be bypassed around the applicant's detention basin if this is the only practicable alternative. Storage needed for the applicant's property shall be computed as described in Article III, Section 34.01. However, if the Village decides to route tributary area flows through an applicant's basin, the final design stormwater releases shall be based on the combined total of the applicant's property plus tributary areas. It must be shown that at no time will the runoff rate from the applicant's property exceed the allowable release rate for his/her property alone.

Section 35 - Early Completion of Detention Facilities: Where detention, retention, or depressional storage areas are to be used as part of the drainage system for a property, they shall be constructed as the first element of the initial earthwork program. Any eroded sediment captured in these facilities shall be removed by the applicant on a regular basis and before project completion in order to maintain the design volume of the facilities.

Section 36 - Fee in Lieu of Detention: All new development or redevelopment not exceeding fifteen thousand (15,000) square feet of impervious surface may pay a fee of \$10,000 for each acre-foot of detention which would be required under this ordinance rather than installing detention facilities on the property, unless specifically directed to do otherwise by the Zoning Officer. The Village, also shall have the option of requiring a fee of \$10,000 for each acre-foot of detention needed in lieu of the applicant building a basin on-site provided a new development or redevelopment project exceeds fifteen thousand (15,000) square feet of impervious surface, provided the property will discharge stormwater to the Village storm drainage system, if applicable.

In instances where regional benefits and economies of scale can be achieved, it will be permissible for adjacent properties to utilize a common regional detention basin. Applicants shall have the option of paying a fee of \$10,000 for each acre-foot of detention required so that the Village can build regional facilities or the applicants can jointly build the necessary facilities themselves.

Article IV - SOIL EROSION AND SEDIMENT CONTROL:

Section 40 - Findings: The Village hereby finds that:

- a.) The soil types found in the Village Illinois are susceptible to erosion and if left unprotected could cause severe loss of soil with resultant damage to property;
- b.) The topography of the Village contains areas with steep slopes upon which, if clearing of trees and/or inappropriate construction takes place, could result in severe erosion and slope stability problems, which could result in damage to property;
- c.) Excessive quantities of soil may erode from areas undergoing development for certain non-agricultural uses including but not limited to the construction of dwelling units, commercial buildings and industrial plants, the building of roads and highways, the modification of stream channels and drainageways, and the creation of recreational facilities;
- d.) The washing, blowing, and falling of eroded soil across and upon roadways endangers the health and safety of users thereof, by decreasing vision and reducing traction of road vehicles;
- e.) Soil erosion necessitates the costly repairing of gullies, washed out fills, and embankments;
- f.) Sediment from soil erosion clogs drainage systems and pollutes rivers, streams, lakes, wetlands, and reservoirs;
- g.) Sediment limits the use of water and waterways for most beneficial purposes, promotes the growth of undesirable aquatic weeds, destroys fish and other desirable aquatic life, and is costly and difficult to remove; and
- h.) Sediment reduces the channel capacity of waterways and the storage capacity of flood plains and natural depressions, resulting in increased chances of flooding at risk to public health and safety.

Section - 41 - General Principles: It is the objective of this ordinance to control soil erosion and sedimentation caused by development activities, including clearing, grading, stripping, excavating, and filling of land, in the Village. Measures taken to control soil erosion and off-site sediment runoff shall be adequate to assure that sediment is not transported from the site by a storm event of ten-year, 24 hour frequency or less. The following principles shall apply to all new development or redevelopment activities within the Village and to the preparation of the submissions required under Article IV, Section 42 of this ordinance:

- a.) New development or redevelopment shall be related to the topography and soils of the site so as to create the least potential for erosion. Areas of steep slopes greater than seven percent (7%) where high cuts and fills maybe required are to be

avoided wherever possible, and natural contours should be followed as closely as possible,

- b.)** Natural vegetation shall be retained and protected wherever possible. Areas immediately adjacent to natural watercourses, lakes, ponds, and wetlands are to be left undisturbed wherever possible. Temporary crossings of watercourses, when permitted, must include appropriate stabilization measures,
- c.)** Special precautions shall be taken to prevent damages resultant from any necessary development activity within or adjacent to any stream, lake, pond, abandoned wetland or mine. Preventive measures shall reflect the sensitivity of these areas to erosion and sedimentation,
- d.)** The smallest practical area of land should be exposed for the shortest practical time during development,
- e.)** Sediment basins or traps, filter barriers, diversions, and any other appropriate sediment or runoff control measures shall be installed prior to site clearing and grading and maintained to remove sediment from run-off waters from land undergoing development,
- f.)** The selection of erosion and sediment control measures shall be based on assessment of the probable frequency of climatic and other events likely to contribute to erosion, and on evaluation of the risks, costs, and benefits involved,
- g.)** In the design of erosion control facilities and practices, aesthetics and the requirements of continuing maintenance must be considered,
- h.)** Provisions shall be made to accommodate the increased run-off caused by changed soil and surface conditions during and after development. Drainageways should be designed so that their final gradients and the resultant velocities and rates of discharge will not create additional erosion on-site or downstream,
- i.)** Permanent vegetation and structures shall be installed and functional as soon as practical during development,
- j.)** Those areas being converted from agricultural purposes to other land uses shall be vegetated with an appropriate protective cover prior to development,
- k.)** All waste generated as a result of site development activity shall be properly disposed of and shall be prevented from being carried off the site by either wind or water,
- l.)** All construction sites shall provide measures to prevent sediment from being tracked onto public or private roadways, and

- m.) All temporary soil erosion and sediment control practices shall be maintained to function as intended until the contributing drainage area has been permanently stabilized at which time they shall be removed.

Section 42 - Soil Erosion and Sediment Control Plan Submittal Requirements: Each applicant shall submit the information depending on development size, as regulated to ensure that the provisions of this ordinance are met. The submittal shall include sufficient information to evaluate the environmental characteristics of the property, the potential adverse impacts of the development related to erosion both on-site and off-site, and the effectiveness of the proposed erosion and sediment control plan in reducing sediment loss and meet the provisions of Article I, Section 11. The applicant shall certify on the drawing that all clearing, grading, drainage, and construction shall be accomplished in strict conformance with the erosion and sediment control plan. The following information shall be submitted for both existing and proposed property conditions; new developments or re-developments meeting the requirements of Article I, Section 12.

42.01 - Soil Erosion and Sediment Control Plan Requirements: Shall meet the requirements of Article III, Section 30.01, Section 30.011, and Section 30.012.

42.011 - Mapping and Descriptions: The existing and proposed erosion and sediment control features of the property and immediate vicinity including:

- a.) As required in Article III, Section 30.01, Section 30.011, and Section 30.012;
- b.) Location of the slope disturbance line;
- c.) Location and description of the soil erosion and sediment control measures to be employed during construction;
- d.) For any structures proposed to be located on the slope side of the slope disturbance line the map shall include the limits of disturbance including tree removal, soil erosion and sediment control measures during construction, cross section view of any proposed cut or fill, erosion and sediment control measures during construction, details of method (s) proposed for providing slope stability, permanent stormwater control measures, and permanent erosion and sediment control measures all being certified by a registered professional engineer or a "Certified Professional Erosion Control Specialist;"
- e.) The predominant soil types on the site, their location, and their limitations for the proposed use as defined by the U.S.D.A. Natural Resources Conservation Service;
- f.) The proposed use of the site, including present and planned development, areas of clearing, stripping, grading, excavation and filling; proposed contours, finished grades, and street profiles; the stormwater plan as required in Article II; kinds and locations of utilities, areas and acreages proposed to be paved, sodded or seeded, vegetatively stabilized, or left undisturbed; and the location of trees over eight (8) inches in diameter and their type;

- g.)** A soil erosion and sediment control plan, including a narrative, shall be submitted showing all measures necessary to meet the objectives of this ordinance throughout all phases of construction. The development of a soil erosion and sediment control plan shall follow the requirements of this ordinance and the procedures in the latest edition of the "Illinois Procedures and Standards for Urban Soil Erosion and Sediment Control" (commonly known as the Greenbook), which is hereby incorporated into this ordinance by reference. The Village in consultation with the RISWCD, may waive specific requirements for the content of submissions upon finding that the information submitted is sufficient to show that the work will comply with the objectives and principles of this ordinance. Permanent soil erosion and sediment control features needed at the completion of any development site shall be included in the submittal. The submitted soil erosion and sediment control plan shall include:
- 1.)** Location and description, including standard details, of all sediment control measures and specifics of sediment basins and traps, including outlet details;
 - 2.)** Location and description of all soil stabilization and erosion control measures, including seeding mixtures and rates, types of sod, method of seedbed preparation (type and extent of tillage, weed control, planting equipment, etc...), expected seeding dates, type, method and rate of lime and fertilizer application (soil fertility testing required), kind and quantity of mulching for both temporary and permanent vegetative control measures, and types of non-vegetative stabilization measures;
 - 3.)** Location and description of all runoff control measures, including diversions, waterways, and outlets;
 - 4.)** Location and description of methods to prevent tracking of sediment off-site including construction entrance details, as appropriate;
 - 5.)** Description of dust and traffic control measures;
 - 6.)** Locations of stockpiles and description of stabilization methods;
 - 7.)** Description of offsite fill or borrow volumes, locations and methods of stabilization;
 - 8.)** Provisions for maintenance of control measures, including type and frequency of maintenance, easements, and estimates of the cost of maintenance; and
 - 9.)** Identification (name, address, and telephone) of the person(s) or entity which will have legal responsibility for maintenance of soil erosion control

structures and measures during development and after development is completed.

Section 43 - Design and Operation Standards and Requirements:

The practice standards and specifications outlined in the Soil Erosion and Sediment Control plan shall follow criteria in the latest edition of the Illinois Urban Manual.

- a.) All clearing, grading, stripping, excavating, and filling which is subject to the approval requirements of this ordinance shall be subject to the applicable standards and requirements set forth and/or referenced in this ordinance;
- b.) Responsibility: The permittee shall not be relieved of responsibility for damage to persons or property otherwise imposed by law, and the Village or its officers or agents, including the Directors and Staff of the RISWCD will not be made liable for such damage by (1) the issuance of a permit under this ordinance, (2) compliance with the provisions of that permit or with conditions attached to it by the Village, (3) failure of the Village officials to observe or recognize hazardous or unsightly conditions, (4) failure of the Village officials to recommend denial of or to deny a permit, or (5) exemptions from the permit requirements of this ordinance; and
- c.) Site Design Requirements: Practice standards and specifications for measures outlined in the soil erosion and sediment control plan shall follow criteria in the latest edition of the "Illinois Urban Manual: A Technical Manual Designed for Urban Ecosystem Protection and Enhancement", which is hereby incorporated into this ordinance by reference.

43.01 - Erosion and Sediment Control Design Requirements: New developments or re-developments shall comply with Article IV, Section 42 and meet the following:

43.011 - Control measures shall be constructed to control runoff from the property to such an extent possible that sediment is retained on-site.

43.012 - Temporary on-site control measures required shall be constructed and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.

43.013 - Disturbed areas shall be stabilized with permanent measures within seven (7) calendar days following the end of active disturbance, or redisturbance consistent with the following criteria:

- a.) Appropriate permanent stabilization measures shall include seeding, mulching, sodding, with non-vegetative measures as a last resort; and
- b.) Areas having slopes greater than 12% shall be stabilized with sod, mat, or blanket in combination with seeding or equivalent.

43.014 - All temporary and permanent erosion and sediment control practices must be maintained and repaired as needed to assure effective performance of their intended function.

43.015 - All temporary erosion and sediment control measures shall be disposed in a proper manner within thirty (30) days after final site stabilization is achieved with permanent soil stabilization measures. Trapped sediment and other disturbed soils resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.

43.016 - Site Development Requirements: On-site sediment control measures, as specified by the following criteria, shall be constructed as specified in the referenced handbooks, and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.

- a.)** For new developments or redevelopments less than one (1) acre, filter barriers (including filter fences, straw bales, or equivalent control measures) shall be constructed to control all on-site runoff. Vegetated filter strips, with a minimum width of twenty-five (25) feet, may be used as an alternative only where runoff in sheet flow is expected;
- b.)** For new developments or re-developments more than one (1) acre but less than five (5) acres, a sediment trap or equivalent control measure shall be constructed at the downslope point of the disturbed area,
- c.)** For new developments or re-developments greater than five (5) acres, a sediment basin or equivalent control measure shall be constructed at the down slope point of the disturbed area;
- d.)** Sediment basin and sediment trap designs shall provide for both "dry" detention and "wet" detention sediment storage. The detention storage shall be composed of equal volumes of "wet" detention storage and "dry" detention storage and each shall be sized as regulated in Article III, Section 33. The release rate of the basin shall be that rate as regulated in Article III. The elevation of the outlet structure shall be placed such that it only drains the dry detention storage;
- e.)** The sediment storage shall be sized to store the estimated sediment load generated from the site over the duration of the construction period with a minimum storage equivalent to the volume or sediment generated in one year. For construction periods exceeding one year, the 1-year sediment load and a sediment removal schedule may be substituted; and
- f.)** To the extent possible or as otherwise regulated in this ordinance all desirable trees eight (8) inches in diameter and larger shall be protected for their present and future value for erosion protection and other environmental benefits. Trees that have been selected for preservation shall be marked prior to the beginning of any clearing, grading, stripping, excavation, or filling of the site. A "No" construction zone shall be established and marked at the perimeter of the dripline of each tree which is to be preserved.

43.017 - Stormwater conveyance channels, including ditches, swales, and diversions, and the outlets of all channels and pipes shall be designed and constructed as regulated in Article III. All constructed or modified channels shall be stabilized within 48 hours, consistent with the following standards and as required in the referenced handbooks:

- a.) For grades up to 4 percent, seeding in combination with mulch, erosion blanket, or an equivalent control measure shall be applied. Sod or erosion blanket or mat shall be applied to the bottom of the channel;
- b.) For grades of 4 to 8 percent, sod or an equivalent control measure shall be applied in the channel; and
- c.) For grades greater than 8 percent, rock, riprap, or an equivalent control measure shall be applied over filter fabric or other type of soil protection, or the grade shall be effectively reduced using drop structures.

43.018 - Land disturbance activities in stream channels shall be avoided, where possible, or as regulated in Article III. If disturbance activities are unavoidable, the following requirements shall be met.

- a.) Construction vehicles shall be kept out of the stream channel to the maximum extent practicable. Where construction crossings are necessary, temporary crossings shall be constructed of non-erosive material, such as riprap or gravel;
- b.) The time and area of disturbance of stream channels shall be kept to a minimum. The stream channel, including bed and banks, shall be stabilized within 48 hours after channel disturbance is completed, interrupted, or stopped; and
- c.) Whenever channel relocation is necessary, the new channel shall be constructed under dry conditions and fully stabilized before flow is diverted, incorporating meanders, pool and riffle sequence, and riparian planting.

43.019 - Storm sewer inlets and culverts shall be protected by sediment traps or filter barriers meeting accepted design standards and specifications.

43.020 - Soil storage piles containing more than 10 cubic yards of material shall not be located with a downslope drainage length of less than 50 feet to a roadway, drainage channel, or abandoned mine. Filter barriers, including straw bales, filter fence, or equivalent, shall be installed immediately surrounding the perimeter of the pile.

43.021 - If dewatering devices are used, discharge locations shall be protected from erosion. All pumped discharges shall be routed through appropriately designed sediment traps or basins, or equivalent and shall not be deposited into an abandoned mine.

43.022 - Each site shall have graveled (or equivalent) entrance roads, access drives, and parking areas of sufficient length and width to prevent sediment from being tracked onto public or private

roadways. Any sediment reaching a public or private road shall be removed by shoveling or street cleaning (not flushing) before the end of each workday and transported to a controlled sediment disposal area.

Section 44 - Maintenance of Control Measures: All soil erosion and sediment control measures necessary to meet the requirements of this ordinance shall be maintained by the applicant or subsequent land owner during the period of land disturbance and development of the site in a satisfactory manner to ensure adequate performance. The applicant or contractor responsible for maintaining the soil erosion and sediment control practices shall inspect all such practices at least once every 7 days or within 24 hours of a precipitation event equal to or exceeding 0.5" of rainfall.

Article V - Long Term Maintenance Responsibility:

Section 50 - Long Term Maintenance Responsibility: Maintenance of stormwater drainage, and soil erosion and sediment control facilities located on private property shall be the responsibility of the owner of that property. Before an appropriate permit is obtained from the Village, the applicant shall execute a maintenance agreement with the Village guaranteeing that the applicant and all future owners of the property will maintain its stormwater drainage and soil erosion and sediment control system. Such agreement shall be recorded with the Recorder of Deeds of the County. The maintenance agreement shall include a schedule for regular maintenance of each aspect of the property's stormwater drainage and soil erosion and sediment control system and shall provide for access to the system for inspection by authorized personnel of the Village. The maintenance agreement shall also stipulate that if the appropriate personnel of the Village, notify the property owner in writing of maintenance problems which require correction, the property owner shall begin such corrections within twenty four (24) hours and shall not extend beyond seven (7) calendar days of such notification. If the corrections are not made within this time period the Village may have the necessary work completed and assess the cost to the property owner. The Village shall require a bond to be filed by the property owner for maintenance of the stormwater drainage and soil erosion and sediment control system.

Article VI - Inspections:

Section 60 - Inspections: The Rock Island County SWCD shall make inspections as hereinafter required and shall either approve that portion of the work completed or shall notify the permittee wherein the work fails to comply with the site development or erosion and sediment control plan as approved. The Rock Island County SWCD will notify the Village of permittees failure to comply with ordinance regulations. Plans for grading, stripping, excavating, and filling work bearing the stamp of approval of the Village and Rock Island County SWCD shall be maintained at the site during progress of the work. In order to obtain inspections and to ensure compliance with the approved erosion and sediment control plan, the grading or building permit, and this Ordinance, the permittee shall notify the Village and the Rock Island County SWCD within two (2) working days of the completion of the construction stages specified below:

- a.) Upon completion of installation of sediment and runoff control measures (including perimeter controls and diversions), prior to proceeding with any other earth disturbance or grading;
- b.) After stripping and clearing;
- c.) After rough grading;
- d.) After final grading;
- e.) After seeding and landscaping deadlines; and
- f.) After final stabilization and landscaping, prior to removal of temporary sediment controls.

If stripping, clearing, grading and/or landscaping are to be done in phases or areas, the permittee shall give notice and request inspection at the completion of each of the above work stages in each phase or area. If an inspection is not made and notification of the results given within five (5) working days after notice is received by the Village from the permittee, the permittee may continue work at his/her own risk, without presuming acceptance by the Village. Notification of the results of the inspection shall be given in writing at the site. A duplicate copy shall be kept by the enforcing agency of the Village and/or the Rock Island County SWCD.

Section 61 - Special Precautions: If at any stage of the grading of any development site the Rock Island County SWCD determines by inspection that the nature of the site is such that further work authorized by an existing permit is likely to imperil any property, public way, stream, lake, wetland, or drainage structure, the Village shall require, as a condition of allowing the work to be done, that such reasonable special precautions to be taken as is considered advisable to avoid the likelihood of such peril. "Special precautions" may include, but shall not be limited to, a more level exposed slope, construction of additional drainage facilities, berms, terracing, compaction, or cribbing, installation of plant materials for erosion control, and recommendations of a registered soils engineer and/or engineering geologist which may be made requirements for further work.

61.01 - Where it appears that storm damage may result because the grading on any development site is not complete, work shall be stopped and the permittee required to install temporary structures or take such other measures as may be required to protect adjoining property or the public safety. On large developments or where unusual site conditions prevail, the Zoning Officer shall specify the time of starting grading and time of completion or may require that the operations be conducted in specific stages so as to ensure completion of protective measures or devices prior to the advent of seasonal rains.

Section 62 - Amendment of Plans: Major amendments to stormwater drainage and detention or erosion and sediment control plans shall be submitted to the Zoning Officer and the Rock Island County Soil and Water Conservation District. Plan amendments shall be processed and approved or disapproved in the same manner as the original plans. Field modification of a minor nature may be authorized by the Zoning Officer and/or Rock Island County Soil and Water Conservation District, by written authorization to the permittee.

Article VII - Permitting:

Section 70 - Application for Permit: Application for a development permit shall be made by the owner of the property or his authorized agent to the Zoning Officer on a form furnished for that purpose. Each application shall bear the name(s) and address(es) of the owner or developer of the site, the contractor(s) and of any consulting firm retained by the applicant together with the name of the applicant's principal contact at such firm. Each application shall include certification that any land clearing, construction, or development involving the movement of earth shall be in accordance with the plans approved upon issuance of the permit.

Section 70.01 – Application Fee: All applications for a development permit shall be accompanied with an application fee as set forth in Exhibit A, attached hereto and incorporated herein. In addition, the applicant shall be responsible for reimbursing the Village for any additional cost necessary for review, inspection, and approval of this project including, but not limited to the engineering services of the Village Engineer. The Zoning Officer shall require a \$500.00 deposit to cover these additional costs.

Section 71 - Bond Required: The applicant for a development permit shall be required to file with the Village a faithful performance bond or bonds, letter of credit, or other improvement security satisfactory to the Village Attorney, in an amount deemed sufficient by the Zoning Officer, and for such period as specified by the Village. These faithful performance bond or bonds, letter of credit, or other improvement security would be used to cover engineering and inspection costs, and the cost of failure or repair of improvements installed on the site.

Section 72 - Review and Approval: Each application for an erosion and sediment control plan shall be reviewed and acted upon according to the following procedures:

- a.) As a condition of this ordinance, the Village shall require the applicant, or designated agent, to consult with the Rock Island County Soil and Water Conservation District (RISWCD) on soil erosion and sediment control plans. The

applicant shall submit all required items to the RISWCD the same day that the application is made to the Village.

The RISWCD shall:

1. Review the applicant's soil erosion and sediment control plans and provide written evaluation to the Village regarding the adequacy (effectiveness) to address the provisions of this ordinance. The RISWCD shall retain the services of a professional trained in the implementation of soil erosion and sediment control practices to perform the services outlined in this section. The RISWCD will assess a fee as set forth in Exhibit B, attached hereto, and incorporated herein to be paid by the applicant for performing these services;
2. Attend a pre-construction meeting with the applicant or designated agent to review implementation of erosion and sediment control plans;
3. Conduct onsite inspections during the active construction phases of land development projects to determine whether site development is in compliance with the approved erosion and sediment control plans, and determine adjustments needed to the approved plans. After construction has been completed, determine whether permanent site stabilization has been achieved and identify operation and maintenance needs;
4. Prepare correspondence as needed regarding the effectiveness (or corrective measures needed) or adequacy of soil erosion and sediment control measures, and
5. Consult with land developers, consultants, and contractors concerning the design criteria, installation and maintenance procedures and other information regarding conservation practices recommended under the provisions of this ordinance.

The Village of Carbon Cliff shall:

1. After review of the application and required submissions if it is found to be in conformance with the provisions of this ordinance, approve the erosion and sediment control plan;
 2. Approve the erosion and sediment control plan subject to such reasonable conditions as may be necessary to secure substantially the objectives of this ordinance, and issue the approval subject to these conditions; or
 3. Disapprove the erosion and sediment control plan, indicating the deficiencies and the procedure for submitting a revised application and/or submission.
- b.) No approval for an erosion and sediment control plan shall be issued for an intended development site unless one or more of the following have been obtained: The development, including but not limited to subdivisions and planned unit development, has been approved by the Village where applicable; or

1. Such permit is accompanied by or combined with a valid building permit issued by the Village Building Official; or
2. The proposed earth moving is coordinated with any overall development program previously approved by the Village for the area in which the site is situated; and
3. All relevant federal and state permits including, but not limited to: NPDES, 404, 401, NRI's, etc. have been received for the portion of the site subject to soil disturbance, and
4. Applicant is successful in the appeals process.

72.01 - Failure of the Zoning Officer to act on an original or revised application within thirty (30) days of receipt shall authorize the applicant to proceed in accordance with the plans as filed and in compliance with the regulations contained herein, unless such time is extended by agreement between the Zoning Officer and the applicant. Pending preparation and approval of a revised plan, development activities shall be allowed to proceed in accordance with conditions established by the Zoning Officer.

Section 73 - Expiration of Permit: Every development permit shall expire and become null and void if the work authorized by such permit has not been commenced within one hundred and eighty (180) days, or if not completed by a date which shall be specified in the permit; except that the Zoning Officer may, if the permittee presents satisfactory evidence that unusual difficulties have prevented work being commenced or completed within the specified time limits, grant a reasonable extension of time if written application is made before the expiration date of the permit. The Zoning Officer may require modification of the erosion control plan to prevent any increase in erosion or off-site sediment runoff resulting from any extension.

Section 74 – Scope of Appeals:

74.01 - An appeal may be taken to the Board of Appeals by the applicant, any person or agency which received notice of the filing of the application, or by any person, firm, corporation, office, department, board or bureau aggrieved by decision of the Zoning Officer. Such appeal shall be taken within such time as shall be prescribed by the Board of Appeals by general rule by filing with the Zoning Officer a notice of appeal specifying the grounds thereof. The Zoning Officer shall forthwith transmit to the Board of Appeals all of the papers constituting a record upon which the Section appealed from was taken.

74.02 - The Factors to be considered on appeal shall include, but need not be limited to, the effects of the proposed development activities on the surface water flow to tributary and downstream lands, any comprehensive watershed management plans, or the use of any retention facilities; possible saturation of fill and unsupported cuts by water, both natural and domestic; runoff surface waters that produce erosion and silting of drainageways; nature and type of soil or rock which when disturbed by the proposed development activities may create earth movement and produce slopes that cannot be landscaped; and excessive and unnecessary scarring of the natural landscape through grading or removal of vegetation.

74.03 – Findings on Appeal:

74.031 – An appeal shall stay all proceedings in furtherance of the action appealed from unless the Zoning Officer certifies to the Board of Appeals, after the notice of the appeal has been filed with him, that by reason of facts stated in the certificate a stay would, in his opinion, cause imminent peril to life or property.

74.032 – The Board of Appeals shall select a reasonable time and place for the hearing of the appeal, give due notice thereof to the parties, and shall render a written decision on the appeal without unreasonable delay. The Board of Appeals may affirm or may, upon the concurring vote of four (4) members, reverse wholly or in part or modify the order, requirement, decision, or determination that, in its opinion, ought to be done. To that end, the Board of Appeals shall have all the powers of the officer from whom the appeal is taken. The Zoning Officer shall maintain records of all actions of the Board of Appeals relative to appeals.

Section 75 - Retention of Plans: Plans, specifications, and reports for all site developments shall be retained in original form or on microfilm by the Zoning Officer.

Section 76 – Amendments:

76.01 – This ordinance may be amended, provided that in all amendments adopted under the authority of this Section, due allowance shall be made for existing conditions, the conservation of property values, and the direction of building development to the best advantages of the entire community.

76.02 – Initiations of Amendments: Amendments may be proposed by the Village Board, Plan Commission, Village President, Zoning Official or the Rock Island County SWCD.

76.03 – Application for Amendment: An application for an amendment shall be filed with the Zoning Officer in such form and accompanied by such information as required by the Zoning Officer. Such application shall be forwarded to the Plan Commission with the request to hold a public hearing on said application for amendment.

76.04 – Hearing on Application: The Plan Commission shall hold a public hearing on each application for an amendment at such time and place as shall be established by the Plan Commission. The hearing shall be conducted and a record of such proceedings shall be preserved in such manner, as the Plan Commission shall, by rule, prescribe from time to time.

76.05 – Notice of Hearing: Notice of time and place of such hearing shall be published at least once in one or more newspapers of general circulation in the Village of Carbon Cliff not less than fifteen (15) nor more than thirty (30) days before such hearing. Supplemental or additional notices may be published or distributed as the Plan Commission may, by rule, prescribe from time to time.

76.06 – Findings of Fact and Recommendation of the Plan Commission:

76.061 – Within forty-five (45) days after the close of the hearing on a proposed amendment, the Plan Commission shall make written findings of fact and shall submit same together with its recommendations to the Village Board.

76.062 – The Plan Commission shall not recommend the adoption of a proposed amendment unless it finds that the adoption of such amendment is in the public interest.

76.07 – Action by Village Board:

76.071 – The Village Board shall not act upon a proposed amendment to this Ordinance until it shall have received a written report and recommendation from the Plan Commission on the proposed amendment.

76.072 – The Village Board may grant or deny any amendment.

76.073 – The Village Board may request specific changes to a proposed amendment to this Ordinance once it has received a written report and recommendation from the Plan Commission on the proposed amendment. However, before the proposed amendment with the Village Board’s specific changes, can be adopted by the Village Board; the proposed amendment with the specific changes must be forwarded to the Plan Commission for another Public Hearing, Findings of Fact, and written recommendation.

76.074 – A proposed amendment or a proposed amendment with specific changes that doesn’t receive a written recommendation from the Plan Commission, shall not be adopted except by a concurrence of two-thirds (2/3) of the Village Trustees then holding office.

76.08 – Effect of Denial of Amendment: No application for an amendment that has been denied wholly or in part by the Village Board shall be resubmitted for a period of one (1) year from the date of said denial except on the grounds of new evidence or proof of change of conditions found to be valid by the Plan Commission.

Article VIII - Enforcement:

Section 80 - Stop-Work Order; Revocation of Permit: In the event any person holding a development permit pursuant to this ordinance violates the terms of the permit, or carries on-site development in such a manner as to materially adversely affect the health, welfare, environment, or safety of persons residing or working in the neighborhood of the development site or so as to be materially detrimental to the public welfare or injurious to property or improvements in the neighborhood, the Zoning Officer shall suspend or revoke the development permit.

80.01 - Suspension of a permit shall be by a written stop-work order issued by the Zoning Officer and delivered to the permittee or his agent or the person performing the work. The stop-work order shall be effective immediately, shall state the specific violations cited, and shall state the conditions under which work may be resumed. A stop-work order shall remain in effect until appealed by the permittee to the Board of Appeals at which time the conditions of Article VII,

Section 74 can be met or until the specific violations cited are corrected to the satisfaction of the zoning officer.

80.02 - No development permit shall be revoked until a hearing is held by the Board of Appeals. Written notice of such hearing shall be served on the permittee, either personally or by certified mail return receipt requested, and shall state:

- a.) The reasons for revocation, in clear and concise language; and
- b.) The time, date and place where such hearing will be held.

Such notice shall be served on the permittee at least five (5) days prior to the date set for the hearing. At such hearing, the permittee shall be given an opportunity to be heard and may call witnesses and present evidence on his behalf. At the conclusion of the hearing the Board of Appeals shall determine whether the permit shall be revoked.

Section 81 – Fees: The fee for variances and appeals shall be Seventy-five (\$75.) dollars.

Section 82 - Violations and Penalties: No person shall construct, enlarge, alter, repair or maintain any grading, excavation or fill, or cause the same to be done, contrary to or in violation of any terms of this ordinance. Any person violating any of the provisions of this ordinance shall be deemed guilty of a misdemeanor, and each day during which any violation of any of the provisions of this ordinance is committed, continued, or permitted shall constitute a separate offense. Upon conviction of any such violation, such person, partnership, or corporation shall be punished by a fine of not less than Seventy Five dollar (\$75.00), and nor more than Seven Hundred Fifty dollars (\$750.00) for each offense. In addition to any other penalty authorized by this section, any person, partnership, or corporation convicted of violating any of the provisions of this ordinance shall be required to restore the site to the condition existing prior to commission of the violation, or to bear the expense of such restoration.

Article IX - Effective Date

This ordinance shall be in full force and effect from and after its passage and approval and publication, as required by law.

Passed by Village Board of the Village of Carbon Cliff, Illinois, this ____ day of _____, 2001.

ADOPTED by the Board of Trustees for the Village of Carbon Cliff this ____ day of _____, 2001.

	AYES	NAYS	ABSENT
Don Brewer	_____	_____	_____
Don Chapman	_____	_____	_____
Mark Gast	_____	_____	_____
Myron James	_____	_____	_____
Richard Wienandt	_____	_____	_____
Kindra Williams	_____	_____	_____
	AYES _____	NAYS _____	ABSENT _____

APPROVED by the President of the Board of Trustees of the Village of Carbon Cliff this ____ day of _____, _____.

Kenneth Williams, President

ATTEST:

Karen L. Hopkins, Village Clerk

SEAL

Appendix A

Desirable Trees Native to Northwestern Illinois

Ash, Blue, *Fraxinus quadrangulata*
Ash, Green, *Fraxinus pennsylvanica*
Ash, White, *Fraxinus americana*
Birch, River or Red, *Betula nigra*
Coffeetree, Kentucky, *Gymnocladus dioica*
Hackberry, Common, *Celtis occidentalis*
Hickory, Shagbark, *Carya ovata*
Ironwood (Hophornbeam), *Ostrya virginiana*
Larch, American (Tamarack), *Larix laricina*
Linden, American (Basswood), *Tilia americana*
Maple, Black, *Acer nigrum*
Maple, Red or Swamp, *Acer rubrum*
Maple, Sugar or Rock, *Acer saccharum*
Oak, Black, *Quercus velutina*
Oak, Bur, *Quercus macrocarpa*
Oak, Chinkapin, *Quercus muehlenbergii*
Oak, Pin or Swamp, *Quercus palustris*
Oak, Red, *Quercus rubra*
Oak, Swamp White, *Quercus bicolor*
Pecan, *Carya illinoensis*
Redbud, *Cercis canadensis*
Arborvitae, White Cedar, *Thuja occidentalis*
Juniper, Eastern Redcedar, *Juniperus virginiana*
Pine, Easter White, *Pinus strobus*

Appendix B

Desirable Trees Native to Areas South of Carbon Cliff, Illinois. Additional planting is encouraged.

Baldcypress, *Taxodium distichum*

Beech, European, *Fagus sylvatica* (except)

Buckeye, Red, *Aesculus pavia*

Dogwood, Flowering, *Cornus florida*

Hickory, Shellbark, *Carya laciniosa* (for wet areas)

Persimmon, Common, *Diospyros virginiana*

Sassafras, Common, *Sassafras albidum*

Sourgum (Black Tupelo), *Nyssa sylvatica*

Sweetgum, *Liquidambar styraciflua*

Tuliptree, *Liriodendron tulipifera*

VILLAGE OF CARBON CLIFF
(309) 792-8235

FOR OFFICE USE ONLY	Carbon Cliff Application No.:
Meets technical standards _____ Does not meet technical standards _____	
Date Application received: _____ Date all Information received: _____ Reviewed by: _____	
Fee Paid: _____	Check No.: _____

	APPLICANT (Owner/Developer)	Erosion Control Consultant/Engineer
Name		
Address		
City/State/Zip		
Phone		
Relationship to project		

Job site contact person: _____

Contact person phone number:(_____) - _____ - _____ **Fax number:**(_____) - _____ - _____

Village/Municipal contact person: _____ **Phone #**(_____) - _____ - _____

Township, range, & section: _____

Proposed land use: _____ **Acreage of land disturbance:** _____

Pre-construction meeting date (if known): _____ **Construction start date:** _____

Total number of phases _____ **Phase number** _____

The applicant agrees to the following conditions:

1. Submit all required information listed on the following page for each phase of development, regarding the soil erosion and sediment control (SE/SC) plan.
2. Upon submittal of this application, pay the applicable fee, based on the attached fee schedule, in accordance with total acres of disturbance to the original topography and/or vegetation.
3. Notify representatives from the Village of Carbon Cliff, Rock Island County Soil and Water Conservation District (SWCD) and the Natural Resources Conservation Service, (NRCS) of the pre-construction meeting to review implementation of the SE/SC plan.
4. Allow a Village of Carbon Cliff, Rock Island County SWCD, or NRCS representative the right to conduct on-site investigations throughout all active construction phases to determine whether all necessary SE/SC practices have been installed and are functioning properly.
5. Upon commencement of earthwork or construction, document SE/SC site inspections with all information being accurate and complete.
6. Comply with the Village of Carbon Cliff and Rock Island County SWCD's written and verbal recommendations regarding:
 - A. The SE/SC plan and corrections or changes made thereto.
 - B. Installation and maintenance requirements of the SE/SC practices on-site.
7. If any changes occur to the plans, schedules, etc., the applicant shall be responsible for notifying the Village of Carbon Cliff and the Rock Island County Soil and Water Conservation District.

Upon receipt of all required information, the SE/SC plan will be reviewed within 15 working days and all involved parties will be notified whether or not the plan meets technical standards.

Applicant's Signature: _____ **Date:** _____

Site Plan Checklist

The soil erosion and sediment control plan cannot be reviewed until all of the following information is submitted for each upcoming active construction phase:

1. Existing site conditions and natural resources present, including:

- _____ Site boundaries and adjacent lands which accurately identify site location.
- _____ Buildings, roads and utilities.
- _____ Topography, vegetation, drainage patterns, subwatershed delineation, critical erosion areas, and any subsurface drainage tiles.
- _____ Wetland and floodplain delineation.
- _____ Location and identification of soil types.
- _____ Adjacent areas that affect or are affecting the project site, e.g. drainage onto or through the site affecting wetlands, streams, lakes, and drainage areas downstream.
- _____ Vicinity map.
- _____ Show areas where trees and vegetation are to be preserved.
- _____ Map legend, including north arrow and scale on all materials submitted.

2. Final site conditions, including:

- _____ An accurate depiction of post-construction appearance, e.g. roads, buildings, open space.
- _____ Locations, dimensions, cross sections and elevations of all (temporary and permanent) stormwater management facilities (including sediment basins), plus inlet and outlet locations.
- _____ Surface flow direction, including sheet flow and concentrated flow direction.
- _____ Post-construction topography, final contours should be easily distinguished (2 foot contour is preferred) including subwatershed delineations.

3. A complete soil erosion and sediment control plan, including:

- _____ Location and detailed drawings of all permanent and temporary soil erosion and sediment control practices.
- _____ A schedule outlining the installation of the practices with the responsible parties identified.
- _____ Inspection, and maintenance schedules with responsible parties identified.
- _____ Seeding information: rates, species, dates, fertilization, temporary or permanent.
- _____ Location and dimension of all temporary soil and aggregate stockpiles.

4. Locations, dimension & phase timeline of all land disturbing activities, including:

- _____ Designate construction limits, areas that will be disturbed and areas of wetland fill.
- _____ Describe grading and building schedule and phasing timeline.

Narrative Checklist

The soil erosion and sediment control plan cannot be reviewed until all of the following information is submitted for each upcoming active construction phase:

- _____ **Project description** - Briefly describes the nature and purpose of the land disturbing activity, and the area (acres) to be disturbed.

- _____ **Existing site conditions**- A description of the existing topography , vegetation, drainageways, subsurface drain tile, buildings, roads and utilities.

- _____ **Adjacent areas**- A description of neighboring areas such as streams, lakes, residential areas, roads, etc. which might be affected by the land disturbance. Describe any adjacent or neighboring activities that may affect the soil erosion and sediment control plan.

- _____ **Off-site areas**- Will any other areas be disturbed? Describe any off-site land disturbing activities.

- _____ **Soils**- Provide a brief description of the soils on the site at the exposed soil horizon such as soil name, mapping unit, erodibility, permeability, texture, structure and depth to seasonal high groundwater. (this information is available from the local Soil and Water Conservation District).

- _____ **Critical areas**- A description of areas on the site which have potentially serious problems, e.g. steep or long slopes, channels, intermittent streams, and side hill seeps.

- _____ **Soil erosion and sediment control measures**- A description of the methods which will be used to control erosion and sedimentation on the site. Control methods should meet the standards in section 4 of the Illinois Urban Manual.

- _____ **Permanent stabilization**- A brief description including specifications of how the site will be stabilized after construction is completed.

- _____ **Stormwater runoff calculations**- Will the development site cause an increase in peak runoff rates? Will the increase in runoff cause soil erosion or channel degradation downstream? Describe the strategy to control stormwater runoff.

- _____ **Calculations**- Detailed calculations for the design of temporary sediment basins, permanent stormwater detention basins, diversions, channels, etc.. Include pre and post development runoff.

- _____ **Detail drawings**- Include detail drawings form the Illinois Urban Manual. Any structural practices used that are not referenced to the Illinois Urban Manual or local handbooks should be explained and illustrated with detail drawings.

- _____ **Maintenance** - Provide a schedule of maintenance for all temporary and permanent erosion and sediment control practices to ensure that they perform properly. Identify the parties responsible for maintenance.

EXHIBIT B DEVELOPMENT APPLICATION FEE SCHEDULE

50 cubic yards (38.2 m ³) or less	\$23.50
51 to 100 cubic yards (40 m ³ to 76.5 m ³)	37.00
101 to 1,000 cubic yards (77.2 m ³ to 764.6 m ³)—\$37.00 for the first 100 cubic yards (76.5 m ³) plus \$17.50 for each additional 100 cubic yards (76.5 m ³) or fraction thereof.	
1,001 to 10,000 cubic yards (765.3 m ³ to 7645.5 m ³)—\$194.50 for the first 1,000 cubic yards (764.6 m ³), plus \$14.50 for each additional 1,000 cubic yards (764.6 m ³) or fraction thereof.	
10,001 to 100,000 cubic yards (7646.3 m ³ to 76,455 m ³)—\$325.00 for the first 10,000 cubic yards (7645.5 m ³), plus \$66.00 for each additional 10,000 cubic yards (7645.5 m ³) or fraction thereof.	
100,001 cubic yards (76,456 m ³) or more—\$919.00 for the first 100,000 cubic yards (76,455 m ³), plus \$36.50 for each additional 10,000 cubic yards (7645.5 m ³) or fraction thereof.	
Other Inspections and Fees:	
1. Inspections outside of normal business hours (minimum charge—two hours)	\$50.50 per hour
2. Reinspection fees assessed under provisions of Section 108.8	\$50.50 per hour
3. Inspections for which no fee is specifically indicated (minimum charge—one-half hour)	\$50.50 per hour

FEE SCHEDULE

Fee is based on acreage of the site

Base Fee: \$100 (One acre or less)

*Round acres to nearest whole number

160+ acres = 5\$ for each additional acre

Erosion and Sediment Control Program Fee Schedule															
Acres	Fee	Acres	Fee	Acres	Fee	Acres	Fee	Acres	Fee	Acres	Fee	Acres	Fee	Acres	Fee
1	100	21	984	41	2142	61	2502	81	2856	101	3096	121	3330	141	3450
2	100	22	1044	42	2160	62	2520	82	2868	102	3108	122	3338	142	3456
3	400	23	1102	43	2176	63	2538	83	2880	103	3120	123	3342	143	3462
4	400	24	1164	44	2196	64	2558	84	2892	104	3132	124	3348	144	3466
5	400	25	1224	45	2214	65	2574	85	2904	105	3144	125	3354	145	3474
6	400	26	1284	46	2232	66	2592	86	2916	106	3156	126	3360	146	3480
7	400	27	1344	47	2250	67	2610	87	2926	107	3168	127	3368	147	3486
8	400	28	1404	48	2268	68	2628	88	2940	108	3180	128	3372	148	3492
9	400	29	1464	49	2286	69	2646	89	2952	109	3192	129	3378	149	3498
10	400	30	1524	50	2304	70	2664	90	2964	110	3204	130	3384	150	3504
11	420	31	1584	51	2322	71	2682	91	2976	111	3216	131	3390	151	3510
12	564	32	1644	52	2340	72	2700	92	2988	112	3228	132	3396	152	3516
13	624	33	1704	53	2358	73	2718	93	3000	113	3240	133	3402	153	3522
14	684	34	1764	54	2376	74	2736	94	3012	114	3252	134	3408	154	3528
15	744	35	1824	55	2394	75	2754	95	3024	115	3264	135	3414	155	3534
16	804	36	1884	56	2412	76	2772	96	3036	116	3276	136	3420	156	3540
17	864	37	1944	57	2430	77	2790	97	3046	117	3288	137	3426	157	3546
18	924	38	2004	58	2448	78	2808	98	3060	118	3300	138	3432	158	3552
19	974	39	2064	59	2466	79	2825	99	3072	119	3312	139	3438	159	3558
20	1024	40	2124	60	2464	80	2843	100	3084	120	3324	140	3444	160	3564

**SOIL EROSION
AND
STORMWATER
MANAGEMENT**

SOIL EROSION AND STORMWATER MANAGEMENT

CHAPTER 1 – GENERAL AND ADMINISTRATIVE PROCEDURES

SECTION 1 – AUTHORITY AND PURPOSE

SECTION 2 – APPLICABILITY

SECTION 3 – EXEMPTIONS

SECTION 4 – EXCEPTIONS

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SOIL EROSION AND STORMWATER MANAGEMENT

CHAPTER 1 – GENERAL AND ADMINISTRATIVE PROCEDURES

SECTION 1 – AUTHORITY AND PURPOSE

This policy is enacted as per city regulation of the City of Clinton, Illinois.

The purpose of this policy is to diminish threats to public health and safety, protect property, prevent damage to the environment, and promote public welfare by guiding, regulating and controlling the design, construction, use and maintenance of any new development or redevelopment or other activity which disturbs or breaks the topsoil or otherwise results in the movement of earth and/or changes the stormwater drainage pattern and/or stormwater flows from that which would have occurred if the land had been left in its natural state. This stormwater runoff and resulting soil erosion could result in the inundation of damageable properties, the erosion and destabilization of downstream channels, and the pollution of valuable stream and lake resources. One cause of increases in stormwater runoff quantity or rate and impairment of quality and loss of valuable topsoil is the new development or redevelopment of the land. This policy regulates these activities to minimize adverse impacts.

This policy is adopted to accomplish the following objectives:

1. To assure that new development or redevelopment does not increase the drainage or flood hazards, or create unstable conditions susceptible to soil erosion;
2. To protect new buildings and major improvements to buildings from flood damage due to increased stormwater runoff and soil erosion;
3. To protect human life and health from the hazards of increased flooding and soil erosion on a watershed basis;
4. To lessen the burden on the taxpayer for flood control projects, repairs to flood-damaged public facilities and utilities, correction of channel erosion problems, and flood rescue and relief operations caused by stormwater runoff and soil erosion quantities from new development or redevelopment;
5. To protect, conserve, and promote the orderly development of land and soil, water air, animal, and plant resources;
6. To preserve the natural hydrologic and hydraulic functions of watercourses and flood plains and to protect water quality and aquatic habitats;
7. To preserve the natural characteristics of stream corridors in order to manage flood and stormwater impacts, improve water and groundwater quality, reduce soil erosion, protect aquatic and riparian habitat, maintain quality forest resources, provide recreational opportunities, provide aesthetic benefits, enhance community and economic development.

SECTION 2 – APPLICABILITY:

This policy shall apply to all new development or redevelopment in Clinton, Illinois. Except as otherwise provided in this policy, no person, firm or corporation, public or private, the State of Illinois and its agencies or political subdivisions, the United States of America, and its agencies or political subdivisions, any agent, servant, officer or employee of any of the foregoing which meets the following provisions, or is otherwise exempted in this policy, shall not commence any development activities without first having obtained a development permit from the Building and Zoning Administrator of Clinton, Illinois.

SECTION 3 – EXEMPTIONS:

A development permit shall not be required for the following:

1. Any new development, redevelopment or other activity falling below the minimum standards as set forth in *Chapter 1.0, Section 3.0*.
2. The agricultural use of land, including the implementation of conservation measures included in a farm conservation plan approved by the USDA-NRCS and Soil and Water Conservation District, and including the construction of agricultural structures.
3. The maintenance of any existing stormwater drainage/detention component or structure or any existing soil erosion/sediment control component or structure; including dredging, levee restoration, tree removal or other function which maintains the original design capacities of the above.

4. The construction of, improvements to, or the maintenance of any street, road, highway, or interstate highway performed by any unit of government whose powers grant such authority.

SECTION 4 – EXCEPTIONS:

The Zoning Board of Appeals, Clinton, Illinois, may, in accordance with the following procedures, authorize exceptions to any of the requirements and regulations set forth in this policy:

Application for exception shall be made by a verified petition of the applicant for a development permit, stating fully the grounds of the petition and the facts relied upon by the applicant. Such petition shall be filed with the development permit application. In order for the petition to be granted, it shall be necessary that the Board of Appeals find all of the following facts with the respect to the land referred to in the petition:

1. That the land is of such shape or size or is affected by such physical conditions or is subject to such title limitations or record, that it is impossible or impractical for the applicant to comply with all of the requirements of this policy;
2. That the exception is necessary for the preservation and enjoyment of a substantial property right of the applicant; and
3. That the granting of the exception will not be detrimental to the public welfare, environment or injurious to other property in the vicinity of the subject's property.
4. Each application for an exception shall be made to the Clinton Zoning Office. The Zoning Office and Department of Public Works & Construction will review and transmit recommendations to the Board of Appeals, which shall review such recommendations prior to granting or denying the exception.

The Board of Appeals shall hold a public hearing on each application for exception, within thirty (30) days after receiving the application, in the manner provided with respect to appeals. Within thirty (30) days after public hearing, the Board of Appeals shall either approve the site development permit application with the exceptions and conditions it deems necessary or it shall disapprove such development permit application and exception application or it shall take other such action as appropriate.

SECTION 5 – RESPONSIBILITY:

The applicant shall not be relieved of responsibility for damage to persons or property otherwise imposed by law, and Clinton, Illinois or its officers or agents will not be made liable for such damage, by (1) the issuance of a development permit under this policy, (2) compliance with the provisions of that development permit or conditions attached to it by the Zoning Administrator, (3) failure of Clinton, Illinois officials to observe or recognize hazardous or unsightly conditions, (4) failure of Clinton, Illinois officials to recommend denial or to deny a development permit, or (5) exemptions from development permit requirements of this policy.

SECTION 6 – SEPARABILITY:

The provisions and sections of this policy shall be deemed to be separable, and the invalidity of any portion of this policy shall not affect the validity of the remainder.

SECTION 7 – DEFINITIONS:

For the purposes of this policy certain terms are defined and set forth below:

1. **Adverse Impacts:** Any negative impact on plant, soil, air or water resources affecting their beneficial uses including recreation, aesthetics, aquatic habitat, quality, and quantity.
2. **Applicant:** Any person, firm, or governmental agency who executes the necessary forms to procure official approval of a development or permit to carry out construction of a new development or redevelopment from Clinton, Illinois.
3. **Base Flood Elevation:** The elevation at all locations delineating the level of flooding resulting from the 100-year frequency flood event, which has a one (1) percent chance of occurring in any given year.
4. **Building Permit:** A permit issued by the Clinton, Illinois for the construction, erection or alteration of a structure or building and the related ground and surface preparation prior to and after completion of construction, erection or alteration of a structure or building.

5. **Bypass Flows:** Stormwater runoff from upstream properties tributary to a property's drainage system but not under its control.
6. **Certify or Certification:** Formally attesting that the specific inspections and tests were performed, and that such inspections and tests comply with the applicable requirements of this policy.
7. **Channel:** Any defined river, stream, creek, brook, branch, natural or artificial depression, ponded area, on-stream lake or impoundment, flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or manmade drainage way, which has a definite bed and bank or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.
8. **Channel Modification:** Alteration of a channel by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, riprapping, (or other armoring), filling, widening, deepening, straightening, relocating, lining, and significant removal of bottom or woody rooted vegetation. Channel modification does not include the man-made clearing of debris or removal of trash.
9. **Clearing:** Any activity that removes the natural vegetative ground cover.
10. **Compensatory Storage:** An artificially excavated, hydraulically equivalent volume of storage within the floodplain used to balance the loss of natural flood storage capacity when fill or structure are placed within the floodplain.
11. **Conduit:** Any channel, pipe, sewer, or culvert used for the conveyance or movement of water whether open or closed.
12. **Cubic Yard:** A one (1) yard by one (1) yard by one (1) yard amount of material in excavation and/or fill above ground level.
13. **DBH:** The measurement of tree diameter taken at 4.5 feet.
14. **Detention Basin:** A facility constructed or modified to provide for the temporary storage of stormwater runoff and the controlled release by gravity of this runoff at a prescribed rate during and after a flood or storm.
15. **Detention Time:** The amount of time stormwater is held within a detention basin.
16. **Development:** Any manmade change to real estate or property, including:
 - 1) The division or subdivision of any duly recorded parcel of property;
 - 2) Construction, reconstruction or placement of a building or any addition to a building;
 - 3) Installation of a manufactured home on a site, preparing a site for a manufactured home, or installing a travel trailer on a site for more than 180 days per year;
 - 4) Construction of roads, bridges, or similar projects;
 - 5) Redevelopment of a site;
 - 6) Filling, dredging, grading, clearing, excavating, paving or other non-agricultural alterations of a ground surface;
 - 7) Storage of materials or deposit of solid or liquid waste;
 - 8) Any other activity that might alter the magnitude, frequency, direction, or velocity of stormwater flows from a property.
17. **Drainage Plan:** A plan, including engineering drawings and supporting calculations, which describes the existing stormwater drainage system and environmental features, including grading, as well as proposed alterations or changes to the drainage system and environment of a property.
18. **Dry Basin:** A detention basin designed to drain after temporary storage of stormwater flows and to normally be dry over much of its bottom area.
19. **Erosion:** The general process whereby soil or earth is moved by rainfall, flowing water, wind or wave action.
20. **Excavation:** Any act by which organic matter, earth, sand, gravel, rock or any other similar material, is cut into, dug, quarried, uncovered, removed, displaced, relocated or bulldozed and shall include the conditions resulting from such actions.
21. **Excess Stormwater Runoff:** The volume and rate of flow of stormwater discharged from a new development or redevelopment which is or will be in excess of that volume and rate which existed before development or redevelopment.
22. **Existing Grade:** The vertical location of the existing ground surface prior to excavation or filling.
23. **Farm Drainage:** The surface drainage methods, i.e., waterways, and surface ditches that follow natural drainage courses.
24. **Farm Tile:** The underground conduit that removes excess subsurface waters and/or surface water.
25. **Fill:** Any act by which earth, sand, gravel, rock, or any other material, is deposited, placed, replaced, pushed, dumped, pulled, transported or moved by man to a new location and shall include the conditions resulting therefrom.
26. **Final Grade:** The vertical location of the ground surface after grading work is completed in accordance with the engineering plans.

27. **Flood Fringe:** That area as designated by the Federal Emergency Management Agency (FEMA) on either side of the floodway. This area is subject to inundation from the base flood but conveys little or no flow.
28. **Flood Hazard Boundary map (FHBM):** A very generalized map prepared by the Federal Emergency Management Agency (FEMA) which shows only where floodplains are located based on very basic data. FHBMs do not include base flood elevations.
29. **Flood Insurance Rate Map (FIRM):** A map prepared by the Federal Emergency Management Agency (FEMA) that depicts the special flood hazard area (SFHA) within a community. This map includes insurance rate zones and regulatory floodplains and may or may not depict regulatory floodways.
30. **Floodplain:** That land adjacent to a body of water with ground surface elevations at or below the base flood or the 100-year flood elevation which is subject to inundation. The floodplain as designated by the Federal Emergency management Agency (FEMA) is also known as the Special flood Hazard Area (SFHA). This area is the collective combination of the regulatory floodway and the flood fringe.
31. **Floodway:** The channel, and that portion of the floodplain, including on-stream lakes, adjacent to a stream or watercourse which is needed to store and convey the anticipated existing and future 100-year frequency flood discharge with no more than a 0.1 foot increase in stage due to any loss of flood conveyance or storage and no more than a ten percent (10%) increase in velocities.
32. **Grading:** The excavation or fill or any combination thereof and shall include the conditions resulting from any excavation or fill.
33. **Hydrograph:** A graph showing for a given location on a stream or conduit, the flow-rate with respect to time.
34. **Hydrograph Method:** This method estimates runoff volume and runoff hydrographs for the point of interest by generating hydrographs for individual sub-areas, combining them, and routing them through stream lengths and reservoir structures. Factors such as rainfall amount and distribution runoff curve number, time of concentration, and travel times are included.
35. **Illinois Drainage Law:** Circular 1355, University of Illinois Extension Office, covering laws that pertain to drainage rights, permits for streams and manmade ditches.
36. **Impervious Surface:** That area of property that is covered by materials other than soil and vegetation and that has no intended capacity to absorb stormwater, such as parking lots, driveways, sidewalks, patios, tennis courts, roofs and other structures.
37. **Infiltration:** The passage or movement of water into the soil surfaces.
38. **Loessal Soil:** A sediment, commonly non-stratified and unconsolidated, composed predominately of silt sized particles with accessory clay and sand.
39. **Lot:** an individual platted parcel in an approved subdivision.
40. **Major Drainage System:** That portion of a drainage system needed to store and convey flows beyond the capacity of the minor drainage system.
41. **Minor Drainage System:** That portion of a drainage system designed for the convenience of the public. It consists of street gutters, storm sewers, small open channels, and swales and, where manmade, is to be designed to handle the 10-year runoff event.
42. **Mitigation:** Mitigation is when the prescribed controls are not sufficient and additional measures are required to offset the development, including those measures necessary to minimize the negative effects which stormwater drainage and development activities might have on the public health, safety and welfare. Examples of mitigation include, but are not limited to compensatory storage, soil erosion and sedimentation control, and channel restoration.
43. **Modified Rational Method:** As described in the Illinois Department of Transportation "Drainage Manual" is based on the principal that the maximum rates of runoff from a given drainage area occurs at that point in time when all parts of the watershed are contributing to the flow. The rainfall generating the peak flow is assumed to be of uniform intensity for the entire watershed with rainfall duration equal to the time of concentration.
44. **Natural:** Conditions resulting from physical, chemical, and biological processes without intervention by man.
45. **Natural Drainage:** Channels formed in the existing surface topography of the earth prior to changes made by unnatural causes.
46. **One Hundred-Year Event:** A rainfall, runoff, or flood event having a one percent change occurring in any given year. A 24-hour storm duration is assumed unless otherwise noted.
47. **Parcel:** All contiguous land in one ownership.
48. **Peak Flow:** The maximum rate of flow of water at a given point in a channel or conduit.
49. **Permittee:** Any person to whom a building permit is issued.

50. **Person:** any individual, firm or corporation, public or private, the State of Illinois and its agencies or political subdivisions, the United States of America, and its agencies or political subdivisions, and any agent, servant, officer or employee of any of the foregoing.
51. **Positive Drainage:** Provision for overland paths for all areas of a property including depressional areas that may also be drained by storm sewer.
52. **Prime Farmland:** Prime farmland is land that is best suited to food, feed, forage, fiber and oilseed crops. It may be cropland, pasture, woodland, or other land, but it is not urban and built up land or water areas. It is either used for food or fiber or is available for those uses. The soil qualities, growing season and moisture supply are those needed for a well managed soil to economically produce a sustained high yield of crops. Prime farmland produces the highest yields with minimum inputs of energy and economic resources, and farming it results in the least damage to the environment.
53. **Property:** A parcel of real estate.
54. **Retention Basin:** A facility designed to completely retain a specified amount of stormwater runoff without release except by means of evaporation, infiltration, emergency bypass or pumping.
55. **Sedimentation:** The process that deposits soils, debris, and other materials either on other ground surfaces or in bodies of water or stormwater drainage systems.
56. **Site:** A parcel of land, or a contiguous combination thereof, where grading work is performed as a single unified operation.
57. **Slope Disturbance Line:** The line that delineates relatively level building areas from areas where slopes exceed four percent (4%) and where special precautions must be taken.
58. **Stormwater Drainage System:** All means, natural and manmade, used for conducting stormwater to, through or from a drainage area to the point of final outlet from a property. The stormwater drainage system includes but is not limited to any of the following: conduits and appurtenance features, canals, channels, ditches, streams, culverts, streets, storm sewers, detention basins, swales and pumping stations.
59. **Stormwater Runoff:** The waters derived from melting snow or rain falling within a tributary drainage basin which are in excess of the infiltration capacity of the soils of that basin, which flow over the surface of the ground or are collected in channels or conduits.
60. **Storm Sewer:** A closed conduit for conveying collected stormwater.
61. **Stream:** Any river, creek, brook, branch, flowrate, ravine, or natural or man-made drainage way which has a definite bed and banks or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.
62. **Stripping:** Any activity that removes the vegetative surface cover including tree removal, any spraying or clearing, and storage or removal of topsoil.
63. **Swale – (Grass lined channel):** A natural or constructed channel that is shaped or graded to required dimensions and established in suitable vegetation for stable conveyance of runoff.
64. **Ten-Year Event:** A runoff, rainfall, or flood event having a ten percent (10%) chance of occurring in any given year. A 24 hour storm duration is assumed unless otherwise noted.
65. **Time of Concentration:** The elapsed time for stormwater to flow from the most hydraulically remote point in a drainage basin to a particular point of interest in that watershed.
66. **Tributary Watershed:** All of the land surface area that contributes runoff to a given point.
67. **Two-Year Event:** A runoff, rainfall, or flood event having a fifty percent (50%) chance of occurring in any given year. A 24-hour storm duration is assumed unless otherwise noted.
68. **Vacant:** Land on which there are no structures or only structures that are secondary to the use or maintenance of the land itself.
69. **Watershed:** All land area drained by, or contributing water to, the same stream, creek, ditch, lake, marsh, stormwater facility, groundwater or depressional area.
70. **Wet Basin:** A detention basin designed to maintain a permanent pool of water after the temporary storage of stormwater runoff.
71. **Wetlands:** Wetlands are defined by regulation as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” For general, but not inclusive locations of designated wetlands refer to mapping prepared jointly by the U.S. Department of Interior, Fish and Wildlife Service and the Illinois Department of Natural Resources, Office of Resource Conservation; National Wetlands inventory Mapping, 1987. The applicant may be required to provide a field investigation by a qualified wetland delineator.

SECTION 8 – ENFORCEMENT AND PENALTIES

CHAPTER 2 – SITE DEVELOPMENT REQUIREMENTS

PART 1 - STORMWATER DRAINAGE AND DETENTION:

Section 1.0 – Drainage Plan Submittal Requirements:

Each applicant shall submit the following information, to ensure that the provisions of this policy are met. The submittal shall include sufficient information to evaluate the environmental characteristics of the property, the potential adverse impacts and benefits of the development on water resources both on-site and off-site, and the effectiveness of the proposed drainage plan in managing stormwater runoff, and meet the provisions of Chapter 1.0, Section 2.0. The applicant shall certify on the drawings that all clearing, grading, drainage and construction shall be accomplished in strict conformance with the drainage plan. The following information shall be submitted for both existing and proposed property conditions for all new developments or re-developments that meet or exceed the minimum requirements of Chapter 1.0, Section 3.0.

1.1 - Drainage Plan Requirements: A topographic survey of the property at two-foot (2) contours unless otherwise specified or approved by the Zoning Office & Department of Public Works & Construction. The plan map shall be keyed to a consistent datum specified by the City of Clinton, Illinois. If the mapping is compiled using a digital format and the Global Positioning System (GPS), the applicant will provide both paper and digital copies including GPS points.

1.1.1– Mapping and Descriptions: An existing drainage and proposed drainage plan for the property and one hundred (100) feet surrounding the property at a scale of not more than one hundred (100) feet to one (1) inch, and including the following:

- 1.) property boundary, dimensions, and approximate acreage;
- 2.) building setback lines;
- 3.) all existing and proposed structures and sizes;
- 4.) square feet of existing and proposed impervious surface;
- 5.) all existing, or proposed easements;
- 6.) all existing, abandoned, or proposed water or monitoring well head locations;
- 7.) all sanitary or combined sewer lines and septic systems;
- 8.) the banks and centerline of streams and channels;
- 9.) shoreline of lakes, ponds, and detention basins with normal water level elevation;
- 10.) farm drains and tiles;
- 11.) soils classifications;
- 12.) location, size and slope of stormwater conduits and drainage swales;
- 13.) depressional storage areas;
- 14.) detention facilities;
- 15.) roads, streets and associated stormwater inlets including finished grades;
- 16.) base flood elevation, flood fringe, and regulatory floodway;
- 17.) basis of design for the final drainage network components;
- 18.) a statement giving any applicable engineering assumptions and calculations;
- 19.) a vicinity map showing the relationship of the site to its general surroundings at a scale of not less than two thousand (2,000) feet to one (1) inch (1:24,000);
- 20.) title, scale, north arrow, legend, seal of Licensed Professional Engineer, date, and name of person preparing plans;
- 21.) cross-section data for open channel flow paths and designated overland flow paths;
- 22.) direction of storm flows;

- 23.) flow rates and velocities at critical points in the drainage system;
- 24.) a statement by the design engineer of the drainage system's provision for handling events greater than the 100-year, 24 hour runoff; and
- 25.) A statement of certification of all drainage plans, calculations, and supporting data by a Licensed Professional Engineer.

1.1.2– Environmental Features: A depiction of environmental features of the property and immediate vicinity including the following:

- 1.) the limits of designated regulatory and non-regulatory wetland areas;
- 2.) the location of trees greater than eight (8) inches in diameter, taken at 4.5 dbh;
- 3.) any designated natural areas, prime farmland; and
- 4.) any proposed environmental mitigation features.

Section 2.0 – Minimization of Increases in Runoff Volumes and Rates:

In the selection of a drainage plan for a new development or re-development, the applicant shall evaluate and implement site design features which minimize the increase in runoff volumes and rates from the site. The applicant's drainage plan submittal shall include evaluations of site design features that are consistent with the following hierarchy:

- 1.) Preservation of regulatory floodplains, flood prone and wetland areas, and federal, state and municipally funded erosion control practices, i.e., waterways and terraces.
- 2.) Minimize impervious surfaces on the property, consistent with the needs of the project.
- 3.) Attenuate flows by use of open vegetated swales and natural depressions and preserve the existing natural stream channel.
- 4.) Infiltration of runoff on-site;
- 5.) Provide stormwater retention structures;
- 6.) Provide wet or wetland detention structures;
- 7.) Provide dry detention structures; and
- 8.) Construct storm sewers.

Section 3.0 – Water Quality and Multiple Uses:

The drainage system should be designed to minimize adverse surface and groundwater quality impacts off-site and on the property itself. Detention basins shall incorporate design features to capture stormwater runoff pollutants. Detention of stormwater shall be promoted throughout the property's drainage system to reduce the volume of stormwater runoff and to reduce the quantity of runoff pollutants.

The drainage system should incorporate multiple uses where practicable. Uses considered compatible with stormwater management include open space, aesthetics, aquatic habitat, recreation (boating, fishing, trails, playing fields), wetlands and water quality mitigation.

Section 4.0 – Design Criteria, Standards, and Methods:

4.1 – Release Rates: The drainage system for new developments or re-developments shall be designed to control the peak rate of discharge from the property for the two year, 24-hour and 100-year, 24 hour events to levels which will not cause an increase in flooding or channel instability downstream when considered in aggregate with other developed properties and downstream drainage capacities. For new developments or re-developments meeting the provisions of Section 3.0 the Modified Rational Method of design as specified in the Illinois Department of Transportation (IDOT) "Drainage Manual" will be used to calculate release rates. The peak discharge rate from events less than or equal to the 2 year, 24 hour event and the peak discharge rate for the 100-year, 24 hour event shall be determined by the Zoning Office and Department of Public Works & Construction.

4.1.1 – Detention Basin Outlet Design: Backwater on the outlet structure from the downstream drainage system shall be addressed when designing the outlet.

4.2 – Detention Storage Requirements: The design maximum storage to be provided in the detention basin shall be based on the runoff from the runoff difference before and after development from the 100-

year, 24-hour event. All detention basin storage shall be computed using Hydrograph Methods utilizing reservoir routing (also called modified plus or level pool) or equivalent method.

4.3 – Drainage System Design and Evaluation: The following criteria should be used in evaluating and designing the drainage system. The design will provide capacity to pass the 2-year, 24-hour peak flow in the minor drainage system and an overload flow path for flows in excess of the design capacity. Whenever practicable, the stormwater systems shall not result in the inter-basin transfer of drainage unless no other alternative exists.

4.3.1 – Design Methodologies: Major and minor conveyance systems as well as detention basins shall be designed as specified in Section 4.1.

4.3.2 – Positive Drainage: Whenever practicable, all developments must be provided an overland flow path that will pass the 100-year, 24-hour flow at a stage at least one (1) foot below the lowest foundation grade in the vicinity of the flow path. Overland flow paths designed to handle flows in excess of the minor drainage system capacity shall be provided drainage easements. Street ponding and flow depths shall not exceed curb heights.

4.4 – Rainfall: Unless a continuous simulation approach to drainage system hydrology is used, all design rainfall events shall be based on the Illinois State Water Survey's Bulletin 70. The first quartile point rainfall distribution shall be used for the design and analysis of conveyance systems with critical duration less than or equal to 12 hours. The third quartile point rainfall distribution shall be used for the design and analysis of detention basins and conveyance system with critical duration greater than 12 and less than or equal to 24 hours. The fourth quartile distribution shall be used in the design and analysis of systems with duration greater than 24 hours. The first, third, and fourth quartile distributions described by Huff are presented in Table 37 of Bulletin 70. Refer to Table 13 of Bulletin 70 for rainfall depth, duration, and frequency. The USDDA-NRCS Type II distribution may be used as an alternate to the Huff distributions.

4.5 – Antecedent Moisture: Computations of runoff hydrographs, which do not rely on a continuous accounting of antecedent moisture conditions, shall use wet antecedent moisture condition as a minimum.

4.6 – Wet Detention Basin Design: Wet detention basins shall be designed to remove stormwater pollutants, to be safe, to be aesthetically pleasing, and as much as feasible to be available for recreational use.

4.6.1– Wet Basin Depths: Wet basins shall be at least three feet deep, excluding near-shore banks and safety ledges. If fish habitat is to be provided, they shall be at least eight (8) feet deep over twenty-five percent (25%) of the bottom area to prevent winter kill.

4.6.2– Wet Basin shoreline Slopes: The side slopes of wet basins at the normal pool elevation shall not be steeper than three to one (3 to 1 horizontal to vertical). It is recommended that aquatic vegetation be established around the perimeter to provide protection from shoreline erosion.

4.6.3– Permanent Pool Volume: The permanent pool volume in a wet basin at normal depth shall be equal to the runoff volume from its watershed for the 2-year, 24-hour event as a minimum.

4.6.4 – Wet Basin Inlet and Outlet Orientation: The distance between detention inlets and outlets shall be maximized. Inlets and outlets shall be at opposite ends of the basin providing that the orientation does not create undue hardship based on topography or other natural constraints. Designers are encouraged to use baffles or berms in the basin bottom to prevent short-circuiting. There shall be no low flow bypass between the inlet and outlet. Paved low flow channels shall not be used. The minimum flow length shall be ten (10) feet with a recommended minimum ratio of two to one (2:1) for width.

4.7 – Dry Detention Basin Design: In addition to the other requirements of this policy, dry basins shall be designed to remove stormwater pollutants, to be safe, to be aesthetically pleasing and as much as feasible to be available for multiple uses.

4.7.1 – Dry Basin Drainage: Dry basins shall be designed so that eighty percent (80%) of their bottom area shall have standing water no longer than seventy-two (72) hours for any runoff event less

than the 100-year, 24 hour event. Grading plans shall clearly distinguish the wet portion of the basin bottom. Under drains directed to the outlet may be used to accomplish this requirement.

4.7.2– Velocity Dissipation: Velocity dissipation measures shall be incorporated into dry basin designs to minimize erosion at inlets and outlets and to minimize re-suspension of pollutants.

4.7.3– Dry Basin Inlet and Outlet Orientation: Shall be the same as Chapter 3.0, Section 4.6.4.

4.7.4 – Temporary Stilling / Sedimentation Basin: A stilling / sedimentation basin shall be constructed at each major inlet to a dry basin for water storage only, during construction. The basin must be protected from soil erosion. The volume of the basin shall be a minimum of 500 ft.3 per acre of impervious surface in the drainage area. Side slopes shall be no steeper than three (3) feet to one (1) foot (3:1) and basin depths shall be minimum of three (3) feet to minimize re-suspension.

4.8 - Existing Depressional Areas: Existing depressional storage volume will be maintained and the volume of detention storage provided to meet the requirements of this policy shall be in addition to existing storage.

4.9- Minimum Detention Outlet Size: Where a single pipe outlet or orifice plate is to be used to control discharge, it shall have a minimum diameter of twelve (12) inches. If this minimum orifice size permits release rates greater than those specified in this section, outlets, structures such as perforated risers, or flow control orifices shall be used.

4.10–Detention in Flood Plains: The placement of detention basins within the flood plain is strongly discouraged because of questions about their reliable operation during flood events. However, the stormwater detention requirements of this policy may be fulfilled by providing detention storage within flood fringe areas on the project site provided the following provisions are met as well as compliance with Chapter 1.0, Section 2.0.

4.10.1– Detention in Flood Fringe Areas: The placement of a detention basin in a flood fringe area shall require compensatory storage for 1.5 times the volume below the base flood elevation occupied by the detention basin including any berms. The release from the detention storage provided shall still be controlled consistent with the requirements of this section. The applicant shall demonstrate its operation for all stream-flow and floodplain backwater conditions. Excavations for compensatory storage along watercourses shall be opposite or adjacent to the area occupied by detention. All flood plain storage lost below the existing ten-year flood elevation shall be replaced below the existing ten-year elevation. All floodplain storage lost above the existing ten-year flood elevation shall be replaced above the existing ten-year flood elevation. All compensatory storage excavations shall be constructed to drain freely and openly to the watercourse and comply with Chapter 1.0, Section 2.0.

4.10.2– Detention on Prime Farmland: The placement of detention basins shall avoid the utilization of prime farmland. All detention basin construction shall examine potential impacts to adjacent agricultural land and shall address measures that will be implemented to eliminate such impacts and comply with Chapter 1.0, Section 2.0.

4.10.3– Detention in Floodways: Detention basins shall be placed in the floodway only in accordance with Chapter 3.0, Section 4.10.

4.10.4– On-Stream Detention: On-stream detention basins are discouraged but allowable if they provide regional public benefits and if they meet the other provisions of this policy with respect to water quality and control of the two-year and 100-year, 24-hour events from the property. Further criteria are presented in Chapter 3.0, Section 5.0 of this policy. If on-stream detention is used in watersheds larger than one square mile, the applicant will use hydrographic modeling to demonstrate that the design will not increase the water level for any properties upstream or downstream of the property. Also, impoundment of the stream as part of on-stream detention:

- 1.) shall not prevent the migration of indigenous fish species, which require access to upstream areas as part of their life cycle, such as for spawning;
- 2.) shall not cause or contribute to the degradation of water quality or stream aquatic habitat;
- 3.) shall include a design calling for gradual bank slopes, appropriate bank stabilization measures, and a pre-sedimentation basin;
- 4.) shall not involve any stream channelization or the filling of wetlands;

- 5.) shall require the implementation of an effective non-point source management program throughout the upstream watershed which shall include as a minimum: runoff reduction “Best Management Practices” (BMPs) consistent with Chapter 3.0, Section 2.0; 2 year, 24 hour detention / sedimentation basins for all development consistent with Chapter 3.0, Section 4.10.4.
- 6.) shall not occur downstream of a wastewater discharge;
- 7.) shall not contribute to the duration or flood frequency of any adjacent land; and
- 8.) shall comply with Chapter 1.0, Section 2.0.

4.11– Drainage Into Wetlands, Rivers, Streams, Lakes, Ponds, and Depressional Storage Areas:

Wetlands, lakes, ponds and depressional storage areas shall be protected from damaging modifications and adverse changes in runoff quality and quantity associated with land developments. In addition to the other requirements of this policy, the following requirements shall be met for all developments whose drainage flows into wetlands, rivers, lakes, ponds, or depressional storage areas:

4.11.1- Detention in Wetlands, Rivers, Streams, Lakes, Ponds or Depressional Storage Areas:

Existing wetlands, rivers, lakes, ponds or depressional storage areas shall not be modified for the purposes of stormwater detention unless it is demonstrated that the proposed modifications will maintain or improve its habitat and ability to perform beneficial functions and shall comply with Chapter 1.0, Section 2.0. Existing storage and release rate characteristics of wetlands, rivers, lakes, ponds or depressional storage areas shall be maintained and the volume of detention storage provided to meet the requirements of this section shall be in addition to this existing storage.

4.11.2– Sediment Control: The existing wetlands, rivers, lakes, ponds or depressional storage areas shall be protected during construction and as further regulated in Chapter 4.0 of this policy, and shall not be filled.

4.11.3- Alteration of Drainage Patterns: Site drainage patterns shall not be altered to substantially decrease or increase the existing area tributary to the wetlands, rivers, lakes, ponds or depressional storage areas as defined in the Illinois Drainage Laws.

4.11.4- Detention/Sedimentation: All runoff from the development shall be routed through a preliminary detention/sedimentation basin designed to capture the two-year, 24-hour event and hold it for at least 24 hours, before being discharged to the wetland, river, lake, pond or depressional storage area. This basin shall be constructed before property grading begins and shall be maintained throughout the construction process. In addition, the drainage hierarchy defined in Chapter 3.0, Section 1.0 should be followed to minimize runoff volumes and rates being discharged to the wetland, river, stream, lake, pond or depressional storage area and as further regulated in Chapter 2.0 and Chapter 4.0 of this policy.

4.11.5– Vegetated Buffer Strip: A buffer strip of at least 36 feet in width, (USDA-NRCS minimum filter strip standard), preferably vegetated with native plant species, shall be maintained or restored around the periphery of a wetland, river, stream, lake, pond or depressional storage area.

4.12– Street Detention, Parking Lot Detention and Culvert Drainage:

4.12.1– Street Detention: If streets are to be used as part of the minor or major drainage system, ponding depths shall not exceed curb heights and shall not remain flooded for more than eight (8) hours for any event less than or equal to the 100-year, 24 hour event.

4.12.2– Parking Lot Detention: The maximum stormwater ponding depth in any parking area shall not exceed six (6) inches for more than four (4) hours.

4.12.3– Culvert, Road and Driveway Crossings: Sizing of culvert crossings shall consider entrance and exit losses as well as tail water conditions on the culvert.

4.13– Infiltration Practices: To effectively reduce runoff volumes, infiltration practices including basins, trenches and porous pavement should be located in hydrologic soil groups “A” and “B” as designated by the USDA-NRCS in the soil survey of DeWitt County, Illinois. Infiltration basins and trenches designed to re-charge groundwater shall not be located within seventy-five (75) feet of a water supply well or building

foundation and comply with Chapter 1.0, Section 2.0. A sediment-settling basin shall be provided to remove coarse sediment from stormwater flows before they reach infiltration basins or trenches. Stormwater shall not be allowed to stand more than seventy (70) hours over eighty percent (80%) of the dry basin's bottom area for the maximum design event to be ex-filtrated. The bottom of infiltration basins or trenches shall be a minimum of four feet above the seasonally high groundwater level. Engineering calculations demonstrating infiltration rates shall be included with the application.

4.13.1– Vegetated Filter Strips and Swales: To effectively filter stormwater pollutants and promote infiltration of runoff, sites should be designed to maximize the use of vegetated filter strips and swales. Whenever practicable, runoff from impervious surfaces should be directed onto filter strips and swales comprised of native grasses and forbs before being routed to a storm sewer or detention basin. (Refer to the Filter Strip Standard in the Illinois Urban Manual for Specifications.)

4.14– Safety Considerations: The drainage system components, especially all detention basins, shall be designed to protect the safety of any children or adults coming in contact with the system during runoff events and shall comply with Chapter 1.0, Section 2.0.

4.14.1– Side Slopes: The side slopes of all detention basins at 100-year, 24 hour capacity shall be as level as practicable to prevent accidental falls into the basin and for stability and ease of maintenance. Side slopes of detention basins and open channels shall not be steep than three (3) to one (1) (3:1) (horizontal to vertical).

4.14.2– Safety Ledge: All wet detention basins shall have a level safety ledge at least four feet in width 2.5 to 3 feet below the normal water depth.

4.14.3– Velocity: Velocities throughout the surface drainage system shall be controlled to safe levels taking into consideration rates and depths of flow.

4.14.4– Overflow Structures: All stormwater detention basins shall be provided with an overflow structure capable of safely passing excess flows at a stage at least one foot below the lowest foundation grade in the vicinity of the detention basin. The design flow rate of the overflow structure shall be equivalent to the 100-year, 24-hour inflow rate.

4.15– Maintenance Consideration: The stormwater drainage system shall be designed to minimize and facilitate maintenance. Turfed side slopes shall be designed to allow lawn-mowing equipment to easily negotiate them. Wet basins shall be provided with alternate outflows, which can be used to completely drain the pool for sediment removal. Pumping may be considered if drainage by gravity is not feasible. Pre-sedimentation basins shall be included, where feasible, for localizing sediment deposition and removal. Site access for heavy equipment shall be provided.

Section 5.0 – Accommodating Flows from Upstream Tributary Areas:

Stormwater runoff from areas tributary to the property shall be considered in the design of the property's drainage system. Whenever practicable, flows from upstream areas that are not to be detained should be routed around the basin being provided for the site being developed.

5.1– Upstream Areas Not Meeting Policy Requirements: When there are areas not meeting the storage and release rates of this policy, tributary to the applicant's property, regionalized detention on the applicant's property shall be explored by the applicant. The following steps shall be followed:

- 1.) The applicant shall compute the storage volume needed for his property using the release rates of Chapter 3.0, Section 4.0, the applicant's property area, and the procedures described in Chapter 3.0, Section 3.0.
- 2.) Areas tributary to the applicant's property, not meeting the storage and release rate requirements of this policy, shall be identified..
- 3.) Using the areas determined above plus the applicant's property area, total storage needed for the combined properties shall be computed.

Allowable release rates shall be computed using the combined property areas. Storage shall be computed as described in Chapter 3.0, Section 4.0. If tributary areas are not developed, a reasonable fully developed land cover, based on local zoning, shall be used for the purposes of computing storage.

Once the necessary combined storage is computed the City of Clinton, Illinois may choose to pay for over-sizing the applicant's detention basin to accommodate the regional flows. The applicant's responsibility will be limited to the storage for his property as computed above. If the City of Clinton, Illinois selects regional storage, then the design produced in Chapter 3.0, Section 3.0 shall be implemented. If regional storage is rejected by the City of Clinton, Illinois, the applicant shall bypass all tributary area flows around the applicant's basin whenever practicable. If the applicant must route upstream flows through his basin and the upstream areas exceed one-square mile in size, the applicant must meet the provision of Section 4.8.3 for on-stream basins.

5.2– Upstream Areas Meeting Policy Requirements: When there are areas which meet the storage and release rate requirements of this policy, tributary to the applicant's property, the upstream flows shall be bypassed around the applicant's detention basin if this is the only practicable alternative. Storage needed for the applicant's property shall be computed as described in Chapter 3.0, Section 5.1. However, if the City of Clinton, Illinois decides to route tributary area flows through an applicant's basin, the final design stormwater releases shall be based on the combined total of the applicant's property plus tributary areas.

Section 6.0 – Early Completion of Detention Facilities:

Where detention, retention, or depressional storage areas are to be used as part of the drainage system for the property, they shall be constructed as the first element of the initial earthwork program. The applicant on a regular basis and before project completion shall remove any eroded sediment captured in these facilities in order to maintain the design volume of the facilities.

Section 7.0 – Fee in Lieu of Detention:

All new development or re-development not exceeding fifteen thousand (15,000) square feet of impervious surface may pay a fee of \$10,000 for each acre-foot of detention which would be required under this policy rather than installing detention facilities on the property, unless specifically directed to do otherwise by the appropriate local official. The City of Clinton, Illinois also shall have the option for new development or re-development exceeding fifteen thousand (15,000) square feet of impervious surface of requiring a fee of \$10,000 for each acre-foot of detention needed in lieu of the applicant building a basin on-site provided the property will discharge stormwater to the City of Clinton, Illinois storm sewer system if applicable.

In instances where regional benefits and economies of scale can be achieved, it will be permissible for adjacent properties to utilize a common regional detention basin. Applicants shall have the option of paying a fee of \$10,000 for each acre-foot of detention required so that the City of Clinton, Illinois can build regional facilities or they can jointly build the necessary facilities themselves.

CHAPTER 4 – SOIL EROSION AND SEDIMENT CONTROL:

Section 1.0 – Findings:

The City of Clinton, Illinois hereby finds that:

1. The soil types found in Clinton, Illinois are susceptible to erosion and if left unprotected could cause loss of soil with resultant damage to property;
2. The topography of the City of Clinton, Illinois contains areas with steep slopes upon which, if clearing of trees and/or inappropriate construction takes place, could result in severe erosion and slope stability problems which could result in damage to property;
3. Excessive quantities of soil may erode from areas undergoing development for certain non-agricultural uses including but not limited to the construction of dwelling units, commercial buildings and industrial plants, the building of roads and highways, the modification of stream channels and drainage ways, and the creation of recreational facilities;
4. The washing, blowing and falling of eroded soil across and upon roadways endangers the health and safety of users thereof, by decreasing vision and reducing traction of road vehicles;

5. Soil erosion necessitates the costly repairing of gullies, washed out fills, and embankments;
6. Sediment from soil erosion tends to clog sewers and ditches and to pollute and silt rivers, streams, lakes, sinkholes, wetlands and reservoirs;
7. Sediment limits the use of water and waterways for most beneficial purposes, promotes the growth of undesirable aquatic weeds, destroys fish and other desirable aquatic life and is costly and difficult to remove; and
8. Sediment reduces the channel capacity of waterways and the storage capacity of flood plains and natural depressions, resulting in increased chances of flooding at risk to public health and safety.

Section 2.0 – General Principles:

It is the objective of this policy to control soil erosion and sedimentation caused by development activities, including clearing grading, stripping, excavating and filling of land, in the City of Clinton, Illinois. Measures taken to control soil erosion and off-site sediment runoff shall be adequate to assure that sediment is not transported from the site by a storm event of ten-year, 24 hour frequency or less. The following principles shall apply to all new development or redevelopment activities within the City of Clinton, Illinois and to the preparation of the submissions required under Chapter 4.0, Section 3.0 of this policy.

1. New development or re-development shall be related to the topography and soils of the site so as to create the least potential for erosion. Areas of steep slopes greater than four percent (4%) where high cuts and fills may be required are to be avoided wherever possible, and natural contours should be followed as closely as possible.
2. Existing and/or natural vegetation shall be retained and protected wherever possible. Areas immediately adjacent to natural watercourses, lakes, ponds, wetlands and urban roadways that have storm sewer inlets are to be left undisturbed wherever possible. Temporary crossings of watercourses, when permitted, must include appropriate stabilization measures.
3. Special precautions shall be taken to prevent damages resultant from any necessary development activity within or adjacent to any stream, lake, pond, wetland and sinkholes from broken farm tile. Preventive measures shall reflect the sensitivity of these areas to erosion and sedimentation.
4. The smallest practical area of land should be exposed for the shortest practical time during development.
5. Sediment basins or traps, filter barriers, diversions, and any other appropriate sediment or runoff control measures shall be installed prior to site clearing and grading and maintained to remove sediment from run-off waters from land undergoing development.
6. The selection of erosion and sediment control measures shall be based on assessment of the probable frequency of climatic and other events likely to contribute to erosion, and on evaluation of the risks, costs and benefits involved.
7. In the design of erosion control facilities and practices, aesthetics and the requirements of continuing maintenance must be considered.
8. Provision shall be made to accommodate the increased run-off caused by changed soil and surface conditions during and after development. Drainage ways should be designed so that their final gradients and the resultant velocities and rates of discharge will not create additional erosion on-site or downstream.
9. Permanent vegetation and structures shall be installed and functional as soon as practical during development.
10. Those areas being converted from agricultural purposes to other land uses shall be vegetated with an appropriate protective cover prior to development.
11. All waste generated as a result of site development activity shall be properly disposed of and shall be prevented from being carried off the site by either wind or water.
12. All construction sites shall provide measures to prevent sediment from being tracked onto public or private roadways.
13. All temporary soil erosion and sediment control practices shall be maintained to function as intended until the contributing drainage area has been permanently stabilized at which time they shall be removed.

Section 3.0 – Erosion and Sediment Control Plan Submittal Requirements:

Each applicant shall submit the information depending on development size, as regulated to ensure that the provisions of this policy are met. The submittal shall include sufficient information to evaluate the environmental characteristics of the property, the potential adverse impacts of the development related to erosion both on-site and off-site and the effectiveness of the proposed erosion and sediment control plan in reducing sediment loss and meet the provisions of Chapter 1.0, Section 2.0. The applicant shall certify on the drawing that all clearing, grading, drainage and construction shall be accomplished in strict conformance with the erosion and sediment control plan. The following information shall be submitted for both existing and proposed property conditions; new developments or re-developments meeting the requirements of Chapter 1.0, Section 3.0.

3.1 – Erosion and Sediment Control Plan Requirements: Shall meet the requirements of Chapter 3.0, Section 1.1, Section 1.1.1, and Section 1.1.2.

3.1.1 – Mapping and Descriptions: The existing and proposed erosion and sediment control features of the property and immediate vicinity including:

- 1.) As required in Chapter 3.0, Section 1.1, Section 1.1.1, and Section 1.1.2;
- 2.) Location of the slope disturbance line;
- 3.) Location and description of the erosion and sediment control measures to be employed during construction;
- 4.) For any structures proposed to be located on the slope side of the slope disturbance line, the map shall include the limits of disturbance including tree removal, erosion and sediment control measures during construction, cross section view of any proposed cut or fill, erosion and sediment control measures during construction, details of method(s) proposed for providing slope stability, permanent stormwater control measures, and permanent erosion and sediment control measures all being certified by a registered professional engineer or a “Certified Professional Erosion Control specialist.”
- 5.) The predominant soil types on the site, their location, and their limitations for the proposed use as defined by the USDA Natural Resources Conservation Service.
- 6.) The proposed use of the site, including present and planned development, areas of clearing, stripping, grading, excavation and filling; proposed contours, finished grades, and street profiles; the stormwater plan as required in Chapter 2.0; kinds and locations of utilities, areas and acreage proposed to be paved, sodded or seeded, vegetatively stabilized, or left undisturbed; and the location of trees over eight (*) inches in diameter (taken at 4.5 feet dbh) and their type.
- 7.) The erosion and sediment control plan showing all measures necessary to meet the requirements of this policy throughout all phases of construction and those remaining permanently after completion of the development of the site, including:
 - a.) Location and description, including standard details, of all sediment control measures runoff control measures, including diversions, waterways and outlets, and design specifics of sediment basins and traps including outlet details.
 - b.) Location and description of all soil stabilization and erosion control measures, including seeding mixtures and rates, types of sod, method of seedbed preparation, expected seeding dates, type and rate of lime and fertilizer application, kind and quantity of mulching for both temporary and permanent vegetative control measures, and types of non-vegetative stabilization measures.
 - c.) Location and description of methods to prevent tracking of sediment off-site including construction entrance details, as appropriate.
 - d.) Description of dust and traffic control measures.
 - e.) Locations of stockpiles and description of stabilization methods.
 - f.) Location of off-site fills or borrow volumes, locations and methods of stabilization.
 - g.) Provisions for maintenance of control measures, including type and frequency of maintenance, easements, and estimates of the cost of maintenance.
 - h.) The proposed phases of development of the site, including stripping and clearing, rough grading and construction, and final grading and landscaping. Phasing should identify the expected date on which clearing will begin, the estimated duration of exposure of cleared area, and the sequence of installation

of temporary sediment control measures (including perimeter controls), installation of stormwater drainage, paving streets and parking areas, final grading and the establishment of permanent vegetative cover, and the removal of temporary measures. It shall be the responsibility of the applicant to notify the Building and Zoning Administrator of any significant changes that occur in the site development schedule after the initial erosion and sediment control plan has been approved.

Section 4.0 – Design and Operation Standards and Requirements:

The preparation of soil erosion and sediment control plans and the design criteria, standards, and methods shall be prepared in accordance with the requirements of this policy and the standards and specifications contained in the newly revised “Illinois Urban Manual”. (This manual was revised through an interagency effort. Begun in April 1997 and completed in 1999, participating agencies were USDA-NRCS, US Army Corp of Engineers, US and Illinois Environmental Protection Agency, IL Dept of Transportation, IL Dept of Agriculture, Soil and Water Conservation Districts, IL Dept of Natural Resources, US Fish & Wildlife, Tri-County Planning Commission, NIPC and SWIPC.) In the event of conflict between the provisions of said manuals and of this policy, this policy shall govern.

4.1 – Erosion and Sediment Control Design Requirements: New developments or re-developments shall comply with Chapter 4.0, Section 3.0, and meet the following:

- 4.1.1 – Control measures shall be constructed to control runoff from the property to such an extent possible that sediment is retained on-site.
- 4.1.2 – Temporary on-site control measures required shall be constructed and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.
- 4.1.3 – Disturbed areas shall be stabilized with permanent measures within seven (7) calendar days following the end of active disturbance, or re-disturbance consistent with the following criteria:
 - 1. Appropriate permanent stabilization measures shall include seeding, mulching, and sodding, with non-vegetative measures as a last resort.
 - 2. Areas having slopes greater than eight percent (8%) shall be stabilized with sod, mat, or blanket in combination with seeding or equivalent.
- 4.1.4 – All temporary and permanent erosion and sediment control practices must be maintained and repaired as needed to assure effective performance of their intended function.
- 4.1.5 – All temporary erosion and sediment control measures shall be disposed in a proper manner within thirty (30) days after final site stabilization is achieved with permanent soil stabilization measures. Trapped sediment and other disturbed soils resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.
- 4.1.6 – **Site Development Requirements:** On-site sediment control measures, as specified by the following criteria, shall be constructed as specified in the referenced handbook, and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.
 - 1. For new developments or re-developments less than one (1) acre, filter barriers (including filter fences, straw bales, or equivalent control measures) shall be constructed to control all on-site runoff. Vegetated filter strips, with a minimum width of twenty-five (25) feet, may be used as an alternative only where runoff in sheet flow is expected.
 - 2. For new developments or re-developments more than one (1) acre but less than five (5) acres, a sediment trap or equivalent control measure shall be constructed at the down slope point of the disturbed area.

3. For new developments or re-developments greater than five (5) acres, a sediment basin or equivalent control measure shall be constructed at the down slope point of the disturbed area.
 4. Sediment basin and sediment trap designs shall provide for both “dry” detention and “wet” detention sediment storage. The detention storage shall be composed of equal volumes of “wet” detention storage and “dry” detention storage and each shall be sized as regulated in Chapter 3.0. The elevation of the outlet structure shall be placed such that it only drains the dry detention storage.
 5. The sediment storage shall be sized to store the estimated sediment load generated from the site over the duration of the construction period with a minimum storage equivalent to the volume or sediment generated in one year. For construction periods exceeding one year, the 1-year sediment load, and sediment removal schedule may be substituted.
 6. To the extent possible or as otherwise regulated in this policy all desirable trees eight (8) inches diameter (Taken at 4.5 feet dbh) and larger shall be protected for their present and future value for erosion protection and other environmental benefits. Trees that have been selected for preservation shall be marked prior to the beginning of any clearing, grading, stripping, excavation, or filling of the site. A “No Construction Zone” shall be established and marked at the perimeter of the drip line of each tree, which is to be preserved.
- 4.1.7 - Stormwater conveyance channels, including ditches, swales, and diversions, and the outlets of all channels and pipes shall be designed and constructed as regulated in Chapter 3.0. All constructed or modified channels shall be stabilized within 48 hours, consistent with the following standards, and as required in the referenced handbook:
1. For grades up to 4 percent (4%) seeding in combination with mulch, erosion blanket, or an equivalent control measure shall be applied. Sod or erosion blanket or mat shall be applied to the bottom of the channel.
 2. For grades of four to eight percent (4% - 8%), sod or an equivalent control measure shall be applied in the channel.
 3. For grades greater than eight percent (8%), rock, riprap, or an equivalent control measure shall be applied over filter fabric or other type of soil protection, or the grade shall be effectively reduced using drop structures.
- 4.1.8 – Land disturbance activities in stream channels shall be avoided, where possible, or as regulated in Chapter 3.0. If disturbance activities are unavoidable, the following requirements shall be met:
1. Construction vehicles shall be kept out of the stream channel to the maximum extent practicable. Where construction crossings are necessary, temporary crossings shall be constructed of non-erosive material, such as riprap or gravel.
 2. The time and area of disturbance of stream channels shall be kept to a minimum. The stream channel, including bed and banks, shall be stabilized within 48 hours after channel disturbance is completed, interrupted, or stopped.
 3. Whenever channel relocation is necessary, the new channel shall be constructed under dry conditions and fully stabilized before flow is diverted, incorporating meanders, pool and riffle sequence, and riparian planting.
- 4.1.9 – Storm sewer inlets and culverts shall be protected by sediment traps or filter barriers meeting accepted design standards and specifications.
- 4.1.10 – Soil storage piles containing more than 10 cubic yards of material shall not be located with a down slope drainage length of less than 25 feet to a roadway or drainage channel. Filter barriers, including straw bales, filter fence, or equivalent, shall be installed immediately on the down slope side of the piles.
- 4.1.11 – If de-watering devices are used, discharge locations shall be protected from erosion. All pumped discharges shall be routed through appropriately designed sediment traps or basins, or equivalent and shall not be deposited into a sinkhole.
- 4.1.12 – Each site shall have graveled (or equivalent) entrance roads, access drives, and parking areas of sufficient length and width to prevent sediment from being tracked onto public or private roadways. Any sediment reaching a public or private road shall be removed by

shoveling or street cleaning (not flushing) before the end of each workday and transported to a controlled sediment disposal area.

Section 5.0 – Maintenance of Control Measures:

All soil erosion and sediment control measures necessary to meet the requirements of this policy shall be maintained periodically by the applicant, or subsequent land owner during the period of land disturbance and development of the site in a satisfactory manner to ensure adequate performance.

CHAPTER 5 – Long Term Maintenance Responsibility:

Section 1.0 – Long Term Maintenance Responsibility:

Maintenance of stormwater drainage, and erosion and sediment control facilities located on private property shall be the responsibility of the owner of that property. Before an appropriate permit is obtained from the City of Clinton, Illinois, the applicant shall execute a maintenance agreement with the City of Clinton, Illinois of guaranteeing that the applicant and all future owners of the property will maintain its stormwater drainage and erosion and sediment control system. Such agreement shall be recorded with the Recorder of Deeds of DeWitt County, Illinois. The maintenance agreement shall include a schedule for regular maintenance of each aspect of the property's stormwater drainage and erosion and sediment control system and shall provide for access to the system for inspection by authorized personnel of the City of Clinton, Illinois. The maintenance agreement shall also stipulate that if the appropriate personnel of the City of Clinton, Illinois notifies the property owner in writing of maintenance problems which require correction, the property owner shall begin such corrections within twenty-four (24) hours and shall not extend beyond seven (7) calendar days of such notification. If the corrections are not made within this time period the City of Clinton, Illinois may have the necessary work completed and assesses the cost to the property owner. The City of Clinton, Illinois has the option of requiring a bond to file by the property owner for maintenance of the stormwater drainage and erosion and sediment control system.

CHAPTER 6 – Inspections:

Section 1.0 – Inspections:

The Zoning Office and/or Department of Public Works & Construction of said entities shall make inspections as hereinafter required and shall either approve that portion of the work completed or shall notify the permittee wherein the work fails to comply with the stormwater drainage or erosion and sedimentation control plan as approved. The DeWitt County Soil and Water Conservation District could serve as an agent under a contract agreement for said entities to provide inspection. Plans for grading, stripping, excavating, and filling work bearing the stamp of approval of the Building and Zoning Administrator shall be maintained at the site during progress of the work. In order to obtain inspections and to ensure compliance with this policy, the permittee shall notify the Zoning Office or its agent, within two (2) working days of the completion of the construction stages specified below:

1. Upon completion of installation of the stormwater drainage and erosion and sediment control measures (including perimeter controls and diversions), prior to proceeding with any other earth disturbance or grading;
2. After stripping and clearing;
3. After rough grading;
4. After final grading;
5. After seeding and landscaping deadlines, and
6. After final stabilization and landscaping, prior to removal of sediment controls.

If stripping, clearing, grading and/or landscaping are to be done in phases or areas, the permittee shall give notice and request inspection at the completion of each of the above work stages in each phase or area. If an inspection is not made and the City of Clinton, Illinois receives notification of the results given within five working days after notice from the permittee, the permittee may continue work at his/her own risk, without presuming acceptance by the City of Clinton, Illinois. Notification of the results of the inspection shall be given in writing at the site.

Section 2.0 – Special Precautions:

If at any stage of the grading of any development site the Building and Zoning Administrator of said entities, determines by inspection that the nature of the site is such that further work authorized by an existing permit is likely to imperil any property, public way, stream, lake, wetland, or drainage structure, the Building and Zoning administrator of said entities, may require, as a condition of allowing the work to be done, that such reasonable special precautions to be taken as is considered advisable to avoid the likelihood of such period. "Special precautions" may include, but shall not be limited to, a more level exposed slope, construction of additional drainage facilities, berms, terracing, compaction, or cribbing,

installation of plant materials for erosion control, and recommendations of a registered soils engineer and/or engineering geologist which may be made requirements for further work.

- 2.0.1 – Where it appears that storm damage may result because the grading on any development site is not complete, work will be stopped and the permittee required to install temporary structures or take such other measures as may be required to protect adjoining property or the public safety. On large developments, or where unusual site conditions prevail, the Building and Zoning Administrator of said entities, may specify the time of starting grading and time of completion or may require that the operations be conducted in specific stages so as to ensure completion of protective measures or devices prior to the advent of seasonal rains.

Section 3.0 – Amendment of Plans:

Major amendments to stormwater drainage and detention or erosion and sediment control plans shall be submitted to the Building and Zoning Administrator of said entities, and shall be processed and approved or disapproved in the same manner as the original plans. Field modification of a minor nature may be authorized by the Building and Zoning Administrator of said entities by written authorization to the permittee.

CHAPTER 7 – Permitting:

Section 1.0 – Application for Permit:

Application for a development permit shall be made by the owner of the property or his authorized agent to the City Zoning Office of said entities on a form furnished for that purpose. Each application shall bear the name(s) and address(es) of the owner or developer of the site, the contractor(s) and of any consulting firm retained by the applicant together with the name of the applicant's principal contact at such firm, and shall be accompanied by a filing fee. Each application shall include certification that any land clearing, construction or development involving the movement of earth shall be in accordance with the plans approved upon issuance of the permit.

Section 2.0 – Bond Required:

The applicant for a development permit will be required to file with the City of Clinton, Illinois, a faithful performance bond or bonds, letter of credit, or other improvement security satisfactory to the City of Clinton, Illinois Attorney, in an amount deemed sufficient by the Building and Zoning Administrator of said entities, to cover all costs of improvements, landscaping, maintenance of improvements and landscaping, and soil erosion and sediment control measures for such period as specified by the City of Clinton, Illinois, and engineering and inspection costs to cover the cost of failure or repair of improvements installed on the site.

Section 3.0 – Review and Approval:

Each application for a development permit shall be reviewed and acted upon according to the following procedures:

1. The City Zoning Office and Department of Public Works & Construction of said entities will review each application for a development permit to determine its conformance with the provisions of this policy. The Officer will also refer any application to the DeWitt County Soil and Water Conservation District staff and USDA-NRCS field office for review and comment. Within thirty (30) days after receiving an application, the Zoning Office of said entities shall in writing:
 - a. Approve the permit application if it is found to be in conformance with the provisions of this policy; and issue the permit;
 - b. Approve the permit application subject to such reasonable conditions as may be necessary to secure substantially the objectives of this policy, and issue the permit subject to these conditions; or
 - c. Disapprove the permit application, indicating the deficiencies and the procedure for submitting a revised application and/or submission.

Section 3.1– No development permit shall be issued for intended developments site unless:

1. The development, including but not limited to subdivision or planned unit development, has been approved by the City of Clinton Illinois where applicable; or
2. Such permit is accompanied by or combined with a valid building permit issued by the City of Clinton, Illinois; or
3. The proposed earth moving is coordinated with any overall development program previously approved by the City of Clinton, Illinois for the area in which the site is situated; and
4. All relevant federal and state permits have been received for the portion of the site subject to soil disturbance as noted in Chapter 1.0. Section 2.0.

3.1 – Failure of the Zoning Office of said entities to act on an original or revised application within thirty (30) days of receipt shall authorize the applicant to proceed in accordance with the plans as filed, and in compliance with the regulations contained herein, unless such time is extended by agreement between the Zoning Office of said entities and the applicant. Pending preparation and approval of a revised plan, development activities shall be allowed to proceed in accordance with conditions established by the Zoning Office of said entities.

Section 4.0 – Expiration of Permit:

Every development permit shall expire and become null and void if the work authorized by such permit has not been commenced within one hundred and eighty (180) days, or if not completed by a date which shall be specified in the permit; except that the Building and Zoning Administrator of said entities may, if the permittee presents satisfactory evidence that unusual difficulties have prevented work being commenced or completed within the specified time limits, grant a reasonable extension of time if written application is made before the expiration date of the permit. The Building and Zoning Administrator of said entities might require modification of the erosion control plan to prevent any increase in erosion or off-site sediment runoff resulting from any extension.

Section 5.0 – Appeals:

The applicant, or any person or agency which received notice of the filing of the application, may appeal the decision of the Building and Zoning Administrator to the Board of Appeals. Upon receipt of an appeal, the Board of Appeals shall schedule and hold a public hearing, after giving fifteen (15) days notice thereof. The Board shall render a decision within thirty (30) days after the hearing. Factors to be considered on review shall include, but need not be limited to, the effects of the proposed development activities on the surface water flow to tributary and downstream lands, any comprehensive watershed management plans, or the use of any retention facilities; possible saturation of fill and unsupported cuts by water, both natural and domestic; runoff surface waters that produce erosion and silting of drainage ways; nature and type of soil or rock which when disturbed by the proposed development activities may create earth movement and produce slopes that cannot be landscaped; and excessive and unnecessary scarring of the natural landscape through grading or removal of vegetation.

Section 6.0 – Retention of Plans:

Plans, specifications, and reports for all site developments shall be retained in original form or on microfilm by the Building and Zoning Administrator of said entities.

CHAPTER 8 – Enforcement:

Section 1.0 – Stop-Work Order:

Revocation of Permit: In the event any person holding a development permit pursuant to this policy violates the terms of the permit, or carries on-site development in such a manner as to materially adversely affect the health, welfare, environment, or safety of persons residing or working in the neighborhood of the development site or so as to be materially detrimental to the public welfare or injurious to property or improvements in the neighborhood, the Building and Zoning Administrator of said entities may suspend or revoke the development permit.

- 2.1 – Suspension of a permit shall be by a written stop-work order issued by the Building and Zoning Administrator of said entities, and delivered to the permittee or his agent or the

person performing the work. The stop-work order shall be effective immediately, shall state the specific violations cited, and shall state the conditions under which work may be resumed. A stop-work order shall remain in effect until the next regularly scheduled meeting of the Board of Appeals at which time the conditions of Chapter 7.0, Section 5.0 below, can be met.

2.2 – No development permit shall be revoked until the Board of Appeals of said entities holds a hearing. Written notice of such hearing shall be served on the permittee, either personally or by registered mail, and shall state:

1. The grounds for complaint or reasons for suspension or revocation, in clear and concise language; and
2. The time when and place where such hearing will be held.

Such notice shall be served on the permittee at least five (5) days prior to the date set for the hearing. At such hearing, the permittee shall be given an opportunity to be heard and may call witnesses and present evidence on his behalf. At the conclusion of the hearing, the Board of Appeals of said entities shall determine whether the permit shall be revoked.

Section 2.0 – Violations and Penalties:

No person shall construct, enlarge, alter, repair or maintain any grading, excavation or fill, or cause the same to be done, contrary to or in violation of any terms of this policy. Any person violating any of the provisions of this policy shall be deemed guilty of a misdemeanor, and each day during which any violation of any of the provisions of this policy is committed, continued, or permitted shall constitute a separate offense. Upon conviction of any such violation, such person, partnership, or corporation shall be punished by a fine of not less than Five Hundred Dollars (\$500) per day for each offense. In addition to any other penalty authorized by this section, any person, partnership, or corporation convicted of violating any of the provisions of this policy shall be required to restore the site to the condition existing prior to commission of the violation, or to bear the expense of such restoration.

CHAPTER 9 – Effective Date

This policy shall be in full force and effect from and after its passage and approval and publication, as required by law.

Passed by the City of Clinton, Illinois, on this *day* of *month*, *year*.

Passed: _____

Approved: _____

Official

Attest:

Official

ORDINANCE #

AN ORDINANCE PROVIDING FOR THE CONTROL
OF STORM WATER DRAINAGE AND DETENTION,
SOIL EROSION AND SEDIMENT CONTROL WITHIN
THE
VILLAGE OF DWIGHT, ILLINOIS

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ARTICLE I

Authority and Purpose; Other Relevant Permitting; Applicability; Exemptions; Exceptions; and Separability:

Section 10 - Authority and Purpose: This ordinance is enacted pursuant to the police powers granted to the Village of Dwight, Illinois, by the Illinois Compiled Statutes, 65 ILCS 5/1-2-1, 5/11-12-12, 5/11/30-2, and 5/11/31-2.

The purpose of this ordinance is to diminish threats to public health and safety, protect property, prevent damage to the environment and promote public welfare by guiding, regulating, and controlling the design, construction, use, and maintenance of any new development or redevelopment or other activity which disturbs or breaks the topsoil or otherwise results in the movement of earth and/or changes the storm water drainage pattern and/or storm water flows from that which would have occurred if the land had been left in its natural state. This storm water runoff and resulting soil erosion could result in the inundation of damageable properties, the erosion and destabilization of downstream channels, and the pollution of valuable stream and lake resources. One cause of increases in storm water runoff quantity or rate and impairment of quality, and loss of valuable topsoil is the new development or redevelopment of the land. This ordinance regulates these activities to minimize adverse impacts.

This ordinance is adopted to accomplish the following objectives:

- a.) To assure that new development or redevelopment does not increase the drainage or flood hazards, or create unstable conditions susceptible to soil erosion;
- b.) To protect new buildings and major improvements to buildings from flood damage due to increased storm water runoff and soil erosion;
- c.) To protect human life and health from the hazards of increased flooding and soil erosion on a watershed basis;
- d.) To lessen the burden on the taxpayer for flood control projects, repairs to flood-damaged public facilities and utilities, correction of channel erosion problems, and flood rescue and relief operations caused by storm water runoff and soil erosion quantities from new development or redevelopment;

- e.) To protect, conserve, and promote the orderly development of land and soil, water, air, animal, and plant resources;
- f.) To preserve the natural hydrologic and hydraulic functions of watercourses, wetlands and flood plains for protecting water quality, and enhance storm water management and aquatic habitats;
- g.) To preserve the natural characteristics of stream corridors in order to manage flood and storm water impacts, improve water and groundwater quality, reduce soil erosion, protect aquatic and riparian habitat, maintain quality forest resources, provide recreational opportunities, provide aesthetic benefits, enhance community and economic development.

Section 11 - Other Relevant Permitting: Before a Development Permit under this ordinance becomes effective, all required Federal, State, and Local permits will have been received for the site subject to new development or redevelopment. The acquisition of these permits shall be the sole responsibility of the applicant. These may include but are not limited to Section 404 of the Clean Waters Act; Section 106 of the National Historic Preservation Act; Section 10 of the Rivers and Harbors Act; or permitting required by the Illinois Department of Natural Resources, Office of Water Resources in accordance with the Rivers, Lakes and Streams Act, 615 ILCS; the Soil and Water Conservation Districts Act, 70 ILCS; the Farmland Preservation Act, 505 ILCS; the Illinois Groundwater Protection Act, 415 ILCS; and the National Pollutant Discharge Elimination System Permit (NPDES) and Section 401 of the Clean Water Act thru the Illinois Environmental Protection Agency, Division of Water Pollution Control; and the Threatened and Endangered Species Act, 16 USC 1531 ET. SEQ. Compliance is also required with; but not limited to, the Zoning Ordinance of the Village of Dwight, Illinois, and the Uniform Building Code, most recent edition adopted by the Village, Chapter on Excavation and Grading.

Section 12 - Applicability: This ordinance shall apply to all new development or redevelopment in the Village. Except as otherwise provided in this ordinance, no person, firm or corporation, public or private, the State of Illinois and its agencies or political subdivisions, the United States of America, and its agencies or political subdivisions, any agent, servant, officer or employee of any of the foregoing which meets the following provisions or is otherwise exempted in this ordinance, shall not commence any development activities without first having obtained a development permit from the Village Administrator.

12.01 - Any new development or redevelopment that will include an area that will meet or exceed ten thousand (10,000) square feet of total impervious surface (i.e., streets, roof, patio or parking area or any combination thereof); or

12.02 - Any land disturbing activity (i.e., clearing, grading, stripping, excavation, fill, or any combination thereof) that will affect an area that will meet or exceed ten thousand (10,000) square feet or that will exceed 100 cubic yards; or

12.03 - Any land disturbing activity greater than 500 square feet if the activity is within 100 feet of a lake, pond, stream, or wetland; and is done in conjunction with sub sections 12.01 or 12.02; or

12.04 - Any land disturbing activity on the sloping side of the slope disturbance line and is in conjunction with sections 12.01, 12.02, or 12.03; or

12.05 - Any tree cutting or mechanized land clearing that will involve six or more trees, native to North East Central Illinois, that have a diameter in excess of eight (8) inches DBH and is done in conjunction with Article I, Sections 12.01, 12.02, 12.03 or 12.04.

12.06 - The construction of one single family dwelling that is not constructed as part of a residential development shall not be subject to the provisions of this ordinance regarding permanent storm water control measures.

12.07 – The Village reserves the right to require any non-agricultural, construction development activity, regardless of disturbed area or type of activity, to comply with this ordinance if it is determined to be the cause of or a contributor to an existing or potential erosion, sediment, or stormwater impact.

Section 13 - Exemptions: A development permit shall not be required for the following:

- a.) Any new development, redevelopment or other activity falling below the minimum standards as set forth in Article I, Section 12.
- b.) The agricultural use of land, including the implementation of conservation measures included in a farm conservation plan approved by the Natural Resources Conservation Service, and including the construction of agricultural structures.
- c.) The maintenance of any existing storm water drainage/detention component or structure or any existing soil erosion/sediment control component or structure; including dredging, levee restoration, tree removal or other function which maintains the original design capacities of the above.
- d.) The construction of, improvements to, or the maintenance of any street, road, highway or interstate highway performed by any unit of government whose powers grant such authority.

- e.) Development that has been substantially completed before the effective date of the ordinance.

Section 14 - Variances: The Zoning Board of Appeals, after a public hearing, may determine and vary the requirements and regulations of this ordinance in harmony with their general purpose and intent, where the Board of Appeals makes written finding of fact in accordance with the standards herein after prescribed and further, find that there are practical difficulties or particular hard ships in the way of carrying out the strict letter of requirements and regulations of this ordinance.

14.01 - Application for variance shall be made by a verified petition of the applicant for a development permit, stating fully the grounds of the petition and the facts relied upon by the applicant. Such petition shall be filed with the development permit application. Each application for a variance shall be made in writing and filed with the Zoning Administrator. The Zoning Administrator and the Village Engineer will review and transmit recommendations to the Board of Appeals, which shall review such recommendations prior to granting or denying the variance.

14.02 – Standards for variance. The Board of Appeals shall not vary the requirements and regulations of this ordinance, as authorized in this section, unless there is evidence presented to it in each specific case:

14.021 The land is of such shape or size or is affected by such physical conditions or is subject to such title limitations of record, that it is impossible or impractical for the applicant to comply with all of the requirements of this ordinance;

14.022 The variance is necessary for the preservation and enjoyment of a substantial property right of the applicant; and

14.023 The granting of the variance will not be detrimental to the public welfare, environment or injurious to other property in the vicinity of the subject property.

14.03 - The Board of Appeals shall hold a public hearing on each application for variance, in accordance with the Village of Dwight Zoning Ordinance. Within thirty (30) days after the public hearing, the Board of Appeals shall either approve the site development permit application with the variances and conditions it deems necessary or it shall disapprove such development permit application and variance application or it shall take other such action as appropriate.

Section 15 - Separability: The provisions and sections of this ordinance shall be deemed to be separable, and the invalidity of any portion of this ordinance shall not affect the validity of the remainder.

Section 16 - Responsibility: The applicant shall not be relieved of responsibility for damage to persons or property otherwise imposed by law, and the Village or its officers or agents, will not be made liable for such damage, by (1) the issuance of a development permit under this ordinance, (2) compliance with the provisions of that development permit or conditions attached to it by the Zoning Administrator (3) failure of the Village of Dwight Officials to observe or recognize hazardous or unsightly conditions, (4) failure of the Village officials to recommend denial or to deny a development permit, or (5) exemptions from development permit requirements of this ordinance.

Section 17 - Non-conforming Uses: Non-conforming structures and uses shall not be replaced or enlarged in any manner unless such replacement or enlargement conforms to the requirements of this Ordinance and has been approved by the local government having jurisdiction.

Section 18 - Violations: Consistent with Chapter 1.0 Section 3.0 and Chapter 8 Section 2.0 of this Ordinance, it shall be unlawful for any person to undertake any development without first securing a Development Permit in accordance with this Ordinance. It shall be unlawful for any person to violate any provision of this Ordinance. Injunctive relief is specifically authorized for enforcement of the provisions of this Ordinance.

Article II - Definitions:

Section 20 - Definitions: For the purposes of this ordinance certain terms are defined and set forth below:

20.01 - Adverse Impacts: Any negative impact on plant, soil, air or water resources affecting their beneficial uses including recreation, aesthetics, aquatic habitat, quality, and quantity.

20.02 - Applicant: Any person, firm, or governmental agency who executes the necessary forms to procure official approval of a development or permit to carry out construction of a new development or re-development from the Village of Dwight, Illinois.

20.03 - Base Flood Elevation: The elevation at all locations delineating the level of flooding resulting from the 100-year frequency flood event, which has a one percent (1%) probability of being equaled or exceeded in any given year.

20.04 – Board of Appeals: “ Board of Appeals” shall mean the Zoning Board of Appeals of the Village of Dwight, Illinois, with the jurisdiction as set forth in the Municipal Code of the Village of Dwight.

20.05 – Building Inspector: Is the officer or other designated authority charged with the administration and enforcement of the Uniform Building Code for the Village of Dwight, Illinois.

20.06 - Building Permit: A permit issued by the Village of Dwight, Illinois, for the construction, erection or alteration of a structure or building and the related ground and surface preparation prior to and after completion of construction, erection or alteration of a structure or building.

20.07 - Bypass Flows: Storm water runoff from upstream properties tributary to a property's drainage system but not under its control.

20.08 - Certify or Certification: Formally attesting that the specific inspections and tests were performed, and that such inspections and tests comply with the applicable requirements of this ordinance.

20.09 - Channel: Any defined river, stream, creek, brook, branch, natural or artificial depression, ponded area, on-stream lake or impoundment, abandoned mine, flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or manmade drainage way, which has a definite bed and bank or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

20.10 - Channel Modification: Alteration of a channel by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, riprapping (or other armoring), filling, widening, deepening, straightening, relocating, lining, and significant removal of bottom or woody rooted vegetation. Channel modification does not include the man-made clearing of debris or removal of trash.

20.11 - Clearing: Any activity, which removes the natural vegetative ground cover.

20.12 - Compensatory Storage: An artificially excavated, hydraulically equivalent volume of storage within the flood plain used to balance the loss of natural flood storage capacity when fill or structure are placed within the flood plain.

20.13 - Conduit: Any channel, pipe, sewer or culvert used for the conveyance or movement of water, whether open or closed.

20.14 – County: County of Livingston, Illinois.

20.15 - Cubic Yard: A one- (1) yard by one (1) yard by one (1) yard amount of material in excavation and/or fill.

20.16 - DBH: The measurement of tree diameter taken 4.5 feet above ground level.

20.17 - Detention Basin: A facility constructed or modified to provide for the temporary storage of storm water runoff and the controlled release by gravity of this runoff at a prescribed rate during and after a flood or storm.

20.18 - Detention Time: The amount of time storm water is held within a detention basin.

20.19 - Development: Any manmade change to real estate or property, including:

- a.) The division or subdivision of any duly recorded parcel of property;
- b.) Construction, reconstruction or placement of a building or any addition to a building valued at more than one thousand dollars (\$1000.);
- c.) Installation of a manufactured home on a site, preparing a site for a manufactured home, or installing a travel trailer on a site for more than 180 days per year;
- d.) Construction of roads, bridges, or similar projects;
- e.) Redevelopment of a site;
- f.) Filling, dredging, grading, clearing, excavating, paving drilling, mining or other non-agri-cultural alterations of a ground surface;
- g.) Storage of materials or deposit of solid or liquid waste;
- h.) Any other activity that might alter the magnitude, frequency, direction, or velocity of storm water flows from a property.

20.20 - Development Permit: A permit issued by the Village of Dwight, IL. for any man made change to real estate.

20.21 - Drainage Plan: A plan, including engineering drawings and supporting calculations, which describes the existing storm water drainage system and environmental features, including grading, as well as proposed alterations or changes to the drainage system and environment of a property.

20.22 - Dry Basin: A detention basin designed to drain after temporary storage of storm water flows and to normally be dry over much of its bottom area.

20.23- Erosion: The general process whereby soil or earth is moved by rainfall, flowing water, wind or wave action.

20.24 - Excavation: Any act by which organic matter, earth, sand, gravel, rock or any other similar material, is cut into, dug, quarried, uncovered, removed, displaced, re-located or bulldozed and shall include the conditions resulting from such actions.

20.25 - Excess Storm Water Runoff: The volume and rate of flow of storm water discharged from a new development or re-development which is or will be in excess of that volume and rate which existed before development or re-development.

20.26 - Existing Grade: The vertical location of the existing ground surface prior to excavation or filling.

20.27 - Farm Drainage: The surface drainage methods, i.e. waterways, and surface ditches that follow natural drainage courses.

20.28 - Farm Tile: The underground conduit that removes excess subsurface waters and/or surface water.

20.29 - Fill: Any act by which earth, sand, gravel, rock, or any other material, is deposited, placed, replaced, pushed, dumped, pulled, transported or moved by man to a new location and shall include the conditions resulting therefrom.

20.30 - Final Grade: The vertical location of the ground surface after grading work is completed in accordance with the engineering plans.

20.31 - Flood Fringe: That area as designated by the Federal Emergency Management Agency (FEMA) on either side of the flood way. This area is subject to inundation from the base flood but conveys little or no flow.

20.32 - Flood Hazard Boundary Map (FHBM): A very generalized map prepared by the Federal Emergency Management Agency (FEMA) which shows only where flood plains are located based on very basic data. FHBM's do not include base flood elevations.

20.33 - Flood Insurance Rate Map (FIRM): A map prepared by the Federal Emergency Management Agency (FEMA) that depicts the special flood hazard area (SFHA) within a

community. This map includes insurance rate zones and regulatory flood plains and may or may not depict regulatory flood ways.

20.34 - Flood Plain: That land adjacent to a body of water with ground surface elevations at or below the base flood or the 100-year frequency flood elevation which is subject to inundation. The flood plain as designated by the Federal Emergency Management Agency (FEMA) is also known as the Special Flood Hazard Area (SFHA). This area is the collective combination of the regulatory flood way and the flood fringe.

20.35 - Flood Way: The channel and that portion of the flood plain, including on-stream lakes, adjacent to a stream or watercourse which is needed to store and convey the anticipated existing and future 100-year frequency flood discharge with no more than a 0.1 foot increase in stage due to any loss of flood conveyance or storage and no more than a ten percent (10%) increase in velocities.

20.36 - Grading: The excavation or fill or any combination thereof and shall include the conditions resulting from any excavation or fill.

20.37 - Hydro Graph: A graph showing for a given location on a stream or conduit, the flow rate with respect to time.

20.38 - Hydro Graph Method: This method estimates runoff volume and runoff hydro graphs for the point of interest by generating hydro graphs for individual subareas, combining them, and routing them through stream lengths and reservoir structures. Factors such as rainfall amount and distribution, runoff curve number, time of concentration, and travel time are included.

20.39 - Illinois Drainage Law: Circular 1355, University of Illinois Extension Office, covering laws that pertain to drainage rights, permits for streams and man made ditches.

20.40 - Impervious Surface: That area of property that is covered by materials other than soil and vegetation and that has no intended capacity to absorb storm water, such as parking lots, driveways, sidewalks, patios, tennis courts, roofs and other structures.

20.41 - Infiltration: The passage or movement of water into the soil surfaces.

20.42 - Livingston County SWCD/LCSWCD: Livingston County Soil & Water Conservation District.

20.43 - Loessal Soil: A sediment, commonly non-stratified and unconsolidated, composed predominately of silt sized particles with accessory clay and sand.

20.44 - Lot: An individual platted parcel in an approved subdivision.

20.45 - Major Drainage System: That portion of a drainage system needed to store and convey flows beyond the capacity of the minor drainage system.

20.46 - Minor Drainage System: That portion of a drainage system designed for the convenience of the public. It consists of street gutters, storm sewers, small open channels, and swales and, where manmade, is to be designed to handle the 10-year runoff event.

20.47 - Mitigation: Mitigation is when the prescribed controls are not sufficient and additional measures are required to offset the development, including those measures necessary to minimize the negative effects which storm water drainage and development activities might have on the public health, safety and welfare. Examples of mitigation include, but are not limited to compensatory storage, soil erosion and sedimentation control, and channel restoration.

20.48 - Natural: Conditions resulting from physical, chemical, and biological processes without intervention by man.

20.49 - Natural Drainage: Channels formed in the existing surface topography of the earth prior to changes made by unnatural causes.

20.50 - One Hundred-Year Event: A rainfall, runoff, or flood event having a one percent (1%) probability of being equaled or exceeded in any given year. A 24 hour storm duration is assumed unless otherwise noted.

20.51 - Parcel: All contiguous land in one ownership.

20.52 - Peak Flow: The maximum rate of flow of water at a given point in a channel or conduit.

20.53 - Permittee: Any person to whom a building permit or a development permit is issued.

20.54 - Person: Any individual, firm or corporation, public or private, the State of Illinois and its agencies or political subdivisions, the United States of America, and its agencies or political subdivisions, and any agent, servant, officer or employee of any of the foregoing.

20.55 - Plan Commission: Planning Commission shall mean the Planning Commission of the Village of Dwight, Illinois, as created and with the jurisdiction as set forth in the Municipal Code of the Village of Dwight, Illinois.

20.56 - Positive Drainage: Provision for overland paths for all areas of a property including depressional areas that may also be drained by storm sewer.

20.57 - Prime Farmland: Prime farmland is land that is best suited to food, feed, forage, fiber and oilseed crops. It may be cropland, pasture, woodland, or other land, but it is not urban and built up land or water areas. It is either used for food or fiber or is available for those uses. The soil qualities, growing season and moisture supply are those needed for a well managed soil to economically produce a sustained high yield of crops. Prime farmland produces the highest yields with minimum inputs of energy and economic resources, and farming it results in the least damage to the environment.

20.58 - Property: A parcel of real estate.

20.59 - Redevelopment: Any alteration of or addition to real estate or property with existing manmade changes to the property as defined by development in Section 2.16 of this Ordinance.

20.60 - Retention Basin: A facility designed to completely retain a specified amount of storm water runoff without release except by means of evaporation, infiltration, emergency bypass or pumping.

20.61 - Sedimentation: The process that deposits soils, debris, and other materials either on other ground surfaces or in bodies of water or storm water drainage systems.

20.62 - Site: A parcel of land, or a contiguous combination thereof, where grading work is performed as a single unified operation.

20.63 - Slope Disturbance Line: The line which delineates relatively level building areas from areas where slopes exceed 7 percent (7%) and where special precautions must be taken.

20.64 - Storm Water Drainage System: All means, natural and manmade, used for conducting storm water to, through or from a drainage area to the point of final outlet from a property. The storm water drainage system includes but is not limited to any of the following: conduits and appurtenance features, canals, channels, ditches, streams, culverts, streets, storm sewers, detention basins, swales and pumping stations.

20.65 - Storm Water Runoff: The waters derived from melting snow or rain falling within a tributary drainage basin which are in excess of the infiltration capacity of the soils of that basin, which flow over the surface of the ground or are collected in channels or conduits.

20.66 - Storm Sewer: A closed conduit for conveying collected storm water.

20.67 - Stream: Any river, creek, brook, branch, flowage, ravine, or natural or man-made drainage way which has a definite bed and banks or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

20.67 - Stripping: Any activity which removes the vegetative surface cover including tree removal, by spraying or clearing, and storage or removal of top soil.

20.68 - Swale - (Grass lined channel) A natural or constructed channel that is shaped or graded to required dimensions and established in suitable vegetation for stable conveyance of runoff.

20.69 – Ten-Year Event: A runoff, rainfall, or flood event having a ten percent (10%) chance of occurring in any given year. A 24 hour storm duration is assumed unless otherwise note.

20.70 - Time of Concentration: The elapsed time for storm water to flow from the most hydraulically remote point in a drainage basin to a particular point of interest in that watershed.

20.71 - Tributary Watershed: All of the land surface area that contributes runoff to a given point.

20.72 – Two-Year Event: A runoff, rainfall, or flood event having a fifty percent (50%) chance of occurring in any given year. A 24 hour storm duration is assumed unless otherwise noted.

20.73 - Vacant: Land on which there are no structures or only structures which are secondary to the use or maintenance of the land itself.

20.74 – Village: Village of Dwight, Illinois.

20.75 – Village Attorney: Attorney for the Village of Dwight, Illinois.

20.76 – Village Engineer: Engineer for the Village of Dwight, Illinois.

20.77 - Watershed: All land area drained by, or contributing water to, the same stream, creek, ditch, lake, marsh, storm water facility, groundwater or depressional area.

20.78 - Wet Basin: A detention basin designed to maintain a permanent pool of water after the temporary storage of storm water runoff.

20.79 - Wetlands: Wetlands are defined by regulation as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." For general, but not inclusive locations of designated wetlands refer to mapping prepared jointly by the U.S. Department of Interior, Fish and Wildlife Service and the Illinois Department of Natural Resources, Office of Resource Conservation; National Wetlands

Inventory Mapping, 1987. The applicant may be required to provide a field investigation by a qualified wetland delineator.

20.80 – Zoning Administrator: The Village Administrator and the Building Inspector, as Zoning Administrator shall be in charge of the Administration and enforcement of this Ordinance.

Article III- Storm Water Drainage and Detention:

Section 30 - Drainage Plan Submittal Requirements: Each applicant shall submit the following information, to ensure that the provisions of this ordinance are met. The submittal shall include sufficient information to evaluate the environmental characteristics of the property, the potential adverse impacts and benefits of the development on water resources both on-site and off-site, and the effectiveness of the proposed drainage plan in managing storm water runoff, and meet the provisions of Article I, Section 11. The applicant shall certify on the drawings that all clearing, grading, drainage, and construction shall be accomplished in strict conformance with the drainage plan. The following information shall be submitted for both existing and proposed property conditions for all new developments or re-developments that meet or exceed the minimum requirements of Article I, Section 12.

30.01 - Drainage Plan Requirements: A topographic survey of the property at two-foot (2) contours unless otherwise specified or approved by the Village Engineer. The plan map shall be keyed to a consistent datum specified by the Village. If the mapping is compiled using a digital format and the Global Positioning System (GPS), the applicant will provide both paper and digital copies including GPS points.

30.011 - Mapping and Descriptions: An existing drainage and proposed drainage plan for the property and one hundred (100) feet surrounding the property at a scale of not more than one hundred (100) feet to one (1) inch, and including the following: " Unless otherwise specified by the Village Engineer"

- a.) property boundary, dimensions, and approximate acreage;
- b.) building setback lines;
- c.) all existing and proposed structures and sizes;
- d.) area in square feet of existing and proposed impervious surface;
- e.) all existing, or proposed easements and covenants;
- f.) all existing, abandoned, or proposed water or monitoring well head locations;
- g.) all sanitary or combined sewer lines and septic systems;
- h.) the banks and centerline of streams and channels;

- i.) shoreline of lakes, ponds, and detention basins with normal water level elevation;
- j.) farm drains and tiles;
- k.) soils classifications;
- l.) location, size and slope of storm water conduits and drainage swales;
- m.) depressional storage areas;
- n.) detention facilities showing inlet & outlet control facilities;
- o.) roads, streets and associated storm water inlets including finished grades;
- p.) base flood elevation, flood fringe, and regulatory flood way;
- q.) basis of design for the final drainage network components;
- r.) a statement giving any applicable engineering assumptions and calculations;
- s.) a vicinity map showing the relationship of the site to its general surroundings at a scale of not less than two thousand (2,000) feet to one (1) inch (1:24,000);
- t.) title, scale, north arrow, legend, seal of Licensed Professional Engineer, date, and name of person preparing plans;
- u.) cross-section data for open channel flow paths and designated overland flow paths;
- v.) direction of storm flows;
- w.) flow rates and velocities at critical points in the drainage system;
- x.) a statement by the design engineer of the drainage system's provision for handling events greater than the 100 year, 24 hour runoff;
- y.) a statement of certification of all drainage plans, calculations, and supporting data by a Licensed Professional Engineer;
- z.) abandoned mine location and type; and
- aa.) subwatershed boundaries within the property.

30.012 - Environmental Features: A depiction of environmental features of the property and immediate vicinity including the following:

- a.) the limits of designated regulatory and non-regulatory wetland areas;
- b.) the location and limits of abandoned mining activity;
- c.) the location of trees greater than eight (8) inches DBH,
- d.) any designated natural areas, prime farmland; and
- e.) any proposed environmental mitigation features.

Section 31 - Minimization of Increases in Runoff Volumes and Rates: In the selection of a drainage plan for a new development or redevelopment, the applicant shall evaluate and implement site design features which minimize the increase in runoff volumes and rates from the

site and addresses the water quality treatment requirements of this ordinance. The applicant's drainage plan submittal shall include evaluations of site design features which are consistent with the following hierarchy:

- a.) Preservation of regulatory flood plains, flood prone and wetland areas;
- b.) Minimize impervious surfaces on the property, consistent with the needs of the project;
- c.) Attenuate flows by use of open vegetated swales and natural depressions and preserves the existing natural stream channel;
- d.) Infiltration of runoff on-site;
- e.) Provide storm water retention structures;
- f.) Provide wet or wetland detention structures;
- g.) Provide dry detention structures; and
- h.) Construct storm sewers.

Section 32 - Water Quality and Multiple Uses: The drainage system should be designed to minimize adverse surface and groundwater quality impacts off-site and on the property itself. Detention basins shall incorporate design features to capture storm water runoff pollutants. In particular, designers shall give preference to wet bottom and wetland type designs and all flows from the development shall be routed through the basin (i.e. low flows shall not be bypassed). Detention of storm water shall be promoted throughout the property's drainage system to reduce the volume of storm water runoff and to reduce the quantity of runoff pollutants.

The drainage system should incorporate multiple uses where practicable. Uses considered compatible with storm water management include open space, aesthetics, aquatic habitat, recreation (boating, fishing, trails, playing fields), wetlands and water quality mitigation.

Section 33 - Design Criteria, Standards, and Methods:

33.01 - Release Rates: The drainage system for new developments or redevelopments shall be designed to control the peak rate of discharge from the property for the 2 year, 24 hour and 100 year, 24 hour events to levels which will not cause an increase in flooding or channel instability downstream when considered in aggregate with other developed properties and downstream drainage capacities. Calculations to determine the peak discharge rate from events less than or equal to the 2 year, 24 hour event and the peak discharge rate for the 100-year, 24 hour event shall be submitted to the Village Engineer for approval.

33.011 - Detention Basin Outlet Design: Backwater on the outlet structure from the downstream drainage system shall be addressed when designing the outlet.

33.02 - Detention Storage Requirements: The design maximum storage to be provided in the detention basin shall be based on the runoff from the runoff difference before and after development from the 100 year, 24 hour event. All detention basin storage shall be computed using Hydro graph Methods utilizing reservoir routing (also called modified pulse or level pool) or equivalent method as described in Section 33.04.

33.03 - Drainage System Design and Evaluation: The following criteria should be used in evaluating and designing the drainage system. The design will provide capacity to pass the 10 year, 24 hour peak flow in the minor drainage system and an overload flow path for flows in excess of the design capacity. Whenever practicable, the storm water systems shall not result in the interbasin transfer of drainage unless no other alternative exists.

33.031 - Design Methodologies: Major and minor conveyance systems for areas up to 10 acres, may be designed using the Rational Formula. The Rational Formula may also be used in sizing the minor drainage system for larger sites up to 100 acres. Runoff hydrograph methods as described in Section 33.04 must be used for major drainage system design for all systems with greater than 10 acres of drainage area and for the design of all detention basins.

33.032 - Positive Drainage: Whenever practicable, all developments must be provided an overland flow path that will pass the 100 year, 24 hour flow at a stage at least one (1) foot below the lowest foundation grade in the vicinity of the flow path. Overland flow paths designed to handle flows in excess of the minor drainage system capacity shall be provided drainage easements. Street ponding and flow depths shall not exceed curb heights.

33.04 - Methods for generating runoff hydrographs: Runoff hydrographs shall be developed incorporating the following assumptions of rainfall amounts and antecedent moisture.

33.041 - Rainfall: Unless a continuous simulation approach to drainage system hydrology is used, all design rainfall events shall be based on the Illinois State Water Survey's Bulletin 70. The first quartile point rainfall distribution shall be used for the design and analysis of conveyance systems with critical durations less than or equal to 12 hours. The third quartile point rainfall distribution shall be used for the design and analysis of detention basins and conveyance system with critical durations greater than 12 and less than or equal to 24 hours. The fourth quartile distribution shall be used in the design and analysis of systems with durations greater than 24 hours. The first, third, and fourth quartile distributions described by Huff are presented in Table 37 of Bulletin 70. Refer to Table 13 of Bulletin 70 for rainfall depth, duration, and frequency. The NRCS Type II distribution may be used as an alternate to the Huff distributions.

33.042 - Antecedent Moisture: Computations of runoff hydrographs, which do not rely on a continuous accounting of antecedent moisture conditions, shall use wet antecedent moisture condition as a minimum.

33.05 - Agriculture Tiles and Sanitary Sewers: Connections to sanitary sewers or existing agricultural storm water management system (tiles) shall not be permitted for new developments. However, in exceptional circumstances and with the approval of the Village Engineer, connections to existing agricultural storm water management systems may be allowed if the applicant demonstrates that the existing system has adequate hydraulic capacity, and structural integrity. Additionally, development meeting the criteria in Section 33 shall either obtain a maintenance agreement or deed or plat restriction covering the entire downstream drain tile in accordance to be determined of this ordinance before a connection to that system is permitted. Field tile systems disturbed during the process of land development must be reconnected by those responsible for their disturbance unless the approved drainage plan incorporates the tiles in the land development design.

33.06 - Wet Detention Basin Design: Wet detention basins shall be designed to remove storm water pollutants, to be safe, to be aesthetically pleasing, and as much as feasible to be available for recreational use.

33.061 - Wet Basin Depths: Wet basins shall be at least three feet deep, excluding near-shore banks and safety ledges. If fish habitat is to be provided they shall be at least ten (10) feet deep over twenty-five (25%) percent of the bottom area to prevent winterkill.

33.062 - Wet Basin Shoreline Slopes: The side slopes of wet basins at the normal pool elevation shall not be steeper than five to one (5 to 1 horizontal to vertical). It is recommended that native aquatic vegetation be established around the perimeter to provide protection from shoreline erosion.

33.063 - Permanent Pool Volume: The permanent pool volume in a wet basin at normal depth shall be equal to the runoff volume from its watershed for the 2 year, 24 hour event as a minimum.

33.064 - Wet Basin Inlet and Outlet Orientation: The distance between detention inlets and outlets shall be maximized. Inlets and outlets shall be at opposite ends of the basin providing that the orientation does not create undue hardship based on topography or other natural constraints. Designers are encouraged to use baffles or berms in the basin bottom to prevent short-circuiting. There shall be no low flow bypass between the inlet and outlet. Paved low flow channels shall not be used. The minimum flow length shall be ten (10) feet with a recommended minimum ratio of two to one (2:1) for width.

33.07 - Dry Detention Basin Design: In addition to the other requirements of this ordinance, dry basins shall be designed to remove storm water pollutants, to be safe, to be aesthetically pleasing and as much as feasible to be available for multiple uses.

33.071 - Dry Basin Drainage: Dry basins shall be designed so that eighty percent (80%) of their bottom area shall have standing water no longer than seventy-two (72) hours for any runoff event less than the 100-year, 24 hour event. Grading plans shall clearly distinguish the wet portion of the basin bottom. Under drains directed to the outlet may be used to accomplish this requirement.

33.072 - Velocity Dissipation: Velocity dissipation measures shall be incorporated into dry basin designs to minimize erosion at inlets and outlets and to minimize resuspension of sediment.

33.073 - Dry Basin Inlet and Outlet Orientation: Shall be the same as Article III, Section 33.064.

33.074 - Temporary Sediment Trap: A sediment trap shall be constructed at each major inlet to a dry basin during construction. The temporary sediment trap should be designed in accordance with criteria in the Illinois Urban Manual.

33.08 - Existing Depressional Areas: Existing depressional storage volume will be maintained and the volume of detention storage provided to meet the requirements of this ordinance shall be in addition to existing storage.

33.09 - Minimum Detention Outlet Size: Where a single pipe outlet or orifice plate is to be used to control discharge, it shall have a minimum diameter of twelve (12) inches. If design release rates call for smaller outlets, a design that minimizes the possibility of clogging shall be used. Minimum outlet restrictor size shall be 4" provided there is adequate downstream capacity. Detention volumes for a development shall be dictated by adherence to the release rates specified in Section 33.01.

33.10 - Detention in Flood Plains: The placement of detention basins within the flood plain is strongly discouraged because of questions about their reliable operation during flood events. However, the storm water detention requirements of this ordinance may be fulfilled by providing detention storage within flood fringe areas on the project site provided the following provisions are met as well as compliance with Article I, Section 11.

33.1001 - Detention in Flood Fringe Areas: The placement of a detention basin in a flood fringe area shall require compensatory storage for 1.5 times the volume below the base flood elevation occupied by the detention basin including any berms. The release from the detention storage provided shall still be controlled consistent with the requirements of this section. The applicant shall demonstrate its operation for all stream-flow and flood plain backwater

conditions. Excavations for compensatory storage along watercourses shall be opposite or adjacent to the area occupied by detention. All flood plain storage lost below the existing ten-year flood elevation shall be replaced below the existing ten-year elevation. All flood plain storage lost above the existing ten-year flood elevation shall be replaced above the existing ten-year flood elevation. All compensatory storage excavations shall be constructed to drain freely and openly to the watercourse and comply with Article I, Section 11.

33.1002 - Detention on Prime Farmland: Whenever feasible, the placement of detention basins shall avoid the utilization of prime farmland. All detention basin construction shall examine potential impacts to adjacent agricultural land and shall address measures that will be implemented to eliminate such impacts and comply with Article I, Section 11.

33.1003 - Detention in Flood Ways: Detention basins shall not be placed in the floodway. Not all floodways are mapped. If the drainage area of the waterway at the proposed construction location is one square mile or greater, the applicant shall contact the Illinois Department of Natural Resources, Office of Water Resources for a determination as to State permit requirements.

33.1004 - On-Stream Detention: On-stream detention basins are discouraged but allowable if they provide regional public benefits and if they meet the other provisions of this ordinance with respect to water quality and control of the 2 year and 100 year, 24 hour events from the property. Further criteria are presented in Article III, Section 34 of this ordinance. If on-stream detention is used in watersheds larger than one square mile, the applicant will use hydrographic modeling to demonstrate that the design will not increase the water level for any properties upstream or downstream of the property. Also, impoundment of the stream as part of on-stream detention:

- a.) shall not prevent the migration of indigenous fish species, which require access to upstream areas as part of their life cycle, such as for spawning;
- b.) shall not cause or contribute to the degradation of water quality or stream aquatic habitat;
- c.) shall include a design calling for gradual bank slopes, appropriate bank stabilization measures, and a pre-sedimentation basin;
- d.) shall not involve any stream channelization or the filling of wetlands;
- e.) shall require the implementation of an effective non-point source management program throughout the upstream watershed which shall include as a minimum: runoff reduction "Best Management Practices" (BMP's) consistent with Article III, Section 31; 2 year, 24 hour detention / sedimentation basins for all development consistent with Article III, Section 33.074;
- f.) shall not occur downstream of a wastewater discharge;

- g.) shall not contribute to the duration or flood frequency of any adjacent land, and
- h.) shall comply with Article I, Section 11.

33.11 - Drainage Into Wetlands, Rivers, Streams, Lakes, Ponds, and Depressional Storage Areas: Wetlands, lakes, ponds and depressional storage areas shall be protected from damaging modifications and adverse changes in runoff quality and quantity associated with land developments. In addition to the other requirements of this ordinance, the following requirements shall be met for all developments whose drainage flows into wetlands, rivers, lakes, ponds or depressional storage areas:

33.1101 -Detention in Wetlands, Rivers, Streams, Lakes, Ponds or Depressional Storage Areas: Existing wetlands, rivers, lakes, ponds or depressional storage areas shall not be modified for the purposes of storm water detention unless it is demonstrated that the proposed modifications will maintain or improve its habitat and ability to perform beneficial functions and shall comply with Article I, Section 11. Existing storage and release rate characteristics of wetlands, rivers, lakes, ponds or depressional storage areas shall be maintained and the volume of detention storage provided to meet the requirements of this section shall be in addition to this existing storage.

33.1102 - Sediment Control: The existing wetlands, rivers, lakes, ponds, or depressional storage areas shall be protected during construction and as further regulated in Article IV of this Ordinance, and shall not be filled without appropriate permits under the Clean Water Act.

33.1103 - Alteration of Drainage Patterns: Site drainage patterns shall not be altered to substantially decrease or increase the existing area tributary to wetlands, rivers, lakes, ponds or depressional storage areas. Drainage patterns shall not be altered by development to direct runoff offsite to other than natural drainage outlets existing prior to development.

33.1104 - Detention/Sedimentation: All runoff from the development shall be routed through a preliminary detention/sedimentation basin designed to capture the two-year, 24 hour event and hold it for at least 24 hours, before being discharged to the wetland, river, lake, pond, or depressional storage area. This basin shall be constructed before property grading begins and shall be maintained throughout the construction process. In addition, the drainage hierarchy defined in Article III, Section 30 should be followed to minimize runoff volumes and rates being discharged to the wetland, river, stream, lake, pond, or depressional storage area and as further regulated in Article II and Article IV of this ordinance.

33.1105 - Vegetated Buffer Strip: A buffer strip of at least 25 feet in width, preferably vegetated with native plant species, shall be maintained or restored around the periphery of a wetland, river, stream, lake, pond or depressional storage area.

33.1106 - Loessal Soils: Care must be taken to avoid open flow discharges of storm water over silt (Loessal) soils due to high potential for erosion.

33.1107 - Abandoned Mines: The following requirements apply for new developments or re-developments where abandoned mines are determined to be present:

- a. A storm water detention basin shall not be placed in or over an abandoned mine;
- b. Storm water detention basins shall not be located closer than one hundred (100) feet from the opening of an abandoned mine;
- c. The outflow from a storm water detention basin, channel, ditch or any storm water runoff generated as a result of a new development or redevelopment shall not empty into or be directed, redirected by any means into or through any abandoned mine;
- d. If, after the review of the storm water drainage plan, the Village Engineer may determine that more detailed information is required, a abandoned mine evaluation may be required. A abandoned mine evaluation which addresses the geologic, engineering and environmental factors resulting from a new development or redevelopment be performed by a professional with experience and expertise in abandoned mine topography, whom shall certify the results of the evaluation. This evaluation shall be the responsibility of the applicant and performed at no cost to the Village. After a review of this evaluation the Village Engineer may either approve or disapprove the drainage plan as submitted;
- e. Whenever an abandoned mine is discovered or it becomes apparent that the abandoned mine has not yet been identified, it shall be reported to the Village Engineer; and
- f. Shall comply with Article I, Section 11.

33.12 - Street Detention, Parking Lot Detention, and Culvert Drainage:

33.1201 - Street Detention: If streets are to be used as part of the minor or major drainage system, ponding depths shall not exceed curb heights and shall not remain flooded for more than eight (8) hours for any event less than or equal to the 100 year, 24 hour event.

33.1203 - Parking Lot Detention: The maximum storm water ponding depth in any parking area shall not exceed six (6) inches for more than four (4) hours.

33.1203 - Culvert, Road and Driveway Crossings: Sizing of culvert crossings shall consider entrance and exit losses as well as tailwater conditions on the culvert.

33.13 - Infiltration Practices: To effectively reduce runoff volumes, infiltration practices including basins, trenches, and porous pavement should be located in hydrologic soil groups “A” and “B” as designated by the USDA NRCS and shall follow criteria in the Illinois Urban Manual with Article I, Section 11. Infiltration basins and trenches designed to re-charge groundwater shall not be located within seventy-five (75) feet of a water supply well or building foundation. An appropriate sediment control device shall be provided to remove coarse sediment from storm water flows before they reach infiltration basins or trenches. Storm water shall not be allowed to stand more than seventy-two hours over eighty percent of the dry basin's bottom area for the maximum design event to be ex-filtrated. The bottom of infiltration basins or trenches shall be a minimum of three feet above the seasonally high groundwater and bedrock level. Engineering calculations demonstrating infiltration rates shall be included with the application.

33.1301 - Vegetated Filter Strips and Swales: To effectively filter storm water pollutants and promote infiltration of runoff, sites should be designed to maximize the use of vegetated filter strips and swales, shall be designed to follow criteria in the Illinois Urban Manual. Whenever practicable, runoff from impervious surfaces should be directed onto filter trips and swales comprised of native grasses and forbs before being routed to a storm sewer or detention basin.

33.14 - Safety Considerations: The drainage system components, especially all detention basins, shall be designed to protect the safety of any children or adults coming in contact with the system during runoff events and shall comply with Article I, Section 11.

33.1401 - Side Slopes: The side slopes of all detention basins at 100 year, 24 hour capacity shall be as level as practicable to prevent accidental falls into the basin and for stability and ease of maintenance. Side slopes of detention basins and open channels shall not be steeper than three (3) to one (1) (horizontal to vertical).

33.1402 - Safety Ledge: All wet detention basins shall have a level safety ledge at least four feet in width 2.5 to 3 feet below the normal water depth.

33.1403 - Velocity: Velocities throughout the surface drainage system shall be controlled to safe levels taking into consideration rates and depths of flow.

33.1404 - Overflow Structures: All storm water detention basins shall be provided with an overflow structure capable of safely passing excess flows at a stage at least one foot below the lowest foundation grade in the vicinity of the detention basin. The design flow rate of the overflow structure shall be equivalent to the 100 year, 24 hour inflow rate.

33.15 - Maintenance Considerations: The storm water drainage system shall be designed to minimize and facilitate maintenance. Turfed side slopes shall be designed to allow lawn-mowing

equipment to easily negotiate them. Wet basins shall be provided with alternate outflows, which can be used to completely drain the pool for sediment removal. Pumping may be considered if drainage by gravity is not feasible. Pre-sedimentation basins shall be included, where feasible, for localizing sediment deposition and removal. Site access for heavy equipment shall be provided. Use of native vegetation is strongly encouraged to reduce maintenance, increase wildlife habitat, and to provide other benefits. Vehicles and heavy equipment shall not run over the roots of established trees within the critical root zone. Trees shall be protected following criteria in the Illinois Urban Manual.

33.1501 - A maintenance plan for the ongoing maintenance of all storm water management system components, including wetlands, is required prior to plan approval. The plan shall include:

- a.) Maintenance tasks and their frequency;
- b.) The party responsible for performing the maintenance tasks;
- c.) A description of all permanent public or private access maintenance easements and overland flow paths, and compensatory storage areas; and
- d.) A description of dedicated sources of funding for the required maintenance.

Section 34 - Accommodating Flows From Upstream Tributary Areas: Storm water runoff from areas tributary to the property shall be considered in the design of the property's drainage system. Whenever practicable, flows from upstream areas that are not to be detained should be routed around the basin being provided for the site being developed.

34.01 - Upstream Areas Not meeting Ordinance Requirements: When there are areas not meeting the storage and release rates of this ordinance, tributary to the applicant's property, regionalized detention on the applicant's property shall be explored by the applicant. The following steps shall be followed:

- a.) The applicant shall compute the storage volume needed for his/her property using the release rates of Article III, Section 33 of this Ordinance.
- b.) The applicant shall identify and define areas tributary to the applicant's property, that do not meet the storage and release rate requirements of this Ordinance.
- c.) Using the areas determined above plus the applicant's property area, the applicant shall compare the total storage needed for the combined properties.

If tributary areas are not developed, a reasonable fully developed land cover, based on local zoning, shall be used for the purposes of computing storage.

Once the necessary combined storage is computed the Village may choose to pay for over-sizing the applicant's detention basin to accommodate the regional flows. The applicant's responsibility will be limited to the storage for his property as computed above. If regional storage is selected by the Village then the design produced in Article III, Section 32 shall be implemented. If regional storage is rejected by the Village the applicant shall bypass all tributary area flows around the applicant's basin whenever practicable. If the applicant must route upstream flows through his basin and the upstream areas exceed one-square mile in size, the applicant must meet the provision of Section 33.1004 for on-stream basins.

34.02 - Upstream Areas Meeting Ordinance Requirements: When there are areas which meet the storage and release rate requirements of this ordinance, tributary to the applicant's property, the upstream flows shall be bypassed around the applicant's detention basin if this is the only practicable alternative. Storage needed for the applicant's property shall be computed as described in Article III, Section 34.01. However, if the Village decides to route tributary area flows through an applicant's basin, the final design storm water releases shall be based on the combined total of the applicant's property plus tributary areas. It must be shown that at no time will the runoff rate from the applicant's property exceed the allowable release rate for his/her property alone.

Section 35 - Early Completion of Detention Facilities: Where detention, retention, or depressional storage areas are to be used as part of the drainage system for a property, they shall be constructed as the first element of the initial earthwork program prior to the commencement of mass grading. Any eroded sediment captured in these facilities shall be removed by the applicant on a regular basis and before project completion in order to maintain the design volume of the facilities.

Section 36 - Fee in Lieu of Detention: All new development or redevelopment not exceeding fifteen thousand (15,000) square feet of impervious surface may pay a fee of \$10,000 for each acre-foot of detention which would be required under this ordinance rather than installing detention facilities on the property, unless specifically directed to do otherwise by the Zoning Administrator. The Village, also shall have the option for new development or re-development exceeding fifteen thousand (15,000) square feet of impervious surface of requiring a fee of \$10,000 for each acre-foot of detention needed in lieu of the applicant building a basin on-site provided the property will discharge storm water to the Village storm drainage system if applicable.

In instances where regional benefits and economies of scale can be achieved, it will be permissible for adjacent properties to utilize a common regional detention basin. Applicants shall have the option of paying a fee of \$10,000 for each acre-foot of detention required so that the Village can build regional facilities or the applicants can jointly build the necessary facilities themselves.

The \$10,000 fee for each acre-foot is based on the value of \$10,000 in the year 2001. Said fee may be increased by the Village from time to time based on inflation as determined by the Consumer Price Index so that this amount will increase over time. In lieu of using the Consumer Price Index, and amount of not more than two (2) percent per year may be used to increase the fee.

Article IV - SOIL EROSION AND SEDIMENT CONTROL:

Section 40 - Findings: The Village hereby finds that:

- a.** The soil types found in the Village of Dwight, Illinois are susceptible to erosion and if left unprotected could cause severe loss of soil with resultant damage to property;
- b.** The topography of the Village contains areas with steep slopes upon which, if clearing of trees and/or inappropriate construction takes place, could result in severe erosion and slope stability problems which could result in damage to property;
- c.** Excessive quantities of soil may erode from areas undergoing development for certain non-agricultural uses including but not limited to the construction of dwelling units, commercial buildings and industrial plants, the building of roads and highways, the modification of stream channels and drainage ways, and the creation of recreational facilities;
- d.** The washing, blowing, and falling of eroded soil across and upon roadways endangers the health and safety of users thereof, by decreasing vision and reducing traction of road vehicles;
- e.** Soil erosion necessitates the costly repairing of gullies, washed out fills, and embankments;

- f. Sediment from soil erosion clogs drainage systems and pollutes rivers, streams, lakes, wetlands, and reservoirs;
- g. Sediment limits the use of water and waterways for most beneficial purposes, promotes the growth of undesirable aquatic weeds, destroys fish and other desirable aquatic life, and is costly and difficult to remove; and
- h. Sediment reduces the channel capacity of waterways and the storage capacity of flood plains and natural depressions, resulting in increased chances of flooding at risk to public health and safety.

Section - 41 - General Principles: It is the objective of this ordinance to control soil erosion and sedimentation caused by development activities, including clearing, grading, stripping, excavating, and filling of land, in the Village. Measures taken to control soil erosion and off-site sediment runoff shall be adequate to assure that sediment is not transported from the site by a storm event of ten-year frequency, 24 hour duration or less. The following principles shall apply to all new development or redevelopment activities within the Village and to the preparation of the submissions required under Article IV, Section 42 of this ordinance:

- a. New development or redevelopment shall be related to the topography and soils of the site so as to create the least potential for erosion. Areas of steep slopes greater than seven percent (7%) where high cuts and fills maybe required are to be avoided wherever possible, and natural contours should be followed as closely as possible,
- b. Natural vegetation shall be retained and protected wherever possible. Areas immediately adjacent to natural watercourses, lakes, ponds, and wetlands are to be left undisturbed wherever possible. Temporary crossings of watercourses, when permitted, must include appropriate stabilization measures,
- c. Special precautions shall be taken to prevent damages resultant from any necessary development activity within or adjacent to any stream, lake, pond, abandoned mine or wetland. Preventive measures shall reflect the sensitivity of these areas to erosion and sedimentation,
- d. The smallest practical area of land should be exposed for the shortest practical time during development,

- e. Sediment basins or traps, filter barriers, diversions, and any other appropriate sediment or runoff control measures shall be installed prior to site clearing and grading and maintained to remove sediment from run-off waters from land undergoing development,
- f. The selection of erosion and sediment control measures shall be based on assessment of the probable frequency of climatic and other events likely to contribute to erosion, and on evaluation of the risks, costs, and benefits involved,
- g. In the design of erosion control facilities and practices, aesthetics and the requirements of continuing maintenance must be considered,
- h. Provisions shall be made to accommodate the increased run-off caused by changed soil and surface conditions during and after development. Drainage ways should be designed so that their final gradients and the resultant velocities and rates of discharge will not create additional erosion on-site or downstream,
- i. Permanent vegetation and structures shall be installed and functional as soon as practical during development,
- j. Those areas being converted from agricultural purposes to other land uses shall be vegetated with an appropriate protective cover prior to development,
- k. All waste generated as a result of site development activity shall be properly disposed of and shall be prevented from being carried off the site by either wind or water,
- l. All construction sites shall provide measures to prevent sediment from being tracked onto public or private roadways, and
- m. All temporary soil erosion and sediment control practices shall be maintained to function as intended until the contributing drainage area has been permanently stabilized at which time they shall be removed.

Section 42 - Soil Erosion and Sediment Control Plan Submittal Requirements: Each applicant shall submit the information depending on development size, as regulated to ensure that the provisions of this ordinance are met. The submittal shall include sufficient information to evaluate the environmental characteristics of the property, the potential adverse impacts of the development related to erosion both on-site and off-site, and the effectiveness of the proposed erosion and sediment control plan in reducing sediment loss and meet the provisions of Article I, Section 11. The applicant shall certify on the drawing that all clearing, grading, drainage, and

construction shall be accomplished in strict conformance with the erosion and sediment control plan. The following information shall be submitted for both existing and proposed property conditions; new developments or re-developments meeting the requirements of Article I, Section 12.

42.01 - Soil Erosion and Sediment Control Plan Requirements: Shall meet the requirements of Article III, Section 30.01, Section 30.011, and Section 30.012.

42.011 - Mapping and Descriptions: The existing and proposed erosion and sediment control features of the property and immediate vicinity including:

- a.) As required in Article III, Section 30.01, Section 30.011, and Section 30.012;
- b.) Location of the slope disturbance line;
- c.) Location and description of the soil erosion and sediment control measures to be employed during construction;
- d.) For any structures proposed to be located on the slope side of the slope disturbance line the map shall include the limits of disturbance including tree removal, soil erosion and sediment control measures during construction, cross section view of any proposed cut or fill, erosion and sediment control measures during construction, details of method (s) proposed for providing slope stability, permanent storm water control measures, and permanent erosion and sediment control measures all being certified by a registered professional engineer or a "Certified Professional in Erosion and Sediment Control;"
- e.) The predominant soil types on the site, their location, and their limitations for the proposed use as defined by the U.S.D.A. Natural Resources Conservation Service;
- f.) The proposed use of the site, including present and planned development, areas of clearing, stripping, grading, excavation and filling; proposed contours, finished grades, and street profiles; the storm water plan as required in Article II; kinds and locations of utilities, areas and acreage proposed to be paved, sodded or seeded, vegetatively stabilized, or left undisturbed; and the location of trees over eight (8) inches in diameter and their type;

g.) A soil erosion and sediment control plan, including a narrative, shall be submitted showing all measures necessary to meet the requirements of this Ordinance throughout all phases of construction and those remaining permanently after completion of the development of the site. The development of a soil erosion and sediment control plan shall follow the requirements of this ordinance and the procedures in the latest edition of the "Illinois Procedures and Standards for Urban Soil Erosion and Sediment Control" (commonly known as the Greenbook), which is hereby incorporated into this ordinance by reference. The Village may waive specific requirements for the content of submissions upon finding that the information submitted is sufficient to show that the work will comply with the objectives and principles of this ordinance. Permanent soil erosion and sediment control features needed at the completion of any development site shall be included in the submittal. The submitted soil erosion and sediment control plan shall include:

- 1.)** Location and description, including standard details, of all sediment control measures and specifics of sediment basins and traps, including outlet details;
- 2.)** Location and description of all soil stabilization and erosion control measures, including seeding mixtures and rates, types of sod, method of seedbed preparation (type and extent of tillage, weed control, planting equipment, etc...), expected seeding dates, type, method and rate of lime and fertilizer application (soil fertility testing required), kind and quantity of mulching for both temporary and permanent vegetative control measures, and types of non-vegetative stabilization measures;
- 3.)** Location and description of all runoff control measures, including diversions, waterways, and outlets;
- 4.)** Location and description of methods to prevent tracking of sediment off-site including construction entrance details, as appropriate;
- 5.)** Description of dust and traffic control measures;
- 6.)** Locations of stockpiles and description of stabilization methods;

- 7.) Description of offsite fill or borrow volumes, locations and methods of stabilization;
- 8.) Provisions for maintenance of control measures, including type and frequency of maintenance, easements, and estimates of the cost of maintenance; and
- 9.) The proposed phases of development of the site, including stripping and clearing, rough grading and construction, and final grading and landscaping. Phasing should identify the expected date on which clearing will begin, the estimated duration of exposure of cleared area, and the sequence of installation of temporary sediment control measures (including perimeter controls), installation of stormwater drainage, paving streets and parking areas, final grading and the establishment of permanent vegetative cover, and the removal of temporary measures. It shall be the responsibility of the applicant to notify the Building Inspector and Zoning Administrator of any significant changes that occur in the site development schedule after the initial erosion and sediment control plan has been approved.
- 10.) Identification (name, address, and telephone) of the person(s) or entity which will have legal responsibility for maintenance of soil erosion control structures and measures during development and after development is completed.

Section 43 - Design and Operation Standards and Requirements:

The practice standards and specifications outlined in the Soil Erosion and Sediment Control plan shall follow criteria in the latest edition of the Illinois Urban Manual, which is hereby incorporated into this Ordinance by reference. In the event of conflict between the provisions of said manual and this Ordinance, this Ordinance shall govern.

- a.) All clearing, grading, stripping, excavating, and filling which is subject to the approval requirements of this ordinance shall be subject to the applicable standards and requirements set forth and/or referenced in this ordinance;
- b.) Responsibility: The permittee shall not be relieved of responsibility for damage to persons or property otherwise imposed by law, and the Village or its officers or agents will not be made liable for such

damage by (1) the issuance of a permit under this ordinance, (2) compliance with the provisions of that permit or with conditions attached to it by the Village, (3) failure of the Village officials to observe or recognized hazardous or unsightly conditions, (4) failure of the Village officials to recommend denial of or to deny a permit, or (5) exemptions from the permit requirements of this ordinance; and

- c.) Site Design Requirements: Practice standards and specifications for measures outlined in the soil erosion and sediment control plan shall follow criteria in the latest edition of the "Illinois Urban Manual: A Technical Manual Designed for Urban Ecosystem Protection and Enhancement", which is hereby incorporated into this ordinance by reference.

43.01 - Erosion and Sediment Control Design Requirements: New developments or re-developments shall comply with Article IV, Section 42 and meet the following:

43.011 - Control measures shall be constructed to control runoff from the property to such an extent possible that sediment is retained on-site.

43.012 - Temporary on-site control measures required shall be constructed and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.

43.013 - Disturbed areas shall be stabilized with permanent measures within seven (7) calendar days following the end of active disturbance, or redisturbance consistent with the following criteria:

- a. Appropriate permanent stabilization measures shall include seeding, mulching, sodding, with non-vegetative measures as a last resort; and
- b. Areas having slopes greater than 12% shall be stabilized with sod, mat, or blanket in combination with seeding or equivalent.

43.014 - All temporary and permanent erosion and sediment control practices must be maintained and repaired as needed to assure effective performance of their intended function.

43.015 - All temporary erosion and sediment control measures shall be disposed in a proper manner within thirty (30) days after final site stabilization is achieved with permanent soil stabilization measures. Trapped sediment and other disturbed soils resulting from the disposition

of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.

43.016 - Site Development Requirements: On-site sediment control measures, as specified by the following criteria, shall be constructed as specified in the referenced handbooks, and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.

- a.** For new developments or redevelopments less than one (1) acre, filter barriers (including filter fences, straw bales, or equivalent control measures) shall be constructed to control all on-site runoff. Vegetated filter strips, with a minimum width of twenty-five (25) feet, may be used as an alternative only where runoff in sheet flow is expected;
- b.** For new developments or re-developments more than one (1) acre but less than five (5) acres, a sediment trap or equivalent control measure shall be constructed at the downslope point of the disturbed area,
- c.** For new developments or re-developments greater than five (5) acres, a sediment basin or equivalent control measure shall be constructed at the down slope point of the disturbed area;
- d.** Sediment basin and sediment trap designs shall provide for both "dry" detention and "wet" detention sediment storage. The detention storage shall be composed of equal volumes of "wet" detention storage and "dry" detention storage and each shall be sized as regulated in Article III 3.0. The release rate of the basin shall be that rate as regulated in Article III. The elevation of the outlet structure shall be placed such that it only drains the dry detention storage;
- e.** The sediment storage shall be sized to store the estimated sediment load generated from the site over the duration of the construction period with a minimum storage equivalent to the volume or sediment generated in one year. For construction periods exceeding one year, the 1-year sediment load and a sediment removal schedule may be substituted; and
- f.** To the extent possible or as otherwise regulated in this ordinance all desirable trees eight (8) inches in diameter and larger shall be protected for their present and future value for erosion protection and other environmental benefits. Trees that have been selected for preservation shall be marked prior to the beginning of any clearing, grading, stripping, excavation, or filling of the site. A "No Construction Zone" shall be

established and marked at one (1) foot beyond the perimeter of the dripline of each tree which is to be preserved.

43.017 - Storm water conveyance channels, including ditches, swales, and diversions, and the outlets of all channels and pipes shall be designed and constructed as regulated in Article III. All constructed or modified channels shall be stabilized within 48 hours, consistent with the following standards and as required in the referenced handbooks:

- a.** For grades up to 4 percent, seeding in combination with mulch, erosion blanket, or an equivalent control measure shall be applied. Sod or erosion blanket or mat shall be applied to the bottom of the channel;
- b.** For grades of 4 to 8 percent, sod or an equivalent control measure shall be applied in the channel; and
- c.** For grades greater than 8 percent, rock, riprap, or an equivalent control measure shall be applied over filter fabric or other type of soil protection, or the grade shall be effectively reduced using drop structures.

43.018 Land disturbance activities in stream channels shall be avoided, where possible, or as regulated in Article III. If disturbance activities are unavoidable, the following requirements shall be met.

- a.** Construction vehicles shall be kept out of the stream channel to the maximum extent practicable. Where construction crossings are necessary, temporary crossings shall be constructed of non-erosive material, such as riprap or gravel;
- b.** The time and area of disturbance of stream channels shall be kept to a minimum. The stream channel, including bed and banks, shall be stabilized within 48 hours after channel disturbance is completed, interrupted, or stopped; and
- c.** Whenever channel relocation is necessary, the new channel shall be constructed under dry conditions and fully stabilized before flow is diverted, incorporating meanders, pool and riffle sequence, and riparian planting.

43.019 - Storm sewer inlets and culverts shall be protected by sediment traps or filter barriers meeting accepted design standards and specifications.

43.020 - Soil storage piles containing more than 10 cubic yards of material shall not be located with a downslope drainage length of less than 50 feet to a roadway, drainage channel, or abandoned mine. Filter barriers, including straw bales, filter fence, or equivalent, shall be installed immediately surrounding the perimeter of the pile.

43.021 - If dewatering devices are used, discharge locations shall be protected from erosion. All pumped discharges shall be routed through appropriately designed sediment traps or basins, or equivalent and shall not be deposited into an abandoned mine.

43.022 - Each site shall have graveled (or equivalent) entrance roads, access drives, and parking areas of sufficient length and width to prevent sediment from being tracked onto public or private roadways. Any sediment reaching a public or private road shall be removed by shoveling or street cleaning (not flushing) before the end of each workday and transported to a controlled sediment disposal area.

Section 44 - Maintenance of Control Measures: All soil erosion and sediment control measures necessary to meet the requirements of this ordinance shall be maintained by the applicant or subsequent land owner during the period of land disturbance and development of the site in a satisfactory manner to ensure adequate performance. The applicant or contractor responsible for maintaining the soil erosion and sediment control practices shall inspect all such practices at least once every 7 days or within 24 hours of a precipitation event equal to or exceeding 0.5" of rainfall.

Article V - Long Term Maintenance Responsibility:

Section 50 - Long Term Maintenance Responsibility: Maintenance of storm water drainage, and soil erosion and sediment control facilities located on private property shall be the responsibility of the owner of that property. Before an appropriate permit is obtained from the Village, the applicant shall execute a maintenance agreement with the Village guaranteeing that the applicant and all future owners of the property will maintain its storm water drainage and soil erosion and sediment control system. Such agreement shall be recorded with the Recorder of Deeds of the County. The maintenance agreement shall include a schedule for regular maintenance of each aspect of the property's storm water drainage and soil erosion and sediment control system and shall provide for access to the system for inspection by authorized personnel of the Village. The maintenance agreement shall also stipulate that if the appropriate personnel of the Village notify the property owner in writing of maintenance problems which require correction, the property owner shall begin such corrections within twenty four (24) hours and shall not extend beyond seven (7) calendar days of such notification. If the corrections are not made within this time period the Village may have the necessary work completed and assess the cost to the property owner. The Village shall require a bond to be filed by the property owner for maintenance of the storm water drainage and soil erosion and sediment control system.

Article VI - Inspections:

Section 60 - Inspections: The Village Engineer shall make inspections as hereinafter required and shall either approve that portion of the work completed or shall notify the permittee wherein the work fails to comply with the storm water drainage or erosion and sediment control plan as approved. Plans for grading, stripping, excavating, and filling work bearing the signed approval of the Village shall be maintained at the site during progress of the work. In order to obtain inspections and to ensure compliance with the approved erosion and sediment control plan, the grading or building permit, and this Ordinance, the permittee shall notify the Village within two (2) working days of the completion of the construction stages specified below:

- a. Upon completion of installation of sediment and runoff control measures (including perimeter controls and diversions), prior to proceeding with any other earth disturbance or grading;
- b. After stripping and clearing;
- c. After rough grading;
- d. After final grading;
- e. After seeding and landscaping deadlines; and
- f. After final stabilization and landscaping, prior to removal of temporary sediment controls.

If stripping, clearing, grading and/or landscaping are to be done in phases or areas, the permittee shall give notice and request inspection at the completion of each of the above work stages in each phase or area. If an inspection is not made and notification of the results given within five (5) working days after notice is received by the Village from the permittee, the permittee may continue work at his/her own risk, without presuming acceptance by the Village. Notification of the results of the inspection shall be given in writing at the site. A duplicate copy shall be kept by the enforcing agency of the Village.

Section 61 - Special Precautions: If at any stage of the grading of any development site the Village determines by inspection that the nature of the site is such that further work authorized by an existing permit is likely to imperil any property, public way, stream, lake, wetland, or drainage structure, the Village shall require, as a condition of allowing the work to be done, that such reasonable special precautions to be taken as is considered advisable to avoid the likelihood of such peril. "Special precautions" may include, but shall not be limited to, a more level exposed slope, construction of additional drainage facilities, berms, terracing, compaction, or cribbing,

installation of plant materials for erosion control, and obtaining and following recommendations of a registered professional engineer with adequate knowledge and experience in the field of soil erosion and sediment control and/or a certified professional in Erosion and Sediment Control which may be made requirements for further work.

61.01 - Where it appears that storm damage may result because the grading on any development site is not complete, work shall be stopped and the permittee required to install temporary structures or take such other measures as may be required to protect adjoining property or the public safety. On large developments, or where unusual site conditions prevail, the Zoning Administrator shall specify the time of starting grading and time of completion or may require that the operations be conducted in specific stages so as to ensure completion of protective measures or devices prior to the advent of seasonal rains.

Section 62 - Amendment of Plans: Major amendments to storm water drainage and detention or erosion and sediment control plans shall be submitted to the Zoning Administrator and shall be processed and approved or disapproved in the same manner as the original plans. Field modification of a minor nature may be authorized by the Zoning Administrator by written authorization to the permittee.

Article VII - Permitting:

Section 70 - Application for Permit: Application for a development permit shall be made by the owner of the property or his authorized agent to the Village on a form furnished for that purpose. Each application shall bear the name(s) and address(es) of the owner or developer of the site, the contractor(s) and of any consulting firm retained by the applicant together with the name of the applicant's principal contact at such firm. Each application shall include certification that any land clearing, construction, or development involving the movement of earth shall be in accordance with the plans approved upon issuance of the permit.

Section 70.01 – Application Fee: All applications for a development permit shall be accompanied with an application fee as set forth in Exhibit A, attached hereto and incorporated herein. In addition, the applicant shall be responsible for reimbursing the Village for any additional cost necessary for review, inspection, and approval of this project, including but not limited to the engineering services of the Village Engineer. The Zoning Administrator shall require a \$500.00 deposit to cover these additional costs.

Section 71 - Bond Required: The applicant for a development permit shall be required to file with the Village a faithful performance bond or bonds, letter of credit, or other improvement security satisfactory to the Village Attorney in an amount deemed sufficient by the Zoning Administrator to cover all costs of improvements, landscaping, maintenance of improvements

and landscaping, and soil erosion and sediment control measures for such period as specified by the Village and engineering and inspection costs to cover the cost of failure or repair of improvements installed on the site.

Section 71.01 The Bond shall conform to the following requirements:

- (1) The Surety company issuing the bond shall be licensed by the Illinois Department of Insurance pursuant to the Illinois Insurance Code.
- (2) The surety bond shall be on the form provided in appendix () herein.
- (3) Any payments made under the bond will be placed in a special fund designated by the Village.
- (4) The Bond must guarantee that the permittee will comply with the issued permit and will meet all permit conditions.
- (5) The surety will become liable on the Bond obligation when, during the term of the Bond, the permittee fails to perform as guaranteed by the Bond. The permittee fails to perform when:
 - (a) He/she abandons the project
 - (b) He/she is adjudicated bankrupt
 - (c) He/she fails to comply with the terms of the storm water management and soil erosion and sediment control permit.
 - (d) He/she fails to perform work as ordered to do so by the Building and Zoning Administrator of said entities or by a court of competent jurisdiction.
- (1) The sum of the bond shall be determined by the permit analyst in accordance with objective criteria based on the types and sizes of development, size of retention basins needed, cost to develop and implement storm water management and soil erosion and sediment control techniques as specified in the permit, the acreage of the project, and any other criteria deemed appropriate by the Village.
- (2) Upon application to the Village and submission of proof of accurate cost estimates for developing and implementing the storm water management and soil erosion and sediment control system in accordance with principles set forth in this ordinance and in accordance with any permit issued, the Village may consider and lower the amount required for bonding upon a showing of special circumstances.
- (3) The bond must be issued for the time it will take to complete the development or redevelopment project and shall be for a term of at least two years and must not be cancelable during the term.
- (4) The Village shall release the surety if, after the surety becomes liable on the bond, the permittee or another person provided immediate compliance with the permit no later than 30 days notice is sent from the Village.
- (5) After required work has been completed, the Village shall refund any unspent money that was paid to the Village.

Section 72 - Review and Approval: Each application for an approved erosion and sediment control plan shall be reviewed and acted upon according to the following procedures:

1. The Village Engineer shall:

1. Review the applicant's soil erosion and sediment control plans and provide written evaluation to the Village regarding the adequacy (effectiveness) to address the provisions of this ordinance. The Village shall retain the services of a professional trained in the implementation of soil erosion and sediment control practices to perform the services outlined in this section. The Village will assess a fee as set forth in Exhibit A, attached hereto, and incorporated herein to be paid by the applicant for performing these services;
2. Attend a pre-construction meeting with the applicant or designated agent to review implementation of erosion and sediment control plans;
3. Conduct onsite inspections during the active construction phases of land development projects to determine whether site development is in compliance with the approval erosion and sediment control plans, and determine adjustments needed to the approved plans. After construction has been completed, determine whether permanent site stabilization has been achieved and identify operation and maintenance needs;
4. Prepare correspondence as needed regarding the effectiveness (or corrective measures needed) or adequacy of soil erosion and sediment control measures, and
5. Consult with land developers, consultants, and contractors concerning the design criteria, installation and maintenance procedures and other information regarding conservation practices recommended under the provisions of this ordinance.

b. **The Village of Dwight shall:**

1. After review of the application and required submissions if it is found to be in conformance with the provisions of this ordinance, approve the erosion and sediment control plan;

2. Approve the erosion and sediment control plan subject to such reasonable conditions as may be necessary to secure substantially the objectives of this ordinance, and issue the approval subject to these conditions; or
3. Disapprove the erosion and sediment control plan, indicating the deficiencies and the procedure for submitting a revised application and/or submission

c. No approval for an erosion and sediment control plan shall be issued for an intended development site unless one or more of the following have been obtained:

1. the development, including but not limited to subdivisions and planned unit development, has been approved by the Village where applicable; or
2. such permit is accompanied by or combined with a valid building permit issued by the Village Building Inspector; or
3. the proposed earth moving is coordinated with any overall development program previously approved by the Village for the area in which the site is situated; and
4. all relevant federal and state permits including, but not limited to: NPDES, 404, 401, NRI's, etc. have been received for the portion of the site subject to soil disturbance, and
5. Applicant is successful in the appeals process.

72.01 - Failure of the Zoning Administrator to act on an original or revised application within thirty (30) days of receipt shall authorize the applicant to proceed in accordance with the plans as filed and in compliance with the regulations contained herein, unless such time is extended by agreement between the Zoning Administrator and the applicant. Pending preparation and approval of a revised plan, development activities shall be allowed to proceed in accordance with conditions established by the Zoning Administrator.

Section 73 - Expiration of Permit: Every development permit shall expire and become null and void if the work authorized by such permit has not been commenced within one hundred and eighty (180) days, or if not completed by a date which shall be specified in the permit; except that the Zoning Administrator may, if the permittee presents satisfactory evidence that unusual

difficulties have prevented work being commenced or completed within the specified time limits, grant a reasonable extension of time if written application is made before the expiration date of the permit. The Zoning Administrator may require modification of the erosion control plan to prevent any increase in erosion or off-site sediment runoff resulting from any extension.

Section 74 – Scope of Appeals:

74.01 - An appeal may be taken to the Board of Appeals by the applicant, any person or agency which received notice of the filing of the application, or by any person, firm, corporation, office, department, board or bureau aggrieved by decision of the Zoning Administrator. Such appeal shall be taken within such time as shall be prescribed by the Board of Appeals by general rule by filing with the Zoning Administrator a notice of appeal specifying the grounds thereof. The Zoning Administrator shall forthwith transmit to the Board of Appeals all of the papers constituting a record upon which the Section appealed from was taken.

74.02 - The factors to be considered on appeal shall include, but need not be limited to, the effects of the proposed development activities on the surface water flow to tributary and downstream lands, any comprehensive watershed management plans, or the use of any retention facilities; possible saturation of fill and unsupported cuts by water, both natural and domestic; runoff surface waters that produce erosion and silting of drainage ways; nature and type of soil or rock which when disturbed by the proposed development activities may create earth movement and produce slopes that cannot be landscaped; and excessive and unnecessary scarring of the natural landscape through grading or removal of vegetation.

74.03 – Findings on Appeal:

74.031 – An appeal shall stay all proceedings in furtherance of the action appealed from unless the Zoning Administrator certifies to the Board of Appeals, after the notice of the appeal has been filed with him, that by reason of facts stated in the certificate a stay would, in his opinion, cause imminent peril to life or property.

74.032 – The Board of Appeals shall select a reasonable time and place for the hearing of the appeal, give due notice thereof to the parties, and shall render a written decision on the appeal without unreasonable delay. The Board of Appeals may affirm or may, upon the concurring vote of four (4) members, reverse wholly or in part or modify the order, requirement, decision, or determination that, in its opinion, ought to be done. To that end, the Board of Appeals shall have all the powers of the officer from whom the appeal is taken. The Zoning Administrator shall maintain records of all actions of the Board of Appeals relative to appeals.

Section 75 - Retention of Plans: Plans, specifications, and reports for all site developments shall be retained in original form or on microfilm by the Zoning Administrator.

Section 76 – Amendments:

76.01 – The ordinance may be amended, provided that in all amendments adopted under the authority of this Section, due allowance shall be made for existing conditions, the conservation of property values, and the direction of building development to the best advantages of the entire community.

76.02 – Initiations of Amendments: Amendments may be proposed by the Village Board, Planning Commission, Village President, Zoning Administrator or the Livingston County SWCD.

76.03 – Application for Amendment: An application or an amendment shall be filed with the Zoning Administrator in such form and accompanied by such information as required by the Zoning Administrator. Such application shall be forwarded to the Planning Commission with the request to hold a public hearing on said application for amendment.

76.04 – Hearing on Application: The Planning commission shall hold a public hearing on each application for an amendment at such time and place as shall be established by the Planning Commission. The hearing shall be conducted and a record of such proceedings shall be preserved in such manner, as the Planning Commission shall, by rule, prescribe from time to time.

76.05 – Notice of Hearing: Notice of time and place of such hearing shall be published at least once in one or more newspapers or general circulation in the Village of Dwight not less than fifteen (15) nor more than thirty (30) days before such hearing. Supplemental or additional notices may be published or distributed as the Planning Commission may, by rule, prescribe from time to time.

76.06 – Findings of Fact and Recommendation of the Planning Commission:

76.061 – Within forty-five (45) days after the close of the hearing on a proposed amendment, the Planning Commission shall make written findings of fact and shall submit same together with its recommendations to the Village Board.

76.062 – The Planning Commission shall not recommend the adoption of a proposed amendment unless it finds that the adoption of such amendment is in the public interest.

76.07 – Action by Village Board:

76.071 – The Village Board shall not act upon a proposed amendment to this Ordinance until it shall have received a written report and recommendation from the Planning Commission on the proposed amendment.

76.072 – The Village Board may grant or deny an application for an amendment.

76.073 – The Village Board may request specific changes to a proposed amendment to this Ordinance once it has received a written report and recommendation from the Planning Commission on the proposed amendment. However, before the proposed amendment with the Village Board's specific changes, can be adopted by the Village Board; the proposed amendment with the specific changes must be forwarded to the Planning Commission for another Public Hearing, Findings of Facts, and written recommendation.

76.074 – A proposed amendment or a proposed amendment with specific changes that doesn't receive a written recommendation from the Planning Commission, shall not be adopted except by a favorable vote of two-thirds (2/3) of the Village Trustees then holding office.

76.08 – Effect of Denial of Amendment: No application for an amendment that has been denied wholly or in part by the Village Board shall be resubmitted for a period of one (1) year from the date of said denial except on the grounds of new evidence or proof of change of conditions found to be valid by the Planning Commission.

Article VIII - Enforcement:

Section 80 - Stop-Work Order; Revocation of Permit: In the event any person holding a development permit pursuant to this ordinance violates the terms of the permit, or carries on-site development in such a manner as to materially adversely affect the health, welfare, environment, or safety of persons residing or working in the neighborhood of the development site or so as to be materially detrimental to the public welfare or injurious to property or improvements in the neighborhood, the Zoning Administrator shall suspend or revoke the development permit.

80.01 - Suspension of a permit shall be by a written stop-work order issued by the Zoning Administrator and delivered to the permittee or his agent or the person performing the work. The stop-work order shall be effective immediately, shall state the specific violations cited, and shall state the conditions under which work may be resumed. A stop-work order shall remain in effect until appealed by the permittee to the Board of Appeals at which time the conditions of Article VII, Section 74 can be met.

80.02 - No development permit shall be revoked until a hearing is held by the Board of Appeals. Written notice of such hearing shall be served on the permittee, either personally or by certified mail return receipt requested, and shall state:

- a. The reasons for revocation, in clear and concise language; and
- b. The time, date and place where such hearing will be held.

Such notice shall be served on the permittee at least five (5) days prior to the date set for the hearing. At such hearing, the permittee shall be given an opportunity to be heard and may call witnesses and present evidence on his behalf. At the conclusion of the hearing the Board of Appeals shall determine whether the permit shall be revoked.

Section 81 – Fees: The fee for variances and appeals are as set forth in Exhibit A.

Section 82 - Violations and Penalties: No person shall construct, enlarge, alter, repair or maintain any grading, excavation or fill, or cause the same to be done, contrary to or in violation of any terms of this ordinance. Any person violating any of the provisions of this ordinance shall be deemed guilty of a misdemeanor, and each day during which any violation of any of the provisions of this ordinance is committed, continued, or permitted shall constitute a separate offense. Upon conviction of any such violation, such person, partnership, or corporation shall be punished by a fine of not less than Seventy Five dollar (\$75.00), and nor more than Seven Hundred Fifty dollars (\$750.00) for each offense. In addition to any other penalty authorized by this section, any person, partnership, or corporation convicted of violating any of the provisions of this ordinance shall be required to restore

the site to the condition existing prior to commission of the violation, or to bear the expense of such restoration.

Section 83 – Repealer: All ordinances and resolutions or any part thereof in conflict with all or any part of this Ordinance are hereby repealed in so far as they do conflict.

Section 84 – Severability: That if any section, subdivision, or sentence of this ordinance shall for any reason be held invalid or unconstitutional, such decision shall not affect the validity of the remaining portion of this ordinance.

Article IX - Effective Date

This ordinance shall be in full force and effect from and after its passage and approval and publication, as required by law.

Passed by Village Board of the Village of Dwight, Illinois, this ____ day _____ of , 2001.

Signed: _____

Title: _____

Attest: _____

Title: _____

(SEAL)

Exhibit A

Application Fees:

Initial Application Fees:	\$500.00
Inspection Fees:	60% Paid by the Developer 40% Paid by the Village of Dwight
Zoning Board of Appeals Hearing	\$300.00

Exhibit B

Desirable Trees Native to North East Central Illinois

American Hornbeam	<i>Carpinus carolina</i>
Arborvitae, White Cedar	<i>Thuja occidentalis</i>
Ash, Blue	<i>Fraxinus quadragulata</i>
Ash , Green	<i>Fraxinus pennsylvanica</i>
Ash, White	<i>Fraxinus americana</i>
Baldcypress	<i>Taxodium distichum</i>
Beech, American	<i>Fagus grandifolia</i>
Birch, River	<i>Betula nigra</i>
Coffeetree, Kentucky	<i>Gymnocladus dioicus</i>
Dogwood, Flowering	<i>Cornus florida</i>
Hackberry	<i>Celtis occidentalis</i>
Hickory, Shagbark	<i>Carya ovata</i>
Hickory, Shellbark	<i>Carya illinoensis</i>
Honeylocust, Thornless	<i>Gleditsia triacanthos</i>
Ironwood (Hophornbeam)	<i>Ostrya virginiana</i>
Juniper, Eastern Red Cedar	<i>Juniperus virginiana</i>
Linden, American (Basswood)	<i>Tilia americana</i>
Maple, Black	<i>Acer nigrum</i>
Maple, Red or Swamp	<i>Acer rubrum</i>
Maple, Sugar or Swamp	<i>Acer saccharum</i>
Oak, Black	<i>Quercus velutina</i>
Oak, Bur	<i>Quercus macrocarpa</i>
Oak, Pin or Swamp	<i>Quercus palustris</i>
Oak, Red	<i>Quercus rubra</i>
Oak, Scarlet	<i>Quercus coccinea</i>
Oak, Shingle	<i>Quercus, imbricaria</i>
Oak, Swamp White	<i>Quercus, bicolor</i>
Pecan	<i>Carya illinoensis</i>
Persimmon, Common	<i>Diospyros virginiana</i>
Pine, Eastern White	<i>Pinus strobus</i>
Redbud	<i>Cercis canadensis</i>
Sassafras, Common	<i>Sassafras albidum</i>
Serviceberry, Allegheny	<i>Amelanchier laevis</i>

CHAPTER 9

OTHER ORDINANCES

SECTION:	CONTENTS:
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3-9-2	Ordinance 1748 - Soil Erosion and Sedimentation Control Ordinance
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3-9-4	Ordinance 1747 - Stormwater Drainage and Detention Ordinance

ORDINANCE NO. 1369

An Ordinance Regulating Development in Special Flood Hazard Areas.

Be it ordained by the President and Board of Trustees of the Village of Plainfield, Illinois, as follows:

Index Section 100.00

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Section 200.0 Purpose

This Ordinance is enacted pursuant to the police powers granted to this Village by Illinois Revised Statutes, Chapter 24, Sections 1-2-1, 11-12-12m, 11-30-8 and 11-31-2. The purpose of this Ordinance is to maintain this Village's eligibility in the National Flood Insurance Program; to minimize potential losses due to periodic flooding including loss of life, loss of property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety and general welfare; and to preserve and enhance the quality of surface waters, conserve economic and natural

values and provide for the wise utilization of water and related land resources. This Ordinance is adopted in order to accomplish the following specific purposes:

- 200.1 To meet the requirements of Chapter 19, paragraph 65(g) of the Illinois Revised Statutes, An Act in Relation to the Regulation of the Rivers, Lakes and Streams of the State of Illinois, “approved June 10, 1911, as amended.
- 200.2 To assure that new development does not increase the flood or drainage hazards to others, or creating unstable conditions susceptible to erosion;
- 200.3 To protect new buildings and major improvements to buildings from flood damage;
- 200.4 To protect new buildings and major improvements to buildings from flood damage;
- 200.5 To lessen the burden on the taxpayer for flood control projects, repairs to flood-damaged public facilities and utilities, and flood rescue and relief operations; and
- 200.6 To make federally subsidized flood insurance available for property in the Village by fulfilling the requirements of the National Flood Insurance Program.
- 200.7 To comply with the rules and regulations of the National Flood Insurance Program codified as 44 CFR 59-79, as amended.
- 200.8 To protect, conserve, and promote the orderly development of land and water resources:
- 200.9 To preserve the natural hydrologic functions of watercourses and flood plains and to protect water quality and aquatic habitats;
- 200.10 To preserve the natural characteristics of stream corridors in order to moderate flood and storm water impacts, improve water quality, reduce soil erosion, protect aquatic and riparian habitat, provide recreational opportunities, provide aesthetic benefits and enhance community and economic development.

Section 300.0 Definitions

For the purposes of this Ordinance, the following definitions are adopted:

- 300.1 **ACT:** An act in relation to the regulation of the rivers, lakes and streams of the State of Illinois,” Ill. Rev. Stat. 1987, ch. 19, par. 52 et seq.
- 300.2 **APPLICANT:** Any person, firm, corporation or agency which submits an application.
- 300.3 **APPROPRIATE USE:** Only uses of the regulatory floodway that are permissible and will be considered for permit issuance. The only uses that will be allowed are as specified in Section 802.0.
- 300.4 **BASE FLOOD:** The flood having a one-percent probability of being equaled or exceeded in any given year. The base flood is also known as the 100-year frequency flood event. Application of the base flood elevation at any location is as defined in Section 600 of this ordinance.
- 300.5 **BUILDING:** A structure that is principally above ground and is enclosed by walls and a roof. The term includes a gas or liquid storage tank, a manufactured home, mobile home or a prefabricated building. This term also includes recreational vehicles and travel trailers to be installed on a site for more than 180 days.
- 300.6 **CHANNEL:** Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or man-made drainageway, which has a definite bed and banks or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.
- 300.7 **CHANNEL MODIFICATION:** Alteration of a channel by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, rip-rapping (or other armoring), widening, deepening, straightening, relocating, lining and significant removal of bottom or woody vegetation. Channel modification does not include the clearing of dead or dying vegetation, debris, or trash from the channel. Channelization is a severe form of channel modification involving a significant change in the channel cross-section and typically involving relocation of the existing channel (e.g. straightening).
- 300.8 **COMPENSATORY STORAGE:** An artificially excavated, hydraulically equivalent volume of storage within the SFHA used to balance the loss of natural flood storage capacity when artificial fill or structures are placed within the flood plain. The uncompensated loss of natural flood plain storage can increase off-site floodwater elevations and flows.

- 300.9 **CONDITIONAL APPROVAL OF A REGULATOR FLOODWAY MAP CHANGE:** Preconstruction approval by DWR and the Federal Emergency Management Agency of a proposed change to the floodway map. This preconstruction approval, pursuant to this Part, gives assurances to the property owner that once an Appropriate Use is constructed according to permitted plans, the floodway map can be changed, as previously agreed, upon review and acceptance of as-built plans.
- 300.10 **CONDITIONAL LETTER OF MAP REVISION (CLOMR):** A letter which indicates that the Federal Emergency Management Agency will revise base flood elevations, flood insurance rate zones, flood boundaries or floodway as shown on an effective Flood Hazard Boundary Map or Flood Insurance Rate Map, once the as-built plans are submitted and approved.
- 300.11 **CONTROL STRUCTURE:** A structure designed to control the rate of flow that passes through the structure, given a specific upstream and downstream water surface elevation.
- 300.12 **DAM:** All obstructions, wall embankments or barriers, together with their abutments and appurtenant works, if any, constructed for the purpose of storing or diverting water or creating a pool. Underground water storage tanks are not included.
- 300.13 **DEVELOPMENT:** Any man-made change to real estate, including:
- (A) Construction, reconstruction, repair, or placement of a building or any addition to a building.
 - (B) Installing a manufactured home on a site, preparing a site for a manufactured home, or installing a travel trailer on a site for more than 180 days.
 - (C) Drilling, mining, installing utilities, construction of roads, bridges, or similar projects.
 - (D) Demolition of a structure or redevelopment of a site.
 - (E) Clearing of land as an adjunct of construction.
 - (F) Construction or erection of levees, walls, fences, dams, or culverts; channel modification; filling, dredging, grading, excavating, paving, or other non-agricultural alterations of the ground surface; storage of materials; deposit of solid or liquid waste;

(G) Any other activity of man that might change the direction, height, or velocity of flood or surface water, including extensive vegetation removal; Development does not include maintenance of existing buildings and facilities such as re-roofing or resurfacing of roads when there is no increase in elevation, or gardening, plowing, and similar agricultural practices that do not involve filling, grading, or construction of levees.

300.14 DWR: Illinois Department of Transportation, Division of Water Resources.

300.15 ELEVATION CERTIFICATES: A form published by the Federal Emergency Management Agency that is used to certify the elevation to which a building has been elevated.

300.16 EROSION: The general process whereby soils are moved by flowing water or wave action

300.17 EXEMPT ORGANIZATIONS: Organizations which are exempt from this ordinance per the Ill. Rev. Stat. including state, federal or local units of government.

300.18 FEMA: Federal Emergency Management Agency and its regulations at 44 CFR 59-79 effective as October 1, 1988. This incorporation does not include any later editions or amendments.

300.19 FLOOD: A general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal waves, or the unusual and rapid accumulation or runoff of surface waters from any source.

300.20 FLOOD FREQUENCY: A period of years, based on a statistical analysis, during which a flood of a stated magnitude may be expected to be equaled or exceeded.

300.21 FLOOD FRINGE: That portion of the flood plain outside of the regulatory floodway.

300.22 FLOOD INSURANCE RATE MAPS (FIRM): A map prepared by the Federal Emergency Management Agency that depicts the special flood hazard area (SFHA) within a community. This map includes insurance rate zones and flood plains and may or may not depict floodways.

- 300.23 FLOOD PLAIN: That land typically adjacent to a body of water with ground surface elevations at or below the base flood or the 100-year frequency flood elevation. Flood plains may also include detached Special Flood Hazard Areas, ponding areas, etc. The flood plain is also known as the Special Flood Hazard Area (SFHA). The flood plains are those lands within the jurisdiction of the Village of Plainfield that are subject to inundation by the base flood of 100-year frequency flood. The SFHA's of the Village of Plainfield are generally identified as such on the Flood Insurance Rate Map of the Village of Plainfield prepared by the Federal Emergency Management Agency (or the U.S. Department of Housing and Urban Development) and Dated November 17, 1981. The SFHA's of those parts of unincorporated Will County that are within the extraterritorial jurisdiction of the Village or that may be annexed into the Village are generally identified as such on the Flood Insurance Rate Map prepared for Will County by the Federal Emergency Management Agency (or the U.S. Department of Housing and Urban Development) and dated April 15, 1982.
- 300.24 FLOODPROOFING: Any combination of structural and non-structural additions, changes or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.
- 300.25 FLOODPROOFING CERTIFICATE: A form published by the Federal Emergency Management Agency that is used to certify that a building has been designed and constructed to be structurally dry floodproofed to the flood protection elevation.
- 300.26 FLOOD PROTECTION ELEVATION (FPE): The elevation of the base flood or 100-year frequency flood plus two feet of freeboard at any given location in the SFHA.
- 300.27 FREEBOARD: An increment of elevation added to the base flood elevation to provide a factor of safety for uncertainties in calculations, unknown localized conditions, wave actions and unpredictable effects such as those caused by ice or debris jams.
- 300.28 HYDROLOGIC AND HYDRAULIC CALCULATIONS: Engineering analysis which determine expected flood flows and flood elevations based on land characteristics and rainfall events.
- 300.29 LETTER OF MAP AMENDMENT (LOMA): Official determination by FEMA that a specific structure is not in a 100-year flood zone: amends the effective Flood Hazard Boundary Map or FIRM.

- 300.30 LETTER OF MAP REVISION (LOMR): Letter that revises base flood or 100-year frequency flood elevations, flood insurance rate zones, flood boundaries or floodways as shown on an effective FHBM or FIRM.
- 300.31 MANUFACTURED HOME: A structure, transportable in one or more sections, which is built on a permanent chassis and is designated for use with or without a permanent foundation when connected to the required utilities. The term manufactured homes also includes park trailers, travel trailers and other similar vehicles placed on site for more that 180 consecutive days.
- 300.32 MANUFACTURED HOME PARK OR SUBDIVISION: A parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.
- 300.33 MITIGATION: Mitigation includes those measures necessary to minimize the negative effects which flood plain development activities might have on the public health, safety and welfare. Examples of mitigation include compensatory storage, soil erosion and sedimentation control, and channel restoration.
- 300.34 NGVD: National Geodetic Vertical Datum of 1929. Reference surface set by the National geodetic Survey deduced from a continental adjustment of all existing adjustments in 1929.
- 300.35 NATURAL: When used in reference to channels means those channels formed by the existing surface topography of the earth prior to changes made by man. A natural stream tends to follow a meandering path; its flood plain is not constrained by levees; the area near the bank has not been cleared, mowed or cultivate; the stream flows over soil and geologic materials typical of the area with no substantial alteration of the course or cross-section of the stream caused by filling or excavating. A modified channel may regain some natural characteristics over time as the channel meanders and vegetation is re-established. Similarly, a modified channel may be restored to more natural conditions by man through re-grading and re-vegetation.
- 300.36 ORDINARY HIGH WATER MARK (OHWM): The point on the bank or shore up to which the presence and action of surface water is so continuous so as to leave a distinctive mark such as by erosion, destruction or prevention of terrestrial vegetation, predominance of aquatic vegetation or other easily recognized characteristics.
- 300.37 PUBLIC FLOOD CONTROL PROJECT: A flood control project which

will be operated and maintained by a public agency to reduce flood damages to existing buildings and structures which includes a hydrologic and hydraulic study of the existing and proposed conditions of the watershed. Nothing in this definition shall preclude the design, engineering, construction or financing, in whole or in part, of a flood control project by persons or parties who are not public agencies.

300.38 PUBLICLY NAVIGABLE WATERS: All streams and lakes capable of being navigated by watercraft.

300.39 REGISTERED LAND SURVEYOR: A land surveyor registered in the State of Illinois, under the Illinois Land Surveyors Act (Ill. Rev. Stat. 1987, ch. 111, pars. 3201-3234).

300.40 REGISTERED PROFESSIONAL ENGINEER: An engineer registered in the State of Illinois, under the Illinois Professional Engineering Act (Ill. Rev. Stat. 1987, ch. 111, pars. 5101-5137).

300.41 REGULATORY FLOODWAY: The channel, including on-stream lakes, and that portion of the flood plain adjacent to a stream or watercourse as designated by DWR, which is needed to store and convey the existing and anticipated future 100-year frequency flood discharge with no more than a 0.1 foot increase in stage due to the loss of flood conveyance or storage, and no more than a 10% increase in velocities. The regulatory floodways are designated for the DuPage River, Lily Cache Creek, Springhole creek, East Norman Drain and West Norman Drain, on the Flood Boundary and Floodway Map prepared by FEMA (or Department of Housing and Urban Development) and dated May 17, 1982. The regulatory floodways for those parts of unincorporated Will County that are within the extraterritorial jurisdiction of the Village that may be annexed into the Village are designated for the DuPage River, Lily Cache Creek, Springhold Creek, East Norman Drain and West Norman Drain on the Flood Boundary and Floodway map prepared by FEMA (or Department of Housing and Urban Development) and dated April 51, 1982. To locate the regulatory floodway boundary on any site, the regulatory floodway boundary should be scaled off the regulatory floodway boundary should be scaled off the regulatory floodway map and located on a site plan, using reference marks common to both maps. Where interpretation is needed to determine the exact location of the regulatory floodway boundary, the Division should be contacted for the interpretation.

300.42 REPAIR, REMODELING OR MAINTENANCE: Development activities which do not result in any increases in the outside dimension of a building or any changes to the dimensions of a structure.

- 300.43 **RETENTION/DETENTION FACILITY:** A retention facility stores stormwater runoff without a gravity release. A detention facility provides for storage of stormwater runoff and controlled release of this runoff during and after a flood or storm.
- 300.44 **RIVERINE SFHA:** Any SFHA subject to flooding from a river, creek, intermittent stream, ditch, on stream lake system or any other identified channel. This term does not include areas subject to flooding from lakes, ponding areas, areas of sheet flow, or other areas not subject to overbank flooding.
- 300.45 **RUNOFF:** The water derived from melting snow or rain falling on the land surface, flowing over the surface of the ground or collected in channels or conduits.
- 300.46 **SEDIMENTATION:** The processes that deposit soils, debris, and other materials either on other ground surfaces or in bodies of water or watercourses.
- 300.47 **SPECIAL FLOOD HAZARD AREA (SFHA):** Any base flood area subject to flooding from a river, creek, intermittent stream, ditch, or any other identified channel or ponding and shown on a Flood Hazard boundary Map or Flood Insurance Rate Map as Zone A, A0, A1-30 AE, A99, AH, V0, V30, VE, V, M, or E.
- 300.48 **STRUCTURE:** The results of a man-made change to the land constructed on or below the ground, including the construction, reconstruction or placement of a building or any addition to a building; installing a manufactured home on a site; preparing a site for a manufactured home or installing a travel trailer on a site for more than 180 days.
- 300.49 **SUBSTANTIAL IMPROVEMENT:** Any repair, reconstruction or improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure either, (a) before the improvement or repair is started, or (b) if the structure has been damaged, and is being restored, before the damage occurred. For the purposes of this definition “substantial Improvement” is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. The term does not, however, include either (1) any project for improvement of a structure to comply with existing state or local health, sanitary, or safety code specifications which are solely

necessary to assure safe living conditions or (2) any alteration of a structure listed on the National Register of Historic Places or a State Inventory of Historic Places.

300.50 TRANSITION SECTION: Reaches of the stream or floodway where water flows from a narrow cross-section to a wide cross-section or vice versa.

Section 400.0 How to Use This Ordinance

The Village Administrator shall be responsible for fulfilling all of the duties listed in Section 500.0.

To fulfill those duties, the Village Administrator first should use the criteria listed in Section 600.0, base Flood Elevations, to determine whether the development site is located within a flood plain. Once it has been determined that a site is located within a flood plain, the village Administrator must determine whether the development site is with in a flood fringe, a regulatory floodway, or within a SFHA or flood plain on which no floodway has been identified. If the site is within a flood fringe, the village Administrator shall require that the minimum requirements of Section 799.0 be met. If the site is within a floodway, the Village Administrator shall require that the minimum requirements of Section 800.0 be met. If the site is located within a SFHA or flood plain for which no detailed study has been completed and approved, the village Administrator shall require that the minimum requirements of Section 900.0 be met.

In addition, the general requirements of Section 10000.0 shall be met for all developments meeting the requirements of Section 700.0, 800.0, or 900.0. The Village Administrator shall assure that all subdivision proposals shall meet the requirements of Section 1100.0.

If a variance is to be granted for a proposal, the Village Administrator shall review the requirements of Section 1200.0 to make sure they are met. In addition, the Village Administrator shall complete all notification requirements.

In order to assure that property owners obtain permits as required in this Ordinance, the Village Administrator may take any and all actions as outlined in Section 1400.0

Section 500.0 Duties of the Enforcement Official(s)

The Village Administrator shall be responsible for the general administration and enforcement of this Ordinance which shall include the following:

501.0 Determining the Flood Plain Designation. Check all new development

sites to determine whether they are in a Special Flood Hazard Area (SFHA). If they are in a SFHA, determine whether they are in a floodway, flood fringe or in a flood plain on which a detailed study has not been conducted which drains more than one (1) square mile.

- 502.0 Professional Engineer Review. If the development site is within a floodway or in a flood plain on which a detailed study has not been conducted which drains more than (1) square mile then the permit shall be referred to a registered professional engineer (P.E.) Under the employ or contract of the Village for review to ensure that the development meets the requirements of Section 800.0. In the case of an Appropriate Use, the P.E. shall state in writing that the development meets the requirements of Section 800.0.
- 503.0 Dam Safety Requirements. Ensure that a DWR Dam Safety permit has been issued or a letter indicating no Dam Safety permit is required. If the proposed development activity includes construction of a dam as defined in Section 300.12. Regulated dams may include weirs, restrictive culverts or impoundment structures.
- 504.0 Other permit Requirements. Ensure that any and all required federal, state and local permits are received prior to the issuance of a flood plain development permit.
- 505.0 Plan Review and Permit Issuance. Ensure that all development activities within the SFHAs of the jurisdiction of the Village meet the requirements of this Ordinance and issue a flood plain development permit in accordance with the provisions of this Ordinance and other regulations of this community when the development meets the conditions of this Ordinance.
- 506.0 Inspection Review. Inspect all development projects before, during and after construction to assure proper elevation of the structure and to ensure they comply with the provisions of this Ordinance;
- 507.0 Elevation and Floodproofing Certificates. Maintain in the permit files an Elevation Certificate certifying the elevation of the lowest floor (including basement) or a residential or non-residential building or the elevation to which a non-residential building has been floodproofed, using a Floodproofing Certificate, for all buildings subject to section 1000.0 of this Ordinance for public inspection and provide copies of same;
- 508.0 Records for Public Inspection. Maintain for public inspection and furnish upon request base flood data, SFHA and regulatory floodway maps, copies

of federal or state permit documents, variance documentation, Conditional Letter of Map Revision, Letter of Map Revision, Letter of Map Amendment and “as built” elevation and floodproofing or elevation and floodproofing certificates for all buildings constructed subject to this Ordinance.

509.0 State Permits. Ensure that construction authorization has been granted by the Illinois Division of Water Resources, for all development projects subject to Sections 800.0 and 900.0 of this Ordinance, unless enforcement responsibility has been delegated to the Village Administrator. Upon acceptance of this Ordinance by DWR and FEMA, responsibility is hereby delegated to the Village Administrator as per 92 Ill. Adm. Code 708 for construction in the regulatory floodway and flood plain when floodways have not been defined in Sections 800.0 and 900.0 of this Ordinance. However, the following review approvals are not delegated to the Village Administrator and shall require review or permits from DWR:

- a. Organizations which are exempt from this Ordinance, as per the Illinois Revised Statutes;
- b. Department of Transportation projects, dams or impoundment structures as defined in Section 300.12 and all other state, federal or local unit of government projects, including projects of the Village and County, except for those projects meeting the requirements of Sec. 802.5;
- c. An engineer’s determination that an existing bridge or culvert crossing is not a source of flood damage and the analysis indicating the proposed flood profile, per Section 802.1(e);
- d. An engineer’s analysis of the flood profile to Section 802.1(d);
- e. Alternative transition sections and hydraulically equivalent compensatory storage as indicated in section 802.1(a, b, and h);
- f. Permit issuance of structures within or over publicly navigable rivers, lakes and streams;
- g. Any changes in the base Flood Elevation or floodway locations; and,
- h. Base Flood Elevation determinations where none now exist.

510.0 Cooperation with other agencies. Cooperate with state and federal flood

plain management agencies to improve base flood or 100-year frequency flood and floodway data and to improve the administration of this Ordinance. Submit data to DWR and the Federal Emergency Management Agency for proposed revisions of a regulatory map. Submit reports as required for the National Flood Insurance Program. Notify the Federal Emergency Management Agency of any proposed amendments to this Ordinance.

- 511.0 Promulgate Regulations. Promulgate rules and regulations as necessary to administer and enforce the provisions of this Ordinance, subject however to the review and approval of DWR and FEMA for any Ordinance changes.

Section 600.0 Base Flood Elevation

This Ordinance's protection standard is based on the Flood Insurance Study for the Village. If a base flood elevation or 100-year frequency flood elevation is not available for a particular site, then the protection standard shall be according to the best existing data available in the Illinois State Water Survey's Flood Plain Information Repository. When a party disagrees with the best available data, he/she may finance the detailed engineering study needed to replace existing data with better data and submit it to DWR and FEMA.

- 601.0 The base flood or 100-year frequency flood elevation for the SFHAs of DuPage River and Lily Cache Creek, Springhole Creek, East Norman Drain and West Norman Drain shall be as delineated on the 100-year flood profiles in the Flood Insurance Study of the Village prepared by FEMA (or the Department of Housing and Urban Development) and dated May 17, 1982, and such amendments to such study and maps as may be prepared from time to time.
- 602.0 The base flood or 100-year frequency flood elevation for the SFHAs of those parts of unincorporated Will County that are within the extraterritorial jurisdiction of the Village or that may be annexed into the Village shall be as delineated on the 100-year flood profiles in the Flood Insurance Study of Will County prepared by FEMA (or the Department of Housing and Urban Development) and dated October 15, 1981, and such amendments or revisions to such study and maps as may be prepared from time to time.
- 603.0 The base flood or 100-year frequency flood elevation for each SFHA delineated as an "AH Zone" or "AO Zone" shall be that elevation (or depth) delineated on the Flood Insurance Rate Map of the Village.

604.0 The base flood or 100-year frequency flood elevation each of the remaining SFHAs delineated as an “A Zone” on the Flood Insurance Rate Map of the Village shall be according to the best existing data available in the Illinois State Water Survey Flood Plain Information Repository. When no base flood or 100-year frequency flood elevation for a riverine SFHA shall be determined from a backwater model, such as HEC-II, WSP-2, or a dynamic model such as HIP. The flood flows used in the hydraulic models shall be obtained from a hydrologic model, such as HEC-I, TR-20, or HIP, or by techniques presented in various publications prepared by the United States Geological Survey for estimating peak flood discharges. Flood flows should be based on anticipated future land use conditions in the watershed as determined from adopted local and regional land use plans. Along any watercourses draining more than one (1) square mile, the above analyses shall be submitted to DWR for approval, once approved it must be submitted to the Illinois State Water Survey Floodplain Information Repository for filing. For a non-riverine SFHA, the Base Flood Elevation shall be the historic Flood of Record plus three feet, unless calculated by a detailed engineering study and approved by the Illinois State Water Survey.

Section 700.0

Development in and/or filling of the flood fringe may be permitted if protection is provided against the base flood or 100-year frequency flood by proper elevation, and compensatory storage and other provisions of this Ordinance are met. No use will be permitted which adversely affects the capacity of drainage facilities or systems. Developments located within the flood fringe shall meet the requirements of this section, along with the requirements of Section 1000.0.

701.0 Development Permit. No person, firm, corporation, or governmental body not exempted by state law shall commence any development in the SFHA without first obtaining a development permit from the Village.

701.1 Application for a development permit shall be made on a form provided by the Village. The application shall be accompanied by drawings of the site, drawn to scale, showing property line dimensions and legal description for the property and sealed by a licensed engineer, architect or land surveyor; existing grade elevations in M.S.L., 1929 adj. datum or N.G.V.D. and all changes in grade resulting from excavation or filling; the location and dimensions of all buildings and additions to buildings. For all proposed buildings, the elevation of the lowest floor (including basement) and lowest adjacent grade shall be shown on the submitted plans and the development will be subject to the requirements of Section 1000.0 of this Ordinance.

- 701.2 Upon receipt of a development permit application, the Village Administrator shall compare the elevation of the site to the base flood or 100-year frequency flood elevation. Any development located on land that can be shown to have been higher than the base flood elevation as of the site's first Flood Insurance Rate Map identification is not in the SFHA and, therefore, not subject to the requirements of this Ordinance. The Building Official shall maintain documentation of the existing ground elevation at the development site and certification that this ground elevation existed prior to the date of the site's first Flood Insurance Rate Map identification.
- 701.3 A soil erosion and sedimentation control plan for disturbed areas shall be submitted. This plan shall include a description of the sequence of grading activities and the temporary sediment and erosion control measures to be implemented to mitigate their effects. This plan shall also include a description of final stabilization and re-vegetation measures, and the identification of a responsible party to ensure post-construction maintenance.
- 701.4 The Village Administrator shall be responsible for obtaining from the application, copies of all other local, state and federal permits, approvals or permit-not-required letters that may be required for this type of activity. The Village Administrator shall not issue a permit unless all other local, state and federal permits have been obtained.
- 702.0 Preventing Increased Damages. No development in the flood fringe shall create a threat to public health and safety.
- 702.1 If fill is being used to elevate the site above the base flood or 100-year frequency flood elevation, the applicant shall submit sufficient data and obtain a letter of map revision (LOMR) from FEMA for the purpose of removing the site from the flood plain.
- 702.2 Compensatory Storage. Whenever any portion of a flood plain is authorized for use, the volume of space which will be occupied by the authorized fill or structure below the base flood or 100-year frequency flood elevation shall be compensated for and balanced by a hydraulically equivalent volume of excavation taken from below the base flood or 100-year frequency flood elevation. The excavation volume shall be at least equal to 1.5 times the volume of storage lost due to the fill or structure. In the case of streams and watercourses, such excavation shall be made opposite or adjacent to the areas so filled or occupied. All flood plain storage lost below the existing 10-year flood elevation shall be replaced below the proposed 10-year flood elevation. All flood plain storage lost

above the existing 10-year flood elevation shall be replaced above the proposed 10-year flood elevation. All such excavations shall be constructed to drain freely and openly to the watercourse.

Section 800.0 Occupation and Use of Identified Floodways

This section applies to proposed development, redevelopment, site modification or building modification within a regulatory floodway. The regulatory floodway for the DuPage River, Lily Cache Creek, Springhole Creek, East Norman Drain and West Norman Drain shall be as delineated on the regulatory floodway maps designated by DWR according and reference in Section 300.41. Only those uses and structures will be permitted which meet the criteria in this section. All floodway modifications shall be the minimum necessary to accomplish the purpose of the project. The development shall also meet the requirements of Section 1000.

801.0 Development Permit. No person, firm, corporation or governmental body not exempted by state law shall commence any development in a floodway without first obtaining a development permit from the Village.

801.1 Application for a development permit shall be made on a form provided by the village. The application shall include the following information:

- a. Name and address of applicant;
- b. Site location (including legal description) of the property, drawn to scale, on the regulatory floodway map, indicating whether it is proposed to be in an incorporated or unincorporated area;
- c. Name of stream or body of water affected;
- d. Description of proposed activity;
- e. Statement of purpose of proposed activity;
- f. Anticipated dates of initiation and completion of activity;
- g. Name and mailing address of the owner of the subject property if different from the applicant;
- h. Signature of applicant or the applicant's agent;
- i. If the applicant is a corporation, the president or other authorized officer shall sign the application form;

- j. If the applicant is a partnership, each partner shall sign the application form; and
- k. If the applicant is a land trust, the trust officer shall sign the name of the trustee by him (her) as trust officer. A disclosure affidavit shall be filed with the application, identifying each beneficiary of the trust by name and address and defining the respective interests therein.
- l. Plans of the proposed activity shall be provided which include as a minimum:
 - (i) A vicinity map showing the site of the activity, name of the waterway, boundary lines, names of roads in the vicinity of the site, graphic or numerical scale, and north arrow;
 - (ii) A plan view of the project and engineering study reach showing existing and proposed conditions including principal dimensions of the structure or work, elevations in mean sea level (1929 adjustment) datum or N.G.V.D., adjacent property lines and ownership, drainage and flood control easements, location of any channels and any existing or future access roads, distance between proposed activity and navigation channel (when the proposed construction is near a commercially navigable body of water), regulatory floodway limit, flood plain limit, specifications and dimensions of any proposed channel modifications, location and orientation of cross-sections, north arrow, and a graphic or numerical scale.
 - (iii) Cross-section views of the project and engineering study reach showing existing and proposed conditions including principal dimensions of the work as shown in plan view, existing and proposed elevations, normal water elevation, 10-year frequency flood elevation, 100-year frequency flood elevation, and graphic or numerical scales (horizontal and vertical);
 - (iv) A soil erosion and sedimentation control plan for disturbed areas. This plan shall include a description of the sequence of grading activities and the temporary sediment and erosion control measures to be implemented to mitigate their effects. This plan shall also include a

description of final stabilization and re-vegetation measures, and the identification of a responsible party to ensure post-construction maintenance.

- (v) A copy of the regulatory floodway map, marked to reflect any proposed change in the regulatory floodway location.
- m. Any and all other local, state and federal permits or approval letters that may be required for this type of development.
- n. Engineering calculations and supporting data shall be submitted showing that the proposed work will meet the permit criteria of Section 802.0.
- o. If the regulatory floodway delineation, base flood or 100-year frequency flood elevation will change due to the proposed project, the application will not be considered complete until DWR has indicated conditional approval of the regulatory floodway map change. No structures may be built until a Letter of Map Revision has been approved by FEMA.
- p. The application for a structure shall be accompanied by drawings of the site, drawn to scale showing property line dimensions and existing ground elevations and all changes in grade resulting from any proposed excavation or filling, and flood plain and floodway limits; sealed by a registered professional engineer, licensed architect or registered land surveyor; the location and dimensions of all buildings and additions to buildings; and the elevation of the lowest floor (including basement) of all proposed buildings subject to the requirements of Section 1000.0 of this Ordinance.
- q. If the proposed project involves a channel modification, the applicant shall submit following information:
 - (i) A discussion of the purpose of and need for the proposed work;
 - (ii) A discussion of the feasibility of using alternative locations or methods to accomplish the purpose of the proposed work;
 - (iii) An analysis of the extent and permanence of the impacts the project would have on the physical and biological conditions of the body of water affected;

- (iv) An analysis of the extent and permanence of the impacts each feasible alternative identified in 802.1 (d)(i) of this Section would have on the physical and biological conditions of the body of water affected; and
- (v) An analysis of the impacts of the proposed project, considering cumulative effects on the physical and biological conditions of the body of water affected.

801.2 The Village Administrator shall be responsible for obtaining from the applicant copies of all other local, state, and federal permits and approvals that may be required for this type of activity. The Village Administrator shall not issue the development permit unless all required federal and state permits have been obtained. A Registered Professional Engineer, under the employ or contract of the Village shall review and approve applications reviewed under this Section.

802.0 Preventing Increased Damages and a List of Appropriate Uses. The only development in a floodway which will be allowed are Appropriate Uses, which will not cause a rise in the base flood elevation, and which will not create a damaging or potentially damaging increase in flood heights or velocity or be a threat to public health and safety and welfare or impair the natural hydrologic and hydraulic functions of the floodway or channel, or permanently impair existing water quality or aquatic habitat. Construction impacts shall be minimized by appropriate mitigation methods as called for in this Ordinance. Only those Appropriate Uses listed in 92 Ill. Adm. Code 708 will be allowed. Appropriate uses do not include the construction or placement of any new structures, fill, building additions, buildings on stilts, excavation or channel modifications done to accommodate otherwise non-appropriate uses in the floodway, fencing (including landscaping or planting designed to act as a fence) and storage of materials except as specifically defined above as an Appropriate Use. The approved Appropriate Uses are as follows:

- a. Flood control structures, dikes, dams and other public works or private improvements relating to the control of drainage, flooding, erosion, or water quality or habitat for fish and wildlife.
- b. Structures or facilities relating to the use of, or requiring access to, the water or shoreline, such as pumping and treatment facilities, and facilities and improvements related to recreational boating, commercial shipping and other functionally water depended uses;

- c. Storm and sanitary sewer outfalls;
- d. Underground and overhead utilities;
- e. Recreational facilities such as playing fields and trail systems including any related fencing (at least 50% open when viewed from any one direction) built parallel to the direction of flood flows, and including open air pavilions;
- f. Detached garages, storage sheds, or other non-habitable accessory structures without toilet facilities to existing buildings that will not block flood flows, nor reduce floodway storage;
- g. Bridges, culverts, roadways, sidewalks, railways, runways and taxiways and any modification thereto;
- h. Parking lots and any modifications thereto (where depth of flooding at the 100-year frequency flood event will not exceed 1.0') and aircraft parking aprons built at or below ground elevation;
- i. Regulatory floodway re-grading, without fill, to create a positive non-erosive slope toward a watercourse.
- j. Flood proofing activities to protect previously existing lawful structures including the construction of water tight window wells, elevating structures, or construction of floodwalls around residential, commercial or industrial principal structures where the outside toe of the floodwall shall be no more than ten (10) feet away from the exterior wall of the existing structure, and, which are not considered substantial improvements to the structure.
- k. In the case of damaged or replacement buildings, reconstruction or repairs made to a building that are valued at less than 50% of the market value of the building before it was damaged or replaced, and which do not increase the outside dimensions of the building.
- l. Additions to existing buildings above the BFE that do not increase the building's foot print and are valued at less than 50% of the market value of the building.

802.1 Within the regulatory floodway as identified on the regulatory floodway maps designate by DWR, the construction of an Appropriate Use, will be considered permissible provided that the proposed project meets the

following engineering and mitigation criteria and is so stated in writing with supporting plans, calculations and data by a registered professional engineer and provided that any structure meets the protection requirements of Section 1000.0 of this Ordinance:

a. Preservation of Flood Conveyance, so as Not to Increase Flood Stages Upstream. For appropriate uses other than bridge or culvert crossings, on-stream structures or dams, all effective regulatory floodway conveyance lost due to the project will be replaced for all flood events up to and including the 100-year frequency flood. In calculation effective regulatory floodway conveyance, the following factors shall be taken into consideration:

(i) Regulatory floodway conveyance, $'K' = 1.486/n AR^{2/3}$

Where “n” is Manning’s roughness factor, “A” is the effective area of the cross-section, and “R” is the ratio of the area to the wetted perimeter. (See Open Channel Hydraulics, Ven Te Chow, 1959, McGraw-Hill Book Company, New York)

(ii) The same Manning’s “n” value shall be used for both existing and proposed conditions unless a recorded maintenance agreement with a federal, state or local unit of government can assure the proposed conditions will be maintained or the land cover is changing from a vegetative to a non-vegetative land cover.

(iii) Transition sections shall be provided and used in calculations of effective regulatory floodway conveyance. The following expansion and contraction ratios shall be used unless and applicant’s engineer can prove to DWR through engineering calculations or model tests that more abrupt transitions may be used with the same efficiency:

(a) When water is flowing from a narrow section to a wider section, the water should be assumed to expand no faster than at a rate of one foot horizontal for every four feet of the flooded stream’s length.

(b) When water is flowing from a wide section to a narrow section, the water should be assumed to contract no faster than at a rate of one foot

horizontal for every one foot of the flooded stream's length.

- (c) When expanding or contracting flows in a vertical direction, a minimum of one foot vertical transition for every ten feet of stream length shall be used.
 - (d) Transition sections shall be provided between cross-sections with rapid expansions and contractions and when meeting the regulatory floodway delineation on adjacent properties.
 - (e) All cross-sections used in the calculations shall be located perpendicular to the flood flows.
- b. Preservation of Floodway Storage so as not to Increase Downstream Flooding. Compensatory storage shall be provided for any regulatory floodway storage lost due to the proposed work from the volume of fill or structures placed and the impact of any related flood control projects. Compensatory storage for fill or structures shall be equal to at least 1.5 times the volume of flood plain storage lost. Artificially created storage lost due to a reduction in head loss behind a bridge shall not be required to be replaced. The compensatory regulatory floodway storage shall be placed between the proposed normal water elevation and the proposed 100-year flood elevation. All regulatory floodway storage lost below the existing 10-year flood elevation shall be replaced below the proposed 10-year flood elevation. All regulatory floodway storage lost above the existing 10-year flood elevation shall be replaced above the proposed 10-year flood elevation. All such excavations shall be constructed to drain freely and openly to the watercourse. If the compensatory storage will not be placed at the location of the proposed construction, the applicant's engineer shall demonstrate to DWR through a determination of flood discharges and water surface elevations that the compensatory storage is hydraulically equivalent.
- c. Preservation of Floodway Velocities so as Not to Increase Stream Erosion of Flood Heights. For all Appropriate Uses, except bridges or culverts or on stream structures, the proposed work will not result in an increase in the average channel or regulatory floodway velocities. However in the case of bridges or culverts or on stream structures built for the purpose of backing up water in the stream during normal or flood flows, velocities may be

increased at the structure site if scour, erosion and sedimentation will be avoided by the use of rip-rap or other design measures.

- d. Construction of New Bridges or Culvert Crossings and Roadway Approaches. The proposed structure shall not result in an increase of upstream flood stages greater than 0.1 foot when compared to the existing conditions for all flood events up to and including the 100-year frequency event' or the upstream flood stage increases will be contained within the channel banks (or within existing vertical extensions of the channel banks) such as within the design protection grade of existing levees or flood walls or within recorded flood easements. If the proposed construction will increase upstream flood stages greater than 0.1 feet, the developer must contact

DWR, Dam Safety Section for a Dam Safety permit or waiver.

- (i) The engineering analysis of upstream flood stages must be calculated using the flood study flows, and corresponding flood elevations for tailwater conditions for the flood study specified in Section 600.0 of this Ordinance. Culverts must be analyzed using the U.S. DOT, FHWA Hydraulic Chart for the Selection of Highway Culverts. Bridges must be analyzed using the U.S. DOT/Federal Highway Administration Hydraulics of Bridge Waterways calculation procedures.
- (ii) Lost floodway storage must be compensated for per Section 802.1(b).
- (iii) Velocity increases must be mitigated per Section 802.1(c).
- (iv) If the crossing is proposed over a public water that is used for recreational or commercial navigation, a Department of Transportation permit must be received.
- (v) The hydraulic analysis for the backwater caused by the bridge showing the existing condition and proposed regulatory profile must be submitted to DWR for concurrence that a CLOMR is not required by Section 802.0.
- (vi) All excavations for the construction of the crossing shall

be designated per Section 802.1(h).

- e. Reconstruction or Modification of Existing Bridges, Culverts, and Approach Roads.
 - (i) The bridge or culvert and roadway approach reconstruction or modification shall be constructed with no more than 0.1 foot increase in backwater over the existing flood profile for all flood frequencies up to and including the 100-year event, if the existing structure is not a source of flood damage.
 - (ii) If the existing bridge or culvert and roadway approach is a source of flood damage to buildings or structures in the upstream flood plain, the applicant's engineer shall evaluate the feasibility of redesigning the structure to reduce the existing backwater, taking into consideration the effects of flood stages on upstream and downstream properties.
 - (iii) The determination as to whether or not the existing crossing is a source of flood damage and should be redesigned must be prepared in accordance with the Department of Transportation Rules 92 Ill. Adm. Code 708 (floodway Construction in Northeastern Illinois) and submitted to the Division for review and concurrence before a permit is issued.

- f. On-stream Structures Built for the Purpose of Backing Up Water.

Any increase in upstream flood stages greater than 0.0 foot when compared to the existing conditions, for all flood events up to and including the 200-year frequency event shall be contained within the channel banks (or within existing vertical extensions of the channel banks) such as within the design protection grade of existing levees or flood walls or within recorded flood easements. A permit or letter indicating a permit is not required must be obtained from DWR, Dam safety Section for a Dam Safety permit or waiver for any structure built for the purpose of backing up water in the stream during normal or flood flow. All dams and impoundment structures as defined in Section 300.12 shall meet the permitting requirements of 92 Ill. Adm. Code 702 (construction and Maintenance of Dams). If the proposed activity involves a modification of the channel or floodway to accommodate an impoundment, it shall be demonstrated that:

- (i) The impoundment is determined to be in the public interest by providing flood control, public recreation, or regional stormwater detention;
 - (ii) The impoundment will not prevent the migration of indigenous fish species, which require access to upstream areas as part of their life cycle, such as for spawning;
 - (iii) The impoundment will not cause or contribute to degraded water quality or habitat conditions. Impoundment design should include gradual bank slopes, appropriate bank stabilization measures, and a pre-sedimentation basin.
 - (iv) A non-point source control plan has been implemented in the upstream watershed to control the effects of sediment runoff as well as minimize the input of nutrients, oil and grease, metals and other pollutants. If there is more than one municipality in the upstream watershed, the municipality in which the impoundment is constructed should coordinate with upstream municipalities to ensure comprehensive watershed control;
 - (v) The project otherwise complies with the requirements of Section 800.
- g. Flood Proofing of Existing Habitable, Residential and Commercial structures. If construction is required beyond the outside dimensions of the existing building, the outside perimeter of the floodproofing construction shall be placed no further than 10 feet from the outside of the building. Compensation of lost storage and conveyance will not be required for floodproofing activities.
- h. Excavation in the Floodway. When excavation is proposed in the design of bridges and culvert openings, including the modifications to and replacement of existing bridge and culvert structures, or to compensate for lost conveyance for other Appropriate Uses, transition sections shall be provided for the excavation . The following expansion and contraction ratios shall be used unless an applicant engineer can prove to DWR through engineering calculations or model tests that more abrupt transitions may be used with the same efficiency:
- (i) When water is flowing from a narrow section to a wider section, the water should be assumed to expand no faster

than at a rate of one foot horizontal for every four feet of the flooded stream's length;

- (ii) When water is flowing from a wide section to a narrow section, the water should be assumed to contract no faster than at a rate of one foot horizontal for every one foot of the flooded stream's length; and
 - (iii) When expanding or contracting flows in a vertical direction, a minimum of one foot vertical transition for every ten feet of stream length shall be used.
 - (iv) Erosion/scour protection shall be provided inland upstream and downstream of the transitions sections.
- i. If the proposed activity involves a channel modification, it shall be demonstrated that:
- (i) There are no practicable alternatives to the activity which would accomplish its purpose with less impact to the natural conditions of the body of water affected. Possible alternatives include levees, bank stabilization, flood proofing of existing structures, removal of structures from the flood plain, clearing the channel, high flow channel, or the establishment of a stream side buffer strip or green belt. Channel modification is acceptable if the purpose is to restore natural conditions and improve water quality and fish and wildlife habitat;
 - (ii) Water quality, habitat, and other natural functions would be significantly improved by the modification and no significant habitat area may be destroyed, or the impacts are offset by the replacement of an equivalent degree of natural resource values;
 - (iii) The activity has been planned and designed and will be constructed in a way which will minimize its adverse impacts on the natural conditions of the body of water affected, consistent with the following criteria:
 - (a) The physical characteristics of the modified channel shall match as closely as possible those of the existing channel in length, cross-section, slope and sinuosity. If the existing channel has been

previously modified, restoration of more natural physical conditions should be incorporated into channel modification design, where practical.

- (b) Hydraulically effective transitions shall be provided at both the upstream and down stream ends of the project, designed such that they will prevent erosion.
- (c) One-sided construction of a channel shall be used when feasible. Removal of streamside (riparian) vegetation should be limited to one side of the channel, where possible to preserve the shading and stabilization effects of the vegetation.
- (d) Clearing of vegetation shall be limited to that which is essential for construction of the channel.
- (e) Channel banks shall be constructed with a side slope no steeper than 3:1 horizontal to vertical, wherever practicable. Natural vegetation and gradual side slopes are the preferred methods for bank stabilization. Where high velocities or sharp bends necessitate the use of alternative stabilization measures, natural rock or rip-rap are preferred materials. Artificial materials such as concrete, gabions, or construction rubble should be avoided unless there are no practicable alternatives.
- (f) All disturbed areas associated with the modification shall be seeded or otherwise stabilized as soon as possible upon completion of construction. Erosion blanket or an equivalent material shall be required to stabilize disturbed channel banks prior to establishment of the vegetative cover.
- (g) If the existing channel contains considerable bottom diversity such as deep pools, riffles, and other similar features, such features shall be provided in the new channel. Spawning and nesting areas and flow characteristics compatible with fish habitat shall also be established, where

appropriate.

- (h) A sediment basin shall be installed at the downstream end of the modification to reduce sedimentation and degradation of downstream water quality.
 - (i) New or relocated channels should be built in the dry and all items of construction, including vegetation, should be completed prior to diversion of water into the new channel.
 - (j) There shall be no increases in stage or velocity as the channel enters or leaves the project site for any frequency flood unless necessitated by a public flood control project or unless such an increase is justified as part of a habitat improvement or erosion control project.
 - (k) Unless the modification is for a public flood control project, there shall be no reduction in the volume of floodwater storage outside the floodway as a result of the modification; and
- (iv) The project otherwise complies with the requirements of Section 800.
- j. Seeding and Stabilization Plan. For all activities located in a floodway, a seeding and stabilization plan shall be submitted by the applicant.
- k. Soil Erosion and sedimentation Measures. For all activities in the floodway, including grading, filling, and excavation, in which there is potential for erosion of exposed soil, soil erosion and sedimentation control measures shall be employed consistent with the following criteria:
- (i) The construction area shall be minimized to preserve the maximum vegetation possible. Construction shall be scheduled to minimize the time soil is exposed and unprotected. In no case shall the existing natural vegetation be destroyed, removed, or disturbed more than 15 days prior to the initiation of improvements.

- (ii) Temporary and/or permanent soil stabilization shall be applied to denuded areas as soon as possible. As a minimum, soil stabilization shall be provided within 15 days after final grade is reached on any portion of the site, and within 15 days to denuded areas which may not be at final grade but will remain undisturbed for longer than 60 days.
 - (iii) Sedimentation control measures shall be installed before any significant grading or filling is initiated on the site to prevent the movement of eroded sediments off site or into the channel. Potential sediment control devices include filter fences, straw bale fences, check dams, diversion ditches, and sediment basins.
 - (iv) A vegetated buffer strip of at least 25 feet in width shall be preserved and/or re-established, where possible, along existing channels (See 802.1 (p)). Construction vehicle use of channels shall be minimized. Temporary stream crossings shall be constructed, wherever necessary, to minimize erosion. Necessary construction in or along channels shall be restabilized immediately.
 - (v) Soil erosion and sedimentation control measures shall be designed and implemented consistent with “Procedures and Standards for Urban Soil Erosion and Sedimentation Control in Illinois” (1988) also known as the “Green Book” and “Standards and Specifications for Soil Erosion and Sediment Control” (IEPA, 1987).
- l. Public Flood Control Projects. For public flood control projects, the permitting requirements of this section will be considered met if the applicant can demonstrate to DWR through hydraulic and hydrologic calculations that the proposed project will not singularly or cumulatively result in increased flood heights outside the project right-of-way or easements for all flood events up to an including the 100-year frequency event.
- m. General Criteria for Analysis of Flood Elevations.
- (i) The flood profiles, flows and floodway data in the regulatory floodway study, referenced in Section 600.0, must be used for analysis of the base conditions. If the study data appears to be in error or conditions have

changed, DWR shall be contacted for approval and concurrence on the appropriate base conditions data to use.

- (ii) If the 100-year regulatory floodway elevation at the site of the proposed construction is affected by backwater from a downstream receiving stream with a larger drainage area, the proposed construction shall be shown to meet the requirements of this section for the 100-year frequency flood elevations of the regulatory floodway conditions and conditions with the receiving stream at normal water elevations.
 - (iii) If the applicant learns from DWR, local governments, or a private owner that a downstream restrictive bridge or culvert is scheduled to be removed, reconstructed, modified, or a regional flood control project is scheduled to be built, removed, constructed or modified within the next five years, the proposed construction shall be analyzed and shown to meet the requirements of this section for both the existing conditions and the expected flood profile conditions when the bridge, culvert or flood control project is built.
- n. Conditional Letter of Map Revision. If the Appropriate Use would result in a change in the regulatory floodway location or the 100-year frequency flood elevation, the applicant shall submit to DWR and to FEMA all the information, calculations and documents necessary to be issued a conditional regulatory floodway map revision and receive from DWR a conditional approval of the regulatory floodway change before a permit is issued. However, the final regulatory floodway map will not be changed by DWR until as-built plans or record drawings are submitted and accepted by FEMA and DWR. In the case of non-government projects, the municipality in incorporated areas and the county in unincorporated areas shall concur with the proposed conditional regulatory floodway map revision before DWR approval can be given. No filling, grading, dredging or excavating shall take place until a conditional approval is issued. No further development activities shall take place until a final Letter of Map Revision (LOMR) is issued by FEMA and DWR.
- o. Professional Engineer's Supervision. All engineering analyses shall be performed by or under the supervision of a registered

professional engineer.

- p. For all activities in the floodway involving construction within 25 feet of the channel, the following criteria shall be met:
 - (i) A natural vegetation buffer strip shall be preserved within at least 25 feet of the ordinary high water mark of the channel.
 - (ii) Where it is impossible to protect this buffer strip during the construction of an Appropriate Use, a vegetated buffer strip shall be established upon completion of construction.
 - (iii) The use of native riparian vegetation is preferred in the buffer strip. Access through this buffer strip shall be provided, when necessary, for stream maintenance purposes.

After receipt of conditional approval of the regulatory floodway change and issuance of a permit and a Conditional Letter of Map Revision, construction as necessary to change the regulatory floodway designation may proceed but no buildings or structures or other construction that is not an Appropriate Use may be placed in that area until the regulatory floodway map is changed and a final Letter of Map Revision is received. The regulatory floodway map will be revised upon acceptance and concurrence by DWR and FEMA of the “as built” plans.

802.2 State Review. For those projects listed below located in a regulatory floodway, the following criteria shall be submitted to DWR for their review and concurrence prior to the issuance of a permit:

- a. DWR will review an engineer’s analysis of the flood profile due to a proposed bridge pursuant to Section 802.1(d).
- b. DWR will review an engineer’s determination that an existing bridge or culvert crossing is not a source of flood damage and the analysis indicating the proposed flood profile, pursuant to Section 802.1(e).
- c. The DWR will review alternative transition sections and hydraulically equivalent storage pursuant to Section 802.1 (a, b and h).
- d. The DWR will review and approve prior to the start of construction any Department projects, dams (as defined in Section

300.12) and all other state, federal or local units of government projects, including projects of the municipality or country.

802.3 Other Permits. In addition to the other requirements of this Ordinance, a development permit for a site located in a floodway shall not be issued unless the applicant first obtains a permit or written documentation that a permit is not required from DWR, issued pursuant to Illinois Revised Statutes, Chapter 19, Section 52 et seq. No permit from DWR shall be required if the Division has delegated this responsibility to the Village Administrator.

802.4 Dam Safety Permits. Any work involving the construction, modification or removal of a dam as defined in Section 300.12 per 92 Ill. Adm. Code 702 (Rules for Construction of Dams) shall obtain an Illinois Division of Water Resources Dam safety permit prior to the start of construction of a dam. If the Village Administrator finds a dam that does not have a DWR permit, the Village Administrator shall immediately notify the Dam Safety Section of the Division of Water Resources. If the Village Administrator finds a dam which is believed to be in unsafe condition, the Village Administrator shall immediately notify the owner of the dam, DWR, Dam Safety Section in Springfield and the Illinois Emergency Services and Disaster Agency (ESDA).

802.5 Activities That Do Not Require a Registered Professional Engineer's Review. The following activities may be permitted without a registered professional engineers review. Such activities shall still meet the other requirements of this Ordinance, including the mitigation requirements.

- a. Underground and overhead utilities that:
 - (i) Do not result in any increase in existing ground elevations, or
 - (ii) Do not require the placement of above ground structures in the floodway, or
 - (iii) In the case of underground stream crossings, the top of the pipe or encasement is buried a minimum of 3' below the existing stream bed, and
 - (iv) In the case of overhead utilities, no supporting towers are placed in the watercourse and are designed in such a fashion as not to catch debris.

- b. Storm and sanitary sewer outfalls that:
 - (i) Do not extend riverward or lakeward of the existing adjacent natural bank slope, and
 - (ii) Do not result in an increase in ground elevation, and
 - (iii) Are designed so as not to cause stream erosion at the outfall location.
- c. Construction of sidewalks, athletic fields excluding fences, properly anchored playground equipment and patios at grade.
- d. Construction of shoreline and streambank protection that:
 - (i) Does not exceed 1000 feet in length.
 - (ii) Materials are not placed higher than the existing top of bank.
 - (iii) Materials are placed so as not to reduce the cross-sectional area of the stream channel or bank of the lake.
- e. Temporary stream crossing in which:
 - (i) The approach roads will be 0.5' (½ foot) or less above natural grade.
 - (ii) The crossing will allow stream flow to pass without backing up the water above the stream bank vegetation line or above any drainage tile or outfall invert.
 - (iii) The top of the roadway fill in the channel will be at least 2' below the top of the lowest bank. Any fill in the channel shall be non-erosive material, such as rip-rap or gravel.
 - (iv) All disturbed stream banks will be seeded or otherwise stabilized as soon as possible upon installation and again upon removal of construction.
 - (v) The access road and temporary crossings will be removed within one year after authorization.

Not Identified.

In SFHA or flood plains, where no floodways have been identified and no base flood or 100-year frequency flood elevations have been established by FEMA, and draining more than a square mile, no development shall be permitted unless the cumulative effect of the proposals, when combined with all other existing and anticipated uses and structures, shall not significantly impede or increase the flow and passage of the floodwaters nor significantly increase the base flood or 100-year frequency flood elevation.

901.1 Development Permit. No person, firm, corporation, or governmental body, not exempted by state law, shall commence any development in a SFHA or flood plain without first obtaining a development permit from the Village. Application for a development permit shall be made on a form provided by the Village. The application shall be accompanied by drawings of the site, drawn to scale showing property line dimensions; and existing grade elevations and all changes in grade resulting from excavation or filling, sealed by a licensed engineer, architect or surveyor; the location and dimensions of all buildings and additions to buildings; and the elevations of the lowest floor (including basement) of all proposed buildings subject to the requirements of Section 1000 of this Ordinance.

The application for a development permit shall also include the following information:

- a. A detailed description of the proposed activity, its purpose, and intended use;
- b. Site location (including legal description) of the property, drawn to scale, on the regulatory floodway maps, indicating whether it is proposed to be in an incorporated or unincorporated area;
- c. Anticipated dates of initiation and completion of activity;
- d. Plans of the proposed activity shall be provided which include as a minimum:
 - (i) A vicinity map showing the site of the activity, name of the waterway, boundary lines, names of roads in the vicinity of the site, graphic or numerical scale, and north arrow;
 - (ii) A plan view of the project and engineering study reach showing existing and proposed conditions including principal dimensions of the structure or work, elevations

in mean sea level (1929 adjustment) datum or N.G.V.D., adjacent property lines and ownership, drainage and flood control easements, distance between proposed activity and navigation channel (when the proposed construction is near a commercially navigable body of water), flood plain limit, location and orientation of cross-sections, north arrow, and a graphical or numerical scale;

(iii) Cross-section views of the project and engineering study reach showing existing and proposed conditions including principal dimensions of the work as shown in plan view, existing and proposed elevations, normal water elevation, 10-year frequency flood elevation, 100-year frequency flood elevation, and graphical or numerical scales (horizontal and vertical); and

e. Engineering calculations and supporting data shall be submitted showing that the proposed work will meet the criteria of Section 902.0.

f. Any and all other local, state and federal permits or approvals that may be required for this type of development.

901.2 Based on the best available existing data according to the Illinois state Water Survey's Flood Plain Information Repository, the Village Administrator shall compare the elevation of the site to the base flood or 100-year frequency flood elevation. Should no elevation information exist for the site, the developer's engineer shall calculate the elevation according to Section 604.0. Any development located on land that can be shown to have been higher than the base flood elevation as of the site's first Flood Insurance Rate Map Identification is not in the SFHA and, therefore, not subject to the requirements of this Ordinance. The Building Official shall maintain documentation of the existing ground elevation at the development site and certification that this ground elevation existed prior to the date of the site's first Flood Insurance Rate Map identification.

901.3 The Village Administrator shall be responsible for obtaining from the applicant copies of all other local, state, and federal permits, approvals or permit-not-required letters that may be required for this type of activity. The Village Administrator shall not issue the development permit unless all required local, state and federal permits have been obtained.

902.0 Preventing Increased Damages. No development in the SFHA, where a floodway has not been determined shall create a damaging or potentially damaging increase in flood heights or velocity or threat to public health,

safety and welfare or impair the natural hydrologic and hydraulic functions of the floodway or channel, or impair existing water quality or aquatic habitat. Construction impacts shall be minimized by appropriate mitigation methods as called for in this Ordinance.

- 902.1 Within all riverine SFHA's where the floodway has not been determined, the following standards shall apply:
- a. The developer shall have a Registered Professional Engineer state in writing and show through supporting plans, calculations, and data that the project meets the engineering requirements of Section 802.1 (a) through (l) for the entire flood plain as calculated under the provisions of Section 604.00 of this Ordinance. As an alternative, the developer should have an engineering study performed to determine a floodway and submit that engineering study to DWR for acceptance as a regulatory floodway. Upon acceptance of their floodway by the Department, the developer shall then demonstrate that the project meets the requirements of Section 800.0 for the regulatory floodway. The floodway shall be defined according to the definition in Section 300.41 of this Ordinance.
 - b. A development permit shall not be issued unless the applicant first obtains a permit from DWR or written documentation that a permit is not required from DWR.
 - c. No permit from DWR shall be required if the Division has delegated permit responsibility to the Village Administrator per 92 Ill. Adm. Code, Part 708 for regulatory floodways, per DWR Statewide Permit entitled "Construction in Flood Plains with No Designated Floodways in Northeastern Illinois."
 - d. Dam Safety Permits. Any work involving the construction, modification or removal of a dam or an on-stream structure to impound water as defined in Section 300.12 shall obtain an Illinois Division of Water Resources Dam safety permit or letter indicating a permit is not required prior to the start of construction of a dam. If the Village Administrator finds a dam that does not have DWR permit, the Village Administrator shall immediately notify the Dam Safety Section of the Division of Water Resources. If the Village Administrator finds a dam which is believed to be in unsafe condition, the Village Administrator shall immediately notify the owner of the dam and the Illinois Emergency Services, DWR, Dam Safety Section in Springfield and Disaster Agency (ESDA).

- e. The following activities may be permitted without a Registered Professional Engineer's review or calculation of a base flood elevation and regulatory floodway. Such activities shall still meet the other requirements of this Ordinance:
 - (i) Underground and overhead utilities that:
 - (a) Do not result in any increase in existing ground elevations, or
 - (b) Do not require the placement of above ground structures in the floodway, or
 - (c) In the case of underground stream crossings, the top of the pipe or encasement is buried a minimum of 3' below the existing streambed, and
 - (d) In the case of overhead utilities, no supporting towers are placed in the watercourse and are designed in such a fashion as not to catch debris.
 - (ii) Storm and sanitary sewer outfalls that:
 - (a) Do not extend riverward or lakeward of the existing adjacent natural bank slope, and
 - (b) Do not result in an increase in ground elevation, and
 - (c) Are designed so as not to cause stream bank erosion at the outfall location.
 - (iii) Construction of shoreline and streambed protection that:
 - (a) Does not exceed 1000 feet in length or 2 cubic yards per lineal foot of streambed.
 - (b) Materials are not placed higher than the existing top of bank.
 - (c) Materials are placed so as not to reduce the cross-sectional area of the stream channel by more than 10%.

- (iv) Temporary stream crossings in which:
 - (a) The approach roads will be 0.5' (½ foot) or less above natural grade.
 - (b) The crossing will allow stream flow to pass without backing up the water above the stream bank vegetation line or above any drainage tile or outfall invert.
 - (c) The top of the roadway fill in the channel will be at least 2' below the top of the lowest bank. Any fill in the channel shall be non-erosive material, such as rip-rap or gravel.
 - (d) All disturbed stream banks will be seeded or otherwise stabilized as soon as possible upon installation and again upon removal of construction.
 - (e) The access road and temporary crossings will be removed within one year after authorization.
- (v) The construction of light poles, sign posts and similar structures.
- (vi) The construction of sidewalks, driveways, athletic fields (excluding fences), patios and similar surfaces which are built at grade;
- (vii) The construction of properly anchored, walled, open structures such as playground equipment, pavilions, and carports built at or below existing grade that would not obstruct the flow of flood waters;
- (viii) The placement of properly anchored buildings not exceeding seventy (70) square feet in size, nor ten (10) feet in any one dimension (e.g., animal shelters and tool sheds);
- (ix) The construction of additions to existing buildings which do not increase the first floor area by more than twenty (20) percent, which are located on the upstream or downstream side of the existing building, and which do not extend beyond the sides of the existing building that

are parallel to the flow of flood waters;

- (x) Minor maintenance dredging of a stream channel where:
 - (a) The affected length of stream is less than 1000 feet.
 - (b) The work is confined to reestablishing flows in natural stream channels, or
 - (c) The cross-sectional area of the dredged channel conforms to that of the natural channel upstream and downstream of the site.

- f. The flood carrying capacity within any altered or relocated watercourse shall be maintained.

902.2 Compensatory Storage. Whenever any portion of a flood plain is authorized for use, the volume of space which will be occupied by the authorized fill or structure below the base flood or 100-year frequency flood elevation shall be compensated for and balanced by a hydraulically equivalent volume of excavation taken from below the base flood or 100-year frequency flood elevation. The excavation volume shall be at least equal to 1.5 times the volume of storage lost due to the fill or structure. In the case of streams and watercourses, such excavation shall be made opposite or adjacent to the areas so filled or occupied. All flood plain storage lost below the existing 10-year flood elevation shall be replaced below the proposed 10-year flood elevation. All flood plain storage lost above the existing 10-year flood elevation shall be replaced above the proposed 10-year flood elevation shall be replaced above the proposed 10-year flood elevation. All such excavations shall be constructed to drain freely and openly to the watercourse.

1000.0 Permitting Requirements Applicable to All Flood Plain Areas.

In addition to the requirements found in Sections 700.0, 800.0, and 900.0 for development in flood fringes, regulatory floodways, and SFHA or flood plains where no floodways have been identified (Zones A, A0, AH, AE A1-A30, A99, V0, V1-V30, VE, V, M or E), the following requirements shall be met.

1001.0 Public Health Standards

1001.1 No developments in the SFHA shall include locating or storing chemicals, explosives, buoyant materials, animal wastes, fertilizers, flammable liquids, pollutants, or other hazardous or toxic materials below the flood plain elevation.

1001.2 New and replacement water supply systems, wells, sanitary sewer lines and on-site waste disposal systems may be permitted providing all manholes or other above ground openings located below the FPE are watertight.

1002.0 Carrying Capacity and Notification. For all projects involving channel modification, fill, or stream maintenance (including levees), the flood carrying capacity of the watercourse shall be maintained. In addition, the Village Administrator shall notify adjacent communities in writing 30 days prior to the issuance of a permit for the alteration or relocation of the watercourse.

1003.0 Protecting Buildings. All buildings located within a 100-year flood plain also know as SFHA, shall be protected from flood damage below the flood protection elevation. However, existing buildings located within a regulatory floodway shall also meet the more restrictive Appropriate Use standards included in Section 800.0. This building protection criteria applies to the following situations:

- a. Construction or placement of a new building.
- b. A structural alteration to an existing building that either increases the first floor area by more than 20% or the building's market value by more than 50%;
- c. Installing a manufactured home on a new site or a new manufactured home on an existing site. This building protection requirements does not apply to returning a mobile home to the same site it lawfully occupied before it was removed to avoid flood damage; and
- d. Installing a travel trailer on a site for more than 180 days.

This building protection requirement may be met by one of the following methods.

1003.1 A residential or non-residential building, when allowed, may be constructed on permanent land fill in accordance with the following:

- a. The lowest floor, (including basement) shall be at or above the flood protection elevation.
- b. The fill shall be placed in layers no greater than one (1) foot deep before compaction and should extend at least ten (10) feet beyond the foundation of the building before sloping below the flood protection elevation. The top of the fill shall be above the flood protection elevation. However, the ten (10) foot minimum may be waived if a structural engineer certifies an alternative method to protect the building from damages due to hydrostatic pressures. The fill shall be protected against erosion and scour. The fill shall not adversely effect the flow or surface drainage from or onto neighboring properties.

1003.2 A residential or non-residential building may be elevated in accordance with the following:

- a. The building or improvements shall be elevated on crawl space, stilts, piles, walls, or other foundation that is permanently open to flood waters and not subject to damage by hydrostatic pressures of the base flood or 100-year frequency flood. The permanent openings shall be no more than one foot above grade, and consists of a minimum of two openings. The openings must have a total net area of not less than one square inch for every one square foot of enclosed area subject to flooding below the Base Flood Elevation.
- b. The foundation and supporting members shall be anchored and aligned in relation to flood flows and adjoining structures so as to minimize exposure to known hydrodynamic forces such as current, waves, ice and floating debris.
- c. All areas below the flood protection elevation shall be constructed of materials resistant to flood damage. The lowest floor (including basement) and all electrical, heating, ventilating, plumbing and air conditioning equipment and utility meters shall be locate at or above the flood protection elevation. Water and sewer pipes, electrical and telephone lines, submersible pumps, and other waterproofed service facilities may be located below the flood protection elevation.
- d. No area below the flood protection elevation shall be used for storage of items or materials.

- e. Manufactured homes and travel trailers to be installed on a site for more than 180 days, shall be elevated to or above the flood protection elevation; and, shall be anchored to resist flotation, collapse, or lateral movement by being tied down in accordance with the Rules and regulations for the Illinois Mobile Home Tie-Down Act issued pursuant to 77 Ill. Adm. Code 870.

1003.3 Only a non-residential building may be structurally floodproofed (in lieu of elevation) provided that a registered professional engineer shall certify that the building has been structurally dry floodproofed below the flood protection elevation, the structure and attendant utility facilities are watertight and capable of resisting the effects of the base flood or 100-year frequency flood. The building design shall take into account flood velocities, duration, rate of rise, hydrostatic and hydrodynamic forces, the effects of buoyancy, and impacts from debris or ice. Floodproofing measures shall be operable without human intervention and without an outside source of electricity (levees, berms, floodwalls and similar works are not considered floodproofing for the purpose of this subsection).

1003.4 Non-conforming structures located in a regulatory floodway may remain in use, but may not be enlarged, replaced or structurally altered. A non-conforming structure damaged by flood, fire, wind or other natural or man-made disaster may be restored unless the damage exceeds fifty percent (50%) of its market value before it was damaged, in which case it shall conform to this Ordinance.

Section 1100.0 Other Development Requirements

The Board of Trustees shall take into account flood hazards, to the extent that they are known in all official actions related to land management, use and development.

1100.1 New subdivisions, manufactured home parks, annexation agreements, and Planned Unit Developments (PUDs) within the SFHA shall be reviewed to assure that the proposed developments are consistent with Sections 700, 800, 900 and 1000 of this Ordinance and the need to minimize flood damage. Plats or plans for new subdivisions, mobile home parks and Planned Unit Developments (PUDs) shall include a signed statement by a Registered Professional Engineer that the plat or plans account for changes in the drainage of surface waters in accordance with the Plat Act (Ill. Rev. Stat., Ch. 109, Sec. 2).

1100.2 Proposals for new subdivisions, manufactured home parks, travel trailer parks, planned unit developments (PUDs) and additions to manufactured

home parks and additions to subdivisions shall include base flood or 100-year frequency flood elevation data and floodway delineations.. Where this information is not available from an existing study filed with the Illinois State Water Survey, the applicant's engineer shall be responsible for calculating the base flood or 100-year frequency flood elevation per Section 604.0 and the floodway delineation per the definition in Section 300.41 and submitting it to the State Water Survey and DWR for review and approval as best available regulatory data.

1100.3 Streets, blocks, lots, parks and other public grounds shall be located and laid out in such a manner as to preserve and utilize natural streams and channels. Wherever possible, the flood plains shall be included within parks or other public grounds.

1100.4 The Board of Trustees shall not approve any Planned Unit Development (PUD) or plat of subdivision located outside the corporate limits unless such agreement or plat is in accordance with the provisions of this Ordinance.

Section 1200.0 Variances

No variances shall be granted to any development located in a regulatory floodway as defined in Section 300.13. However, when a development proposal is located outside of a regulatory floodway, and whenever the standards of this Ordinance place undue hardship on a specific development proposal, the applicant may apply to the Village for a variance. The Village Administrator shall review the applicant's request for a variance and shall submit his recommendation to the Board of Trustees.

1200.1 No variance shall be granted unless the applicant demonstrates that:

- a. The development activity cannot be located outside the SFHA;
- b. An exceptional hardship would result if the variance were not granted;
- c. The relief requested is the minimum necessary;
- d. There will be no additional threat to public health and safety.
- e. There will be no additional public expense for flood protection, rescue or relief operations, policing, or repairs to stream beds and banks, roads, utilities, or other public facilities;

- f. The provisions of Sections 702.0 and 902.0 of this Ordinance shall still be met;
- g. The activity is not in a regulatory floodway;
- h. The applicant's circumstances are unique and do not represent a general problem, and
- i. The granting of the variance will not alter the essential character of the area involved including existing stream uses.

1200.2 The Village Administrator shall notify an applicant in writing that a variance from the requirements of Section 1000.0 that would lessen the degree of protection to a building will:

- a. Result in increased premium rates for flood insurance up to amounts as high as \$25 for \$100 of insurance coverage.
- b. Increase the risks to life and property; and
- c. Require that the applicant proceed with knowledge of these risks and that he will acknowledge in writing that he assumes the risk and liability.

1200.3 Variances requested in connection with restoration of a site or building listed on the National Register of Historical Places or documented as worthy of preservation by the Illinois Historic Preservation Agency may be granted using criteria more permissive than the requirements of Sections 1200.0 and 1200.2.

Section 1300.0 Disclaimer of Liability

The degree of flood protection required by this Ordinance is considered reasonable for regulatory purposes and is based on available information derived from engineering and scientific methods of study. Larger floods may occur or flood heights may be increased by man-made or natural causes. This Ordinance does not imply that development, either inside or outside of the SFHA, will be free from flooding or damage. This Ordinance does not create liability on the part of the Village or any officer or employee thereof for any flood damage that results from reliance on this Ordinance or any administrative decision made lawfully thereunder.

Section 1400.0 Penalty

Failure to comply with the requirements of a permit or conditions of a variance resolution shall be deemed to be a violation of this Ordinance. Upon due investigation, the Village Administrator may determine that a violation of the minimum standards of this Ordinance exist. The Village Administrator shall notify the owner in writing of such violation.

1400.1 If such owner fails after ten days notice to correct the violation:

- a. The Village Administrator may make application to the Circuit Court for an injunction requiring conformance with this Ordinance

or make such other order as the Court deems necessary to secure compliance with the Ordinance.
- b. Any person who violates this Ordinance shall, upon conviction thereof, be fined not less than one hundred dollars (\$100.00) or more than one thousand dollars (\$1000.00) for each offence.
- c. A separate offense shall be deemed committed upon each day during or on which a violation occurs or continues.
- d. The Village Administrator may record a notice of violation on the title to the property.

1400.2 The Village Administrator shall inform the owner that any such violation is considered a willful act to increase flood damages and, therefore, may cause coverage by a Standard Flood Insurance Policy to be suspended.

1400.3 Nothing herein shall prevent the Village Administrator from taking such other lawful action to prevent or remedy any violations. All costs connected therewith shall accrue to the person or persons responsible.

Section 1500.0 Abrogation and Greater Restrictions

This Ordinance is not intended to repeal, abrogate or impair any existing easements, covenants, or deed restrictions. Where this Ordinance and other ordinance, easements, covenants, or deed restrictions conflict or overlap, whichever imposes the more stringent restrictions shall prevail. This Ordinance is intended to repeal the original ordinance or resolution which was adopted to meet the National Flood Insurance Program regulations, but is not intended to repeal the resolution which the Village passed in order to establish initial eligibility for the program. Ordinance 1039 is hereby repealed.

Section 1600.0 Separability

The provisions and sections of this Ordinance shall be deemed separable and the invalidity of any portion of this Ordinance shall not affect the validity of the remainder.

Section 1700.0 Effective Date

This Ordinance shall be in full force and effect from and after its passage, approval, and publication, as required by law.

Section 3-9-2: SOIL EROSION AND SEDIMENT CONTROL ORDINANCE

NOW, THEREFORE, BE IT ORDAINED BY THE PRESIDENT AND BOARD OF TRUSTEES OF THE VILLAGE OF PLAINFIELD, WILL COUNTY, ILLINOIS, AS FOLLOWS:

100.0 Findings and Purpose

101.0 Findings

The Board of Trustees of the Village of Plainfield hereby finds that:

- 101.1 Excessive quantities of soil may erode from areas undergoing development for certain non-agricultural uses including but not limited to the construction of dwelling units, commercial buildings and industrial plants, the building of roads and highways, the modification of stream channels and drainageways, and the creation of recreational facilities;
- 101.2 The washing, blowing, and falling of eroded soil across and upon roadways endangers the health and safety of users thereof, by decreasing vision and reducing traction of road vehicles;
- 101.3 Soil erosion necessitates the costly repairing of gullies, washed-out fills, and embankments;
- 101.4 Sediment from soil erosion tends to clog sewers and ditches and to pollute and silt rivers, streams, lakes, wetlands, and reservoirs;
- 101.5 Sediment limits the use of water and waterways for most beneficial purposes, promotes the growth of undesirable aquatic weeds, destroys fish and other desirable aquatic life, and is costly and difficult to remove; and
- 101.6 Sediment reduces the channel capacity of waterways and the storage capacity of floodplains and natural depressions, resulting in increased chances of flooding at risk to public health and safety.

The Board of Trustees therefore declares that the purpose of this ordinance is to safeguard persons, protect property, prevent damage to the environment, and

promote the public welfare by guiding, regulating and controlling the design, construction, use and maintenance of any development or other activity which disturbs or breaks the topsoil or otherwise results in the movement of earth on land situated in the Village of Plainfield. It is the intention of this ordinance that the delivery of sediment from sites affected by land disturbing activities be limited, as closely as practicable, to that which would have occurred if the land had been left in its natural undisturbed state. The ordinance is applied to all development, as defined in section 3-9-1, in the Village.

200.0 Definitions

For the purposes of this Ordinance certain terms used herein are defined as set forth below:

- 200.1 **BUILDING PERMIT:** A permit issued by the Village of Plainfield for the construction, erection or alteration of a structure or building.
- 200.2 **CERTIFY OR CERTIFICATION:** Formally attesting that the specific inspections and tests where required have been performed, and that such tests comply with the applicable requirements of this Ordinance.
- 200.3 **CLEARING:** Any activity which removes vegetative ground cover.
- 200.4 **CUBIC YARDS:** The amount of material in excavation and/or fill measured by the method of "average end areas".
- 200.5 **EXCAVATION:** Any act by which organic matter, earth, sand, gravel, rock or any other similar material is cut into, dug, quarried, uncovered, removed, displaced, relocated or bulldozed and shall include the conditions resulting therefrom.
- 200.6 **EXISTING GRADE:** The vertical location of the existing ground surface prior to excavation or filling.
- 200.7 **FILL:** Any act by which, earth, sand, gravel, rock or any other material is deposited, placed, replaced, pushed, dumped, pulled, transported or moved by man to a new location and shall include the conditions resulting therefrom.
- 200.8 **FINAL GRADE:** The vertical location of the ground or pavement surface after the grading work is completed in accordance with the site development plan.

- 200.9 GRADING: Excavation or fill or any combination thereof and shall include the conditions resulting from any excavation or fill.
- 200.10 NATURAL DRAINAGE: Channels formed in the existing surface topography of the earth prior to changes made by unnatural causes.
- 200.11 PARCEL: All contiguous land in one ownership.
- 200.12 PERMITTEE: Any person to whom a site development permit is issued.
- 200.13 PERSON: Any individual, firm or corporation, public or private, the State of Illinois and its agencies or political subdivisions, and the United States of America, its agencies and instrumentalities, and any agent, servant, officer or employee of any of the foregoing.
- 200.14 REMOVAL: Cutting vegetation to the ground or stumps, complete extraction, or killing by spraying.
- 200.15 SITE: A lot or parcel of land, or a contiguous combination thereof, where grading work is performed as a single unified operation.
- 200.16 SITE DEVELOPMENT: Altering terrain and/or vegetation and constructing improvements.
- 200.17 SITE DEVELOPMENT PLAN: A permit issued by the Village of Plainfield for the construction or alteration of ground improvements and structures for the control of erosion, runoff and grading.
- 200.18 STREAM: Any river, creek, brook, branch, flowage, ravine, or natural or man-made drainageway which has a definite bed and banks or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.
- 200.19 STRIPPING: Any activity which removes the vegetative surface cover including tree removal, clearing, and storage or removal of top soil.
- 200.20 VACANT: Land on which there are no structures or only structures which are secondary to the use or maintenance of the land itself.
- 200.21 VILLAGE: The Village of Plainfield, Will County, Illinois.
- 200.22 WETLANDS: Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that

under normal circumstances do support, a prevalence of vegetation typically adapted for line if saturated soil conditions.

300.00 General Principles

It is the objective of this ordinance to control soil erosion and sedimentation caused by development activities, including clearing, grading, stripping, excavating, and filling of land, in the Village. Measures taken to control soil erosion and offsite sediment runoff should be adequate to assure that sediment is not transported from the site by a storm event of ten-year frequency or less.

The erosion and sedimentation control practices discussed in the Illinois Urban Manual and the following principles shall apply to all development activities within the Village and to the preparation of the submissions required under Section 400.0 of this ordinance:

- 300.1 Development should be related to the topography and soils of the site so as to create the least potential for erosion. Areas of steep slopes where high cuts and fills may be required should be avoided wherever possible, and natural contours should be followed as closely as possible.
- 300.2 Natural vegetation should be retained and protected wherever possible. Areas immediately adjacent to natural watercourses, lakes, ponds, and wetlands should be left undisturbed wherever possible. Temporary crossings of watercourses, when permitted, must include appropriate stabilization measures.
- 300.3 Special precautions should be taken to prevent damages resultant from any necessary development activity within or adjacent to any stream, lake, pond, or wetland. Preventative measures should reflect the sensitivity of these areas to erosion and sedimentation.
- 300.4 The smallest practical area of land should be exposed for the shortest practical time during development.
- 300.5 Sediment basins or traps, filter barriers, diversions, and any other appropriate sediment or runoff control measures should be installed prior to site clearing and grading and maintained to remove sediment from runoff waters from land undergoing development.
- 300.6 The selection of erosion and sedimentation control measures should be

based on assessment of the probable frequency of climatic and other events likely to contribute to erosion, and on evaluation of the risks, costs, and benefits involved.

- 300.7 In the design of erosion control facilities and practices, aesthetics and the requirements of continuing maintenance should be considered.
- 300.8 Provision should be made to accommodate the increased run-off caused by changed soil and surface conditions during and after development. Drainageways should be designed so that their final gradients and the resultant velocities and rates of discharge will no create additional erosion onsite or downstream.
- 300.9 Permanent vegetation and structures should be installed and functional as soon as practical during development.
- 300.10 Those areas being converted from agricultural purposes to other land uses should be vegetated with an appropriate protective cover prior to development.
- 300.11 All waste generated as a result of site development activity should be property disposed of and should be prevented from being carried off the site by either wind or water.
- 300.12 All construction sites should provide measures to prevent sediment from being tracked onto public or private roadways.

400.0 Site Development Permit

401.0 Permit Required

Except as otherwise provided in this ordinance, no persons shall commence or perform any clearing, grading, stripping, excavating, or filling of land which meets the following provisions without having first obtained a site development permit from the Building Department of the Village of Plainfield.

- 401.1 Any land distributing activity (i.e., clearing, grading, stripping, excavation, fill, or any combination thereof) that will affect an area in excess of 5000 sq. ft.;
- 401.2 Any land disturbing activity that will affect an area in access of 500 sq. ft. if the activity is within 25 feet of a lake, pond, stream, or wetland; or
- 401.3 Excavation, fill, or any combination thereof that will exceed 100 cubic

yards.

402.0 Exceptions

A permit shall not be required for any of the following provided that the person responsible for any such development shall implement necessary soil erosion and sediment control measures to satisfy the principles set forth in Section 300.0 of this Ordinance.

402.1 Excavation below final grade for the basement and footings of a single-family residence and appurtenant structures on a site in excess of two acres for which a building permit has been issued by the Village.

402.2 Agricultural use of land, including the implementation of conservation measures included in a farm conservation plan approved by the Soil and Water Conservation District and including the construction of agricultural structures;

402.3 Installation, renovation, or replacement of a septic system to serve an existing dwelling or structure.

403.0 Application for Permit

Application for a site development permit shall be made by the owner of the property or his authorized agent to the Planning Department on a form furnished for that purpose. Each application shall bear the name(s) and address(es) of the owner or developer of the site and of any consulting firm retained by the applicant together with the name of the applicant's principal contact as such firm. Each application shall include certification that any land clearing, construction, or development involving the movement of earth shall be in accordance with the plans approved upon issuance of the permit.

404.0 Submissions

Each application for a site development permit shall be accompanied by the following information:

404.1 A vicinity map in sufficient detail to enable easy location in the field of the site for which the permit is sought, and including the boundary line and approximate acreage of the site, existing zoning, and a legend and scale.

404.2 A development plan of the site showing:

- a. Existing topography of the site and adjacent land within

approximately 100 feet of the boundaries, drawn at no greater than two-foot contour intervals and clearly portraying the conformation and drainage pattern of the area.

- b. The location of existing buildings, structures, utilities, streams, lakes, floodplains, wetlands and depressions, drainage facilities, vegetative cover, paved areas, and other significant natural or man-made features on the site and adjacent land within 100 feet of the boundary.
 - c. A general description of the predominant soil types on the site, their location, and their limitations for the proposed use.
 - d. Proposed use of the site, including present development and plan utilization; areas of clearing, stripping, grading, excavation, and filling; proposed contours, finished grades, and street profiles; provisions for storm drainage, including storm sewers, swales, detention basins and any other measures to control the rate of runoff, within a drainage area map, indications of flow directions, and computations; kinds and locations of utilities; and areas and acreage proposed to be paved, covered, sodded or seeded, vegetatively stabilized, or left undisturbed.
- 404.3 An erosion and sediment control plan showing all measures necessary to meet the objectives of this ordinance throughout all phases of construction and permanently after completion of development of the site, including:
- a. Location and description, including standard details, of all sediment control measures and design specifics of sediment basins and traps, including outlet details.
 - b. Location and description of all soil stabilization and erosion control measures, including seeding mixtures and rates, types of sod, method of seedbed preparation, expected seeding dates, type and rate of lime and fertilizer application, kind and quantity of mulching for both temporary and permanent vegetative control measures, and types of non-vegetative stabilization measures.
 - c. Location and description of all runoff control measures, including diversions, waterways, and outlets.
 - d. Location and description of methods to prevent tracking of sediment offsite, including construction entrance details, as appropriate.

- e. Description of dust and traffic control measures.
- f. Locations of stockpiles and description of stabilization methods.
- g. Description of off-site fill or borrow volumes, locations, and methods of stabilization.
- h. Provisions for maintenance of control measures, including type and frequency of maintenance, easements, and estimates of the cost of maintenance.
- i. Identification (name, address, and telephone) of the person(s) or entity which will have legal responsibility for maintenance of erosion control structures and measures during development and after development is completed.

404.4 The proposed phasing of development of the site, including stripping and clearing, rough grading and construction, and final grading and landscaping. Phasing should identify the expected date on which clearing will begin, the estimated duration of exposure of cleared areas, and the sequence of installation of temporary sediment control measures (including perimeter controls), clearing and grading, installation of temporary soil stabilization measures, installation of storm drainage, paving streets and parking areas, final grading and the establishment of permanent vegetative cover, and the removal of temporary measures, it shall be the responsibility of the applicant to notify the Planning Department of any signification changes which occur in the site development schedule after the initial erosion and sediment control plan has been approved.

These submissions shall be prepared in accordance with the requirements of this ordinance and the standards and requirements contained in the "Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control" prepared by the Northeastern Illinois Soil Erosion and Sedimentation Control Steering Committee and adopted by the Will County Soil and Water Conservation District, which standards and requirements are hereby incorporated into this ordinance by reference.

The Village may waive specific requirements for the content of submissions upon finding that the information submitted to show that the work will comply with the objectives and principles of this ordinance.

405.0 Bonds

The applicant is required to file with the Village a faithful performance bond or bonds, letter of credit, or other improvement security satisfactory to the Village Attorney in an amount deemed sufficient by the Village Engineer and Village Attorney to cover all costs of improvements, landscaping, maintenance of improvements and landscaping, and soil erosion and sediment control measures for such period as specified by the Village, and engineering and inspection costs to cover the cost of failure or repair of improvements installed on the site.

406.0 Review and Approval

Each application for a site development permit shall be reviewed and acted upon according to the following procedures:

406.1 The Planning Department will review each application for a site development permit to determine its conformance with the provisions of this ordinance. The Planning Department may also refer any application to the Will County Soil and Water Conservation District and/or any other local government or public agency within whose jurisdiction the site is located for review and comment. Within thirty (30) days after receiving an application, the Planning Department shall in writing:

- a. Approve the permit application if it is found to be in conformance with the provisions of this ordinance, and issue the permit.
- b. Approve the permit application subject to such reasonable conditions as may be necessary to secure substantially the objectives of this ordinance, and issue the permit subject to these conditions; or
- c. Disapprove the permit application, indicating the deficiencies and the procedure for submitting a revised application and/or submission.

406.2 No site development permit shall be issued for an intended development site unless:

- a. the development, including but not limited to subdivisions and planned unit development, has been approved by the Village where applicable, or
- b. such permit is accompanied by or combined with a valid building permit issued by the Village, or
- c. the proposed earth moving is coordinated with any overall

development program previously approved by the Village for the area in which the site is situated; and

- d. all relevant federal and state permits (i.e., for floodplains and wetlands) have been received for the portion of the site subject to soil disturbance.

406.3 Failure of the Village to act on an original or revised application within thirty (30) days of receipt shall authorize the applicant to proceed in accordance with the plans as filed unless such time is extended by agreement between the Village and the applicant. Pending preparation and approval of a revised plan, development activities shall be allowed to proceed in accordance with conditions established by the Village.

407.0 Expiration of Permit

Every site development permit shall expire and become null and void if the work authorized by such permit has not been commenced within one hundred and eighty (180) days, or is not completed by a date which shall be specified in the permit; except that the Planning Department may, if the permittee presents satisfactory evidence that unusual difficulties have prevented work being commenced or completed within the specified time limits, grant a reasonable extension of time if written application is made before the expiration date of the permit. The Planning Department may require modification of the erosion control plan to prevent any increase in erosion control plan to prevent any increase in erosion or offsite sediment runoff resulting from any extension.

408.0 Appeals

The applicant, or any person or agency which received notice of the filing of the application may appeal the decision of the Planning Department as provided in Section 406.0, to the Board of Appeals. Upon receipt of an appeal, the Board of Appeals shall schedule and hold a public hearing, after giving 15 days notice thereof. The board shall render a decision within thirty (30) days after the hearing.

Factors to be considered on review shall include, but need not be limited to, the effects of the proposed development activities on the surface water flow to tributary and downstream lands, any comprehensive watershed management plans, or the use of any retention facilities; possible saturation of fill and unsupported cuts by water, both natural and domestic; runoff surface waters that produce erosion and silting of drainageways; nature and type of soil or rock which when disturbed by the proposed development activities may create earth movement and produce slopes that cannot be landscaped and excessive and unnecessary scarring of the natural landscape through grading or removal of vegetation.

409.0 Retention of Plans

Plans, specifications, and reports for all site developments shall be retained in original form or on microfilm by the Village.

500.0 Design and Operation Standards and Requirements

501.0 Applicability

All clearing, grading, stripping, excavating, and filling which is subject to the permit requirements of this ordinance shall be subject to the applicable standards and requirements set forth in this Section 500.0.

502.0 Responsibility

The permittee shall not be relieved of responsibility for damage to persons or property otherwise imposed by law, and the Village or its officers or agents will not be made liable for such damage, by:

1. the issuance of a permit under this ordinance,
2. compliance with the provisions of that permit or with conditions attached to it by the Planning Department,
3. failure of Village Officials to observe or recognize hazardous or unsightly conditions,
4. failure of Village officials to recommend denial of or to deny a permit, or
5. exemptions from the permit requirements of this ordinance.

503.0 Site Design Requirements

503.1 On-site sediment control measures, as specified by the following criteria, shall be constructed and functional prior to initiating clearing, grading, stripping, excavating or fill activities on the site.

- a. For disturbed areas draining less than 1 acre, filter barriers (including filter fences, straw bales, or equivalent control measures) shall be constructed to control all offsite runoff as specified in reference handbooks. Vegetated filter strips, with a minimum width of 25 feet, may be used as an alternative only where runoff in sheet flow is expected.

- b. For disturbed areas draining more than one but less than five acres, a sediment trap or equivalent control measure shall be constructed at the downslope point of the disturbed area.
- c. For disturbed areas draining more than five acres, a sediment basin or equivalent control measure shall be constructed at the downslope point of the disturbed area.
- d. Sediment basins and sediment traps designs shall provide for both detention storage and sediment storage. The detention storage shall be composed of equal volumes of "wet" detention storage and "dry" detention storage and each shall be sized for the 2-year, 24-hour runoff from the site under maximum runoff conditions during construction. The release rate of the basin shall be that rate required to achieve minimum detention times of at least 10 hours. The elevation of the outlet structure shall be placed such that it only drains the dry detention storage.
- e. The sediment storage shall be sized to store the estimated sediment load generated from the site over the duration of the construction period with a minimum storage equivalent to the volume of sediment generated in one year. For construction periods exceeding one year, the one-year sediment load and a sediment removal schedule may be substituted.

503.2 Stormwater conveyance channels, including ditches, swales, and diversions, and the outlets of all channels and pipes shall be designed and constructed to withstand the expected flow velocity from the 10-year frequency storm without erosion. All constructed or modified channels shall be stabilized within 48 hours, consistent with the following standards:

- a. For grades up to 4 percent, seeding in combination with mulch, erosion blanket, or an equivalent control measure shall be applied. Sod or erosion blanket or mat shall be applied to the bottom of the channel.
- b. For grades of 4 to 8 percent, sod or an equivalent control measure shall be applied in the channel.
- c. For grades greater than 8 percent, rock, riprap, or an equivalent control measure shall be applied, or the grade shall be effectively reduced using drop structures.

- 503.3 Disturbed areas shall be stabilized with temporary or permanent measures within 7 calendar days following the end of active disturbance, or re-disturbance, consistent with the following criteria:
- a. Appropriate temporary or permanent stabilization measures shall include seeding, mulching, sodding, and/or non-vegetative measures.
 - b. Areas having slopes greater than 12 percent shall be stabilized with sod, mat or blanket in combination with seeding, or equivalent.
- 503.4 Land disturbance activities in stream channels shall be avoided, where possible. If disturbance activities are unavoidable, the following requirements shall be met:
- a. Construction vehicles shall be kept out of the stream channel to the maximum extent practicable. Where construction crossings are necessary, temporary crossings shall be constructed on non-erosive material, such as riprap or gravel.
 - b. The time and area of disturbance of stream channels shall be kept to a minimum. The stream channel, including bed and banks, shall be restabilized within 48 hours after channel disturbance is completed, interrupted, or stopped.
 - c. Whenever channel relocation is necessary, the new channel shall be constructed in the dry and fully stabilized before flow is diverted.
- 503.5 Storm sewer inlets and culverts shall be protected by sediment traps or filter barriers meeting accepted design standards and specifications.
- 503.6 Soil storage piles containing more than 10 cubic yards of material shall not be located with a downslope drainage length of less than 25 feet to a roadway or drainage channel. Filter barriers, including straw bales, filter fence, or equivalent, shall be installed immediately on the downslope side of the piles.
- 503.7 If dewatering devices are used, discharge locations shall be protected from erosion. All pumped discharges shall be routed through appropriately designed sediment traps or basins or equivalent.
- 503.8 Each site shall have graveled (or equivalent) entrance roads, access drives,

and parking areas of sufficient length and width to prevent sediment from being tracked onto public or private roadways. Any sediment reaching a public or private road shall be removed by shoveling or street cleaning (not flushing) before the end of each workday and transported to a controlled sediment disposal area.

503.9 All temporary and permanent erosion and sediment control practices must be maintained and repaired as needed to assure effective performance of their intended function.

503.10 All temporary erosion and sediment control measures shall be disposed of within thirty (30) days after final site stabilization is achieved with permanent soil stabilization measures. Trapped sediment and other disturbed soils resulting from the disposition of temporary measures should be permanently stabilized to prevent further erosion and sedimentation.

504.0 Handbooks Adopted by Reference

The standards and specifications contained in the "Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control" cited in Section 400.0 are hereby incorporated into this Section 500.0 and made a part hereof by reference for the purpose of delineating procedures and methods of operation under site development and erosion and sedimentation control plans approved under Section 400.0. In the event of conflict between provisions of said manuals and of this ordinance, the ordinance shall govern.

505.0 Maintenance and Control Measures

All soil erosion and sediment control measures necessary to meet the requirements of this ordinance shall be maintained periodically by the applicant or subsequent land owner during the period of land disturbance and development of the site in a satisfactory manner to ensure adequate performance.

506.0 Inspection

The Building Official or his representative shall make inspections as hereinafter required and shall either approve that portion of the work completed or shall notify the permittee wherein the work fails to comply with the site development or erosion and sedimentation control plan as approved. Plans for grading, stripping, excavating, and filling work bearing the stamp of approval of the (permitting authority) shall be maintained at the site during progress of the work. In order to obtain inspections and to ensure compliance with the approved erosion and sediment control plan, the grading or building permit, and this Ordinance, the

permittee shall notify the Building Official within two (2) working days of the completion of the construction stages specified below:

1. Upon completion of installation of sediment and runoff control measures (including perimeter controls and diversions), prior to proceeding with any other earth disturbance or grading,
2. After stripping and clearing,
3. After rough grading,
4. After final grading,
5. After seeding and landscaping deadlines, and
6. After final stabilization and landscaping, prior to removal of sediment controls.

If stripping, clearing, grading and/or landscaping are to be done in phases or areas, the permittee shall give notice and request inspection at the completion of each of the above work stages in each phase or area. If an inspection is not made and notification of the results given within five working days after notice is received by the Village from the permittee, the permittee may continue work at his/her own risk, without presuming acceptance by the Village. Notification of the results of the inspection shall be given in writing at the site.

507.0 Special Precautions

507.1 If at any stage of the grading of any development site, the Building Official determines by inspection that the nature of the site is such that further work authorized by an existing permit is likely to imperil any property, public way, stream, lake, wetland, or drainage structure, the Building Official may require, as a condition of allowing the work to be done, that such reasonable special precautions to be taken as considered advisable to avoid the likelihood of such peril. "Special precautions" may include, but shall not be limited to, a more level exposed slope, construction of additional drainage facilities, berm, more level exposed slope, construction of additional drainage facilities, berm, terracing, compaction, or cribbing, installation of plant materials for erosion control, and recommendations of a registered soils engineer and/or engineering geologist which may be made requirements for further work.

507.2 Where it appears that storm damage may result because the grading on any development site is not complete, work may be stopped and the permittee

required to install temporary structures or take such other measures as may be required to protect adjoining property or the public safety. On large developments or where unusual site conditions prevail, the Village may specify the time of starting grading and time of completion or may require that the operations be conducted in specific stages so as to insure completion of protective measures or devices prior to the advent of seasonal rains.

508.0 Amendment of Plans

Major amendments of the site development or erosion and sedimentation control plans shall be submitted to the Planning Department and shall be processed and approved or disapproved in the same manner as the original plans. Field modifications of a minor nature may be authorized by the Building Official by written authorization to the permittee.

600.0 Enforcement

601.0 Exceptions

The Board of Appeals may, in accordance with the following procedures, authorize exceptions to any of the requirements and regulations set forth in this ordinance.

601.1 Application for any exception shall be made by a verified petition of the applicant for a site development permit, stating fully the grounds of the petition and the facts relied upon by the applicant. Such petition shall be filed with the site development application. In order for the petition to be granted, it shall be necessary that the Board of Appeals find all of the following facts with respect to the land referred to in the petition:

- a. That the land is of such shape or size or is affected by such physical conditions or is subject to such title limitations of record, that it is impossible or impractical for the applicant to comply with all of the requirements of this ordinance;
- b. That the exception is necessary for the preservation and enjoyment of a substantial property right of the applicant; and
- c. That the granting of the exception will not be detrimental to the public welfare or injurious to other property in the vicinity of the subject property.

601.2 Each application for an exception shall be referred to the Planning

Department for review. The Village Planner shall transmit his/her recommendations to the Board of Appeals, which shall review such recommendations prior to granting or denying such recommendations prior to granting or denying the exception.

601.3 The Board of Appeals shall hold a public hearing on each application for exception, within thirty (30) days after receiving application, in the manner provided with respect to appeals. After public hearing, the Board may approve the site development permit application with the exceptions and conditions it deems necessary or it may disapprove such site development permit application and exception application or it may take such other action as appropriate.

602.0 Stop-Work Order; Revocation of Permit

In the event any person holding a site development permit pursuant to this ordinance violates the terms of the permit, or carries on site development in such a manner as to materially adversely affect the health, welfare, or safety of persons residing or working in the neighborhood of the development site or so as to be materially detrimental to the public welfare or injurious to property or improvements in the neighborhood, the Village may suspend or revoke the site development permit.

602.1 Suspension of a permit shall be by a written stop-work order issued by the Building Official and delivered to the permittee or his agent or the person performing the work. The stop-work order shall be effective immediately, shall state the specific violations cited, and shall state the conditions under which work may be resumed. A stop-work order shall remain in effect until the next regularly scheduled meeting of the Board of Appeals at which the conditions of sub-paragraph 602.2 below can be met, unless the permittee immediately takes all action necessary to come into compliance with the ordinance.

602.2 No site development permit shall be permanently suspended or revoked until a hearing is held by the Board of Appeals. Written notice of such hearing shall be served on the permittee, either personally or by registered mail, and shall state:

1. the grounds for complaint or reasons for suspension or revocation, in clear and concise language; and
2. the time when and place where such hearing will be held.

Such notice shall be served on the permittee at least five (5) days prior to

the date set for hearing. At such hearing, the permittee shall be given an opportunity to be heard and may call witnesses and present evidence on his behalf. At the conclusion of the hearing the Board of Appeals shall determine whether the permit shall be suspended or revoked.

603.0 Violations and Penalties

No person shall construct, enlarge, alter, repair, or maintain any grading, excavation or fill, or cause the same to be done, contrary to or in violation of any terms of this ordinance. Any person violating any of the provisions of this ordinance shall be deemed guilty of an ordinance violation, and each day during which any violation of any of the provisions of this ordinance is committed, continued, or permitted shall constitute a separate offense. Upon conviction of any such violation, such person, partnership, or corporation shall be punished by a fine of not more than \$1000.00 for each offense. In addition to any other penalty authorized by this section, any person, partnership, or corporation convicted of violating any of the provisions of this ordinance shall be required to restore the site to the condition existing prior to commission of the violation, or to bear the expense of such restoration.

604.0 Separability

The provisions and sections of this ordinance shall be deemed to be separable, and the invalidity of any portion of this ordinance shall not affect the validity of the remainder.

605.0 Effective Date

This ordinance shall be in full force and effect from and after its passage and approval and publication, as required by law.

This ordinance shall be numbered as Ordinance No. 1748.

PASSED this 18th day of August, 1997.

Section 3-9-3:

STREAM AND WETLAND PROTECTION

SECTION:

- 4-10- 1: Authority
- 4-10- 2: Short Title
- 4-10- 3: Purpose and Intent
- 4-10- 4: Definitions
- 4-10- 5: Special Use Permit
- 4-10- 5-1: Application for Permit; Fee
- 4-10- 5-2: Submissions
- 4-10- 5-3: Bonds
- 4-10- 5-4: Review and Approval
- 4-10- 5-5: Permit Exceptions
- 4-10- 5-6: Effect on Other Permits
- 4-10- 6: General Provisions; Area Affected
- 4-10- 6-1: Lowland Conservancy Overlay District
- 4-10- 6-2: District Boundary
- 4-10- 6-3: Minimum Setback of Development Activity From Streams
- 4-10- 6-4: Site Development Plan
- 4-10- 6-5: Geologic And Soil Characteristics; Report
- 4-10- 6-6: Hydrologic Controls/Drainage Control Plan
- 4-10- 6-7: Site Grading and Excavation Plan
- 4-10- 6-8: Natural Vegetation Buffer Strip Required
- 4-10- 7: Watercourse Relocation and Minor Modifications
- 4-10- 7-1: Permitting Stream Modification
- 4-10- 7-2: Content of Stream Modification/Relocation Plan
- 4-10- 7-3: Armoring of Channels and Banks
- 4-10- 7-4: Use of Culverts
- 4-10- 7-5: On-Stream Impoundments
- 4-10- 8: Impact Assessment
- 4-10- 9: Stream Maintenance Easement
- 4-10- 10: Bonds
- 4-10- 11: Liability
- 4-10- 12: Separability
- 4-10- 13: Retroactivity
- 4-10- 14: Enforcement
- 4-10- 15: Stop-Work Order; Revocation of Permit
- 4-10- 16: Violations and Penalties

NOW, THEREFORE, BE IT ORDAINED BY THE PRESIDENT AND BOARD OF TRUSTEES OF THE VILLAGE OF PLAINFIELD, WILL COUNTY, ILLINOIS, AS FOLLOWS:

4-10-1:AUTHORITY: The Lowland Conservancy Overlay District is adopted by the Board of Trustees, pursuant to 65 Illinois Compiled Statutes 5/11-13-1.

4-10-2:SHORT TITLE: This Chapter shall be known and may be cited as the PLAINFIELD LOWLAND CONSERVANCY OVERLAY DISTRICT ORDINANCE.

4-10-3:PURPOSE AND INTENT: It is the purpose and intent of this Chapter to promote the health, safety and general welfare of the present and future residents of Plainfield and downstream drainage areas by providing for the protection, preservation, proper maintenance, and use of Plainfield watercourses, lakes, ponds, floodplain and wetland areas. This Chapter applies to all development within the Village. This Chapter is more specifically adopted:

- (A) To prevent flood damage by preserving storm and flood water storage capacity;
- (B) To maintain the normal hydrologic balance of streams, floodplains, ponds, lakes, wetlands, and groundwater by storing and providing for infiltration of wet-period runoff in floodplains and wetlands, and releasing it slowly to the stream to maintain in-stream flow;
- (C) To manage stormwater runoff and maintain natural runoff conveyance systems, and minimize the need for major storm sewer construction and drainageway modification;
- (D) To improve water quality, both by filtering and storing sediments and attached pollutants, nutrients, and organic compounds before they drain into streams or wetlands, and by maintaining the natural pollutant-assimilating capabilities of streams, floodplains and wetlands;
- (E) To protect shorelines and stream banks from soil erosion, using natural means and materials wherever possible;
- (F) To protect fish spawning, breeding, nursery and feeding grounds;
- (G) To protect wildlife habitat;
- (H) To preserve areas of special recreational, scenic, or scientific interest, including

natural areas and habitats of endangered species;

- (I) To maintain and enhance the aesthetic qualities of developing areas; and
- (J) To encourage the continued economic growth and high quality of life of the

Village which depends in part on an adequate quality of water, a pleasing natural environment, and recreational opportunities in proximity to the Village.

In order to achieve the purpose and intent of this Chapter, Village hereby designates the Lowland Conservancy Overlay District which shall be considered as an overlay to the zoning districts created by the Village zoning ordinances as amended. Any proposed development activity with the District must obtain a special use permit as approved by the governing body of the Village.

4-10-4:DEFINITIONS:

ARMORING: A form of channel modification which involves the placement of materials (concrete, riprap, bulkheads, etc.) within a stream channel or along a shoreline to protect property above streams, lakes, and ponds from erosion and wave damage caused by wave action and stream flow.

BULKHEAD: A retaining wall that protects property along water.

CHANNEL: A natural or artificial watercourse of perceptible extent that periodically or continuously contains moving water, or which forms a connecting link between two (2) bodies of water. It has a definite bed and banks that serve to contain the water.

CHANNEL MODIFICATION OR CHANNELIZATION: To alter a watercourse by changing the physical dimension or materials of the channel. Channel modification includes damming, riprapping (or other armoring), widening, deepening, straightening, relocating, lining and significant removal of bottom or woody vegetation. Channel modification does not include the clearing of debris or trash from the watercourse. Channelization is a severe form of channel modification involving a significant change in the channel cross-section and typically involving relocation of the existing channel (e.g., straightening).

CONTROL STRUCTURES: A structure designed to control the rate of stormwater runoff that passes through the structure, given a specific upstream and downstream water surface elevation.

CULVERT: A structure designed to carry drainage water or small streams

below barriers such as roads, driveways, or railway embankments.

DEPRESSION 1 AREA: Any area which is lower in elevation on all sides than surrounding properties (i.e., does not drain freely), or whose drainage is severely limited such as by a restrictive culvert. A depressional area will fill with water on occasion when run off into it exceeds rate of infiltration into underlying soil or exceeds the discharge through its controlled outlet. Large depressional areas may provide significant stormwater or floodplain storage.

DEVELOPMENT: The carrying out of any building, agricultural, or mining operation, or the making of any change in the use or appearance of land, and the dividing of land into two (2) or more parcels. The following

activities or uses shall be taken, for the purposes of this Chapter, to involve development as defined herein:

- (A) Any construction, reconstruction, or alteration of a structure to occupy more or less ground area, or the on-site preparation for same;
- (B) Any change in the intensity of use of land, such as an increase in the number of dwelling units on land; or a material increase in the site coverage of businesses, manufacturing establishments, offices, and dwelling units, including mobile homes, campers, and recreational vehicles, on land;
- (C) Any agricultural use of land including, but not limited to, the use of land in horticulture, floriculture, forestry, dairy, livestock, poultry, beekeeping, pisciculture, and all forms of farm products and farm production;
- (D) The commencement of drilling, except to obtain soil samples, or the commencement of mining, filling, excavation, dredging, grading or other alterations of the topography;
- (E) Demolition of a structure or redevelopment of a site;
- (F) Clearing of land as an adjunct of construction for agricultural, private residential, commercial or industrial use;

- (G) Deposit of refuse, solid or liquid waste, or fill on a parcel of land, or the storage of materials;
- (H) Construction, excavation, or fill operations relating to the creation or modification of any road, street, parking facility or any drainage canal, or to the installation of utilities or any other grading activity that alters the existing topography;
- (I) Construction or erection of dams, levees, walls, fences, bridges or culverts; and
- (J) Any other activity that might change the direction, height, or velocity of flood or surface waters.

DISTRICT: The Lowland Conservancy Overlay District as defined in Section 4-10-6-2 of this Chapter.

EROSION: The general process whereby soils are moved by flowing water or wave action.

FILTERED VIEW: The maintenance or establishment of woody vegetation of sufficient density to screen developments from a stream or wetland, to provide for streamback stabilization and erosion control, to serve as an aid to infiltration of surface runoff, and to provide cover to shade the water. The vegetation need not be so dense as to completely block the view. Filtered view means no clear cutting.

FLOODPLAIN: That land adjacent to a body of water with ground surface elevations at or below the 100-year frequency flood elevation.

FLOODWAY: That portion of the floodplain (sometimes referred to as the base floodplain or special flood hazard area) required to store and convey the base flood. The floodway is the 100-year floodway as designated and regulated by the Illinois Department of Transportation/Division of Water Resources. The remainder of the floodplain which is outside the regulatory floodway is referred to as the flood fringe or floodway fringe.

HYDRAULIC CHARACTERISTICS: The features of a watercourse which determine its water conveyance capacity. These features include but are not limited to: size and configuration of the cross-section of the watercourse and floodway; texture and roughness of materials along the watercourse; alignment of watercourse; gradient of watercourse; amount and type of vegetation within the watercourse; and size, configuration, and

other characteristics of structures within the watercourse. In low-lying areas the characteristics of the overbank area also determine water conveyance capacity.

LAKE OR POND: Any inland waterbody, fed by spring or surface water flow.

LOT: An area of land, with defined boundaries, that is designated in official assessor's records as being one parcel.

NATURAL: In reference to watercourses, means those stream channels, grassed waterways and swales formed by the existing surface topography of the earth prior to changes made by unnatural causes. A natural stream tends to follow a meandering path; its floodplain is not constrained by levees; the area near the bank has not been cleared, mowed or cultivated; the stream flows over soil and geologic materials typical of the area with no alteration of the course or cross-section of the stream caused by filling or excavating.

ORDINARY HIGH WATER MARK (OHWM): The point on the bank or shore up to which the presence and action of surface water is so continuous so as to leave a distinctive mark such as by erosion, destruction or prevention of terrestrial vegetation, predominance of aquatic vegetation, or other easily recognized characteristics.

QUALIFIED PROFESSIONAL: A person trained in one or more of the disciplines of biology, geology, soil science, engineering, or hydrology whose training and experience ensure a competent analysis and assessment of stream, lake, pond and wetland conditions and impacts.

REGISTERED PROFESSIONAL ENGINEER: A professional engineer registered under the provisions of "The Illinois Professional Engineering Act" and any act amendatory thereof.

RETENTION/DETENTION FACILITY: A facility that provides for storage of storm water runoff and controlled release of this runoff during and after a flood or storm.

RUNOFF: The portion of precipitation on the land that is not absorbed by the soil or plant material and which runs off the land.

SEDIMENTATION: The processes that deposit soils, debris, and other materials either on other ground surfaces or in water bodies or watercourses.

SETBACK: The horizontal distance between any portion of a structure or any

development activity and the ordinary high water mark of a perennial or intermittent stream, the ordinary high water mark of a lake or pond, or the edge of a wetland, measured from the structure's or development's closest point to the ordinary high water mark, or edge.

STREAM: A body of running water flowing continuously or intermittently in a channel on or below the surface of the ground; 7.5 minute topographic maps of the U.S. Geological Survey are one reference for identifying perennial and intermittent streams. For purposes of this Chapter, the term "stream" does not include storm sewers.

STRUCTURE: Anything that is constructed, erected or moved to or from any premises which is located above, on, or below the ground including, but not limited to roads, signs, billboards, and mobile homes. Temporary recreational facilities including, but not limited to, tents, camper trailers, and recreation vehicles are not considered structures when used less than one hundred eighty (180) days per year and located landward of the minimum setback provided as a natural vegetation strip.

VEGETATION: All plant growth, especially trees, shrubs, mosses, and grasses.

WATERCOURSE: Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, slough, gulch, draw, ditch, channel, conduit, culvert, swale, grass waterway, gully, ravine, wash, or natural or man-made drainageway, which has a definite channel, bed and banks, in or into which stormwater runoff and floodwater flow either regularly or intermittently.

WETLAND: Those transitional lands between terrestrial and aquatic system where the water table is usually at or near the surface or the land is covered by shallow water. Classification or areas as wetlands shall follow the "Classification of Wetlands and Deepwater Habitats of the United States" as published by the U.S. Fish and Wildlife Service (FWS/OBS-79/31).

4-10-5:SPECIAL USE PERMIT: To ensure that proposed development activity can be carried out in a manner which is compatible and harmonious with the natural amenities of the Lowland Conservancy Overlay District and with surrounding land uses, a request for a special use permit for such development activity must be submitted for approval by the governing body of the Village.

No special use permit shall be issued unless the Village finds that:

- (A) The development will not detrimentally affect or destroy natural features such as ponds, streams, wetlands, and forested areas, nor impair their natural functions, but will preserve and incorporate such features into the development's site;
- (B) The location of natural features and the site's topography have been considered in the designing and siting of all physical improvements;
- (C) Adequate assurances have been received that the clearing of the site of topsoil, trees, and other natural features will not occur before the commencement of building operations; only those areas approved for the placement of physical improvements may be cleared;
- (D) The development will not reduce the natural retention storage capacity of any watercourse, nor increase the magnitude and volume of flooding at other locations; and that in addition, the development will not increase stream velocities; and
- (E) The soil and subsoil conditions are suitable for excavation and site preparation, and the drainage is designed to prevent erosion and environmentally deleterious surface runoff.

There shall be no development, including the immediate or future clearing or removal of natural ground cover and/or trees, within the Lowland Conservancy Overlay District for any purpose, unless a special use permit is granted subject to the provisions of this Chapter or the provisions of the Village Zoning Ordinance.

Dumping, filling, mining, excavating, dredging, or transferring of any earth material within the district is prohibited unless a special use permit is granted.

No ponds or impoundments shall be created nor other alterations or improvements shall be allowed in the district for recreational uses, storm water management, flood control, agricultural uses or as scenic features unless a special use permit is granted.

4-10-5-1: APPLICATION FOR PERMIT; FEE: Application for a special use permit shall be made by the owner of the property, or his/her authorized agent, to the Village on a form furnished for that purpose. Each application shall bear the name(s) and address(es) of the owner or developer of the site and of any consulting firm retained by the applicant

together with the name of the applicant's principal contact at such firm, and shall be accompanied by a filing fee of one hundred dollars (\$100.00). Each application shall include certification that any land clearing, construction, or development involving the movement of earth shall be in accordance with the plans approved upon issuance of the permit.

4-10-5-2: SUBMISSIONS: Each application for a special use permit shall be accompanied by the following information as specified in the sections cited:

General Provisions:

	Section
Site Development Plan	4-10-6-4
Geologic and Soil Report	4-10-6-5
Drainage Control Plan	4-10-6-6
Site Grading and Excavation Plan	4-10-6-7
Landscape Plan	4-10-6-8

Justification for Watercourse
Relocation and Minor Modifications:

Stream Modification/Relocation Plan	4-10-7-2
Channel and Bank Armoring	4-10-7-3
Culverts	4-10-7-4
On-Stream Impoundments	4-10-7-5
Impact Assessment (at option of the Village)	4-10-8

Where a proposed development activity is less than two and one-half (2 1/2) acres in area the Village, upon approval of the Village Engineer, may waive or simplify any or all of the submission requirements provided, that the person responsible for any such development shall implement necessary protection measures to satisfy the purpose and intent set forth in Section 4-10-3 of this Chapter.

4-10-5-3: BONDS: The applicant may be required to file with the Village a faithful performance bond or bonds, letter of credit, or other improvement security satisfactory to the Village Attorney, in an amount deemed sufficient by the Village to cover all costs of improvements, landscaping, or maintenance of improvements and landscaping, for such period as specified by the Village, and engineering and inspection costs to cover the cost of failure or repair of improvements installed on the site.

4-10-5-4: REVIEW AND APPROVAL: Each application for a special use permit shall be reviewed and acted upon according to the following procedures:

(A) The Village Board will review each application for a special use permit to determine its conformance with the provisions of this Chapter. The Board may also refer any application to the Will County Soil and Water Conservation District and/or any other local government or public agency within whose jurisdiction the site is located for review and comments. Within thirty (30) days after receiving an application, the Village Board shall in writing:

- 1) approve the permit application, if it is found to be in conformance with the provisions of this Chapter and issue the permit;
- 2) approve the permit application subject to such reasonable conditions as may be necessary to secure substantially the objectives of this Chapter, and issue the permit subject to these conditions; or
- 3) disapprove the permit application, indicating the deficiencies and the procedure for submitting a revised application and/or submission.

(B) No special use permit shall be issued for an intended development site unless:

1. The development, including but not limited to subdivisions and planned unit developments, has been approved by the Village where applicable; or
2. Such permit is accompanied by or combined with a valid building permit issued by the Village; or
3. The proposed development is coordinated with any overall development program previously approved by the Village for the area in which the site is situated.

(C) Failure of the Village to act on an original or revised application within thirty (30) days of receipt shall authorize the applicant to proceed in accordance with the plans as filed, unless such time is extended by agreement between the Village and the applicant. Pending preparation and approval of a revised plan, development activities shall be allowed to proceed in accordance with conditions established by the Village.

4-10-5-5: PERMIT EXCEPTIONS: The provisions of this Chapter shall not apply to:

- (A) Emergency work necessary to preserve life or property; when emergency work is performed under this Section, the person performing it shall report the pertinent facts relating to the work to the Village within ten (10) days after commencement of the work and shall thereafter obtain a special use permit and shall perform such work as may be determined by the agency to be reasonably necessary to correct any impairment to the watercourse, lake, pond, floodplain or wetland (in terms of the purposes of this Chapter, subsection 4-10-3(A) through (J));
- (B) Work consisting of the operation, repair, or maintenance of any lawful use of land existing on the date of adoption of the Ordinance codified in this Chapter;
- (C) Land adjacent to farm ditches if:
 - 1. Such lands are not adjacent to a natural stream or river; or
 - 2. Those parts of such drainage ditches adjacent to such lands were not streams before ditching; or
 - 3. Such lands are maintained in agricultural uses without buildings and structures.

Where farm ditches are found to contribute to adverse environmental impacts or hazards to persons or property, the Village may include designated farm ditches in the District. The Village may also require that linings, bulkheads, dikes and culverts to be removed to mitigate hazards, or that other mitigative measures be taken, such as the maintenance of a natural vegetation buffer strip.

4-10-5-6: EFFECT ON OTHER PERMITS: The granting of a special use permit under the provisions herein shall in no way affect the owner's responsibility to obtain the approval required by any other statute, ordinance, or regulation of any State agency or subdivision thereof, or to meet other Village ordinances and regulations. Where State and/or Federal permits are required, a special use permit will not be issued until they are obtained.

4-10-6: GENERAL PROVISIONS; AREA AFFECTED: This Chapter applies to development in or near streams, lakes, ponds and wetlands within the Village. Streams, lakes, and ponds (including intermittent streams) are

those which are shown on the United States Department of the Interior Geological Survey (USGS) 7.5 minute quadrangle maps and those additional streams, lakes, and ponds delineated on maps adopted as part of this Chapter. Those maps are hereby made a part of this Chapter, and two (2) copies thereof shall remain on file in the office of the Village Clerk for public inspection. Within the jurisdiction of the Village, those waterbodies and watercourses that are named and are subject to the provisions of this Chapter are: (list of waterbodies and watercourses). Wetlands are those designated in the U.S. Fish and Wildlife Service/Illinois Department of Conservation wetland inventory and those additional wetlands delineated on maps adopted as part of this Chapter.

If new drainage courses, lakes, ponds or wetlands are created as part of a development, the requirements for setbacks and uses within setbacks, and the criteria for watercourse relocation and minor modification shall apply. The District shall be amended as appropriate to include these areas.

4-10-6-1: **LOWLAND CONSERVANCY OVERLAY DISTRICT:** The Lowland Conservancy Overlay District shall be considered as an overlay to the zoning districts created by the Village Zoning Ordinance as amended. In addition to the requirements of this Chapter, applicants for a special use permit within the District shall meet all requirements of the underlying zoning districts. In the event of a conflict between the overlay district requirements and the underlying zoning district requirements, the most restrictive requirements prevail.

4-10-6-2: **DISTRICT BOUNDARY:** The procedures, standards and requirements contained in this Chapter shall apply to all lots within wetlands and streams, and all lots lying wholly or in part:

- (A) Within the special flood hazard area (SFHA) designated by the Federal Emergency Management Agency (FEMA); or
- (B) Within one hundred feet (100') of the ordinary high water mark (OHWM) of a perennial stream or intermittent stream, the ordinary high watermark of a lake or pond, or the edge of a wetland; or
- (C) Within depressional areas serving as floodplain or stormwater storage areas, as designated on the Lowland Conservancy District Map.

The District is designated on a map labeled "Lowland Conservancy Overlay District Map", which is made to be part of this Chapter and which has the same force and effect as if all the notations, references, and

descriptions shown thereon were set forth or described herein. Designated areas are shown on said Map which shall be and remain on file in the office of the Village Clerk, and additional areas may be approved from time to time and be made exhibits hereto.

4-10-6-3: MINIMUM SETBACK OF DEVELOPMENT ACTIVITY FROM STREAMS:

- (A) Minimum Setback: Absolutely no development activity (except as provided below) may occur within the minimum setback which is defined as seventy five feet (75') from the ordinary high water mark of streams, lakes and ponds, or the edge of wetlands, or within a designated depressional area. In no case shall the setback be less than the boundary of the 100-year floodway as defined by FEMA. These setback requirements do not apply to a stream in a culvert unless the stream is taken out of the culvert as part of development activity. If a culvert functions as a low-flow culvert, where water is intended to periodically flow over it, the setback requirements apply.

- (B) Development Activities: The following development activities may be permitted, subject to issuance of a special use permit, within the minimum setback areas only if, as a practical matter, they cannot be located outside the setback area. Such development activities will only be approved based upon a report, prepared by a qualified professional, which demonstrates that they will not adversely affect water quality; destroy, damage or disrupt significant habitat area, adversely affect drainage and/or stormwater retention capabilities; adversely affect flood conveyance and storage; lead to unstable earth conditions, create erosion hazards, or be materially detrimental to any other property in the area of the subject property or to the Village as a whole, including the loss of open space or scenic vistas:
 - 1. Minor improvements such as walkways, benches, comfort stations, informational displays, directional signs, foot bridges, observation decks, and docks;
 - 2. The maintenance, repair, replacement, and reconstruction of existing highways and bridges, electrical transmission and telecommunication lines, poles, and towers; and
 - 3. The establishment and development of public and private

parks and recreation areas, outdoor education areas, historic natural and scientific areas, game refuges, fish and wildlife improvement projects, game bird and animal farms, wildlife preserves and public boat launching ramps.

(C) Considerations: Review of the proposed development activity within the minimum setback area will consider the following:

1. Only limited filling and excavating necessary for the development of public boat launching ramps, swimming beaches, or the development of park shelters or similar structures is allowed. The development and maintenance of roads, parking lots and other impervious surfaces necessary for permitted uses are allowed only on a very limited basis, and where no alternate location outside of the setback area is available.
2. Land surface modification within the minimum setback shall be permitted for the development of stormwater drainage swales between the developed area of the site (including a stormwater detention facility on the site) and a stream, lake or pond, or wetlands detention basins within the setback are generally discouraged, unless it can be shown that resultant modification will not impair water quality, habitat, or flood storage functions.
3. No filling or excavating within wetlands is permitted except to install piers for the limited development of walkways and observation decks. Walkways and observation decks should avoid high quality wetland areas, and should not adversely affect natural areas designated in the Illinois Natural Areas Inventory or the habitat of rare or endangered species.
4. Wetland area occupied by the development of decks and walkways must be mitigated by an equal area of wetland habitat improvement.
5. Modification of degraded wetlands for purposes of stormwater management is permitted where the quality of the wetland is improved and total wetland acreage is preserved. Where such modification is permitted, wetlands shall be protected from the effects of increased

stormwater runoff by measures such as detention or sedimentation basins, vegetated swales and buffer strips, and sediment and erosion control measures on adjacent developments. the direct entry of storm sewers into wetlands shall be avoided. Environmental impact analysis of wetland

modification may be required in accordance with Section 4-10-8 of this Chapter.

(D) Applicants For Special Use Permit:

1. An applicant for a special use permit must stabilize areas left exposed after land surface modification with vegetation normally associated with that stream or wetland. The planting of native riparian vegetation is recommended as the preferred stabilization measure. Other techniques should be used only when and where vegetation fails to control erosion. The preferred alternative is riprap, using natural rock materials where practicable, installed on eroding bank areas in a manner that provides interstitial space for vegetative growth and habitat for macroinvertebrates and other stream organisms. Lining of the stream channel bottom is not permitted.
2. The applicant shall minimize access to the applicant's proposed development activity within all or part of the Lowland Conservancy Overlay District where such access could adversely affect the stream, lake, pond, wetland, or related environmentally sensitive areas.

4-10-6-4: SITE DEVELOPMENT PLAN: A site development plan must be prepared for any proposed development within, or partly within, the Lowland Conservancy Overlay District and must indicate:

- (A) Dimension and area of parcel, showing also the vicinity of the site in sufficient detail to enable easy location, in the field, of the site for which the special use permit is sought, and including the boundary line, underlying zoning, a legend, a scale, and a north arrow (this requirement may be satisfied by the submission of a separate vicinity map);
- (B) Location of any existing and proposed structures;

- (C) Location of existing or proposed on-site sewage systems or private water supply systems;
- (D) Location of any perennial or intermittent stream, lake or pond, and its ordinary high water mark;
- (E) Location and landward limit of all wetlands;
- (F) Location of setback lines as defined in this Chapter;
- (G) Location of the 100-year floodway;
- (H) Location of existing or future access roads;
- (I) Specifications and dimensions of stream, wetland or other water areas proposed for alterations;
- (J) Cross-sections and calculations indicating any changes in flood storage volumes; and
- (K) Such other information as reasonably requested by Village.

The applicant shall present evidence, prepared by a qualified professional, that demonstrates that the proposed development activity will not endanger health and safety, including danger from the obstruction or diversion of flood flow. The developer shall also show, by submitting appropriate calculations and resource inventories, that the proposed development activity will not substantially reduce natural floodwater storage capacity, destroy valuable habitat for aquatic or other flora and fauna, adversely affect water quality or ground water resources, increase stormwater runoff velocity so that water levels on other lands are substantially raised or the danger from flooding increased, or adversely impact any other natural stream, floodplain, or wetland functions, and is otherwise consistent with the intent of this Chapter.

4-10-6-5: **GEOLOGIC AND SOIL CHARACTERISTICS; REPORT:** The site proposed for development shall be investigated to determine the soil and geologic characteristics, including soil erosion potential. A report, prepared by a licensed professional engineer, geoscientist, or soil scientist experienced in the practice of geologic and soil mechanics, shall be submitted with every application for land development within the Lowland Conservancy Overlay District. This report shall include a description of soil type and stability of surface and subsurface conditions. Any area which the investigation indicates as being subject to geologic or

soil hazards shall not be subjected to development, unless the engineer or soil scientist can demonstrate conclusively that these hazards can be overcome.

4-10-6-6: HYDROLOGIC CONTROLS/DRAINAGE CONTROL PLAN:

A drainage control plan that describes the hydraulic characteristics of on-site and nearby watercourses as well as the proposed drainage plan, prepared by a registered professional engineer experienced in hydrology and hydraulics, shall be submitted with each application for land development within the Lowland Conservancy Overlay District. Unless otherwise noted, the following restrictions, requirements and standards shall apply to all development within the Lowland Conservancy Overlay District:

- (A) Natural open-channel drainageways shall be preserved; and
- (B) Runoff from areas of concentrated impervious cover (e.g., roofs, driveways, streets, patios, etc.) shall be collected and transported to a drainageway (preferably a natural drainageway) with sufficient capacity to accept the discharge without undue erosion or detrimental impact. Vegetated drainage swales are preferred over conveyances constructed of concrete or other manufactured materials.

The drainage control plan shall identify appropriate measures, such as recharge basins and detention/retention basins, which will limit the quantitative and qualitative effects of stormwater runoff to pre-development conditions.

4-10-6-7: SITE GRADING AND EXCAVATION PLAN: Section 4-10-6-7 applies to the extent that grading and excavation and erosion control plans, which satisfy the following requirements, are not already required by a jurisdiction.

- (A) Application; Contents of Plan: A site grading and excavation plan, prepared by a registered professional engineer, trained and experienced in civil engineering, shall be submitted with each application for a special use permit and shall include the following:
 - 1. Details of the existing terrain and drainage pattern with one foot (1') contours;
 - 2. Proposed site contours at one foot (1') intervals;

3. Dimensions, elevation and contours of grading, excavation and fill;
 4. A description of methods to be employed in disposing of soil and other materials that is removed from allowable grading and excavation sites, including location of the disposal site if on the property;
 5. A schedule showing when each stage of the project will be completed, including the total area of soil surface to be disturbed during each stage, and estimated starting and completion dates. The schedule shall be prepared so as to limit, to the shortest possible period, the time soil is exposed and unprotected. In no case shall the existing natural vegetation be destroyed, removed or disturbed more than fifteen (15) days prior to initiation of the improvements; and
 6. A detailed description of the re-vegetation and stabilization methods to be employed, to be prepared in conjunction with the landscape plan per Section 4-10-6-8. This description should include locations of erosion control measures such as sedimentation basins, straw bales, diversion swales, etc.
- (B) Compliance With Chapter: The grading and excavation plan must be consistent with all the provisions of this Chapter.
- (C) Restrictions and Requirements: Unless otherwise provided in this Chapter, the following restrictions, requirements and standards shall apply to all development within the District:
1. Every effort shall be made to develop the site in such a manner so as to minimize the alteration of the natural topography;
 2. No grading, filling, cleaning, clearing, terracing or excavation of any kind shall be initiated until final engineering plans are approved and the special use permit is granted by the Village; and
 3. The depositing of any excavation, grading or clearing material within a stream, lake, pond or

wetland area (i.e., within the District) shall be prohibited.

- (D) **Installation of Physical Barrier:** In addition to locating all site improvements on the subject property to minimize adverse impacts on the stream, lake, pond, or wetland, the applicant shall install a berm, curb, or other physical barrier during construction, and following completion of the project, where necessary, to prevent direct runoff and erosion from any modified land surface into a stream, lake, pond, or wetland. All parking and vehicle circulation areas should be located as far as possible from a stream, lake, pond or wetland.
- (E) **Limit Activity:** The Village may limit development activity in or near a stream, lake, pond, or wetland to specific months, and to a maximum number of continuous days or hours, in order to minimize adverse impacts. Also, the Village may require that equipment be operated from only one side of a stream, lake, or pond in order to minimize bank disruption. Other development techniques, donations, and restrictions may be required in order to minimize adverse impacts on streams, lakes, ponds or wetlands, and on any related areas not subject to development activity.

4-10-6-8: **NATURAL VEGETATION BUFFER STRIP REQUIRED:** To minimize erosion, stabilize the streambank, protect water quality, maintain water temperature at natural levels, preserve fish and wildlife habitat, to screen man-made structures, and also to preserve aesthetic values of the natural watercourse and wetland areas, a natural vegetation strip shall be maintained along the edge of the stream, lake, pond or wetland. The natural vegetation strip shall extend landward a minimum of twenty five feet (25') from the ordinary high water mark of a perennial or intermittent stream, lake or pond and the edge of a wetland.

Within the natural vegetation strip, trees and shrubs may be selectively pruned or removed for harvest of merchantable timber, to achieve a filtered view of the waterbody from the principal structure and for reasonable private access to the stream, lake, pond or wetland. Said pruning and removal activities shall ensure that a live root system stays intact to provide for streambank stabilization and erosion control.

A landscape plan, prepared by a professional landscape architect, shall be submitted with each special use permit application for development activity within the Lowland Conservancy Overlay District and contain the following:

- (A) A plan describing the existing vegetative cover of the property and showing those areas where the vegetation will be removed as part of the proposed construction; and
- (B) A plan describing the proposed re-vegetation of disturbed areas specifying the materials to be used. The vegetation must be planned in such a way that access for stream maintenance purposes shall not be prevented.

4-10-7: WATERCOURSE RELOCATION AND MINOR MODIFICATIONS:

Watercourse relocation or modification is generally not permitted because these activities are not usually consistent with the purposes of this Chapter. Under certain circumstances, relocation and minor modification may be permitted through a special use permit where certain problems can be mitigated by relocation and/or minor modification, specifically when:

- (A) Off-site hydrologic conditions are causing erosion, flooding and related problems; or
- (B) On-site soil and geologic conditions are resulting in unstable conditions that pose hazards to life, health, and existing structures or property; or
- (C) The quality of previously modified or relocated streams can be improved through restoration; or
- (D) Officially adopted stormwater management plans call for placement of detention or retention facilities in a stream; or
- (E) Public utilities, including sanitary sewers, pipelines, and roadways require stream crossing or relocation where there are not practical alternatives.

Modifications of watercourses as a convenience for site design purposes is not permitted.

4-10-7-1: PERMITTING STREAM MODIFICATION: Stream modification, when permitted, is subject to the following conditions and restrictions:

- (A) Water quality, habitat and other natural functions must be significantly improved by the modification; no significant habitat area may be destroyed;

- (B) The amount of flow and velocity of a stream is not to be increased or decreased as the stream enters or leaves a subject property, unless this reflects an improvement over previous conditions in terms of reduced flooding, reduced erosion, or enhanced low-flow conditions;
- (C) Prior to diverting water into a new channel, a qualified professional approved by the Village shall inspect the stream modification, and issue a written report to the Village that the modified stream complies with the requirements of Section 4-10-7-2; and
- (D) Stream channel enlargement, or other modifications that would increase conveyance, shall not be permitted if the intended purpose is to accommodate development activities in the floodplain.

4-10-7-2: CONTENT OF STREAM MODIFICATION/RELOCATION PLAN: Stream relocation may be permitted in accordance with a stream relocation plan which provides for:

- (A) The creation of a natural meander pattern, pools, riffles, substrate;
- (B) The formation of gentle side slopes (at least 3 feet horizontally per 1 foot vertically), including installation of erosion control features;
- (C) The utilization of natural materials wherever possible;
- (D) The planting of vegetation normally associated with streams, including primarily native riparian vegetation;
- (E) The creation of spawning and nesting areas wherever appropriate;
- (F) The reestablishment of the fish population wherever appropriate;
- (G) The restoration of water flow characteristics compatible with fish habitat areas, wherever appropriate;
- (H) The filling and re-vegetation of the prior channel;
- (I) A proposed phasing plan, specifying time of year for all project phases;
- (J) Plans for sediment and erosion control; and

- (K) Establishment of a low-flow channel which reflects the conditions of a natural stream.

4-10-7-3: ARMORING OF CHANNELS AND BANKS: Armoring in the form of bulkheads, riprap or other materials or devices is not permitted except in accordance with the following:

- (A) Significant erosion cannot be prevented in any other way and the use of vegetation and gradual bank slopes has not sufficiently stabilized the shoreline or bank;
- (B) The bulkhead or other device is not placed within a wetland, or between a wetland and a lake or pond;
- (C) The bulkhead, riprap or other device will minimize the transmittal of wave energy or currents to other properties; and
- (D) The exchange in the horizontal or vertical configuration of the land must be kept to a minimum.

Where permission to install bulkheads or other armoring devices is requested as part of the special use permit application, documentation and certification pertaining to the items above must be submitted.

4-10-7-4: USE OF CULVERTS: Culverts are not permitted in streams except in accordance with the following:

- (A) Where a culvert is necessary for creating access to a property; use of culverts as a convenience, in order to facilitate general site design, is not to be considered.
- (B) The culvert must allow passage of fish inhabiting the stream, and accommodate the 100-year flood event without increasing upstream flooding, except where a restricting culvert is desirable as part of an overall storm and floodwater management plan;
- (C) The culvert must be maintained free of debris and sediment to allow free passage of water, and if applicable, fish; and
- (D) The stream bottom should not be significantly widened for the placement of a culvert as this increases siltation; if multiple culverts must be installed, one culvert should be at the level of the bottom of the stream and the others at or above normal water elevation.

4-10-7-5: ON-STREAM IMPOUNDMENTS: Impoundment of streams is not permitted except in accordance with the following:

- (A) The impoundment is determined to be in the public interest by providing regional stormwater detention, flood control, or public recreation;
- (B) The impoundment will not prevent the upstream migration of indigenous fish species;
- (C) A nonpoint source control plan has been implemented in the upstream watershed to control the effects of sediment runoff as well as minimized the input of nutrients, oil and grease, metals, and other pollutants;
- (D) Impoundments without permanent low-flow pools are preferred except where a permanent pool is necessary to achieve the intended benefits of the impoundment (e.g., recreation or water quality mitigation); and
- (E) Impoundment design shall include gradual bank slopes, appropriate bank stabilization measures, and a pre-sedimentation basin.

4-10-8: IMPACT ASSESSMENT: The Village may ask an applicant to submit a report prepared by a qualified professional, and approved by the Village, in order to assess the potential impact of proposed development on a lake, stream or wetland and associated environmentally sensitive areas, including loss of flood storage potential, loss of habitat, changes in species diversity and quantity, impacts on water quality, increases in human intrusion, and impacts on associated streams, lakes, ponds, wetlands or downstream areas.

4-10-9: STREAM MAINTENANCE EASEMENT: The applicant shall grant an access easement for stream maintenance purposes to the Village over twenty five feet (25') parallel to the stream bank.

4-10-10: BONDS: The Village may required the posting of a bond or surety to ensure compliance with any aspect of this Chapter.

4-10-11: LIABILITY: Prior to issuance of a construction permit, the applicant shall enter into an agreement with the Village which runs with the property, in a form acceptable to the Village Attorney, indemnifying the Village for any damage resulting from development activity on the subject property which is related to the physical condition of the stream or

wetland.

4-10-12: **SEPARABILITY:** Every section, provision, or part of this Chapter is declared separable from every other section, provision, or part; and if any section, provision, or part thereof shall be held invalid, it shall not affect any other section, provision, or part.

4-10-13: **RETROACTIVITY:** The requirements of this Chapter apply to all platted and unplatted lands within the jurisdiction of the Village.

4-10-14: **ENFORCEMENT:** Authority for administration of this Chapter resides with the Village Board.

4-10-15: **STOP-WORK ORDER; REVOCATION OF PERMIT:** In the event any person holding a special use permit pursuant to this Chapter violates the terms of the permit, or carries on-site development in such a manner so as to materially and adversely affect the health, welfare, or safety of persons residing or working in the neighborhood of the development site, or so as to be materially detrimental to the public welfare or injurious to property or improvements in the neighborhood, the Village may suspend or revoke the special use permit.

(A) Suspension of a permit shall be by a written stop-work order issued by the Village and delivered to the permittee or his agent or the person performing the work. The stop-work order shall be effective immediately, shall state the specific violations cited, and shall state the conditions under which work may be resumed. A stop-work order shall remain in effect until the next regularly scheduled meeting of the Village Board, at which the conditions of subsection (B) below can be met.

(B) No special use permit shall be permanently suspended or revoked until a hearing is held by the Village Board. Written notice of such hearing shall be served on the permittee, either personally or by registered mail, and shall state:

1. The grounds for complaint or reasons for suspension or revocation, in clear and concise language; and
2. The time when and place where such hearing will be held.

Such notice shall be served on the permittee at least five (5) days prior to the date set for the hearing. At such hearing, the permittee shall be given an opportunity to be heard and may call witnesses

and present evidence on his/her behalf. At the conclusion of the hearing the Village Board shall determine whether the permit shall be suspended or revoked.

4-10-16: VIOLATIONS AND PENALTIES: No person shall undertake or continue any development activity contrary to or in violation of any terms of this Chapter. Any person violating any of the provisions of this Chapter shall be deemed guilty of an ordinance violation, and each day during which any violation of any of the provisions of this Chapter is committed, continued, or permitted shall constitute a separate offense. Upon conviction of any such violation, such person, partnership, or corporation shall be punished by a fine of not more than one thousand dollars (\$1000.00) for each offense. In addition to any other penalty authorized by this Section, any person, partnership, or corporation convicted by violating any of the provisions of this Chapter shall be required to restore the site to the condition existing prior to commission of the violation, or to bear the expense of such restoration.

4-10-17: EFFECTIVE DATE:

This ordinance shall be in full force and effect from and after its passage and approval and publication, as required by law.

This ordinance shall be numbered as Ordinance No. 1749.

Section 3-9-4:

STORMWATER DRAINAGE & DETENTION ORDINANCE

NOW, THEREFORE, BE IT ORDAINED BY THE PRESIDENT AND BOARD OF TRUSTEES OF THE VILLAGE OF PLAINFIELD, WILL COUNTY, ILLINOIS, AS FOLLOWS:

100.0 Authority and Purpose

This ordinance is enacted pursuant to the police powers granted to Will County, Village of Plainfield, by the Illinois Compiled Statutes (Chapter 65, Sections 5\11-12-5,6 and 12; 5\11-13-1; 11-14-1; 5\11-30-2 and 8; 5\11-105-1; 5\11-109-1; 5\11-110-1; and Chapter 50, Section 815\1.)

The purpose of this ordinance is to diminish threats to public health, safety and welfare caused by runoff of excessive stormwater from new development and redevelopment in the Village. This excessive stormwater could result in the inundation of damageable properties, the erosion and destabilization of downstream channels, and the pollution of valuable stream and lake resources. The cause of increases in stormwater runoff quantity and rate and impairment of quality is the development and improvement of land and as such this ordinance regulates these activities to prevent adverse impacts.

This ordinance is adopted to accomplish the following objectives:

- 100.1 To insure that new development does not increase the drainage or flood hazards to others, or create unstable conditions susceptible to erosion;
- 100.2 To protect new buildings and major improvements to buildings from flood damage due to increased stormwater runoff;
- 100.3 To protect human life and health from the hazards of increased flooding on a watershed basis;
- 100.4 To lessen the burden on the taxpayer for flood control projects, repairs to flood damaged public facilities and utilities, correction of channel erosion problems, and flood rescue and relief operations caused by increased

stormwater runoff quantities from new development;

- 100.5 To protect, conserve, and promote the orderly development of land and water resources;
 - 100.6 To preserve the natural hydrologic and hydraulic functions of watercourses and flood-plains and to protect water quality and aquatic habitats;
 - 100.7 To preserve the natural characteristics of stream corridors in order to moderate flood and stormwater impacts, improve water quality, reduce soil erosion, protect aquatic and riparian habitat.
 - 100.8 To enhance community aesthetics by promoting establishment of nontidal wetlands for recreational, environmental and ecological benefits.
- 200.0 Definitions
- 200.1 **ADVERSE IMPACTS:** Any deleterious impact on water resources or wetlands affecting their beneficial uses including recreation, aesthetics, aquatic habitat, quality, and quantity.
 - 200.2 **APPLICANT:** Any person, firm, or governmental agency who executes the necessary forms to procure official approval of a development or permit to carry out construction of a development from the Village of Plainfield.
 - 200.3 **BASE FLOOD ELEVATION:** The elevation at all locations delineating the level of flooding resulting from the 100 year frequency flood event.
 - 200.4 **BEST MANAGEMENT PRACTICE (BMP):** A measure used to control adverse stormwater-related effects. BMPs include devices such as swales, filter strips, infiltration trenches, and detention basins designed to remove pollutants, reduce runoff rates and volumes, and protect aquatic habitats.
 - 200.5 **BYPASS FLOWS:** Stormwater runoff from upstream properties tributary to a property's drainage system but not under its control.
 - 200.6 **CHANNEL:** Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or manmade drainageway, which has a definite bed and bank or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.
 - 200.7 **CHANNEL MODIFICATION:** Alteration of a channel by changing the

physical dimensions or materials of its bed or banks. Channel modification includes damming, riprapping (or other armoring), widening, deepening, straightening, relocating, lining, and significant removal of bottom or woody rooted vegetation. Channel modification does not include the clearing of debris or removal of trash.

200.8 COMPENSATORY STORAGE: An artificially excavated, hydraulically equivalent volume of storage within the floodplain used to balance the loss of natural flood storage capacity when fill or structures are placed within the floodplain.

200.9 CONDUIT: Any channel, pipe, sewer or culvert used for the conveyance or movement of water, whether open or closed.

200.10 DETENTION BASIN: A facility constructed or modified to provide for the temporary storage of stormwater runoff and the controlled release by gravity of this runoff at a prescribed rate during and after a flood or storm.

200.11 DETENTION TIME: The mean residence time of stormwater in a detention basin.

200.12 DEVELOPMENT:

Any man-made change to real estate, including;

- a. Preparation of a plot or subdivision;
- b. Construction, reconstruction or placement of building or any addition to a building;
- c. Installation of a manufactured home on a site, preparing a site for a manufactured home, or installing a travel trailer on a site for more than 180 days;
- d. Construction of roads, bridges, or similar projects;
- e. Redevelopment of a site;
- f. Filling, dredging, grading, clearing, excavating, paving, or other non-agricultural alterations of the ground surface;
- g. Storage of materials or deposit of solid or liquid waste; and
- h. Any other activity that might alter the magnitude, frequency, deviation, direction, or velocity of stormwater flows from a

property.

- 200.13 DRAINAGE PLAN: A plan, including engineering drawings and supporting calculations, which describes the existing stormwater drainage system and environmental features, as well as the drainage system and environmental features which are proposed after development of a property.
- 200.14 DRY BASIN: A detention basin designated to drain completely after temporary storage of stormwater flows and to normally be dry over the majority of its bottom area.
- 200.15 EROSION: The general process whereby earth is removed by flowing water or wave action.
- 200.16 EXCESS STORMWATER RUN-OFF: The volume and rate of flow of stormwater discharged from an urbanized drainage area which is or will be in excess of that volume and rate which pertained before urbanization.
- 200.17 FLOODPLAIN: The land adjacent to a body of water with ground surface elevations at or below the base flood or the 100-year frequency flood elevation. The floodplain is also known as the Special Flood Hazard Area (SFHA).
- 200.18 FLOOD FRINGE: That portion of the floodplain outside of the regulatory floodway.
- 200.19 FLOODWAY: The channel and that portion of the floodplain adjacent to a stream or watercourse which is needed to store and convey the anticipated existing and future 100-year frequency flood discharge with no more than a 0.1 foot increase in stage due to any loss of flood conveyance or storage and no more than a ten percent increase in velocities.
- 200.20 HYDROGRAPH: A graph showing for a given location on a stream or conduit, the flow rate with respect to time.
- 200.21 INFILTRATION: The passage or movement of water into the soil surfaces.
- 200.22 MAJOR DRAINAGE SYSTEM: That portion of a drainage system needed to store and convey flows beyond the capacity of the minor drainage system.
- 200.23 MINOR DRAINAGE SYSTEM: That portion of a drainage system

designed for the convenience of the public. It consists of street gutters, storm sewers, small open channels, and swales and, where manmade, is designed to handle a minimum of the 10-year runoff event.

200.24 MITIGATION: Mitigation includes those measures necessary to minimize the negative effects which stormwater drainage and development activities might have on the public health, safety and welfare. Examples of mitigation include compensatory storage, soil erosion and sedimentation control, and channel restoration.

200.25 NATURAL: Conditions resulting from physical, chemical, and biological processes without intervention by man.

200.26 ONE HUNDRED-YEAR EVENT: A rainfall, runoff, or flood event having a one percent change of occurring in any given year.

200.27 POSITIVE DRAINAGE: Provision for overland paths for all areas of a property including depressional areas that may also be drained by storm sewer.

200.28 PEAK FLOW: The maximum rate of flow of water at a given point in a channel or conduit.

200.29 PROPERTY: A parcel of real estate.

200.30 REGULATORY FLOODWAY: The channel, including on-stream lakes, and that portion of the floodplain adjacent to a stream or watercourse as designated by DWR, which is needed to store and convey the existing and anticipated future 100-year frequency flood discharge with no more than a 0.1 foot increase in stage due to the loss of flood conveyance or storage, and no more than a ten percent increase in velocities. The regulatory floodways are designated for the DuPage River, Lily Cache Creek, Springhole Creek, East Norman Drain, and West Norman Drain, on the Flood Boundary and Floodway Map prepared by FEMA (or Department of Housing and Urban Development) and dated September 6, 1995. The regulatory floodways for those parts of unincorporated jurisdiction of the Village that may be annexed into the Village are designated for the DuPage River, Lily Cache Creek, Springhole Creek, East Norman Drain and West Norman Drain on the Flood Boundary and Floodway map prepared by FEMA (or department of Housing and Urban Development) and dated September 6, 1995. To locate the regulatory floodway boundary on any site, the regulatory floodway boundary should be scaled off the regulatory floodway map and located on a site plan, using reference marks common to both maps. Where interpretation is needed to determine the

exact location of the regulatory floodway boundary, the Division should be contacted for the interpretation.

200.31 RETENTION BASIN: A facility designed to completely retain a specified amount of stormwater runoff without release except by means of evaporation, infiltration, emergency bypass or pumping.

200.32 SEDIMENTATION: The process that deposits soils, debris, and other materials either on other ground surfaces or in bodies of water or stormwater drainage systems.

200.33 STORMWATER DRAINAGE SYSTEM: All means, natural or man-made, used for conducting stormwater to, through or from a drainage area to the point of final outlet from a property. The stormwater drainage system includes but is not limited to any of the following: conduits and appurtenance features, canals, channels, ditches, streams, culverts, streets, storm sewers, detention basins, swales and pumping stations.

200.34 STORMWATER RUNOFF: The waters derived from melting snow or rain falling within a tributary drainage basin which are in excess of the infiltration capacity of the soils of that basin, which flow over the surface of the ground or are collected in channels or conduits.

200.35 STORM SEWER: A closed conduit for conveying collected stormwater.

200.36 TIME OF CONCENTRATION: The elapsed time for stormwater to flow from the most hydraulically remote point in a drainage basin to a particular point of interest in that watershed.

200.37 TRIBUTARY WATERSHED: All of the land surface area that contributes runoff to a given point.

200.38 TWO-YEAR EVENT A runoff, rainfall, or flood event having a fifty percent chance of occurring in any given year.

200.39 WET BASIN: A detention basin designed to maintain a permanent pool of water after the temporary storage of stormwater runoff.

300.0 Stormwater Detention

A combination of storage and controlled release of stormwater runoff shall be required for all non-residential developments of two or more acres, for all multi-family developments of two or more acres, all single family subdivisions of five or more acres, and for all sites involving

improvements which have and will have impervious areas of 50% of gross lot area or greater. In cases where improvements will be made to facilities existing prior to the date of this ordinance, the percent of imperviousness will be based on the entire parcel. If this percentage is 50% or greater, the storm water detention requirement shall be applied only to the portion of the parcel being improved.

For properties which are not required to have stormwater release and storage structures per this section, Best Management Practices, for pollutant removal and runoff minimization should be applied.

400.0 Drainage Plan Submittal Requirements

Each applicant shall submit the following information, depending on development size, to ensure that the provisions of this ordinance are met. The submittal shall include sufficient information to evaluate the environmental characteristics of the property, the potential adverse impacts of the development on water resources both on-site and downstream, and the effectiveness of the proposed drainage plan in managing stormwater runoff. The applicant shall certify on the drawings that all clearing, grading, drainage, and construction shall be accomplished in strict conformance with the drainage plan. The following information shall be submitted for both existing and proposed property conditions. All information and data required and submitted shall be prepared by and bear the seal of registered Illinois Professional Engineer.

Properties smaller than 10 acres shall submit only the Basic Drainage Plan called for in Section 401.0. Properties larger than 10 acres shall comply with the submittal requirements of both the Basic Drainage Plan and the Advanced Drainage Plan of Section 402.0.

401.0 Basic Drainage Plan

401.1 Topographic Map: A topographic survey of the property at one-foot contours under existing and proposed conditions, and areas upstream and downstream, necessary to determine off-site impacts of the proposed drainage plan. The map shall be keyed to a consistent datum specified by the Village of Plainfield.

401.2 Drainage System: Mapping and descriptions, where relevant, of existing and proposed drainage system features of the property and immediate vicinity including:

- a. the banks and centerline of streams and channels;

- b. shoreline of lakes, ponds, and detention basins;
- c. farm drains and tiles;
- d. sub-watershed boundaries within the property;
- e. watershed soils classifications;
- f. the property's location within the larger watershed;
- g. location, size and slope of stormwater conduits and drainage swales;
- h. sanitary sewers;
- i. depressional storage areas;
- j. delineation of upstream and downstream drainage features and watersheds which might be affected by the development;
- k. detention facilities;
- l. roads and streets and associated stormwater inlets;
- m. base flood elevation, and regulatory floodway where identified for the property; and
- n. basis of design for the final drainage network components.

401.3 Environmental Features: A depiction of environmental features of the property and immediate vicinity including the following:

- a. the limits of wetland areas;
- b. any designated natural areas; and
- c. any proposed environmental mitigation features.

402.0 Advanced Drainage Plan

The same information as required in Section 401.0 is required for properties larger than 10 acres along with the following additional

information for the minor drainage system's design runoff event and the 100-year event of critical duration:

- a. elevations and maps of 100-year flooding;
- b. cross-section data for open channel flow paths and designated overland flow paths;
- c. direction of stormflows;
- d. flow rates and velocities at representative points in the drainage system; and
- e. a statement by the design engineer of the drainage system's provisions for handling events greater than that 100-year's runoff.

500.0 Minimization of Increases in Runoff Volumes and Rates

It is the policy of the Plan Commission to encourage design of storm water runoff systems that help retain and maximize the ground water recharge capacity of the area being developed. Wherever possible the subdivider shall give consideration to providing compensatory recharge for the reduction in percolation which occurs when ground surface is paved or roofed over. The use of natural gravel deposits for the lower portions of storm runoff storage areas, the flattening of drainage slopes and the retention of natural topography are examples of possible recharge methods.

In the selection of a drainage plan for a development, the applicant shall evaluate and implement, where practicable, site design features which minimize the increase in runoff volumes and rates from the site. The applicant's drainage plan submittal shall include evaluations of site design features which are consistent with the following hierarchy:

1. Minimize impervious surfaces on the property, consistent with the needs of the project;
2. Attenuate flows by use of open vegetated swales and natural depressions so as to reduce runoff rates and volumes, protect aquatic habitats and remove pollutants, and preserve existing natural stream channels;
3. Infiltrate runoff on-site;

4. Provide stormwater retention structures;
5. Utilize wetland detention basins;
6. Provide stormwater detention structures; and
7. Construct storm sewers.

600.0 Water Quality and Multiple Uses

The drainage system should be designed to minimize adverse water quality impacts downstream and on the property itself. Detention basins shall incorporate design features to capture stormwater runoff pollutants and preference shall be given to wetland systems and wet basins over dry basin designs. Retention and infiltration of stormwater shall be promoted throughout the property's drainage system to reduce the volume of stormwater runoff and to reduce the quantity of runoff pollutants. Best Management Practices (BMP) including structural devices (e.g. swales, filter strips, infiltration trenches, and detention basins) designed to remove pollutants, reduce runoff rates and volumes, and protect aquatic habitats shall be used. All flows from the site shall be routed through the basin(s).

The drainage system should incorporate multiple uses where practicable. Uses considered compatible with stormwater management include open space, aesthetics, aquatic habitat, recreation (boating, trails, playing fields), wetlands and water quality mitigation. The applicant should avoid using portions of the property exclusively for stormwater management.

700.0 Design Criteria, Standards, and Methods

701.0 Release Rates:

- a. The drainage system for a property shall be designed to control the peak rate of discharge from the property for the two-year, 24-hour and 100-year, 24-hour events to levels which will not cause an increase in flooding or channel instability downstream when considered in aggregate with other developed properties and downstream drainage capacities. The peak discharge from events less than or equal to the two-year event shall not be greater than 0.04 cfs per acre of property drained. The peak 100-year discharge shall not be greater than 0.15 cfs per acre of property drained. The peak 100-year discharge shall not be greater than 0.15 cfs per acre of property drained.

- b. Should downstream sewers, streams and channels be found by the Village Engineer to be inadequate to receive the release rate provided herein, the allowable release rate shall be reduced to that rate permitted by the receiving downstream sewers and channels. Additional detention, as determined by the Village Engineer, shall be required to store that portion of the runoff exceeding the capacity of the receiving sewers and channels.

701.1 Detention Basin Outlet Design: Backwater on the outlet structure from the downstream drainage system shall be evaluated when designing the outlet.

702.0 Detention Storage Requirements: The design maximum storage to be provided in a detention basin shall be based on the runoff from the 100-year, 24-hour event and reservoir (also called modified plus or level pool) routing or equal. Detention storage shall be computed using hydrograph methods as described in this section.

703.0 Drainage System Design and Evaluation: The following criteria should be used in evaluating and designing the drainage system. The underlying objective is to provide capacity to pass the 10-year peak flow in the minor drainage system and an overload flow path for flows in excess of the design capacity.

703.1 Design Methodologies:

- a. Major and minor conveyance systems for all developments ten acres or less may be designed using the Rational Method with a release rate not to exceed 0.15 cfs/acre for the 100-year storm.
- b. Major drainage systems for all developments greater than ten acres must be designed by Runoff Hydrograph methods as described in Section 704.0 with release rates not to exceed 0.04 cfs/acre for the 2-year storm and 0.15 cfs/acre for the 100-year storm, except where it can be shown that said methods result in a greater than ten percent loss of developable land (gross-acreage less any floodplain, wetlands, or other areas recognized as undevelopable by the Board) in which case requirements for developments ten acres or less shall be followed.
- c. The Rational Method may be used in sizing the minor drainage system for all sites.
- d. If in the opinion of the Village Engineer release rates less than

those outlined above are required due to downstream conveyance limitations, those release rates shall be used.

- 703.2 Positive Drainage: Whenever practicable, all areas of the property must be provided an overland flow path that will pass the 100-year flow at a stage at least one foot below the lowest foundation grade in the vicinity of the flow path. Overland flow paths designed to handle flows in excess of the minor drainage system capacity shall be provided drainage easements. All drainage easements shall prohibit the placing of sandboxes, above grade planters, nonflow-through fences, and other obstructions across these overland flow paths. Street ponding and flow depths shall not exceed curb heights by more than one inch.
- 704.0 Methods for Generating Runoff Hydrographs: Runoff hydrographs shall be developed incorporating the following assumptions of rainfall amounts and antecedent moisture.
- 704.1 Rainfall: Unless a continuous simulation approach to drainage system hydrology is used, all design rainfall events shall be based on the Illinois State Water Survey's Bulletin 70. The first quartile point rainfall distribution shall be used for the design and analysis of conveyance systems with critical durations less than or equal to twelve hours. The third quartile point rainfall distribution shall be used for the design and analysis of detention basins and conveyance system with critical durations greater than twelve and less than or equal to 24 hours. The fourth quartile distribution shall be used in the design and analysis of systems with durations greater than 24 hours. The first, third and fourth quartile distributions described by Huff are presented in Table 37 of Bulletin 70. The SCS Type II distribution may be used as an alternate to the Huff distributions. The effects of a 16-inch, 18-hour SCS Type II rainfall shall also be assessed so as to predict the operation of the system during an event similar to the July 1996 (or current) rainfall of record. But this event need not be considered as the design condition.
- 704.2 Antecedent Moisture: Computations of runoff hydrographs which do not rely on a continuous accounting of antecedent moisture conditions shall assume a minimum antecedent moisture condition of two.
- 705.0 Wet Detention Basin Design: Wet detention basins shall be designed to remove stormwater pollutants, to be safe, to be aesthetically pleasing, and as much as feasible to be available for recreational use. Designs incorporating wetland establishment to further control pollutants, increase aesthetics and provide recreational opportunities are encouraged.

- 705.1 Wet Basin Depths: Wet basins shall be at least three feet deep, excluding near shore banks and safety ledges. If fish habitat is to be provided they shall be at least ten feet deep over twenty-five percent of the bottom area to prevent winter freeze out.
- 705.2 Wet Basin Shoreline Slopes: The side slopes of wet basins at the normal pool elevation shall not be steeper than 5 to 1 (horizontal and vertical).
- 705.3 Permanent Pool Volume: The permanent pool volume in a wet basin at normal depth shall be equal to the runoff volume from its watershed for the 2-year event.
- 705.4 Inlet and Outlet Orientation: To the extent feasible, the distance between detention inlets and outlets shall be maximized. If possible, they should be at opposite ends of the basin and located to avoid short-circuiting. The use of paved low flow channels is discouraged.
- 706.0 Wetland and Dry Detention Basin Design: In addition to the other requirements of this Ordinance, wetland and dry basins shall be designed to remove stormwater pollutants, to be safe, to be aesthetically pleasing and as much as feasible to be available for multiple uses.
- 706.1 Wetland and Dry Basin Drainage: Dry basins shall be designed so that the portion of their bottom area which is intended to be dry shall have standing water no longer than seventy-two hours for any runoff event less than the 100-year event. Under drains directed to the outlet may be used to accomplish this requirement. Grading plans shall clearly distinguish the wet/wetland portion of the basin from the dry portion.
- 706.2 Velocity Dissipation: Velocity dissipation measures shall be incorporated into dry basin designs to minimize the resuspension of pollutants.
- 706.3 Inlet and Outlet Orientation: To the extent feasible, the distance between detention inlets and outlets shall be maximized. If possible, they should be at opposite ends of the basin.
- 706.4 Stilling/Sedimentation Basins: A stilling/sedimentation basin should be constructed at each major inlet to a wetland or dry basin consistent with Section 709.4.
- 707.0 RESERVED
- 708.0 Detention in Floodplains: The placement of detention basins within the floodplain is strongly discouraged because of questions about their reliable

operation during flood events. However, the stormwater detention requirements of this ordinance may be fulfilled by providing detention storage within flood fringe areas on the project site provided the following provisions are met.

- 708.1 Detention in Flood Fringe Areas: The placement of a detention basin in a flood fringe area shall require compensatory storage for 1.5 times the volume below the base flood elevation occupied by the detention basin including any berms. The release from the detention storage provided shall still be controlled consistent with the requirements of this section. The applicant shall demonstrate its operation for all stream flow and floodplain backwater conditions. Excavations for compensatory storage along watercourses shall be opposite or adjacent to the area occupied by detention. All floodplain storage lost below the 10-year flood elevation shall be replaced above the proposed 10-year flood elevation. All compensatory storage excavations shall be constructed to drain freely and openly to the watercourse.
- 708.2 Detention in Floodways: Detention basins shall be placed in the floodway only in accordance with 708.3.
- 708.3 On-stream Detention: On-stream detention basins are discouraged but allowable if they provide regional public benefits and if they meet the other provisions of this ordinance with respect to water quality and control of the 2-year and 100- year, 24-hour events from the property. Further criteria are presented in Section 800.0 of this ordinance. If on-stream detention is used for watersheds larger than one square mile, it is recommended that the applicant use dynamic modeling to demonstrate that the design will not increase stage for any properties upstream or downstream of the property. Also impoundment of the stream as part of on-stream detention:
- a. shall not prevent the migration of indigenous fish species, which require access to upstream areas as part of their life cycle, such as for spawning;
 - b. shall not cause or contribute to the degradation of water quality or stream aquatic habitat;
 - c. shall include a design calling for gradual bank slopes, appropriate bank stabilization measures, and a pre-sedimentation basin;
 - d. shall not involve any stream channelization or the filling of wetlands;

- e. shall require the implementation of an effective nonpoint source management program throughout the upstream watershed;
- f. shall not occur downstream of a wastewater discharge; and
- g. shall comply with 92 Illinois Administrative Code Parts 702 and 708 and the floodplain ordinance of the Village of Plainfield.

709.0 Drainage into Wetlands: Existing wetlands shall be protected from damaging modifications and adverse changes in runoff quality and quantity associated with land developments. In addition to the other requirements of this ordinance, the following requirements shall be met for all developments whose drainage flows into wetlands.

709.1 Detention Wetlands: Existing wetlands shall not be modified for the purposes of stormwater detention unless it is demonstrated that the existing wetland is low in quality and the proposed modifications will improve its habitat and ability to perform beneficial functions. Existing depressional storage in wetlands shall be maintained and the volume of detention storage provided to meet the requirements of this section shall be in addition to this existing storage. Establishment of new emergent wetlands to accept drainage from stormwater detention systems are encouraged as a benefit to aesthetics, pollution control and recreational opportunity.

709.2 Sediment Control: The existing wetland shall be protected during construction by appropriate soil erosion and sediment control measures and shall not be filled.

709.3 Alteration of Drainage Patterns: Site drainage patterns shall not be altered to substantially decrease or increase the existing area tributary to the wetland.

709.4 Detention/Sedimentation: All runoff from the development shall be routed through a preliminary detention/sedimentation basin incorporating pollutant removal functions and designed to capture the 2-year, 24-hour event and hold it for at least 24 hours, before being discharged to the wetland. The area of the basin shall be at least 500 square feet per acre of impervious surface in the drainage area. Side slopes shall be no steeper than three horizontal to one vertical and basin depths should be at least

three feet to minimize resuspension of accumulated sediment. This basin shall be constructed before property grading begins.

In addition, the drainage hierarchy defined in section 500.0 should be followed to minimize runoff volumes and rates being discharged to the wetland.

- 709.5 **Vegetated Buffer Strip:** A buffer strip of at least 25 feet in width, preferable vegetated with native plant species, shall be maintained or restored around the periphery of the wetland.
- 709.6 **Vegetated Filter Strips and Swales:** To effectively filter stormwater pollutants and promote infiltration of runoff, sites should be designed to maximize the use of vegetated filter strips and swales. Wherever practicable, runoff from impervious surfaces should be directed onto filter strips and swales before being routed to a storm sewer or detention basin.
- 710.0 **Street, Parking Lot, and Culvert Damage**
- 710.1 **Streets:** If streets are to be used as part of the minor or major drainage system, ponding depths shall not exceed curb heights by more than one-inch and shall not remain flooded for more than eight hours for any event less than or equal to the 100-year event.
- 710.2 **Parking Lots:** The maximum stormwater ponding depth in any parking area shall not exceed six inches for more than four hours.
- 710.3 **Culvert Road and Driveway Crossings:** Sizing of culvert crossing shall consider entrance and exit losses as well as tailwater conditions on the culvert.
- 711.0 **Infiltration Practices:** To effectively reduce runoff volumes, infiltration practices including basins, trenches, and porous pavement should be located on soils in hydrologic soil groups "A" or "B" as designated by the U.S. Soil Conservation Services. Infiltration basins and trenches designed to recharge groundwater shall not be located within seventy-five feet of a water supply well or a building foundation. A sediment settling basin shall be provided to remove coarse sediment from stormwater flows before they reach infiltration basins or trenches. Stormwater shall not be allowed to stand more than seventy-two hours over eighty percent of a dry basin's bottom area for the maximum design event to be ex-filtrated. The bottom of infiltration facilities shall be a minimum of four feet above seasonally high groundwater and bedrock.
- 712.0 **Safety Considerations:** The drainage system components, especially all detention basins, shall be designed to protect the safety of any children or

adults coming in contact with the system during runoff events.

- 712.1 Side Slopes: the side slopes of all detention basins at 100-year capacity shall be a level as practicable to prevent accidental falls into the basin and for stability and ease of maintenance. Side slopes of detention basins and open channels shall not be steeper than three to one (horizontal to vertical).
- 712.2 Safety Ledge: All wet detention basins shall have a level safety ledge at least 4 feet in width 2.5 to 3 feet below the normal water depth.
- 712.3 Velocity: Velocities throughout the surface drainage system shall be controlled to safe levels taking into consideration rate and depths of flow.
- 712.4 Overflow Structures: All stormwater detention basins shall be provided with an overflow structure capable of safely passing excess flows at a stage at least one foot below the lowest foundation grade in the vicinity of the detention basin. The design flow rate of the overflow structure shall be equivalent to the 100-year inflow rate.
- 713.0 Maintenance Considerations: The stormwater drainage system shall be designed to minimize and facilitate maintenance. Turfed side slopes shall be designed to allow lawn mowing equipment to easily negotiate them. Wet basins shall be provided with alternate outflows which can be used to completely drain the pool for sediment removal. (Pumping may be considered if drainage by gravity is not feasible.) Pre-sedimentation basins shall be included, where feasible, for localizing sediment deposition and removal. Access for heavy equipment shall be provided.

800.0 The Bypass System

The bypass system shall be designed to comply with the requirements of Section 3-9-3B of the subdivision Control Ordinance. Design capacity shall be predicated on the assumption that all upstream areas have been fully developed as proposed in the Plainfield Official Plan and/or the Will County Comprehensive Plan. The bypass flow rate shall be computed using a runoff coefficient of not less than 0.35. An allowance, equivalent to the reduction in the flow rate provided, will be made for upstream detention that has been previously approved by the Village and/or Will County and that has been constructed. (700.0)

Bypass channels may be incorporated into lot or improvement designs as follows:

- a. Drainage ways may be provided in a depressed median of a double roadway, street, or parkway, provided the median is wide enough to permit flat side slopes along the storm channel.
- b. A continuous easement shall be provided along rear lot lines within which utility lines and drainage facilities may be located and maintained, but within no accessory buildings and/or obstructing structures may be located.
- c. Any such bypass drainage way shall be provided with an easement at least twelve feet wide, six feet on each side of a lot line where applicable. Such an easement will permit necessary public channel maintenance and improvement.

Where development of a property presents the threat of flooding or damage by flash runoff to downstream residents, the facilities for storm water runoff control shall be constructed prior to any earth moving or drainage constructed on the project side.

900.0 Early Completion of Detention Facilities

Where detention, retention, or depressional storage areas are to be used as part of the drainage system for a property, they shall be constructed as the first element of the initial earthwork program. Any eroded sediment captured in these facilities shall be removed by the applicant before project completion in order to maintain the design volume of the facilities.

1000.0 Reserved

1100.0 Maintenance Responsibility

Maintenance of stormwater drainage facilities located on private property shall be the responsibility of the owner of that property. Before a Construction permit is obtained from the Village of Plainfield, the applicant shall execute a maintenance agreement with the Village of Plainfield guaranteeing that the applicant and all future owners of the property will maintain its stormwater drainage system. The maintenance agreement shall also specifically authorize representatives of the Village of Plainfield to enter on to the property for the purpose of inspections and maintenance of the drainage system. Such agreement shall be recorded with the Recorded of Deeds of Will County. The maintenance agreement shall include a schedule for regular maintenance of each aspect of the property's stormwater drainage system and shall provide for access to the

system for inspection by authorized personnel of the Village of Plainfield. The maintenance agreement shall also stipulate that if the Village Attorney of the Village of Plainfield notify the property owner in writing of maintenance problems which require correction, the property owner shall make such corrections within 30 (thirty) calendar days of such notification. If the corrections are not made within this time period the Village of Plainfield may have the necessary work completed and assess the cost to the property owner.

The Village of Plainfield has the option of requiring a bond to be filed by the property owner for maintenance of the stormwater drainage system.

1200.0 Administration

1201.0 Inspections

1201.10 Inspections During Construction: General site grading shall not begin until any necessary detention facilities are in place and operational. The Village Building Official or his representative will also conduct periodic inspections of the work in progress to be certain that the drainage system is being built as designed. If any violations of the provisions or requirements of this ordinance are noted during such inspections, the Village Building Official shall notify the property owner in writing of the items needing correction. The property owner shall be given ten (10) calendar days to make such corrections unless given a specific extension of time in writing by the Village Building Official.

Failure to complete such corrections within the specified time period shall constitute a violation of this ordinance.

1201.20 Final Inspection: Upon notification by the applicant that the drainage system is completed, the Village Engineer or his representative shall conduct a final inspection. If the drainage system is found to contain deficiencies which require correction the Village of Plainfield shall notify the property owner of the necessary corrections. The property owner shall correct such deficiencies within ten (10) calendar days unless given a specific extension of time in writing by the Village. Failure to make necessary corrections within the specified time period shall constitute a violation of this ordinance. Upon finding that the drainage system meets the provisions and requirements of this ordinance the Village Engineer shall issue a written report of drainage system completion to the Village President and Board of Trustees. The Village shall notify the property owner of satisfactory completion.

1201.30 Routine Inspections: All privately owned drainage systems shall be

inspected by representatives of the Village of Plainfield not less often than once per year. A written report shall be filed of the results of any inspection and a copy sent to the property owner detailing any problems which need correction.

1202.0 Enforcement: The administration and enforcement of this ordinance shall be the responsibility of the Planning & Building Department of the Village of Plainfield.

1203.0 Appeals: All appeals to the Village Engineer, Village Building Official or Village Planner's decisions regarding the interpretation of this ordinance shall be heard by the Village President and Board of Trustees of the Village of Plainfield.

1300.0 Severability

If any section, clause, provision or portion of this ordinance is judged unconstitutional or invalid by a court of competent jurisdiction, the remainder of this ordinance shall remain in force and not be affected by such judgment.

1400.00 Penalties

Any person convicted of violating any of the provisions or requirements of this ordinance shall be guilty of an ordinance violation and shall be subject to a fine of not more than \$1000.00 or be imprisoned for not more than 6 months. Each day the violation continues shall be considered a separate offense.

1500.0 Effective Date

This ordinance shall be in full force and effect from and after its passage and approval and publication, as required by law.

This ordinance shall be numbered as Ordinance No. 1747.

APPENDIX F - USDA PROGRAMS THAT MAY BE APPLICABLE TO URBAN OR URBANIZING AREAS

INTRODUCTION

This appendix contains information on the United States Department of Agriculture (USDA) programs approved under the Farm Security and Rural Investment Act of 2002 (2002 Farm Bill) regarding the bill's conservation provisions. Although tailored for agricultural lands, these programs may complement local initiatives in urban or urbanizing areas regarding environmentally-sensitive areas and storm water management, floodplain preservation, ground water recharge, wildlife habitat, open space, recreation, and the preservation of rural character. Opportunities may exist for utilizing these programs as land is converted from agricultural to urban land uses. These programs could also be useful in meeting requirements of the Non-point Source Discharge Elimination System (NPDES) phase II. Developers and municipal planners can conceivably take advantage of USDA programs and become a program participant as long as the land associated with the program continues to meet USDA criteria. Crucial issues affecting USDA criteria includes having the land registered with a valid farm tract number and insuring that participation in the USDA program(s) is initiated prior to changes in agricultural land use.

The following is a summary of programs that could possibly assist conservation activities in an urban or urbanizing areas:

Conservation Reserve Program (CRP) The CRP is a voluntary program for eligible producers that offers incentive and maintenance payments for specified conservation activities on eligible crop or pasture lands. The program's purpose is to encourage the planting of ground covers that improve soil, water and wildlife resources. CRP makes available federal cost-share assistance of up to 50% of the participant's cost in installing approved conservation practices. Contract duration may last from ten to fifteen years. CRP could potentially be used in steep-sloped areas that would otherwise prohibit development. CRP could also be utilized for tree or native grass plantings in conjunction with required buffers between development and sensitive water bodies.

Environmental Quality Incentives Program (EQIP) EQIP is a voluntary program for eligible producers, on eligible land, that offers incentive payments of up to 90% of the costs on eligible conservation practices. Soon to be available under the EQIP program are Conservation Innovation Grants. These grants, after their draft provisions have been finalized, are anticipated to be available for use by the broader public to leverage federal investment, stimulate innovative approaches, and accelerate technology transfer. Any development proposal that could incorporate conservation best management practices could potentially be eligible under this program. Developers who need to meet local development requirements mandating groundwater protection, buffers and storm water detention, could utilize this program to help offset implementation costs. Some types of practices that could qualify under EQIP include riparian forest buffers, rock chutes, wetland enhancement, filter strips, diversions, water and sediment control basins, and grassed waterways. One example in Illinois of the use of EQIP funds in an urbanizing area includes a site near East Peoria, where EQIP funds were used prior to site development for the construction of two ponds to include spillway construction, seeding, and mulching.

Farmland Protection Program/Farm and Ranch Lands Protection Program (FPP/FRPP)

The purpose of the FPP/FRPP is to encourage topsoil protection by limiting non-agricultural uses of the land. Under the program, the federal government may contribute up to 50% of the cost for the purchase of development rights regarding a qualifying parcel. At the time of this writing, the FRPP rules were in draft form and open for public comment. The FRPP is anticipated to be similar in many ways to the FPP program, which has been repealed. The FRPP program could potentially be used in conjunction with community development or agricultural land subdivision. The FRPP could be useful for development requirements that encourage open space set-asides which maximizes land remaining on the tax rolls. FRPP would also be useful for planned unit developments or conservation subdivision designs that permit the agreed-upon density, yet allow larger areas of contiguous open space. Land under FRPP could also be used for other than row-crop production. Tree farms, specialty crops, gardens, and nurseries are all potential land uses under the program that could continue to generate revenues for both the land owner and the community while providing open space, aesthetic features, and passive storm water management.

Wildlife Habitat Incentives Program (WHIP) Through this program, NRCS provides technical expertise and funding needed for practices that enhance wildlife habitat on private land. Landowners may enter into five to ten year agreements to implement an approved habitat enhancement plan. Longer agreements may be available for landowners that are willing to create long-lasting habitat for especially vulnerable species. This program is unique in that a farm tract number is not a requirement for enrollment. Any privately owned land can be eligible under WHIP as long as it enhances wildlife habitat. Examples of where this program could be utilized in site planning and development include odd lots or land contiguous to streams, lakes, or storm water detention/retention areas where native plantings that enhance wildlife habitat are desirable.

Wetlands Reserve Program (WRP) WRP is a voluntary program that provides technical and financial assistance to eligible landowners to address wetlands, wildlife habitat, and other soil and water natural resource concerns. Through this program, eligible landowners must file an application for either a permanent conservation easement, a 30-year easement, or a minimum 10-year restoration agreement. The federal government may pay up to 100% for wetland restoration and permanent easement costs; 75% of restoration and 75% of the permanent easement costs on a 30-year easement; and 75% of restoration costs for a restoration cost-share agreement.

One example of a development that has taken advantage of the wetland reserve program has been the Hidden Creek development in Ohio, where 232 acres were set aside in perpetuity to protect wildlife habitat along a nearby creek. The developer, working in cooperation with the NRCS and the local soil and water conservation district, desired to maintain the environmentally-sensitive areas of the property in a natural state and made the decision to qualify and participate. Prior to development, the environmentally-sensitive lands were set aside and the USDA-NRCS, in accordance with WRP program criteria, designed the wetlands and were awarded a permanent conservation easement. The developer was eligible for cost-share money and technical

assistance and the wetlands thereafter will provide wetland functions that can be used in conjunction with development: passive storm water detention, ground water filtering, and natural open space.

Included as part of this appendix are fact sheets regarding each of the above mentioned programs.

The intent here is to provide the reader with examples of concepts, incentives and resources from the USDA that could potentially be incorporated into community-based conservation projects. While an effort has been made to provide an accurate listing of program information, this information is constantly changing to better meet the public's needs. For the most up-to-date information regarding programs, please contact your local USDA service center or visit the national USDA-NRCS website at <http://www.il.nrcs.usda.gov>

This section was updated in November 2002.

NRCS IL November 2002

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Conservation Reserve Program

Authorization

The Food Security Act of 1985, as amended, authorized the Conservation Reserve Program (CRP), which is implemented through the Farm Service Agency (FSA) on behalf of the Commodity Credit Corporation (CCC). The program is also governed by the regulations published in 7 CFR part 1410.

Overview

The CRP is a voluntary program that offers annual rental payments, incentive payments, and annual maintenance payments for certain activities, and cost-share assistance to establish approved cover on eligible cropland.

The program encourages farmers to plant long-term resource-conserving covers to improve soil, water, and wildlife resources. CCC makes available cost-share assistance in an amount equal to not more than 50 percent of the participant's costs in establishing approved practices. Contract duration is between 10 and 15 years.

CRP is administered by FSA. The Natural Resources Conservation Service, Cooperative State Research and Education Extension Service, state forestry agencies, and local soil and water conservation districts provide

technical support. Private sector technical assistance vendors may also be available.

Eligible Land

To be eligible for placement in the CRP land must be:

- Cropland that is planted or considered planted to an agricultural commodity 2 of the 5 most recent crop years (including field margins) and which is physically and legally capable of being planted in a normal manner to an agricultural commodity; or
- Marginal pastureland that is either:
 - Certain acreage enrolled in the Water Bank Program; or
 - Suitable for use as a riparian buffer to be planted to trees.

Additional Requirements for Cropland

In addition to the eligible land requirements, cropland must meet one of the following:

1. Have a weighted average Erosion Index (EI) of 8 or higher or be considered highly erodible land according to the conservation compliance provisions;
2. Be considered a cropped wetland;

3. Be devoted to any of a number of highly beneficial environmental practices, such as filter strips, riparian buffers, grass waterways, shelterbelts, wellhead protection areas, and other similar practices;
4. Be subject to scour erosion;
5. Be located in a national or state CRP conservation priority area;
6. Be cropland associated with or surrounding noncropped wetlands.

Ranking Criteria

Offers for CRP contracts are ranked according to the Environmental Benefits Index (EBI).

The designated technical agency collects data for each of the EBI factors, based upon the relative environmental benefits for the land offered. Each eligible offer is ranked in comparison to all others and selections made from that ranking.

EBI factors include:

- Wildlife habitat benefits resulting from covers on contract acreage;
- Water quality benefits from reduced erosion, runoff, and leaching;
- On-farm benefits of reduced erosion;
- Benefits that will likely endure beyond the contract period;

- Air quality benefits from reduced wind erosion;
- Benefits of enrollment in conservation priority areas where enrollment would contribute to the improvement of identified adverse water quality, wildlife habitat, or air quality; and
- Cost.

Producer Eligibility Requirements

A producer must have owned or operated the land for at least 12 months prior to close of the signup period, unless:

- The new owner acquired the land as a result of death of the previous owner;
- The only ownership change occurred due to foreclosure where the owner exercised a timely right of redemption in accordance with state law; or
- The circumstances of the acquisition present adequate assurance to CCC that the new owner did not acquire the land for the purpose of placing it in CRP.

Rental Rates

The CCC bases rental rates on the relative productivity of soils within each county and the average dryland cash rent or the cash-rent equivalent.

The maximum CRP rental rate for each offer is calculated in advance of enrollment. Producers may offer land at that rate or may offer a

lower rental rate to increase the likelihood that their offer will be accepted.

In addition, CCC offers additional financial incentives of up to 20 percent of the annual payment for certain continuous signup practices.

Other Payments

The CCC encourages restoration of wetlands by offering a one-time incentive payment equal to 25 percent of the cost of restoring the hydrology of the site. This is in addition to the 50-percent cost share provided to establish approved cover.

Continuous Signup

Eligible acreage devoted to certain special conservation practices, such as riparian buffers, filter strips, grass waterways, shelterbelts, living snow fences, contour grass strips, salt tolerant vegetation, and shallow water areas for wildlife, may be enrolled at any time under the CCC's continuous signup and are not subject to competitive bidding. In addition, land within a designated public wellhead area may be eligible to be enrolled on a continuous basis. (See *FSA Fact Sheet: "Continuous Signup for High-Priority Practices"* for further details.)

The United States Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audio-tape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

Fact Sheet

June 2002

Environmental Quality Incentives Program

Overview

The Environmental Quality Incentives Program (EQIP) is a voluntary conservation program that promotes agricultural production and environmental quality as compatible National goals. Through EQIP, farmers and ranchers may receive financial and technical help to install or implement structural and management conservation practices on eligible agricultural land.

EQIP was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill). The Natural Resources Conservation Service (NRCS) administers EQIP. Funding for EQIP comes from the Commodity Credit Corporation.

How EQIP Works

EQIP activities are carried out according to an EQIP plan of operations developed in conjunction with the producer. Contracts for confined livestock feeding operations require development and implementation of a comprehensive nutrient management plan (CNMP). This plan is approved by the local conservation district. Practices are subject to NRCS technical standards adapted for local conditions. Farmers and ranchers may elect to use an approved third-party provider for technical assistance.

EQIP applications are accepted throughout the year. NRCS evaluates each application using a state and locally developed evaluation process. Higher priorities are given to applications that encourage the use of cost-effective conservation practices, address National conservation priorities, and optimize environmental benefits.

State Technical Committees, Tribal representatives, and local working groups convened by the conservation district advise NRCS on implementation of the program to address identified resource needs and concerns.

EQIP may pay up to 75 percent of the costs of certain conservation practices important to improving and maintaining the health of natural resources in the area. Incentive payments may be made to encourage a producer to adopt land management practices, such as nutrient management, manure management, integrated pest management, irrigation water management, and wildlife habitat management, or to develop a CNMP and components of a CNMP. Limited resource farmers and beginning farmers may be eligible for up to 90 percent of the cost of conservation practices.

EQIP offers contracts with a minimum term of one year after implementation of the last scheduled practice and a maximum term of ten years. These contracts provide incentive payments and cost share payments for implementing conservation practices.

Total cost-share and incentive payments are limited to \$450,000 per individual over the period of the 2002 Farm Bill, regardless of the number of farms or contracts. Starting in fiscal year 2003, no individual or entity may receive EQIP payments in any crop year in which the individual or entity's average adjusted gross income for the preceding three years exceeds \$2.5 million, unless 75 percent of that income is from farming, ranching, or forestry interests.

Conservation Innovation Grants

EQIP provides opportunities for Conservation Innovation Grants, which are competitive grant awards to stimulate innovative approaches to environmental enhancement and protection, in conjunction with agricultural production.

The Secretary of Agriculture is authorized to use EQIP funds each fiscal year from 2003 to 2007 to award grants to government or non-government organizations or individuals that leverage Federal funds to implement innovative approaches to conservation. Grant amounts may not exceed 50 percent of the total cost of each project.

Conservation Innovation Grants provide the opportunity for the U.S. Department of Agriculture (USDA) to work with other public and private entities to accelerate technology transfer and implementation of promising technologies to address the Nation's most pressing agricultural related natural resource problems. Agricultural producers, particularly those facing the most difficult challenges, will benefit by having more options for enhancing the environment and meeting Federal, State, and local regulations.

Ground and Surface Water Conservation

EQIP provides for additional funding specifically to promote ground and surface water conservation activities to improve irrigation systems; convert to the production of less water intensive agricultural commodities; improve water storage through measures such as water banking and groundwater recharge; or institute other measures that improve groundwater and surface water conservation, as determined by the Secretary.

Assistance to a producer may be provided only to facilitate a conservation measure that results in a net savings in groundwater or surface water resources in the agricultural operation of the producer. This provision is funded for fiscal years 2002 through 2007.

Eligibility

Producers engaged in livestock or crop production on eligible land may apply for the program. Eligible land includes cropland; rangeland; pasture; private non-industrial forestland; and other farm or ranch lands, as determined by the Secretary.

For More Information

If you need more information about EQIP, please contact your local USDA Service Center, listed in the telephone book under U.S. Department of Agriculture, or your local conservation district. Information also is available on the World Wide Web at: <http://www.nrcs.usda.gov/programs/farmbill/2002/>



Visit USDA on the Web at:
<http://www.usda.gov/farmbill>

Fact Sheet

May 2002

Farmland Protection Program

Overview

The Farmland Protection Program (FPP) is a voluntary program that helps farmers and ranchers keep their land in agriculture. The program provides matching funds to State, Tribal, or local governments and non-governmental organizations with existing farmland protection programs to purchase conservation easements or other interests in land. FPP is reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill). The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) manages the program.

Benefit/Accomplishments

Through 2001, more than 108,000 acres have been protected in 28 states.

How FPP Works

USDA works through State, Tribal, and local governments and non-governmental organizations to conduct the FPP. These entities acquire conservation easements from landowners. Participating landowners agree not to convert their land to non-agricultural uses and to develop and implement a conservation plan for any highly erodible land. All highly erodible lands enrolled must have a conservation plan developed based on the standards in the NRCS Field Office Technical Guide and approved by the local conservation district. Landowners retain all rights to use the property for agriculture.

To participate, a landowner submits an application to an entity—a State, Tribal, or local government or a non-governmental organization—that has an existing farmland protection program. The NRCS State

conservationist, with advice from the State Technical Committee, awards funds to qualified entities to conduct their farmland protection programs. Although a minimum of 30 years is required for conservation easements, priority is given to applications with perpetual easements.

Eligibility

To qualify for FPP, the land offered must be part or all of a farm or ranch and must:

- Contain prime, unique, or other productive soil or historical or archaeological resources;
- Be included in a pending offer from a State, Tribal, or local government or non-governmental organization's farmland protection program;
- Be privately owned;
- Be covered by a conservation plan for any highly erodible land;
- Be large enough to sustain agricultural production;
- Be accessible to markets for what the land produces; and
- Be surrounded by parcels of land that can support long-term agricultural production.

If the land cannot be converted to non-agricultural uses because of existing deed restrictions or other legal constraints, it is ineligible for FPP.

Funding

FPP is funded through the Commodity Credit Corporation. The FPP share of the easement cost must not exceed 50 percent of the appraised fair market value of the conservation easement or other interest in the land. A State,

Tribal, or local government or non-governmental organization may supplement its share of the easement cost through a landowner's donation, not to exceed 25 percent of the appraised fair market value of the conservation easement.

For More Information

If you need more information about FPP, please contact your local USDA Service Center, listed in the telephone book under U.S. Department of Agriculture, or your local conservation district. Information also is available on the World Wide Web at:
<http://www.nrcs.usda.gov/programs/farmbill/2002/>



Visit USDA on the Web at:
<http://www.usda.gov/farmbill>

Fact Sheet

May 2002

Wildlife Habitat Incentives Program

Overview

The Wildlife Habitat Incentives Program (WHIP) is a voluntary program that encourages creation of high quality wildlife habitats that support wildlife populations of National, State, Tribal, and local significance. Through WHIP, the Natural Resources Conservation Service (NRCS) provides technical and financial assistance to landowners and others to develop upland, wetland, riparian, and aquatic habitat areas on their property.

WHIP is reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill). Through WHIP, NRCS works with private landowners and operators; conservation districts; and Federal, State, and Tribal agencies to develop wildlife habitat on their property. Funding for WHIP comes from the Commodity Credit Corporation.

Benefits

Since WHIP began in 1998, nearly 11,000 participants have enrolled more than 1.6 million acres into the program. Most efforts have concentrated on improving upland wildlife habitat, such as native prairie, but there is an increasing emphasis on improving riparian and aquatic areas. The 2002 Farm Bill greatly expands the available tools for improving wildlife habitat conditions across the Nation.

Species that have benefited from WHIP activities include the grasshopper sparrow, bobwhite quail, swift fox, short-eared owl, Karner-blue butterfly, gopher tortoise, Louisiana black bear, Eastern collared lizard,

Bachman's sparrow, ovenbird, and acorn woodpecker.

How WHIP Works

Conservation districts convene local work groups to identify local wildlife habitat priorities. The local work groups then provide input to the State Technical Committee that advises the State conservationist in the development of a State WHIP plan. The State WHIP plan serves as a guide for the development of the State WHIP ranking criteria.

Persons interested in entering into a cost-share agreement with the U.S. Department of Agriculture (USDA) to develop wildlife habitat may file an application at any time. Participants voluntarily limit future use of the land for a period of time, but retain private ownership.

NRCS works with the participant to develop a wildlife habitat development plan. This plan becomes the basis of the cost-share agreement between NRCS and the participant. NRCS provides cost-share payments to landowners under these agreements that are usually 5 to 10 years in duration, depending upon the practices to be installed.

There are shorter-term agreements to install practices that are needed to meet wildlife emergencies, as approved by the NRCS State conservationist. NRCS also provides greater cost-share assistance to landowners who enter into agreements of 15 years or more for practices on essential plant and animal habitat. NRCS can use up to 15 percent of its available WHIP funds for this purpose.

NRCS does not place limits on the number of acres that can be enrolled in the program or the amount of payment made; however, some States may choose to establish such requirements. NRCS welcomes projects that provide valuable wildlife habitat and does not want to discourage any landowner who desires to implement practices that will improve habitat conditions for declining species.

NRCS continues to provide assistance to landowners after completion of habitat development activities. This assistance may be in the form of monitoring habitat practices, reviewing management guidelines, or providing basic biological and engineering advice on how to achieve optimum results for targeted species.

Applications are accepted through a continuous sign-up process. Applications may be obtained and filed at any time with your local USDA Service Center or conservation district office. Applications also may be obtained through USDA's e-gov Internet site at: www.sc.egov.usda.gov. Enter "Natural Resources Conservation Service" in the Agency field, "Wildlife Habitat Incentives Program" in the Program Name field, and "CCC-1250" in the Form Number field. Applications also may be accepted by cooperating conservation partners approved or designated by NRCS.

Eligibility

Eligible lands under the program are:

- Privately owned land;
- Federal land when the primary benefit is on private or Tribal land;
- State and local government land on a limited basis; and
- Tribal land.

If land is determined eligible, NRCS places emphasis on enrolling:

- Habitat areas for wildlife species experiencing declining or significantly reduced populations;
- Practices beneficial to fish and wildlife that may not otherwise be funded; and
- Wildlife and fishery habitats identified by local and State partners and Indian Tribes in each State.

For More Information

If you need more information about WHIP, please contact your local USDA Service Center, listed in the telephone book under U.S. Department of Agriculture, or your local conservation district. Information also is available on the World Wide Web at: <http://www.nrcs.usda.gov/programs/farmbill/2002/>



Visit USDA on the Web at:
<http://www.usda.gov/farmbill>

Fact Sheet

May 2002

Wetlands Reserve Program

Overview

The Wetlands Reserve Program (WRP) is a voluntary program that provides technical and financial assistance to eligible landowners to address wetland, wildlife habitat, soil, water, and related natural resource concerns on private lands in an environmentally beneficial and cost-effective manner. The program provides an opportunity for landowners to receive financial incentives to enhance wetlands in exchange for retiring marginal land from agriculture. WRP is reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill). The Natural Resources Conservation Service (NRCS) administers the program. Funding for WRP comes from the Commodity Credit Corporation.

Benefits

WRP participants benefit by:

- Receiving financial and technical assistance in return for restoring and protecting wetland functions and values;
- Seeing a reduction in problems associated with farming potentially difficult areas; and
- Having incentives to develop wildlife recreational opportunities on their land.

Wetlands benefit the Nation by providing fish and wildlife habitat; improving water quality by filtering sediments and chemicals; reducing flooding; recharging groundwater; protecting biological diversity; as well as providing opportunities for educational, scientific, and recreational activities.

How WRP Works

Landowners and Tribes may file an application for a conservation easement or a cost-share

restoration agreement with the U.S.

Department of Agriculture (USDA) to restore and protect wetlands. Participants voluntarily limit future use of the land, but retain private ownership.

The program offers three enrollment options:

Permanent Easement. This is a conservation easement in perpetuity. Easement payments for this option equal the lowest of three amounts: the agricultural value of the land, an established payment cap, or an amount offered by the landowner. In addition to paying for the easement, USDA pays 100 percent of the costs of restoring the wetland.

30-Year Easement. Easement payments through this option are 75 percent of what would be paid for a permanent easement. USDA also pays 75 percent of restoration costs.

For both permanent and 30-year easements, USDA pays all costs associated with recording the easement in the local land records office, including recording fees, charges for abstracts, survey and appraisal fees, and title insurance.

Restoration Cost-Share Agreement. This is an agreement (generally for a minimum of 10 years) to re-establish degraded or lost wetland habitat. USDA pays 75 percent of the cost of the restoration activity. This enrollment option does not place an easement on the property. Other agencies, conservation districts, and private conservation organizations may provide additional assistance for easement payments and wetland restoration costs as a way to reduce the landowner's share of the

costs. Such special partnership efforts are encouraged.

NRCS and its partners, including conservation districts, continue to provide assistance to landowners after completion of restoration activities. This assistance may be in the form of reviewing restoration measures, clarifying technical and administrative aspects of the easement and project management needs, and providing basic biological and engineering advice on how to achieve optimum results for wetland dependent species.

Applications are accepted through a continuous sign-up process. Applications may be obtained and filed at any time with your local USDA Service Center or conservation district office. Applications also may be obtained through USDA's e-gov Internet site at: www.sc.egov.usda.gov. Enter "Natural Resources Conservation Service" in the Agency field, "Wetlands Reserve Program" in the Program Name field, and "CCC-1250" in the Form Number field.

Eligibility

To offer a conservation easement, the landowner must have owned the land for at least 12 months prior to enrolling it in the program, unless the land was inherited, the landowner exercised the landowner's right of redemption after foreclosure, or the landowner can prove the land was not obtained for the purpose of enrolling it in the program. To participate in a restoration cost-share agreement, the landowner must show evidence of ownership.

To be eligible for WRP, land must be restorable and be suitable for wildlife benefits. This includes:

- Wetlands farmed under natural conditions;
- Farmed wetlands;
- Prior converted cropland;
- Farmed wetland pasture;

- Farmland that has become a wetland as a result of flooding;
- Range land, pasture, or production forest land where the hydrology has been significantly degraded and can be restored;
- Riparian areas which link protected wetlands;
- Lands adjacent to protected wetlands that contribute significantly to wetland functions and values; and
- Previously restored wetlands that need long-term protection.

Ineligible Land. Ineligible land includes wetlands converted after December 23, 1985; lands with timber stands established under a Conservation Reserve Program contract; Federal lands; and lands where conditions make restoration impossible.

Uses of WRP Land

On acreage subject to a WRP easement, participants control access to the land and may lease the land for hunting, fishing, and other undeveloped recreational activities. At any time, a participant may request that additional activities be evaluated to determine if they are compatible uses for the site. This request may include such items as permission to cut hay, graze livestock, or harvest wood products. Compatible uses are allowed if they are fully consistent with the protection and enhancement of the wetland.

For More Information

If you need more information about WRP, please contact your local USDA Service Center, listed in the telephone book under U.S. Department of Agriculture, or your local conservation district. Information also is available on the World Wide Web at: <http://www.nrcs.usda.gov/programs/farmbill/2002/>



Visit USDA on the Web at:
<http://www.usda.gov/farmbill>

APPENDIX G - GRANT INFORMATION SUMMARY FOR CONSERVATION PROJECTS

INTRODUCTION

FOR THE LATEST VERSION OF THIS SUMMARY WITH HYPERLINKS, PLEASE VISIT THE USDA-NRCS WEBSITE AT: <http://www.il.nrcs.usda.gov>

This summary is intended to assist individuals, groups, and local units of government in search of funding or other financial incentives for community-based conservation projects in Illinois. The list is divided into five categories: federal funding sources, state funding sources, other public/private sources, and private sources. A key has been developed to identify eligible groups for each grant after the title of the grant:

Key to group eligibility:

- “I” individuals eligible
- “G” local units of government
- “O” all organizations eligible to apply
- “P” private not-for-profit (501C3) groups only eligible
- “E” educational institutions
- “U” unknown or eligibility varies, need to contact administrators.

For the purposes of this document, conservation is defined as holistically as possible to include grants or financial incentives that enhance the wise use and management of natural and cultural resources in urban, suburban, and rural communities. Some of these grants may not have conservation as a specific goal, but could be used to achieve multiple objectives that include conservation.

The intent of this document is to provide the reader with examples of what is available in financial incentives. Many other funding alternatives exist, and may better fit local needs. This document is provided as a public service and does not constitute a recommendation or endorsement of any particular grant or program; also note that the absence of any particular grant or program does not constitute a negative endorsement. While an effort has been made to provide an accurate listing, funding information is constantly changing and omissions or errors may occur. Please recycle previous editions. For corrections, comments or additional copies of this summary, please contact:

USDA- Natural Resources Conservation Service (NRCS)

ATTN: Keith Eichorst, NRCS Community Planner
313-J Plainfield-Naperville Road, Plainfield, IL 60544
Email: Keith.Eichorst@il.usda.gov

Other sources of information should be consulted and evaluated to insure an informed choice is made before actions are taken.

This section was updated in April 2002.

NRCS IL April 2002

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FEDERAL FUNDING SOURCES

The federal government is an excellent place to investigate funding resources for conservation projects. Once you identify your specific requirements, the Catalog of Federal Domestic Grants (CFDA) is the single best place to look for federal funding sources-the catalog should be available at your local library or you can view the CFDA on-line:

Catalog of Federal Domestic Assistance:

<http://www.cfda.gov>

Web site for federal forms and grant administration procedures:

<http://www.whitehouse.gov/omb/grants/index.html>

Web sites of federal agencies may give you more information about individual government programs as well as provide information on other opportunities for assistance:

United States Department of Agriculture (USDA) Illinois Natural Resources Conservation Service (NRCS):

<http://www.il.nrcs.usda.gov>

Federal Emergency Management Agency (FEMA)

<http://www.fema.gov>

United States Department of Housing and Urban Development (HUD):

<http://www.hud.gov>

United States Environmental Protection Agency (USEPA)

<http://www.epa.gov/ogd>

USEPA Catalog of Funding Sources for Watershed Protection

<http://www.epa.gov/owow/wtr1/watershed/wacademy/fund/wfund.pdf>

Partners for Fish and Wildlife: O, I, E, G.

- Eligible projects include restoration or enhancement of wildlife habitat, does not fund land acquisition or salaries.
- Need to call for application deadlines.
- Matching or in-kind services preferred, 10-year habitat development agreement required.
- Contact the US Fish and Wildlife Service (USFWS) at 847-381-2253 or 309-793-5800 for information.

Northeastern Illinois Wetlands Conservation Account: I, G, O, P, E.

- Eligible projects include restoration, enhancement, and preservation of wetlands. Other eligible projects include those that promote understanding, appreciation, and stewardship of wetlands
- Application deadlines vary. \$5,000-\$150,000 grant range.
- Matching funds preferred but not required. Limited to Northeastern Illinois area.
- Contact the U.S. Fish and Wildlife Service at 847-381-2253 for information.

Challenge Grant Program: O, I, E, G.

- Purpose for wildlife habitat restoration, streambank stabilization, or education.
- Application deadlines from June to August. Grant ranges vary up to \$10,000.
- 50% Match required.
- Contact U.S. Fish and Wildlife Service at 847-381-2253 or 309-793-5800.

US Environmental Protection Agency - Environmental Education Grants: E, P, G.

- Eligible projects include environmental education activities such as curricula design or dissemination, designing or demonstrating educational field methods, and training educators.

- November deadline.
- Requires a minimum of 25% matching funds or in-kind services.
- Contact US Environmental Protection Agency (USEPA) at 312-353-5282.
<http://www.epa.gov/region5/enved>.

Environmental Justice Small Grants: E, P.

- Projects include those that use community-based approaches for environmental protection.
- Project grants shall not exceed \$20,000.
- Contact USEPA at 1-312-353-1440 or 1-800-962-6215.
<http://www.epa.gov/seahome/resources>

Community based Environmental Protection for Communities: U

- Purpose is to provide place-based approaches to address community and environmental approaches to slow the loss of open space, habitat, and wetlands.
- Matching share required.
- Need to call for deadlines
- Contact USEPA at 312-886-4856
<http://www.epa.gov/ecocommunity>

Section 1135 Project Modifications for the Improvement of the Environment: G, P, U.

- Federal funds and technical assistance available for studies, planning, engineering, construction and administration.
- Cost-share up to \$5 million plus non-federal match, 25% for project costs.
- Contact Army Corps of Engineers at 312-353-6400, 309-794-5590 or 314-331-8404.

Section 206 Aquatic Ecosystem Restoration: G, P, U.

- Projects include funding and assistance to carry out ecosystem restoration and enhancement that is documented to be in the public interest, will improve the environment, and is cost effective.
- Federal cost-share of up to \$5 million is available, 35% non-federal cost-share required.
- Contact the Army Corps of Engineers at 312-353-6400, 309-794-5590 or 314-331-8404

Scenic Byway Program: U.

- Purpose is to create or preserve treasured American byways or roads.
<http://www.byways.org>

Federal Tax Incentives for Conservation: I, O, U.

- Owners of environmentally sensitive land that has been donated for conservation purposes, or has been placed in a conservation easement, may qualify for significant federal tax deductions.
- Reference is the Internal Revenue Service (IRS) Code [170(h)].
- Contact the IRS or your federal tax advisor for more information.

STATE FUNDING SOURCES

The State of Illinois administers numerous programs for community-based conservation. Some of the money for these programs originates at the federal level and is “pass-through” funding, but much comes directly from the State.

Useful State websites:

Catalog of State Assistance to Local Governments:

<http://www.legis.state.il.us/commission/igcc/catalog1999.pdf>

Illinois Dept of Natural Resources (IDNR):

<http://www.dnr.state.il.us/finast.htm>

Education grants:

<http://www.dnr.state.il.us/lands/education/classrm/grant>.

Illinois Department of Agriculture (IDOA):

<http://www.agr.state.il.us>

Illinois Environmental Protection Agency (IEPA):

<http://www.epa.state.il.us/>

Illinois FIRST Program: U

-Conservation purposes include brownfield cleanups and construction of trails and parks.

-Contact your local state legislative office for application details.

<http://www100.state.il.us/state/ilfirst>

Hazard Mitigation Assistance Program: G.

-Governments must be enrolled and in good standing with the National Flood Insurance Program (NFIP).

-Eligible initiatives for projects include acquisition of insured structures and underlying real property for open space uses.

-Provides up to 75% of project costs, 25% match required.

-Contact is the Illinois Emergency Management Agency (IEMA) at 217-782-8719.

<http://www.state.il.us/iema>

Non-point Source Management Program (Section 319 grants): G, O.

-Eligible projects include controlling or eliminating non-point pollution sources.

-Application deadline is August.

-Requires 40% matching funds or in-kind services.

-Contact Illinois Environmental Protection Agency (IEPA) at 217-782-3362.

<http://www.epa.state.il.us/water/financial-assistance>

Illinois Clean Lakes Program: G.

-Financial assistance available for lakes over 6 acres that are publicly-owned with public access.

-Application deadline is Aug. 31 (pre-approval) and Oct. 31 (final approval).

-Requires 40% match for phase I, 50% local match for phase II.

-Contact IEPA at 217-782-3362.

<http://www.epa.state.il.us/water/financial-assistance/index.html>

Lake Education Assistance Program: G, E, P.

-Eligible projects include educational programs on inland lakes and lake watersheds.

-Maximum funding of \$500 is reimbursed after completion. Deadlines are Sept. & Jan.

-Contact IEPA at 217-782-3362.

<http://www.epa.state.il.us/water/financial-assistance/index.html>

Priority Lake and Watershed Implementation Program: G.

-Eligible projects include funding to implement protection/restoration practices that improve water quality prioritized publicly-owned lakes.

-Funding up to 100%, projects range from \$5,000 to \$30,000.

-Contact IEPA at 217-782-3362.

<http://www.epa.state.il.us/water/financial-assistance/index.html>

Open Space Lands Acquisition and Development (OSLAD) Program & Open Lands Trust Grant Program: G.

-Eligible projects include money for acquisition and development of public parks for passive recreation/open space.

-Application deadlines vary. Conservation easement required with both programs.

-Funding is reimbursable up to 50% of project costs, reimbursable up to \$2 million for the Trust Grant.
-Contact Illinois Dept. of Natural Resources (IDNR) for both programs at 217-782-7481.
<http://dnr.state.il.us/ocd/>

Greenways and Trails Planning Assistance Program: G.

-Eligible units of government include counties and communities > 10,000
-\$20,000 maximum awarded, 50% in-kind contribution required.
-Must follow a planning process
-Contact IDNR at 217-782-3715
<http://www.dnr.state.il.us/gnthome.htm>

Illinois Trail Grant Programs: G,P,O.

-A collection of various trail programs where eligible projects include acquiring or constructing non-motorized bicycle and snowmobile paths and facilities.
-Deadline is March and May.
-0%-50% match required, depending upon which type of trail grant.
-Contact IDNR at 217-782-7481.
<http://dnr.state.il.us/ocd/gaoutnew.htm>

Urban & Community Forestry Grant Program: G.

-Purpose is to create or enhance local forestry programs in communities with a local forestry ordinance.
-May deadline.
-50% match required, reimbursement up to \$5,000.
-Contact IDNR at 217-782-2361.

Illinois Wildlife Preservation Fund (Small Project Program): I, O, U.

-Eligible projects include those that deal with management, site inventories or on-going education programs.
-Deadline is April.
-Funding up to \$1,000 per project, match preferred but not required.
-Contact IDNR at 217-785-8774.

Small Projects Fund: G.

-Provides assistance to smaller communities for alleviating locally significant drainage and flood problems.
-Provides funding for planning and implementation of flood control projects in accordance with an adopted plan.
-Grants and technical assistance awarded up to \$100,000.
-Contact IDNR-OWR at 217-782-4637.

Schoolyard Habitat Action Grants: E, O.

-Eligible projects include enhancement of wildlife habitat, with emphasis on youth involvement and education.
-Project must involve a trained WILD educator or facilitator, Maximum funding to \$600.
-Application deadline is October.
-Contact the IDNR at 217-524-4126.
<http://dnr.state.il.us/lands/education/CLASSRM/grants>

Conservation 2000 -- Ecosystems Program: O.

-Eligible projects include habitat protection or improvement, technical assistance, and education.
-The Ecosystems Program provides financial and technical support to groups (ecosystem partners) which seek to maintain and enhance ecological and economic conditions in key watersheds of Illinois.
-February deadline, contact IDNR at 217-782-7940.
<http://dnr.state.il.us/c2000>

Illinois Transportation Enhancement Program: G.

-Eligible projects include those that support alternative modes of transportation and that preserve visual and cultural resources, including historic preservation and landscaping beautification.

- Planning is encouraged to be completed now for new disbursements.
- Local 20% match required for projects, 50% match for land acquisition.
- Contact Illinois Dept. of Transportation (IDOT) at 1-800-493-3434.
<http://www.dot.state.il.us>

Learn & Serve Illinois: E.

- Eligible projects include those that combine conservation with hands-on learning in public schools.
- Grades K-12 and regional education offices only eligible, similar program exists for colleges/universities.
- Contact is at 312-814-3606 ggreene@isbe.net
<http://www.isbe.state.il.us/learnservice>

Certified Local Government Program [for historic preservation]: G.

- Eligible projects include historical surveys, education and historical preservation planning.
- October deadline, 40% match required.
- Contact the Illinois Historic Preservation Agency at 217-785-5042.
<http://www.state.il.us/hpa>

Illinois Heritage Grants [for historic preservation]: G, O.

- Eligible projects are those that entail historical construction.
- 40% match required.
- Contact the Illinois Historic Preservation Agency at 217-785-5042
<http://state.il.us/hpa>

State Tax Incentives for Conservation: O, I.

- Urban land that is environmentally sensitive may qualify for significant property tax reductions:
 - Real Property Conservation Rights Act (765 ILCS 120/1 et seq.).
 - If land is qualified by having a conservation easement, it may be assessed at 8 1/3 fair market value.
 - Illinois Natural Areas Preservation Act (525 ILCS 30/1 et seq)/17 Ill Adm. Code.
 - If land is qualified by being designated as an Illinois Nature Preserve, it may be assessed at \$1/year in perpetuity.
 - Open Space Assessment (Illinois Property Tax Code Sections 10-155).
 - A lower use evaluation is used for land in open space, 10 acre minimum area, not applicable in Cook County.
 - Preferential Assessment of Common Areas (Illinois Property Tax Code Sections 10-35).
 - Purpose is to encourage open space in residential developments, if qualifying, assessment is reduced to \$1/year.

Other tax incentives may also apply, contact IDNR regarding the Real Property Conservation Rights Act and the Illinois Natural Areas Preservation Act at 217-785-8774. Contact your local township or county assessor to determine eligibility under the Open Space Assessment and Preferential Assessment of Common Areas.

OTHER PUBLIC/PRIVATE SOURCES

Community Development Assistance Program (Community Development Block Grant): G.

- Eligible projects must include activities that improve community welfare, specifically in moderate or low-income areas. Conservation-related projects can possibly include the acquisition of real property (e.g., flood-prone areas), construction of water or sewer facilities, and initiatives for energy conservation. Funding competition is intense.
- Application deadlines vary; no match required.
- Money originates at the federal level as the Community Development Block Grant and is administered directly to “entitlement” communities such as the urbanized counties in Northeastern Illinois and selected municipalities such as the City of Chicago. In other areas, municipalities and other units of local government should contact their county government to apply for funds from the state under the Community Development Assistance Program. Community groups should work through their local municipality in incorporated areas and the next level of local government (i.e. township or county) in other areas.

Conservation 2000 -- Streambank Stabilization & Restoration Program (SSRP): G, O, I.

- Eligible projects include naturalized stream bank stabilization practices in rural and urban communities.
- Application deadlines are January, May and September.
- 25% match required, 20% for qualified watershed planning areas.
- Contact the local Soil & Water Conservation District that services your county. Offices are listed in the phone book under "local government."

Habitat Restoration Fund for the Fox and Kishwaukee River Watersheds: I, O, E, G.

- Eligible projects include native plantings, upland habitat & wetland restoration.
- Deadlines in March and August.
- 75% cost-share, up to \$5,000.
- Contact the Lake, Kane-DuPage, DeKalb, Boone, McHenry or North Cook Soil and Water Conservation Districts for more information.

Great Lakes Basin Program for Soil Erosion and Sediment Control: U.

- USDA-sponsored projects include protection of Great Lakes Water Quality by controlling erosion and sedimentation (only available in Lake, Cook, and Will Counties). Typical grant amount around \$25,000.
- Application deadline in January.
- Contact the Great Lakes Commission at 734-665-9135.
- <http://www.glc.org/basin/RFP.html>

Chicago Wilderness Small Grants: U.

- Eligible projects include natural areas enhancement, education, and research that focus on biological diversity of northeastern Illinois, northwestern Indiana, and the southeastern Wisconsin region.
- Application deadlines vary, need to call
- 1:1 matching funds or in-kind services required.
- Contact the Chicago Wilderness at 312-346-8166 ext. 30 for information.

Wetland Restoration Fund: G, U.

- Eligible projects include wetlands and other aquatic ecosystem restorations, projects must be in the six-county Chicago metropolitan area and have either a conservation easement or be owned by a government agency.
- Deadline is March and October
- No match required, project site must have a conservation easement, projects range from \$5,000-\$100,000
- Contact Corelands at 312-427-4256, ext. 241.

River Network's Watershed Assistance Grants Program: U.

- Eligible projects include community-based partnerships that conserve or restore watersheds.
- Deadlines are February 18 and June 15
- Grant amounts range from \$1,500-30,000.
- Contact River Network at 503-241-3506 ext. 47.
- <http://www.rivernetwork.org> wag@rivernetwork.org

Community Tree Planting & Partnership Enhancement Monetary Grant Program: P.

- Eligible projects include community tree plantings with seedlings and grants to organizations for urban areas.
- Seedlings are donated directly to organizations conducting the plantings or monetary grants.
- Seedlings must be maintained and reports required for two years after grant award.
- Contact the National Tree Trust at 202-628-8733/Fax-8735 for more information on both these programs.
- <http://www.nationaltreetrust.com>

National Fish and Wildlife Foundation Grants: U.

- Eligible projects include habitat restoration and protection on private lands
- Deadlines vary per individual program
- Sample grant sizes range from under \$5,000 to \$75,000.

-Contact is at 202-857-0166
<http://www.nfwf.org>

North American Lake Management Society: U.

-Grant Programs and other incentives periodically offered to enhance the protection of lake watersheds.
<http://www.nalms.org/>

America the Beautiful Fund: U.

-Free seeds provided in support of USDA-sponsored initiative
-Phone is at 202-638-1649
<http://www.america-the-beautiful.org>

Illinois Conservation Foundation: P, G.

-Eligible projects include those that enhance natural resources.
-February deadlines.
-Grants up to \$5,000.
-Contact is at 312-814-7237
<http://www.icf.org>

PRIVATE SOURCES

Private sources of funding for community and urban conservation projects include corporations and individuals that have established foundations for charitable purposes. Many corporate foundations focus their philanthropy in areas near their operations, so local retailers, businesses, or the local chamber of commerce might be a source of revenue for your project. Most, but not all, require that the group applying for funding be sponsored by a not-for-profit [501(c)(3)] corporation. Information about private foundations can be identified through organizations that specialize in grant information research. Fees for services or products may be charged by these organizations, so be sure to clarify if charges will be incurred. For “do-it-yourselfers,” local grant data collection centers are available throughout Illinois and in convenient Indiana and Missouri locations:

Resources for Global Sustainability

P.O. Box 3665, Cary, NC 27519.
1-800-724-1857
RGS publishes a yearly catalog called
“Environmental Grantmaking Foundations”
<http://www.environmentalgrants.com>

The Foundation Center.

79 Fifth Street, New York, New York 10003.
1-212-620-4230
<http://www.fdncenter.org>

Sonoran Institute

Useful web site in identifying resources:
<http://www.sonoran.org/cat/search.asp>

State Of Illinois Grant Data Collection Centers **Foundation Center Cooperating Collections**

The Donor’s Forum of Chicago.

-208 S. LaSalle St., Suite 735, Chicago, IL 60604.
-312-578-0175.
<http://www.donorsforum.org> info@donorsforum.org.

Metropolitan Association for Philanthropy, Inc

1 Metropolitan Square, Suite 1295
211 North Broadway St. Louis, MO 63102
314-621-6220
<http://www.mapstl.org>

Evanston Public Library.

-1703 Orrington Ave Evanston, IL 60201.
-847-866-0305.

Evansville -Vanderburgh County Public Library

-22 Southeast Fifth St., Evansville, IN 47708
-812-428-8218

Rock Island Public Library

-401 -19th St. Rock Island, IL
-309-732-7323
<http://www.rbls.lib.il.us/rip/index.html>

University of Illinois at Springfield (Brookens Library)

-Shepherd Rd. Springfield, IL 62794
-217-206-6633
<http://www.uis.edu/library/fdc.htm>

Vigo County Public Library

-1 Library Sq. Terre Haute, IN 47807
-812-232-1113

Examples of private grant sources for community-based conservation projects include:

Kodak American Greenways Awards Program: P, G.

-Eligible projects include greenway and trail projects.
-Grants range from \$500-\$2,500.
-Contact Greenways Coordinator at 703-525-6300 or <http://www.conservationfund.org>
-leighannemcdonald@conservationfund.org.

Chicago Community Trust: P

222 N. LaSalle St. Ste 1400 (Chicago area only)
Chicago, IL 60601 312-372-3356
<http://www.cct.org> info@cct.org

Exxon-mobile Educational Foundation: U, P.

-Emphasis is on conservation and education.
-Contact is at 1-972-444-1104.
<http://www.exxon.mobile.com>

Field Foundation of Illinois: P.

-Funding restricted to six-county Chicago metropolitan area.
-Focus is on prevention and reduction of pollution and preservation and protection of the natural environment.
-Call 312-831-0910 for more information.

Gaylord and Dorothy Donnelley Foundation: U, P.

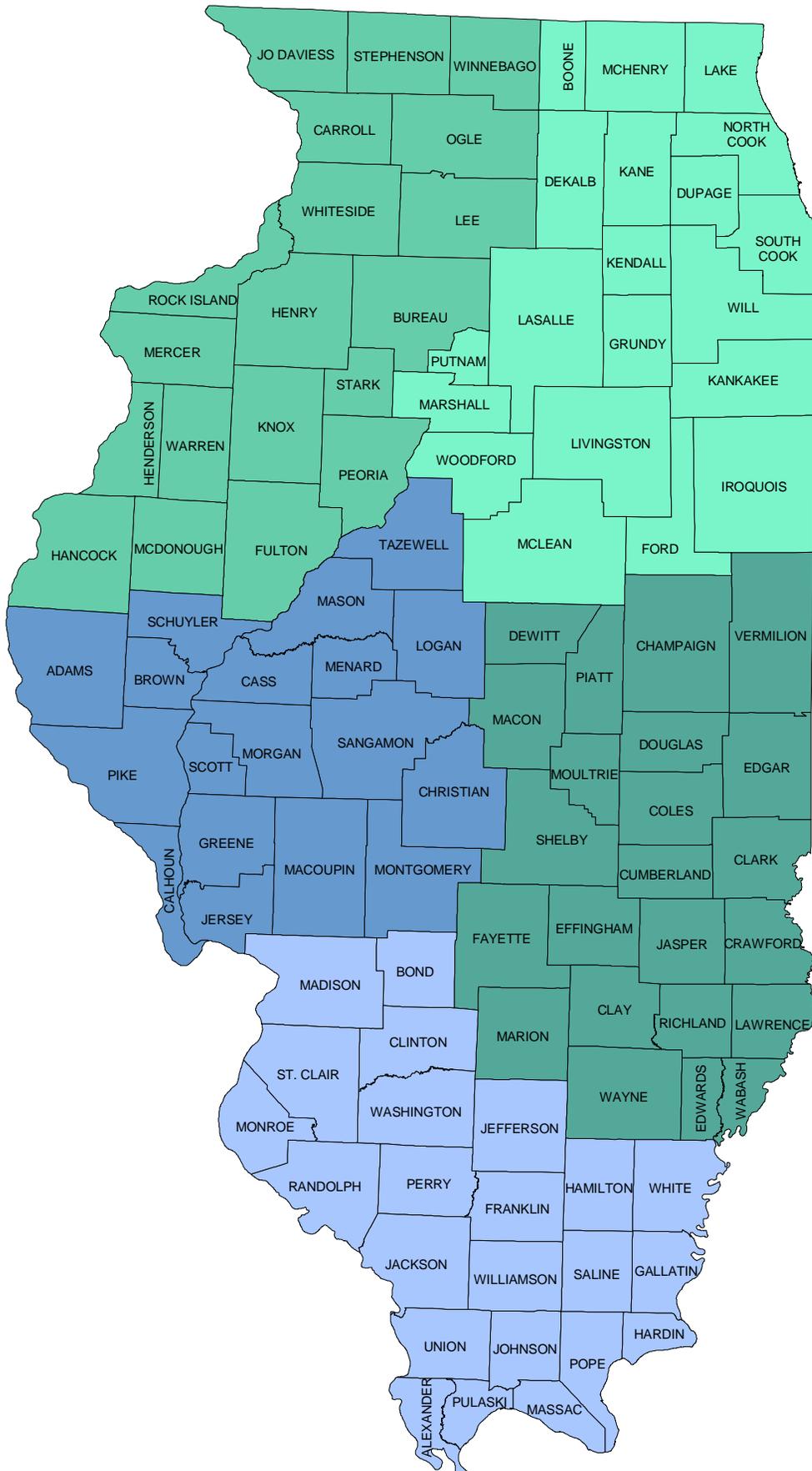
-Eligible projects primarily conservation. Chicago area only, sample grants from \$3,000-\$50,000 range.
-Contact for deadlines.
-Contact is at 35 E. Wacker Drive, Ste. 2600, Chicago, IL 60601, ATTN: Judith Stockdale.
-Phone is at 312-977-2700.
<http://www.gddf.org>

Wildlife Links: I, G, O

-Eligible projects include management & education projects for conservation on golf courses.
-Contact National Fish & Wildlife Foundation at 202-857-0166
<http://www.nfwf.org>

IL NRCS/SWCD Office Directory

Click on colored region
for list of office information



Area 1 Field Offices

The toll free number for voicemail is 1-877-902-9599. When prompted, enter the voice mail number.

Anna Field Office/Union SWCD

201 Springfield Avenue, Suite C, Anna, Illinois 62906
Ph. 618.833.5666 ext. 3

Fax: 618.833.3608

Name	Position		Voicemail:
Richard A. Miller	District Conservationist	ext. 108	None

Belleville Field Office/St. Clair SWCD

2031 Mascoutah Avenue, Belleville, Illinois 62220
NRCS Fax: Ph. 618.235.2500 ext. 3
618.235.3847

SWCD Fax: 618.233.5028

St. Clair County SWCD Website: www.compu-type.net/stccswcd/

Name	Position		Voicemail:
John F. Harryman	District Conservationist	ext. 104	None

Benton Field Office/Franklin SWCD

711 N. DuQuoin Street, Benton, Illinois 62812
Ph. 618.438.5872 ext. 3

Fax: 618.435.3102

Name	Position		Voicemail Ext.:
Diane Wallace	District Conservationist	ext. 108	None

Breese Field Office/Clinton SWCD

1780 N. 4th Street, Breese, Illinois 62230
Ph. 618.526.7919 ext. 3

Fax: 618.526.8021

Name	Position		Voicemail:
Howard E. Zenner	District Conservationist	ext. 108	None

Carmi Field Office/White SWCD

1105 W. Main Street, Carmi, Illinois 62821
Ph. 618.382.2213 ext. 3

Fax: 618.382.5801

Name	Position		Voicemail Ext.:
John H. Wheeler	District Conservationist	ext. 110	None

Edwardsville Field Office/Madison SWCD

7205 Marine Road, Edwardsville, Illinois 62025

Ph. 618.656.4710 ext. 3

Fax: 618.656.5187

Name	Position		Voicemail:
Danny L. Steinman	District Conservationist	ext. 109	None

Greenville Field Office/Bond SWCD

1111 East Harris Avenue, Greenville, Illinois 62246

Ph. 618.664.0555 ext. 3

Fax: 618.664.3958

Name	Position		Voicemail:
Daniel G. Mueller	District Conservationist	ext. 109	None

Harrisburg Field Office/Saline SWCD

807 S. Commercial Street, Harrisburg, Illinois 62946

Ph. 618.252.8621 ext. 3

Fax: 618.252.2295

Name	Position		Voicemail:
James R. Warder	District Conservationist	ext. 109	None

Marion Field Office/Williamson SWCD

712 N. Carbon Street, Marion, Illinois 62959

Ph. 618.993.5396 ext. 3

Fax: 618.997.3126

Name	Position		Voicemail Ext.:
V. Tony Korando	District Conservationist	ext. 112	None

McLeansboro Field Office/Hamilton SWCD

R.R. #5, P.O. Box 277, McLeansboro, Illinois 62859-0277

FedEx/UPS deliveries – Rt. 14 East, McLeansboro, IL 62859

Ph. 618.643.4326 ext. 3

Fax: 618-643-2459

Name	Position		Voicemail Ext.:
Rhonda A. Cox	District Conservationist	ext. 110	None

Metropolis Field Office/Massac SWCD — (Serviced by Vienna FO)

1438 W. 10th Street, Metropolis, Illinois 62960

Ph. 618.524.9367

Fax: 618.524.3948

Mt. Vernon Field Office/Jefferson SWCD

109 Shiloh Drive, Mt. Vernon, Illinois 62864

Ph. 618.244.0773 ext. 3

Fax: 618.244.5942

Name	Position		Voicemail:
Arthur J. Friederich, Jr.	District Conservationist	ext. 108	None

Murphysboro Field Office/Jackson SWCD

1213 N. 14th Street, Murphysboro, Illinois 62966

Ph. 618.684.3064 ext. 3

Fax: 618.684.3980

Name	Position		Voicemail:
W. Scott Martin	District Conservationist	ext. 110	None

Nashville Field Office/Washington SWCD

424 East Holzhauer Drive, Nashville, Illinois 62263

Name Position Ph. 618.327.8862 ext. 3

Vacant District Conservationist ext. 102 Fax: 618.327.9317

Voicemail: None

Pinckneyville Field Office/Perry SWCD

HWY 127 North, P.O. Box 146, Pinckneyville, Illinois 62274

(UPS/FED Ex - 617 N. Main Street)

Ph. 618.357.6016 ext. 3

Fax: 618-357-3038

Name	Position		Voicemail:
Robert L. Spencer	District Conservationist	ext. 107	None

Pope-Hardin SWCD Office — (Serviced by Ridgway (Hardin) & Vienna (Pope) FOs)

PO Box 27, Golconda, Illinois 62938

Ph. 618.683.2651

Fax: 618-683-2651 *(Same as Phone)*

Ridgway Field Office/Gallatin SWCD — (Servicing Gallatin, & Hardin Cos.)

1000 W. Main Street, Ridgway, Illinois 62979

Ph. 618.272.4521 ext. 3

Fax: 618.272.7204

Name	Position		Voicemail:
Rick W. Street	District Conservationist	ext. 106	None

Sparta Office/Randolph SWCD

313 W. Belmont Street, Sparta, Illinois 62286

Ph. 618.443.4382 ext. 3

Fax: 618.443.4699

Name	Position		Voicemail Ext.:
Andrew W. Schlichting	District Conservationist	ext. 108	None

Tamms Office/Alexander-Pulaski SWCD

505 Front Street, P.O. Box 159, Tamms, Illinois 62988

Ph. 618.747.2305 ext. 3

Fax: 618.747.9210

Name	Position		Voicemail:
Arthur L. Houseman	District Conservationist	ext. 108	None

Vienna Office/Johnson SWCD – (Servicing Johnson, Massac, & Pope Cos.)

807 North 1st. Street, Vienna, Illinois 62995

Ph. 618.658.3411 ext. 3

Fax: 618.658.9600

Name	Position		Voicemail:
Keith C. Bell	District Conservationist Team Leader	ext. 209	None

Waterloo Office/Monroe SWCD

140 Williamsburg Lane, Waterloo, Illinois 62298

Ph. 618.939.6181 ext. 3

Fax: 618.939.4647

Name	Position		Voicemail:
Bobby G. Stewart	District Conservationist	ext. 106	None

Area 2 Field Offices

The toll free number for voicemail is 1-877-902-9599. When prompted, enter the voice mail number.

Carlinville Field Office/Macoupin SWCD

300 Carlinville Plaza, Carlinville, Illinois 62626

Ph. 217.854.2626 ext. 3

Fax: 217.854.4102

Name	Position		Voicemail:
David Rahe	District Conservationist	ext. 116	None

Carrollton Field Office/Greene SWCD

R.R. 3, Box 129, Route 267 North, Carrollton, Illinois 62016

Ph. 217.942.5464 ext. 3

Fax: 217.942.6225

Name	Position		Voicemail:
Vacant	District Conservationist	ext. 112	None

Hardin Field Office/Calhoun SWCD

RR 2, PO Box 516, Hardin Illinois 62047

FEDEX/UPS delivery address:RR2 Hwy 100, Box 80, Hardin, IL 62047

Ph. 618.576.2717 ext. 3

Fax: 618.576.2328

Name	Position		Voicemail:
Jacquie L. Simon	District Conservationist (Jerseyville & Hardin FOs)	ext. 109	4355

Havana Field Office/Mason SWCD

930 E. Laurel Avenue, Havana, Illinois 62644

Ph. 309.543.6075 ext. 3

Fax: 309.543.3154

Name	Position		Voicemail:
Kevin W. Donoho	District Conservationist	ext. 101	None

Hillsboro Field Office/Montgomery SWCD

1621 Vandalia Road, Suite D, Hillsboro, Illinois 62049

Ph. 217.532.3610 ext. 3

Fax: 217.532.7813

Name	Position		Voicemail:
Joseph C. Liddell	District Conservationist	ext. 111	4250

Jacksonville Field Office/Morgan SWCD – (Servicing Morgan & Scott Cos.)

1904 West Lafayette, Jacksonville, Illinois 62650

Ph. 217.243.1535 ext. 3

Fax: 217.245.0371

Name	Position	Voicemail:
Matthew E. Bungler	District Conservationist (Jacksonville & Winchester FOs)ext. 118	4065

Jerseyville Field Office/Jersey SWCD

604 East Franklin, Jerseyville, Illinois 62052-9701

Ph. 618.498.6836 ext. 3

Fax: 618.498.2556

Name	Position	Voicemail:
Jacquie L. Simon	District Conservationist (Jerseyville & Hardin FOs)ext. 109	4355

Lincoln Field Office/Logan SWCD

1650 5th Street Road, Lincoln, Illinois 62656

Ph. 217.735.5508 ext. 3

Fax: 217.732.9916

Name	Position	Voicemail:
William M. Dickerson, Jr.	District Conservationist ext. 112	None

Mt. Sterling Field Office/Brown SWCD

511 E. Main Street, Mt. Sterling, Illinois 62353-1378

Ph. 217.773.3993 ext. 3

Fax: 217.773.2236

Name	Position	Voicemail:
Gary J. Lawrence	District Conservationist ext. 110	None

Pekin Field Office/Tazewell SWCD

2934 Court Street, Pekin, Illinois 61554

Ph. 309.346.4462 ext. 3

Fax: 309.346.4223

Name	Position	Voicemail:
Timothy A. Malone	District Conservationist(TDD) 888.801.7210 + Ph. & ext. 111 (TDD) 800.526.0857 + Cel Ph. 309.267.4462	4515

Petersburg Field Office/Menard SWCD

RR 3, Box 16, Petersburg, Illinois 62675

Ph. 217.632.2431 ext. 3

Fax: 217.632.4297

Name	Position	Voicemail:
Robert E. TeRonde	District Conservationist ext. 107	None

Pittsfield Field Office/Pike SWCD

1319 W. Washington Street, Pittsfield, Illinois 62363

Ph. 217.285.5448 ext. 3

Fax: 217.285.6121

Name	Position		Voicemail:
Jill A. Keeton	District Conservationist	ext. 112	None

Quincy Field Office/Adams SWCD

338 South 36th, Quincy, Illinois 62301

Ph. 217.224.9307 ext. 3

Fax: 217.224.4969

Name	Position		Voicemail:
John R. Gunther	District Conservationist	ext. 120	None

Rushville Field Office/Schuyler SWCD

RR 4, P.O. Box 290, Rushville, Illinois 62681-0290

Ph. 217.322.3359 ext. 3

Fax: 217.322.4988

Name	Position		Voicemail Ext.:
Leland H. Hardy	District Conservationist	ext. 112	None

Springfield Field Office/Sangamon SWCD

Farmers Union Bldg., 40 Adloff Lane, Ste 3, Springfield, Illinois 62703

Ph. 217.241.6635 ext. 3

Fax: 217.241.6644

Name	Position		Voicemail:
Harold B. Pyle	District Conservationist	ext. 112	None

Taylorville Field Office/Christian SWCD

951-2 W. Spresser Street, Taylorville, Illinois 62568

Ph. 217.824.2123 ext. 3

Fax: 217.824.4179

Christian County SWCD Website: www.chipsnet.com/ccswcd/

Name	Position		Voicemail:
Eric A. Gerth	District Conservationist	ext. 110	None

Virginia Field Office/Cass SWCD

652 South Main Street, Virginia, Illinois 62691

Ph. 217.452.3535 ext. 3

Fax: 217.452.3553

Name	Position		Voicemail:
Rhonda L. Holliday	District Conservationist	ext. 103	None

Winchester Field Office/Scott SWCD — (Serviced by Jacksonville FO)

R.R. 2, Box 174B, Winchester, Illinois 62694

Ph. 217.742.9561 ext. 3

Fax: 217.742.3369

Name	Position	Voicemail:
Matthew E. Bungler	District Conservationist (Jacksonville & Winchester FOs)ext. 106	4065

Area 3 Field Offices

The toll free number for voicemail is 1-877-902-9599. When prompted, enter the voice mail number.

Belvidere Field Office/Boone SWCD

211 North Appleton Road, P.O. Box 218, Belvidere, Illinois 61008-0218

Ph. 815.544.2677 ext. 3

Fax: 815.544.4281

Name	Position		Voicemail:
Lewis E. Nichols	District Conservationist	ext. 108	None

Bourbonnais Field Office/Kankakee SWCD

685 Larry Power Road, Bourbonnais, Illinois 60914

Ph. 815.937.3233 ext. 3

Fax: 815.937.3268

Name	Position		Voicemail:
Robert J. Gotkowski	District Conservationist	ext. 111	None

Eureka Field Office/Woodford SWCD

937 W. Center Street, Eureka, Illinois 61530

Ph. 309.467.2387 ext. 3

Fax: 309.467.2660

Name	Position		Voicemail:
Mark Jacob	District Conservationist	ext. 111	4195

Grayslake Field Office/Lake SWCD

100 North Atkinson Road, Suite 102A, Grayslake, Illinois 60030-7805

Ph. 847.223.1056

Fax: 847.223.1127

Website: www.lakeswcd.org • E-Mail: lcswcd@mcs.net

Name	Position		Voicemail:
David J. Misek	District Conservationist		None

Henry Field Office/Marshall-Putnam SWCD

RR 1, Box 213, Henry, Illinois 61537-9764

Ph. 309.364.3913 ext. 3

Fax: 309.364.3802

Name	Position		Voicemail:
W. Randy Edwards	District Conservationist	ext. 107	None

Morris Field Office/Grundy SWCD

3585 North Illinois Route 47, Morris, Illinois 60450

Ph. 815.942.0359 ext. 3

Fax: 815.942.5379

Name	Position		Voicemail:
Jeffrey S. White	District Conservationist	ext. 112	None

New Lenox Field Office/Will-South Cook SWCD – (Servicing S. Cook, & Will Cos.)

1201 S. Gougar Road, New Lenox, Illinois 60451

Ph. 815.462.3106 ext. 3

Fax: 815.462.3176

Name	Position		Voicemail:
Robert A. Jankowski	District Conservationist	ext. 109	4205

Normal Field Office/McLean SWCD

402 North Kays Drive, Normal, Illinois 61761

Ph. 309.452.0830 ext. 3

Fax: 309.452.6642

Name	Position		Voicemail:
Kent L. Bohnhoff	District Conservationist	ext. 113	None

Ottawa Field Office/Lasalle SWCD

1691 North 31st Road, Ottawa, Illinois 61350

Ph. 815.433.0551 ext. 3

Fax: 815.433.0665

Name	Position		Voicemail:
Paul W. Youngstrum	District Conservationist	ext. 115	None

Paxton Field Office/Ford SWCD — (Also Serviced by Pontiac FO)

1380 West Ottawa, P.O. Box 232, Paxton, Illinois 60957-0232

Ph. 217.379.2371 ext. 3

Fax: 217.379.4701

Name	Position	Ph. 217.379.2371 ext. 3	Voicemail:
Gregory S. Hinthorn	Soil Conservationist	ext. 107	None

Pontiac Field Office/Livingston SWCD— (Servicing Ford Co.-Paxton FO)

1510 West Reynolds, Box 80, Pontiac, Illinois 61764

Ph. 815.844.6127 ext. 3

Fax: 815.844.6344

Name	Position		Voicemail:
Mark S. Baran	District Conservationist	ext. 117	None

St. Charles Field Office/Kane-DuPage SWCD

545 Randall Road, St. Charles, Illinois 60174

Ph. 630.584.8240 ext. 3

Fax: 630.584.9534

Name	Position		Voicemail:
Thomas P. Ryterske	District Conservationist	ext. 104	None

Streamwood Field Office/North Cook SWCD

P.O. Box 407, Streamwood, Illinois 60107

FedEx Mailings: 899 Jay Street, Elgin, IL 60120

Ph. 847.608.8165 ext. 2

Fax: 847.608.8302

Name	Position		Voicemail:
James P. Rospopo	District Conservationist	ext. 2	None

Sycamore Field Office/Dekalb SWCD

1350 West Prairie Drive, Sycamore, Illinois 60178

Ph. 815.756.3236 ext. 3

NRCS Fx: 815.756.1170 SWCD Fx: 815.756.1132

Name	Position		Voicemail:
Michael L. Richolson	District Conservationist	ext. 108	None

Watseka Field Office/Iroquois SWCD

1001 E. Grant Street, Suite A, Watseka, Illinois 60970

Ph. 815.432.3946 ext. 3

Fax: 815.432.5740

Name	Position		Voicemail:
L. Mike Kiefer	District Conservationist	ext. 102	None

Woodstock Field Office/McHenry SWCD

1143 North Seminary Avenue, P.O. Box 168, Woodstock, Illinois 60098

Ph. 815.338.0099 ext. 3

Fax: 815.338.773

McHenry County SWCD Website: <http://user.mc.net/~mcsxcd/>

Name	Position		Voicemail:
David J. Brandt	District Conservationist	ext. 111	None

Yorkville Field Office/Kendall SWCD

7775A, Route 47, Yorkville, Illinois 60560

Ph. 630.553.5457 ext. 3

Fax: 630.553.7442

Name	Position		Voicemail:
Catherine Hadley	District Conservationist	ext. 107	None

Area 4 Field Offices

The toll free number for voicemail is 1-877-902-9599. When prompted, enter the voice mail number.

Aledo Field Office/Mercer SWCD

308 SE 8th Avenue, Aledo, Illinois 61231

Ph. 309.582.5153 ext. 3

Fax: 309.582.5308

Name	Position		Voicemail:
Jason L. Hessman	District Conservationist	ext. 110	None

Amboy Field Office/Lee County

319 South Mason Avenue, Amboy, Illinois 61310

Ph. 815.857.3621 ext. 3

Fax: 815.857.2711

Website: www.svonline.net/~lcswc/

Name	Position		Voicemail:
Joseph B. Sullivan	District Conservationist	ext. 107	None

Cambridge Field Office/Henry SWCD

301 E. North Street, Cambridge, Illinois 61238

Ph. 309.937.5263 ext. 3

Fax: 309.937.2171

Name	Position		Voicemail:
Richard L. Stewart	District Conservationist	ext. 115	4405

Carthage Field Office/Hancock SWCD

110 Buchanan Street, Carthage, Illinois 62321

Ph. 217.357.2180 ext. 3

Fax: 217.357.3412

Name	Position		Voicemail:
Lori O. Bollin	District Conservationist	ext. 101	None

Elizabeth Field Office/Jo Daviees SWCD

227 N. Main Street, P.O. Box 502, Elizabeth, Illinois 61028-0502

Ph. 815.858.3418 ext. 3

Fax: 815.858.3694

Jo Daviees County SWCD

Website: www.humuss.com/jdswcd/

Name	Position		Voicemail:
Jerry J. Misek	District Conservationist	ext. 108	None

Freeport Field Office/Stephenson SWCD

1620 South Galena Avenue, Freeport, Illinois 61032

Ph. 815.235.2161 ext. 3

Fax: 815.233.3219

Name	Position		Voicemail:
James A. Ritterbusch	District Conservationist	ext. 111	4320

Galesburg Field Office/Knox SWCD

233 South Soangetaha Road, Galesburg, Illinois 61401

Ph. 309.342.5714 ext. 3

Fax: 309.342.2259

Name	Position		Voicemail:
Ronald A. Hall	District Conservationist	ext. 113	None

Lewistown Field Office/Fulton SWCD

15381 N. State HWY 100, Lewistown, Illinois 61542

Ph. 309.547.2215 ext. 3

Fax: 309.547.3439

Name	Position		Voicemail:
Kim D. Smail	District Conservationist	ext. 114	None

Macomb Field Office/McDonough SWCD

1607 West Jackson Street, Macomb, Illinois 61455

Ph. 309.833.1711 ext. 3

Fax: 309.837.1512

Name	Position		Voicemail:
Greg E. Jackson	District Conservationist	ext. 109	None

Milan Field Office/Rock Island SWCD

3020 E. First Avenue, Milan, Illinois 61264

Ph. 309.764.1486 ext. 3

Fax: 309.764.1830

Name	Position		Voicemail:
Joseph S. Gates	District Conservationist	ext. 106	None

Monmouth Field Office/Warren SWCD

701 N. Main Street, Monmouth, Illinois 61462

Warren County SWCD Website: www.maplecity.com/~swcd/

Ph. 309.734.8569 ext. 3

Fax: 309.734.8337

Name	Position		Voicemail:
Catherine A. Olson	District Conservationist (Monmouth & Stronghurst FOs)	ext. 113	4305

Morrison Field Office/Whiteside SWCD

16255 Liberty Street, RR1, Morrison, Illinois 61270

Ph. 815.772.2124 ext. 3

Fax: 815.772.7973

Name	Position		Voicemail:
Mark R. Kaiser	District Conservationist	ext. 104	4215

Mt. Carroll Field Office/Carroll SWCD

807C South Clay Street, Mt. Carroll, Illinois 61053

Ph. 815.244.8732 ext. 3

Fax: 815.244.3836

Name	Position		Voicemail:
James B. Dykema	District Conservationist	ext. 109	None

Oregon Field Office/Ogle SWCD

Ogle County Resource Center, 213 West Pines Road, Oregon, Illinois 61061

Ph. 815.732.6127 ext. 3

Fax: 815.732.3246

Name	Position		Voicemail:
Daniel M. Pierce	District Conservationist	ext. 112	None

Peoria Field Office/Peoria SWCD

2412 West Nebraska Avenue, Peoria, Illinois 61604

Ph. 309.671.7040 ext. 3

Fax: 309.671.7325

Name	Position		Voicemail:
Jon A. Hubbert	District Conservationist	ext. 106	None

Princeton Field Office/Bureau SWCD

312 East Backbone Road, Suite A, Princeton, Illinois 61356

Ph. 815.875.8732 ext. 3

Fax: 815.872.1365

Name	Position		Voicemail:
Roderick R. Kuykendall	District Conservationist	ext. 118	4060

Rockford Field Office/Winnebago SWCD

4833 Owen Center Road, Rockford, Illinois 61101

Ph. 815.987.4247 ext. 3

Fax: 815.987.4244

Name	Position		Voicemail:
Edward A. Johnston	District Conservationist	ext. 133	None

Stronghurst Field Office/Henderson SWCD

323 E. Main Street, P.O. Box 485, Stronghurst, Illinois 61480

Ph. 309.924.1167 ext. 3

Fax: 309.924.1431

Name	Position	Voicemail:
Catherine A. Olson	District Conservationist (Monmouth & Stronghurst FOs)ext. 109	None

Toulon Field Office/Stark SWCD

322A South Downend, Toulon, Illinois 61483

Ph. 309.286.2261 ext. 3

Fax: 309.286.7468

Name	Position	Voicemail:
Ramiro Cordero	District Conservationist ext. 108	None

Area 5 Field Offices

The toll free number for voicemail is 1-877-902-9599. When prompted, enter the voice mail number.

Champaign Field Office/Champaign SWCD – (Servicing Champaign & Ford Cos.)

2110 W. Park Court, Suite C, Champaign, Illinois 61821

Ph. 217.398.5201 ext. 3

Fax: 217-398-5200

Name	Position		Voicemail:
Leon W. Wendte	District Conservationist	ext. 114	None

Charleston Field Office/Coles SWCD

990B West State Street, Charleston, Illinois 61920

Ph. 217.345.3901 ext. 3

Fax: 217.345.9669

Name	Position		Voicemail:
Andrew B. Cerven	District Conservationist	ext. 3	None

Clinton Field Office/DeWitt SWCD

RR4 Box 344A, Clinton, IL 61727

Ph. 217.935.6504

Fax: 217.935.6731

Name	Position		Voicemail:
Scott W. Wallace	District Conservationist	ext. 107	None

Danville Field Office/Vermilion SWCD

1905A U.S. Route 150, Danville, Illinois 61832

Ph. 217.442.8511

Fax: 217.442.6998

Name	Position		Voicemail:
Glen O. Franke	District Conservationist	8511	None

Decatur Field Office/Macon SWCD

4004 College Park Road, Decatur, Illinois 62521

Ph. 217.877.5670 ext. 3

Fax: 217.877.4667

Macon Co. SWCD Website: www.fgi.net/~macnswcd

Name	Position		Voicemail:
Karen D. Brinkman	District Conservationist	ext. 110	None

Edwards County SWCD Office — (Serviced by Fairfield FO)

90 W. Pine Street, Albion, Illinois 62806

Ph. 618.445.3615

Fax: 618.445.3838

Effingham Field Office/Effingham SWCD

2301 Hoffman Drive, Effingham, Illinois 62401

Ph. 217.347.7107 ext. 3

Fax: 217.342.9855

Name	Position		Voicemail:
Bart C. Pals	District Conservationist	ext. 3	None

Fairfield Field Office/Wayne SWCD (Servicing Edwards & Wayne Cos.)

23 Industrial Drive, Suite 3, Fairfield, Illinois 62837

Ph. 618.847.7516 ext. 3

Fax: 618.842.3332

Name	Position		Voicemail:
Bruce E. Currie	District Conservationist	ext. 105	None

Lawrenceville Field Office/ Lawrence SWCD – (Servicing Lawrence & Wabash Cos.)

2812 West Haven Road, Lawrenceville, Illinois 62439

Ph. 618.943.2621 ext. 3

Fax: 618.943.5613

Name	Position		Voicemail:
James D. Moyer	District Conservationist	ext. 110	4285

Louisville Field Office/Clay SWCD

RR 3, Box 41C, Louisville, Illinois 62858

Ph. 618.665.3327 ext. 3

Fax: 618.665.3385

Name	Position		Voicemail:
Laurie L. King	District Conservationist	ext. 111	None

Martinsville Field Office/Clark SWCD

1001 N. York, Martinsville, Illinois 62442

Ph. 217.382.4123 ext. 3

Fax: 217.382.4315

Name	Position		Voicemail:
John Schuler	District Conservationist	ext. 101	None

Monticello Field Office/ Piatt SWCD

4005 Bear Lane, Monticello, Illinois 61856

Ph. 217.762.2571 ext. 3

Fax: 217.762.8022

Name	Position		Voicemail:
Kathleen S. Judd	District Conservationist	ext. 3	None

Mt. Carmel Office/Wabash SWCD — (Serviced by Lawrenceville FO)

USDA Bldg, 219 W. 9th Street, Mt. Carmel, Illinois 62863

Ph. 618.262.4962

Fax: 618.262.7462

Newton Field Office/Jasper SWCD

1403 Clayton Avenue, Newton, Illinois 62448

Ph. 618.783.2319 ext. 3

Fax: 618.783.2374

Name	Position		Voicemail:
Dennis D. Clancy	District Conservationist	ext. 107	None

Olney Field Office/Richland SWCD

821A South West Street, Olney, Illinois 62450

Ph. 618.392.7141 ext. 3

Fax: 618-392-4325

Name	Position		Voicemail:
Vacant	District Conservationist	ext. 110	None

Paris Field Office/Edgar SWCD

11757 IL HWY 1, Paris, Illinois 61944-2212

Ph. 217.465.5325 ext. 3

Fax: 217.466.1130

Name	Position		Voicemail:
Raymond E. Coombes	District Conservationist	ext. 108	None

Robinson Field Office/Crawford SWCD

1212 N. Allen Street, Robinson, Illinois 62454

Ph. 618.544.7517 ext. 3

Fax: 618.544.8961

Name	Position		Voicemail:
John R. Pearse	District Conservationist	ext. 109	None

Salem Field Office/Marion SWCD

1550 E. Main, Salem, Illinois 62881

Ph. 618.548.2230 ext. 3

NRCS Fx: 618.548.2341

SWCD Fx: 618.548.0298

Name	Position		Voicemail:
D. Anthony Antonacci, Jr.	District Conservationist	ext. 101	None

Shelbyville Field Office/ Shelby SWCD – (Servicing Moultrie & Shelby Cos.)

111 N. Cedar, Suite 3, Shelbyville, Illinois 62565

Ph. 217.774.5564 ext. 3

Fax: 217.774.2171

Name	Position	Voicemail:
Gene Davis, Jr.	District Conservationist (Shelbyville & Sullivan FOs)ext. 114	None

Sullivan Field Office/Moultrie SWCD — (Serviced by Shelbyville FO)

1412 South Hamilton, Sullivan, Illinois 61951

Ph. 217.728.8813 ext. 3

Fax: 217.728.4031

Name	Position	Voicemail:
Gene Davis, Jr.	District Conservationist (Shelbyville & Sullivan FOs)ext. 108	None

Toledo Field Office/Cumberland SWCD

201 East Main, Toledo, Illinois 62468

Ph. 217.849.2201 ext. 3

Fax: 217.849.2003

Name	Position	Voicemail:
Wayne W. JohannIng	District Conservationist ext. 104	None

Tuscola Field Office/Douglas SWCD

900 South Washington, Box 2D, Tuscola, Illinois 61953

Ph. 217.253.2022 ext. 3

Fax: 217.253.4359

Douglas Co. SWCD Website: www.staff.uiuc.edu/~m-ragheb/no-till/swcd.html

Name	Position	Voicemail:
Benard Mingo	District Conservationist ext. 109	None

Vandalia Field Office/Fayette SWCD

301 South Third Street, Vandalla, Illinois 62471

Ph. 618.283.1095 ext. 3

Fax: 618.283.4962

Name	Position	Voicemail:
Mary Ann Hoeffliger	District Conservationist ext. 112	4175

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