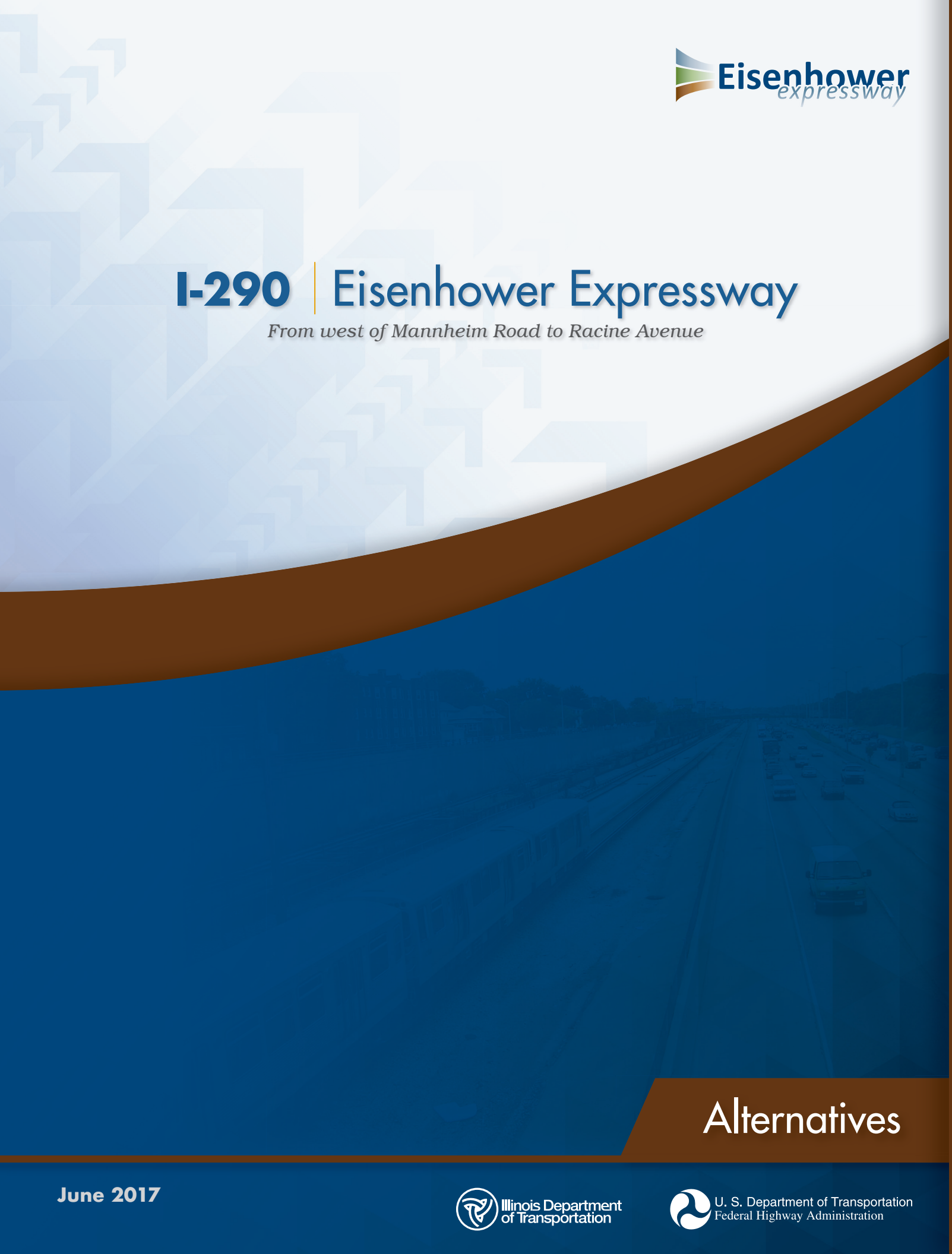
Eisenhower expressway

I-290 | Eisenhower Expressway

From west of Mannheim Road to Racine Avenue



SECTION 2.0
Alternatives

Alternatives

June 2017

Illinois Department of Transportation

U. S. Department of Transportation
Federal Highway Administration

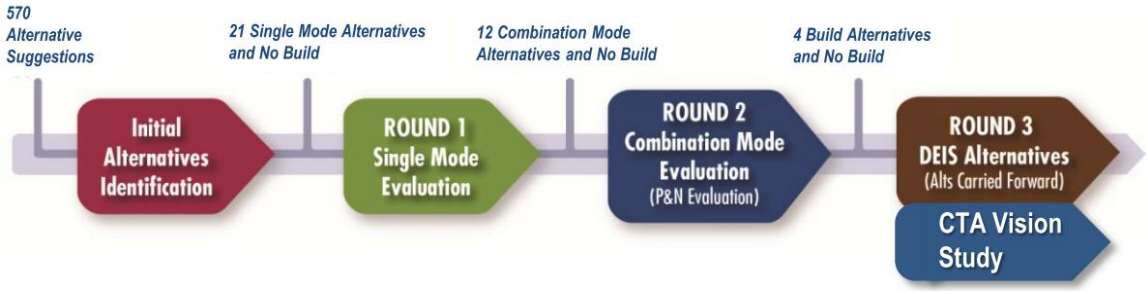
2.0 Alternatives

There have been no substantive changes to this section since publication of the DEIS.

2.1 Introduction

The process for developing and evaluating alternatives for the Interstate 290 (I-290) Eisenhower Expressway multimodal corridor consisted of four sequential steps, as shown in Figure 2-1.

Figure 2-1. Alternatives Development and Evaluation Process



Through these four consecutive steps, a wide range of alternatives were identified, evaluated, and screened, resulting in the identification of four build alternatives and the No Build Alternative to be carried forward into the Draft Environmental Impact Statement (DEIS) for more detailed evaluation. A range of factors was considered in the evaluation process, including how well the alternatives addressed the Purpose and Need (i.e., regional and local travel performance, access to employment, safety, modal connections and opportunities, and facility deficiencies), environmental constraints, displacements, and stakeholder input.

The process included a close examination of all transit modes within the Study Area, the results of which can provide input into future planning efforts by other area transportation agencies (e.g., Regional Transportation Authority [RTA], Chicago Transit Authority [CTA], Metra, Pace). In coordination with the Illinois Department of Transportation (IDOT) and the I-290 Phase I study, CTA initiated a concurrent *Blue Line Forest Park Branch Feasibility/Vision Study* to assess current conditions and identify modernization needs for rail infrastructure and customer amenities for the near- and long-term in this Project Corridor.

As presented herein, IDOT completed the evaluation of four build alternatives and the No Build Alternative. A regional travel demand model tailored specifically for this study was used as the evaluation tool for testing the travel performance of alternatives in Rounds 1, 2, and 3. This travel demand model is based on the Chicago Metropolitan Agency for Planning (CMAP) regional travel demand forecasting model. Several refinements were made to the CMAP model to incorporate additional existing transit

and roadway network detail, more recent travel data, and measures to better capture and evaluate the effects of carpooling, tolling, and transit. The travel demand model and its validation are described in Appendix B-1, Travel Forecasting Model Methodology and Validation.

Regional 2040 population and employment forecasts were developed as inputs to the travel demand model. These market-based forecasts were developed based on 2010 Census data, 90 years of historic population and employment data for the region, current and previous regional socioeconomic forecasts, land availability for development, population holding capacity, demographic data and trends (e.g., household size, migration patterns), local land use policies, and independent Woods & Poole economic forecasts. These forecasts are described in detail in Appendix B-2, Socioeconomic Forecast Report.

For Rounds 1 and 2, a 2040 baseline or No Build population and employment forecast was used as input in the travel demand model. The No Build forecast assumed no major capital improvements to I-290 or to the CTA Blue Line Forest Park Branch in the Study Area. This forecast represents the project's No Build Alternative, which is "alternative neutral" and is the baseline condition against which the transportation performance of alternatives is evaluated. A total of 33 alternatives (21 in Round 1 and 12 in Round 2) were evaluated with this forecast methodology. The number of alternatives evaluated in these rounds made socio-economic forecasting for each individual alternative impractical.

For Round 3, a 2040 Build population and employment forecast was developed assuming I-290 corridor improvements, including an additional lane on I-290 in each direction between Mannheim Road and Austin Boulevard. Appendix B-2 describes the market-based socioeconomic forecasts for the No Build and Build conditions.

Safety performance for Study Area arterials was analyzed based on methodologies prescribed in the American Association of State Highway and Transportation Officials (AASHTO) Highway Safety Manual (HSM). I-290 safety within the project limits was also assessed based on injury and fatal crash rates using statistically based predictive crash models developed by the Texas Transportation Institute (TTI), as the HSM did not have applicable expressway safety analysis tools at the time of the analysis. However, the TTI method has subsequently been adapted into the HSM's latest version.

2.2 Initial Alternatives Identification

This section describes the process that was used to identify the range of alternatives to be evaluated in Round 1. Section 2.2.1 presents the range of stakeholder suggestions, and Section 2.2.2 describes the prescreening process used to identify the set of alternatives to advance into the Round 1 screening process.

2.2.1 Initial Range of Stakeholder Suggestions

Alternatives suggestions for the I-290 Study were actively solicited from project stakeholders[1] and the public through public meetings, Corridor Advisory Group (CAG)/Task Force (TF) meetings, stakeholder meetings, and comments submitted via the project website, e-mails, and letters. Although all alternative suggestions were considered, single mode alternatives were sought for initial evaluation; single mode alternatives are those that use one mode of transportation (e.g., commuter rail, bus rapid transit [BRT], heavy rail transit [HRT], high occupancy vehicle [HOV] lanes, high occupancy toll [HOT] lanes) for the modification of, or addition to, the Study Area transportation network. The purpose of evaluating the single modes was to understand the characteristics of each individual mode and their effectiveness in addressing the transportation needs within the context of the Study Area.

Stakeholders are affected people and organizations, including federal, state, and local agency staff and elected officials, organized groups, area residents, and business owners.

Approximately 170 alternatives suggestions were submitted at the first public meeting (November 2009) and at the CAG/TF Alternatives Workshop in December 2010. Over 400 additional comments suggesting alternatives were submitted via the I-290 Study Website, subsequent CAG/TF meetings, and during the comment period for the second Public Meeting in May 2011. A total of 570 suggestions were submitted regarding alternatives. A comprehensive listing of the alternative suggestions is included in Appendix C.

A **Corridor Advisory Group** served as a regional steering committee that met over seven years during the I-290 Study process. The CAG focused on corridor-wide issues and collaboration. Membership consisted of representatives from each of the eight affected communities along the I-290 Corridor, plus regional planning agencies; CTA and PACE; and CSX Railroad, in addition to representatives from IDOT and Federal Highway Administration. (FHWA).

2.2.2 Single Mode Alternatives Identification

The alternative suggestions were sorted into three main groups: roadway improvements, transit improvements, and related improvements that could be combined with other concepts. Based on the range of stakeholder suggestions, each of the three groups was subdivided, resulting in 33 distinct concept subcategories (e.g., add general purpose lanes to I-290) to which each suggestion or comment was assigned. A functional description of each concept category can be found in Appendix C, which includes a table that describes how the 570 alternative suggestions were categorized.

[1] I-290 Eisenhower Expressway Phase 1 Study, Stakeholder Involvement Plan for Agency and Public Involvement, http://eisenhowerexpressway.com/pdfs/i290_stakeholderinvolvementplan_v5.pdf

A **Single Mode Alternative** is an individual transportation improvement that can be implemented independently as a stand-alone option apart from any other alternative.

After condensing the 570 alternatives into 33 concept categories, the 33 categories were prescreened to identify the single mode alternative concepts to be carried forward for evaluation in Round 1. Each concept was either: 1) carried forward into Round 1, 2) not carried forward into Round 1, or 3) deferred to a later round of evaluation. An important factor in the prescreening process was the potential to serve the two largest travel markets in the Study Area. The two largest travel markets, as identified by the RTA *Cook-DuPage Corridor Study Travel Market Analysis* (December 2005), are the traditional commute towards downtown Chicago and the reverse commute towards DuPage and northwest Cook counties. These two markets have the highest density of work trip origins and destinations. Concepts that had large right-of-way impacts on adjacent communities were not carried forward for further study. Other related improvements were deferred to future evaluation rounds.

Table 2-1 summarizes the results of the concept category prescreening process. A functional description and a detailed disposition for each concept category are shown in Appendix C.

Table 2-1. Summary of Prescreening Findings

Concept Categories	Concept Disposition		
	Carried Forward	Not Carried Forward	Deferred to Subsequent Rounds
Roadway Improvements			
A1. Add general purpose lanes to I-290	✓		
A2. Add HOV lanes to I-290	✓		
A3. Add HOT lanes in each direction	✓		
A4. Toll I-290 lanes	✓		
A5. Arterial widening	✓		
Transit Improvements			
B1. Extend CTA Blue Line to O'Hare International Airport		✓	
B2. Extend CTA Blue Line west	✓		
B3. Extend CTA Blue Line west via Illinois Prairie Path	✓		
B4. Add CTA Blue Line express service			✓
B5. Extend CTA Green Line to Maywood		✓	
B6. Add BRT via Prairie Path	✓		
B7. Add BRT along I-290	✓		
B8. Add BRT along east-west arterials		✓	
B9. Improve existing commuter rail		✓	

Table 2-1. Summary of Prescreening Findings (continued)

Concept Categories	Concept Disposition		
	Carried Forward	Not Carried Forward	Deferred to Subsequent Rounds
B10. New commuter rail service		✓	
B11. Convert existing CTA Blue Line to BRT	✓		
B12. Remove existing CTA Blue Line		✓	
B13. Add High-Speed Rail		✓	
B14. Add Inner Circumferential Commuter Rail		✓	
B15. Express Bus	✓		
B16. Add Automated Guideway Transit		✓	
B17. Add Light Rail Transit		✓	
Related Improvements (that can be combined with other concepts)			
C1. Add express bus service within the Study Area			✓
C2. Interchange improvements and design			✓
C3. Improve nonmotorized facilities			✓
C4. Improve transit stations			✓
C5. Improve transit operations/connections			✓
C6. Add Transportation System Management/Active Traffic Management/Intelligent Transportation Systems (ITS)			✓
C7. Add a cap over the expressway			✓
C8. Double-deck I-290		✓	
C9. CTA Blue Line in subway/tunnel or elevated			✓
C10. Arterial improvements			✓
C11. Other			✓
Category Totals	**11**	**11**	**11**

Source: WSP Parsons Brinckerhoff, 2016.

Of the 33 original categories, 11 concept categories were carried forward for consideration in Round 1 evaluation. Eleven (11) concept categories of related improvements were deferred for consideration in subsequent evaluation steps (i.e., Rounds 2 or 3). Documentation of the reasons for carrying forward, not carrying forward, or deferring concept categories to subsequent evaluation is provided in Appendix C.

General purpose lanes (also referred to as "mixed use" or "mixed flow" lanes) are those where use is allowed by all vehicles (except certain small motorized vehicles, bicycles, and pedestrians on limited access highways), without restriction on number of occupants or imposition of a toll. All lanes on I-290 are currently general purpose.

Based on the 11 single mode concept categories carried forward from the prescreening, 21 single mode alternatives were developed by the project team and CAG/TF for evaluation in Round 1 and are summarized in Table 2-2 through Table 2-4. As seen in these tables, some of the concept categories resulted in multiple single mode alternatives. For example, three versions of the CTA Blue Line extension concept were carried forward as single mode alternatives with different project termini.

Table 2-2. Transit Modes Evaluated in Round 1

Blue Line Extension (Heavy Rail Transit - HRT) 	HRT 1	Forest Park CTA Terminal to Oak Brook via IL Prairie Path, Butterfield Road, and 22nd Street (elevated)
	HRT 2	Forest Park CTA Terminal to Oak Brook via I-290 median (at-grade) and parallel to I-88 (elevated)
	HRT 3	Forest Park CTA Terminal to Mannheim via I-290 median (at-grade)
Express Bus 	EXP	Various services from Forest Park CTA Terminal to DuPage and northwest Cook counties
Bus Rapid Transit (BRT) 	BRT 1	Forest Park CTA Terminal to Oak Brook via IL Prairie Path and Butterfield Road
	BRT 2	Forest Park CTA Terminal to Oak Brook via I-290 median (at-grade) and parallel to I-88 (elevated)
	BRT 3	Cicero Avenue to Oak Brook via I-290 median (at-grade) and parallel to I-88 (elevated)
	BRT 4	Ashland Avenue to Oak Brook with CTA Blue Line conversion to BRT from Ashland Avenue to Forest Park CTA Terminal, along I-290 median (at-grade) and parallel to I-88
	BRT 5	Forest Park CTA Terminal to Lombard via I-290 median (at-grade) and parallel to I-88 (elevated)

Source: WSP Parsons Brinckerhoff, 2016.

Table 2-3. Expressway Modes Evaluated in Round 1

General Purpose (GP) Add Lane			GP LANE	General Purpose Add Lane from I-88 to Central Avenue
Managed Lanes	**HOV Lanes**	**2+ Riders**	HOV 2LL	Racine Avenue to Oak Brook (add two HOV lanes from I-294 to Central Avenue; convert two existing lanes to HOV from Central Avenue to Racine Avenue and on I-88 from IL-83 to I-294)
			HOV 2L	Racine Avenue to I-88 (add two HOV lanes from I-294 to Central Avenue; convert two existing lanes to HOV from Central Avenue to Racine Avenue)
			HOV 2W	Central Avenue to Oak Brook (add two HOV lanes from I-294 to Central Avenue; convert two existing lanes on I-88 to HOV from IL-83 to I-294)
		3+ Riders	HOV 3LL	Racine Avenue to Oak Brook (similar to HOV 2LL but requires 3+ riders for HOV lane use)
			HOV 3L	Racine Avenue to I-88 (similar to HOV 2L but requires 3+ riders for HOV lane use)
			HOV 3W	Central Avenue to Oak Brook (similar to HOV 2W but requires 3+ riders for HOV lane use)
	HOT Lanes		HOT 1	Central Avenue to Oak Brook, 3+ Vehicles Free (similar to HOV 2W but requires 3+ riders or payment of toll for HOT lane use)
			HOT 2	Racine Avenue to Oak Brook, 3+ Vehicles Free (similar to HOV 2LL but requires 3+ riders or payment of toll for HOT lane use)
	Toll Lanes		TOLL 1	Toll Existing I-290 Lanes, Cicero Avenue to I-88
			TOLL 2	Toll I-290 with Add Lanes , Cicero Avenue to I-88

Source: WSP Parsons Brinckerhoff, 2016.
HOV = High occupancy vehicle
HOT = High occupancy toll

Table 2-4. Arterial Improvements Evaluated in Round 1

Arterial Widening	ART	Widening of Roosevelt Road and Madison Avenue to two continuous lanes in each direction (with and without parking) Roosevelt Road from I-294 to Cicero Avenue Madison Avenue from 25th Avenue to Cicero Avenue

Source: WSP Parsons Brinckerhoff, 2016.

The HOV and HOT alternatives assumed that two existing general purpose lanes (one in each direction) would be converted to HOV/HOT lanes along I-88 and along I-290 from Central Avenue to Racine Avenue. Along I-290 from the I-88/290 split to Central Avenue, two new HOV/HOT lanes (one in each direction) would be added to the existing lanes. Appendix C includes a set of maps representing the single mode alternatives listed above.

In addition, the No Build Alternative was included.

2.3 Round 1 Single Mode Alternatives Evaluation

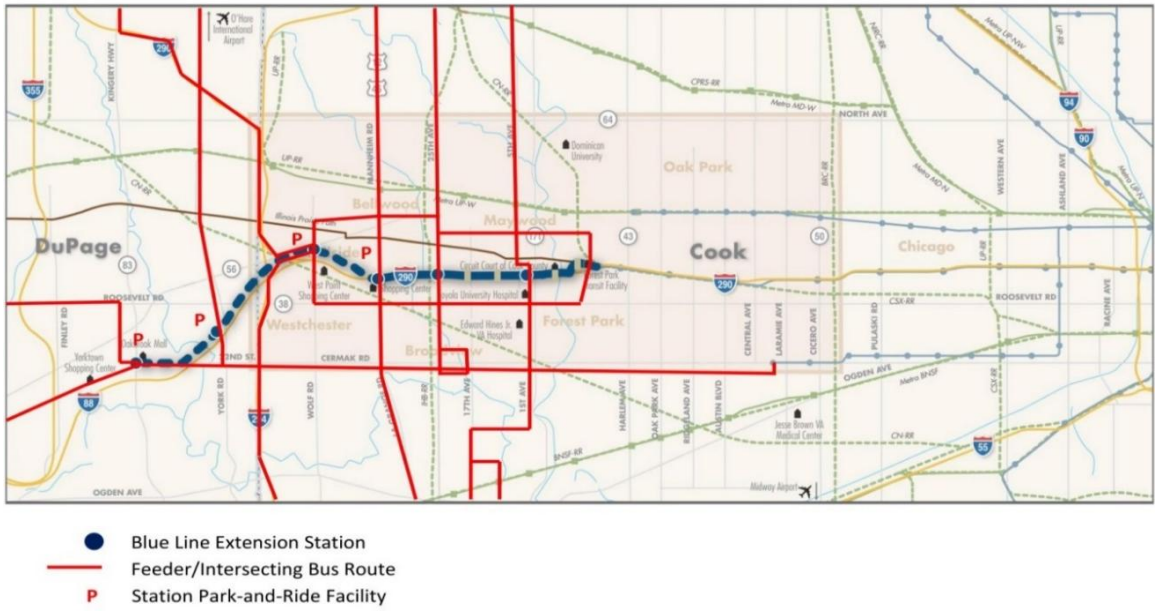
This section describes the results of the Round 1 screening evaluation. Section 2.3.1 describes the definition of the single mode alternatives identified for Round 1 evaluation, Section 2.3.2 summarizes the footprint and fatal flaw analysis results, Section 2.3.3 summarizes the results of the Round 1 evaluation, and Section 2.3.4 describes the combination modes for evaluation in Round 2.

2.3.1 Single Mode Alternatives Definition

Twenty-one (21) single mode alternatives and the No Build Alternative were further defined and evaluated in Round 1. This included the conceptual alignments and layouts of the single mode alternatives and the definition of operational characteristics to be coded in the computerized transportation network for testing with the travel demand model. For the HRT and BRT alternatives that extended west beyond the existing CTA Forest Park Terminal, new stations were assumed along the extended route at 1st Avenue, 25th Avenue, Mannheim Road, Wolf Road, York Road, Roosevelt Road (for Illinois Prairie Path alignments), and 22nd Street. Park-and-ride access was assumed at the Wolf Road, York Road, and 22nd Street stations. Feeder bus routes were also configured to serve the new stations, as shown in Figure 2-2.

For the expressway alternatives, the managed lane alternatives (HOV and HOT) assumed intermediate access and egress locations to and from the managed lane. Depending on the termini of the managed lane, intermediate access and egress locations included I-290/I-88, Mannheim Road, DesPlaines Avenue, Austin Boulevard, and Central Park Avenue. For those expressway alternatives that included tolled facilities, tolling was tested using $0.06 per mile, which was the average toll rate for the Illinois Tollway system at the time.

Figure 2-2. Transit Bus Network Assumptions



Source: WSP Parsons Brinckerhoff, 2016.

2.3.2 Footprint and Fatal Flaw Screening Results

Corridor-level right-of-way footprints were mapped and evaluated to determine if there were any potential impacts that would result in that alternative being fatally flawed due to magnitude of impact. For this initial evaluation, corridor-level footprints evaluated the impact of the main trunk of each alternative and did not include more detailed and undefined components such as interchanges, intersection improvements, or other localized components, such as park-and-ride lots, that will be considered in subsequent rounds of alternative development and refinement. The footprint, or width of the alternative, was based on common design standards for each transportation mode.

Screening was initiated to evaluate the physical impacts of an alternative, or footprint, within the Study Area based on right-of-way requirements. A geographic information system (GIS) level of analysis was used for the initial screening to assess impacts based on information available. Prior to the footprint screening, an environmental constraint workshop was held with project stakeholders at a CAG meeting in September 2010 (Appendix C) to identify potential footprint constraints along I-290. This workshop identified any area outside the existing expressway right-of-way as a constraint.

Corridor-level footprint impacts were then evaluated along any portion of an alignment that extended west of the Des Plaines River. West of the river, alternatives alignment locations were relatively straightforward, with fewer constraint variables affecting their locations. East of the Des Plaines River, all of the alternative alignments generally followed along the existing Project Corridor, with the exception of arterial improvements. None of the expressway alternatives were fatally flawed in Round 1 due to footprint impacts because they all stayed within the existing right-of-way.

For the transit alternatives, the conceptual alignments were either in the median of I-290, running on shoulders or other travel lanes, or elevated; consequently, none of the transit alternatives were fatally flawed in Round 1 due to footprint impacts.

The results of Round 1 footprint screening indicated that the arterial widening alternatives had a disproportionate number of displacements. Due to the very mature and dense urban environment along Roosevelt Road and Madison Street, arterial capacity improvements along these routes would involve widening (from two to four lanes where a two-lane section exists) between Mannheim Road and Cicero Avenue. This would result in 356 to 583 direct impacts to buildings (for widening without and with parallel parking, respectively). For this reason, arterial widening was dropped from further consideration in the alternatives evaluation. The summary table of these results and supporting evaluation exhibits can be found in Appendix C.

2.3.3 Round 1 Evaluation Results

Round 1 evaluated the transportation performance characteristics of each single mode prior to assembling combination mode alternatives in Round 2. Although Round 1 was not intended to be a test for consistency with the project's Purpose and Need, travel performance-based measures related to the Purpose and Need were developed and applied to evaluate the relative performance of the single mode alternatives with respect to the 2040 No Build condition. The performance measures assessed regional and local travel performance, such as vehicle and truck miles of travel, vehicle and truck hours of travel, congested vehicle miles of travel, hours of delay, I-290 and Study Area arterial speeds, travel times, and volume to capacity (v/c) ratios, and east-west Study Area person throughput measures. Accessibility from the Study Area to 2040 jobs was analyzed for both auto and transit modes in terms of the number of jobs accessible in a given time span from a central point in the Study Area.

Safety was also analyzed for I-290, arterials, and transit in the Study Area. Safety for the expressway and arterials was evaluated using the available quantitative safety assessment tools (TTI and HSM). Because no quantitative tool was available to evaluate transit safety, it was assumed that there were no injuries or fatalities for any trip using transit. Multimodal opportunities and connections were assessed for new regional transit trips. The facility condition was determined not to be a differentiator in the evaluation of alternatives in Round 1. As I-290 is in need of reconstruction due to uniformly poor facility conditions throughout the Project Corridor, this factor was evaluated consistently for all of the alternatives, including the No Build Alternative. The results of the Round 1 evaluation of the single mode alternatives are summarized in Table 2-5. As summarized in this table, the remaining nine transit and 11 expressway single mode alternatives were ranked as to how well their performance addressed the five main Purpose and Need points. For further detail, refer to the full results summary matrix for the single mode alternatives in Appendix C.

Table 2-5. Round 1 Evaluation Summary

I-290 Phase I Study
Round 1 - Single Mode Alternatives Purpose and Need Evaluation
Alternatives Measures Initial Ranking Summary
September 29, 2011

This table summarizes the total number of top 4 ranked measures for each need point.

		Blue Line Extension			Express Bus	Bus Rapid Transit (BRT)					GP Add Lane	HOV Add Lane						HOT Add Lane		Toll Lanes (Add Lane)	
												2+ Occupants			3+ Occupants						
	Total # of Measures in each need point category *	Blue Line Ext. Along Prairie Path to Oak Brook	Blue Line Ext. Along I-290 to Oak Brook	Blue Line Ext. Along I-290 to Mannheim (Short)	Express Buses to Forest Park	BRT Along Prairie Path, Oak Brook to Forest Park	BRT Along I-290, Oak Brook to Forest Park	BRT - Oak Brook to Cicero Ave. (CTA Overlap)	BRT - Oak Brook to Ashland Ave. (Blue Line Conversion)	BRT - Forest Park CTA Terminal to Lombard	General Purpose Add Lane	HOV 2+ I-88 to Racine Ave (Long)	HOV 2+ Oak Brook to Central Ave.	HOV 2+ Oak Brook to Racine Ave.	HOV 3+ from I-88 to Racine (Long)	HOV 3+ Oak Brook to Central Ave.	HOV 3+ Oak Brook to Racine Ave.	HOT 3+ Oak Brook to Central Ave.	HOT 3+ Oak Brook to Racine	Toll Existing I-290 Lanes (I-88 to Cicero)	Toll I-290 with an Add Lane (I-88 to Cicero)
		HRT 1	HRT 2	HRT 3	EXP	BRT 1	BRT 2	BRT 3	BRT 4	BRT 5	GP LANE	HOV 2L	HOV 2W	HOV 2LL	HOV 3L	HOV 3W	HOV 3LL	HOT 1	HOT 2	TOLL 1	TOLL 2
Count of top 4 ranked measures	28	2	1	0	0	0	2	2	6	3	9	3	8	9	11	7	14	4	12	8	12
Improve Local And Regional Travel Measures	21	2	0	0	0	0	0	0	2	0	8	2	8	9	9	5	11	4	10	6	9
Improve Access to Employment Measures	3	0	0	0	0	0	1	1	2	1	0	0	0	0	0	0	1	0	2	2	2
Improve Safety Measures	3	0	1	0	0	0	0	0	1	1	1	1	0	0	2	2	2	0	0	0	1
Improve Modal Connections and Opportunities Measures	1	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Improve Facility Deficiencies Measures	-										✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Color Legend: Top 4 Performers (1st, 2nd, 3rd, 4th)

* Total number of non-qualitative measures

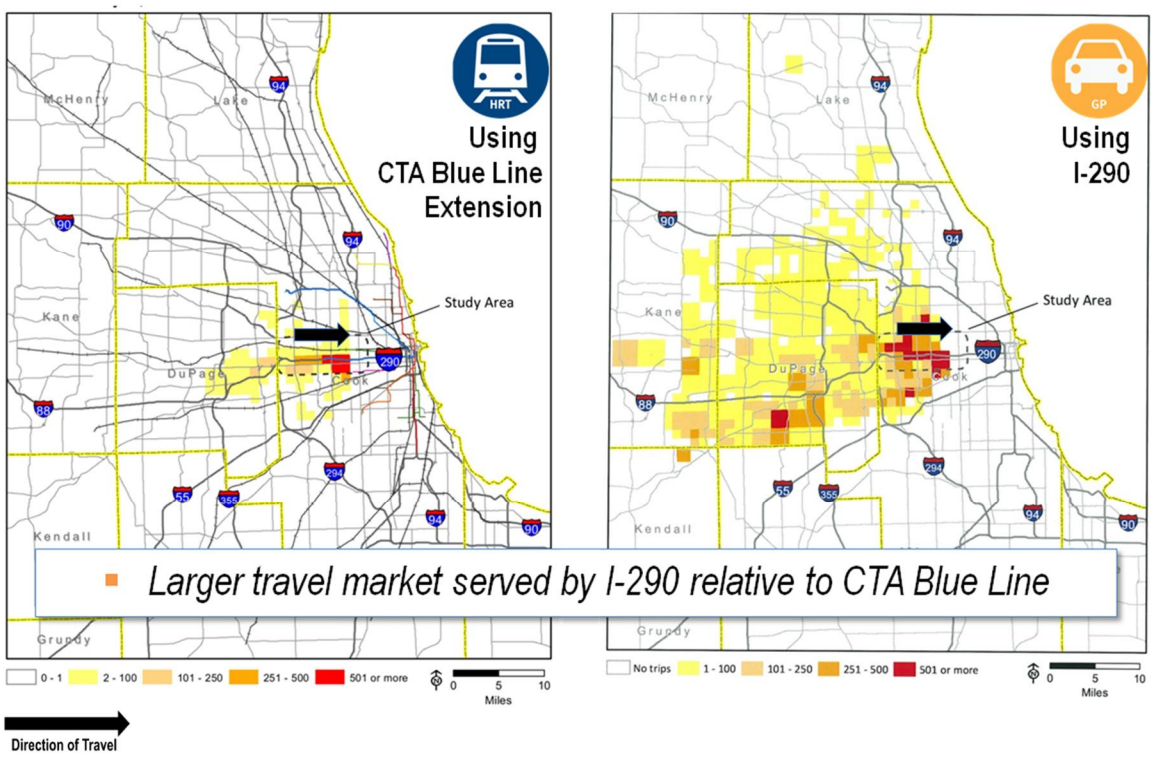
Source: WSP Parsons Brinckerhoff, 2016.

2.3.3.1 Round 1 Transit Mode Findings

The overall findings of the Round 1 evaluation of the single mode transit alternatives using the Regional Travel Demand Model are presented below.

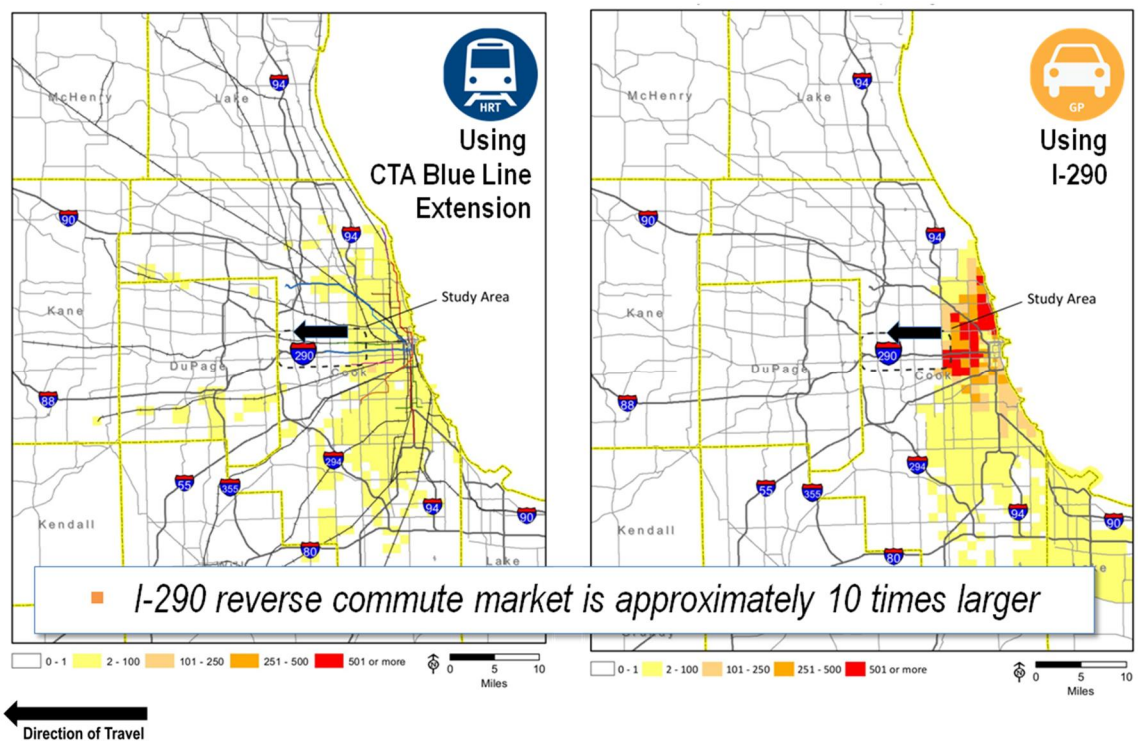
- The transit alternatives provide improved mobility options to areas west of the Forest Park Blue Line station, improved access to jobs, and some diversion of auto users.
- The transit alternatives did not result in any travel performance improvement to the I-290 Expressway. This is primarily due to insufficient diversion from auto to transit to have an impact on I-290 congestion. This is because transit serves a relatively small, compact market, as shown in Figure 2-3 and Figure 2-4. As seen in Figure 2-3 comparing the transit and expressway traditional commute travel markets (home-to-work), the transit travel market is much smaller and confined to an area immediately adjacent to the Blue Line extension compared to the travel market served by the I-290 Expressway, which has a much broader, more extensive draw of users that extends throughout DuPage County, and into Kane County and northwest Cook County. In the reverse commute direction, shown in Figure 2-4, the travel market for the Blue Line extension is broader, due to the extensive existing CTA network in the City of Chicago; however, the transit reverse commute travel market is much smaller than that of the I-290 Expressway at less than a tenth of the size.

Figure 2-3. Traditional Commute Travel Origins



Source: WSP Parsons Brinckerhoff, 2016.

Figure 2-4. Reverse Commute Travel Origins

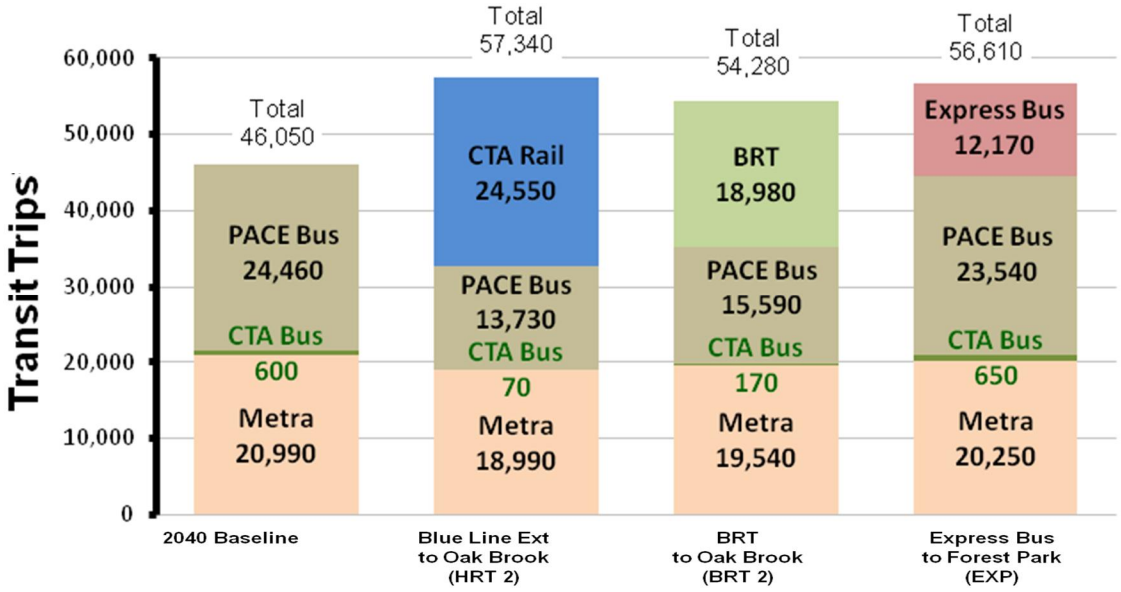


Source: WSP Parsons Brinckerhoff, 2016.

- When comparing single mode transit alternatives, extensions of the existing CTA Blue Line Forest Park Branch with high-capacity transit modes of BRT and HRT showed the highest mode shifts from auto to transit and highest person throughput.
- There was a considerable amount of ridership drawn from other existing public transit services, and no single transit mode alternative was able to attract enough demand from automobile users to substantially reduce the demand on the expressway; therefore, single mode transit alternatives did not improve expressway performance.

For additional assessment and comparison of the transit alternatives, a screen line through the Study Area was evaluated between 1st Avenue and DesPlaines Avenue to compare to the east-west transit trips through the Study Area of three single mode transit alternatives to the baseline condition. As represented in Figure 2-5, approximately 46,000 daily transit trips on Pace and CTA buses and on Metra commuter rail trains cross through this screen line in the 2040 No Build condition. The Blue Line extension and BRT single mode alternatives to Oak Brook (HRT 2 and BRT 2) would result in diversions of up to 2,000 persons from Metra commuter rail and up to 11,000 passengers from Pace and CTA bus services. The ridership on the new BRT services and Blue Line extension would be between 19,000 and 25,000 riders, with a total transit screen line crossing of between 54,000 and 57,000 persons. Most of the ridership on the new transit service would be due to the diversion of trips from other existing transit services. For example, with the Blue Line extension to Oak Brook alternative (HRT 2)

Figure 2-5. Trip Diversions within Transit Modes



Source: WSP Parsons Brinckerhoff, 2016.

Pace Bus, CTA Bus, and Metra rail each would experience a reduction in ridership as a result of the CTA Rail extension. Although CTA Rail would attract 24,550 riders, 13,260 (54 percent) of these riders would be diverted from existing transit services (including 10,730 from PACE, 2,000 from Metra, and 530 from CTA bus). Of the overall increase in transit trips, 8,350 (34 percent) are diversions from auto, and the remaining 2,940 are new transit trips[2]. The diversion of 8,350 trips from auto to transit is small compared to nearly 250,000 weekday auto person trips that would remain on I-290. The other two single mode transit alternatives have similar results.

When comparing the effectiveness of the length of transit improvements, it was found that of the three Blue Line Extension alternatives evaluated (HRT 1, 2, and 3), most of the performance improvements were achieved by a Blue Line Extension to Mannheim Road (HRT 3), which is less than half the length of an extension to Oak Brook (3.5 miles versus 8 miles). Table 2-6 illustrates this comparison for several of the measures evaluated in Round 1.

As an example, the Blue Line Extension to Mannheim Road (HRT 3) provides 71 percent of the newly accessible jobs and 89 percent of new regional transit trips versus an extension to Oak Brook. Also, an HRT terminal west of Mannheim Road may serve as the starting point for a farther westward extension of the HRT line.

[2] I-290 Initial Alternatives Identification and Evaluation, April 2013.

Table 2-6. Performance Comparison of Blue Line Extensions

Performance Comparison* of Blue Line Extensions to:	Alignment Length	Daily Person Throughput	Regional Vehicle Miles Traveled	Regional Hours of Delay (Daily)	# of Jobs Accessible Increase	Overall Safety Improvements (Injury Crash Reductions)	New Transit Trips (Regional)
	Miles	# persons	Miles	Hours	# Jobs	Crash Rate	# trips
Oak Brook (HRT 2)	8	13,812	-37,362	-3,055	128,032	-3.37%	8,353
Mannheim Rd (HRT 3)	3.5	9,552	-35,438	-4,371	91,328	-2.25%	7,456
HRT 3 as % of HRT 2	44%	69%	95%	143%	71%	67%	89%

Source: WSP Parsons Brinckerhoff, 2016.
*From Round 1 single mode evaluation results.

Although not fatally flawed due to impacts, the Blue Line Extension and BRT Alternative along the Prairie Path (HRT 1 and BRT 1) are not being carried forward into Round 2 for further evaluation. The Blue Line extension and BRT alternatives along the Prairie Path and along I-290 (HRT 2) perform very similarly; however, the Prairie Path alignment has greater service overlap/duplication with the existing Metra service, and this alignment diverts more riders from the UP-West line than the alignment along I-290. There are also potential conflicts with the recreational functions of the Illinois Prairie Path corridor, which is considered Section 4(f). For these reasons, the alternatives using the Prairie Path alignment are not being carried forward for evaluation in Round 2.

The BRT 4 Alternative from Oak Brook to Ashland Avenue was evaluated as a conversion of the existing CTA Blue Line to a BRT facility between Ashland Avenue and the Forest Park terminal. This alternative indicated generally similar, and some improved, performance compared to an HRT Blue Line extension to Oak Brook (HRT 2); however, due to the similarity in performance and right-of-way requirements for these two fixed guideway transit facilities, the HRT extension of the Blue Line was selected as the representative mode that will be carried forward for evaluation in the combination alternatives.

2.3.3.2 Expressway Mode Findings

The overall findings of the Round 1 evaluation of the single mode expressway alternatives are presented below.

- Of all the single mode alternatives evaluated, the expressway alternatives showed the greatest improvement in travel performance for the region, in the Study Area, and on the I-290 Expressway itself. Due to the size of the travel markets the expressway is able to serve, there is a much higher demand for use of the expressway alternatives than for the transit alternatives. Of the expressway alternatives, the HOV and HOT lane alternatives had the best overall performance,

followed by the Toll and General Purpose lane alternatives. The HOV, HOT, and Toll lane alternatives also indicated that there would also be travel improvements for users of the general purpose lanes.

- The HOV and HOT lanes showed increased travel speeds over the existing general purpose lanes. Results of the Round 1 evaluation indicated that there was insufficient HOV 3+ Alternative demand (vehicles with three or more persons) to provide optimal peak-period performance.

The Round 1 single mode alternatives showing the best performance relative to the 2040 No Build condition are shown in Table 2-7.

Table 2-7. Single Mode Performance Ratings

Performance Summary	Top Performing Alternatives							
	1st	2nd		3rd	4th		5th	
Overall	 HOV 3LL	 TOLL 2	 HOT 2	 HOV 3+	 HOV 2LL	 GP LANE	 TOLL 1	 HOV 2W

Source: WSP Parsons Brinckerhoff, 2016.

Overall, managed lane expressway alternatives (HOV and HOT) provide some of the best performance benefits due to their ability to serve the high vehicle travel demand in this corridor, and they offer ways to more effectively manage the demand.

2.3.4 Initial Combination Mode Alternatives

Based on the findings of the Round 1 single mode alternative evaluation, 10 combination mode alternatives were assembled for evaluation in Round 2.

2.3.4.1 Expressway Modes in Combination Alternatives

Compared to the No Build condition, the stand-alone expressway alternatives resulted in the greatest improvement in travel performance for the region, Study Area, and along I-290, performing better than stand-alone transit modes for improving local and regional travel, overall access to employment, and safety. The top four expressway modes were selected for further testing in Round 2 as part of a combination mode alternative; GP Lanes, HOV 2+, TOLL, and HOT 3+. HOV with 2+ occupants was selected over HOV with 3+ occupants due to greater reduction in general purpose lane volumes and approximately twice the volume in the HOV lanes.

A fifth expressway alternative that pairs Toll Lanes and HOT 3+ was also identified to test the combined effects of converting I-290 to a tolled facility, with a HOT 3+ managed lane. These five expressway modes cover a range of potential expressway management strategies, from least amount of lane management (GP Lane Alternative) to a high level of lane management (TOLL & HOT 3+ Alternative).

To provide a consistent comparison basis between the Round 2 expressway alternatives, the eastern and western limits for each alternative were standardized to extend from the I-88/I-290 split at Wolf Road in the west to Racine Avenue in the east. These limits were established based on the Round 1 evaluation results, further clarification of tolling/ managed lane conversion legislation, and stakeholder input.

2.3.4.2 Transit Modes in Combination Alternatives

Although the stand-alone transit alternatives did not show the same level of improvements for expressway performance demonstrated by the expressway alternatives, they do offer additional benefits, such as increasing transit access to jobs, improving mobility for persons without auto access, and some auto person trip diversions to transit. To build on the performance improvements exhibited by the expressway alternatives and recognizing the additional benefits that transit provides, combination mode alternatives were developed to systematically test transit modes in combination with each expressway mode to determine if synergistic performance gains could be achieved.

Based on the Round 2 results, and coordination with transit agencies, two transit alternatives were identified for testing in combination with the expressway alternatives – Express Bus service (EXP) and a High Capacity Transit (HCT) extension to Mannheim Road.

EXP was included as a component in all combination mode alternatives due to its operational flexibility and physical compatibility with other modes. EXP would serve a broad market to the west, providing an express connection to the existing Blue Line Terminal in Forest Park or to a new HRT terminal at Mannheim Road. EXP may operate on the shoulder in the GP Add Lanes scenario, or in HOV, HOT, or Toll lanes, allowing this mode to integrate readily into the expressway alternatives.

The single mode transit system extensions evaluated from the existing Forest Park CTA Blue Line Terminal included HRT and BRT alternatives; each were found to be feasible with similar performance characteristics and footprint/right-of-way requirements. Since the HRT and BRT alternatives were found to be so similar in the Round 1 evaluation, the term “high capacity transit” was used going forward into Round 2, to include both the HRT and BRT modes.

The Mannheim Road terminus for an HCT extension was selected due to the single mode transit demand modeling results that suggested, relative to each other, most of the performance improvements were achieved by a Blue Line extension to Mannheim Road compared to an extension farther west to Oak Brook at less than half the length. Each Expressway and Express Bus transit combination alternative will be tested with and without HCT to Mannheim Road to systematically evaluate the effects of HCT in each scenario.

2.3.4.3 Initial Combination Mode Alternatives to be Evaluated in Round 2

Combination alternatives were then assembled to analyze the combined performance of transit and expressway alternatives in meeting the Purpose and Need. In addition, the compatibility of pairing each of the expressway modes with the transit alternatives was analyzed with regard to:

- Travel markets: To what degree do the expressway and transit components of these combination alternatives serve complementary or overlapping travel markets; and
- Operations: How well do the expressway and transit components of the combination alternatives work together from an operational perspective.

The rationale described above resulted in 10 initial combination alternatives, which are summarized in Figure 2-6. The top five highest performing expressway alternatives were first paired with the EXP single mode transit alternative to form the first five combination mode alternatives. Each of the five Expressway and Express Bus alternatives were then paired with the HCT extension from the Forest Park CTA Terminal to Mannheim Road to create the final five alternatives.

Figure 2-6. Initial 10 Combination Mode Alternatives

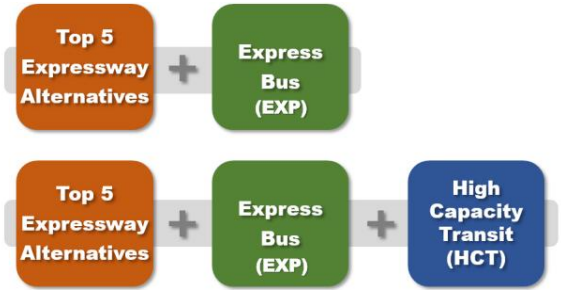
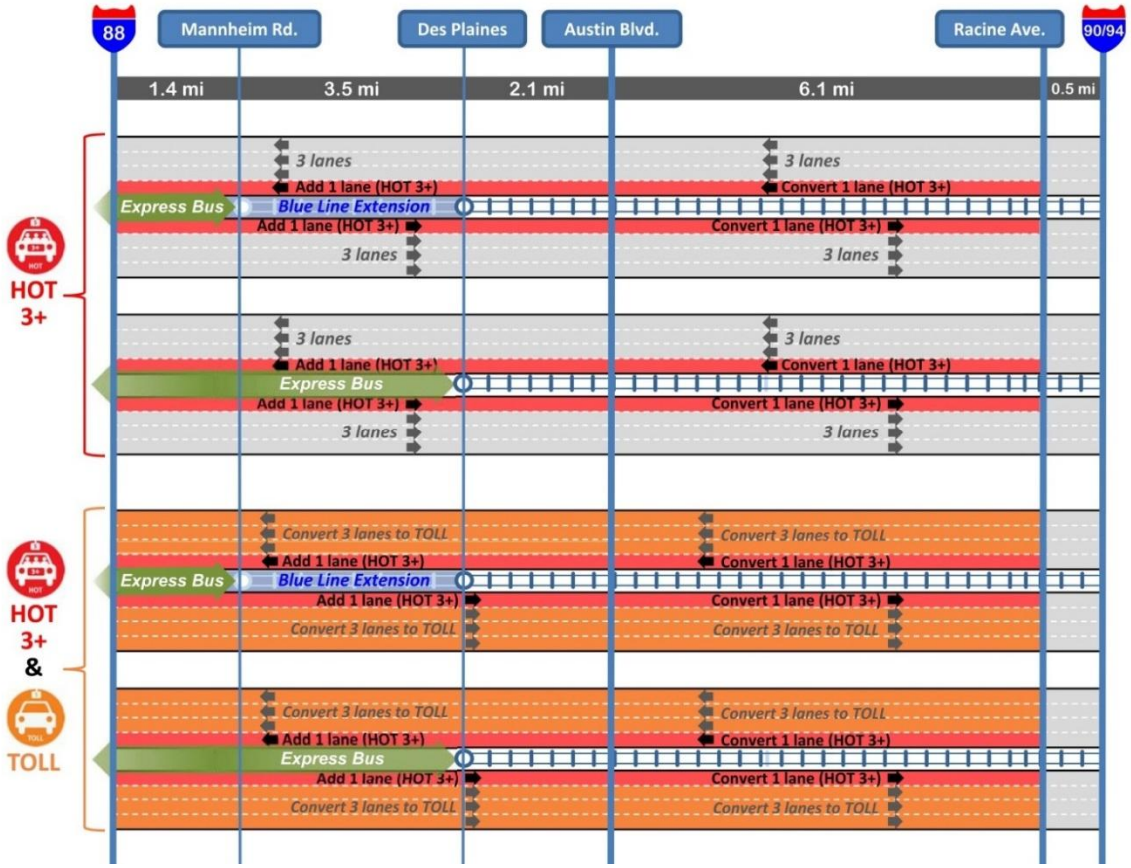


Figure 2-6. Initial 10 Combination Mode Alternatives (continued)



Source: WSP Parsons Brinckerhoff, 2016.

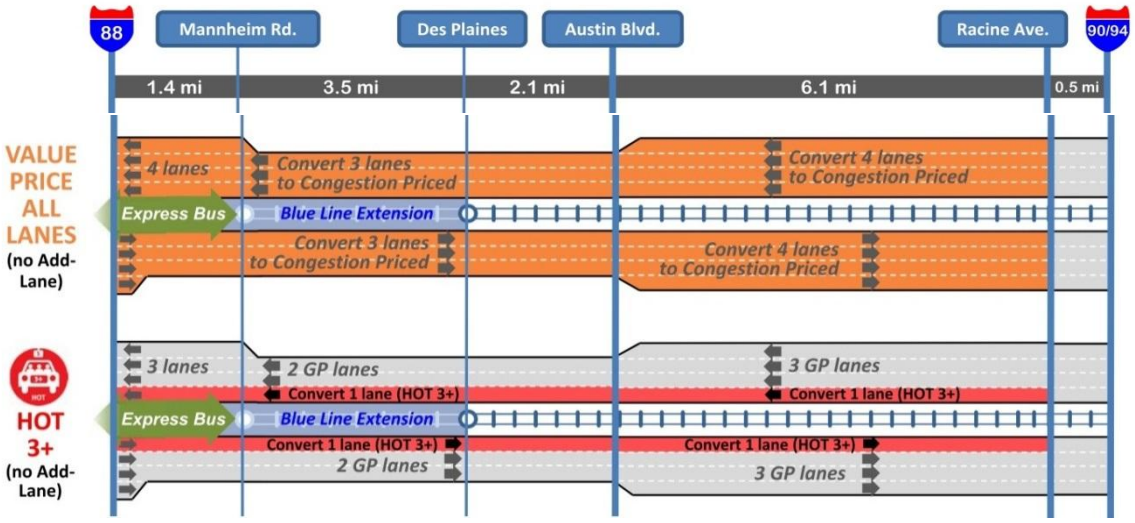
2.4 Round 2 Combination Mode Alternatives Evaluation

The results of the Round 2 screening evaluation of the combination mode alternatives are presented below. Section 2.4.1 presents the definition of the combination mode alternatives identified for Round 2 evaluation, Section 2.4.2 presents the results of the Round 2 evaluation, and Section 2.4.2.1 presents the mainline alternatives carried forward to Round 3.

2.4.1 Combination Mode Alternatives Definition

During the evaluation of the initial 10 combination mode alternatives, the CAG identified two additional combination mode alternatives for evaluation in Round 2 that combined transit and expressway management strategies, but without a lane addition in the existing six-lane section of I-290. The two additional alternatives that do not include a lane addition in the existing six-lane section are represented in Figure 2-7.

Figure 2-7. Additional Round 2 Combination Mode Alternatives



Source: WSP Parsons Brinckerhoff, 2016.

Table 2-8 provides more detailed descriptions of the Round 2 alternatives evaluated. In Round 2, service and operational characteristics of the alternatives were further defined for evaluation in the project's regional travel forecasting model. Model results were used to evaluate the performance measures in Round 2. General footprint variations of the combination mode alternatives were identified.

With regard to the service and operational characteristics of the 12 combination mode alternatives, the EXP component consists of three I-290 express bus services either continuing north on I-290 to serve the northwestern suburbs, heading west on I-88 to serve the western suburbs, or heading south on I-294 to serve the southwestern suburbs. The EXP components were included in all 12 alternatives and have two different termini, depending on whether an HCT extension is included in the combination mode alternative. In the five combination mode alternatives that do not include an HCT extension to the west, the EXP connects via I-290 to the existing Forest Park CTA Blue Line Station. For the seven combination mode alternatives that include an HCT extension to Mannheim Road, the EXP connects to a new CTA terminal located near Mannheim Road (and does not continue farther west along I-290).

For the purposes of evaluation with the regional travel model, the HCT extension was evaluated as an extension of the CTA Forest Park Blue Line rapid transit service; however, this service could be also run as BRT. Intermediate stations at 1st Avenue and 25th Avenue were assumed in each of the seven HCT extension alternatives. Park-and-ride availability was provided at a Mannheim Road terminal station. Feeder bus network assumptions were similar to those included in Figure 2-2, with the bus routes in DuPage County feeding the Mannheim Station.

Table 2-8. Combination Mode Alternatives Descriptions

GP Add Lane		**General Purpose Add Lane** from I-88 to Central Ave. with shoulder riding **Express Bus** from Forest Park to the west	GP Lane: • I-290 performance improvements • Regional & job access improvements • Safety improvements Express Bus: • Local travel & job access improvement • Implementable with GP Lane (Bus on shoulder) HRT: • Auto diversions to transit • Job access improvement
		**General Purpose Add Lane** from I-88 to Central Avenue, **HRT** from Forest Park to Mannheim Rd., **Express Bus** from Mannheim Rd. to the west	
HOV 2+		**HOV 2+** from I-88 to Racine Ave., **Express Bus** operating in **HOV Lane** from Forest Park to the west	HOV Lane: • I-290 performance improvements • Manage added capacity • Regional & job access improvements • Safety improvements Express Bus: • Local travel & job access improvement • Implementable with HOV Lane (Bus in HOV Lane) HRT: • Auto diversions to transit • Job access improvement
		**HOV 2+** from I-88 to Racine Ave., **HRT** from Forest Park to Mannheim Rd, **Express Bus** from Mannheim Rd. to the west	
HOT 3+		**HOT 3+** from I-88 to Racine Ave., **Express Bus** operating in **HOT Lane** from Forest Park to the west	HOT Lane: • I-290 performance improvements • Manage added capacity • Regional & job access improvements • Safety improvements Express Bus: • Local travel & job access improvement • Implementable with HOT Lane (Bus in HOT Lane) HRT: • Auto diversions to transit • Job access improvement
		**HOT 3+** from I-88 to Racine Ave., **HRT** from Forest Park to Mannheim Rd., **Express Bus** from Mannheim Rd. to the west	

Table 2-8. Combination Mode Alternatives Descriptions - Continued

TOLL		**Add lane** from I-88 to Central Ave., **Toll 1 lane** in each direction from I-88 to Racine Ave., and **Express Bus** operating in Toll lane from Forest Park to the west	TOLL Lane: • I-290 performance improvements • Manage added capacity) • Regional & job access improvements • Safety improvements Express Bus: • Local travel & job access improvement • Implementable with TOLL Lane (Bus in Toll Lane) HRT: • Auto diversions to transit • Job access improvement
		**Add lane** from I-88 to Central Ave., **Toll 1 lane** in each direction form I-88 to Racine Avenue, **HRT** to Mannheim Road, and **Express Bus** from Mannheim Rd. to the west	
HOT 3+ & TOLL		**Add HOT 3+ lane** from I-88 to Central Ave., **convert 1 existing lane** in each direction to **HOT 3+ lanes** from Central Ave. to Racine Ave. , **Toll remaining lanes** from I-88 to Racine Ave., and **Express Bus operating in HOT Lane** from Forest Park to the west	HOT Lane & TOLL Lanes: • I-290 performance improvements • Manage existing and added capacity • Regional & job access improvements • Safety improvements Express Bus: • Local travel & job access improvement • Implementable with HOT Lane (Bus in HOT Lane) HRT: • Auto diversions to transit • Job access improvement
		**Add HOT 3+ lane** from I-88 to Central Ave., **convert 1 existing lane** in each direction to **HOT 3+ lanes** from Central Ave. to Racine Ave., **Toll remaining lanes** from I-88 to Racine Ave., **HRT** from Forest Park to Mannheim, and **Express Bus** from Mannheim Rd. to the west	
Value Price & HCT (No Add Lane)		**Value Price all existing lanes** from I-88 to Racine Avenue (maintain existing number of lanes throughout) and extend Blue Line **HRT** to Mannheim Road.	Corridor Advisory Group Suggested Alternative
HOT 3+ & HCT (No Add Lane)		**Convert 1 lane in each direction to HOT 3+** from I-88 to Racine Avenue (maintain existing total number of lanes throughout) and extend Blue Line **HRT** to Mannheim Road.	Corridor Advisory Group Suggested Alternative

Source: WSP Parsons Brinckerhoff, 2016.

The 12 combination mode alternatives include maintaining the existing number of expressway lanes throughout and the addition of a new lane (in each direction) in the existing six-lane section of I-290 between I-88 and Central Avenue for 10 out of the 12 combination mode alternatives. For the managed lane concepts of HOV 2+, HOT 3+, TOLL, and HOT 3+ & TOLL, a conversion of one of the existing four lanes (in each direction) to a managed lane was assumed from Central Avenue to Racine Avenue. Racine Avenue was used as the eastern boundary of this lane conversion to allow sufficient traffic operational weaving distance between Racine Avenue and the ramps to I-90/I-94, and to match the Jane Byrne Interchange project's western terminus.

For those alternatives with a managed lane (HOV and HOT), intermediate access/egress for the managed lane was provided at 1st Avenue, Central Avenue, and California Avenue. For the HOT3+ and the TOLL alternatives, tolling at $0.12 per mile was assumed. The toll rate is consistent with what was used on the Illinois Tollway's I-355 South Extension, which was the most recent Tollway segment implemented at the time of the Round 1 screening in 2011. For the HOT3+ & TOLL and the BASE (2GP) & HOT3+ Alternatives, a toll rate of $0.16 per mile was assumed for the HOT3+ lane, and a toll rate of $0.12 per mile was assumed for the tolling of the general purpose lanes in each direction. For the BASE (3GP) W/ VALUE $ Alternative, toll rates of $0.25 per mile during the morning and afternoon peak periods (7:00 to 9:00 a.m. and 4:00 to 6:00 p.m.), $0.18 per mile during the peak shoulders (6:00 a.m. to 7:00 a.m., 9:00 a.m. to 10:00 a.m., 2:00 p.m. to 4:00 p.m., and 6:00 p.m. to 8:00 p.m.), and $0.12 per mile during the off-peak periods (10:00 a.m. to 2:00 p.m., and 8:00 p.m. to 6:00 a.m.) were assumed.

Within the 12 alternatives that were considered, three general footprint variations result: 1) an expressway lane addition with provision for an HCT extension in the median, 2) an expressway lane addition without the HCT extension provision, and 3) maintaining a six-lane section but including a provision for an HCT extension in the median. Detailed footprint requirements will be developed and evaluated in Round 3.

2.4.2 Round 2 Evaluation Results

For the Round 2 evaluation of the 12 combination mode alternatives, an evaluation matrix was used to summarize and compare how well the alternatives met four out of the five principal Purpose and Need points. The evaluation matrix for the combination mode alternatives included four of the five Purpose and Need point categories (referred to in this section as 'need points'):

- Improve Regional and Local Travel;
- Improve Access to Employment;
- Improve Safety for All Users; and
- Improve Modal Connections and Opportunities.

Because the expressway is in need of reconstruction regardless of the alternative, the fifth need point (Improve Facility Deficiencies) is common to all alternatives and is not a differentiator; therefore, it was not specifically measured in Round 2.

The evaluation measures used for **Improve Regional and Local Travel** were similar to those used in Round 1. These performance measures included assessing regional and local travel performance, such as vehicle and truck miles of travel, vehicle and truck hours of travel, congested vehicle miles of travel, hours of delay, I-290 and Study Area arterial speeds and travel times, and east-west Study Area person throughput measures.

Evaluation measures for **Improve Access to Employment** and **Improve Safety for All Users** are the same as those used in Round 1, which were the 2040 jobs accessible from the Study Area in a given time span for both auto and transit modes.

For the **Improve Modal Connections and Opportunities** need point, besides the new regional transit trip measure, two additional measures were included: 1) the number of households and 2) the number of jobs (employment) within 0.5 mile of a transit station, as compared to the No Build Alternative.

A scoring system was developed for Round 2. Across each of the 26 evaluation measures, alternatives were ranked from 1 to 12 (12 being the best), based on how well they performed relative to the 2040 No Build condition. Each alternative was then scored for each of the four need point categories by averaging the rankings of all the individual measures within the need point category. An overall score for each alternative was then calculated as the sum of the four need point category scores. With this scoring method, each need point category contributes equally to the overall score. The Rank Average for each need point was summed to arrive at the total, overall score for each alternative. For example, as shown in Figure 2-8, the "9.0" rank score for the HOV 2+ & EXP Alternative for Improve Safety for All Users was calculated by averaging the individual measure rankings (1 to 12) of the three travel measures for this alternative.

Figure 2-8. Alternative Ranking Example

Purpose and Need Point	Rank Average	
	HOV 2+ & EXP	HOV 2+ & EXP & HCT
Improve Regional And Local Travel	7.6	8.5
Improve Access to Employment	5.3	2.3
Improve Safety for All Users	9.0	10.0
Improve Modal Connections & Opportunities	1.0	6.7
Improve Facility Condition and Design	✓	✓
Score = Sum of Rank Averages	22.9	27.5

SAFETY	Injuries and Fatalities Rates % Change		Change from No-Build	Performance Rank (Compared to all alternatives)
	3.1	Arterial	0.08%	8
	3.2	Expressway	-10.14%	8
	3.3	Overall *(Arterial, Highway, Transit)*	-7.32%	11
		Need Point Average Rank ->		9.0

Source: WSP Parsons Brinckerhoff, 2016.

2.4.2.1 *Round 2 Screening Results*

The overall result of the Round 2 evaluation of the initial combination mode alternatives is presented in this section. In Figure 2-10 (Rank or Ordinal Scoring), the scores ranged from a high of 28.4 to a low of 17.9, with the largest gap in scores occurring between the top four and the remaining eight alternatives. The GP & EXP & HCT alternative had the highest overall score of all combination alternatives, followed by the HOV 2+ & EXP & HCT, HOT 3+ & EXP & HCT, and the HOT 3+ & TOLL & EXP & HCT Alternative.

At the request of stakeholders, a ratio scoring method was also applied. This method provides weighting for each measure based on the relative performance differences between the alternatives. Each of the 26 evaluation measures for each alternative was compared to the No Build Alternative and scored between 1 to 100 (1 being the worst, 100 being the best, and intermediate performers being scored on a proportionate basis). The alternative score is calculated based on its relative performance (or ratio) compared to the best (100) and worst (1) performer. Alternative scores for each need point were determined by averaging the scores of all the measures for that need point; the maximum score for any one need point is 100. For example, as shown in Figure 2-9, the "63.7" (Improve Safety for All Users) score for the HOV 2+ & EXP Alternative was calculated by averaging the individual performance scores (on a 1 to 100 scale) of the three measures for that need point. The total score for each alternative was then calculated by summing the four separate need point scores. As with the ranking scoring method, each need point contributes equally to the overall score.

Figure 2-9. Alternative Ranking Example (Ratio Scoring)

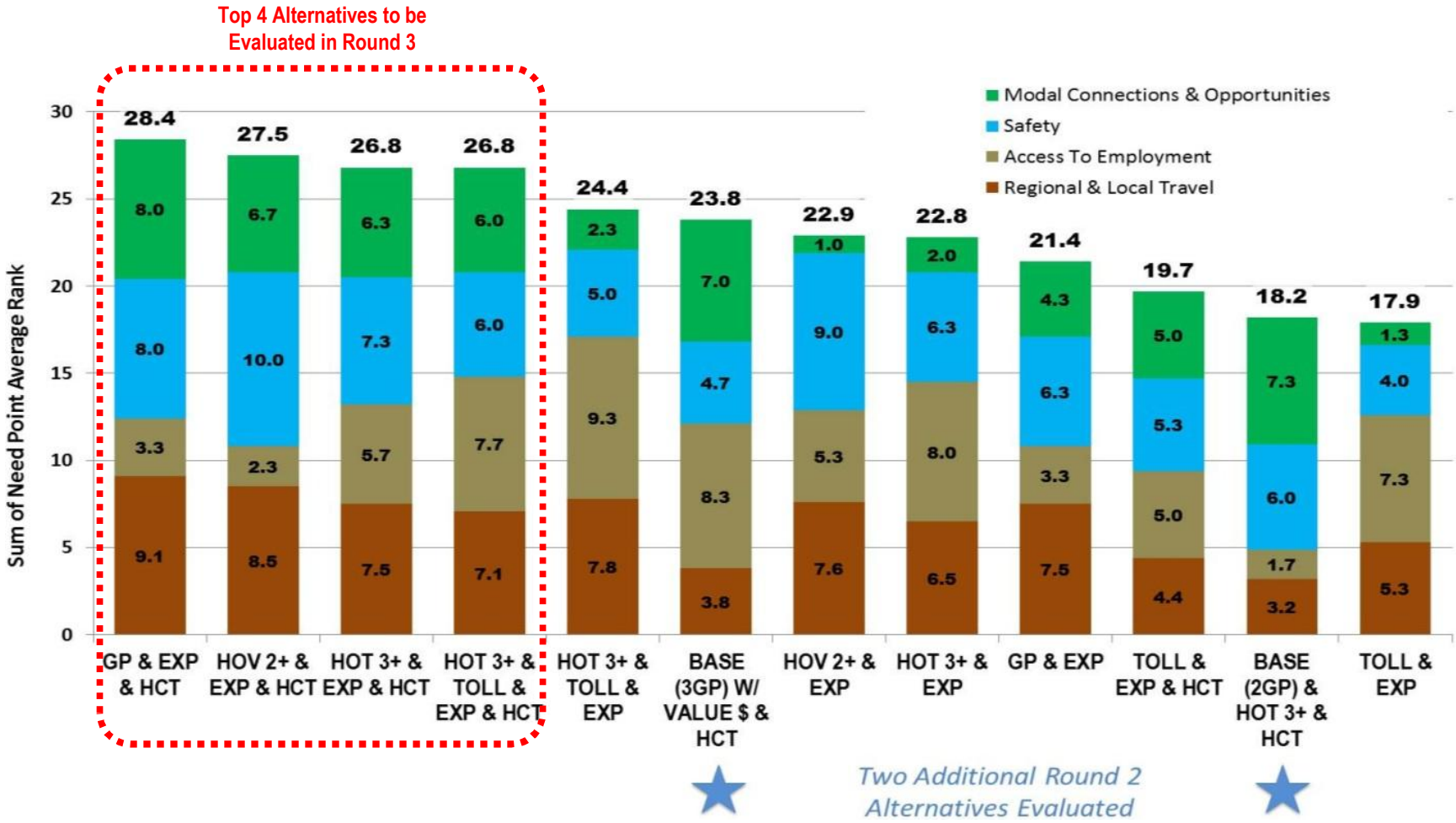
	Ratio Average	
Purpose and Need Point	**HOV 2+ & EXP**	**HOV 2+ & EXP & HCT**
Improve Regional and Local Travel	67.4	72.8
Improve Access to Employment	47.7	13.0
Improve Safety for All Users	63.7	74.3
Improve Modal Connections and Opportunities	0.0	83.3
Improve Facility Condition and Design	✓	✓
Score = Sum of Ratio Averages	**178.7**	**243.4**

SAFETY	Injuries and Fatalities Rates % Change		Change from No-Build	Performance Score (Compared to all alternatives)
	3.1	Arterial	0.08%	75
	3.2	Expressway	-10.14%	28
	3.3	Overall *(Arterial, Highway, Transit)*	-7.32%	88
		Need Point Ratio Score ->		**63.7**

Source: WSP Parsons Brinckerhoff, 2016.

Figure 2-10. Round 2 Overall Alternatives Ranking

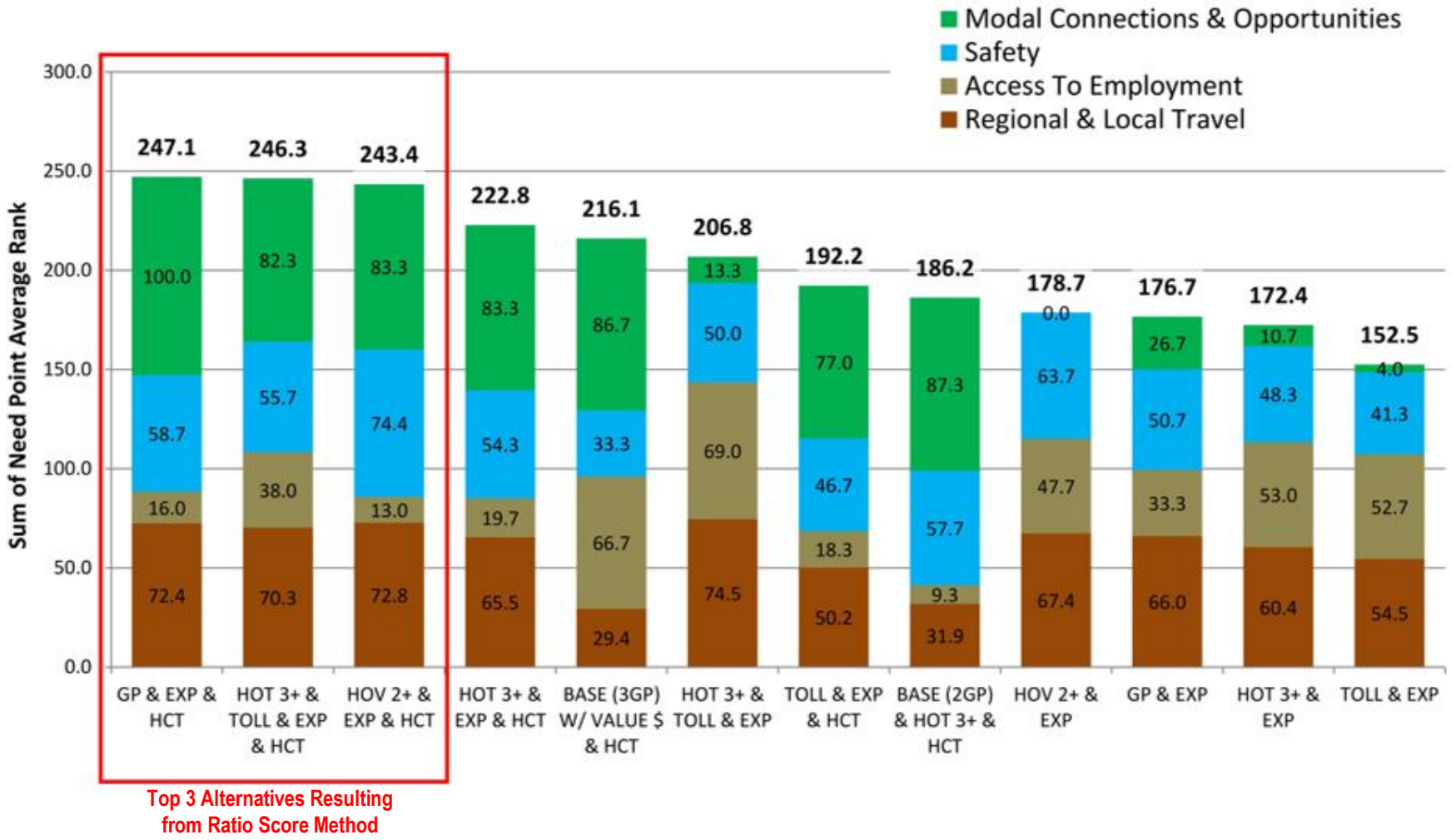
RANK (ORDINAL) SCORING



Source: WSP Parsons Brinckerhoff, 2016.

Figure 2-10. Round 2 Overall Alternatives Ranking (continued)

RATIO SCORING

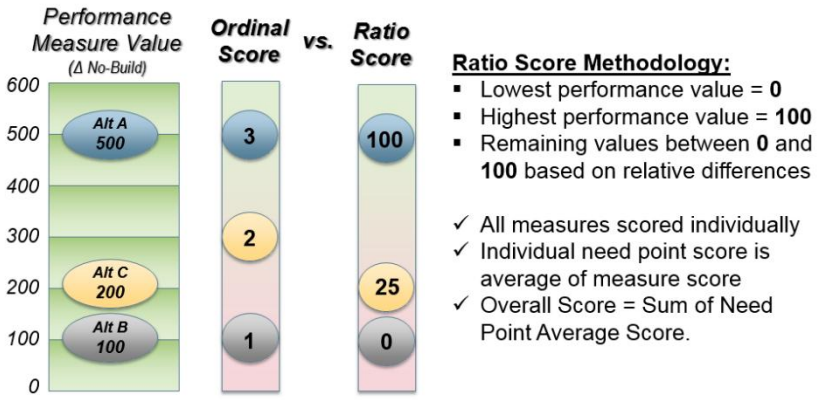


Source: WSP Parsons Brinckerhoff, 2016.

When ratio scoring is used (Figure 2-10 Ratio Scoring), the same alternatives score in the top four as with ordinal scoring, but with a more pronounced point gap separating the top three alternatives as GP & EXP & HCT, followed by HOT 3+ & TOLL & EXP & HCT, and HOV 2+ & EXP & HCT.

Figure 2-11 graphically illustrates a comparison of how the two methods are scored.

Figure 2-11. Comparison of Rank (Ordinal) and Ratio Scoring



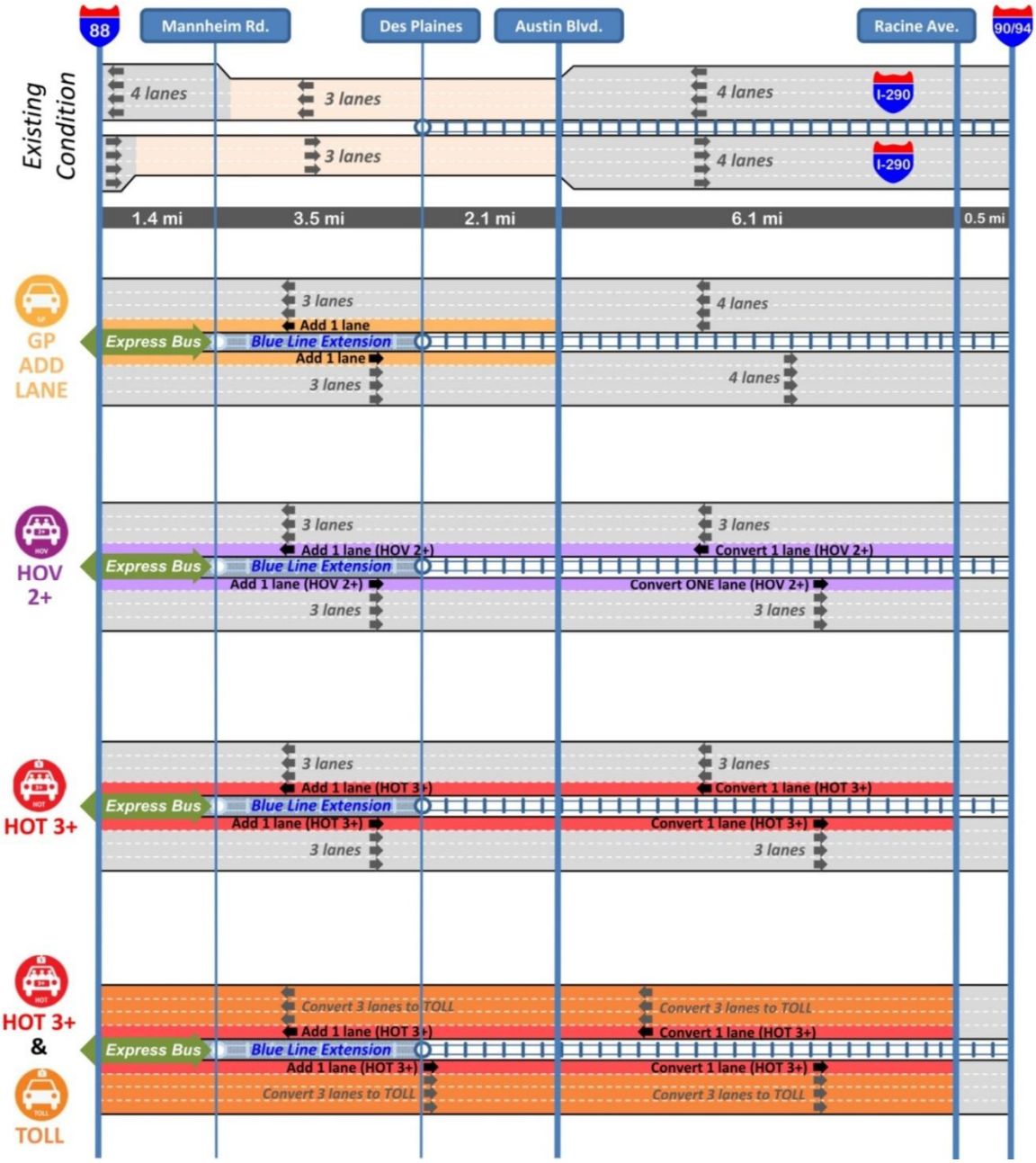
Based on the results of the Round 2 evaluation, the top four alternatives were advanced for further evaluation in Round 3. A logical cutoff exists between the fourth and fifth ranked alternative, where the largest scoring gap between two successively ranked alternatives existed in ordinal scoring. The ratio method suggests three top alternatives with a scoring gap between the third and fourth ranked alternative. This confirmed the soundness of the process and the identification of four top-performing alternatives. These four alternatives selected for further evaluation in Round 3 cover a broad range of transit improvements and expressway management strategies. Figure 2-12 depicts the four alternatives.

General Observations

Adding a Lane to I-290

- The top four scoring alternatives include an additional lane on I-290 between Mannheim Road and Austin Boulevard, and an extension of the CTA Blue Line or a new BRT facility to Mannheim Road ("HCT") with supporting express and feeder bus services. Benefits of the top four alternatives include:
  - Adding a lane generally results in improved travel times (decrease in Vehicle Hours Traveled [VHT]) on I-290 as well as the arterial system.
  - Adding a lane on I-290 generally results in an increase in expressway travel (Vehicle Miles Traveled [VMT]) and a decrease in arterial travel (VMT).
  - Adding a general purpose lane attracts the most traffic onto I-290, while adding a managed lane with higher vehicle occupancy rates or pricing allows more people to travel through the corridor ("daily person throughput").

Figure 2-12. Four Combination Mode Alternatives to be Evaluated in Round 3



- Travel time savings provided by a tolled managed lane makes the Project Corridor relatively more attractive for longer distance trips and, consequently, longer distance trips shift onto I-290 and VMT is increased. However, there is a corresponding decrease in VHT due to the additional capacity provided.
- Tolling, even with adding a lane to I-290, generally results in relatively lower performance on the arterial system. Tolling makes I-290 slightly less attractive for shorter trips that would otherwise divert from the arterial system to I-290.
- Managed lanes result in net improvement in travel times in the remaining general purpose lanes. Existing (and future) carpoolers are drawn to the managed lane and away from the remaining general purpose lanes.

Not Adding a Lane to I-290

- The alternatives that did not include an additional lane on I-290, even in combination with an HCT and supporting bus services, performed relatively poorly.
  - The lack of an additional lane, coupled with congestion pricing or existing lane conversions that restrict flow on I-290, causes a significant shift of travel to an already congested arterial system.
  - Value (congestion) pricing shifts longer distance trips onto I-290 (increased VMT), but congestion pricing, without adding lanes to I-290, also has a net negative effect upon regional and arterial VHT due to the added capacity constraints imposed on the overall system.

Transit Service Expansion

- The alternatives that included HCT and supporting bus services created the relatively highest number of new transit trips, but more than 50 percent of the total ridership consists of trips diverted from other existing transit services.
- The alternatives that included HCT and supporting bus services provide new high-capacity options for the reverse commute.
- The alternatives that included HCT and supporting bus services generally resulted in increased VMT compared to alternatives without these transit components. This is because the HCT improvements in the Study Area shift some medium and shorter distance trips from auto to transit. This frees up capacity for longer distance auto trips to shift onto I-290.
- The alternatives that include HCT and supporting bus services provided slightly better safety performance compared to alternatives that did not include HCT, due to the shift in trips to transit (and to I-290), which has a higher safety performance.

The results matrix for the Round 2 evaluation of the 12 combination mode alternatives is included in Appendix C.

Overall and Combined Performance – Top Four Alternatives

As described above, the top four combination mode alternatives scored relatively higher than the other eight combination mode alternatives that were considered in Round 2. It should also be noted that these four combination mode alternatives all address the Purpose and Need, as overall regional and local travel performance is improved over the No Build Alternative, access to employment is greater than the No Build Alternative, overall safety is improved over the No Build Alternative, and modal opportunities are improved over the No Build Alternative. In addition, all four of these alternatives include reconstruction of I-290 between Cicero Avenue and Mannheim Road, addressing facility condition and design.

The following is a summary of the performance findings of each of the top four alternatives, based on the ordinal scoring method:

- The GP & EXP & HCT Alternative provides the best overall score of 28.4, driven by having the highest regional and local travel, and modal connections and opportunity improvements, as well as providing good safety performance. The added capacity attracts longer distance trips from the arterial network and onto the expressways for which they are intended. This shift from arterials also improves arterial performance in the Study Area, giving GP lanes the relatively highest overall performance for improving regional and local travel. Compared to the other alternatives, the GP lane combination alternatives showed a lower accessibility to jobs and safety performance. Accessibility to jobs for the GP lane combination alternatives is improved over the baseline condition, but not to the same extent as the managed lane alternatives due to the managed lanes providing a faster path than the GP lanes, therefore allowing users of the managed lanes to access more jobs located farther away in 60 minutes or less. With respect to overall safety, this GP lane combination mode alternative results in the best arterial safety due to the highest diversion of traffic from the arterials to the expressway, thus reducing the potential for crashes on the arterials.
- The HOV 2+ & EXP & HCT Alternative scored second best overall at 27.5. It provided the best safety performance and the second highest improvements to local and regional travel, as well as ranking as one of the top three for modal connections and opportunities. HOV lanes provided as much as a 40 percent reduction in daily hours of congestion in the managed lane, and more than 11 percent in the general purpose lanes. This is due in part to the already high percentage of HOV 2+ vehicles in this corridor that could use the HOV 2+ lane. The HOV 2+ combination alternatives indicated the highest overall safety performance improvements due to the increased auto and transit person throughput relative to the volume of traffic on the arterials and expressway.
- The HOT 3+ & EXP & HCT Alternative showed good overall performance, tied for third best in scoring at 26.8. The HOT 3+ alternatives show high person throughput, as the HOT 3+ lane allows better operations management control with toll pricing. Arterial performance was also good for this alternative as there is diversion of longer distance trips from the arterials to the expressway. There is also good performance

related to access to employment due to better operations management of the HOT 3+ lane that result in a relatively faster route (as compared to other combination alternatives) to jobs from the Study Area. Overall safety was also good due to the arterial diversion to the expressway and increased person throughput relative to the traffic volumes on the arterials and expressway.

- The HOT 3+ & TOLL & EXP & HCT Alternative showed good overall performance, tied for third best in scoring at 26.8. The HOT 3+ & TOLL Alternatives result in strong expressway travel performance due to the additional HOT 3+ lane in each direction and the lesser volumes on the expressway because of the tolls in all lanes. However, this is countered by the highest increase in arterial congestion for the combination alternatives with added expressway capacity as traffic is diverted from the expressway to the arterial due to tolling all expressway lanes. Similarly, expressway safety is relatively better (due to lower traffic volumes) and arterial safety is worse because more traffic on the arterials increases the risk of crashes. Job accessibility is also strong due to good expressway performance.

2.4.3 Round 3 DEIS Alternatives

The results from the Round 2 evaluation established the set of mainline combination transit and expressway mode alternatives for detailed evaluation in Round 3. As described in the Round 2 evaluation, the overall scores of the top four combination mode alternatives were relatively higher than the remaining eight alternatives and, as such, the top four combination mode alternatives are carried into Round 3 along with the No Build Alternative. The build alternatives being advanced into Round 3 include:

- GP & EXP & HCT (also referred to as GP Add Lane Alternative)
- HOV 2+ & EXP & HCT (also referred to as HOV 2+ Alternative)
- HOT 3+ & EXP & HCT (also referred to as HOT 3+ Alternative)
- HOT 3+ & TOLL & EXP & HCT (also referred to as HOT 3+ & TOLL Alternative)

These alternatives are depicted in Figure 2-12.

2.5 Round 3 DEIS Alternatives

The result of the Round 2 combination mode evaluation led to the selection of four DEIS build alternatives and the No Build Alternative for further definition and evaluation in Round 3. Round 3 includes formal expansion of the Study Area east to Racine Avenue in Section 2.5.1, further definition of the build alternatives through an interchange type selection process, as described in Section 2.5.2, a summary of Round 3 travel performance in Section 2.5.3, and further refinement of the Round 3 alternatives in Section 2.5.4.

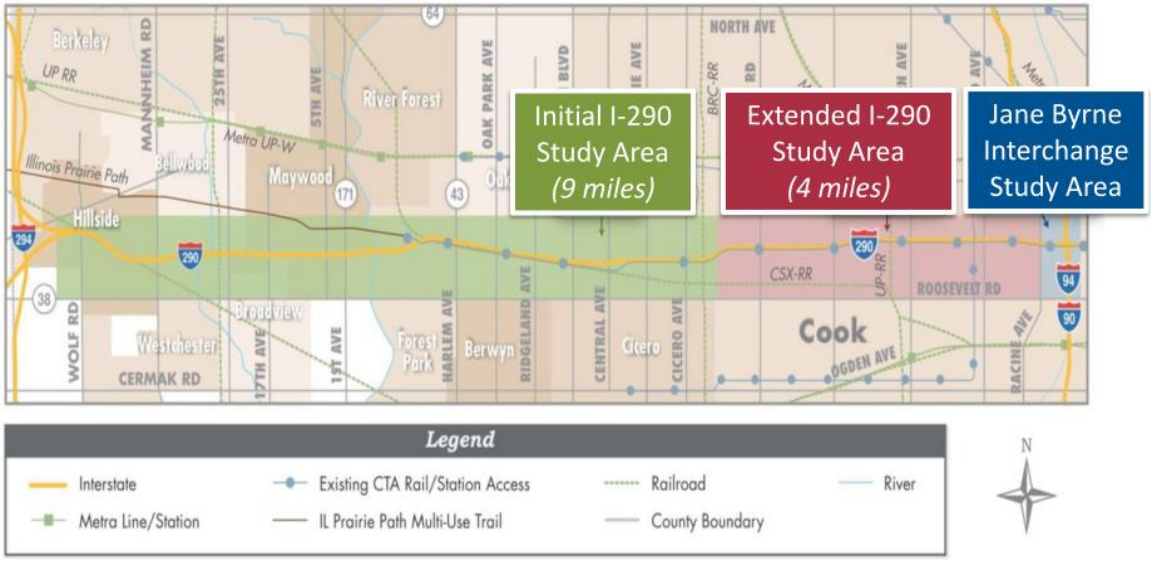
2.5.1 Study Area Extension

The initial Study Area spanned approximately 9 miles from the I-88/I-290 interchange to just east of Cicero Avenue to address the six-lane section bottleneck of I-290. As the

alternatives analysis progressed into the Round 2 evaluation, the managed lane and transit alternatives suggested by project stakeholders included operational improvements that extended east along I-290 to the Jane Byrne (former Circle) Interchange; therefore, the Study Area was formally extended to Racine Avenue for the Round 3 evaluation.

The I-290 revised Study Area is centered along I-290 in Cook County and extends approximately 13 miles from the I-88/I-290 interchange to Racine Avenue (Figure 2-13). This section of I-290 is a primary corridor serving travel between the western suburbs and the City of Chicago loop, as well as connecting southern Cook County to the high employment centers found in the I-88 Technology Corridor and the O'Hare commerce centers. The Study Area includes the seven villages of Hillside, Westchester, Bellwood, Broadview, Maywood, Forest Park, Oak Park, and also the City of Chicago.

Figure 2-13. I-290 Phase I Study Area



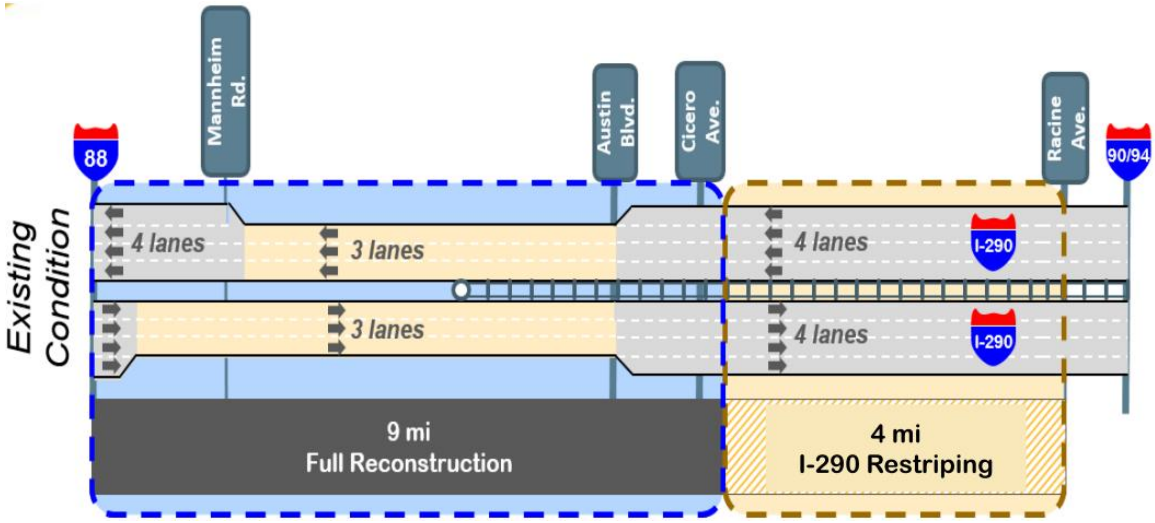
Source: WSP Parsons Brinckerhoff, 2016.

Racine Avenue was chosen as the revised eastern limit of the Study Area because this is also the western limit of the Jane Byrne Interchange Project. The Jane Byrne Interchange Project is addressing safety, facility condition, and congestion issues associated with this system interchange between I-290, I-90, and I-94. Construction of that project began in 2013.

Based on the needs analysis from the I-290 Study, no new expressway capacity is identified for the eight-lane section. As such, full reconstruction of this eight-lane section of the Study Area is not recommended. Any proposed operational changes in this section of the Study Area would be accommodated primarily via revised signing, restriping, and intelligent transportation system (ITS) improvements. No changes to the existing expressway interchanges and ramps are proposed, and the condition of the overhead bridges in the eight-lane restriping section is being addressed as part of separate studies being conducted by IDOT.

Figure 2-14 illustrates the overall 13-mile long Study Area, which is defined by two sections: a full reconstruction section (9 miles) and a restriping section (4 miles). The reconstruction section would require full reconstruction of the expressway and overhead bridges to accommodate the alternatives, which include additional lanes and alignment and profile changes. The restriping section does not require reconstruction to accommodate the alternatives and would consist primarily of new signing and pavement restriping.

Figure 2-14. I-290 Study Area Sections



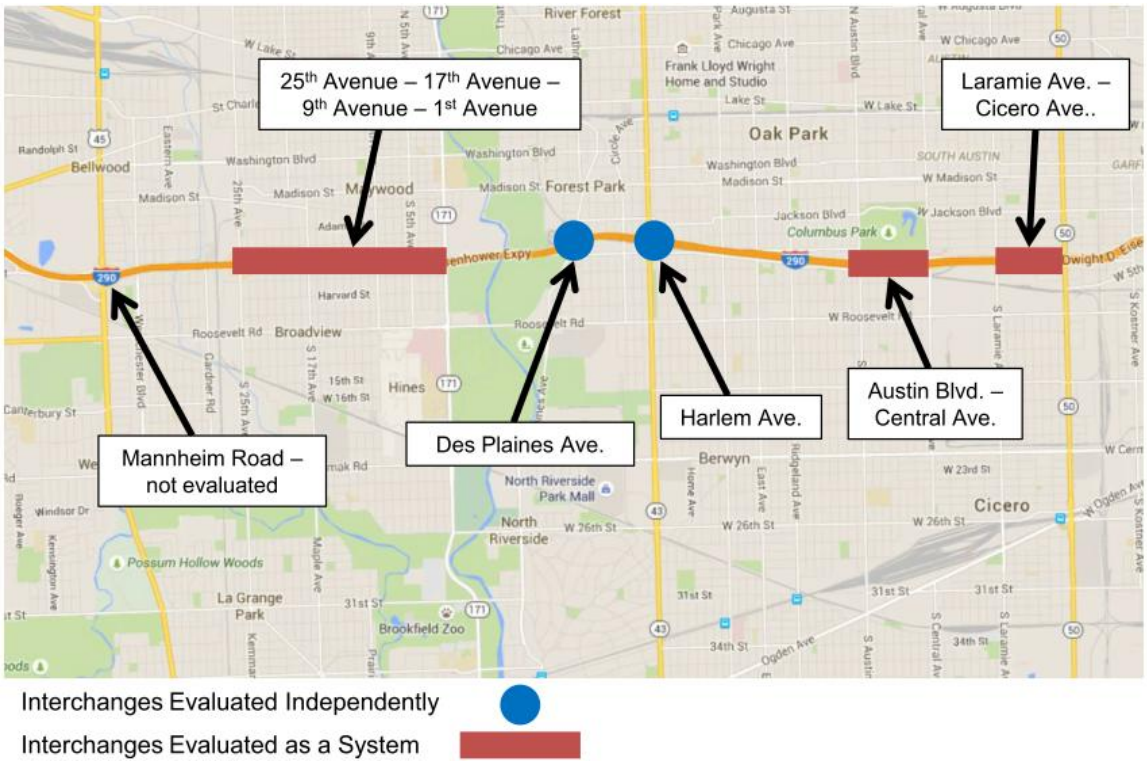
Source: WSP Parsons Brinckerhoff, 2016.

2.5.2 Interchange Type Selection and Refinement Summary

This section describes the recommended interchange concepts to be further refined and evaluated in Round 3. The Combined Design Report fully describes the interchange alternatives considered and the process by which the recommended interchange types were identified. Design concepts at the 11 interchanges were evaluated along the Project Corridor as part of the Round 2 alternatives analysis. The Mannheim Road interchange was fully reconstructed in 2001 with the ramps and overhead bridge designed to accommodate future mainline reconstruction, including an added lane. Therefore, new interchange types for the Mannheim Road interchange were excluded from the interchange type studies.

Of the other 10 existing interchanges, some were evaluated independently due to their isolated nature, while others that are closely spaced or connected via frontage roads were evaluated as a "system," since the operations at one location could have an effect on an adjacent interchange. The primary evaluation factors were safety, geometric impact, traffic operations, and accommodations for potential nonmotorized and transit facilities. Figure 2-15 shows the evaluation type performed for each interchange.

Figure 2-15. Interchanges Evaluated



Source: WSP Parsons Brinckerhoff, 2016.

Stakeholder coordination was critical in the identification and development of the types and locations of interchanges in the corridor. In the Village of Maywood, an Advisory Working Group (AWG), consisting of local residents, business owners, municipal staff, and elected officials, met five times over 8 months with IDOT representatives to focus on the location and configuration of interchanges and access to the community at and in between 25th Avenue and 1st Avenue. During that time, IDOT staff also held 12 working meetings with municipal staff to work through the identification and evaluation of alternatives and to identify the preferred access alternative. Two broader town hall meetings were also held during this time to inform the community on the AWG progress and gather additional input.

In the Village of Oak Park, a Working Group consisting of municipal staff and elected officials was assembled and met 21 times with IDOT representatives over a period of 17 months to discuss and refine project elements. The Working Group included focused reviews regarding the design and operations of the Harlem Avenue and Austin Boulevard interchanges. Eight special Village Board Study Sessions were held to inform the Village Board and community at large and to collect input on the project elements.

Evaluated Independently:

- DesPlaines and Harlem avenues: These interchanges are not directly connected to adjacent interchanges via a frontage road system; therefore, they were evaluated independently.

Evaluated as a System:

- 25th Avenue to 1st Avenue (including existing interchanges at 25th, 17th, 9th, and 1st avenues): There are nine existing ramp connections eastbound and eight existing ramp connections westbound in this 1.5-mile long section, with one-way parallel frontage roads connecting to the expressway via several slip ramps.
- Austin Boulevard and Central Avenue: These two interchanges are located 0.5 mile apart and do not meet current design guidelines for interchange spacing. Furthermore, the existing left-hand ramps at Austin Boulevard present safety and operational issues. Due to the close proximity of Austin Boulevard and Central Avenue, right-hand ramps at Austin Boulevard would conflict with the ramp design requirements for Central Avenue and require unique design considerations. For this reason, these two interchanges were evaluated together geometrically and operationally.
- Laramie Avenue and Cicero Avenue: Laramie Avenue and Cicero Avenue are closely spaced at 0.5 mile apart and connected by one-way frontage roads with slip ramps to I-290. These two half diamond interchanges effectively serve as one full interchange. For these reasons, Laramie Avenue and Cicero Avenue were evaluated as a system.

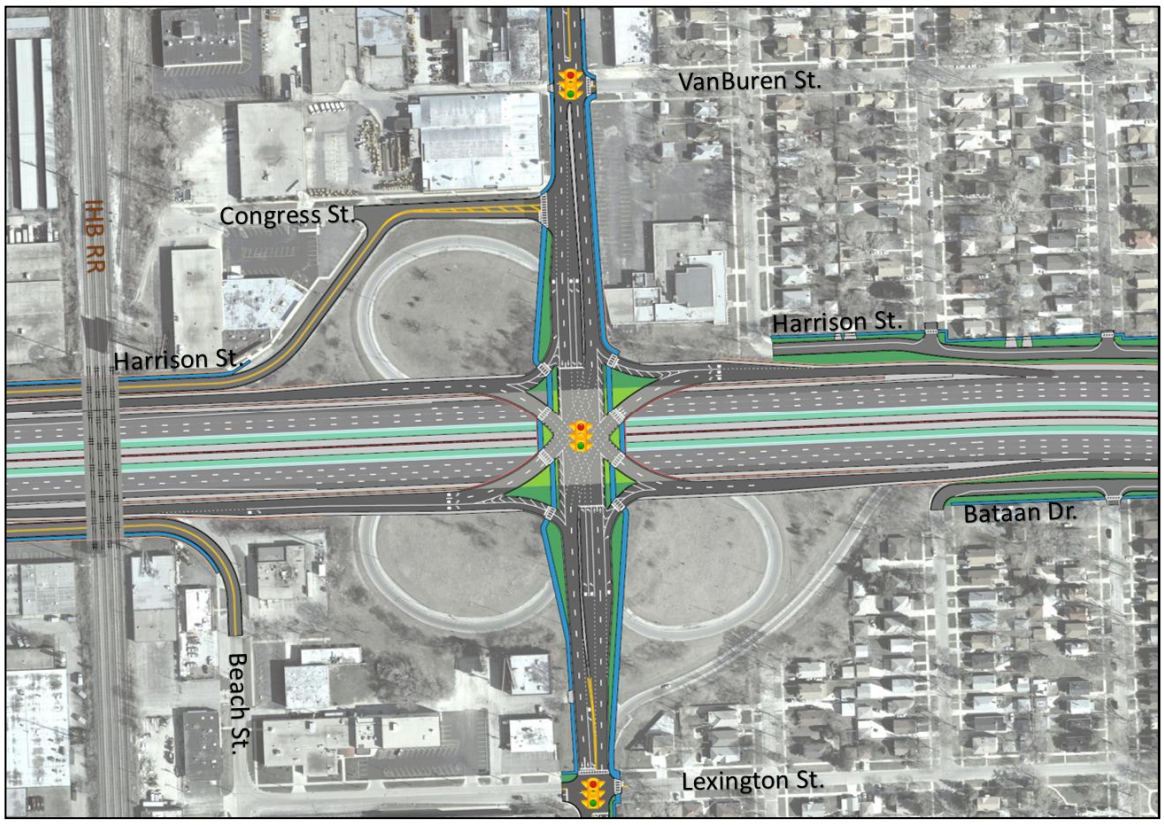
The proposed interchange concepts are the same for each build alternative; therefore, they are not factors in the Round 3 evaluation. The detailed evaluation of interchange alternatives and summary of the proposed interchange design and operations are included in the Combined Design Report for the project.

2.5.2.1 25th Avenue

At 25th Avenue, a Single-Point Urban Interchange (SPUI) was selected as the preferred concept for its high operational performance, its compact design, and compatibility with the land use plans of local villages (Figure 2-16). The compact SPUI would provide full access at 25th Avenue where currently only partial access exists. This design would replace the existing loop ramp configuration, providing additional space for stormwater detention ponds that would be used to accept stormwater overflow from the local communities and minimizing required right-of-way. The existing bridge carrying the IHB Railroad over I-290 would also be reconstructed to accommodate the added lanes, the acceleration/ deceleration lanes, and the two frontage roads.

A raised median along 25th Avenue would be required for the dual northbound and southbound left-turn lanes. To the south, the raised median would extend to just north of the signalized Lexington Street intersection, where northbound and southbound left-turn lanes would be added. To the north, the existing signal at Congress Street would be relocated north to Van Buren Street, a raised median would extend from the interchange to just south of the Van Buren Street intersection, and a southbound left-turn lane would be provided. Due to the raised median extending north to Van Buren Street, access to Congress Street would be reconfigured as right-in, right-out access only.

Figure 2-16. 25th Avenue Proposed Interchange Concept



Source: WSP Parsons Brinckerhoff, 2016.

Nonmotorized improvements at 25th Avenue would include 10-foot-wide, Americans with Disabilities Act (ADA) accessible sidewalks and crossings along the east and west side of 25th Avenue over I-290. All proposed signals would include pedestrian crossing countdown timers.

Only 0.54 acre of right-of-way would be required. 0.061 acre would be required in the northeast quadrant to accommodate the westbound-to-northbound ramp terminal and for widening 25th Avenue to accommodate dual southbound turn lanes. The existing parcel in the northeast quadrant is under consideration by the Village of Bellwood for commercial redevelopment, and the compact SPUI design would minimize right-of-way needed from this parcel. To the south, 0.46 acre of right-of-way would be needed along Indian Joe Drive due to a slight relocation of the frontage road to accommodate the improved I-290 cross section and new eastbound I-290 off-ramp to 25th Avenue. At the Lexington Street intersection, 0.0007 acre would be required to accommodate intersection improvements at Lexington Street.

2.5.2.2 17th Avenue

The proposed interchange concept at 17th Avenue would continue to provide full directional expressway access via improved slip ramp connections to/from Harrison Street and to/from Bataan Drive (Figure 2-17). 17th Avenue improvements would include a northbound right-turn lane at Bataan Drive, 12-foot-wide sidewalks and pedestrian plaza areas with ADA-accessible ramps, and modernized signals. This concept does not require any additional right-of-way.

Figure 2-17. 17th Avenue Proposed Interchange Concept

Source: WSP Parsons Brinckerhoff, 2016.

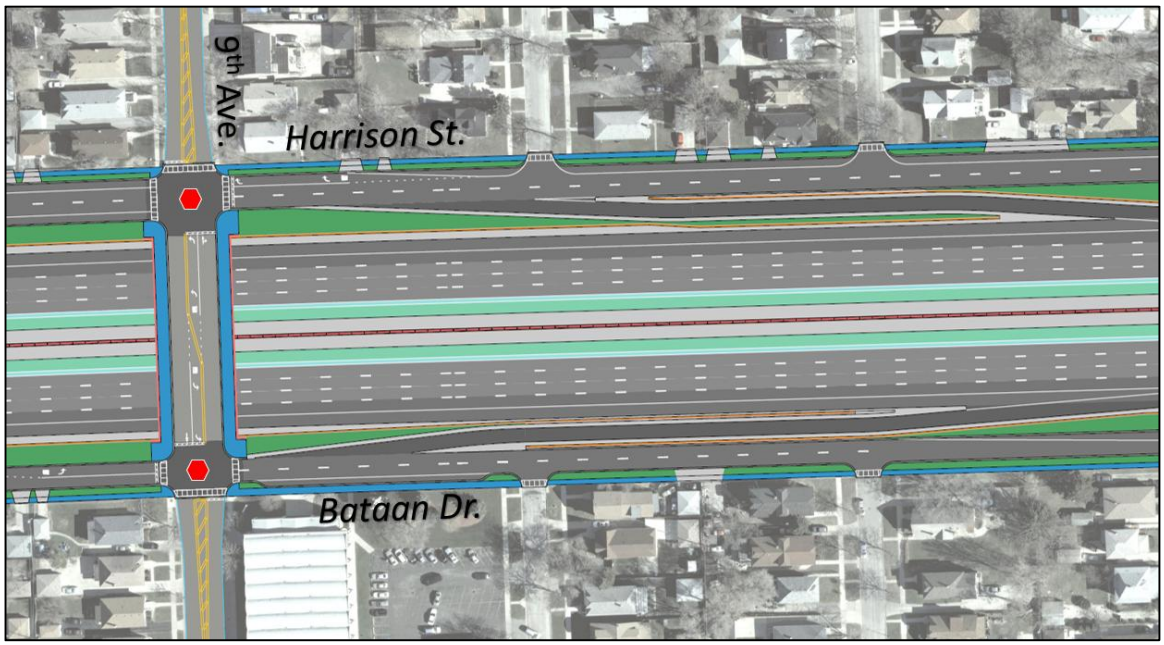
2.5.2.3 9th Avenue

The proposed interchange concept at 9th Avenue would continue to provide expressway access to and from the east via improved slip ramp connections to Harrison Street and from Bataan Drive (Figure 2-18). 9th Avenue improvements would include 12-foot-wide sidewalks and pedestrian plaza areas with ADA-accessible ramps and modernized signals. This concept would not require any additional right-of-way.

2.5.2.4 1st Avenue (IL 171)

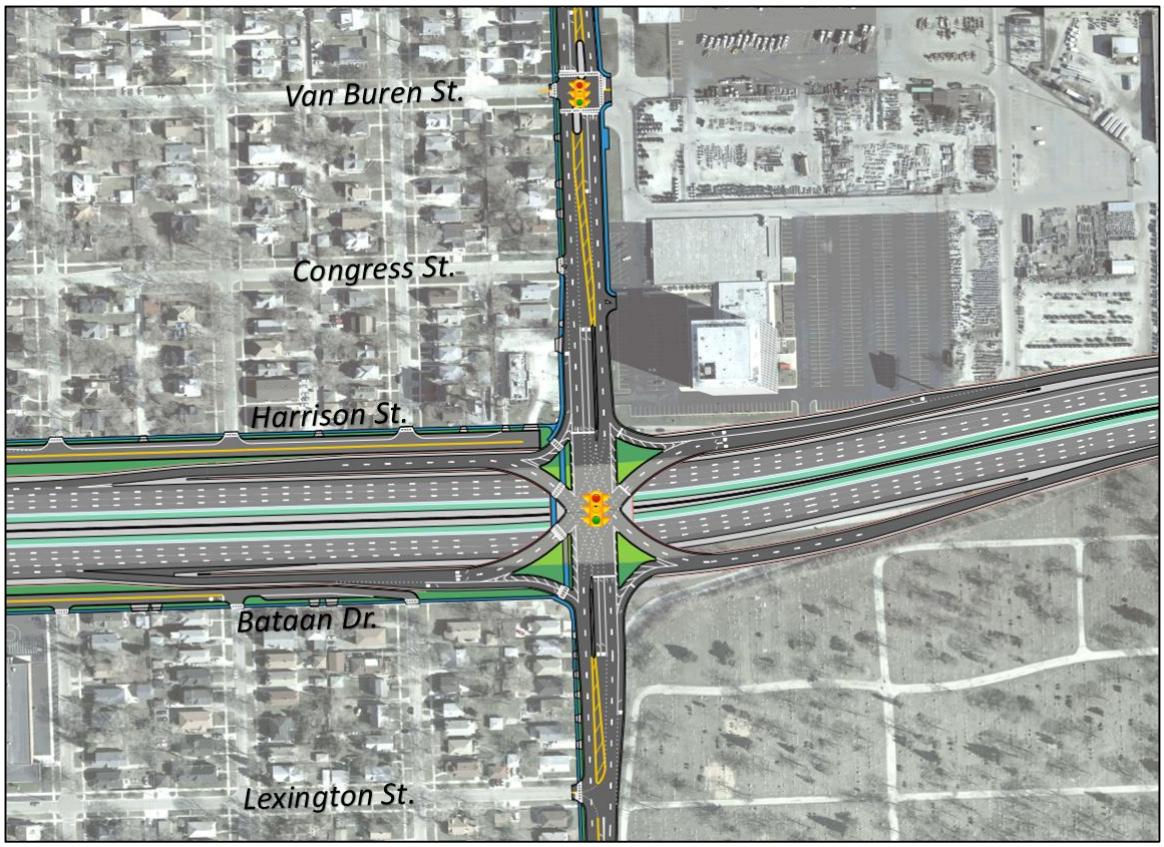
At 1st Avenue, a SPUI was selected as the preferred concept for its efficient operation that would significantly reduce congestion and delay at this location (Figure 2-19). This very congested interchange currently operates at a failing level of service (LOS) F and experiences very long queues and extended delays on 1st Avenue. To improve performance at this interchange, the Harrison Street and Bataan Drive frontage roads would no longer connect with 1st Avenue. Dual left-turn lanes would be provided at all approaches, and signal phasing would be reduced from four to three phases. Compared to the 2040 No Build condition, the proposed SPUI would reduce delay by 74 percent and vehicle stacking by 77 percent.

Figure 2-18. 9th Avenue Proposed Interchange Concept



Source: WSP Parsons Brinckerhoff, 2016.

Figure 2-19. 1st Avenue (IL 171) Proposed Interchange Concept



Source: WSP Parsons Brinckerhoff, 2016.

Painted medians would be provided along 1st Avenue, except along the dual northbound and southbound left-turn lane storage areas, which would be protected from opposing traffic by a raised median. To the north, northbound and southbound left-turn lanes would be provided at Van Buren Street; a short section of raised median is proposed along 1st Avenue at the south leg of the Van Buren Street intersection to accommodate a pedestrian refuge island.

Nonmotorized improvements at 1st Avenue would include a signalized bike and pedestrian crossing of the Illinois Prairie Path at 1st Avenue and a 10-foot-wide ADA-accessible sidewalk along the west side of 1st Avenue and crossing over I-290. All proposed signals would include pedestrian crossing countdown timers. A bus pad and shelter area would be accommodated on the east side of 1st Avenue at Van Buren Street to provide improved transit amenities for Pace Bus Route #320, which serves the Maywood Workforce Center located in the Eisenhower Tower Building.

The compact design footprint of the 1st Avenue interchange would minimize the amount of right-of-way required, with 1.94 total acres required at this location. 1.9 acres would be required in the northeast quadrant between the expressway and Maybrook Drive for widening of 1st Avenue to accommodate dual southbound turn lanes, and northbound and southbound left-turn lanes at Van Buren Street; 0.039 acre of right-of-way would be required in the northwest corner of the interchange to accommodate improved geometry.

2.5.2.5 DesPlaines Avenue

At DesPlaines Avenue, the proposed interchange concept would maintain the existing ramp access to and from the west, and the ramps would be improved to meet current design standards (Figure 2-20). The proposed concept includes on-street bike lanes, 10-foot wide ADA-accessible sidewalks across both sides of the DesPlaines Avenue bridge, a shared use path bridge crossing of DesPlaines Avenue, and a shared use path connection to the east side of DesPlaines Avenue. All new signals would include pedestrian crossing countdown timers. Intersection improvements requested by the Village of Forest Park are also incorporated at the eastbound off-ramp connection with Harrison Street, including improved truck turning radii and improved turn lane channelization at each approach. CTA is planning to fully redevelop and modernize the Forest Park Blue Line Terminal & Yard and Shop facilities. CTA's proposed improvements include extending the CTA terminal over DesPlaines Avenue to provide direct terminal access from both sides of DesPlaines Avenue. The redevelopment plans also include converting Van Buren Street to two-way operations, as well as removing the parking lot on the south side of the terminal.

The proposed DesPlaines Avenue interchange concept is compatible with the current CTA Terminal site plan, as well as the future CTA terminal site concept as proposed at the time of this FEIS. The compatible design can accommodate the terminal site redevelopment without requiring bridge or ramp reconstruction.

Figure 2-20. DesPlaines Avenue Proposed Interchange Concept

Source: WSP Parsons Brinckerhoff, 2016.

A total of 0.088 acre of right-of-way would be required, primarily north of I-290 along the east and west sides of DesPlaines Avenue, to accommodate improved 10-foot-wide sidewalks and 6-foot-wide bike lanes along DesPlaines Avenue.

2.5.2.6 Harlem Avenue (IL 43)

The proposed Harlem Avenue interchange concept is a modified SPUI design (Figure 2-21). Similar to a standard SPUI, the proposed interchange would operate with a single signal location; however, the ramp connections would be accommodated at Harlem Avenue in a compact configuration, comparable to a standard intersection. Expressway ramps would enter and exit I-290 from the right, then cross over the expressway to connect to Harlem Avenue at a compact four-leg intersection. This concept centers the intersection location over the expressway, maximizing the horizontal separation of the intersection from the adjacent signalized intersections at Jackson Boulevard and Harrison Street. No additional right-of-way would be required.

The compact design of the modified SPUI provides operational improvements that would include improved truck turning radii, improved lane channelization, dual left-turn lanes on the ramps, and increased queue storage on the off-ramps. The dual left-turn lanes and increased ramp traffic storage would minimize the risk of ramp traffic backing up onto the expressway through lanes and allow more signal green time to be allocated to the north-south traffic flow and pedestrian crossing movements along Harlem Avenue. Ramp turn signal phases would also be separated to reduce potential turning conflicts with improved

Figure 2-21. Harlem Avenue (IL 43) Proposed Interchange Concept

Source: WSP Parsons Brinckerhoff, 2016.

safety. New signals at the Jackson Boulevard and Harrison/Garfield Street intersections would be coordinated with the interchange signal, which would also improve operations at both of these intersections.

Nonmotorized improvements would include wider ADA-accessible sidewalks across the bridge, pedestrian plaza areas in each corner of the intersection, and a wide transit plaza area near the CTA Harlem Avenue Blue Line station entrance. The wider sidewalk along the east side of Harlem Avenue could also accommodate a bus stop shelter for a new/relocated northbound bus stop located directly across from the CTA station. Crosswalks and pedestrian crossing countdown signals would be provided across all four intersection legs, and pedestrian refuge islands would be located between the ramps. North of the expressway, a ramp connection to the proposed grade-separated east-west shared use trail would be provided.

A total of 0.014 acre of right-of-way would be required by IDOT along the west side of Harlem Avenue, just north of I-290, to accommodate an improved 10-foot-wide sidewalk.

2.5.2.7 *Austin Boulevard*

The proposed Austin Boulevard interchange concept is a modified SPUI design (Figure 2-22). Similar to a standard SPUI, the proposed interchange would operate with a single signal; however, the ramp connections would be accommodated at Austin Boulevard in a compact configuration, comparable to a standard intersection. Expressway ramps would enter and exit I-290 from the right, then cross over the expressway to connect to Austin Boulevard at a compact four-leg intersection. This concept centers the intersection location over the expressway, maximizing the horizontal separation of the intersection from the adjacent signalized intersection at Harrison Street. No additional right-of-way would be required.

Figure 2-22. Austin Boulevard Proposed Interchange Concept

Source: WSP Parsons Brinckerhoff, 2016.

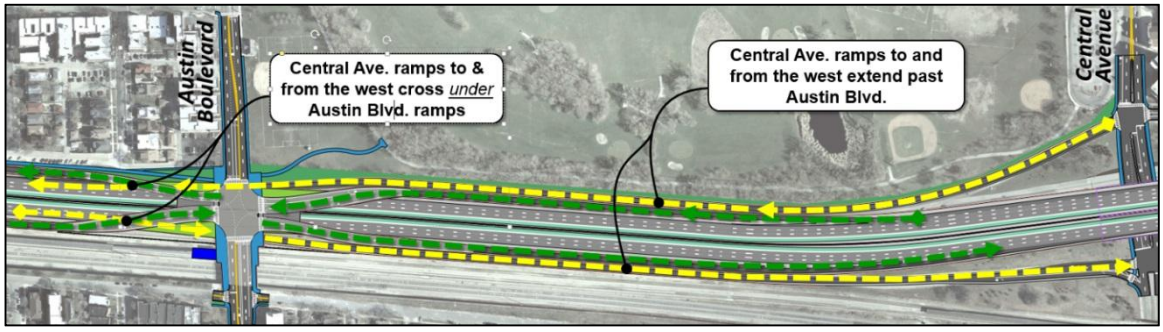
The compact design of the modified SPUI provides operational improvements that would include improved truck turning radii, improved lane channelization, dual southbound left-turn lanes, dual ramp left-turn lanes, and increased queue storage on the off-ramps. The dual left ramp turn lanes and increased ramp traffic storage would minimize the risk of ramp traffic backing up onto the expressway through lanes and would also allow more signal green time to be allocated to the north-south traffic flow and pedestrian crossing movements along Austin Boulevard. Ramp turn signal phases would also be separated to reduce potential turning conflicts with improved safety. A new signal at Harrison Street would be coordinated with the interchange signal, which would also improve operations at Harrison Street. Due to their close proximity to the

interchange ramp signal, Garfield Street and Railroad Avenue would be reconfigured for right-in, right-out only operations.

Nonmotorized improvements would include wider ADA-accessible sidewalks across the bridge, pedestrian plaza areas in each corner of the intersection, and a wide transit plaza area near the CTA Austin Boulevard Blue Line station entrance. The wider sidewalk along the east side of Austin Boulevard could also accommodate a bus stop shelter for a new/relocated northbound bus stop located directly across from the CTA station. Crosswalks and pedestrian crossing countdown signals would be provided across all four intersection legs, and pedestrian refuge islands would be located between the ramps. North of the expressway, the proposed east-west shared use path would connect at grade with Austin Boulevard. A connection of the shared use path to the Columbus Park path would also be accommodated.

Because of the close spacing of Austin Boulevard and Central Avenue, "braided" ramps would be provided to separate entering and exiting traffic between the two interchanges (Figure 2-23). The westbound on-ramp from Central Avenue and eastbound off-ramp to Central Avenue would be extended to the west and would cross under Austin Boulevard and the Austin Boulevard ramps. In this configuration, the off-ramps would enter the expressway prior to an on-ramp, which would improve mainline traffic weaving operations.

Figure 2-23. Austin Boulevard and Central Avenue Braided Ramp Configuration

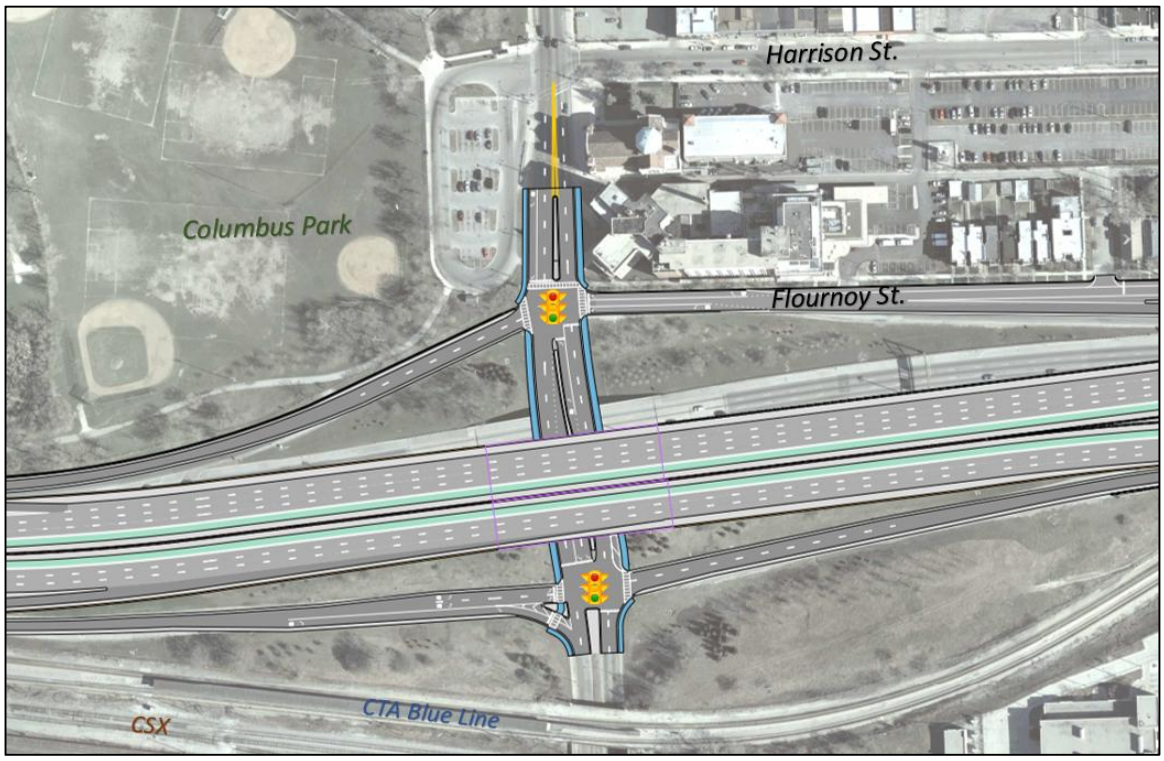


Source: WSP Parsons Brinckerhoff, 2016.

2.5.2.8 Central Avenue

At Central Avenue, the proposed interchange concept would maintain the diamond interchange configuration with some operational and geometric improvements to address current design standards, including dual left-turn lanes on the westbound off-ramp (Figure 2-24). 10-foot-wide, ADA-accessible sidewalks would also be included along both sides of Central Avenue between the ramp intersections. Ramp intersections would have modern signals that include pedestrian countdown timers. No new right-of-way would be required.

Figure 2-24. Central Avenue Proposed Interchange Concept



Source: WSP Parsons Brinckerhoff, 2016.

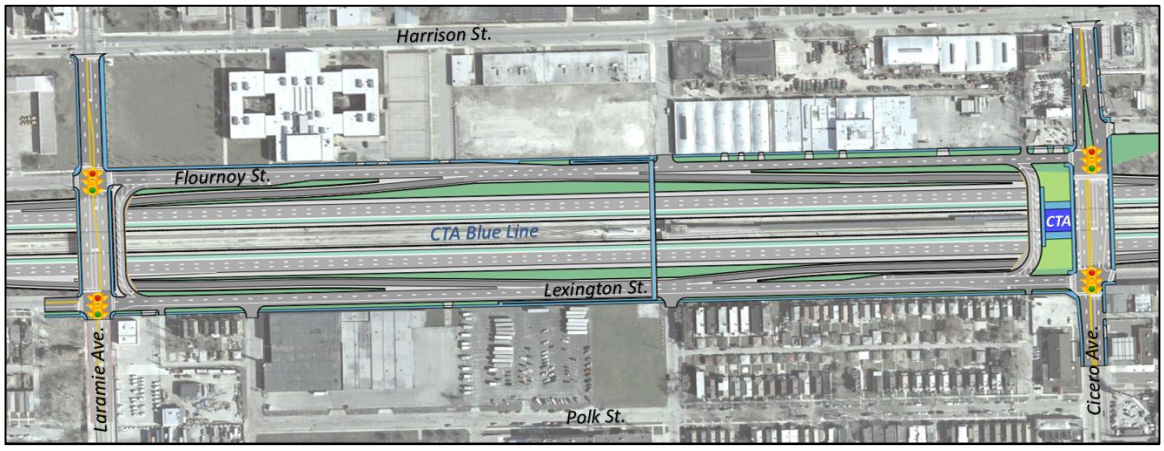
2.5.2.9 Laramie Avenue and Cicero Avenue (IL 50)

Laramie Avenue and Cicero Avenue are very closely spaced and overall operate as a single, full-access interchange (Figure 2-25). The proposed interchange type at Laramie Avenue and Cicero Avenue is identified as a reverse diamond with frontage road U-turns. The reverse diamond with U-turn concept maintains the existing ramp access locations, but it reverses their connections to provide an off-ramp followed by an on-ramp in each direction. This relocates the traffic weave between ramps from the higher speed, higher volume expressway onto the lower speed, lower volume frontage roads. No additional right-of-way would be required at Laramie Avenue or Cicero Avenue.

The U-turn design, sometimes referred to as a "Texas U-Turn" or "Texas Turnaround," allows for vehicles traveling on a one-way frontage road to U-turn onto the opposite frontage road by crossing under or over the freeway.

In this application, a U-turn west of Cicero Avenue would permit traffic heading east on Lexington Street to bypass the two signals at Cicero Avenue to head west on Flournoy Street if their ultimate destination is either westbound I-290 or Laramie Avenue. The U-turn at Cicero Avenue would also include a bus pullout at the CTA Blue Line Cicero Avenue Station to accommodate bus to rail transit transfers.

Figure 2-25. Laramie Avenue and Cicero Avenue (IL 50)
Proposed Interchange Concept



Source: WSP Parsons Brinckerhoff, 2016.

The U-turn east of Laramie Avenue would accommodate the westbound traffic in a similar way. Westbound traffic on Flournoy Street destined for Cicero Avenue or eastbound I-290 could use the U-turn to bypass the two intersections on Laramie Avenue to head eastbound on Lexington Street to access Cicero Avenue or eastbound I-290.

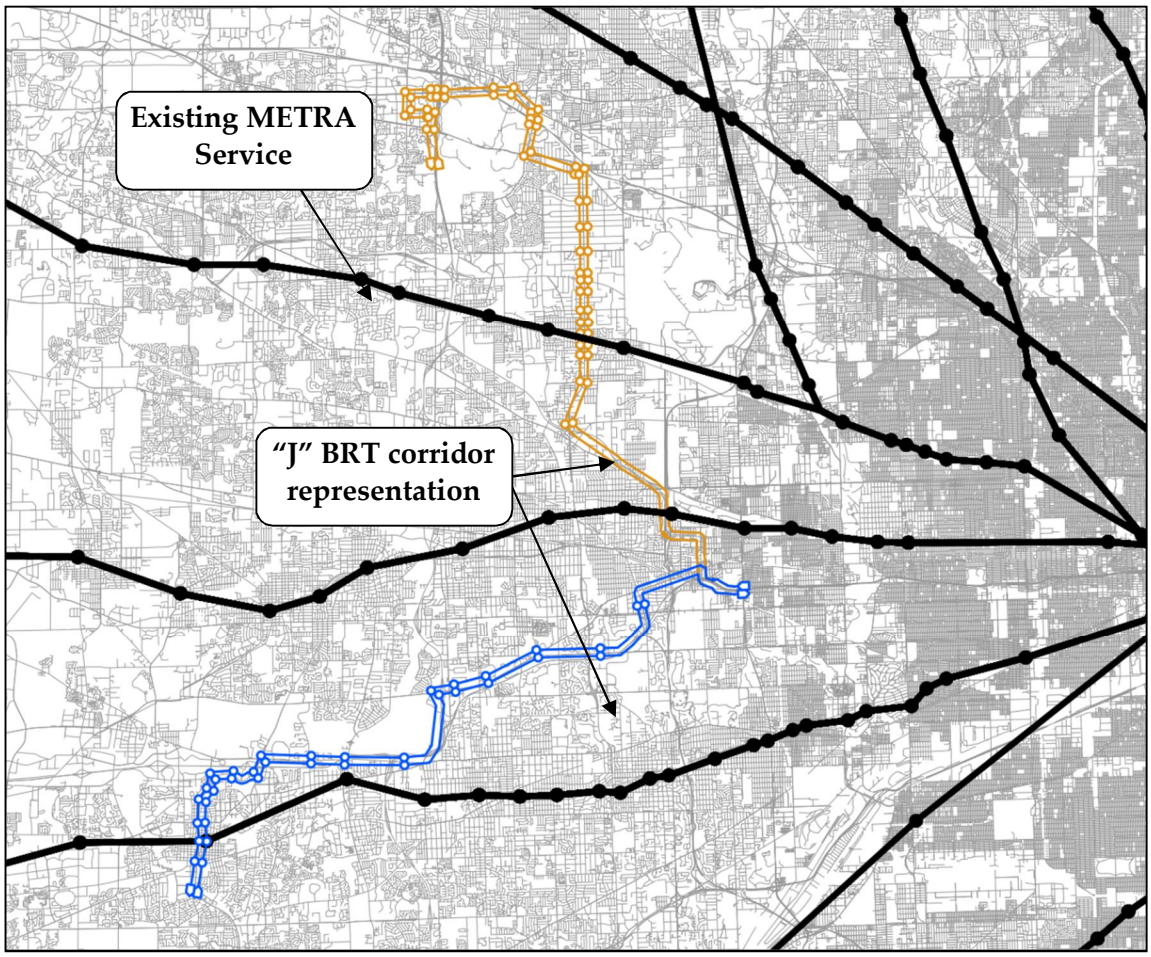
Nonmotorized improvements would include a new pedestrian bridge near Lavergne Avenue that would extend over Flournoy Street and Lexington Street and wider, ADA-accessible 10-foot wide sidewalks across the Laramie Avenue and Cicero Avenue bridges. Bus lanes that service bus stops in front of and across from the CTA Blue Line Station would be provided on the Cicero Avenue Bridge in the northbound and southbound directions. A new signalized pedestrian crossing of Cicero Avenue would be provided just south of the Flournoy Street intersection to improve bus transfers between the CTA station and the northbound bus stop. New signals would be provided at Cicero Avenue and Flournoy Street, and at Cicero Avenue and Lexington Street. All new signals would include pedestrian crossing countdown timers.

2.5.3 Round 3 Travel Performance

The Round 3 alternatives were tested using the travel demand forecasting model. The Round 3 travel performance results reflect use of the 2040 Build market-based population and employment forecasts, the revised Study Area definition described in Section 3.1, and a revised definition of the regional measures from the 21-county modeling area to the six-county northeast Illinois region (Cook, DuPage, Kane, Lake, McHenry, and Will counties).

The transit network was similar to that assumed in Round 2 with the HCT extension to Mannheim Road and bus network assumed, with the addition of two new bus routes representing the two branches of the proposed "J" BRT corridor feeding the Mannheim Road Station (as shown in Figure 2-26), and EXP from DuPage County using the managed lane and serving the University of Illinois Chicago Campus and the Illinois Medical District.

Figure 2-26. Round 3 Transit Network



Source: WSP Parsons Brinckerhoff, 2016.

For the managed lane alternatives (HOV and HOT), the west terminus was I-88 and the east terminus was Ashland Avenue. Intermediate access/egress for the managed lane was assumed at 1st Avenue, Austin Boulevard, and California Avenue. Congestion pricing was assumed for the HOT 3+ lane. Toll rates of $0.20 per mile during the morning and afternoon peak periods (7:00 to 9:00 a.m. and 4:00 to 6:00 p.m.), $0.16 per mile during the peak shoulders (6:00 a.m. to 7:00 a.m., 9:00 to 10:00 a.m., 2:00 p.m. to 4:00 p.m., and 6:00 p.m. to 8:00 p.m.), and $0.12 per mile during the off-peak periods (10:00 a.m. to 2:00 p.m., and 8:00 p.m. to 6:00 a.m.) were assumed. A $0.12 per mile toll was assumed for the tolling of the existing three lanes in each direction on I-290 for the HOT 3+ & TOLL Alternative.

The travel performance for the four Round 3 build alternatives was compared to the No Build Alternative and is presented in Table 2-9. Figures in green denote an improvement, and figures in red a worsening of performance compared to the No Build Alternative.

Table 2-9. Round 3 Travel Performance Comparison (Showing Change from 2040 No Build)

Travel Measure	No Build Alternative	GP & EXP & HCT Alternative	HOV 2+ & EXP & HCT Alternative	HOT 3+ & EXP & HCT Alternative	HOT 3+ & TOLL & EXP & HCT Alternative
Regional VMT (miles)	201,187,710	+151,380	+72,492	+52,211	+33,774
Regional VHT (hours)	8,067,709	-9,840	-9,773	-16,161	-17,300
I-290 Travel Time (Min) (GP/ML)	30.7 / NA	21.2 / NA	23.2 / 13.7	23.0 / 13.5	14.8 / 12.6
Study Area Arterial VMT (miles)	4,294,011	-24,560	+6,944	-8,853	+147,834
Study Area Arterial VHT (Hours)	255,282	-1,996	-967	-1,643	+6,778
Person Throughput	459,122	+25,247	+31,871	+28,604	+25,294
Job Accessibility	5,151,539	+105,053	+364,948	+397,660	+326,499
Overall Safety (crashes per million person miles per year)	0.287	-4.86%	-6.44%	-6.21%	-4.65%
East-West Transit Trips	76,950	+4,375	+2,150	+4,425	+8,425

Source: WSP Parsons Brinckerhoff, 2016.

The travel performance of the Round 3 build alternatives is summarized below.

- GP & EXP & HCT: This alternative had the greatest reduction in arterial VMT and VHT, but also had the greatest increase in regional VMT. This is because the added capacity of the GP lane in each direction between Mannheim Road and Austin Boulevard is not managed; therefore, this additional capacity is nearly fully used, resulting in the most diversion of longer distance trips from the arterials to the expressway. This alternative had the largest increase in regional VMT because more trips are attracted to the expressway system to utilize the additional I-290 capacity. The GP Add Lane also had the second lowest decrease in regional VHT and lowest person throughput. These two travel measures are good indicators of efficient use of the transportation system, because it is the most beneficial to minimize time spent traveling on the highway system and to maximize person throughput. Since the

added GP lane is not managed, it does not encourage carpool use or promote more efficient use of the additional capacity. In addition, the GP lane had the lowest job accessibility due to the lack of a faster managed lane, although the alternative does improve travel times on I-290 versus the No Build Alternative.

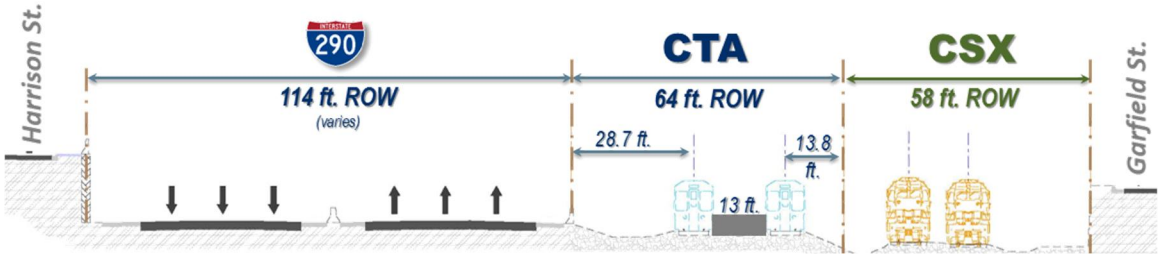
- HOV 2+ & EXP & HCT: This alternative had the highest person throughput, primarily due to the HOV lane, which encourages carpooling. It should be noted that even though this alternative had the lowest increase in east-west transit trips, this was more than offset by the increase in carpool use and more efficient management of the added capacity resulting in the highest person throughput. However, the HOV2+ Alternative had the lowest decrease in regional VHT, in part due to the second highest increase in regional and arterial VMT (as regionally, carpool vehicles are driving farther to get to the additional capacity provided by the HOV lane, and the greatest benefit for diverting from arterial to expressway trips is for carpool vehicles), and the lowest increase in east-west transit trips (due to the most competition for forming new carpools versus switching to transit). Job accessibility is the second highest due to the travel time advantages provided by the managed HOV lane. The HOV 2+ Alternative had the highest overall safety improvement.
- HOT 3+ & EXP & HCT: This alternative had the second lowest increase in regional and arterial VMT and the second highest reduction in regional and arterial VHT. This is due to the additional capacity provided by the HOT 3+ Alternative lane and the reliability and efficiency of its operation; this alternative encourages carpools with 3 or more persons and allows others to pay tolls for a guaranteed faster trip through the use of congestion pricing. As a result, the HOT 3+ Alternative attracts more arterial diversions than the HOV 2+ Alternative and has slightly faster travel times in both the managed lane and general purpose lanes than those of the HOV 2+ Alternative. The HOT 3+ Alternative has the second highest person throughput because it is encouraging 3+ carpools, has the second highest increase in east-west transit trips, and has faster, more reliable managed lane operation based on congestion pricing. It also has the highest job accessibility due to both the improved managed lane travel time and the improvement in arterial performance. Overall, the HOT 3+ Alternative is first or second best in improvement for all of the travel measures, so this alternative provides very balanced transportation benefits.
- HOT 3+ & TOLL & EXP & HCT: This alternative had the lowest increase in regional VMT, the highest reduction in regional VHT, and the fastest I-290 general purpose and managed lane travel times. This is due to the tolling of all of the lanes on I-290 that results in the least traffic on I-290 because of drivers avoiding tolls by diverting from the expressway to arterials. As a result, the HOT 3+ & TOLL Alternative has the highest increase in arterial VMT and VHT, and it has the lowest overall safety improvement. The HOT 3+ & TOLL Alternative has the second lowest person throughput due to lower expressway volumes that more than offset the highest increase in east-west transit trips.

2.5.4 Other Round 3 Refinements and Considerations

2.5.4.1 Expressway and Railroad Right-of-Way Evaluation

As part of the I-290 Study, IDOT evaluated the availability of CTA and freight railroad right-of-way from just east of Austin Boulevard to Circle Avenue to determine an optimal cross-section configuration that considers the needs of CSX Transportation freight rail, CTA rapid transit, and the I-290 Expressway. The typical section, which represents the most constrained section of this area, is located just east of Oak Park Avenue (Figure 2-27).

Figure 2-27. Existing Expressway and Parallel CSX and CTA Constrained Section



Source: WSP Parsons Brinckerhoff, 2016.

CSX Right-of-Way Availability and Typical Section:

Within this footprint evaluation Study Area, CSX operates in a generally 58-foot-wide strip of parallel right-of-way located south of I-290 and CTA. The southern edge of the CSX right-of-way is primarily defined by a retaining wall that extends along the majority of its trackage in this area.

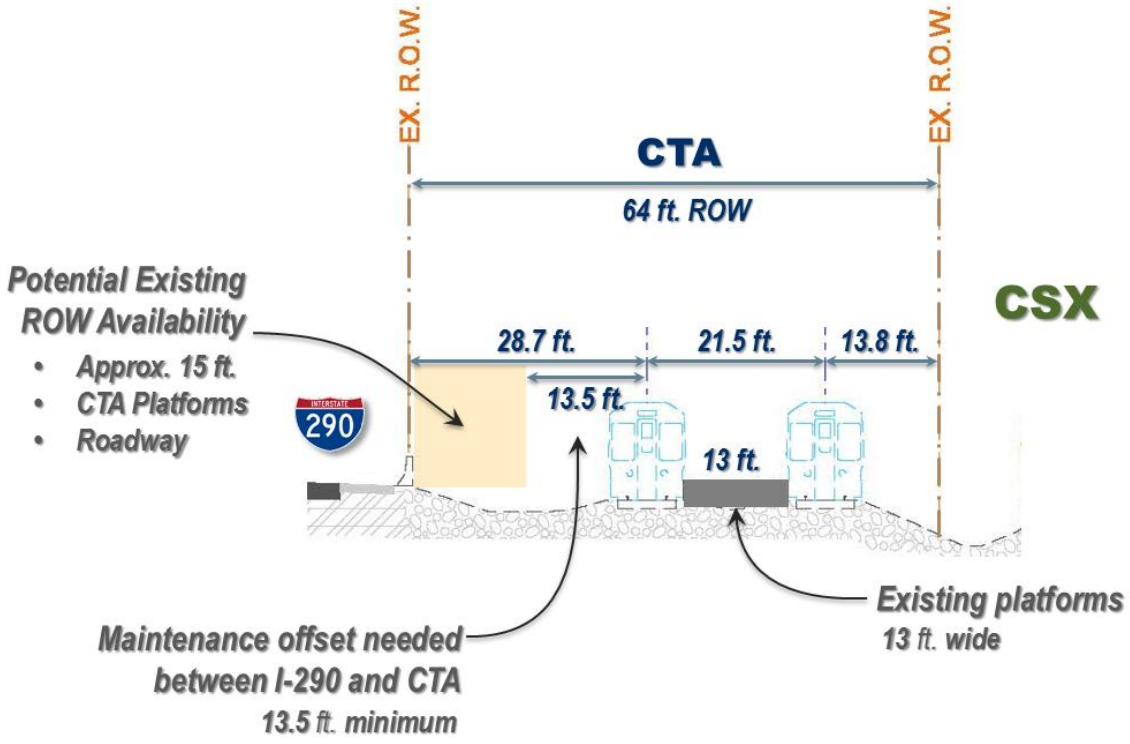
Currently, there are two mainline tracks in this area and a siding track where CSX services the Ferrara Candy Company located along the south edge of the Project Corridor, just east of Circle Avenue. CSX provides weekly rail deliveries to this client (Figure 2-28).

Regarding horizontal clearances, CSX indicated that this is an active freight corridor. As such, CSX stated a need to accommodate a minimum two-track envelope to maintain service and that there is no excess CSX right-of-way available.

CTA Right-of-Way Availability and Safety Evaluation:

The CTA Blue Line Vision Study concluded that as part of the Blue Line modernization needs, the Austin, Oak Park, and Harlem stations would remain in place and would continue to be accessed via dual head houses located at the adjacent cross streets with track-level platform access end-loaded as it is today. The Blue Line Vision Study also concluded that a third or express track is not needed and is not proposed as part of the modernization. Based on the results of the Blue Line Vision Study, CTA indicated that up to 15 feet of CTA right-of-way could be available for expressway improvements.

Figure 2-28. Existing CTA Right-of-Way Configuration



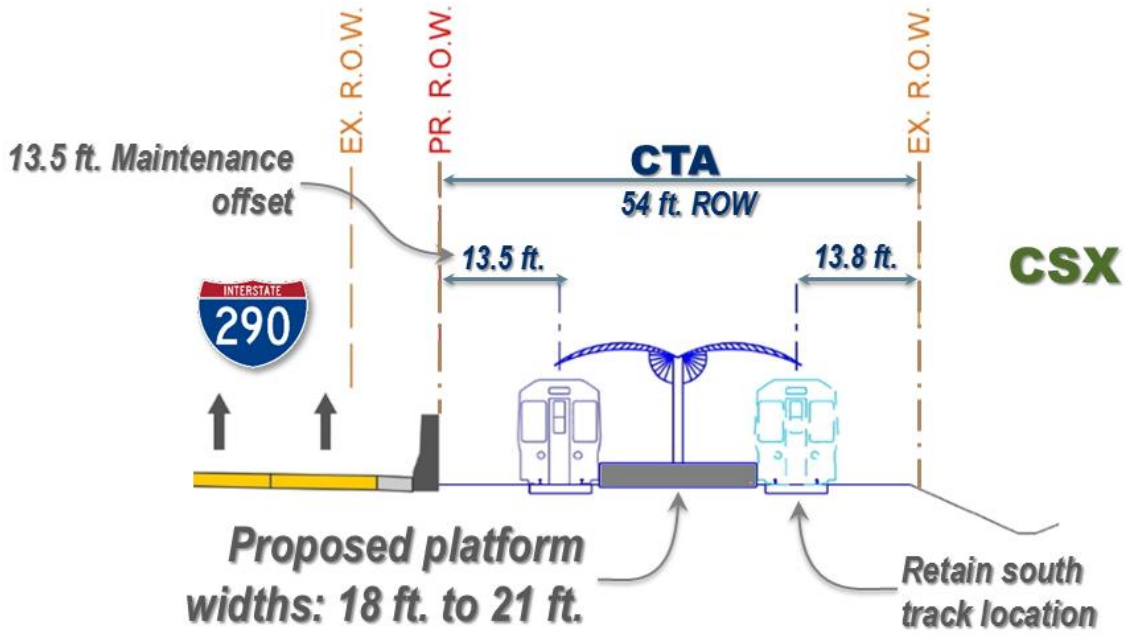
Source: WSP Parsons Brinckerhoff, 2016.

CTA stipulated that any use of CTA right-of-way would require platform widening to accommodate future ridership and up to a 10-car train; a 13.5-foot-wide maintenance offset between the proposed I-290 barrier and the centerline of the CTA rapid transit tracks; and a review of proposed platform widths per National Fire Protection Association (NFPA)-130.

Assuming an expressway improvement utilizing up to 10 feet of CTA right-of-way to accommodate wider shoulders and/or lanes, the resulting space available for platform widths were determined and evaluated. In this evaluation, the south track was assumed to remain on its current alignment, and the north track would be shifted to accommodate wider platforms. The platform widths that could be accommodated (assuming up to 10 feet of CTA right-of-way is used for I-290 improvements) are from approximately 18 to 21 feet wide. Figure 2-29 illustrates generally how the I-290 and CTA right-of-way is proposed to be allocated. Each station platform can accommodate a 10-car train; however, the length of the platform was not a factor in the determination of right-of-way evaluation.

IDOT evaluated the proposed platform widths to determine if the widths would meet the NFPA-130 fire code egress time requirements.

Figure 2-29. 10-Foot Right-of-Way and CTA Right-of-Way Configuration



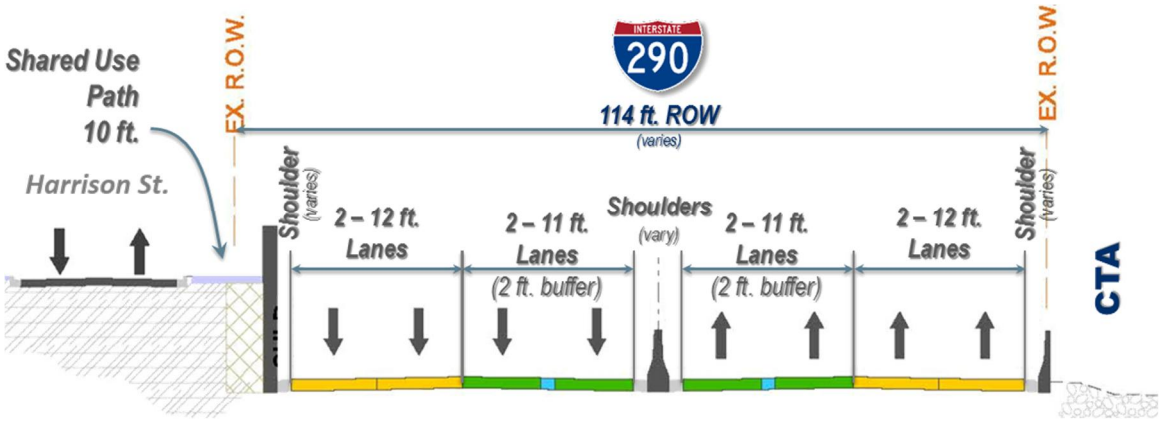
Source: WSP Parsons Brinckerhoff, 2016.

The conceptual platform widths, as proposed for the Harlem, Austin, and Oak Park stations, were found to allow passengers to be evacuated to the street-level sidewalk areas outside the stationhouses within the NFPA-130 time requirements. The analysis indicated that emergency passenger evacuation is primarily affected by the configuration of stationhouse egress barriers (i.e., turnstiles, roto gates, accessible fare gates, emergency exit gates, and station exit doors/gates) than by the width of the end-loaded platforms. Simply increasing platform widths beyond the proposed dimensions (and thereby the clear widths of vertical circulation elements) is not a key factor in reducing total evacuation time per NFPA 130 - 2014. Further and more detailed fire code safety analysis would be required during final design to account for any proposed platform features/amenities and other obstructions.

I-290 Safety Evaluation

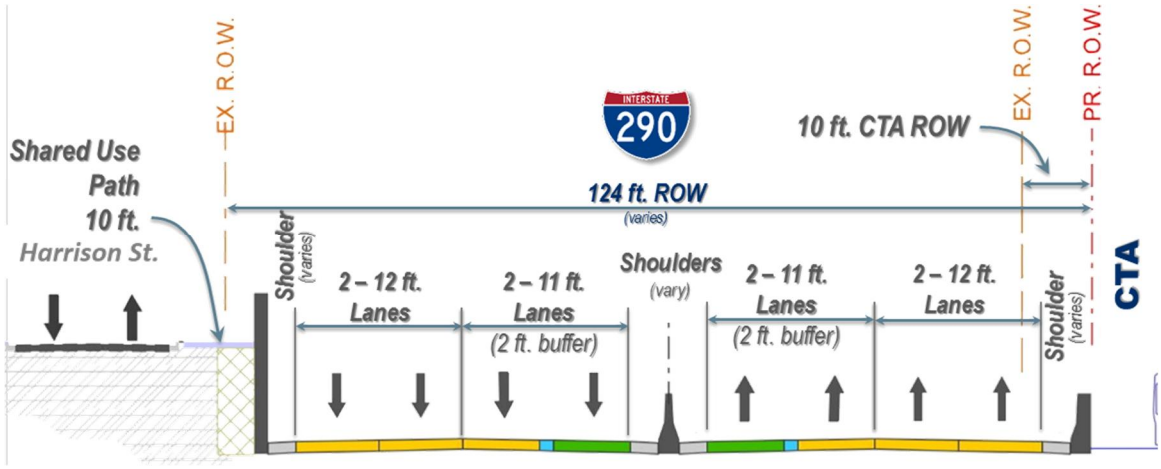
Two expressway geometric alternatives were evaluated as part of the right-of-way footprint evaluation; an alternative that required no right-of-way from CTA (Figure 2-30), and an alternative that assumed up to 10 feet of CTA right-of-way (Figure 2-31)were available to accommodate wider shoulders and/or lanes.

Figure 2-30. I-290 Expressway Improvement Configuration without 10-Foot CTA Right-of-Way



Source: WSP Parsons Brinckerhoff, 2016.

Figure 2-31. I-290 Expressway Improvement Configuration with 10-Foot CTA Right-of-Way



Source: WSP Parsons Brinckerhoff, 2016.

The expressway safety performance of both geometric alternatives was evaluated to determine the best overall lane and shoulder configurations. The Interchange Safety Analysis Tool-Enhanced (ISATe) predictive highway safety evaluation tool developed by TTI was used to test the mainline geometry. The summary of the analysis is presented in Figure 2-32.

Figure 2-32. I-290 Expressway and CTA ROW Safety Evaluation

ISATe Expressway Safety	Lanes (each direction)	Shoulders (minimum)	Injury Crash Reduction (Compared to NoBuild)	Overall Crash Reduction (Compared to NoBuild)
1. No ROW	2 @ 11ft 2 @ 12ft	2ft inner 2ft outer	**-3.9%**	**-11.8%**
2. 10ft. CTA ROW	2 @ 11ft 2 @ 12ft	4ft inner 4ft outer	**-9.6%**	**-15.1%**

Source: WSP Parsons Brinckerhoff, 2016.

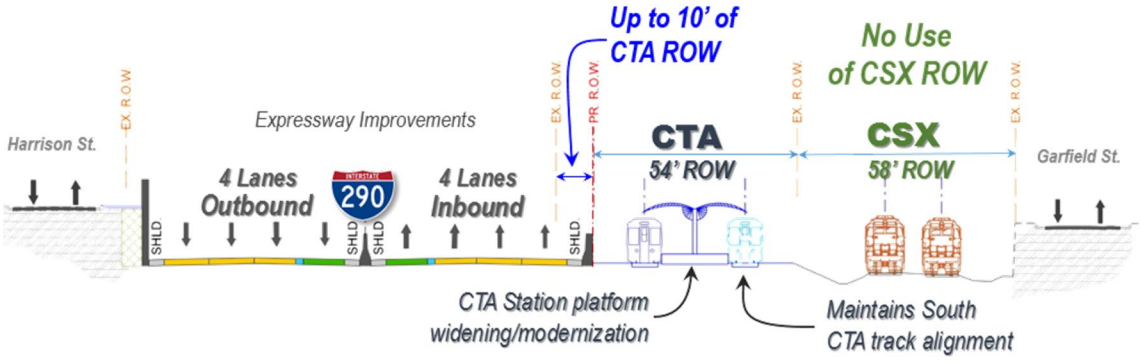
Both expressway alternatives provide safety benefits for reducing injury crashes and overall crashes. Mainline capacity improvement is the primary factor increasing safety for the no CTA right-of-way alternative. Wider shoulders were also found to be key safety factors, in that wider outside shoulders provide a greater safety benefit than wider lanes. Overall, lane widths were not found to be a primary safety performance driver, and if additional space were available to accommodate all 12-foot-wide lanes, the incremental safety benefit would be an additional 0.3 percent decrease in the overall crash rate.

Utilizing up to 10 feet of CTA right-of-way to provide wider shoulders is predicted to provide an additional 3.3 percent decrease in overall crash rate and an additional 5.7 percent decrease in the injury crash rate (more than double the reduction) from the crash rates of the no CTA right-of-way alternative.

Conclusions:

Based on the geometric and safety analysis, up to 10 feet of CTA right-of-way would be utilized for the I-290 improvements, which would more than double the expressway safety performance while also accommodating between 5 and 7 feet of station platform widening, ADA requirements, CTA operational needs, and fire safety requirements (Figure 2-33).

Figure 2-33. I-290 Expressway and CTA Right-of-way Proposed Configuration



Source: WSP Parsons Brinckerhoff, 2016.

2.5.4.2 CSX Railroad Vertical Clearance Evaluation

Between Circle Avenue and Central Avenue, CSX freight railroad tracks run parallel to I-290 and the CTA Blue Line along the south wall of the existing "trench." The existing vertical clearances from the top of the track to the underside of the cross-road bridges between Circle Avenue and Central Avenue do not meet the 23-foot-high vertical clearance required for reconstruction by freight railroad design standards and as identified under IDOT reconstruction criteria in the Bureau of Design and Environment (BDE) Manual Section 39-4.06. Providing a vertical clearance of 23 feet by raising crossroad profiles would result in displacements and impacted properties along the crossroads. Overall, increasing the vertical clearance to 23 feet cannot be justified based on impacts.

Based on coordination with CSX representatives, CSX indicated that a 21-foot, 9-inch vertical clearance is acceptable for their operations. Scenarios were developed and evaluated considering railroad and crossroad profiles, vertical clearance provided, impacts to the existing retaining wall, drainage, and cost. A scenario was developed that provides 21-foot, 9-inch minimum vertical clearance from Austin Boulevard to Circle Avenue without raising crossroad bridge profiles through a combination of some lowering of CSX and utilizing a reduced depth, post-tensioned bridge deck for the crossroad spans over the railroad tracks. The average depth of lowering is 8 inches and is shallow enough that it is not anticipated to impact the existing retaining wall and require its reconstruction. The additional proposed I-290 trunk sewer capacity, combined with 3-acre feet of underground vault storage, should provide CSX with 100-year storm inundation protection, which they currently do not have.

2.5.4.3 CTA Vision Study Findings

In coordination and in parallel with the I-290 Study, CTA performed its own Blue Line Forest Park Branch Feasibility/Vision Study[3] to determine the immediate and long-term improvement needs along this line. Among its findings are the following:

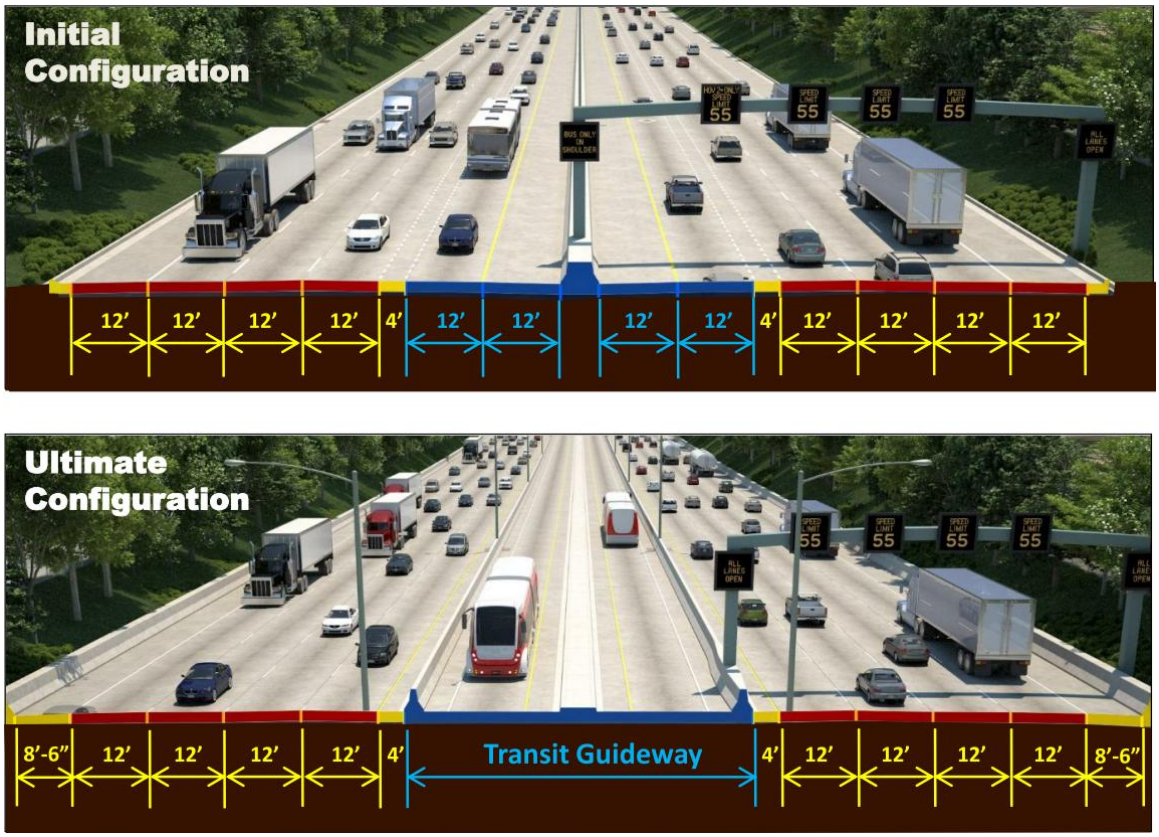
- The Forest Park Branch should be brought to a state of good repair to address deficiencies in track, signals, and stations. The stations closed in the 1970s should be removed.
- CTA should continue to coordinate with IDOT on corridor improvements, including overhead bridges to improve stations and street access, project coordination to achieve long-term cost savings for both projects, and a transit alternative during I-290 construction.
- The Forest Park terminal, yard, and shop should be modernized to improve site circulation and to meet increased rail yard and shop needs, and should be configured to allow a future western extension.

[3] Blue Line Forest Park Branch Feasibility/Vision Study Website: http://www.transitchicago.com/blueweststudy/.

- A third express track (for which space was provided for in the original Project Corridor planning) is not needed; the existing station spacing currently allows the line to function as a west side express. As a result, 10 of the 21 feet of existing vacant CTA right-of-way space is available for I-290 improvements and is compatible with the identified future CTA Blue Line improvements.
- The extension of the Forest Park Branch to the west is not a short-term priority for CTA, but provisions should be made within the project to preserve future extension options to Mannheim Road.

The proposed expressway design is configured to accommodate a future HCT guideway along the median of I-290 from 1st Avenue to east of Manheim Road. All proposed bridge piers, frontage roads, ramps, and retaining walls would be constructed such that they could remain in place when the HCT is added. The space for inside lane and shoulder would be utilized for the transit guideway, and the remaining expressway pavement would remain in place, requiring a minor reconfiguration of the inside auxiliary lane in each direction for use as a through lane. Figure 2-34 illustrates the convertible section concept that would accommodate this CTA Vision Study finding.

Figure 2-34. Convertible Expressway Concept – Initial and Ultimate Configuration



Source: WSP Parsons Brinckerhoff, 2016.

2.5.4.4 Railroad Right-of-Way Allocation and Vertical Clearance Recommendation

Based on the findings for the right-of-way and profile evaluations and in consideration of CTA's Vision Study findings, a combination solution of obtaining 10 feet of right-of-way from CTA and improving clearances over the CSX Railroad to a minimum of 21 feet 9 inches via reduced crossroad bridge depths and minor track lowering is recommended. Utilizing 10 feet of CTA right-of-way would result in improved safety performance at a reasonable cost and level of implementation complexity. CSX access to Ferrara Candy Company would remain in place, although the minor track lowering and some track alignment reconfiguration would likely result in some temporary operational impacts during construction. Construction risks and impacts to the existing south retaining wall, which is still in good condition, would be minimized.

2.5.4.5 Intelligent Transportation System Components

To maximize the safe and efficient flow of traffic in the Project Corridor, ITS concepts would be used to provide integration of devices and operational strategies on I-290, as well as on the adjacent state arterial network. The expectation is that the ITS concepts would help with traffic management during construction and after completion of the I-290 improvements.

The initial proposed ITS plan organizes the systems into expressway, ramp, arterial, and management components, each with multiple ITS systems. The ramp and expressway systems would be directly linked and coordinated. The link between arterial systems and expressway/ramp systems can be via directly coordinated systems or a linkage through policy and operations. The result would be a fully functional integrated ITS corridor. Effective management systems (i.e., software, policies, staffing) are as important to the outcomes as the addition of ITS field devices. Initial proposed ITS devices are described below.

I-290 ITS Devices

The proposed I-290 reconstruction and improvements allow the introduction of new ITS systems, such as Active Traffic Management (ATM), and opportunities to implement a next generation of the existing ITS system, which has ramp metering that has operated in the Project Corridor for years.

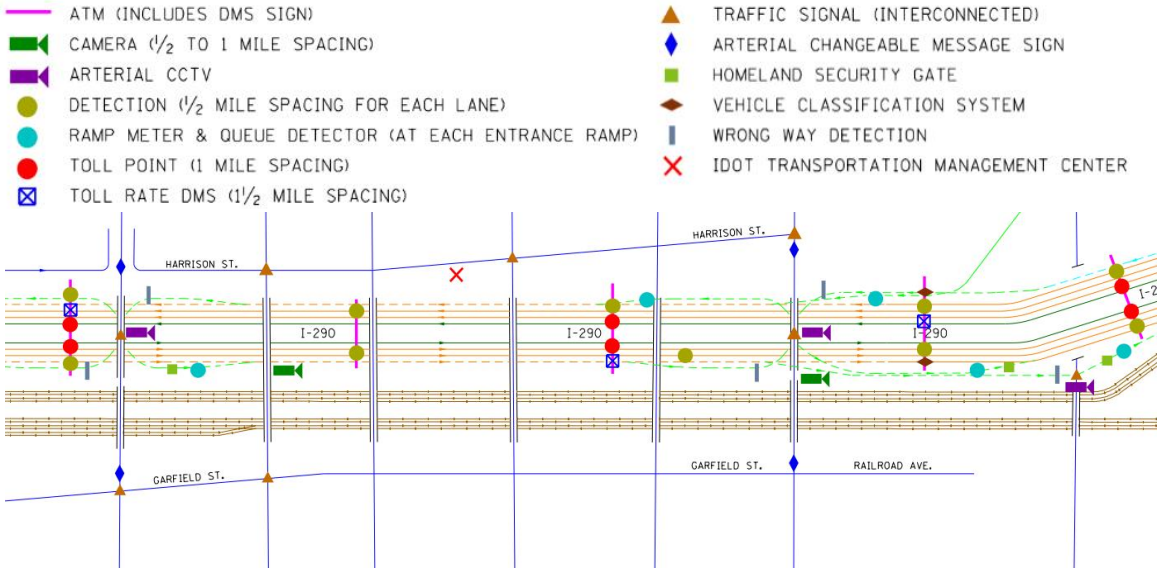
A central component of the I-290 system is the ITS gantry. The gantry is a multipurpose structure that can be used to hold toll rate signs, toll readers, ATM signs, dynamic message signs (DMS), and standard traffic signs. By utilizing a multipurpose gantry, the ITS design becomes a flexible and efficient way to manage a dense network of ITS systems.

The ITS systems on I-290 are dependent on having high quality real-time traffic data for system management. There are a variety of technologies available, either as in-pavement detection or nonintrusive detection systems that are placed on poles or ITS gantries. The detection systems provide real-time information on volume, speed, lane occupancy, and vehicle classification. The data from detectors can be used to set toll prices, provide

travel time and congestion messages, create vehicle classification and traffic data sets, and determine advisory speed limits, as well as run an adaptive ramp metering program. If a toll system is required, it must be interoperable with other toll systems in the Chicago region and provide national interconnectivity. It is expected that any necessary tolling equipment and signing would be accommodated within the ITS gantries.

ATM systems are a relatively new ITS system for managing traffic at the lane level. ATM lane management systems are spaced every 0.5 mile along the expressway and activated to manage reduction in speeds in advance of slowing or stopped traffic and to provide lane-level incident information to drivers (Figure 2-35). Typical messages for ATM are shown in Figure 2-36.

Figure 2-35. Key ITS System Elements



Source: WSP Parsons Brinckerhoff, 2016.

Figure 2-36. Active Traffic Management Messages

Source: WSP Parsons Brinckerhoff, 2016.

2.6 Conclusion – Alternatives Carried Forward for Further Analysis

The process of identifying alternatives for the reconstruction of I-290 was completed through the evaluations described previously in Rounds 1, 2, and 3.

Consideration was given to travel performance and socioeconomic and environmental effects with the intent of keeping the proposed improvements within existing right-of-way to the extent possible (see Section 3.1.7 for proposed right-of-way requirements for the build alternatives). With extensive stakeholder input, the alternatives were refined to better integrate this transportation system recognizing regional and community considerations. Consequently, the alternatives share common elements for improved roadway, transit, and other related elements, along with pedestrian and bicycle movements and noise abatement, and they share the same right-of-way footprint, interchange designs, and accommodations for the parallel CTA and CSX Railroad facilities.

With these considerations and given the design refinements described previously, the four build alternatives advanced previously for analysis in the DEIS (and this FEIS) are shown in Figure 2-37. Together with the No Build Alternative, which is used for comparison purposes, these alternatives are carried forward for detailed evaluation in Section 3.0, Environmental Resources, Impacts, and Mitigation, of this FEIS. The Preferred Alternative is presented in Section 5.0.

Figure 2-37. Four Build Alternatives Advanced to the DEIS