I-290

Environmental Impact Statement

West of Mannheim Road to East of Cicero Avenue

Alternatives Identification and Evaluation

May 2012

Draft Interim Report:

Initial Alternatives Identification and Round 1 & 2 Evaluation

Version 2.0

Note:
This is a draft version of the report which will be updated as the Alternatives Identification and Evaluation process advances towards the identification of the alternatives to be carried forward into the DEIS. Changes to this document relevant to the Round 2 evaluation update are tracked and are indicated by blue, underlined text.

Illinois Department of Transportation

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(subsequent sections to be added when additional evaluation is completed)

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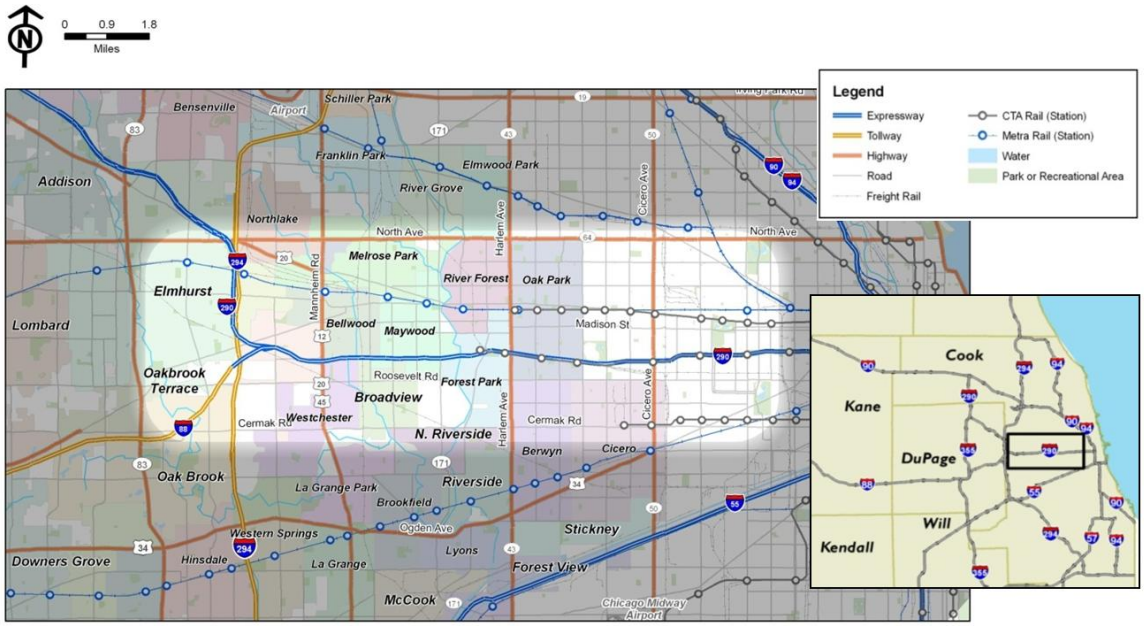
1 Executive Summary

The I-290 Preliminary Engineering and Environmental (Phase I) Study is being undertaken consistent with the National Environmental Policy Act (NEPA) and federal and state policy to prepare an Environmental Impact Statement (EIS) for the reconstruction of I-290 from west of Mannheim Road to east of Cicero Avenue (see Figure 1-1. Study Area Map).

Figure 1-1. Study Area Map



The NEPA process guides potential federal actions to consider impacts to the environment, and requires the evaluation of alternative ways of accomplishing study goals and meeting study needs. The NEPA process establishes three primary steps in project development for an EIS: Establish the Purpose and Need, Alternatives Development and Evaluation, and Identification of the Preferred Alternative.

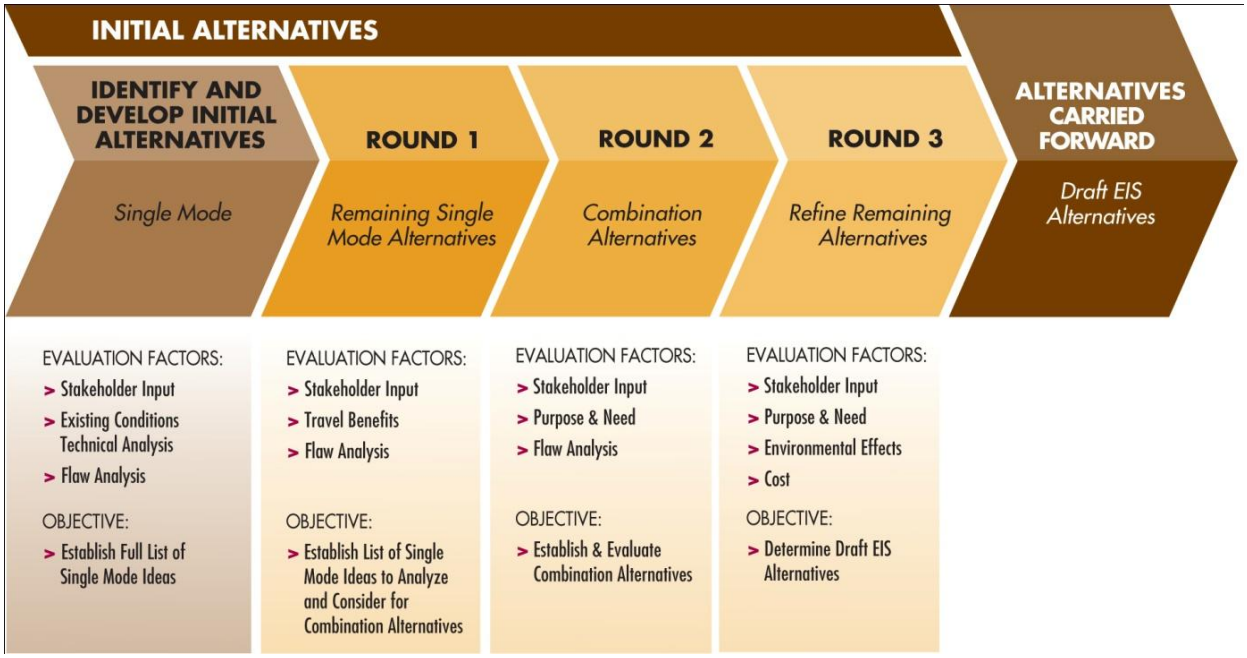
Figure 1-2. Environmental Impact Statement Planning Process

This document, which will be updated as the planning process advances, describes the alternative development and evaluation process used. This process, as illustrated in Figure 1-3, will include:

- Round 1 - The identification and evaluation of single mode alternatives, which are alternatives that consider changes to or improvements of only one mode of transportation, to understand the effectiveness and characteristics of each individual mode.
- Round 2 - The evaluation of an initial set of combination mode alternatives assembled based on the findings from the Round 1 single mode evaluation. Combination mode alternatives include improvements to or additions of more than one mode of transportation (e.g. transit and expressway improvements).
- Round 3 - The revision of the combination alternatives based on the initial results and further development and evaluation.

The goal of this process is to identify the alternatives to be carried forward for evaluation in the Draft EIS. The process also provides the opportunity to examine all modes of travel within the transportation system, which can provide the basis for future planning efforts by other area transportation agencies (i.e. RTA, CTA, Pace, etc).

Figure 1-3. Initial Alternatives Development and Evaluation Process



Prior to the initial alternatives identification process, the Illinois Department of Transportation (IDOT) initiated a project context audit to identify key features of the project area, characteristics of key transportation facilities, and conditions that should be addressed in the scope of the study. With this information, IDOT and the Corridor Advisory Group (CAG)/Task Forces (TF), prepared a project problem statement (February 2010). With stakeholder and transportation agency input, the study team evaluated the condition and performance of the existing transportation system. This activity focused on the identification of transportation needs of the study area, and was documented in the Existing Transportation Systems

Performance (ETSP) Report, August 2010. Based on the findings from the ETSP and with stakeholder input, the Purpose and Need for the project was developed between July 2010 and December 2011 beginning with a basic outline that was gradually expanded and discussed with the CAG/TF and other stakeholders over the course of five CAG/TF meetings and a public meeting in May of 2011. The five needs identified for the I-290 study area are:

1. Improve regional and local travel
2. Improve access to employment
3. Improve safety for all users
4. Improve modal connections and opportunities
5. Improve facility deficiencies

A regional travel demand model was used as the evaluation tool for testing the transportation performance of alternatives. To evaluate alternatives, the project established a baseline or "No Build" based on the Chicago Metropolitan Agency for Planning (CMAP) 2040 data to forecast future travel conditions throughout the study area, and assuming no improvements to I-290 in the study area. As the accepted plan for the regional transportation system for the year 2040, this model establishes the project's No Build alternative, which is 'alternative neutral' and is the baseline condition against which the transportation performance of alternatives area evaluated. The evaluation process includes a relative comparison between alternatives and comparison of each alternative to the No Build alternative. Specific population and employment forecasts will be developed for the evaluation of the alternatives in the Draft EIS.

Alternatives were initially evaluated for fatal flaws throughout the process. A fatal flaw is defined as a characteristic or component of an alternative that would render it infeasible or impractical in the context of this study. Flaws could include substantial direct impacts to residences, businesses, environmental resources, or community facilities. A fatal flaw could also result from the improvement being beyond the context of the I-290 Phase I Study Area or needs. Alternatives that have costs that are not reasonable and prudent can also be removed from consideration.

1.1 Initial Alternatives Identification Summary

The initial alternatives for the Round 1 evaluation were identified through a pre-screening process that considered approximately 460 alternative suggestions submitted by project stakeholders on how to address the Purpose and Need of the I-290 project. These suggestions were sorted into three main groups: roadway improvements, transit improvements, and related improvements that could be combined with other concepts. Each of the three groups was subdivided into concept categories based on the stakeholder suggestions provided (example: add general purpose lanes to I-290). As discussed further in Section 4 and Appendix A of this document, 33 concept categories emerged to which each suggestion was assigned.

The 33 concept categories were pre-screened by IDOT to identify which concepts would be either carried forward into Round 1, not carried forward, or deferred for future evaluation. The pre-screening resulted in 11 of the 33 original categories carried forward into the Round 1 evaluation. In addition to these single mode alternatives, 11 other categories of related improvements were deferred for future consideration.

1.2 Round 1 (Single Mode Evaluation) Summary

The purpose of the single mode evaluation was to understand the effectiveness and characteristics of each individual mode. A regional travel demand model was used to test the alternatives, and is based upon decades of research and calibration to appropriately portray existing and expected future conditions; the CMAP GO TO 2040 plan was used as a base for forecasting future conditions. The model seeks the most efficient mode of travel based upon travel costs and times, trip purposes, and the time-of-day for the trip.

21 single mode alternative concepts, that are derivative of the 11 single mode concept categories carried forward from the pre-screening, were developed by the study team and CAG/TF for evaluation in Round 1. The 21 single mode alternatives are summarized in Table 1-1, and a set of maps representing these alternatives is provided in Appendix C. 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 1-1. List of Single Mode Alternatives Evaluated in Round 1

Transit Mode Alternatives (9 total)

Blue Line Extension (Heavy Rail Transit - HRT) 	[HRT 1] From Forest Park To Oak Brook via IL Prairie Path and Butterfield Road
	[HRT 2] From Forest Park To Oak Brook via IL I-290 and I-88
	[HRT 3] From Forest Park To Mannheim via I-290
Express Bus 	[EXP] Various service from DuPage and Northwest Cook Counties to Forest Park CTA terminal
Bus Rapid Transit (BRT) 	[BRT 1] Oak Brook to Forest Park - via Butterfield Road and IL Prairie Path
	[BRT 2] Oak Brook to Forest Park - via I-88 and I-290
	[BRT 3] Oak Brook to Cicero Avenue - via I-88 and I-290
	[BRT 4] Oak Brook to Ashland Ave - via I-88 and I-290 – CTA Blue Line conversion
	[BRT 5] Lombard to Forest Park - via I-88 and I-290

Expressway Mode Alternatives (11 total)

General Purpose (GP) Add Lane			[GP LANE] General Purpose Add Lane from I-88 to Central Avenue
Managed Lanes	**High Occupancy Vehicle (HOV) Lanes**	2+ Riders	[HOV 2LL] Oak Brook to Racine Avenue
			[HOV 2L] I-88 to Racine Avenue
			[HOV 2W] Oak Brook to Central Avenue
		3+ Riders	[HOV 3LL] Oak Brook to Racine Avenue
			[HOV 3L] I-88 to Racine Avenue
			[HOV 3W] Oak Brook to Central Avenue
	High Occupancy Toll (HOT) Lanes		[HOT 1] Oak Brook to Central Avenue, 3+ Vehicles Free
			[HOT 2] Oak Brook to Racine, 3+ Vehicles Free
	Toll Lanes		[TOLL 1] Toll Existing I-290 Lanes, I-88 to Cicero Avenue
			[TOLL 2] Toll I-290 with Add Lanes , I-88 to Cicero Avenue

Arterial Mode Alternatives (1 alternative with two variations)

Arterial Widening	With Parking	[ART 1 & 2] Widening of Roosevelt Road and Madison Avenue to 4 continuous lanes (2 lanes each direction). • Roosevelt Road from I-294 to Cicero Avenue • Madison Avenue from 25th Avenue to Cicero Avenue
	Without Parking	

The Round 1 single mode travel benefit evaluation results were presented to, and reviewed by the CAG/TF, in July 2011 and September 2011. Further discussion on the single mode evaluation results continued at subsequent CAG/TF meetings. Based on the Round 1 evaluation findings and stakeholder and transportation agency input, an initial set of combination mode alternatives were identified for evaluation in Round 2 in September 2011, and will be further refined at the December 2011 CAG/TF Combination Alternatives Workshop.

The following is a summary of the single mode evaluation results:

<u>Transit Modes:</u>
The Blue Line extension and BRT single mode alternatives were the best performing transit alternatives with similar results and the express bus alternative resulted in local travel and job accessibility improvements. However, no single mode transit alternative showed improvement to I-290 travel performance due to the already well-established and utilized study area transit network, with new service drawing insufficient auto-trip diversions to offset auto demand for I-290, and a smaller narrower transit market as compared to I-290. Given the extent of the existing transit market in the study area, ridership gains on new transit services are limited, and

any ridership on new transit services would be comprised primarily from riders diverting from existing service. For example, the Blue Line extension to Oak Brook alternative [HRT 2] attracts 24,550 riders, 13,260 (54 percent) of these riders are diverted from existing transit services (PACE, Metra), and 8,350 (34 percent) are diversions from auto.

Highway Modes:
The single mode expressway alternatives resulted in the highest travel performance improvements to the I-290 Expressway, as well as the best improvement of regional and local (study area) travel performance. This is due to improving travel for the large market served by I-290, for both the traditional and reverse commute patterns. Managed lane expressway alternatives (HOV and HOT) provide some of the best performance benefits because they add capacity to address the underserved demand in this corridor, and manage its use effectively.

Arterial Widening:
An initial fatal flaw footprint impact evaluation found that arterial widening for Roosevelt Road (IL 38) from I-294 to Cicero Avenue and Madison Avenue from 25th Avenue to Cicero Avenue (with and without parking) resulted in a large number of displacements and, therefore, arterial widening was determined to be fatally flawed and not carried forward for performance evaluations. Arterial improvements will be further considered in conjunction with other modes as the evaluation process advances.

Overall:
While single mode transit alternatives offer some travel benefits, they do not show any improvement to I-290 performance. Overall, expressway modes provide the best travel improvements locally and regionally. Combinations of transit and expressway alternatives will be assembled and evaluated to identify any transportation performance synergies to be gained by various combinations.

The following single modes were dropped from further consideration as part of the I-290 Study, for the following reasons:

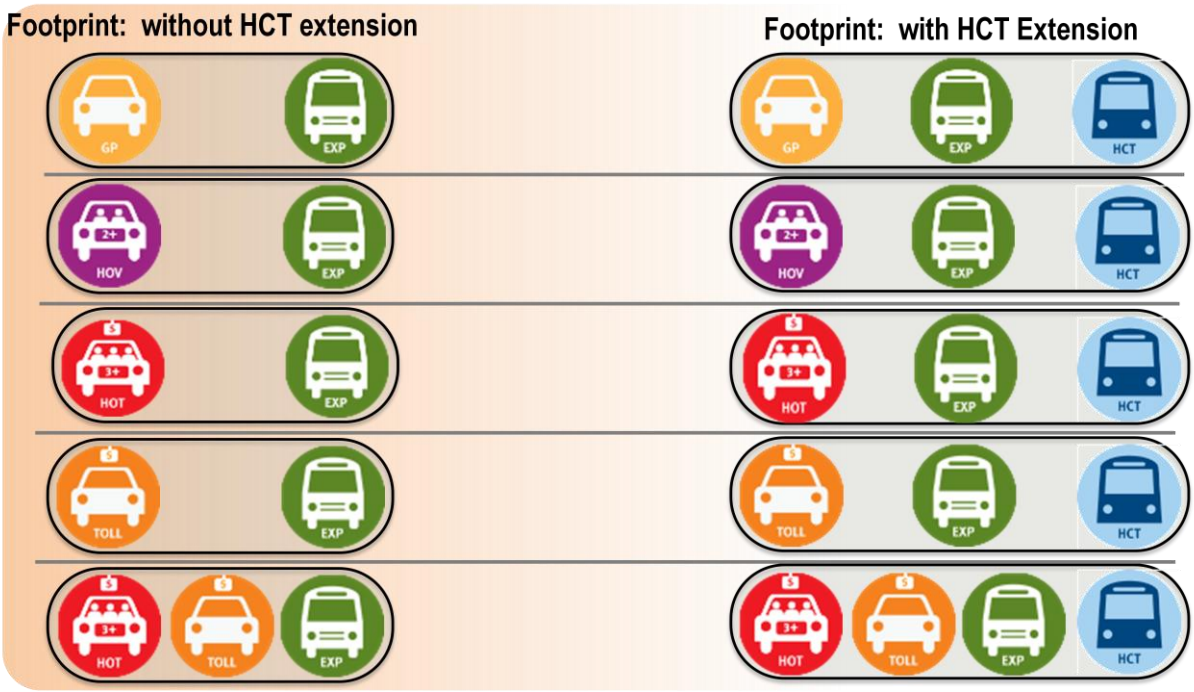
Blue Line Conversion to Bus Rapid Transit (BRT 4): The BRT 4 Alternative from Oak Brook to Ashland Avenue was evaluated as a conversion of the existing CTA Blue Line to a Bus Rapid Transit facility between Ashland Avenue and the Forest Park terminal. This alternative indicated generally similar and some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

Blue Line Extension and BRT Alternatives along the Prairie Path (HRT 1 and BRT 1): 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, diverting 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 and Section 4(f) of the US Department of Transportation Act of 1966. Therefore, the alternatives using the Prairie Path alignment are not being carried forward for evaluation in Round 2

Identification of Initial Combination Modes:

The results from the single mode evaluation were used to establish the set of combination mode alternatives for evaluation in Round 2. Five single mode Expressway alternatives and Express Bus alternatives were first combined to create a preliminary list of combination mode alternatives. These five Expressway and Express Bus Alternatives were also paired with an HCT extension from the Forest Park CTA terminal to Mannheim Road to create 10 combination mode alternatives. Figure 1-4 generally summarizes the 10 combination mode alternatives, and map exhibits that fully describe each of the 10 combination mode alternatives, are provided in Appendix F.

Figure 1-4. 10 Combination Mode Alternatives



1.3 Round 2 - Initial Combination Mode Evaluation Summary

In Round 2, the ten combination mode alternatives identified at the conclusion of Round 1 were evaluated to determine the collective results of combining various single mode alternatives. A full discussion of the Round 2 evaluation is provided in Section 6 of this report.

As in Round 1, Round 2 evaluated alternatives in four of the five need points:

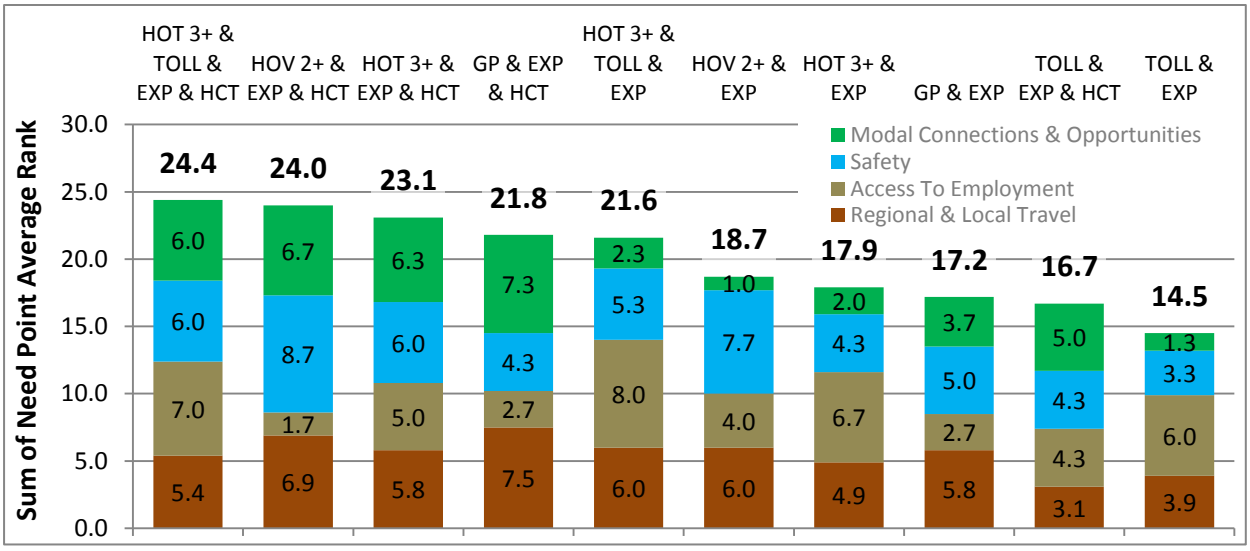
1. Improve Regional and Local Travel
2. Improve Access to Employment
3. Improve Safety for All Users
4. Improve Modal Connections and Opportunities

The fifth need point, Improve Facility Deficiencies, requires more detailed development of the combination mode alternatives before facility condition improvements can be fully identified.

The Round 1 evaluation measures were carried forward into Round 2 but with some revisions based on stakeholder input. Four measures for Improve Regional and Local Travel were removed due to similarity or overlap with other measures, and two additional measures were added for the evaluation of the Improve Modal Connections and Opportunities need point. The alternatives scoring methodology was also revised in Round 2 to give each need point equal weight in the overall score of an alternative. The evaluation measures are presented in Section 3, and the Round 2 revisions to the measures and scoring are further explained in Section 6.2.

The overall result of the Round 2 evaluation of the initial combination mode alternatives is presented in Figure 1-5. Round 2 Overall Alternatives Scoring Summary below. The total scores for each alternative in this table is the cumulative result of the individual need point scores. The evaluation of each need point is discussed in Section 6 of this report. The individual results or each measure and need point are summarized in the Evaluation Matrix provided in Appendix G.

Figure 1-5. Round 2 Overall Alternatives Scoring Summary



As seen in this figure, overall, the HOT 3+ & TOLL & EXP & HCT alternative is the best performing, followed by the HOV 2+ & EXP & HCT, HOT 3+ & EXP & HCT, GP & EXP & HCT, and the HOT 3+ & TOLL & EXP alternatives. The TOLL alternatives were ranked the lowest overall.

Overall Round 2 Observations:

- The HOT 3+ combination mode alternatives with and without TOLL (and with and without HCT) showed good overall performance with three HOT 3+ combination mode alternatives in the top 5 overall performers. Two of the three HOT 3+ alternatives reflected the highest performance related to access to employment due to the ability of the HOT 3+ lanes to manage congestion that results in a relatively faster route (as compared to other combination alternatives) to jobs from the study area. Safety performance in these alternatives was generally better compared to other combination alternatives due to relatively lower traffic volumes (less risk of crashes) and higher person throughput. Through a combination of good access to employment, good regional travel and safety performance, the HOT 3+ & TOLL & EXP & HCT alternative outperforms all others alternatives, overall. It should be noted that conversion of existing non-tolled GP interstate lanes to HOT or Toll lanes is currently restricted legislatively, although there are federal programs that allow conversion of HOV lanes to HOT lanes.
- Alternatives with HOV 2+ (with and without HCT) provided the highest safety improvements, and very good improvements to local and regional travel. HOV lanes provided as much as a 40% reduction in daily hours of congestion in the managed lane, and over 11% 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 safety performance improvements due to a combination of reduced expressway traffic volume and increased person throughput.
- The GP add-lanes combined with HCT provides the best overall regional & local travel improvements, and the best improvement related to modal connections and opportunities. This can be attributed to the performance improvements on I-290 due to the added capacity and that result from the diversion of longer distance trips off the arterial network onto the expressways, and a shift of shorter distance auto trips to HCT. This shift of traffic off arterials in both GP lane alternatives (with and without HCT) improves arterial performance in the study area, giving GP lanes the higher overall performance with respect to improving local travel. However, the GP lane combination alternatives showed the smallest improvement to I-290 expressway performance in the study area, but showed better overall improvement on roadways outside the study area. The GP lane combination alternatives showed a lower accessibility to jobs and safety performance compared to other alternatives. 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. This is due to the managed lanes providing a faster path than the GP Lanes, allowing users of the managed lanes to access more jobs located further away in 60 minutes or less. With respect to safety, GP Lane combination mode alternatives provide higher vehicle volumes than the managed-lane combination mode alternatives. This increased volume slightly increases the potential for crashes relative to the managed-lane combination mode alternatives.

- Alternatives with Tolling (1 lane only in each direction, with and without HCT) generally did not perform as well as other alternatives overall, primarily due to safety and local and regional travel performance. Tolling offered some overall safety improvements due to decreased traffic volumes on the expressway and increased person throughput, however not to the same degree as HOV 2+ or HOT 3+ lane combination mode alternatives. Also, increased traffic volumes on the arterials result in both a decrease in safety performance as compared to the baseline condition, as well as reduced arterial performance as compared to most other combination mode alternatives

Identification of Combination Modes for Further Evaluation:

(This section will be updated at the completion of Round 2)

1.4 Round 3 Summary

(This section will be updated at the completion of Round 3)

1.5 Conclusion

(This section will be updated when the Initial Alternatives Identification and Evaluation is complete)

2 Alternatives Identification and Evaluation Process

After the project needs were identified, alternatives were formally sought to address those needs. The process for developing alternatives and evaluating those alternatives consisted of four iterative steps, which are described below:

1. Identify and Develop Initial Alternatives
2. Round 1 – Single mode evaluation
3. Round 2 – Initial combination mode evaluation
4. Round 3 – Identification of Draft EIS alternatives

These four steps will be used to screen a large range of concepts resulting in the alternatives to be carried forward into the Draft EIS for detailed development and evaluation. Alternatives will be evaluated relative to each other and to the baseline or No Build Alternative. A range of factors were considered in the evaluation process, including: transportation performance, stakeholder input, logical termini, fatal flaws, impacts, and cost.

The goal of this process is to identify the alternatives to be carried forward for evaluation in the Draft EIS. The process also provides the opportunity to examine all modes of travel within the transportation system, which can provide the basis for future planning efforts by other area transportation agencies (i.e. RTA, CTA, etc).

A regional travel demand model was used as the evaluation tool for testing the transportation performance of alternatives in Rounds 1, 2, and 3. The travel demand model is based upon decades of research and calibration to appropriately portray existing and expected future conditions. To evaluate alternatives, the project established a baseline or "No Build" based on Chicago Metropolitan Agency for Planning (CMAP) 2040 data to forecast future travel conditions throughout the study area, and assuming no improvements to I-290 in the study area. As the accepted plan for the regional transportation system for the year 2040, this model establishes the project's No Build alternative, which is 'alternative neutral' and is the baseline condition against which the transportation performance of alternatives are evaluated. The evaluation process includes a relative comparison between alternatives and comparison of each alternative to the No Build alternative. Specific population and employment forecasts will be developed for the evaluation of the alternatives in the DEIS.

2.1 Initial Alternatives Identification

Alternatives suggestions for the I-290 Study were solicited from project stakeholders and the public through public meetings, CAG/TF meetings, via comments submitted to the project website or by other means. Initially, single mode alternatives were sought for evaluation; single mode alternatives are those that involve one mode of transportation (commuter rail, bus rapid transit, subway, HOV lanes, etc.) for the modification of, or addition to, the study area. The purpose of evaluating the single modes was to understand the effectiveness and characteristics of each individual mode. The submitted alternatives were categorized, reviewed, and screened

to identify an initial set of 'corridor level' single mode alternative concept categories that fit within the context of the study for initial evaluation in Round 1. 'Corridor level' alternatives are those alternatives that include the general location, configuration, and mode type of a potential solution. This list was developed, coordinated, and refined with project stakeholder input.

2.2 Round 1 – Single Mode Evaluation

A total of 21 single mode alternatives were identified for evaluation in Round 1, including 9 transit, 11 expressway, and one arterial widening alternative. A summary of the evaluation that led to the selection of these single mode alternatives is provided in Section 4.

The initial set of identified 'corridor-level' single mode alternatives were reviewed for possible fatal flaw impacts, and those not identified as fatally flawed were evaluated with the travel demand model to compare relative transportation performance. Using the results of the Round 1 evaluation, and stakeholder and transportation agency input, various single mode expressway and transit alternatives were reviewed for consideration in combination mode alternatives for further evaluation in Round 2. A summary of the Round 1 evaluation, findings, and list of initial combination mode alternatives is provided in Section 5 of this report.

2.3 Round 2 – Combination Mode Evaluation

Using the results of the Round 1 evaluation, and stakeholder and transportation agency input, a set of 10 combination mode alternatives were assembled for evaluation in Round 2. Combination mode alternatives are those that include two or more single modes as part of an overall corridor level alternative. The results of the Round 2 evaluation will be reviewed with the stakeholders and transportation agencies, and those initial combination mode alternatives that perform well and are not fatally flawed will be considered and/or revised for further evaluation in Round 3.

2.4 Round 3 – Refinement of Remaining Alternatives

In Round 3, with additional stakeholder input, the alternatives and features are further refined based on the findings from Round 2 evaluation. Alternative refinements will undergo additional travel modeling and traffic analysis, impact evaluation (geographic information system (GIS) level footprint, environmental and social impacts), and cost considerations. Interchanges, access, cross-streets, frontage roads, transit access, non-motorized, and other transportation features will also be developed and evaluated.

The objective at the end of Round 3 is to identify the primary modes, alignment(s), and features of the alternative(s) to be carried forward for evaluation in the DEIS.

(This section and Section 7 will be updated at the completion of the Round 3 Evaluation)

3 Evaluation Measures

Measures of transportation performance were developed to evaluate the respective benefits of each alternative. The measures which follow represent the initial evaluation list which is expected to be refined as the alternatives screening process proceeds into subsequent rounds of evaluation. This will also account for more detailed level of design, the refinement of the alternative concepts, and the outcomes of those evaluations.

3.1 Footprint/Fatal Flaw Screening – GIS Level Analysis

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 currently available. The most detailed environmental and socioeconomic analysis, field studies, and documentation will be completed for the DEIS alternatives. Table 3-1 lists the measures of physical impacts of an alternative to be evaluated in Round 1 and in Round 3:

Table 3-1. Footprint Screening Measures

Footprint Screening	Unit	Rnd 1	Rnd 2	Rnd 3
Additional right-of-way required/footprint	acres	●	-	○
Displacements (direct impact to residences and businesses)	#	●	-	○
Parkland Impacts	acres	●	-	○
Historic Property Impacts	#	●	-	○
● Completed as of this version of the report ○ Yet to be completed as of this version of the report				

Alternatives that would result in impacts or displacements may be determined to be fatally flawed and dropped from further consideration.

3.2 Performance & Purpose and Need Screening

The following measures were selected in each need category based on their linkage to addressing the needs outlined in the I-290 Draft Purpose and Need Statement. The following presents the measures to be used in Rounds 1, 2, and 3 evaluations. In Round 1, the performance based measures will be used for the single mode evaluation. Further evaluation with respect to the Purpose and Need will be added in Rounds 2 and 3 as the combination mode alternatives are identified and further defined.

3.2.1 Improve Regional and Local Travel

Measures for improving regional travel listed in Table **3-2** are intended to evaluate the relative potential of an alternative to improve travel conditions through the corridor relative to the 2040 Baseline (No Build) Alternative.

Table 3-2. Regional Measures

Improve Regional Travel	Unit	Rnd 1	Rnd 2	Rnd 3
I-290 Volume to Capacity (v/c)	ratio	●	*not used*	*not used*
I-290 Average Speed	mph	●	*not used*	*not used*
I-290 Average Travel Time	minutes	●	●	○
I-290 Hours of Congestion	hours/day	●	●	○
Person Throughput	persons/day	●	●	○
Vehicle Miles of Travel (VMT)	miles/day	●	●	○
Congested Vehicle Miles of Travel (CVMT)	miles/day	●	●	○
Vehicle Hours of Travel (VHT)	hours/day	●	●	○
Vehicle Hours of Delay	hours/day	●	●	○

I-290 Volume to Capacity Ratio (v/c) – Study Area: Congestion along I-290 affects the ability of this facility to serve regional travel; this measure provides an indication of congestion by relating the actual volume of a facility to its theoretical maximum capacity for acceptable operations. This is expressed as a ratio with values greater than 0.85 indicating potential for congestion, and because the maximum capacity is theoretical, values greater than 1 are possible for this measure. The travel demand model will be used to calculate the AM and PM peak period volume to capacity ratios for each alternative. Lower v/c ratios are desired but this ratio is used as a relative comparison, not an absolute measure. This measure was used in Round 1 only, and was removed for subsequent rounds of evaluation in an effort to consolidate similar measures.

I-290 Average Speed – Study Area: Speeds along I-290 in the study area affect the ability of the expressway to serve regional travel. Average travel speeds along I-290 in the study area for the AM and PM peak periods will be calculated by the travel demand model. Faster travel speeds are desired. This measure was used in Round 1 only, and was removed for subsequent rounds of evaluation in an effort to consolidate similar measures.

I-290 Average Travel Time – Study Area: Travel times along I-290 in the study area affect the ability of the expressway to serve regional travel. Average travel times along I-290 in the study area for the AM and PM peak periods will be calculated by the travel demand model. Shorter travel times are desired.

I-290 Hours of Congestion – Study Area: Congestion along I-290 affects the ability of this facility to serve regional travel. This measure will estimate how many hours of congestion are anticipated per day on I-290 in the study area for each alternative. Congestion is defined as a level of service D or worse on the expressway. The CMAP travel model and/or VISSIM

will be used to estimate the volumes on the facility throughout the day and the LOS will be calculated using the Highway Capacity Manual (2000/2010[1]). Fewer hours of congestion per day are desired.

Person Throughput – Study Area: The travel demand model for I-290 will be used to calculate the study area person throughput for each alternative at one or more 'screen line' locations in the study area. Screen lines capture person throughput across specific locations along I-290 and the east-west arterials in the study area. Person throughput for both auto and transit will be evaluated. Higher overall person throughput is desired.

Vehicle Miles of Travel (VMT) – Regional system and Study Area: This measure indicates the distance travelled (in miles) by all the vehicles at the regional and study area levels. The regional travel demand model will be used to calculate this measure.

Congested Vehicle Miles of Travel (CVMT) – Regional system and Study Area: This measure indicates the vehicle miles traveled in congestion per day, and is calculated and compared at the regional and study area levels for each alternative. The regional travel demand model will be used to calculate this measure. Fewer miles traveled in congestion are desired.

Vehicle Hours of Travel (VHT) – Regional system and Study Area: This measure indicates how many hours are traveled each day by vehicles in the region and study area. The travel demand model for I-290 will be used to calculate this measure for each alternative. Fewer vehicle hours of travel are desired.

Vehicle Hours of Delay – Regional system and Study Area: This measure indicates how many hours of delay vehicular traffic is experiencing in the region and study area each day. The regional travel demand model will be used to calculate this measure for each alternative. Fewer hours of delay are desired.

Commercial Truck needs have regional importance in this corridor because of the lost time and economic loss due to inefficient truck movements resulting from congestion. This measure differs from the I-290 based measures on **Table 3-2** because it evaluates the impacts of an alternative on commercial truck movements which are prominent in this corridor. Regional measures related to truck movements will be evaluated for each alternative. The measures shown in Table 3-3 are the same as the measures above, but limited to trucks.

Table 3-3. Regional Measures - Truck Travel

Improve Regional Travel	Unit	Rnd 1	Rnd 2	Rnd 3
Truck Miles of Travel (TMT)	miles/day	●	●	○
Truck Hours of Travel (THT)	hours/day	●	●	○
Congested TMT	miles/day	●	●	○
Truck Hours of Delay	hours/day	●	●	○

Measures for improving local travel are intended to evaluate the relative potential of an alternative to improve local study area travel conditions. The local travel measures related to the performance of the local arterial network in the I-290 study area are shown in Table 3-4.

Table 3-4. Local Travel Measures

[1] Based on the availability of the current accepted version at the time of evaluation.

Improve Local Travel – Study Area	Unit	Rnd 1	Rnd 2	Rnd 3
Arterial Volume to Capacity (v/c)	Ratio	●	*not used*	*not used*
Arterial Speeds	Mph	●	●	○
Arterial VMT	miles/day	●	●	○
Arterial Vehicle Hours of Delay	hours/day	●	●	○
Arterial Congested VMT	miles/day	●	●	○
Interchange Level of Service (LOS)	LOS	-	-	○

Arterial volume to capacity (v/c), speeds, vehicle miles traveled (VMT), and vehicle hours of delay are the same measures used regionally, but are evaluated on the study area arterials only. The study area arterials include the north-south streets of Mannheim Road, 1st Avenue, Harlem Avenue, Cicero Avenue, bounded by North Avenue and Cermak Road. The east-west study area arterials are Cermak Road, Roosevelt Road, Madison Street, Lake Street, and North Avenue, bounded by Wolf Road and Cicero Avenue. Arterial volume to capacity was only used in Round 1 and was removed from evaluation in subsequent rounds.

When appropriate, interchange levels of service (LOS) will also be evaluated; interchanges will be evaluated in Round 3.

3.2.2 Improve Access to Employment

Measures for improving access to employment are intended to evaluate the relative potential of a corridor alternative to improve the accessibility to jobs by number of regional jobs accessible from the study area within 60 minutes. For Round 1, the number of jobs from a single location in the study area was estimated and used to make relative comparisons. In subsequent rounds, the number of jobs accessible from all study area zones are considered. Sixty (60) minutes is used as it able to cast a wider net for jobs accessible by the transit system in the Chicago area. This information is extracted from the regional transportation model based on 2040 baseline population and employment for each alternative modeled as shown in Table 3-5.

Table 3-5. Access to Employment Measures

Improve Access to Employment	Unit	Rnd 1	Rnd 2	Rnd 3
Accessibility to Jobs by Auto	# of jobs/time	●	●	○
Accessibility to Jobs by Transit	# of jobs/time	●	●	○
Total Accessibility to Jobs (Transit + Auto)	# of jobs/time	●	●	○

3.2.3 Improve Safety for All Users

The measure for addressing pedestrian-vehicle conflicts in the each of the evaluation rounds is shown in Table 3-6.

Table 3-6. Safety Measures - Pedestrian-Vehicular Safety

Address Pedestrian-Vehicle Conflicts	Unit	Rnd 1	Rnd 2	Rnd 3
Number of Conflict/crossing Locations at each Interchange	High/Med/Low	-	-	○

Number of Conflict/crossing Locations at each Interchange: This measure is evaluated in Round 3 when initial interchange concepts are further developed and refined. The number of existing and proposed interchange conflict points/crossing locations will be counted and compared against existing conditions.

Measures for addressing the high comparative crash rates and high frequency of crashes on I-290 are shown in Table 3-7 and are intended to evaluate the relative potential for an alternative to improve overall safety along I-290 and in the study area.

Table 3-7. Safety Measures - Crash Rates

Address High Comparative Crash Rates and High Frequency of Crashes on I-290	Unit	Rnd 1	Rnd 2	Rnd 3
Arterial Safety – Study Area	injury and fatal (K) crashes per million vehicle miles traveled per year (MVMY)	●	●	○
I-290 Safety – Study Area	injury and fatal (K) crashes per million vehicle miles traveled per year (MVMY)	●	●	○
Overall Transportation System Safety – Study Area	injury and fatal (K) crashes per million person miles traveled per year (MPMY)	●	●	○

Arterial Safety – Study Area: This measure was evaluated for the major east-west and north-south arterials within the I-290 Study area using methods established in the American Association of State Highway & Transportation Officials (AASHTO) Highway Safety Manual (HSM), 1st Edition. Existing characteristics of each route were coded, and travel model traffic volumes of each arterial segment were used to calculate injury and fatality rates for each alternative using the HSM method. This measure is expressed in injuries and fatalities per million vehicle miles traveled per year. Lower injury and fatality rates are desired.

I-290 Safety – Study Area: This measure was evaluated in the I-290 Study area for Rounds 1 and 2 using methods described in the Texas Roadway Safety Manual for highways that will be incorporated in a future edition of AASHTO Highway Safety Manual. Geometric characteristics of the existing facility, and proposed conditions (including shoulder widths, lane widths, number of lanes, etc.) each were coded, and travel model traffic volumes of each expressway segment were then applied to calculate injury and fatality rates for each alternative using the Texas Roadway Safety Manual methods. The measure is expressed in injuries and fatalities per million vehicle miles traveled per year. Lower injury and fatality rates are desired. HSM methodology for safety evaluation of highways could be used in subsequent rounds, if available.

Overall Transportation System Safety – Study Area: This measure is used to evaluate the overall safety performance of the alternatives and factors in expressway, arterials, and transit safety performance. The unit for this measure is expressed in injuries and fatalities per million person miles traveled. 'Person miles' is used for this measure because it is the common denominator between both individual vehicular and transit-based travel. Person miles traveled for each facility is calculated from the travel demand model. For expressway and arterials, the injury and fatality rates were calculated by dividing the results of the arterial and highway safety evaluations by the total number of annual person miles traveled on each facility. For this evaluation, it was assumed that there were no injuries or fatalities for users of transit, regardless of mode (bus or train). The rates of all three facilities were then combined to compare the for the overall safety performance of each alternative. Lower injury and fatality rates are desired.

3.2.4 Improve Modal Connections and Opportunities

Measures for improving access to transit, non-motorized connections, and multimodal opportunities are intended to evaluate the relative potential of an alternative's ability to provide better connections between travel modes, as shown in Table 3-8. Since the last two evaluation metrics listed in Table 3-8 were assumed to be satisfied for all single mode and initial combination mode alternatives, they were not used for evaluation in Round 1 or Round 2.

Table 3-8. Modal Connections Measures

Improve Modal Connections and Opportunities		Unit	Rnd 1	Rnd 2	Rnd 3
New Transit Trips – Region		#	●	○	○
Improve Transit Access – Study Area	Jobs (employment) within ½ mile of transit access	#	-	●	○
	Households within ½ mile of transit access	#	-	●	○
Improve Non-Motorized Connections – Study Area (qualitative)		✓	-	-	○
Improve Multi-Modal opportunities – Study Area (qualitative)		✓	-	-	○

New Transit Trips – Region: This measure is used as an indicator of an alternative's ability to improve access to transit. New transit trips are defined as the number of regional transit trips generated by an alternative that exceed the number of regional transit trips of the 2040 no-build scenario. More transit trips are desired.

Transit Access – Study Area: two measures are used to evaluate transit access in the study area. The number of households and jobs (employment) that are within ½ mile of transit access were calculated.

Improving Non-Motorized Connections – Study Area: For this qualitative evaluation, it is assumed that any alternative recommending the reconstruction of existing facilities in the study area will include improvements to non-motorized connections across the I-290 corridor. If an alternative is determined to have the ability to improve non-motorized

connections, a ✓ is assigned. This measure will require more definition in future evaluation rounds.

Improving Multi-Modal Opportunities – Study Area: For this qualitative evaluation, it is assumed that any alternative that involves coordination with transit providers and stakeholders regarding transit opportunities has the potential to improve multi-modal connections. If an alternative is determined to have the ability to improve multi-modal opportunities, a ✓ is assigned. This measure will require more definition in future evaluation rounds.

3.2.5 Improve Facility Deficiencies

Measures for improving facility deficiencies are intended to evaluate an alternative's potential to address existing design deficiencies, as shown in Table 3-9. For alternatives that require the reconstruction of the mainline, cross-roads, and interchanges will assume that geometric and Americans with Disabilities Act (ADA) ramp deficiencies will be addressed. Due to the lack of definition and design details, these evaluation metrics are not used in Round 1 or Round 2 evaluation. Development of these details will occur in Round 3 with the advancement of combination mode alternatives for further study.

Table 3-9. Facility Deficiencies Measures

Improve Facility Deficiencies	Unit	Rnd 1	Rnd 2	Rnd 3
Pavement Age	yes/no	-	-	○
Structure Deficiencies	yes/no	-	-	○
Geometric Deficiencies	yes/no	-	-	○
ADA ramp and Sidewalk Deficiencies	yes/no	-	-	○
Drainage Deficiencies	yes/no	-	-	○

3.3 Cost Estimates

Conceptual capital cost screening level estimates will be developed based on recent local and or national experience. These cost estimates will typically be based on per mile unit costs and contain an appropriate contingency factor to account for uncertainties in the early screening steps. Cost estimates are considered in Rounds 3 and beyond.

4 Initial Alternatives Identification Findings

This section describes the process that was used to identify the alternatives evaluated in Round 1. Section 4.1 presents the range of stakeholder suggestions and Section 4.2 describes the pre-screening process that was used to identify the list of alternatives for the Round 1 screening process.

4.1 Initial Range of Stakeholder Suggestions

Approximately 170 alternatives suggestions were submitted at the first public meeting (November 2009) and at the Corridor Advisory Group/Task Force 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. Over 570 suggestions were submitted regarding alternatives. A comprehensive listing of the alternative suggestions is provided in Appendix A.

The suggestions were sorted into three main groups: roadway improvements, transit improvements, and related improvements that could be combined with other concepts. Based on the stakeholder suggestions, each of the three groups was subdivided into 33 distinct concept sub-categories (example: 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 A which includes a table that describes how the 570 alternatives were screened. A summary of the various concepts by mode are provided in map form in Appendix B. Section 4.2 describes the pre-screening results of the 33 concept categories.

4.2 Single Mode Alternatives Concept Screening

The 33 concept categories were pre-screened 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 pre-screening process was the potential to serve the two largest travel markets in the I-290 study area. The two largest travel markets, as identified by the RTA Cook DuPage Corridor Study Travel Market Analysis (December 2005), are the traditional and reverse commute markets, which serve the highest density of work trip origins and destinations concentrated in the city of Chicago, the near west suburbs centered along the I-290 Study area, and in eastern DuPage County to the west. 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 screening rounds.

Table 4-1 summarizes the results of the concept category pre-screening process. A functional description and a detailed disposition for each concept category are provided in Appendix A.

Table 4-1. Summary of Pre-Screening 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 high-occupancy vehicle (HOV) lanes to I-290	✓		
A3. Add high-occupancy toll (HOT) lanes in each direction	✓		
A4. Toll I-290 lanes	✓		
A5. Arterial Widening	✓		
Transit Improvements			
B1. Extend CTA Blue Line to O'Hare 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		✓	
B10. New commuter rail service		✓	
B11. Convert the existing CTA Blue Line to BRT	✓		
B12. Remove the 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 project area			✓
C2. Interchange improvements and design			✓
C3. Improve non-motorized facilities			✓
C4. Improve transit stations			✓
C5. Improve transit operations/connections			✓
C6. Add Transportation System Management /Active Traffic Management/Intelligent Transportation Systems			✓
C7. Add a cap over the expressway			✓
C8. Double-deck I-290		✓	
C9. CTA Blue Line in Subway/Tunnel or Elevated			✓

Concept Categories	Concept Disposition		
	Carried Forward	Not Carried Forward	Deferred to subsequent rounds
C10. Arterial Improvements			✓
C11. Other			✓
Category Totals	**11**	**11**	**11**

Of the 33 original categories, 11 concept categories were carried forward for consideration in Round 1 evaluation. 11 concept categories of related improvements, as identified Table 4-1, were deferred for consideration in subsequent evaluation steps (i.e. Rounds 2, 3, or DEIS). The rationale for carrying forward, not carrying forward, or deferring concept categories to subsequent evaluation is provided in Appendix A.

5 Round 1 Evaluation Findings

The results of the Round 1 screening evaluation are presented below. Section 5.1 presents the list of initial single mode alternatives identified for Round 1 evaluation, Section 5.2 presents the footprint and flaw analysis results, Section 5.3 presents the results of the travel benefit evaluation, and Section 5.4 summarizes the findings and overall conclusions of the Round 1 evaluation.

5.1 Initial Single Mode Alternatives

21 single mode alternative concepts, that are derivative of the 11 single mode concept categories carried forward from the pre-screening (see Appendix A), were developed by the study team and Corridor Advisory Group for evaluation in Round 1 that are derived The 21 single mode alternatives are summarized in Tables 5-1 through 5-3. 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 5-1. Transit Modes Evaluated in Round 1

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

Table 5-2. 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	Oak Brook to Racine Avenue
			HOV 2L	I-88 to Racine Avenue
			HOV 2W	Oak Brook to Central Avenue
		3+ Riders	HOV 3LL	Oak Brook to Racine Avenue
			HOV 3L	I-88 to Racine Avenue
			HOV 3W	Oak Brook to Central Avenue
	HOT Lanes		HOT 1	Oak Brook to Central Avenue, 3+ Vehicles Free
			HOT 2	Oak Brook to Racine, 3+ Vehicles Free
	Toll Lanes		TOLL 1	Toll Existing I-290 Lanes, I-88 to Cicero Avenue
			TOLL 2	Toll I-290 with Add Lanes , I-88 to Cicero Avenue

Both the HOV and HOT alternatives assume that two existing general purpose lanes (one in each direction) would be converted to HOV/HOT lane 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 HOT/HOV lanes (one in each direction) would be added to the existing lanes. Appendix C presents a set of maps representing the single mode alternatives listed above.

Table 5-3. Arterial Improvements Evaluated in Round 1

Arterial Widening	With Parking	ART 1	Widening of Roosevelt Road and Madison Avenue to 4 continuous lanes (2 lanes each direction). Roosevelt Road from I-294 to Cicero Avenue Madison Avenue from 25th Avenue to Cicero Avenue
	Without Parking	ART 2	

5.2 Footprint and Fatal Flaw Screening Results

Corridor level right of way footprints were evaluated and assessed to determine if there were any significant potential impacts that would result in that alternative being fatally flawed due to impacts or displacements. Corridor level footprints included only the main trunk of the alternative, and did not include interchanges, intersection improvements or other localized components, such as park-and-ride lots that will be determined in subsequent rounds of development. The footprint, or width of the alternative, was based on common design standards for each mode.

Corridor level footprint impacts were evaluated along any portion of an alignment that extended west of the DesPlaines River. West of the river, alternatives alignment locations were

relatively straightforward with fewer constraint variables affecting their locations. East of the DesPlaines River, all the alternative alignments generally follow along the existing I-290 corridor, with the exception of arterial improvements. In this section, two important constraint variables that could directly affect the footprint location are still unresolved at this time, the availability of CSX right-of-way on the south side of I-290. Because this variable could affect how an alternative may be physically accommodated in this area, none of the expressway alternatives were fatally flawed in Round 1 due to footprint impacts.

The results of Round 1 footprint screening indicated that the arterial widening alternatives were fatally flawed because of the number of displacements. Due to the very mature and dense urban environment along Roosevelt Road and Madison Avenue, arterial 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 between 356 to 583 direct impacts to buildings (for widening without and with parallel parking, respectively). For this reason, arterial widening was dropped for further consideration in the alternatives evaluation. Other arterial suggestions may emerge in subsequent rounds and will be considered as appropriate. The summary table of these results and supporting evaluation exhibits maps can be found in Appendix E.

5.3 Travel Benefit Evaluation

Round 1 is intended to evaluate the transportation performance characteristics of each single mode prior to assembling combination mode alternatives in Round 2. Although Round 1 is not intended to be purpose and need test, to be consistent with purpose and need, the performance based criteria presented in Section 3.2 were used to evaluate the single mode alternatives performance relative to the 2040 baseline condition. For further detail, please refer to the full results summary matrix for the single mode alternatives in Appendix D. For each evaluation measure, the four single mode alternatives that resulted in the best performance relative to the baseline condition are indicated. This evaluation is intended to be used as a tool for the presentation and assistance in the interpretation of the Round 1 performance evaluation results. The ratings shown are not considered to be an absolute measure for determining which alternatives are eliminated or carried forward but are best used in a comparative analysis between alternatives of similar mode. In addition, many factors are considered when evaluating alternatives, including stakeholder and transportation agency input, costs, impacts, and more.

5.3.1 Improve Regional and Local Travel

The results of the regional and local travel performance evaluation of the single mode alternatives are presented below. In Round 1, 17 transportation performance measures were evaluated, 13 related to regional travel, and 4 related to Local Travel.

5.3.1.1 Improve Regional Travel

Table 5-4 presents the alternatives that resulted in the best improvements in the I-290 performance measures relative to the 2040 No Build condition. The performance measures are specific to the I-290 Expressway.

Table 5-4. I-290 Expressway Travel Ratings

I-290 Expressway Travel Performance Measures	Top 4 Performing Alternatives Overall			
	1st	2nd	3rd	4th
I-290 Volume to Capacity (all lanes, peak periods)	TOLL 2	TOLL 1	HOV 3LL	HOV 3W
% change relative to baseline	-7.85%	-5.98%	-5.95%	-5.69%
I-290 Average Speeds (all lanes, peak periods)	TOLL 2	TOLL 1	HOV 2LL	HOV 2W
% change relative to baseline	+35.45%	+28.12%	+15.30%	+14.94%
I-290 Average Travel Time Changes (all lanes, peak periods)	TOLL 2	TOLL 1	HOV 2LL	HOV 2W
% change relative to baseline	-26.17%	-21.95%	-13.27%	-13.00%
Daily Hours of Congestion Reduction (I-290 in Study Area)	TOLL 2	HOV 2W	HOV 2L	HOV 2LL
% change relative to baseline	-22.22%	-5.56%	-5.56%	-5.56%

All the expressway single-mode alternatives resulted in an improvement of the I-290 performance travel measures relative to the 2040 No Build conditions. Tolling alternatives experience the highest expressway performance increases because tolls increase user costs, discouraging some users from the expressway and reducing overall traffic on I-290, however local arterial performance decreases due to diversions from the expressway. HOV alternatives also perform well because they manage the demand for the added capacity, providing travel time reductions over 40 percent in the HOV lanes and over 10 percent increase in the adjoining 3 general purpose lanes through the study area compared to the travel times for the existing 3 general purpose lanes[2]. The transit alternatives resulted in no performance improvements on I-290 relative to the 2040 baseline condition in all of the above categories because there was insufficient diversion from auto to transit to have an impact on I-290 congestion. Transit is also serving a smaller, more compact market, as shown later in Figure 5-2.

The tolling alternatives provided the best overall improvement (all lanes) in V/C, speed, and travel time during the peak periods, but the HOV alternatives provided the most improvement in travel times and speeds, with speeds in the HOV lanes showing improvements ranging from 40 percent to 55 percent over the 2040 baseline condition. The HOT alternatives also showed good improvement in peak period travel times and speeds in the HOT lanes. The volumes in the general purpose lanes also decrease between 7 and 10 percent when a managed lane is added to the corridor. This is due to the added managed lane capacity addressing a saturated, bottleneck condition on I-290 and existing and newly formed carpools diverting to the manage lane.

[2] See Appendix D – Summary of Single mode Evaluation Results: Measure 1.3 – I-290 Average Travel Time Changes (peak periods)

All of the expressway alternatives, which add capacity on I-290 (between Mannheim Road and Central Avenue) as General Purpose, HOV, HOT, or toll lanes, resulted in improved travel performance on I-290. All of the transit alternatives resulted in no improvements travel performance on I-290, since they provide for no capacity improvement on I-290, nor generate enough diversions to transit to offset the unmet vehicle demand for the facility.

Table 5-5 presents the alternatives that resulted in the best improvements in Daily Person Throughput (through the study area) relative to the 2040 No Build condition. Daily Person Throughput measures the number of persons in autos and transit vehicles (including both bus and rail vehicles) moving through the study area in an east-west direction.

Table 5-5. Daily Person Throughput Ratings

I-290 Study Area East-West Person Throughput	Top 4 Performing Alternatives Overall			
	1st	2nd	3rd	4th
Daily Person Throughput (through study area)	 HOV 3LL	 HOT 1	 HOV 3L	 HOT 2
% change relative to baseline	+7.31%	+7.11%	+6.87%	+6.82%

HOV/HOT alternatives provide the best overall improvement in person throughput. BRT, HRT, General Purpose and Toll 1 provided some improvement, while Toll 2 provided the least improvement in daily throughput.

Added capacity on I-290 in the form of managed lanes that give preferential treatment to carpools (HOV/HOT) were the alternatives that carried the most people through the study area in an east-west direction. This is due to both the increased I-290 capacity due to the additional HOV/HOT lane, and more efficient throughput of vehicles carrying multiple occupants. Transit alternatives increase the capacity of transit in the study area, which results in some new riders that have diverted from auto. However, transit alternatives also result in a more significant diversion of passengers from existing parallel bus and rail services, limiting the overall increase in person throughput. Adding capacity on I-290 in the form of general purpose or toll lanes improves person throughput, but not to the extent of HOV/HOT because there are no incentives for auto vehicles to carry more occupants.

Table 5-6 presents the alternatives that resulted in the best overall improvements in overall regional performance measures. These evaluation measures are for all roadways in the CMAP model area, which covers 22 counties in 3 states, of which 11 counties in northeast Illinois are reported on.

Table 5-6. Regional Travel Ratings

Regional Travel Performance Measures	Top 4 Performing Alternatives Overall			
	1st	2nd	3rd	4th
Vehicle Miles of Travel (VMT) (daily, regional)	HOV 3LL	HOV 3L	HOV 3W	HRT 1
% change relative to baseline	-0.07%	-0.07%	-0.06%	-0.03%
Vehicle Hours of Travel (VHT) (daily, regional)	HOV 3W	HOV 3LL	HOV 3L	HOV 2W
% change relative to baseline	-0.24%	-0.22%	-0.22%	-0.18%
Congested VMT (daily, regional)	TOLL 2	HOV 3W	HOV 3LL	HOV 3L
% change relative to baseline	-0.47%	-0.46%	-0.45%	-0.42%
Hours of Delay (daily, regional)	HOV 3W	HOV 3L	HOV 3LL	TOLL 2
% change relative to baseline	-0.40%	-0.37%	-0.37%	-0.35%

Daily Vehicle Miles of Travel (VMT) represents the total distance per day traveled by all vehicles in the CMAP region. Daily VMT declines versus the 2040 baseline condition for HOV 3+ and the transit alternatives. HOT, General Purpose, and Toll alternatives resulted in increased VMT. The efficient use of auto in the form of a 3-person (or more) carpool more than offsets the increase in VMT by generally using a slightly longer, but faster route provided by the HOV lane. The HOT, General Purpose, and Toll alternatives result in increased VMT because the auto trips are overall slightly longer to use the additional expressway capacity provided on I-290, but are overall faster trips. Transit alternatives resulted in persons diverting from autos, resulting in less VMT.

Daily Vehicle Hours Traveled (VHT) is the total time spent traveling by all vehicles in the CMAP region, and is an important measure because travel time savings result in economic benefits. Compared to the 2040 baseline condition, HOV 3+ resulted in the largest reduction in VHT, followed by the other expressway alternatives. The transit alternatives showed some reduction in VHT, however the reductions were approximately a third of that provided by the expressway alternatives on average. For the expressway alternatives, VHT savings ranged from 12,000 to 24,000 hours per day. Using an average of 18,000 vehicle hours of travel saved, times 365 days per year, times an average of $20/hour for the value of time[3], results in $131 million dollars of travel time savings a year.

Congested VMT and Hours of Delay are considered measures of congestion for the CMAP region. HOV 3+ and Toll 2 resulted in the most improvement in Congested VMT and Hours of Delay, followed by the other expressway alternatives. The transit alternatives showed some

[3] NCHRP Report 456, Guidebook for Assessing the Social and Economic Impacts of Transportation Projects, adjusted to current dollars based on the Consumer Price Index for All Urban Consumers, Chicago-Gary-Kenosha

reduction in these congested measures, but were generally one-fourth of the reduction provided by the expressway alternatives.

Table 5-7 presents the alternatives that resulted in the best improvements in the regional truck travel performance measures relative to the 2040 baseline condition. Travel time is an important measure for trucks, as the value of time is typically higher for trucks than autos, reflecting the value of goods being transported. Regional truck travel time performance measures include truck hours of travel (THT) and truck hours of delay.

Table 5-7. Regional Truck Travel Ratings

Regional Truck Travel Performance Measures	Top 4 Performing Alternatives Overall			
	1st	2nd	3rd	4th
Truck Miles of Travel (TMT) (daily, regional)	HOV 3LL	HOV 3L	BRT 4	TOLL 1
% change relative to baseline	-0.02%	-0.01%	-0.01%	-0.01%
Truck Hours of Travel (THT) (daily, regional)	TOLL 2	TOLL 1	GP LANE	HOT 2
% change relative to baseline	-0.66%	-0.50%	-0.16%	-0.14%
Congested TMT (daily, regional)	TOLL 2	HOT 2	HOT 1	TOLL 1
% change relative to baseline	-0.70%	-0.57%	-0.47%	-0.37%
Truck Hours of Delay (daily, regional)	TOLL 2	GP LANE	HOT 2	HOT 1
% change relative to baseline	-0.51%	-0.29%	-0.26%	-0.24%

Overall, the Toll, HOT, and General Purpose alternatives showed the most improvement in THT, Congested TMT, and Truck Hours of Delay. HOV and transit also showed improvement in these regional measures for trucks.

5.3.1.2 Improve Local Travel

Table **5-8** presents the alternatives that resulted in the best improvements in the Arterial travel performance measures relative to the 2040 No Build condition in the study area. Arterial Volume to Capacity represents how many vehicles are traveling on an arterial as compared to how many vehicles the arterial can accommodate. At volume to capacity approaching one, the arterials are very congested.

Table 5-8. Arterial Travel Ratings

Study Area Arterial Travel Performance Measures		Top 4 Performing Alternatives Overall			
		1st	2nd	3rd	4th
Arterial Peak Period Volume To Capacity	East-West Arterials	GP LANE	HOV 2LL	HOV 2W	HOT 2
	% change relative to baseline	-4.57%	-3.90%	-3.78%	-3.48%
	North-South Arterials	GP LANE	HOV 2LL	HOV 2W	HOT 2
	% change relative to baseline	-4.50%	-4.01%	-3.87%	-3.86%
Arterial Peak Period Speeds	East-West Arterials	GP LANE	HOV 2LL	HOV 2W	HOV 2L
	% change relative to baseline	+2.52%	+2.45%	+2.34%	+2.28%
	North-South Arterials	HOV 3L	HOV 3LL	BRT 4	HRT 1
	% change relative to baseline	+0.39%	+0.38%	+0.35%	+0.30%

The General Purpose, HOV 2+, and HOT alternatives were the best performing with regards to improving study area arterial travel performance by lowering arterial peak period Volume to Capacity and improving east-west arterial peak period speeds in the study area. The transit alternatives resulted in slightly worse arterial travel performance in the east-west direction.

General Purpose, HOV, BRT, and the transit alternatives showed the most improvements for study area north-south arterials as compared to the 2040 baseline condition.

Generally, east-west arterial travel improvements are seen when capacity improvements are included along I-290, however there is a correlation between the east-west arterial improvements and how the added capacity of the expressway alternative is managed. The less the added capacity to I-290 is managed (General Purpose lanes, with no usage restrictions), the better the performance of the parallel east-west arterials. This is because longer distance trips that were previously using the east-west arterial streets are now using the added capacity on the I-290 Expressway. Since the General Purpose lanes had no requirements for using this added capacity on I-290, it attracted the most longer-distance trips off of the east-west arterials, with more than a 62,000 vehicle miles of travel decrease on study area arterial streets.

Table 5-9 presents the alternatives that resulted in the best improvements in the Local Travel performance measures relative to the 2040 baseline condition. These travel performance measures show which alternatives provide the most travel performance improvement to the study area only.

Table 5-9. Study Area Travel Ratings

Study Area Travel Performance Measures	Top 4 Performing Alternatives Overall			
	1st	2nd	3rd	4th
Arterial Vehicle Miles of Travel (VMT)	GP LANE	HOT 2	HOV 2W	HOT 1
% change relative to baseline	-1.85%	-1.73%	-1.26%	-1.24%
Arterial Vehicle Hours of Travel (VHT) (daily, regional)	HOT 2	GP LANE	HOV 3LL	HOV 2LL
% change relative to baseline	-3.16%	-2.76%	-2.71%	-2.58%
Arterial Congested VMT (daily, regional)	HOT 2	HOV 3LL	HOV 2LL	HOV 3L
% change relative to baseline	-8.10%	-7.45%	-7.13%	-7.11%
Arterial Hours of Delay (daily, regional)	HOT 2	HOV 3LL	HOV 3L	HOV 2LL
% change relative to baseline	-4.69%	-4.48%	-4.34%	-4.02%

The HOT, General Purpose and HOV alternatives result in the most improvement to study area travel performance. The transit alternatives provide some improvement, while the Toll alternatives result in worsening of arterial travel performance in the study area without additional capacity being added.

A comparison of the Study Area Travel Performance Measures table with the Regional Travel Performance Measures table shows that the General Purpose and HOT alternatives provide more benefit to the study area, but overall at the regional level, HOV provides the most benefit.

5.3.2 Improve Accessibility to Employment

Table 5-10 presents the alternatives that resulted in the best improvements in the Access to Employment performance measures relative to the 2040 No Build condition. Changes to the number of jobs accessible by automobile and transit reflect the changes in travel times due to the transportation performance effects of the single mode alternative being evaluated; the faster the travel time, the more jobs accessible within a given time frame.

Table 5-10. Jobs Accessibility Ratings

# of Jobs Accessible within 60 Minutes	Top 4 Performing Alternatives Overall			
	1st	2nd	3rd	4th
By Auto	TOLL 2	HOT 2	TOLL 1	HOV 3LL
% change relative to baseline	+10.75%	+9.28%	+6.95%	+5.41%
By Transit	BRT 4	BRT 5	BRT 2	BRT 3
% change relative to baseline	+13.44%	+8.45%	+7.81%	+7.11%
By Auto & Transit	TOLL 2	HOT 2	BRT 4	TOLL 1
% change relative to baseline	+6.31%	+5.44%	+5.31%	+4.08%

The number of jobs accessible within 60 minutes from a point in the center of the study area by auto, transit, and combined were calculated for each alternative. The expressway modes show the best improvements in job access by auto, and transit had the best improvements in job access by transit. However the single mode transit alternatives generally worsened the number of jobs accessible by auto, which correlates to decreases in I-290 performance exhibited by the transit alternatives.

When considering the total number of jobs accessible by auto and transit for each single mode alternative, Toll and HOT provide the best access, followed by the BRT. Access to jobs would likely increase with combination expressway and transit alternatives, which will be identified and evaluated in the next screening step.

5.3.3 Improve Safety for All Users

The initial single mode alternatives were compared relative to the 2040 baseline condition for the third need point, improve safety for all users, of the Purpose and Need. Injury and fatal crashes per million vehicle miles traveled (per year) for arterials and expressways were calculated using the AASHTO HSM and the Texas Roadway Safety Manual methodologies, respectively. Injury and fatal crashes per million person miles traveled (per year) on arterial, expressways, and transit were estimated for each alternative. The overall measure accounts for transit safety by assuming no injuries or fatalities for transit person miles. The percent change in injury and fatality rates relative to the 2040 baseline condition were then compared. An expanded summary table for the Round 1 safety evaluation can be found in Appendix D. The top four performing single mode alternatives for improving arterial, I-290, and overall safety are shown in Table 5-11.

Table 5-11. Safety Improvement Ratings

Reductions in Injuries and Fatalities % Rates of Change	Top 4 Performing Alternatives Overall			
	1st	2nd	3rd	4th
Arterials	BRT 4	GP LANE	HRT 2	BRT 5
% change relative to baseline	-0.13%	-0.10%	-0.10%	-0.09%
Expressway (I-290)	TOLL 2	HOV 3L	HOV 3LL	HOV 3W
% change relative to baseline	-14.36%	-14.21%	-14.19%	-13.58%
Overall (Arterials, Expressways, Transit)	HOV 3LL	HOV 3L	HOV 3W	HOV 2L
% change relative to baseline	-11.51%	-11.06%	-9.58%	-8.66%

For arterials, the HSM evaluation indicates there is a relatively stable total number of injury and fatal crashes per year across the alternatives ranging from between -3 percent decrease (GP LANE) and 1 percent increase (TOLL 2), compared to the total number of injuries and fatalities of the 2040 baseline condition (263.9). With the exception of the TOLL 2 alternative, all the expressway alternatives showed overall reductions in total injury crashes. For transit alternatives, the analysis indicated slight increases in these types of crashes, with the exception of HRT 3. However, when expressed as a rate of crashes per million vehicle miles traveled, the transit options indicate some reduction in crashes. This is due to a higher increase in vehicle miles traveled compared to a relatively similar total number of crashes. Although the GP LANE alternative ranks 2nd, it had the lowest total number of crashes overall coupled with the lowest number of vehicle miles traveled on the Arterials.

Regarding the safety of I-290, the HOV and TOLL alternatives showed reductions in total number of annual injury and fatal crashes (between -1.1 percent and -14.1 percent) as compared to the 2040 base condition. When expressed as a rate of crashes per million vehicle miles traveled (per year), all the expressway alternatives indicate good safety improvements with crash reductions ranging from -9.6 percent (HOT 2) to -14.4 percent (TOLL 2). All the transit alternatives indicated an increase in total number of crashes and related increases in crash rates.

Overall safety factors in all the projected annual injury and fatal crashes on arterials, expressways, and transit, and divides by the total number of person miles traveled on these facilities in the study area.

Comparing the overall safety performance of the arterials, expressways, and transit in the study area, all the alternatives demonstrated an improvement in safety using person miles traveled as a basis. With the exception of TOLL 1, all the expressway alternatives indicate the highest overall safety improvements, ranging between -5.2 percent (GP LANE) and -11.5 percent (HOV3 LL) reductions in crash rates. These higher crash rate reductions experienced by the

expressway alternatives are due to higher person throughput, combined with overall reductions in these crash types.

5.3.4 Improve Modal Connections and Opportunities

The initial single mode alternatives were compared relative to the 2040 baseline condition for their ability to attract new transit trips, and the top four performing single mode alternatives are shown in Table 5-12. New transit trips represent the number of persons that previously used automobiles and have now switched to transit because of the transit improvement.

For the Round 1 Screening, measures of improving transit access, non-motorized connections and multimodal opportunities were not evaluated. As the alternatives are detailed and refined in later screening rounds, a more robust assessment will be made of these evaluation criteria.

Table 5-12. Modal Connections Ratings

Improve Modal Connections and Opportunities	Top 4 Performing Alternatives Overall			
	1st	2nd	3rd	4th
New Transit Trips (Regional)	 BRT 3	 BRT 5	 BRT 4	 BRT 2
Transit Access (qualitative)	*Not used*			
Non-Motorized Connections (qualitative)	*Not used*			
Multi-Modal Opportunities (qualitative)	*Not used*			

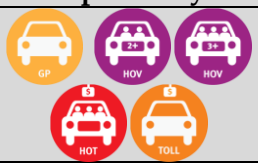
The BRT alternatives are the best performing alternatives for attracting new transit trips, followed closely by the Blue Line extensions. This level of new transit trips is within the bounds of other proposed transit extensions in the region.

It is also informative to examine the diversion of transit riders to auto that result with the expressway alternatives. With the expressway capacity improvements, there are some transit riders that are switching to auto. In general, the HOV and HOT single mode alternatives indicated some transit riders switching to auto (up to 6,800, and 3,200 transit diversions, respectively). The General Purpose and Toll alternatives had relatively no impact on transit.

5.3.5 Improve Facility Deficiencies

The initial single mode alternatives were compared relative to the 2040 baseline condition for the fifth need point of the Purpose and Need, improve facility deficiencies. For the Round 1 Screening, facility deficiencies measures were not used for screening as shown in Table 5-13. As the alternatives are detailed and refined in later screening rounds, a more robust assessment will be made of these evaluation criteria.

Table 5-13. Facility Improvement Ratings

Improve I-290 Facility Condition and Design	Transit	Expressway
		
Pavement Age	*Not used*	
Structure Deficiencies	*Not used*	
ADA Deficiencies	*Not used*	
Drainage Deficiencies	*Not used*	

Since the expressway alternatives require the complete reconstruction and renewal of the expressway, interchanges, and overpasses, these alternatives would address the identified needs for improving the facility condition and design. As standalone improvements, the single mode transit alternatives would not address these needs as they would not require the reconstruction and renewal of the expressway throughout the entire study area.

5.4 Summary of Findings

Twenty-one single mode alternatives were identified for evaluation in Round 1: 9-transit, 11-expressway, and 1 arterial.

5.4.1 Transit Mode Findings

Overall, the single mode transit alternatives provide some improvement in regional congestion and safety, although less than the single mode expressway alternatives. They improve transit access to jobs because of improved transit travel times and improved reverse commute options. The transit alternatives also result in up to 11,600 daily auto person trip diversions, but up to 13,000 diversions from other transit services.

The Blue Line extension and BRT alternatives had similar results and had the best travel performance of the single mode transit alternatives. Each showed some improvement in regional and local travel performance measures, the highest increases in access to jobs by transit and the highest number of new transit trips.

When comparing the effectiveness of the length of transit improvements, it was found that of the three Blue Line Extension alternatives evaluated, the results indicated that the majority of the performance improvements were achieved by a Blue line Extension to Mannheim Road as compared to an extension further west to Oak Brook at less than half the length (3.5 miles vs. 8 miles). Table 5-14 illustrates this comparison for several of the measures evaluated in Round 1.

For example, a Blue Line Extension to Mannheim Road (HRT 3) provides 71 percent of the new jobs accessible, 89 percent of new regional transit trips vs. an extension to Oak Brook. Also, an

HRT terminal at Mannheim may serve as the starting point for a further westward extension of the HRT line.

Table 5-14. Performance Comparison of Blue Line Extensions

Performance Comparison* of Blue Line Extensions to:	Alignment Length (miles)	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%

* 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, diverting 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 would be considered 4(f) lands. Therefore, 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 Bus Rapid Transit facility between Ashland Avenue and the Forest Park terminal. This alternative indicated generally similar and some improved performance as compared to an HRT Blue Line extension to Oak Brook (HRT 2), however, due to the similarity in performance and ROW requirements for these two fixed guideway transit facilities, the HRT extension of the Blue Line will be the representative mode that will be modeled and evaluated in the combination alternatives.

Overall, the single mode transit alternatives do not improve I-290 travel performance as compared to the 2040 No Build conditions, providing no improvements to volume-to-capacity ratios, speeds and travel times, and hours of congestion. This is due to an already well-established and utilized study area transit network, with new service drawing insufficient auto-trip diversions to offset auto demand for I-290, and a smaller narrower transit market as compared to I-290.

Figure 5-1 and Figure 5-2 illustrate differences between the transit and expressway travel markets. As seen in Figure 5-1, the travel market for traditional commute (home-to-work) trips is much smaller and confined to the area immediately around the Blue Line extension as compared to using 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 5-2, 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 the I-290 Expressway at less than a tenth of the size.

Figure 5-1. Traditional Commute Travel Origins

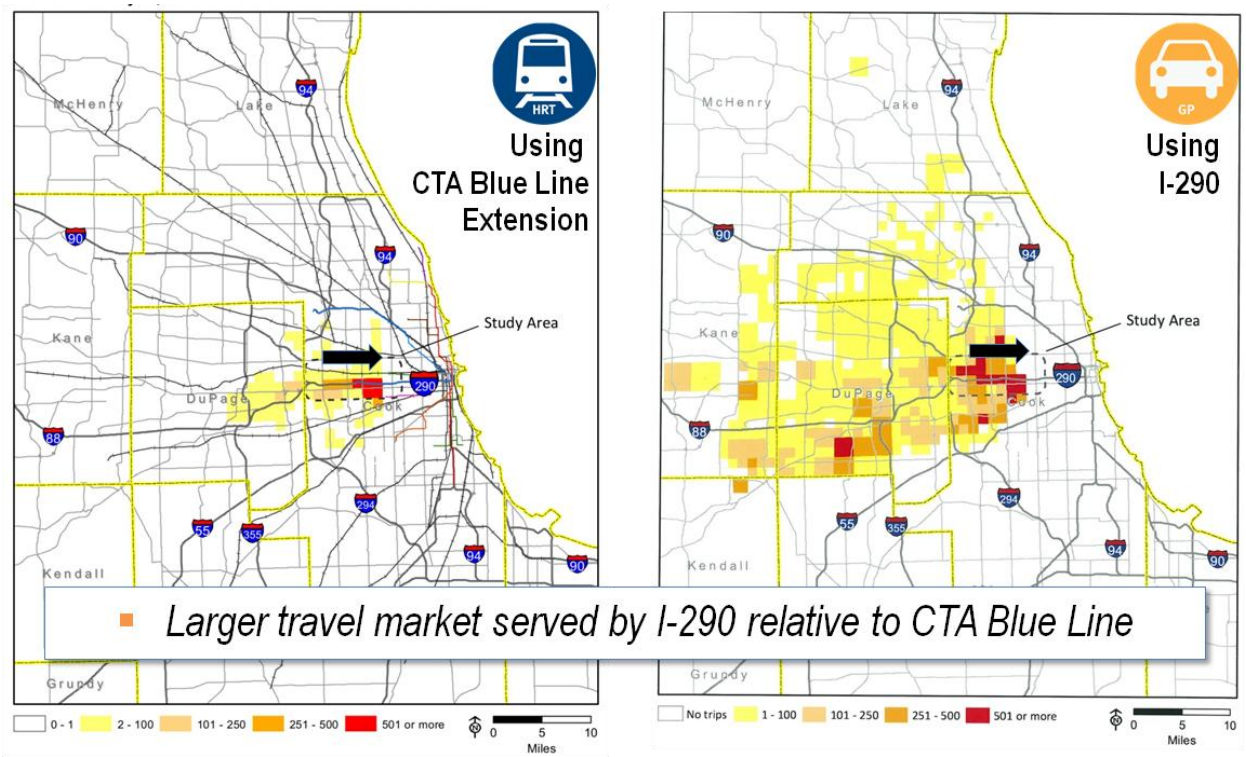
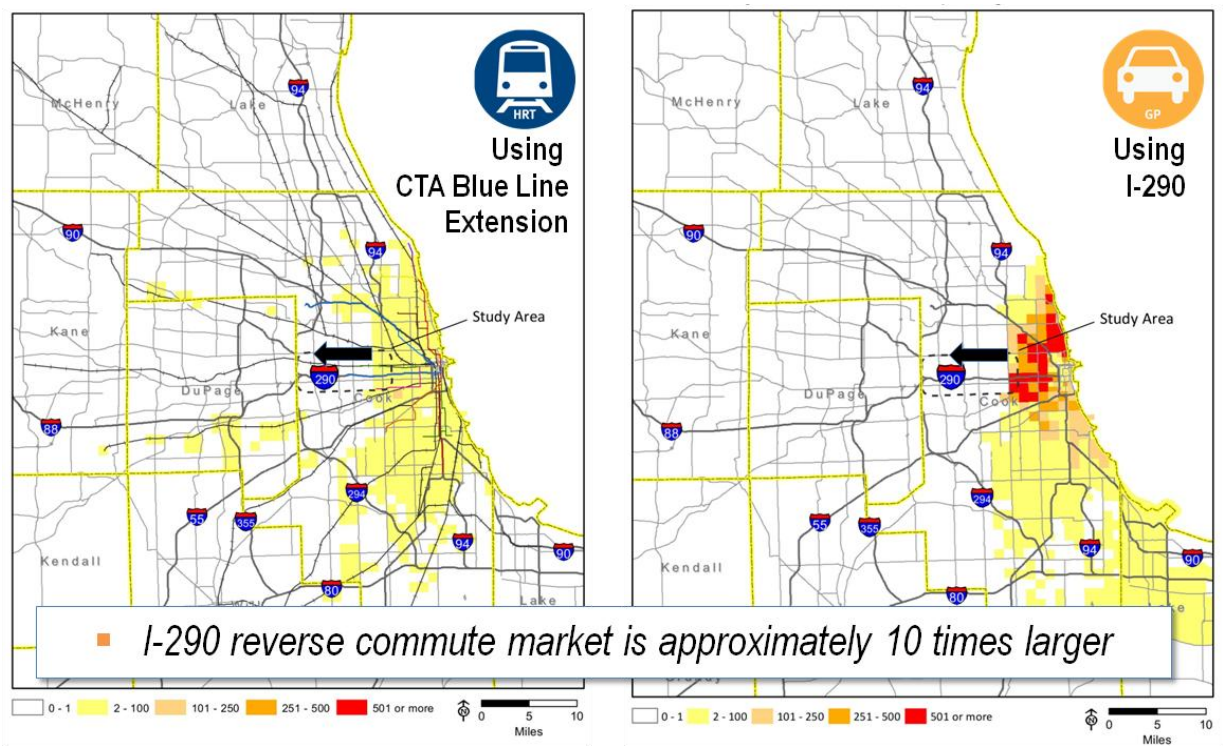
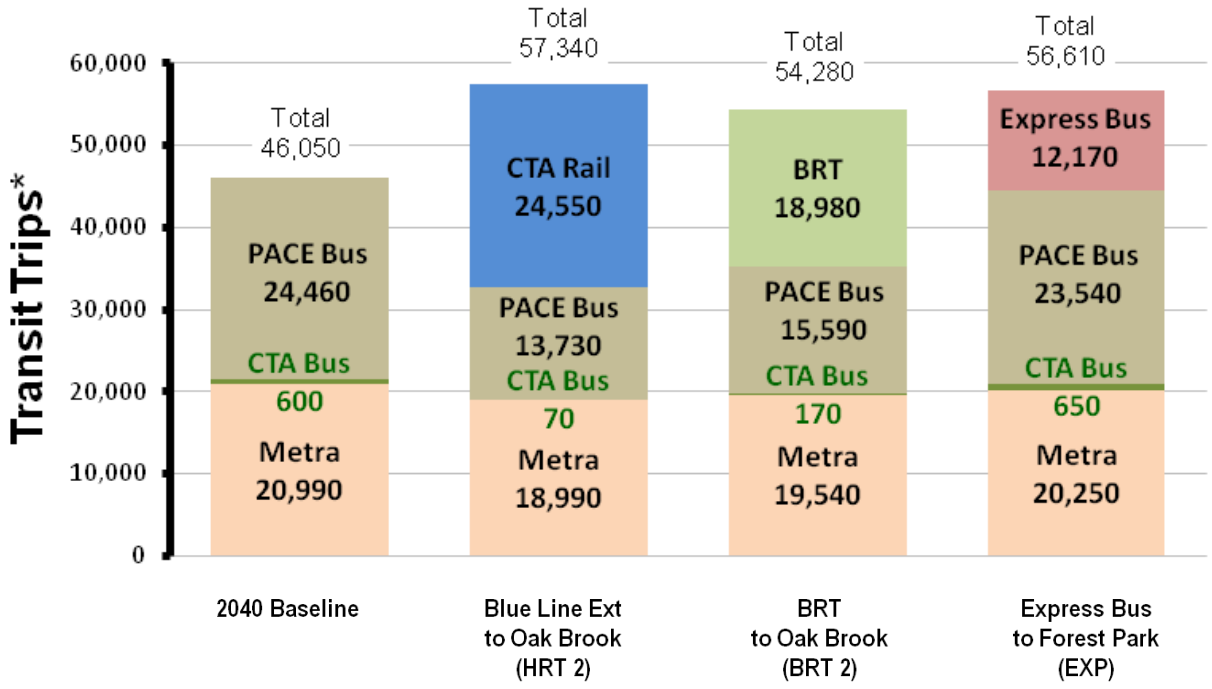


Figure 5-2. Reverse Commute Travel Origins



In addition, new single mode transit service diverts riders from existing transit services. A screen line through the study area was evaluated between 1st Avenue and Des Plaines Avenue in comparison to the east-west transit trips through the study area of three single mode transit alternatives to the baseline condition. As represented in Figure 5-3, approximately 46,000 transit trips in Pace and CTA buses and on Metra commuter rail trains cross 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) result in a diversion of Metra commuter rail trips of up to 2,000 persons, and diversion of Pace and CTA bus riders of up to 11,000 passengers. The ridership on the new Blue Line extension and BRT services is between 19,000 and 25,000 riders, resulting in total screen line crossing of between 54,000 and 57,000 persons. This difference roughly corresponds to the new transit riders (those diverted from auto). Most of the ridership on the new transit service is due to the diversion of trips from other existing transit services. For example, the Blue Line extension to Oak Brook alternative [HRT 2] attracts 24,550 riders, 13,260 (54 percent) of these riders are diverted from existing transit services (PACE, Metra), 8,350 (34 percent) are diversions from auto, and the remaining 2,940 are additional transit trips.

Figure 5-3. Trip Diversions within Transit Modes



In summary, the Blue Line extension and BRT single mode alternatives were the best performing transit alternatives with similar results; however, no single mode transit alternative showed improvement to I-290 travel performance. Regarding an extension of the existing CTA Blue Line, an extension to Mannheim Road would be more cost effective than longer extensions, and therefore Mannheim Road will be the west terminus evaluated in Round 2. The conversion of the existing Blue Line from Forest Park to Ashland to BRT combined with an extension to Oak Brook performed well, but didn't perform appreciably better than HRT so HRT was carried forward as the representative transit. The express bus alternatives resulted in local travel and job accessibility improvements.

5.4.2 Expressway Mode Findings

Overall, the single mode expressway alternatives provide the highest improvement in regional and local (study area) travel performance, and on the I-290 Expressway. They also improve auto access to jobs because of the added capacity that results in reduced time spent traveling. The expressway alternatives also result in up to 6,800 daily transit person trip diversions to auto.

The General Purpose alternative has the best study area peak period arterial performance improvement. The HOV Lane alternatives show the best overall regional travel performance improvement and overall job accessibility improvement. The HOV and HOT Lane alternatives have the best overall performance and person throughput. The Toll and HOV Lane alternatives have the best I-290 travel performance improvements in terms of peak period volume-capacity improvement, peak period average speed increase, and hours of congestion reductions. The Toll and HOT Lane alternatives have the best auto safety improvement and best regional truck performance improvement.

In comparing volumes for the existing I-290 Expressway general purpose lanes for the expressway alternatives in Table 5-15 below, the daily general purpose lane volumes associated with HOV, HOT, and Toll alternative decrease 7 to 10 percent, while the General Purpose lane alternative, (with the added lane in each direction) results in a 14 percent increase in daily volume.

Table 5-15. Expressway General Purpose and Managed Lane Performance

Study Area Performance		2+ HOV Oak Brook to Racine	3+ HOV Oak Brook to Racine	3+ HOT Oak Brook to Racine	General Purpose Add Lane	Toll I-290 Existing Lanes I-88 to Cicero
		HOV 2LL	HOV 3LL	HOT 2	GP LANE	TOLL1
General Purpose Lanes Daily Volume **		-8%	-7%	-7%	14%	-10%
HOV/HOT Lanes	Daily Volume	31,000	17,600	43,700		
	Peak Hr. Volume	2,930	1,970	3,730		
	Peak Hr. Speed**	67%	112%	17%		

The travel performance of the HOV and HOT lanes in the expressway alternatives is also shown in the Table 5-15. With 1,970 peak hour volume (both directions) for the HOV 3+ lanes, there is a concern that the HOV 3+ lanes may not be fully utilized given capacity of over 4,200 vehicles per hour (2,100 vehicles per hour in each direction). The HOT Lane alternative shows the highest volume, due to excess capacity being utilized by vehicles that may pay a toll to access the lane. The overall peak hour travel speeds of all lanes in the HOV and HOT alternatives also provide improvements compared to the overall speeds of the General Purpose lane alternative.

The HOT Lane alternative showed 14 percent speed improvement during the peak hour. However, this can be managed to a greater degree through setting of the dynamic toll rates for the HOT lane.

In summary, the single mode expressway alternatives resulted in the highest travel performance improvements to the I-290 Expressway, as well as the best improvement of regional and local (study area) travel performance. The HOV and HOT Lane alternatives have the best overall performance. The HOV Lane alternatives have the best regional travel performance and job accessibility, and the Toll and HOV Lane alternatives have the best improvement in I-290 Expressway performance. The Toll and HOT Lane alternatives have the best regional truck performance. The Toll alternatives show the least arterial performance improvements among the expressway alternatives. The General Purpose lane alternative has the best improvement in study area peak period arterial performance.

5.4.3 Arterial Mode Findings

An initial fatal flaw footprint impact evaluation found that the arterial widening (with and without parking) resulted in a large number of displacements and, therefore, arterial widening was determined to be fatally flawed and not carried forward for performance evaluations. Less extensive arterial improvements in conjunction with other modes may be considered in subsequent rounds.

5.4.4 Overall Conclusions

The I-290 study area is an existing multi-modal corridor that serves broad travel markets to the east and west of the study area. To the east, the primary travel markets served by this corridor extend to the city of Chicago, the Chicago Central Business District, suburban Cook County, and Lake County, Indiana. To the west the I-290 Corridor serves the markets of west and northwest Cook County, DuPage County, and Kane County. These markets include the auto and transit markets, with the auto travel market being much broader and larger. The traditional commute is the primary market served by transit.

Transit Conclusions

- The transit alternatives provide improved mobility options to areas west of the Forest Park Blue Line station, improved access to jobs, and also diversion of auto users.
- The transit alternatives did not result in any travel performance improvement to the I-290 Expressway.
- When evaluating various single mode transit alternatives, extensions of the existing CTA Blue line with high capacity transit modes of BRT and HRT showed the highest mode shifts and person throughput from auto to transit.
- There was a considerable mode shift between transit modes and no single transit mode alternative was able to shift enough demand from auto to transit to offset the demand on the expressway, and therefore resulted in no improvements to expressway performance.
- Due to the similarity in performance and ROW requirements between the existing Blue Line and a conversion of the existing Blue Line to Bus Rapid Transit (BRT 4) the conversion of the existing Blue Line will not be carried forward.
- Mannheim Road will be the western terminus for Round 2.

Expressway Conclusions

- The expressway alternatives showed the greatest improvement in travel performance for the region, study area and on the I-290 Expressway itself. Due to the size of the expressway travel markets, 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 alternative resulted in congestion improvements for the existing I-290 general purpose lanes.
- The HOV and HOT lanes showed increased travel speeds over the existing general purpose lanes. Round 1 evaluation, raise a concern as to whether optimal peak period HOV 3+ lane volumes will occur; additional evaluation will be needed to further evaluate the effectiveness of HOV 2+ and HOV 3+ .

The alternatives showing the best performance relative to the 2040 baseline condition are shown in Table 5-16.

Table 5-16. Single Mode Performance Ratings

Purpose and Need Summary	Top Performing Alternatives						
	1st	2nd			3rd	4th	
Overall	 HOV 3LL	 HOV 3L	 HOT 2	 TOLL 2	 HOV 2LL	 GP LANE	 TOLL 1

Overall, managed lane expressway alternatives (HOV and HOT) provide some of the best performance benefits because they address the underserved vehicle travel demand in this corridor, and manage its use more effectively.

5.4.5 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.

5.4.5.1 Expressway Modes in Combination Alternatives

The stand-alone expressway alternatives resulted in the greatest improvement in travel performance for the region, study area, and along I-290, when compared to the no-build condition. The stand alone expressway alternatives also resulted in better performance than stand alone transit modes (for improving local and regional travel, overall access to employment and safety). Although the stand alone transit alternative did not show the same level of improvements demonstrated by the expressway alternatives, they do offer additional benefits, such as large increases in transit access to jobs, auto person trip diversions to transit, and some improvements in regional congestion and safety. Building on the performance improvements exhibited by the expressway modes and recognizing the additional benefits that transit provides, initial combination mode alternatives were developed to systematically test the transit modes with each highway mode to determine what performance gains may be achieved

by various combinations. The following four expressway modes were selected for further testing in combination with the transit modes; HOV, Toll, HOT, and GP Lanes. 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. However, a decision as to whether to operate HOV 2+ or HOV 3+ will require more detailed operational analyses as the alternatives continue to be refined.

A fifth expressway combination alternative pairs Toll Lanes and HOT 3+ with transit. This scenario was added to test the combined effects of converting I-290 to a tolled facility (all GP lanes), HOT 3+, and transit.

To provide a consistent comparison between managed lane alternatives (HOV, HOT, Toll), the eastern and western managed lane/toll limits for each alternative extend from the I-88/I-290 split in the west to Racine Avenue in the east. These limits will be revisited depending on the evaluation results, further clarification of tolling/managed lane conversion legislation, and stakeholder input.

5.4.5.2 Transit Modes in Combination Alternatives

Although transit modes do not improve I-290 performance, the transit modes are being tested in combination with the expressway modes to evaluate how transit may improve overall transportation performance of the alternatives in the study area and region.

Express Bus service was included as a component in all combination mode alternatives due to its operational and physical compatibility with other modes. Express bus serves a broad market to the west, providing an express connection to the existing Blue Line Terminal in Forest Park, or to a new Heavy Rail Transit (HRT) terminal at Mannheim Road. Express bus 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 evaluated single mode transit system extensions from the existing Forest Park CTA Blue Line Terminal included Heavy Rail Transit (HRT) and Bus Rapid Transit (BRT) alternatives, and it was found that both modes are feasible, show similar performance characteristics, and have similar footprint/ROW requirements. For the purposes of Round 2 evaluations, the fixed guideway transit is termed High Capacity Transit (HCT) and could be either HRT or BRT, however for modeling purposes, HCT was evaluated as Heavy Rail Transit. The I-290 Phase I study is providing a foundation for future detailed studies of this transit improvement, such as a Federal Transit Administration (FTA) Alternatives Analysis (AA) study.

The Mannheim Road terminus for an HCT extension was selected due to the single mode modeling results that suggested, relative to each other, the majority of the performance improvements were achieved by a Blue Line extension to Mannheim Road as compared to an extension further west to Oak Brook at less than half the length. Also, an HCT terminal at Mannheim may serve as the starting point for a further westward extension of the HCT line (see section 5.4.1). Each Expressway & Express Bus transit combination alternatives will be tested with and without High Capacity Transit to systematically evaluate the effects of HCT in each scenario.

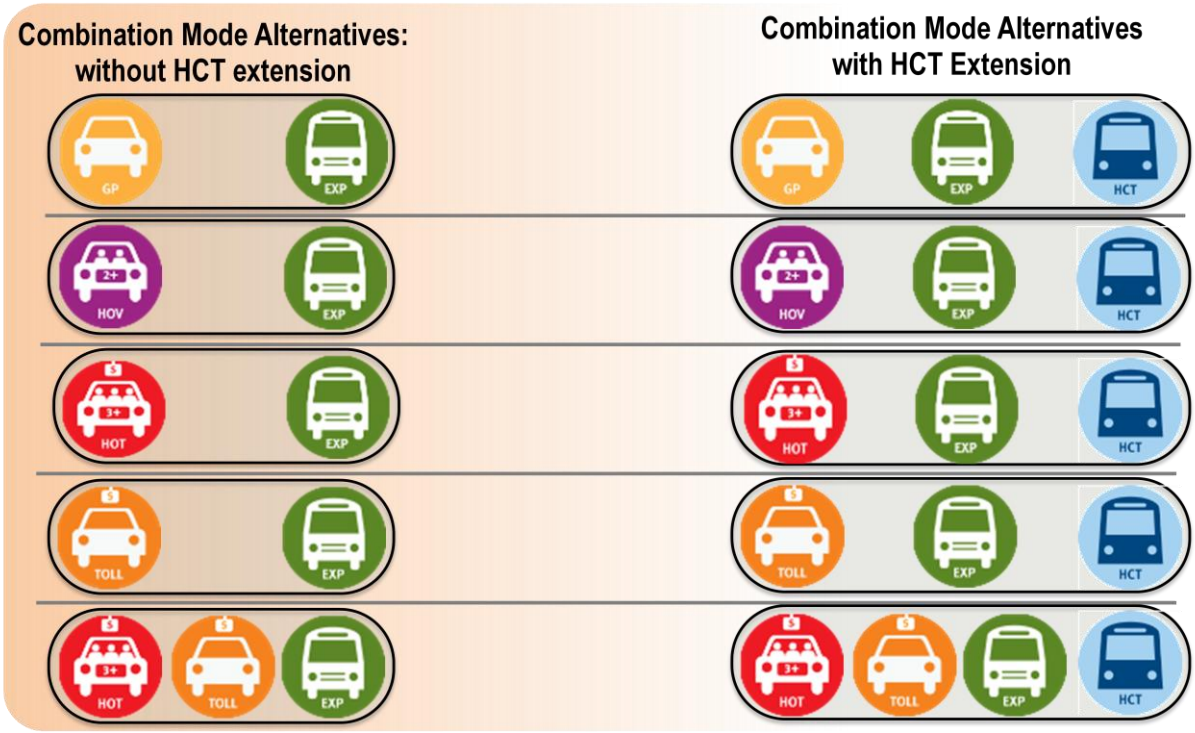
5.4.5.3 Initial Combination Mode Alternatives to be Evaluated in Round 2

Combination alternatives have been assembled to analyze the combined performance of transit and expressway alternatives in meeting study area and regional needs. In addition, the compatibility of pairing each of the expressway modes with the transit alternatives must be analyzed with regards to:

- Travel markets: To what degree do the expressway and transit components of these combination alternatives serve complementary or overlapping travel markets? For example, would HOV lanes compete for some of the same users as HRT and to what extent?
- Operations: How well do the expressway and transit components of the combination alternatives work together from an operational perspective? For example, does express bus run on the inside or outside shoulder with the General Purpose lanes, how well would it operate in a managed lane?

The rationale described above resulted in ten initial combination alternatives, which are summarized in the Table 5-17 below. 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 & 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. Map exhibits that describe each of the 10 combination mode alternatives are provided in Appendix F.

Table 5-17. Initial 10 Combination Mode Alternatives



6 Round 2 Combination Mode Alternatives

The results of the Round 2 screening evaluation of the combination mode alternatives are presented below. Section 6.1 presents the definition of the combination mode alternatives identified for Round 2 evaluation, Section 6.2 presents the Round 2 screening process, Section 6.3 presents the results of the Round 2 evaluation, and Section 6.3.5 summarizes the findings and overall conclusions of the Round 2 evaluation.

6.1 Definition of Combination Mode Alternatives

The 10 combination mode alternatives identified at the end of Round 1 to be advanced for evaluation in Round 2 are identified in Table 6-1. In Round 2, service and operational characteristics of the 10 alternatives were further defined for evaluation in the project's regional travel forecasting **m**odel. Model results were used to evaluate the performance measures in Round 2. General footprint variations of the 10 combination mode alternatives were identified. Refer to Appendix F, which includes a set of maps that describe the 10 combination mode alternatives.

With regard to the service and operational characteristics of the 10 combination mode alternatives, the express bus component (EXP) consists of three I-290 express bus services continuing north on I-290 to serve the northwestern suburbs, heading west on I-88 to serve the western suburbs, and heading south on I-294 to serve the southwestern suburbs. The express bus components were included in all 10 alternatives and have two different termini depending on whether or not an HCT extension is included in the combination mode alternative. In the 5 combination mode alternatives that do not include an HCT extension to the west, the Express bus service connects via I-290 to the existing Forest Park CTA Blue Line Station. For the five combination mode alternatives that include an HCT extension to Mannheim Road, the express bus service connects to a new CTA terminal located near Mannheim Road (and does not continue further east along I-290).

For the purposes of evaluation with the regional travel model the HCT extension was coded as an extension of the CTA Forest Park Blue Line rapid transit service, however, this service could be also run bus rapid transit. Intermediate stations at 1st Avenue and 25th Avenue were assumed in each of the 5 HCT extension alternatives. Park-and-ride availability was also assumed at a Mannheim Road terminal station.

The expressway alternatives assumed in the 10 combination mode alternatives include 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 the managed lane concepts of HOV 2+, HOT 3+, Toll, and HOT 3+ & Toll, a conversion of one of the existing 4 lanes (in each direction) to a managed lane was assumed from Central Avenue to Ashland Avenue. Ashland Avenue was used as the eastern boundary of this lane conversion in order to allow sufficient traffic operational weaving distance between Ashland Avenue and the ramps to I-90/94.

Of the 10 alternatives considered, two general footprint variations result; an expressway lane addition with, and without, a provision for a HCT extension in the median. The different footprint requirements for both scenarios will be further refined and evaluated in Round 3.

The I-290 travel forecasting model was improved for use in testing the Round 2 combination mode alternatives. The regional mode choice model that determines if trips are made using auto or transit was updated to be sensitive to tolling. Therefore, the combination mode alternative results better reflect sensitivity to tolling.

Table 6-1. Combination Mode Alternatives Description

10 Initial Combination Alternatives - Summary			Combination Rationale
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	
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	

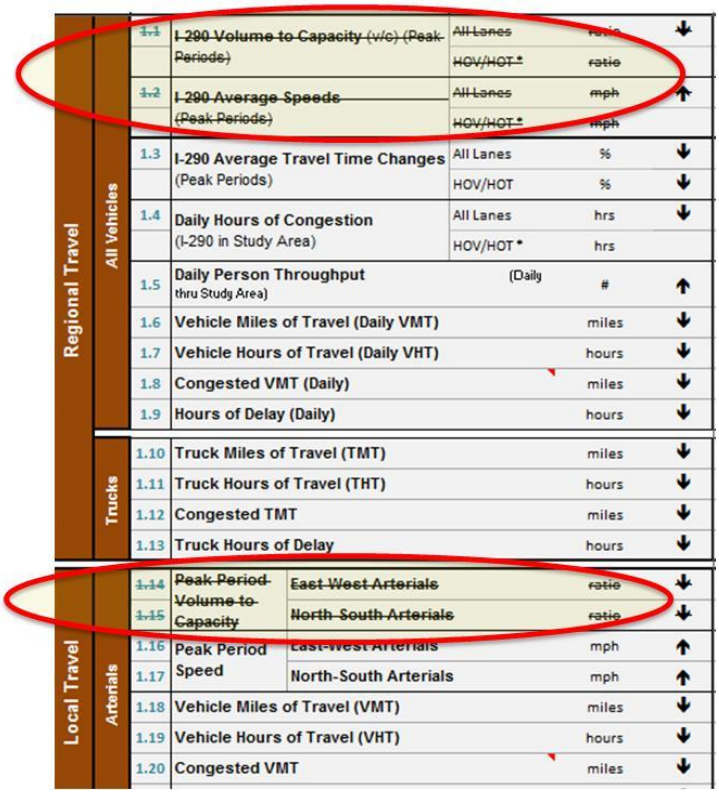
6.2 Round 2 Screening Process

As the study process moves forward with detailed evaluations of fewer alternatives, the screening process and measures will be revised & refined as appropriate. For the Round 2 screening process of the 10 combination mode alternatives, a revised evaluation matrix was developed to address 4 out of the 5 principal Purpose and Need points. The evaluation matrix for the combination mode alternatives addressed:

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

Given the corridor level evaluation and insufficient design detail in Round 2, the Improve Facility Deficiencies need point was not evaluated in Round 2, but will be considered in Round 3.

Evaluation Measures Consolidation



Regional Travel	All Vehicles	~~1.1~~	~~I-290 Volume to Capacity (v/c) (Peak Periods)~~	~~All Lanes~~	~~ratio~~
				~~HOV/HOT *~~	~~ratio~~
		~~1.2~~	~~I-290 Average Speeds (Peak Periods)~~	~~All Lanes~~	~~mph~~
				~~HOV/HOT *~~	~~mph~~
		1.3	I-290 Average Travel Time Changes (Peak Periods)	All Lanes	%
				HOV/HOT	%
		1.4	Daily Hours of Congestion (I-290 in Study Area)	All Lanes	hrs
				HOV/HOT *	hrs
		1.5	Daily Person Throughput thru Study Area)	(Daily	#
		1.6	Vehicle Miles of Travel (Daily VMT)		miles
		1.7	Vehicle Hours of Travel (Daily VHT)		hours
		1.8	Congested VMT (Daily)		miles
		1.9	Hours of Delay (Daily)		hours
	Trucks	1.10	Truck Miles of Travel (TMT)		miles
		1.11	Truck Hours of Travel (THT)		hours
		1.12	Congested TMT		miles
		1.13	Truck Hours of Delay		hours
Local Travel	Arterials	~~1.14~~	~~Peak Period Volume to Capacity~~	~~East-West Arterials~~	~~ratio~~
		~~1.15~~		~~North-South Arterials~~	~~ratio~~
		1.16	Peak Period Speed	East-West Arterials	mph
		1.17		North-South Arterials	mph
		1.18	Vehicle Miles of Travel (VMT)		miles
		1.19	Vehicle Hours of Travel (VHT)		hours
		1.20	Congested VMT		miles

The evaluation measures used for **Improve Regional and Local Travel** are those used in Round 1 (and described in Section 3 of this report), except for some consolidation of similar/repetitive measures. This included the removal of I-290 Volume to Capacity (v/c), Average I-290 Speeds, and Arterial v/c measures.

Evaluation measures for **Improve Access to Employment** and **Improve Safety for All Users** are the same as those used in Round 1.

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

The resulting evaluation matrix for Round 2 is provided in Appendix G.

The alternatives scoring system was revised for Round 2. Across each of the 26 measures, alternatives were ranked from 1 to 10 (10 being the best), based on how well they performed relative to the 2040 no build condition. Each alternative was then scored for each need point by the averaging the rankings of all the measures for that need point. A total score for each

alternative was then calculated as the sum of the 4 need point scores. With this scoring method, each need point contributes equally to the overall score.

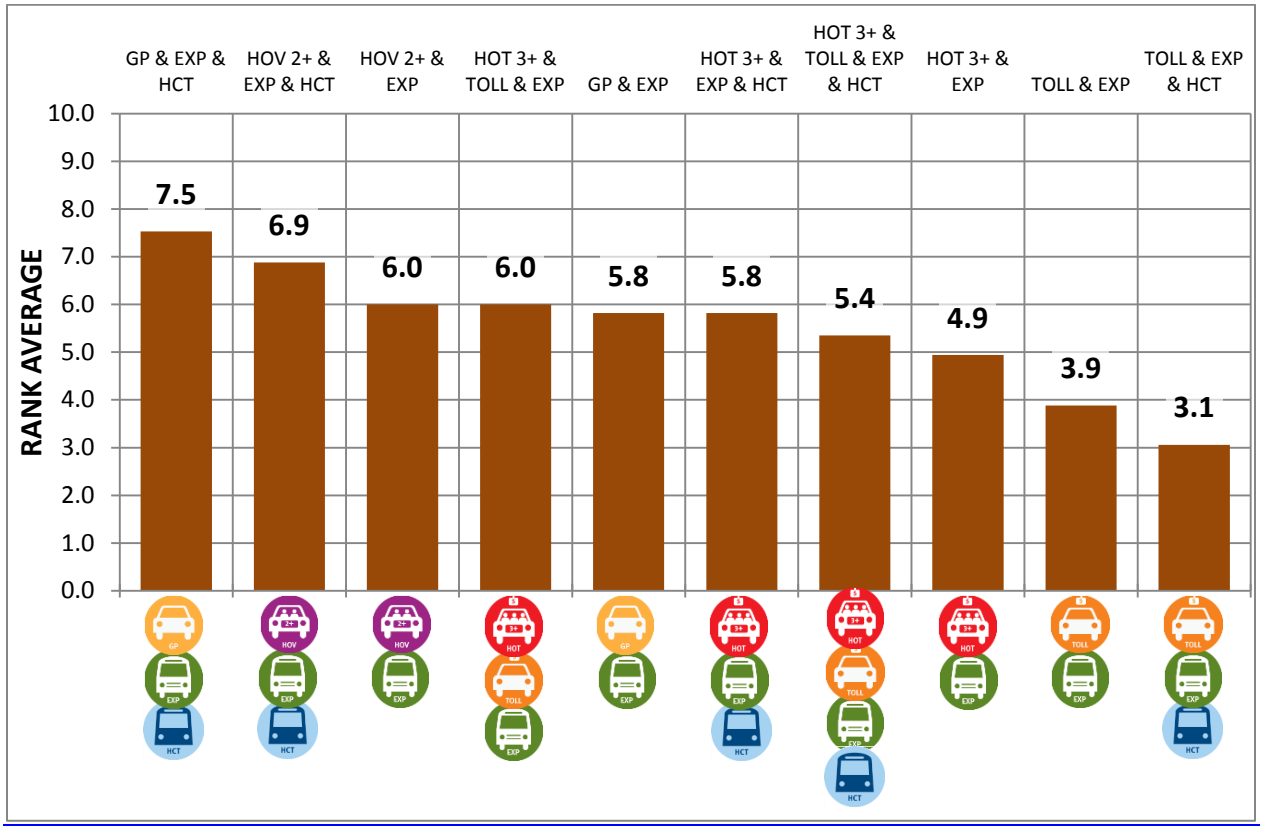
6.3 Round 2 Screening Results

The results matrix for the Round 2 evaluation of the 10 combination mode alternatives is provided in Appendix G. The results of the Round 2 screening are summarized below by each principal need point evaluated.

6.3.1 Improve Regional and Local Travel Findings

Figure 6-1 presents the overall results of the evaluation of the Round 2 combination mode alternatives for the Improve Regional and Local Travel need point. The alternatives are presented from highest to lowest scoring from left to right.

Figure 6-1. Improve Regional and Local Travel - Round 2 Results



As shown by this chart, the GP & EXP & HCT Alternative is the highest ranked alternative, followed by the HOV 2+ & EXP & HCT Alternative. The TOLL alternatives were ranked the lowest for this need point. Since Express Bus (EXP) service is included in all alternatives, for simplicity, 'EXP' has been left out of the descriptions in the following discussions.

In terms of regional travel performance, the HOT 3+ & TOLL alternatives showed the most improvement in average travel time change and daily hours of congestion on I-290 as compared to the 2040 No Build Alternative. This is primarily due to tolling causing reduced volumes on

the 3 tolled general purpose lanes (in each direction) as compared to the other combination mode alternatives, which do not toll the general purpose lanes. The GP alternatives had the least average travel time change on I-290, primarily due to the lack of management of the additional highway capacity on I-290, allowing the lanes to fill up.

The GP & HCT, the HOV 2+, and the HOT 3+ & TOLL alternatives show the most improvement in regional travel performance as compared to the 2040 No Build Alternative. The GP & HCT Alternative modes are more compatible with one another as compared to the managed-lane combination mode alternatives, because managed lanes (HOV & HOT lanes) serve similar travel markets as transit, redirecting some transit riders to auto with ridesharing. It also has good regional truck performance improvement, and has strong study area arterial improvement resulting in strong overall performance. The HOV 2+ alternatives provide good study area arterial improvements and overall good balanced improvement. The HOT 3+ & TOLL Alternative provides strong regional truck performance improvements and strong I-290 performance improvements that result in good regional travel performance.

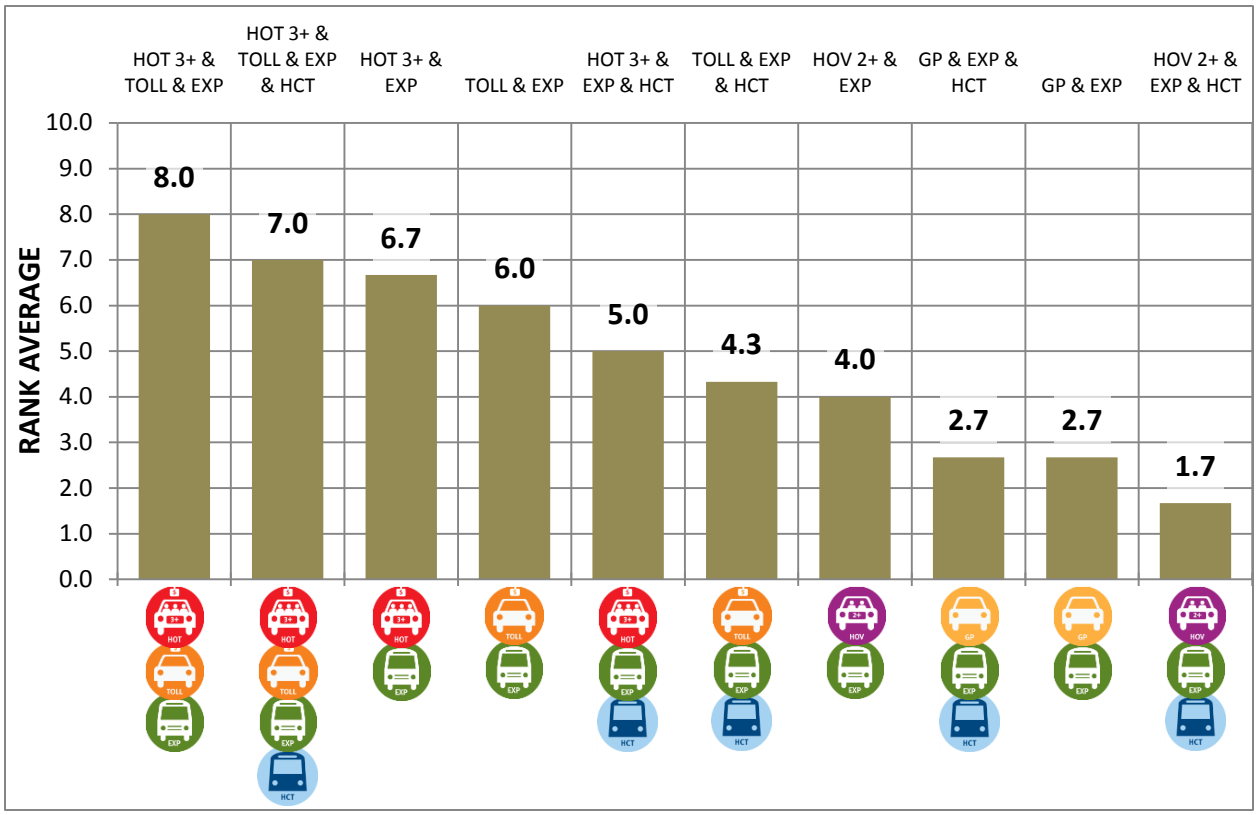
For regional truck performance the HOT 3+ & Toll and GP alternatives showed the most improvement as compared to the 2040 No Build Alternative. The tolling of the 3 general purpose lanes in each direction in the HOT 3+ & Toll Alternative resulted in more autos being diverted than trucks resulting in improved truck travel time savings.

In terms of local study area travel performance, the GP, HOV 2+, and HOT 3+ alternatives showed the most improvement as compared to the 2040 No Build Alternative. This is primarily due to no tolling of the additional capacity in the case of the GP and HOV 2+ alternatives, and limited tolling in the case of the HOT 3+ Alternative resulting in better utilization of the additional capacity on I-290 and diversion of longer distance trips from the study area arterial system.

6.3.2 Improve Access to Employment Findings

The overall results of the Round 2 combination mode alternatives evaluation for the Improve Access to Employment need point are presented in Figure 6-2. As seen in this figure, the HOT 3+ & TOLL alternatives are the best performing, for access by all modes, followed by the HOT 3+ and the TOLL alternatives. The HOV 2+ and GP alternatives were ranked the lowest for this need point as a result of poorer performance in access to jobs by auto as compared to the other alternatives. The lower number of jobs accessible within 60 minutes by auto is related to a smaller reduction in I-290 travel times for the GP and HOV lanes as compared to the other alternatives.

Figure 6-2. Round 2 Improve Access to Employment Results



With respect to auto accessibility to jobs, the TOLL alternatives showed the greatest improvement as compared to the 2040 No Build Alternative. This is primarily due to the TOLL alternatives indicating the greatest travel time improvement on I-290, resulting in more jobs being accessible to the study area in the same amount of time. Also, due to higher travel speeds in the HOT 3+ lanes, users of the HOT 3+ lanes have access to greater number of jobs in the same amount of time. The TOLL and HOT 3+ alternatives showed the next best improvement in I-290 average travel time.

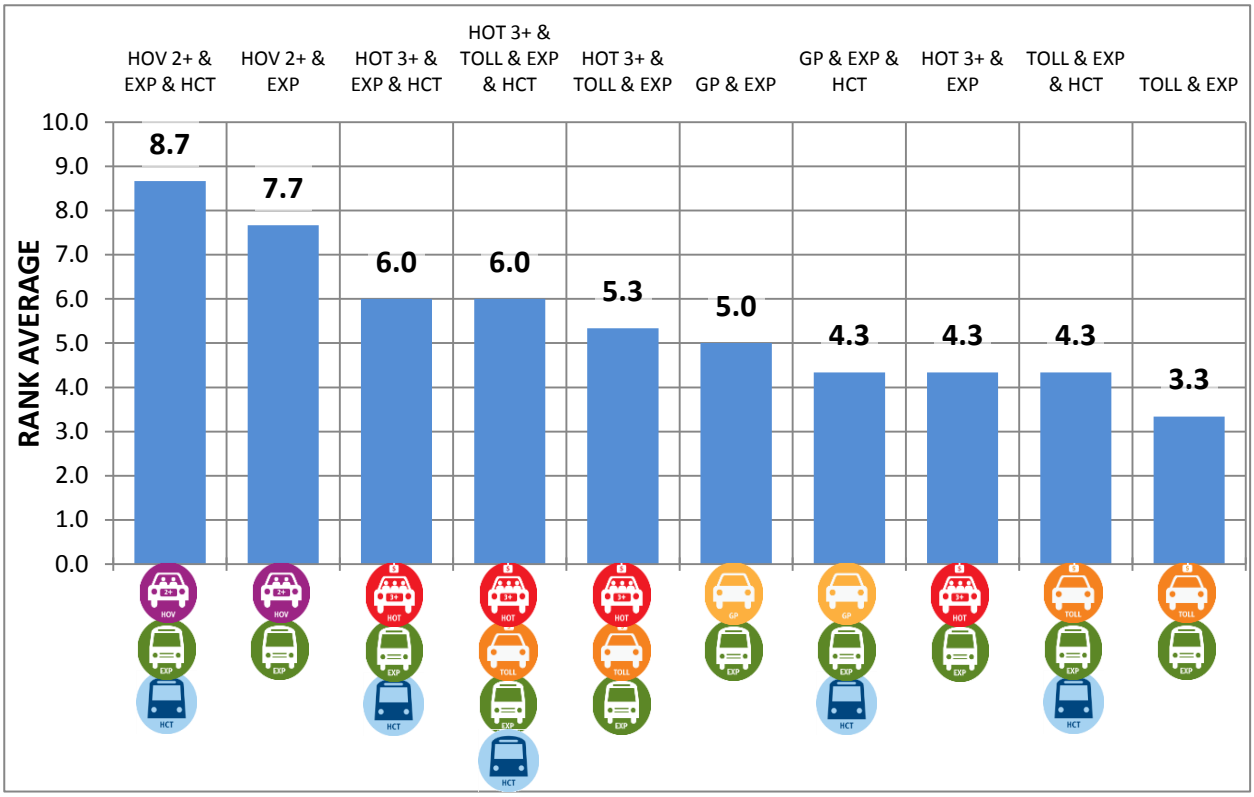
With respect to transit accessibility to jobs, alternatives with only EXP showed slightly greater accessibility to jobs than the EXP & HCT alternatives as compared to the 2040 No Build Alternative. This is primarily due to the bus to HCT transfer location between HCT and EXP alternatives. For the EXP alternatives, the transfer takes place at the existing Forest Park terminal station of the CTA Blue Line. For the EXP & HCT alternatives, this transfer takes place at a terminal near Mannheim Road, several miles west of the Forest Park Terminal. Transfers between EXP and HCT that take place further to the west are subject to three additional stops along the HCT alignment, versus an express bus ride to Forest Park station. These additional stops increase the travel time slightly, resulting in fewer jobs accessible in 60 minutes.

6.3.3 Improve Safety for All Users Findings

The overall results of the evaluation of the Round 2 combination mode alternatives for the Improve Safety for All Users need point are presented in Figure 6-3. In Round 2, the primary variables used to evaluate the relative safety performance between alternatives are traffic volumes and person throughput. As alternatives are better defined in subsequent evaluations,

additional design variables will be incorporated. As seen in this figure, the HOV 2+ & HCT Alternative is the best performing, followed by the HOV 2+, the HOT 3+ & HCT, and the HOT 3+ & TOLL & HCT alternatives. The TOLL & HCT and the TOLL alternatives were ranked the lowest for this need point, relative to each alternatives performance against the no-build condition. These overall lower rankings are driven in part by decreased safety performance on the arterials due to increased traffic. Please refer to Section 3.2.3 for the discussion on how safety performance was evaluated.

Figure 6-3. Round 2 Improve Safety for All Users Results



Related to the arterial streets in the study area, the GP, HOV 2+, and HOT 3+ alternatives show the most improvement in injury and fatal crash rates as compared to the 2040 No Build Alternative because these alternatives indicate the largest decreases in volumes along the study area arterials. The larger the decline in study area arterial volumes, the better improvement in the injury and fatality vehicle crash rate since arterials have a higher baseline rate of injuries and fatalities as compared to expressways. The HOT 3+ & TOLL alternatives indicated a decrease in safety as compared to the 2040 No Build due to the these alternatives causing increases in traffic volumes on study area arterials.

For safety related to the I-290 expressway in the study area, the HOV 3+ & TOLL alternatives showed the greatest improvement in safety performance as compared to the 2040 No Build Alternative primarily due to having the lowest volumes across four lanes in each direction on I-290 in the study area, resulting in less exposure to potential crashes.

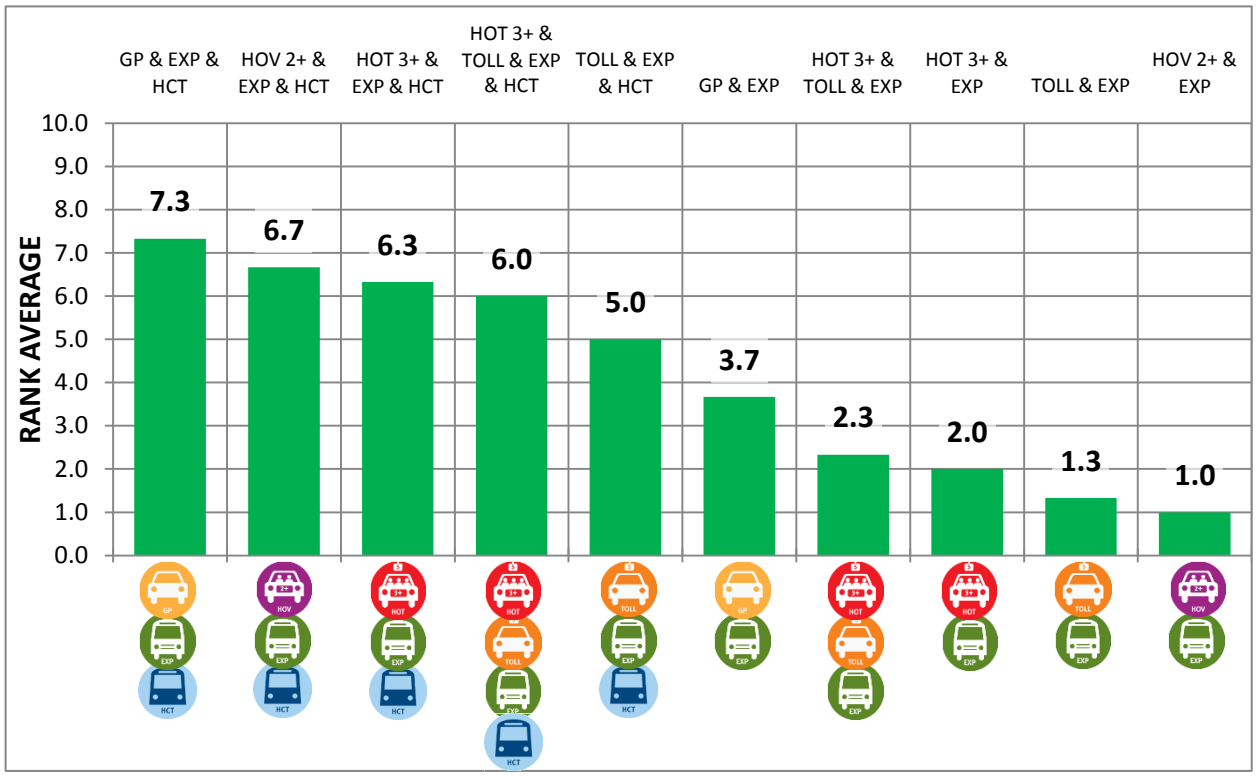
Overall alternative safety performance considers the arterial, expressway, and transit systems in the study area, based on person miles traveled rather than vehicle miles traveled. This measure evaluates crash rate against person throughput via transit and auto, and assumes that there are no injuries or fatalities for transit users. The calculated annual injury and fatalities for the expressway and arterials were totaled, then divided by the number of individual person miles traveled by auto (including multiple passengers per car) and on transit (bus & rail) through the study area. Based on crash rates per person miles traveled, the HOV 2+ alternatives indicate the highest safety improvement as compared to the 2040 No Build alternative, followed by the HOT 3+ alternatives. This is due to the more balanced safety improvements on arterials and the I-290 expressway by these alternatives (as opposed to the GP and HOT 3+ & TOLL alternatives) and the generally higher vehicle occupancy of these alternatives.

Also, of the 10 combination mode alternatives evaluated, generally alternatives with a High Capacity Transit extension show slightly better safety performance than their non-HCT extension counterpart. This is generally related to relative arterial safety improvements due to reductions in arterial traffic when an HCT extension is included. One exception is the comparison between GP & EXP and GP & EXP & HCT. In all cases, the addition of HCT results in a slight increase in traffic volumes on I-290 as compared to the same alternative without the HCT. This is primarily due to a change in trip distribution with HCT, making I-290 more attractive for longer, regional trips and HCT more attractive for trips starting or ending in the study area. The higher traffic volumes result in slightly decreased predicted expressway safety performance in HCT alternatives compared to their non-HCT counterpart (Appendix G summary matrix, measure 3.2). In the case of GP & EXP & HCT, the uptick in I-290 traffic volumes results in the lowest safety rank (rank = 1) in expressway safety improvement. The low rank in the expressway safety measure (measure 3.2) lowers the overall need point rank score below that of its non-HCT counterpart.

6.3.4 Improve Modal Connections and Opportunities Findings

The overall results of the evaluation of the Round 2 combination mode alternatives for the Improve Modal Connections and Opportunities need point are presented in Figure 6-4. As presented by this figure, the GP & HCT, was the best performing followed by the HOV 2+ & HCT, and HOT 3+ & HCT alternatives.

Figure 6-4. Round 2 Improve Modal Connections and Opportunities Results



In regard to the new transit trips evaluation measure, the GP alternatives showed the most improvement, with the GP & EXP & HCT Alternative resulting in an increase of 1,300 transit trips, and the remaining alternatives all showing decreases in transit trips as compared to the 2040 No Build Alternative. The GP alternatives are more compatible with transit, in terms of less travel market competition than the alternatives that contain HOV, HOT, and Tolling options. However, from a physical and operational perspective, the HOV, HOT, and Tolling options provide a managed lane for express bus operations, rather than relying on shoulder riding in the GP alternatives.

In addition, access to transit measures were also included under this need point. Households and employment within a 0.5 miles radius of transit stations were tabulated. Thus, the alternatives that include HCT show higher transit accessibility to households and to employment due to the three additional stations assumed (1st Avenue, 25th Avenue, and Mannheim Road) with an HCT extension to Mannheim Road.

6.3.5 Round 2 Overall Alternatives Ranking

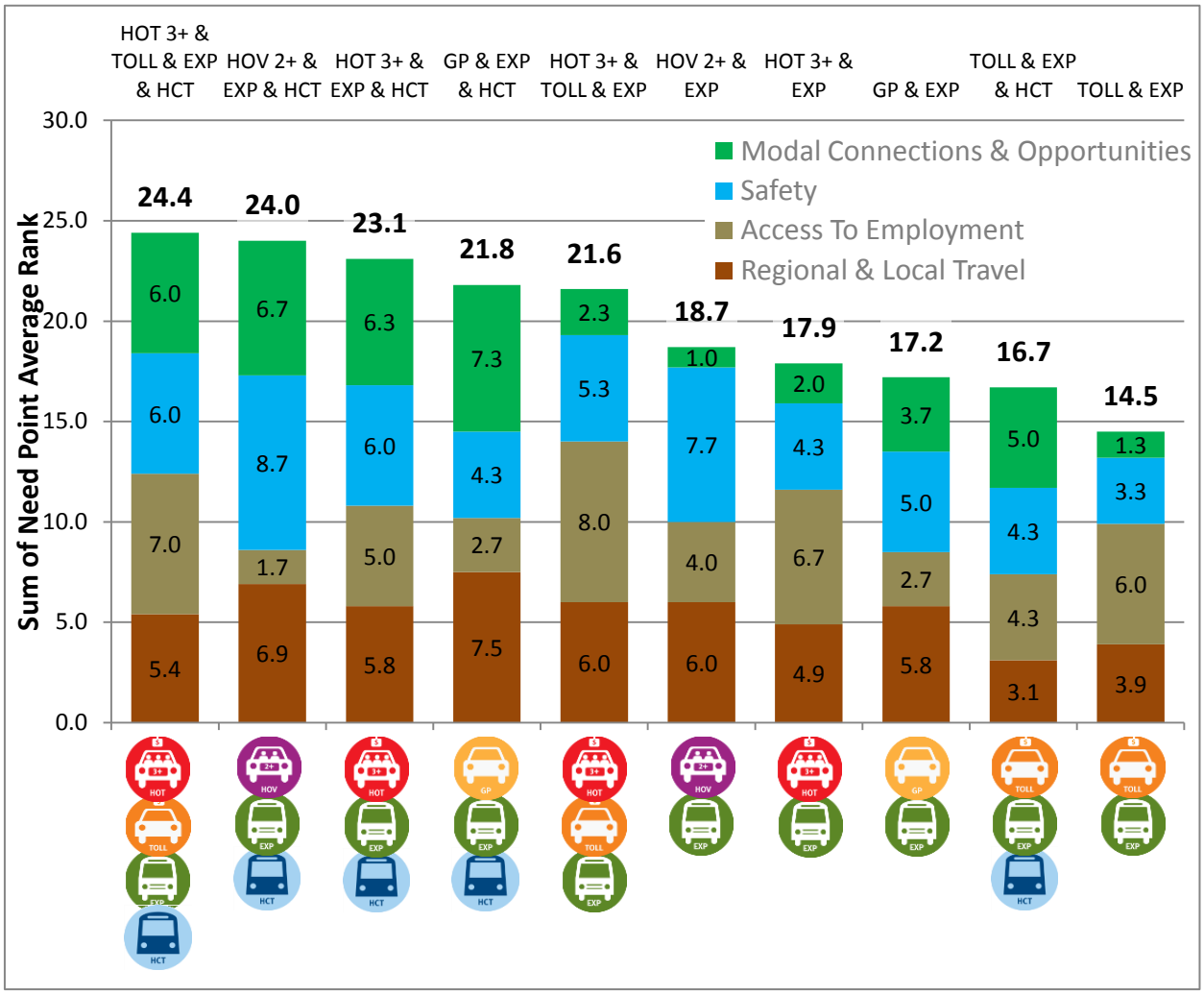
The Rank Average for each need point was summed to arrive at the total, overall score for each alternative. **Figure 6-5** illustrates how the overall scores were calculated.

Figure 6-5. Alternative Ranking Example

P&N Point	Rank Average: HOV 2+ & EXP	Rank Average: HOV 2+ & EXP & HCT
Improve Regional & Local Travel	6.0	6.9
Improve Access to Employment	4.0	1.7
Improve Safety for All Users	7.7	8.7
Improve Modal Connections & Opportunities	1.0	6.7
Improve Facility Condition & Design	✓	✓
Score = Sum of Rank Averages:	18.7	24.0

The overall results of the Round 2 combination mode alternatives evaluation are presented in Figure 6-5. As seen in this figure, the HOV 2+ & EXP & HCT Alternative is the highest scoring alternative, followed by the HOT 3+ & EXP & HCT, the HOT 3+ & TOLL & EXP & HCT alternatives, the GP & EXP & HCT, and the HOT 3+ & TOLL & EXP alternatives. The TOLL alternatives were ranked the lowest overall.

Figure 6-6. Round 2 Overall Alternatives Ranking



Overall Round 2 Observations:

- The HOT 3+ combination mode alternatives with and without TOLL (and with and without HCT) showed good overall performance with three HOT 3+ combination mode alternatives in the top 5 overall performers. Two of the three HOT 3+ alternatives reflected the highest performance related to access to employment due to the ability of the HOT 3+ lanes to manage congestion that results in a relatively faster route (as compared to other combination alternatives) to jobs from the study area. Safety performance in these alternatives was generally better compared to other combination alternatives due to relatively lower traffic volumes (less risk of crashes) and higher person throughput. Through a combination of good

access to employment, good regional travel and safety performance, the HOT 3+ & TOLL & EXP & HCT alternative outperforms all others alternatives, overall. It should be noted that conversion of existing non-tolled GP interstate lanes to HOT or Toll lanes is currently restricted legislatively, although there are federal programs that allow conversion of HOV lanes to HOT lanes.

- Alternatives with HOV 2+ (with and without HCT) provided the highest safety improvements, and very good improvements to local and regional travel. HOV lanes provided as much as a 40% reduction in daily hours of congestion in the managed lane, and over 11% 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 safety performance improvements due to a combination of reduced expressway traffic volume and increased person throughput.
- The GP add-lanes combined with HCT provides the best overall regional & local travel improvements, and the best improvement related to modal connections and opportunities. This can be attributed to the performance improvements on I-290 due to the added capacity and that result from the diversion of longer distance trips off the arterial network onto the expressways, and a shift of shorter distance auto trips to HCT. This shift of traffic off arterials in both GP lane alternatives (with and without HCT) improves arterial performance in the study area, giving GP lanes the higher overall performance with respect to improving local travel. However, the GP lane combination alternatives showed the smallest improvement to I-290 expressway performance in the study area, but showed better overall improvement on roadways outside the study area. The GP lane combination alternatives showed a lower accessibility to jobs and safety performance compared to other alternatives. 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. This is due to the managed lanes providing a faster path than the GP Lanes, allowing users of the managed lanes to access more jobs located further away in 60 minutes or less. With respect to safety, GP Lane combination mode alternatives provide higher vehicle volumes than the managed-lane combination mode alternatives. This increased volume slightly increases the potential for crashes relative to the managed-lane combination mode alternatives.
- Alternatives with Tolling (1 lane only in each direction, with and without HCT) generally did not perform as well as other alternatives overall, primarily due to safety and local and regional travel performance. Tolling offered some overall safety improvements due to decreased traffic volumes on the expressway and increased person throughput, however not to the same degree as HOV 2+ or HOT 3+ combination mode alternatives. Also, increased traffic volumes on the arterials result in both a decrease in safety performance as compared to the baseline condition, as well as reduced arterial performance as compared to most other combination mode alternatives

6.3.6 Alternatives to be Evaluated in Round 3

(This section will be updated at the conclusion of Round 2)