HSR C - This HSR alignment would require the most travel time of the three alternatives under consideration. It would also require the highest capital cost expenditure due to the alignment's length.

LRT A, B, C and D – The travel times of all the LRT lines were comparatively high compared to other transit alternatives, and high enough to make travel from the northern to the southern terminus extremely unlikely due to the long travel time and the characteristics of the vehicle that make it uncomfortable over long distances. Therefore, no light rail alternatives were carried forward for further analysis.

Figure 3-22 Level 2A Preliminary Screening Results – Bus Rapid Transit

Figure 3-23 Level 2A Preliminary Screening Results – Commuter Rail

Figure 3-24 Level 2A Preliminary Screening Results – High Speed

Figure 3-25 Level 2A Preliminary Screening Results – Light Rail

Alternative A

ADVANTAGES
- Serves the most population & employment centers
- Serves work trips

DISADVANTAGES
- Shared ROW, unreliable travel time
- Higher travel times
- Does not improve aging infrastructure
- Higher capital costs
- Higher potential to impact human resources

Not Advanced

Alternative C

ADVANTAGES
- Improves aging infrastructure
- Serves work trips

DISADVANTAGES
- Serves fewest population or employment centers
- Higher capital costs
- Higher travel times
- Unproven technology along this corridor length

Not Advanced

Alternative B

ADVANTAGES
- Serves the most population & employment centers
- Serves work trips

DISADVANTAGES
- Higher travel times
- Does not improve aging infrastructure
- Higher capital costs
- Higher potential to impact human resources

Not Advanced

Alternative D

ADVANTAGES
- Improves aging infrastructure

DISADVANTAGES
- Serves fewest population or employment centers
- Higher capital costs
- Higher travel times
- Unproven technology along this corridor length

Not Advanced

RTD Denver
(Light Rail Example)

3.2.5 Congestion Management Criteria

The Congestion Management criteria included practicability for implementation along the congested sections of I-25, as well as the maximum potential for trip reduction and management relative to the estimated level of congestion. **Table 3-1** illustrates the potential level of effectiveness associated with different congestion management methods and alternatives according to regional data, CDOT data and third party research. The **Congestion Management Alternative Technical Report of February 2006** contains this and other detailed information, and is available for review. This report is included in **Appendix B**.

Table 3-1 Congestion Management Strategies Measures of Effectiveness

Congestion Management Strategies Measures of Effectiveness			
Strategy	**Method**	**Options**	**Typical Effectiveness Measure**
Transportation Demand Management	Public Transit	Express Service	2 to 3% share of all trips
	Ridesharing	Carpools	11.5% work trips
		Vanpools	5% work trips
	Employer Programs	Telecommuting	4.7% work trips
	Land Use Policies		3% reduction in VMT
Transportation Systems Management	Incident Management Program		5% reduction in delay[1]
Intelligent Transportation Systems	Real Time Transportation Information		22% reduction in VHT[2]

Understanding that I-25 needs to be able to accommodate approximately 55,000 additional daily trips by 2030 (roughly doubling current traffic volumes), trip reductions ranging from 2% of all trips to 12% of work trips would not accommodate the need for additional capacity. More specifically, in 2030 many segments of I-25 would be congested (above a 0.9 V/C ratio.) (see **Table 3-2**).

[1] Time savings are only realized if there has been an incident; this is not a consistent time-saving strategy due to the haphazard nature of incidents. Traffic Congestion and Reliability: Linking Solutions to Problems, Final Report. Cambridge Systematics for FHWA, July 19, 2004.

[2] Time savings are realized only when there is delay; this is not a consistent time-saving strategy due to the changing nature of freeway conditions. Litman, Todd. Guide to Calculating Transportation Demand Management Benefits. Victoria Transport Policy Institute, 1999.

Table 3-2 2030 North I-25 AM and PM Volume/Capacity Ratios

2030 North I-25 AM And PM Volume/Capacity Ratios				
LOCATION	2030 Volume-to-Capacity (V/C) Ratios			
	AM Peak Hour		PM Peak Hour	
	Northbound	Southbound	Northbound	Southbound
North of SH 1	0.43	0.32	0.49	0.31
Mountain Vista to SH 1	0.28	0.44	0.38	0.32
SH 14 to Mountain Vista	0.47	0.79	0.66	0.55
SH 14 to SH 68	0.99	0.89	0.95	0.96
SH 68 to SH 392	1.36	1.01	1.07	1.19
SH 392 to SH 34	1.26	1.00	1.06	1.15
SH 34 to SH 402	1.41	0.76	1.07	1.25
SH 402 to SH 60	1.22	0.88	1.02	1.14
SH 60 to SH 60	1.22	0.88	1.02	1.09
SH 60 to SH 56	1.22	0.97	1.03	1.07
SH 56 to Great Western	0.94	0.98	1.02	1.01
Great Western to SH 66	0.86	1.03	1.02	0.94
SH 66 to SH 119	0.57	0.71	0.66	0.62
SH 119 to SH 52	0.69	0.90	0.84	0.80
SH 52 to Union Pacific	0.79	1.09	1.02	0.93
Union Pacific to SH 7	0.93	1.22	1.15	1.03
SH 7 to E-470	1.27	1.19	1.02	1.24
E-470 to 120th Avenue	1.07	1.12	1.05	1.05
120th Avenue to US 36	0.97	1.39	1.28	1.11
US 36 to I-70	1.03	1.14	1.19	0.97
I-70 to Denver Union Station	1.01	1.10	1.15	1.03

Even a 12% decrease in work trips (which constitute roughly 30% of all trips) in these congested segments will not reduce the V/C to uncongested levels (see **Table 3-3**).

Table 3-3 2030 North I-25 AM and PM Volume/Capacity Ratios with Maximum Congestion Management

Location	2030 Volume-to-Capacity (V/C) Ratios 2030 Volume-to-Capacity (V/C) Ratios (Work Trips decreased 12%)			
	AM Peak Hour		PM Peak Hour	
	Northbound	Southbound	Northbound	Southbound
North of SH 1	Not Applicable			
Mountain Vista to SH 1				
SH 14 to Mountain Vista				
SH 14 to SH 68	1.0	0.9	0.9	0.9
SH 68 to SH 392	1.3	1.0	1.0	1.1
SH 392 to SH 34	1.2	1.0	1.0	1.1
SH 34 to SH 402	1.4	0.7	1.0	1.2
SH 402 to SH 60	1.2	0.8	1.0	1.1
SH 60 to SH 60	1.2	0.8	1.0	1.1
SH 60 to SH 56	1.2	0.9	1.0	1.0
SH 56 to Great Western	0.9	0.9	1.0	1.0
Great Western to SH 66	0.8	1.0	1.0	0.9
SH 66 to SH 119	Not Applicable			
SH 119 to SH 52				
SH 52 to Union Pacific	0.8	1.1	1.0	0.9
Union Pacific to SH 7	0.9	1.2	1.1	1.0
SH 7 to E-470	1.2	1.1	1.0	1.2
E-470 to 120th Avenue	1.0	1.1	1.0	1.0
120th Avenue to US 36	0.9	1.3	1.2	1.1
US 36 to I-70	1.0	1.1	1.1	0.9
I-70 to Denver Union Station	1.0	1.1	1.1	1.0

The potential benefit of congestion management measures is calculated by applying the measure of effectiveness to the total number of trips passing through the congested locations. This represents the maximum savings the congestion management strategy could have. Then, after each strategy has been evaluated individually, they are combined to estimate the effectiveness of a comprehensive Congestion Management Alternative: the combined trips reduced from transit, ride-sharing, and telecommuting. Reductions in VHT are not counted, as they do not actually decrease trips. The potential benefits and associated change to volume to capacity ratios are shown in **Table 3-4.**

Table 3-4 Trip Reduction Due to Combined Congestion Management Methods

Trip Reduction Due to Combined Congestion Management Methods			
Location	**Estimated Peak Hour Incremental Benefit**	**New V/C**	**Still congested?**
SH 14 to SH 68	227 Trips	0.92	Yes
SH 392 to SH 34	824 Trips	1.03	Yes
SH 34 to SH 402	125 Trips	1.11	Yes
SH 402 to SH 60	252 trips	1.04	Yes
SH 52 to Union Pacific	161 Trips	0.94	Yes
Union Pacific to SH 7	962 Trips	1.00	Yes
SH 7 to E-470	1,217 Trips	1.09	Yes
E-470 to 120th Avenue	1,096 Trips	0.98	Yes
120th Avenue to US 36	1,203 Trips	1.10	Yes
US 36 to I-70	1,751 Trips	0.99	Yes
I-70 to Denver Union Station	1,489 Trips	0.98	Yes

The potential benefits cannot meet the future traffic demand, and would not substantially enhance connectivity or direct travel within the corridor. However, the congestion management methods described can reduce trips, VMT, and VHT. As a result, they are recommended as complementary solutions to be implemented alongside any Build alternative that is selected.

Congestion Management Screening

Regardless of whether the Congestion Management strategies were implemented independently or as a group, they could not reduce the trips in the congested segments of I-25 to a point below what is considered "congested" by the regional governments (a volume to capacity ratio over 0.9). Therefore, the combined congestion management strategies were screened from further analysis as potential "stand-alone" alternatives, and were not analyzed further in Level 2B Screening. However, they were preserved for further consideration as individual complementary improvements for the Build Alternatives that could be considered in the draft EIS.

Table 3-5 summarizes the congestion management strategies that should be considered to enhance the selected stand-alone alternative, and in what locations they could be most effectively applied.

Table 3-5 Recommended Congestion Management Strategies as Complementary Improvements

Recommended Congestion Management Strategies as Complementary Improvements			
CONGESTION MANAGEMENT STRATEGIES	**Along I-25**	**In Local Communities (Enhancing Access to I-25)**	**Local Interest***
Express Transit Service	NO	YES	NFRMPO, Longmont, Fort Collins, Loveland, Greeley
Carpool	YES	YES	NFRMPO CDOT
Vanpool	YES	YES	NFRMPO CDOT
Telecommuting	YES	YES	City/County of Denver
Land Use Policies	YES	YES	City/County of Denver, NFRMPO
Incident Management Program	YES	YES	Thornton, Northglenn, Adams County
Ramp Metering	YES	NO	CDOT (Region IV ITS Plan)
Real Time Transportation Information	YES	YES	CDOT (Region IV ITS Plan) City/County of Denver Broomfield Thornton, Northglenn, Adams County

*Source: Summary of Stakeholder Interviews, Fall 2004

3.3 LEVEL 2B ALTERNATIVES DEVELOPMENT

Based on the results of Level 2A screening, selected alternatives were carried forward for additional analysis in Level 2B. Data derived from the travel forecasting model were used to supplement the Level 2A evaluation and to conduct the Level 2B screening.

3.3.1 No-Action Alternative

By the time the project had progressed to Level 2B alternatives development, the "FasTracks" referendum had passed in the Regional Transportation District (RTD) serving the Denver metropolitan area. As a result, two rail lines extending north towards the North Front Range acquired a dedicated funding source and could be considered funded, committed and part of the No-Action alternative. This affected alternatives development and analysis in the North I-25 EIS, because, through coordination with RTD, it was determined that potential North Front Range alternatives could either connect to FasTracks stations, or be interlined with FasTracks rail service (depending on the alternative).Therefore, Level 2B rail alternatives included the cost of construction only up to the FasTracks line, and some additional incremental cost paid to RTD to interline with their system.

3.3.2 Build Alternatives - Highway

In Level 2B many highway alternatives were still being considered for evaluation. Some alternatives were variations of each other and would have similar results from a travel demand-forecasting run. Therefore, instead of exhaustively testing each separate alternative, a strategic method was used to perform model runs to assess demand, access, function, and location as described below and illustrated in **Figure 3-25**. A comprehensive summary of the travel demand forecasting effort is included in **Appendix G**.

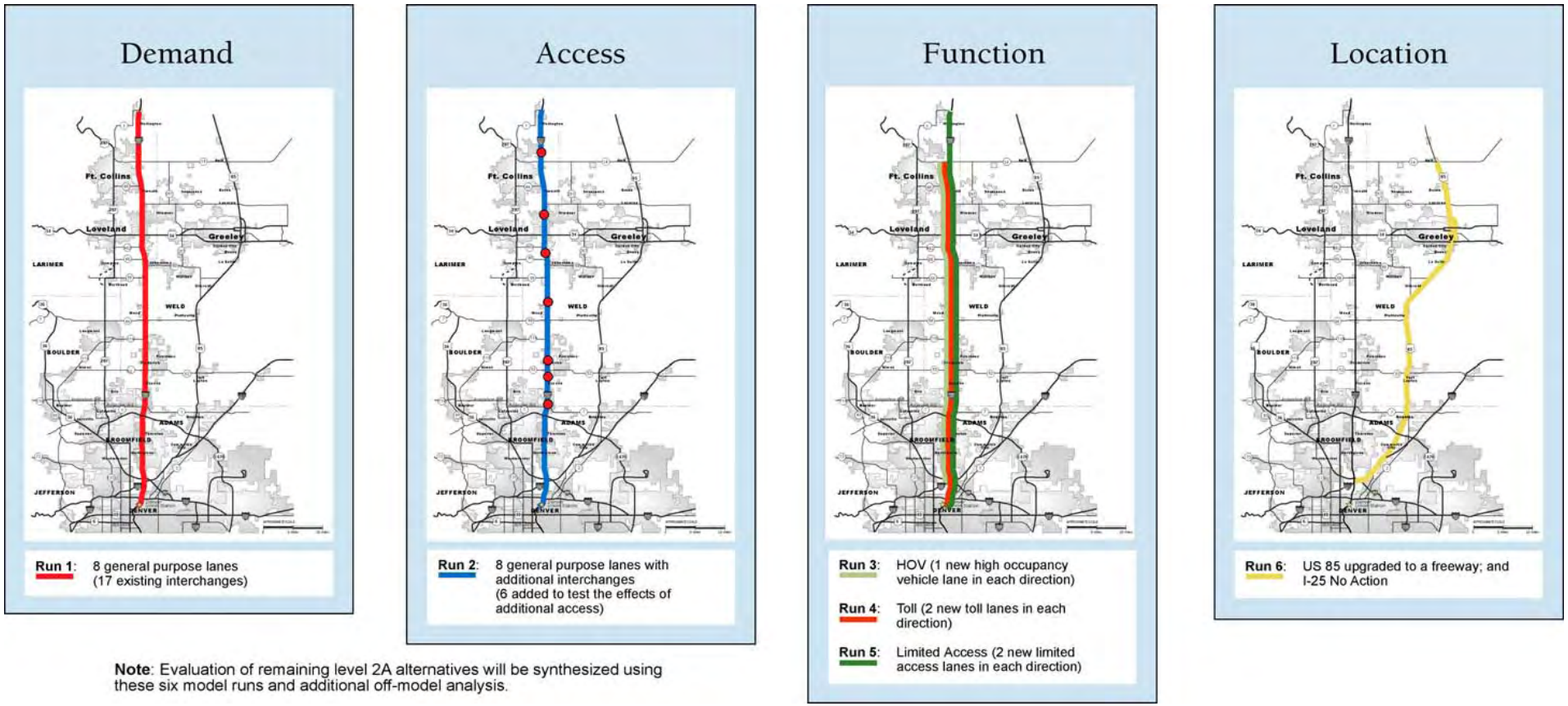
Demand – The model assigned traffic to eight-lane I-25 between US 36 and SH 1. Based on the level of traffic assigned to I-25, a determination was made about the need for four, six and eight-lane cross sections.

Access – Seven new interchange locations were added at existing crossroads between SH 7 and SH 1 to determine what impact providing more access has on I-25.

Function – Three models were run to test the effect of a new lane's function on I-25 operation.

- The first assumed four general-purpose lanes (two in each direction) and two HOV lanes (one in each direction) from SH 66 to SH 14. Six general-purpose lanes and two HOV lanes were assumed from US 36 to SH 66. Both included existing interchanges only.
- The second was used to identify the influence of toll lanes on I-25 and assumed four general-purpose lanes (two in each direction) and four special-use lanes (two in each direction) from SH 66 to SH 14. Six general purpose lanes and four toll lanes were assured from US 36 to SH 66. HOT alternatives and shorter segments of Toll and HOV alternative were determined using the results of these two model runs.
- The third model tested how limiting access to new lanes would impact demand.

Figure 3-26 Level 2B Highway Modeling Approach



Location – This model run was used to identify how well US 85, as a freeway, could relieve anticipated congestion along I-25 in the study area. This was completed at the request of the Technical Advisory Committee even though this alternative was screened in Level 2A.

3.3.3 Build Alternatives - Transit

Similar to the process used for highway analysis, to accommodate the still large number of alternatives requiring modeling, a specific set of model alternatives were chosen from the remaining 2A alternatives to test the difference in operating characteristics as well as locational differences that can affect ridership.

The travel demand model provided information on the:

Alignment – Commuter rail lines were tested on western, mid-western, central and interior alignments to determine any difference in ridership attributed to the location.

All of the transit alternatives had similar headways (20-minute peak and 60-minute off-peak). In addition, similar access was assumed to each alternative in the form of a common bus feeder network, and drive access allowed at station areas. (Large capture areas were assumed for the stations, as exact station locations were not identified. In addition, a similar amount of station areas was assumed for each mode.)

Speed – An alternative with better travel times (due to simulated higher speeds) was tested along the central alignment (and compared to the central alignment run in the "location" test) to determine what additional ridership increment could be captured with higher speeds.

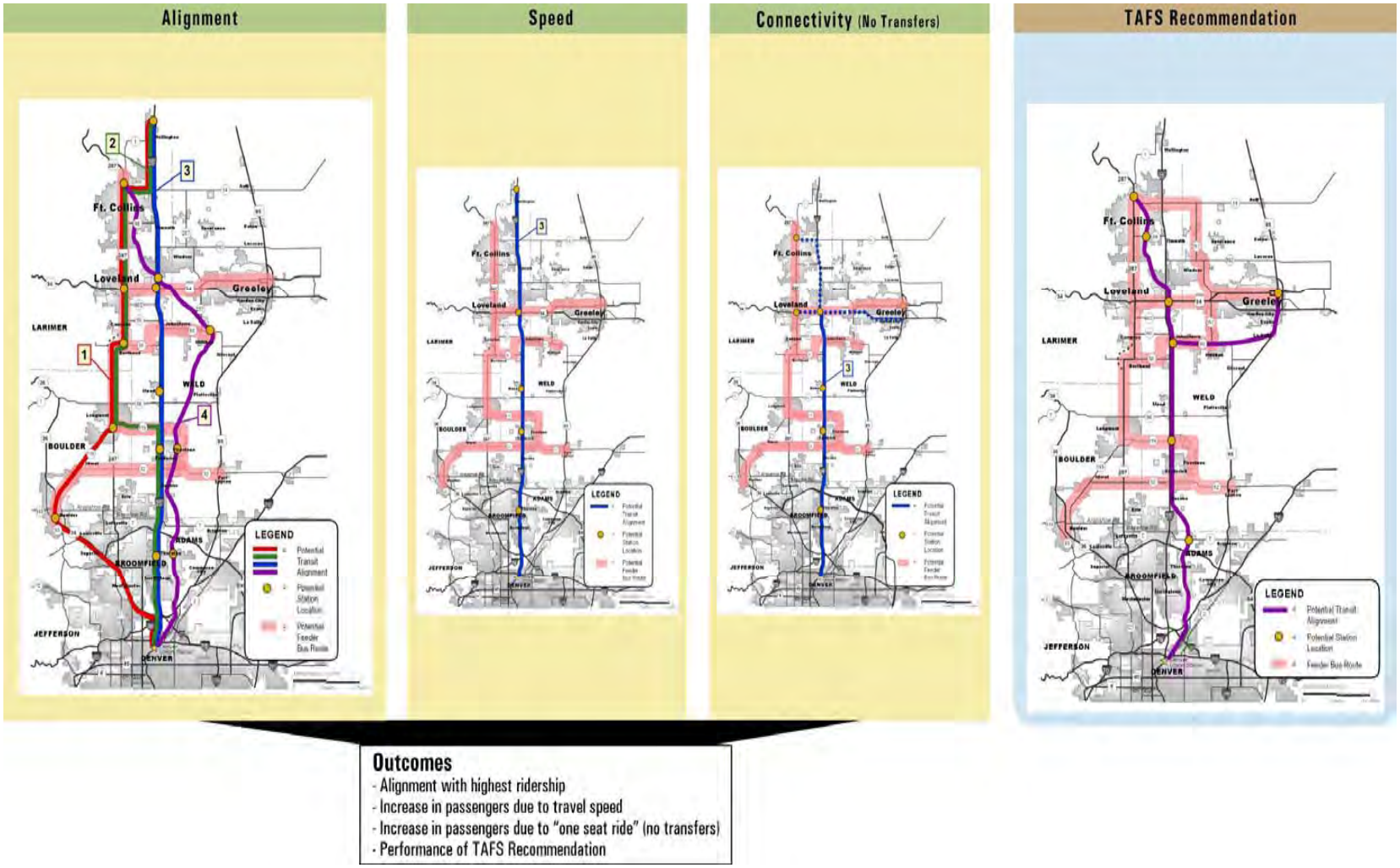
To differentiate between modes, a maximum operating speed of 75 mph was assumed for high speed rail. a maximum operating speed of 65 mph was assumed for rail alternatives, and 60 mph was assumed for the BRT alternative. It should be noted that "rail bias" is included in the travel model (calibrated to observed base-year conditions) to account for the increase in ridership that often accompanies rail service.

Connectivity – To determine the effect of forcing people to drive to the central alignment, a test was conducted of the central alignment with alternating direct service to Fort Collins, Loveland and Greeley.

Assessing the difference in ridership would clarify the ridership benefit of a "one-seat ride" – direct service with no transfer.

TAFS Test – The final test was a run to determine what level of ridership would result from the rail alignment recommended in the previous Transportation Alternatives Feasibility Study that was conducted for northern Colorado. This was conducted as a point of reference for the Technical Advisory Committee. Many members had participated in the TAFS study and were interested in how new alternatives would compare. **Figure 3-27** illustrates Level 2B Transit Model Runs.

Figure 3-27 Level 2B Screening – Transit Model Runs



3.4 LEVEL 2B SCREENING

The modeling effort primarily focused on providing an evaluation of mobility to supplement the evaluation conducted in Level 2A. General screening results were as follows:

- Highway alternatives with the potential to provide an average volume to capacity ratio of 0.90 between SH 66 and SH 14 were advanced, see **Figure 3-28**.
- Transit alternatives with travel time competitive with private auto were advanced.
- Transit alternatives with the highest estimated ridership were advanced, see **Figure 3-29**.
- Based on ridership and cost per user volume to capacity ratio, transit and highway alternatives were analyzed by comparing their utilization (v/c and ridership) to their costs to determine the cost per user. More favorable alternatives were less costly. (At this level of analysis, costs were based on average per mile costs from similar systems and were not based on engineering estimates). Highway costs are illustrated in **Figure 3-30**. Transit costs are illustrated in **Figure 3-31.**
- Alternatives which had the least potential to adversely impact natural resources, and human and social environment were carried forward from Level 2A. In general, environmental criteria used in Level Two were not a discerning factor. At this stage most of the proposed alignments could be shifted during the next level of design to avoid resources. Those alternatives carried forward from Level 2A were supplemented with modeling results to select alternatives to be carried forward into Level Three.

3.4.1 Highway

Additional detailed results pertaining to the highway alternatives evaluated are as follows:

Additional Lanes on I-25 – When eight lanes were assigned to I-25 between US 36 and SH 1, demand increased along the entire I-25 corridor. The largest increases were experienced between US 36 and 144th Avenue, and SH 60 and SH 14. In these two areas, demand grew by about 20%. Between 144th and SH 60, demand increased by approximately 10%. Demand for eight lanes extends from US 36 to SH 119 and between SH 56 and Prospect. North of Prospect, demand drops to a six and four-lane facility demand. Six and eight general purpose lanes on I-25 had the lowest average cost per mile compared to the other highway alternatives. Both six and eight-lane alternatives were retained for additional evaluation in Level Three.

Upgrade Parallel Roadways – Alone, upgrading US 85 would not adequately address mobility needs along I-25. However, based on community support, the alternative was retained for potential inclusion as an improvement to complement other stand-alone alternatives.

Express Lanes – HOT and Toll lane alternatives represented the highest average cost per mile to construct but were found to have the ability to address safety concerns, mobility and replace aging infrastructure. HOT and Toll alternatives extending to SH 14 were retained for additional evaluation.

- While the HOV lane alternative to SH 14 addressed many of the purpose and need goals at lower costs than Toll or HOT, it did not provide substantial improvement in North I-25 general purpose lanes; however, it was retained for additional evaluation in Level Three.

.

Figure 3-28 Purpose and Need Evaluation – Highway Mobility

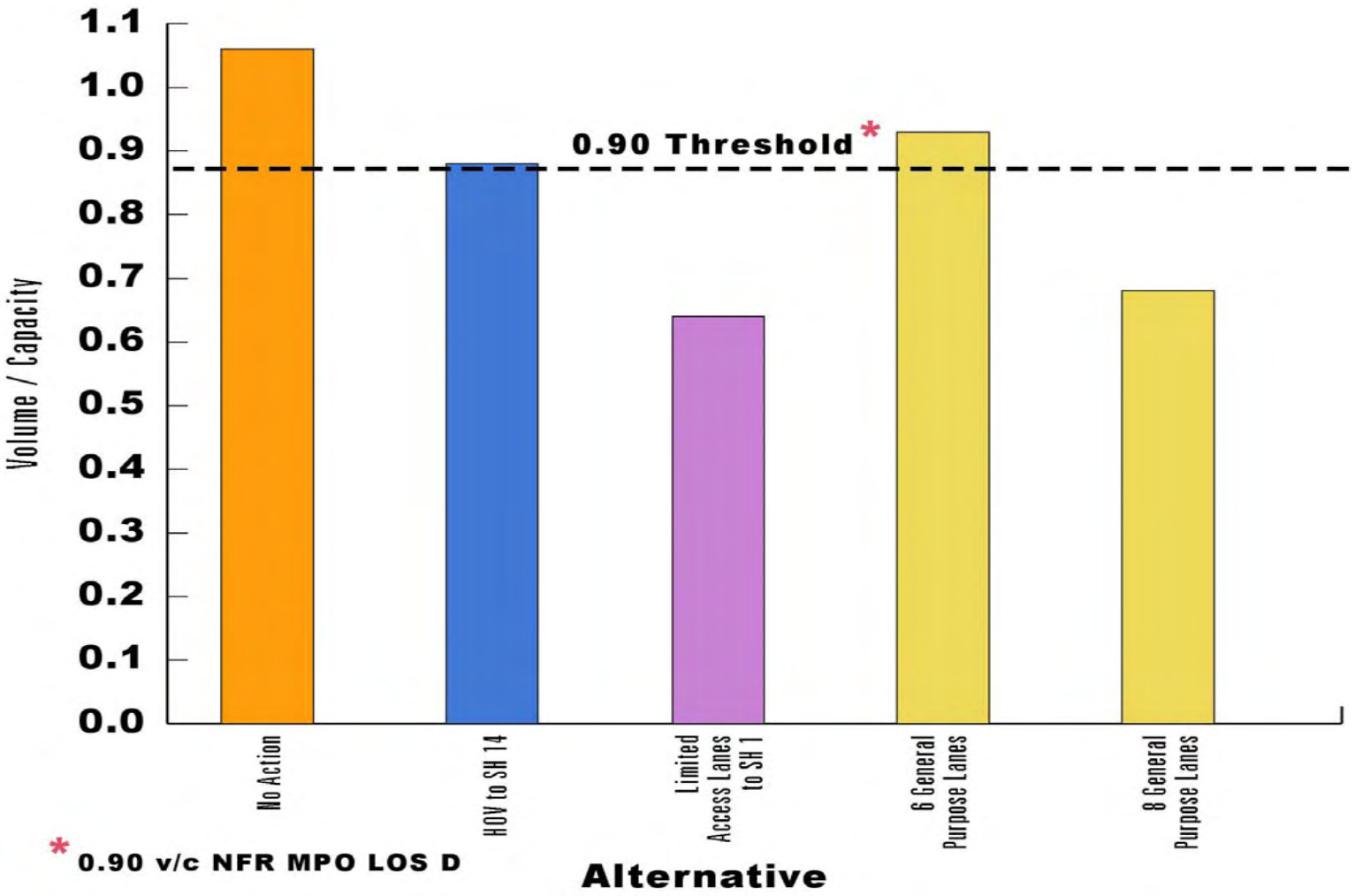


Figure 3-29 Purpose and Need Evaluation – Transit Mobility

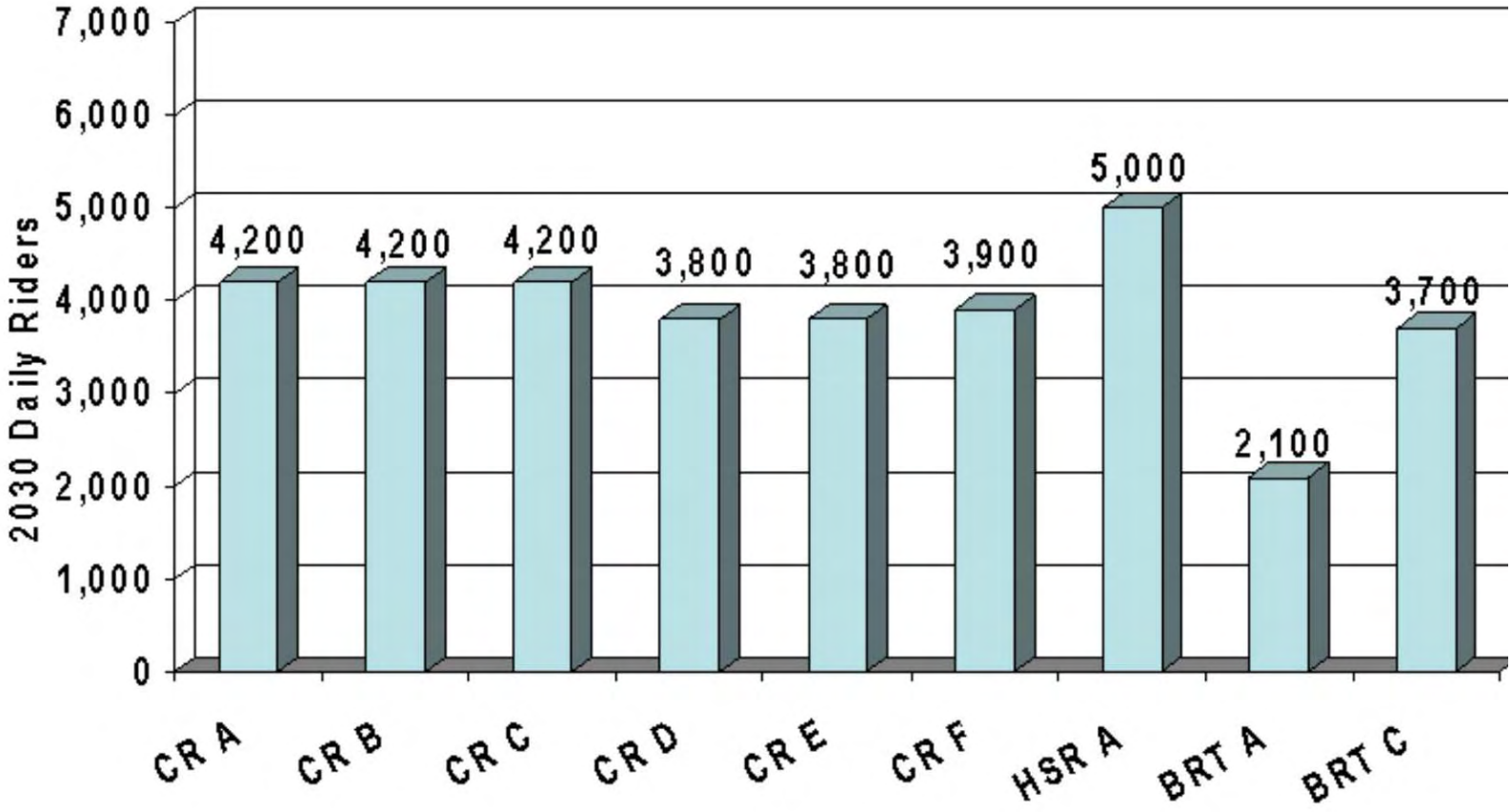


Figure 3-30 Cost Chart for Highway

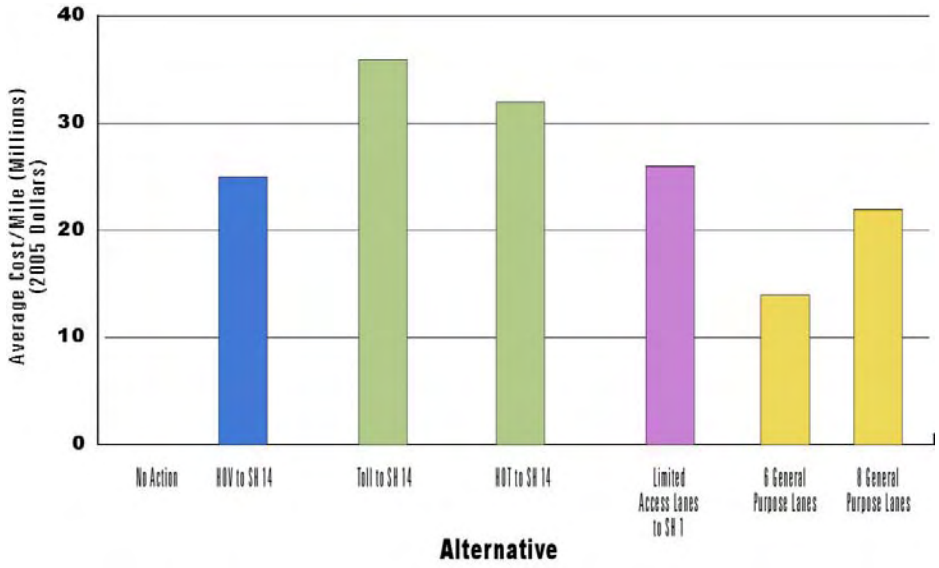
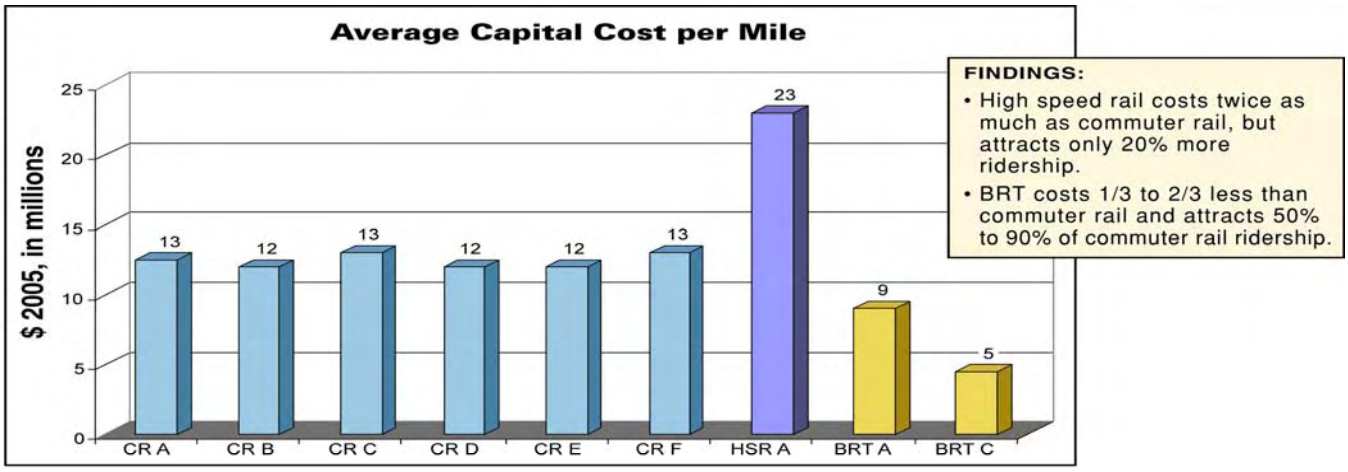


Figure 3-31 Practicability Evaluation – Average Capital Cost Per Mile



COST ESTIMATES ASSUME:

- Average cost per mile from end-to-end
- Grade separations at state highways
- Signals and traffic coordination
- Acquisition of right-of-way
- Transit improvements only - costs do not include associated or related highway improvements
- The use of FasTracks corridors with minimal improvements

- Express lane alternatives that did not extend north of SH 66 would not adequately address safety concerns, capacity/mobility needs or replace aging infrastructure along I-25 in the northern portion of the study area.

Limited Access Lanes –. Average cost per mile was somewhat higher than adding general purpose lanes to I-25 but not as high as additional barrier-separated HOT or Toll lanes. (see **Figure 3-30)**

3.4.2 Transit

Level 2B screening utilized the model's results, along with other data, to make further conclusions about the transit alternatives and to forward a selected set for further study in Level Three. In addition to the ridership forecasts, the North I-25 Travel Model predicted station boarding, feeder bus network ridership, and the 2030 (No-Build) Travel Patterns that the transit alternatives would be trying to serve.

Costs for each of the alternatives were developed using peer system per-mile capital costs, and applying an average cost per mile for right-of-way purchases along the alignment. In order to account for the changes in operating environment (rural versus urban development adjacent to the alignment) both rural and urban peer rail systems were considered. In addition, general costs were estimated for grade separations, track signalization and track electrification based on peer systems. In this analysis BRT had substantially lower capital costs because it assumed the widening of I-25 (a construction cost) without the purchase of right-of-way.

The results can be summarized as follows:

- Commuter rail service will attract approximately 4,000 riders, regardless of the alignment's location.
- High Speed Rail service attracts 20% more passengers at double the cost.
- Bus Rapid Transit attracts 1/3 less ridership compared to 50% less cost.
- Local ridership on the feeder bus network was relatively high.
- Transit serves a high percentage of commuters from the North Front Range to Denver, but the total number of commuters is not a large number.
- Alternatives along the western side of the corridor had a higher potential for physical environmental impacts.
- Alternatives along the interior alignment had a higher potential to impact aquatic resources.

As a result of Level 2B Screening, the following alternatives were screened out from further analysis:

Commuter Rail F– Compared to other commuter rail alternatives, this alignment served very few population or employment centers, and resulted in out-of-direction travel for passengers trying to reach Denver. In addition, it required the restoration of the portion of the Dent Line through Frederick and Firestone to an active railway, rather than a recreational trail

3.5 LEVEL TWO LESSONS LEARNED

Figures 3-32 through Figure 3-44 summarize the major findings of the Level Two evaluation effort. To aid in presentation to the public, the alternatives were given a "final grade" of satisfactory, needs improvement or unsatisfactory. The "final grade" definitions are described below.

Satisfactory

- Sufficiently addresses the evaluation criteria identified.
- Will be considered as a stand-alone alternative, meaning that the alternative could be a primary component of an acceptable transportation solution.
- Moves forward to Level Three.

Needs Improvement

- May not meet the criteria, but if modified or combined with other improvements, may justify further consideration.
- Will be considered complementary, meaning the alternative could be used to improve the functionality of a stand-alone alternative.
- May move forward to Level Three if it can be combined with a "satisfactory" alternative.

Unsatisfactory

- Does not sufficiently address criteria and is not being recommended for further evaluation.
- Determined that the alternative is too costly, does not serve a significant number of travelers, or has the most comparative potential for environmental impacts.
- Does not move forward to Level 3.

Figure 3-32 Level Two Grading Results – Additional Lanes

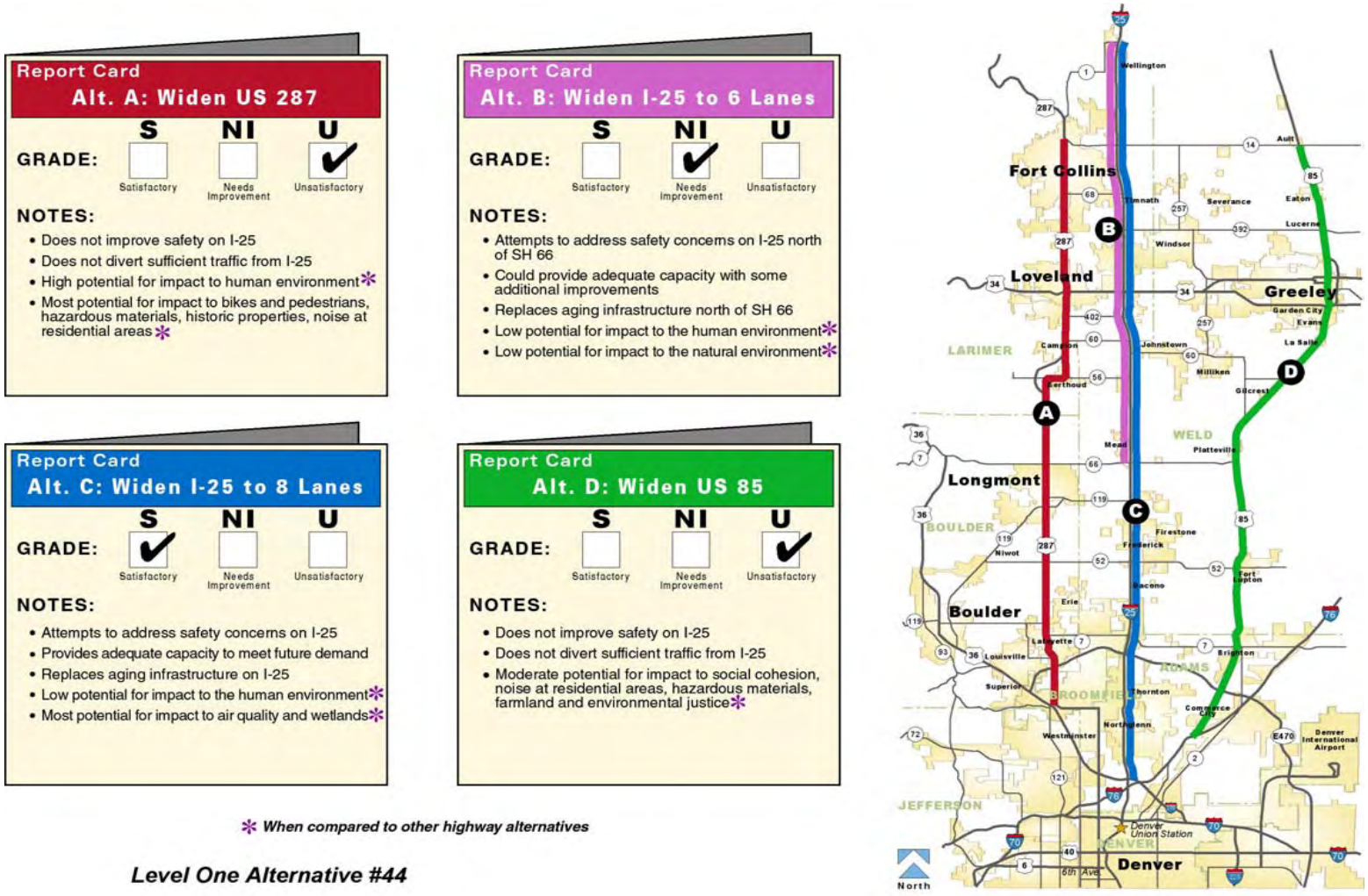


Figure 3-33 Level Two Grading Results – Upgrade Highway Classification

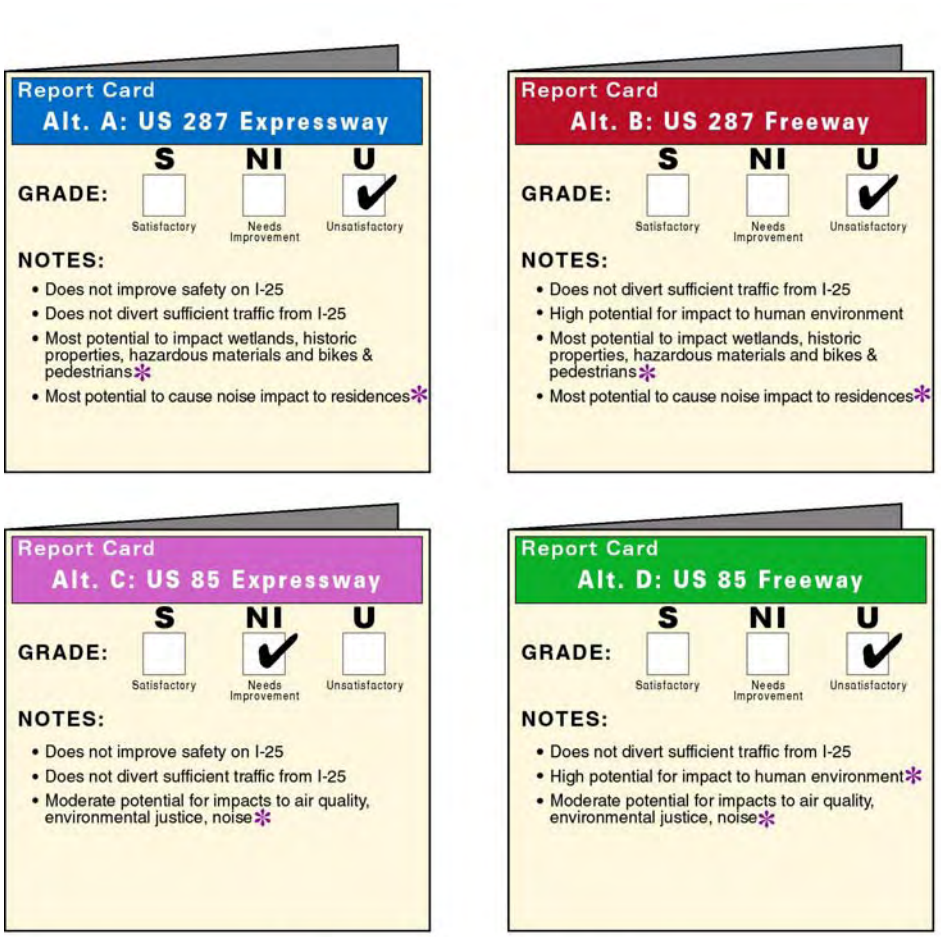


Figure 3-34 Level Two Grading Results – Express Lanes

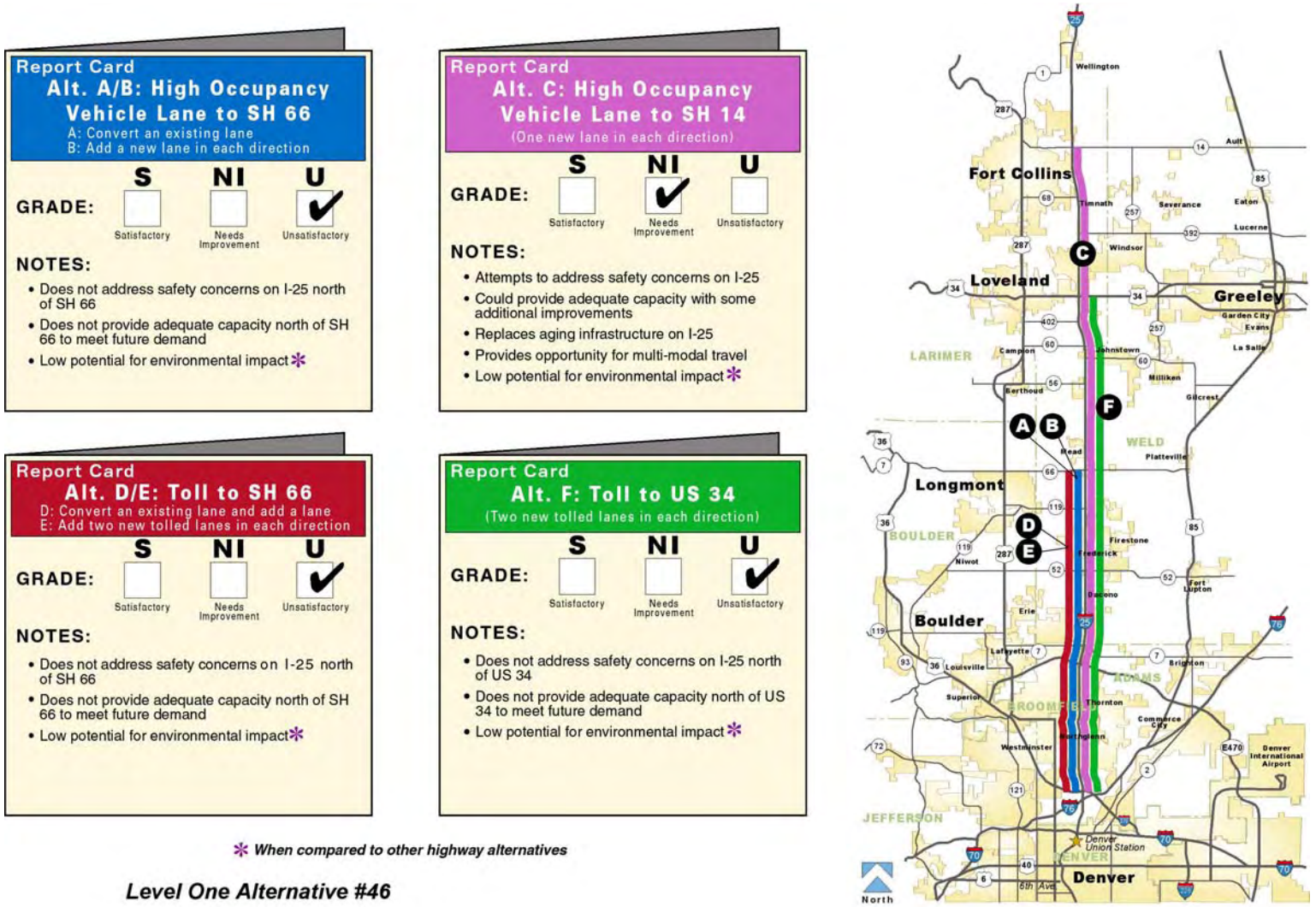


Figure 3-35 Level Two Grading Results – Express Lanes

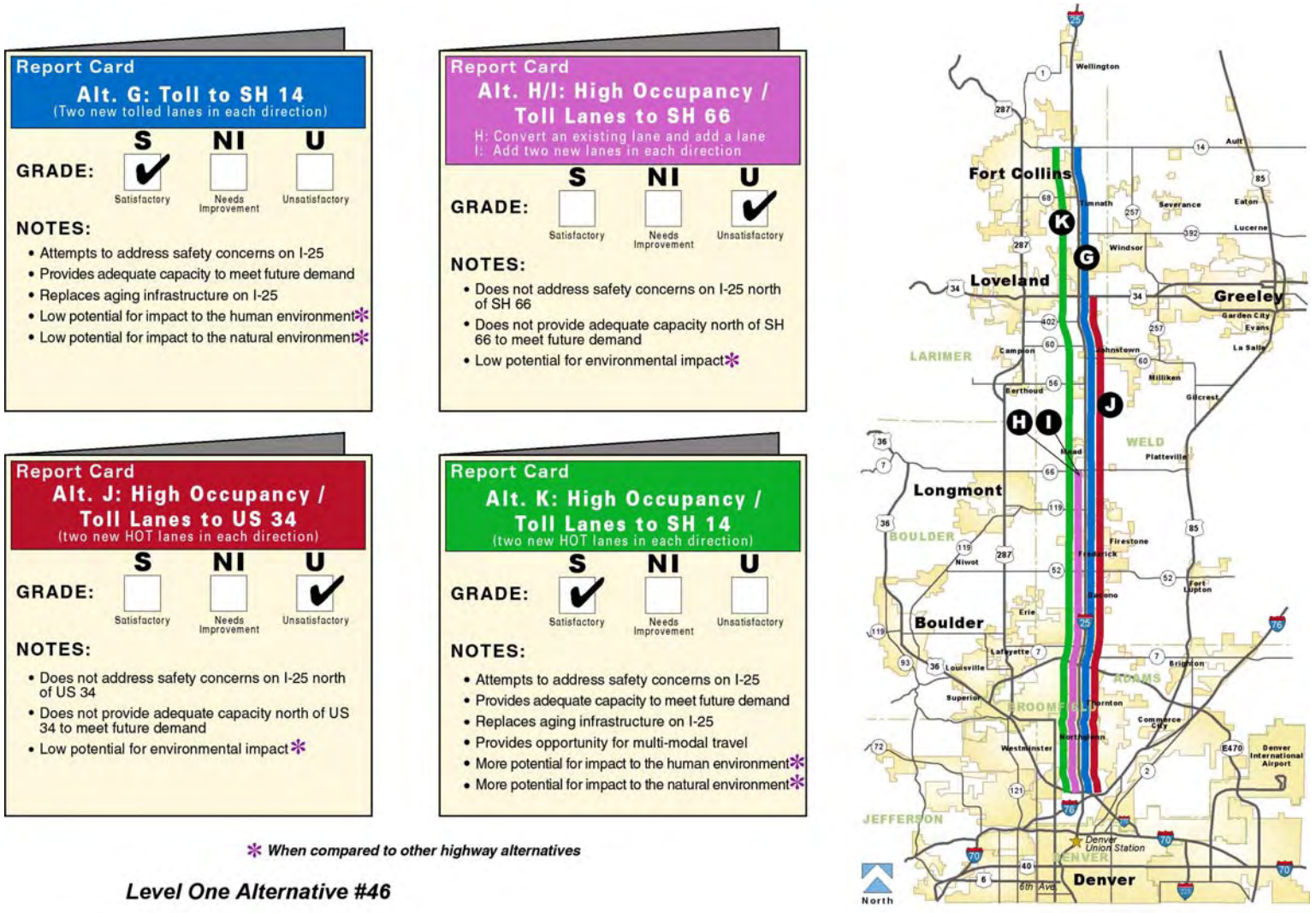


Figure 3-36 Level Two Grading Results – Limited Access Lanes

Report Card

Alt. A: Convert 1 existing lane and add 1 lane south of SH66, add 2 lanes each direction north of SH66

GRADE:	S	NI	U
	✔ Satisfactory	Needs Improvement	Unsatisfactory

NOTES:

- Attempts to address safety concerns on I-25
- Provides adequate capacity to meet future demand
- Replaces aging infrastructure on I-25
- Moderate potential for impact to the human environment ✻
- Moderate potential for impact to the natural environment ✻

Report Card

Alt. B: Add 2 lanes each direction

GRADE:	S	NI	U
	Satisfactory	✔ Needs Improvement	Unsatisfactory

NOTES:

- Attempts to address safety concerns on I-25
- Provides adequate capacity to meet future demand
- Replaces aging infrastructure on I-25
- Most potential for impact to air quality, farmland, wetlands and wildlife ✻

✻ *When compared to other highway alternatives*

Level One Alternative #48

▲ Possible Access Points for Limited Access Lanes

Figure 3-37 Level Two Grading Results – New Highway

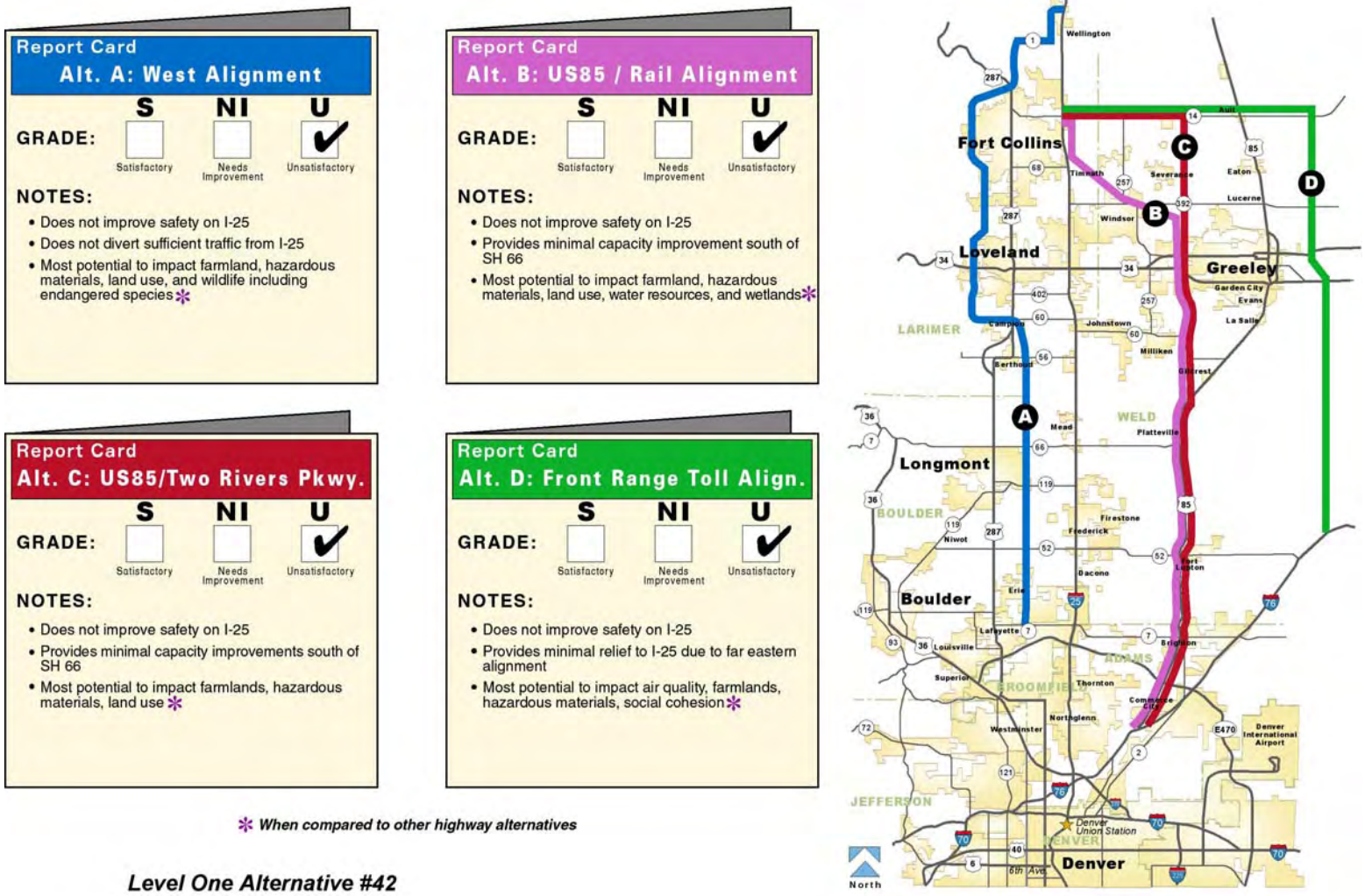


Figure 3-38 Level Two Grading Results – New Arterial

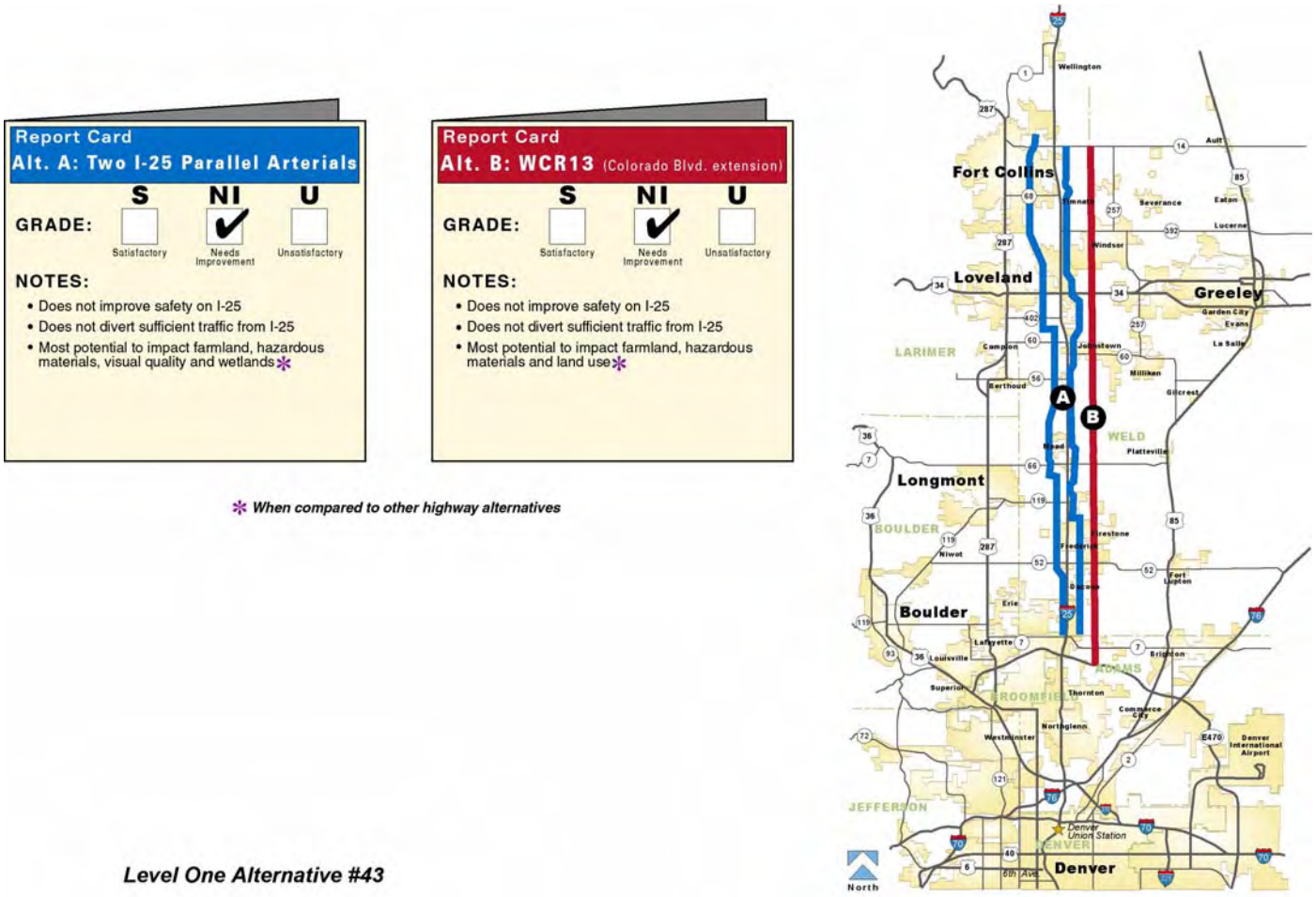


Figure 3-39 Level Two Grading Results – Bus Rapid Transit – Result 1

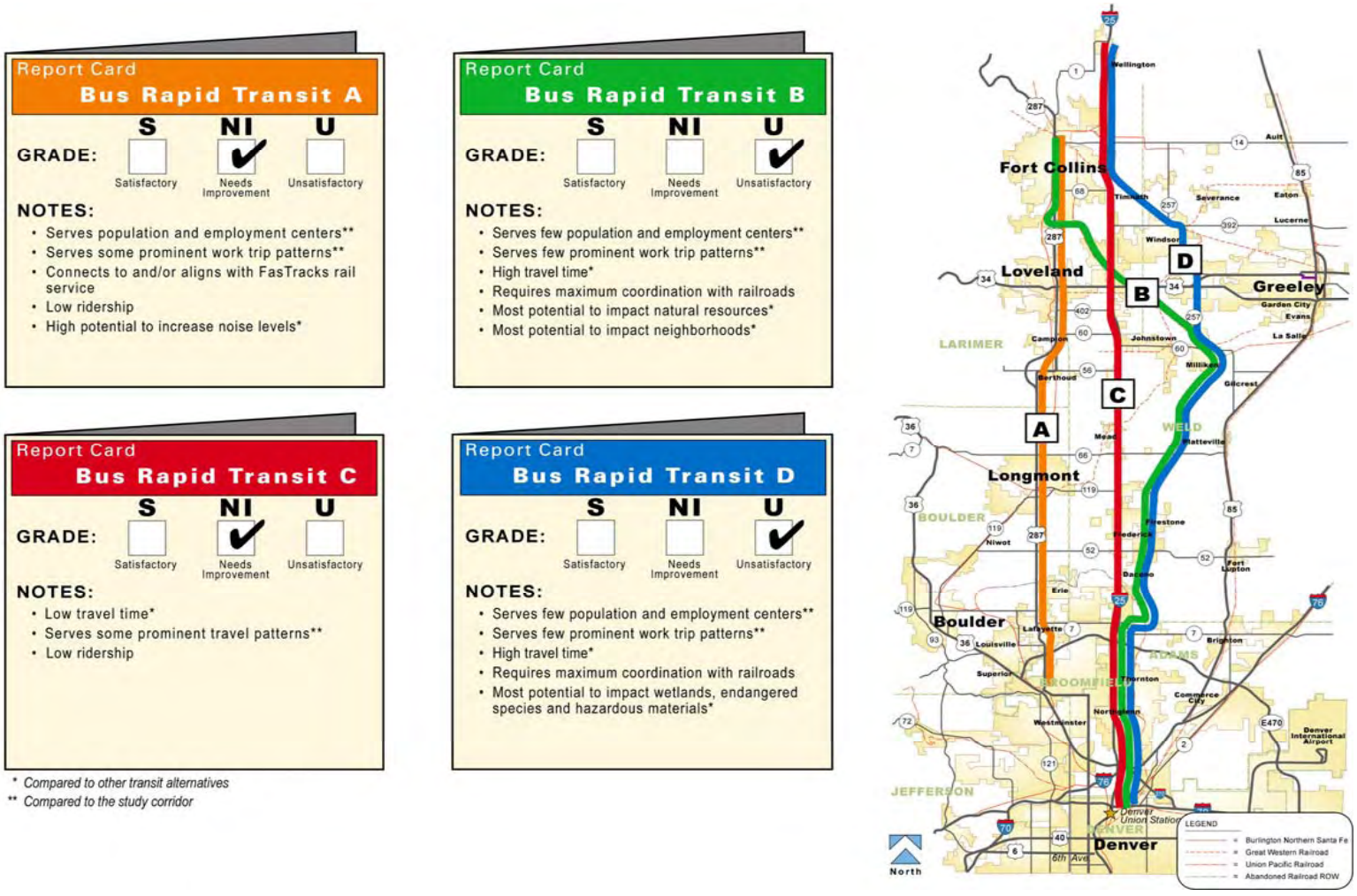


Figure 3-40 Level Two Grading Results – Bus Rapid Transit – Result 2

Report Card
Bus Rapid Transit E

GRADE:	S	NI	U
	Satisfactory	Needs Improvement	Unsatisfactory
			✔

NOTES:

- Serves few population and employment centers**
- Serves few prominent work trip patterns**
- High travel time*
- Requires maximum coordination with railroads
- Most potential to impact neighborhoods, threatened or endangered species, and hazardous materials*

Report Card
Bus Rapid Transit F

GRADE:	S	NI	U
	Satisfactory	Needs Improvement	Unsatisfactory
			✔

NOTES:

- Serves few population and employment centers**
- Serves few prominent work trip patterns**
- High travel time*
- Requires maximum coordination with railroads
- Most potential to impact hazardous materials and increase noise*

* *Compared to other transit alternatives*
** *Compared to the study corridor*

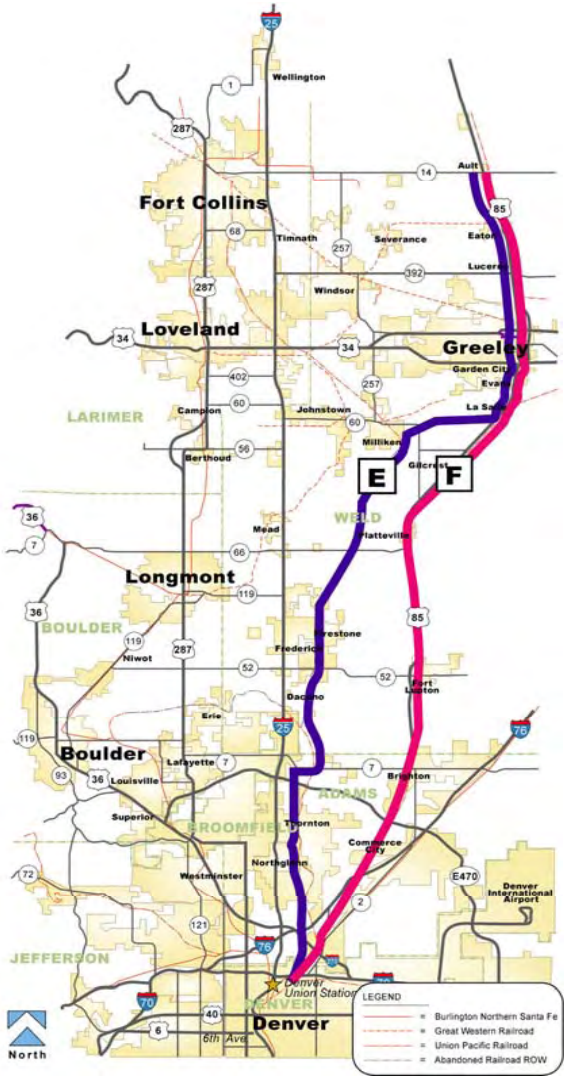


Figure 3-41 Level Two Grading Results – Commuter Rail – Result 1

Report Card
Commuter Rail A

GRADE:	S	NI	U
	Satisfactory	Needs Improvement ✔	Unsatisfactory

NOTES:
- Serves population and employment centers**
- Serves some prominent work trip patterns**
- Connects to and/or aligns with FasTracks rail service
- High travel time*
- Most potential to impact natural resources*
- Low ridership
- Most potential to impact historic properties*
- Impact to residential uses from noise and vibration

Report Card
Commuter Rail B

GRADE:	S	NI	U
	Satisfactory	Needs Improvement ✔	Unsatisfactory

NOTES:
- Serves population and employment centers**
- Serves more prominent work trip patterns**
- Connects to and/or aligns with two FasTracks rail services
- Low ridership
- High travel time*

Report Card
Commuter Rail C

GRADE:	S	NI	U
	Satisfactory	Needs Improvement ✔	Unsatisfactory

NOTES:
- Connects to and/or aligns with two FasTracks rail services
- Serves some prominent travel patterns**
- Highest travel time*
- Low ridership

Report Card
Commuter Rail D

GRADE:	S	NI	U
	Satisfactory	Needs Improvement ✔	Unsatisfactory

NOTES:
- Lower travel time*
- Connects to and/or aligns with FasTracks rail service
- Less potential to impact the human environment*
- Less potential to impact the natural environment*
- Serves few population or employment centers**
- Serves few prominent work trip patterns**
- Low ridership

* *Compared to other transit alternatives*
** *Compared to the study corridor*

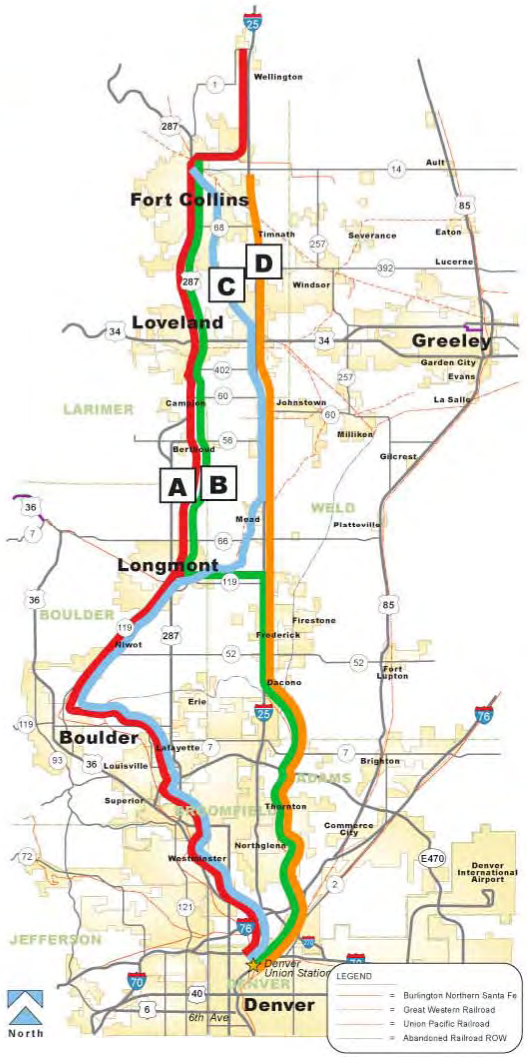


Figure 3-42 Level Two Grading Results – Commuter Rail – Result 2

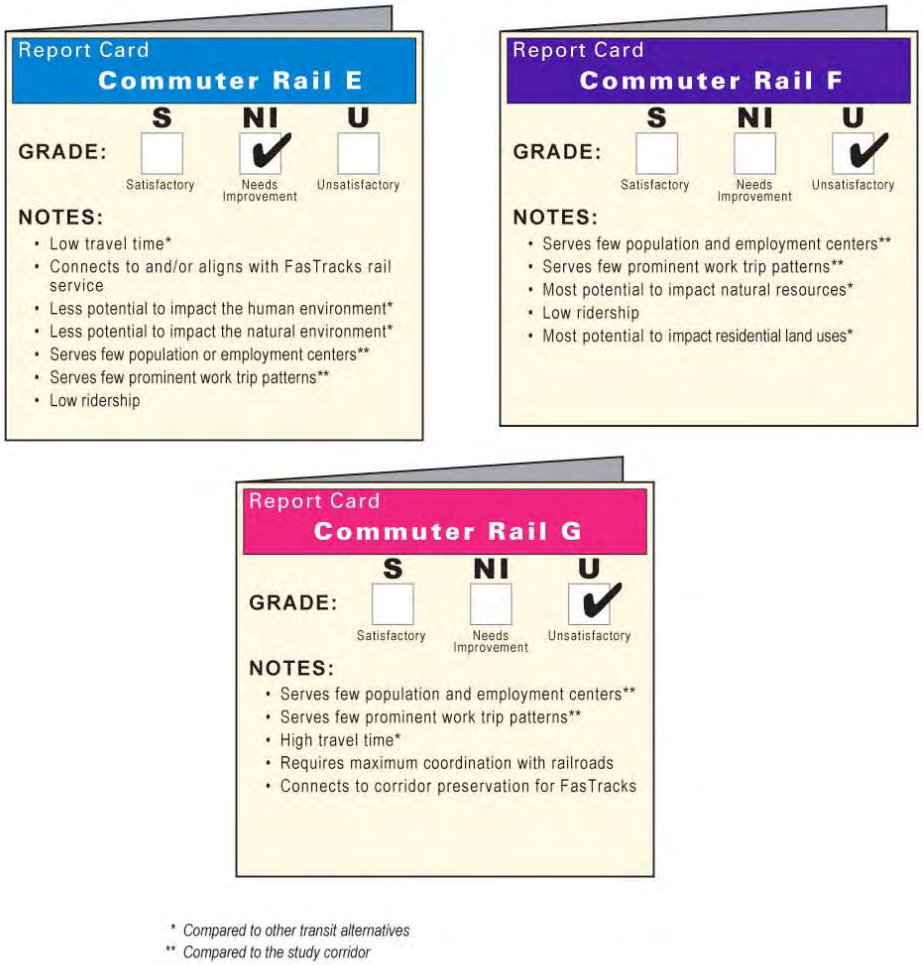


Figure 3-43 Level Two Grading Results – High Speed

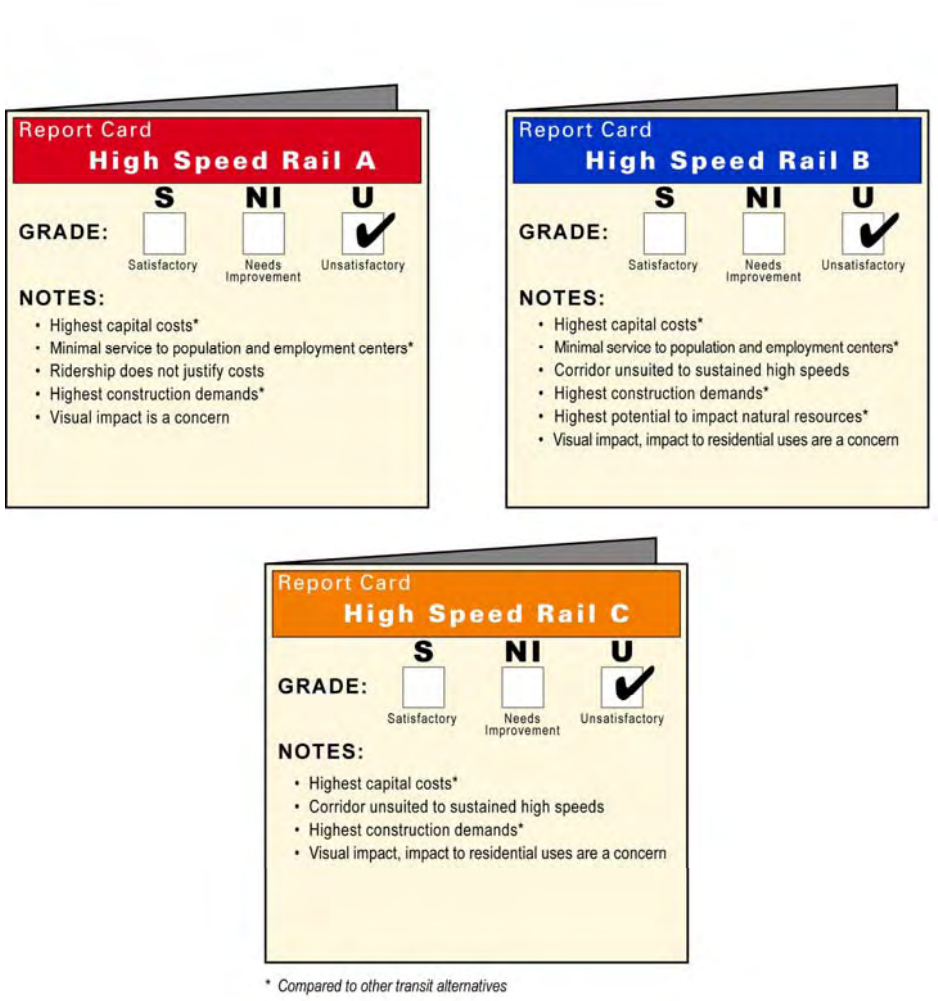
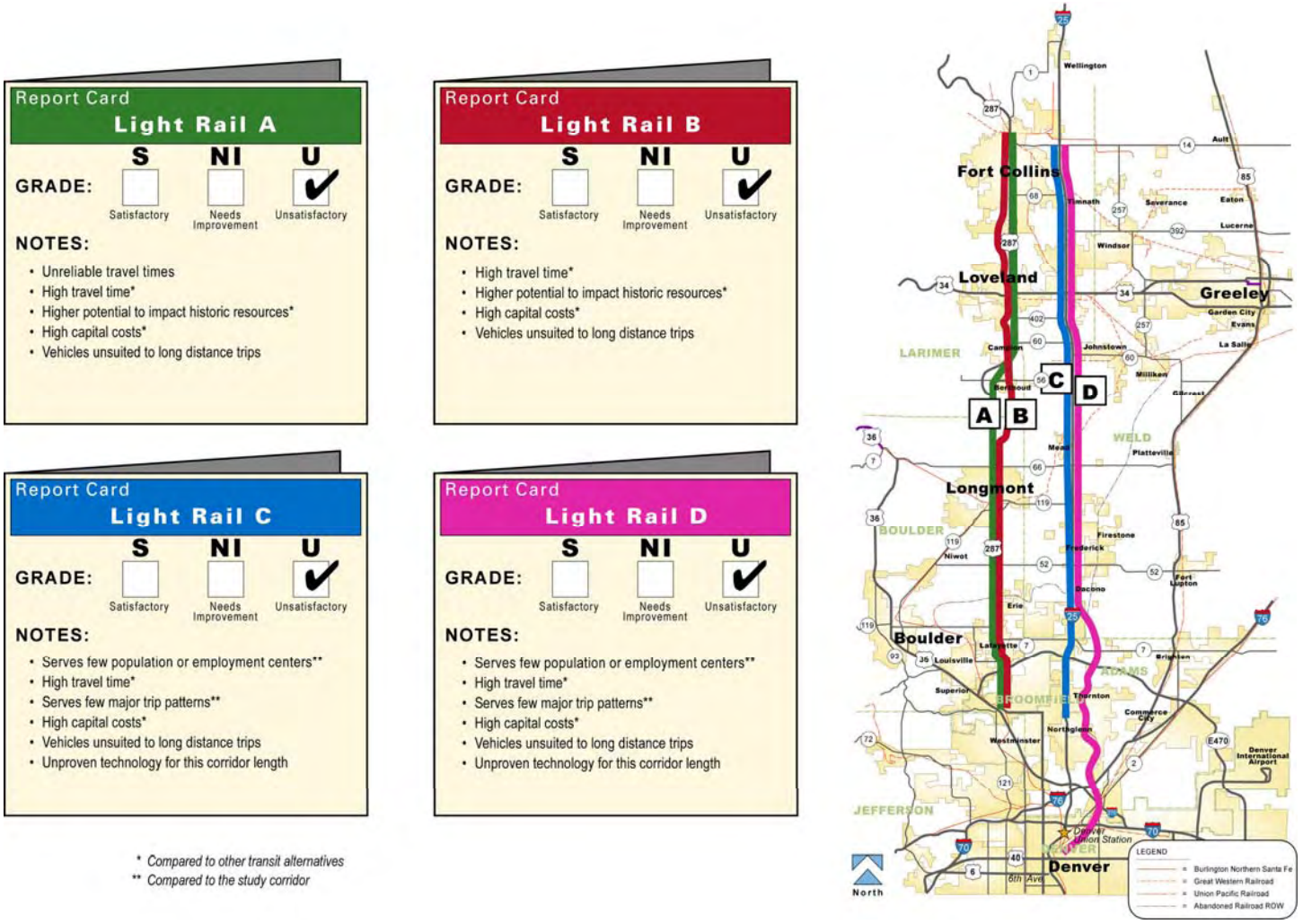


Figure 3-44 Level Two Grading Results – Light Rail



3.5.1 Highway Lessons Learned

Freeway alternatives along I-25 would provide the most potential to improve safety, aging infrastructure and mobility.

Improvements extending only to SH 66 or US 34 would not address the safety concerns, aging infrastructure or the demand anticipated in the northern portion of the study area.

Variation in 2030 travel demand along the corridor indicated that some sections of I-25 might be adequately served by six lanes while others may require a wider, eight-lane cross section.

New highways had the greatest potential to adversely affect natural resources such as water quality, wetlands, wildlife and vegetation; especially those between US 85 and I-25. New arterials did not serve existing populations as well or comply with future land use plans. Express lanes had the least potential to adversely impact social and natural resources.

During Level Two the southern terminus for highway alternatives was reviewed. It was found that general-purpose lane and toll alternatives extending south to E-470 adequately addressed the project's purpose and need. HOT and HOV alternatives would best address the projects purpose and need by extending further south to the existing reversible HOV section at US 36. These findings are documented in the project's southern terminus paper included in **Appendix A**.

3.5.2 Transit Lessons Learned

The main message of Level Two Screening is that the total number of trips between the North Front Range and Downtown Denver is small; therefore, although transit attracts a high percentage of the trips, total ridership is relatively small. By contrast, the percentage of travelers who remain within their own towns is very high, therefore, the local bus network and the feeder bus network ridership was comparatively high. As a result of these findings, none of the transit alternatives were recommended as stand-alone alternatives for implementation. However, several of them were recommended for further consideration packaged with highway improvements, and other transportation improvements, to serve the demand for transit, and to fulfill the project's identified need to implement a multi-modal solution. Practical northern termini would be developed for each individual alternative when transit alternatives were paired with other build alternatives in the future.

The alternatives that were recommended for further analysis were located on the central or western side of the corridor. In the case of rail service, this facilitated connections to FasTracks corridors, which increased mobility while decreasing capital costs and mandatory coordination with the railroads. In the case of bus service this maximized the improvements being considered along I-25. Both bus and rail service is made more feasible where there are a greater number of large and dense communities that will benefit from the service; the land use patterns favor either a western or central alignment over an eastern alignment for that reason.

Mid-central bus rapid transit and rail alignments had the most potential to adversely impact natural resources.

Western commuter rail alignments had the most positive effect on economic and social resources.

High-speed rail on the eastern half of the study area did not serve populations and had the most potential to adversely impact natural resources.

Light rail alignment along I-25 had the least potential to impact environmental resources but did not meet purpose and need and practicability criteria.

3.5.3 Congestion Management

Although the congestion management strategies did not provide sufficient capacity either independently or as a group to preclude a Build Alternative, several strategies were retained for future consideration to complement build alternatives. These include:

- Carpool
- Vanpool
- Telecommuting
- Land Use
- Incident Management program
- Ramp Metering
- Real Time Transportation Information

THIS PAGE LEFT BLANK INTENTIONALLY

4.0 LEVEL THREE

Level Three combined the highway and transit alternatives advanced from Level Two to create packages of improvements. The packages tested the influence of different transit and highway improvements on each other, and ranged from largely highway with minimal transit improvements to largely transit with minimal highway improvements. However, to address all the elements of the purpose and need, all packages included both highway and transit improvements.

4.1 ALTERNATIVES DEVELOPMENT

4.1.1 No-Action Alternative Assumptions

The No-Action Alternative did not change since Level 2B Screening and was not analyzed in Level 3.

4.1.2 Highway Assumptions

As a result of the Level Two screening, seven I-25 improvements were considered for further evaluation. These included:

- 8 general purpose lanes (E-470 to SH 14)
- Toll lanes (E-470 to SH 14)
- HOT lanes (US 36 to SH 14)
- Limited access lanes (E-470 to SH 14)
- 6 general purpose lanes paired with two TEL lanes (E-470/US 36 to SH 14 depending on type of managed lane)
- 6 general purpose lanes (SH 66 to SH 14)
- HOV lanes (US 36 to SH 14)

Each of these alternatives would include improvement to the horizontal and vertical alignment of I-25 and existing interchanges. Existing frontage roads impacted by development of an alternative were assumed to be replaced.

4.1.3 Interchange Assumptions

Interchanges considered geometrically substandard were assumed to be reconfigured and upgraded to improve safety and achieve current design standards. In addition, preliminary operational analyses were conducted during Level Three to determine the interchange configuration necessary to achieve Level of Service D. LOS D was considered the minimum acceptable LOS. For the initial evaluation of highway alternatives, existing interchange locations with upgraded configurations were included. Interchange configuration remained virtually the same for all packages. More detailed information about the access planning process is included in **Appendix E**.

4.1.4 Transit Assumptions

In the Level Two evaluation, it was clear that no transit line would generate enough ridership to form an alternative on its own. The remaining transit options were generalized into four transit alternatives, and advanced for testing with the different highway options. Therefore, BRT Alternatives A and C and Commuter Rail Alternatives A, B, C, D, and E were advanced as four general alternatives:

- BRT along US 287
- BRT along I-25
- Commuter rail service along the Burlington Northern Santa Fe (BNSF) line connecting to FasTracks in Longmont (US 36 line)
- Commuter rail service along I-25 connecting to FasTracks service in Thornton (North Metro line)

Because the purpose and need elements of the North I-25 project include "modal options" and "mobility", a complementary alternative of Commuter Bus was added in some packages to ensure that in each packaged alternative transit service would be provided to each part of the study area. Commuter Bus differed from BRT in that it would travel in lanes shared with private autos. Commuter Bus, Bus Rapid Transit and Commuter Rail provide different levels of transit service quality as well as capacity. Therefore they were considered a "reasonable range" of transit alternatives to package with highway alternatives that were forwarded to Level Three.

4.1.5 Station Assumptions

General station locations were developed for inclusion in the Level Three transit alternatives by considering the following:

- Station spacing appropriate to the mode (approximately every 4-6 miles for commuter rail; approximately every 10 miles for BRT; approximately every 15 miles for Commuter bus)
- Connectivity and access to east and west highways
- Proximity to population centers
- Proximity to activity centers (such as campuses, hospitals, or major employment centers)
- Connectivity to other transit systems
- Committee and stakeholder support

At this level, only the intersection or interchange was identified; a specific station layout was not designed, nor was a specific parcel or site selected. In addition, each of the stations assumed walk, drive, and bus access with the exception of the station near CSU which was considered pedestrian and connecting bus access only. A full **Stations Screening Report** was developed in January 2007 and is included in **Appendix C**.

4.1.6 Maintenance and Storage Facility Assumptions

Maintenance and storage facilities are used for transit vehicle fueling, vehicle repair, vehicle cleaning, parts storage, vehicle storage during overnight or other non-revenue service times, and other system upkeep functions. Depending on the size and scope of the system, they can be operated from a large, central location, or in a series of smaller locations. It was determined that even if the North I-25 transit elements interline with the RTD system, a maintenance and storage facility would be required in the study area, and utilizing an existing or planned RTD facility for the majority of the I-25 vehicle needs would be infeasible. Therefore, it was assumed that the main or major facility would be located in the study area, and additional minor facility needs in the RTD area could be coordinated after the operations plan was finalized. In addition, because of the distribution of the transit modes, it was determined that a combined bus/rail facility was impracticable due to the likelihood for substantial "deadhead service"—the distance buses would have to travel from a maintenance facility on the western side of the corridor to either the central or eastern routes being planned. Appropriate maintenance and storage facilities were assumed as part of the packages. The screening process to develop and analyze them is described in detail in the **Maintenance and Storage Facility Technical Report** of January 2006. This is included in **Appendix D**.

4.1.7 Congestion Management Assumptions

The congestion management elements that were advanced from screening in Level Two were included in the alternative packages as appropriate. Their inclusion and placements were dependent on the elements being tested (transit signal priority and queue jumps were included on bus routes only, for example.) They are described in the package descriptions as being either "on I-25", applicable to freeway access and egress and managing congestion through avoiding it (through VMS signs), or removing it (incident management plan. They are also listed as being applicable to the study area, i.e. supporting existing carpooling and vanpooling programs through the maintenance of carpool lots.

4.1.8 Packaging Assumptions

Level Two Screening determined that transit could not be implemented as the sole improvement in the North I-25 study area, but that it could be implemented alongside a highway improvement to fulfill the project's commitment to providing multi-modal transportation services. Therefore, Level Three Screening developed and screened alternatives that would test various combinations of transit and highway improvements to be able to select the best "package."

Commuter Rail services tested the potential public preference for rail service, as well as the benefits of expanding the planned FasTracks infrastructure north. It was best paired with lower capacity highway alternatives as it provided the greatest transit capacity.

Bus Rapid Transit provides less ridership capacity than commuter rail, but relies on an exclusive or semi-exclusive operating environment to maintain a comparable service quality. It served as the best transit option to pair with express lanes, as they provided a semi-exclusive operating environment that is critical to the definition and viability of Bus Rapid Transit services. In addition, due to the travel time savings of operating in a less-congested express lane, BRT could also provide greater accessibility by stopping more often.

Commuter Bus does not have physical facility improvements; instead it would operate in mixed traffic. It offers less ridership capacity, and less service quality than bus rapid transit, and was therefore best paired with high capacity highway alternatives.

The goal of testing the transit and highway alternatives in packages was:

- to determine the influence of each kind of transit alternative on the highway alternatives, and
- to identify the best performing (highest utilized, relative to its capacity) transit and highway alternatives.

The packages would also answer specific questions raised during the previous levels of evaluation. These include:

- Which type of transit service is most effective: commuter bus vs. BRT vs. commuter rail?
- Can a transit connection to Denver International Airport (DIA) be justified?
- Which commuter rail alignment works best: central or west?
- Does a commuter rail connection between the northern areas of Denver and Longmont improve effectiveness?
- Can a commuter rail spur to Greeley be justified?
- Where do volumes merit six lanes, eight lanes and / or auxiliary lanes on I-25?
- Which is better, managed lanes or general purpose lanes?
- Which is better: HOV, HOT, Toll or limited access lanes?
- Which is better for managed lanes: a buffer or raised median?
- Where on I-25 are managed lanes optimal?

The packages are described below and illustrated in **Figures 4-1** through **Figure 4-8**.

4.1.8.1 PACKAGE 1 – 8 GENERAL PURPOSE LANES WITH COMMUTER BUS

Highway Description:

I-25 would be widened from four general-purpose lanes to **eight general-purpose lanes** between SH 66 and SH 14. From E-470 to SH 66 the six general purpose lanes (included in the no action network) would also be widened to eight general purpose lanes. Deficient interchanges as well as locations with deficient vertical/horizontal alignments along I-25 would be upgraded. Other optional highway improvements that could be included in this package to improve operation of I-25 or to sufficiently meet the purpose and need of the project include parallel arterials and upgrading US 85.

Transit Description:

Bus service would operate within shared general purpose lanes at all times. **Commuter bus** service would operate from Fort Collins to Denver along:

- Harmony Road from Mason Street to I-25;
- I-25 from Harmony Road to Denver Union Station (DUS).

Transit service also includes feeder bus service east and west to connect the northern Colorado communities to the I-25 transit service.

If ridership projections and cost estimates indicate that service to DIA is viable, a bus transit line to DIA could be added to this package.

Congestion Management:

Throughout study area:	On I-25:
Carpool	Variable message signing
Vanpool	Incident management
Telecommuting	Ramp metering
Support sustainable growth	

Background:

Eight available general purpose lanes provide relatively free-flowing freeway conditions, allowing the bus to achieve acceptable speeds. This alternative combines a high quality (high capacity, fast travel time) highway improvement with a lower quality (longer and less reliable travel time) transit improvement.

Figure 4-1 Package 1: 8 General Purpose Lanes with Commuter Bus

4.1.8.2 PACKAGE 2 – TOLL LANES WITH COMMUTER BUS

Highway Description:

This package would include adding two new Toll lanes in each direction on I-25 from E-470 to SH 14. All users in these new lanes would be tolled. Users in the existing general purpose lanes would not pay a toll. Deficient interchanges as well as locations with deficient vertical/horizontal alignments along I-25 would be upgraded.

Transit Description:

Commuter bus service would operate from Fort Collins to Denver along:

- Harmony Road from Mason Street to I-25; and
- I-25 from Harmony Road to DUS.

Bus service would operate in shared lanes along Harmony Road, and within the barrier-separated toll lanes on I-25. Access and egress would be provided from the toll lanes at each interchange allowing buses to access the station areas.

A second commuter bus service would operate in shared lanes along US 287 from Fort Collins to Longmont, and a third commuter bus service would operate on US 85 from Greeley to DUS and on US 85, E-470 and Pena from Greeley to the Airport. US 85 service would have alternating destinations with one run serving DUS and the next run serving DIA.

Transit service also includes feeder bus service east and west to connect the northern Colorado communities to the I-25 transit service.

Congestion Management:

Throughout Study Area:	On I-25:	On US 287 and US 85:
Carpool	Variable message signing	Transit signal priority
Vanpool	Incident management	Signal coordination
Telecommuting	Ramp metering	Bus queue jump
Support sustainable growth	Pedestrian/Bike Improvements	

Background:

On I-25, toll lanes would provide a less-congested operating environment than general purpose lanes, but would not provide the more exclusive operating environment necessary to operate BRT with median stations. Because toll lanes restrict general access to the improved lane by charging a toll for its use, it was paired with transit improvements on the western central and eastern side of the corridor that would stop in several communities. This effectively combines a highway improvement with less access to a transit improvement with more access.

Figure 4-2 Package 2: Toll Lanes with Commuter Bus

4.1.8.3 PACKAGE 3 – HIGH-OCCUPANCY/TOLL LANES WITH BUS RAPID TRANSIT

Highway Description:

This package would include adding two new High-Occupancy/Toll lanes in each direction on I-25 from US 36 to SH 14. All single-occupant vehicles in the new lanes would be tolled. Users with two or more occupants could use the new lanes for free. Users in the existing general purpose lanes would not pay a toll. Deficient interchanges as well as locations with deficient vertical/horizontal alignments along I-25 would be upgraded.

Transit Description:

BRT service would operate from Fort Collins to Denver along:

- Harmony Road from Mason Street to I-25; and
- I-25 from Harmony Road to DUS.

BRT service would operate in shared lanes along Harmony Road, and within the barrier-separated HOT lanes on I-25.

Commuter bus service would be operated within shared lanes on US 287 from Fort Collins to Longmont and on US 85 from Greeley to DUS.

Transit service also includes feeder bus service east and west to connect the northern Colorado communities to the I-25 transit service.

If ridership projections and cost estimates indicate that service to DIA is viable, a bus transit line to DIA could be added to this package.

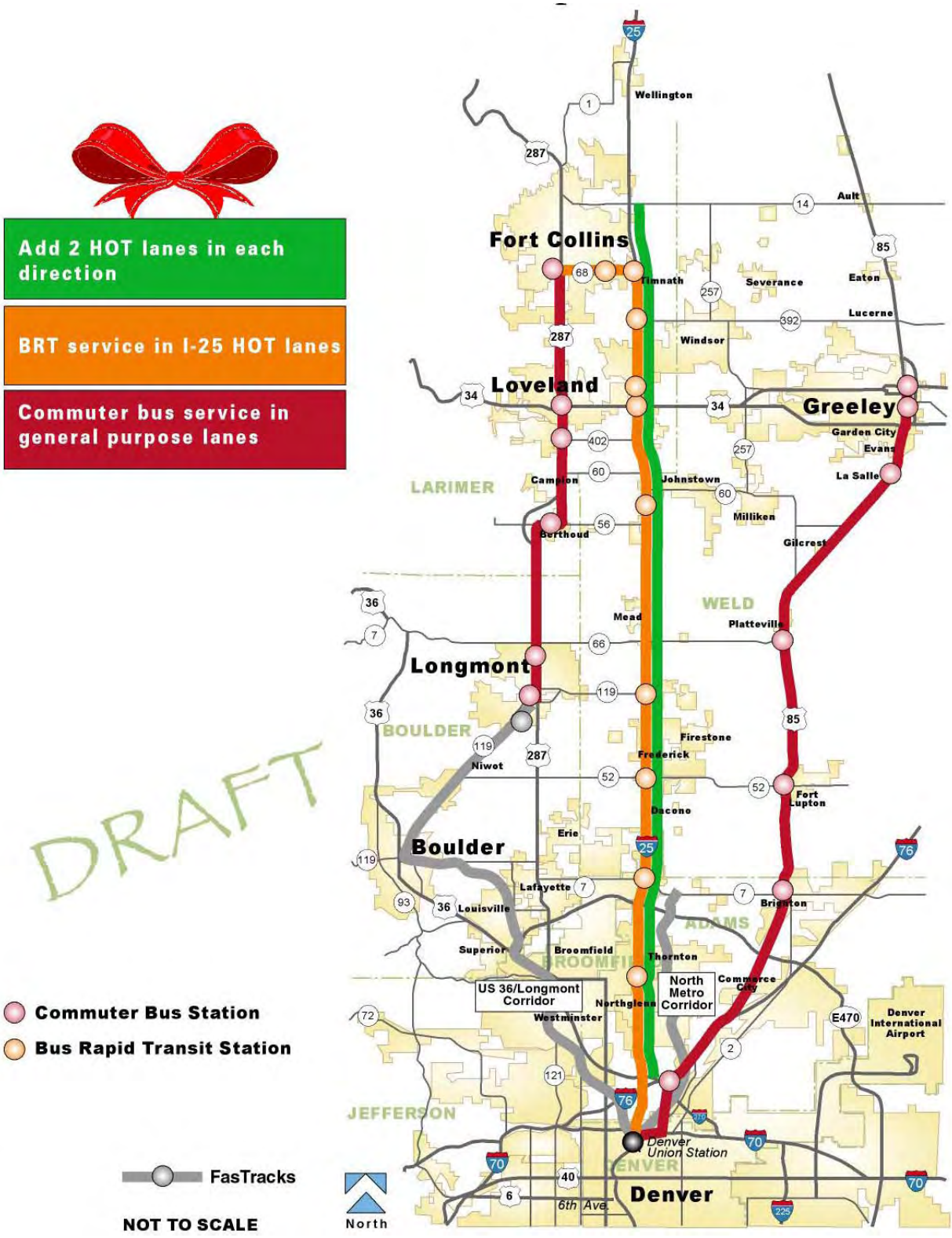
Congestion Management:

Throughout Study Area:	On I-25:	On US 287 and US 85:
Carpool	Variable message signing	Transit signal priority
Vanpool	Incident management	Signal coordination
Telecommuting	Ramp metering	Bus queue jump
Support sustainable growth		Pedestrian/bike improvements

Background:

When compared to Package 2, this alternative will directly test the incremental difference in ridership between BRT and commuter bus service on I-25, and service on US 85 to DUS and DIA instead of service only to DUS.

Figure 4-3 Package 3: High-Occupancy/Toll Lanes with Bus Rapid Transit



4.1.8.4 PACKAGE 4 – LIMITED-ACCESS LANES WITH COMMUTER BUS

Highway Description:

This package would include adding two new Limited-Access lanes in each direction on I-25 from SH 66 to SH 14 and one new lane in each direction from E-470 to SH 66. Two lanes in each direction would be barrier separated from the two general purpose lanes from E-470 to SH 14. Access and egress points to and from the barrier separated lanes would be limited to E-470, SH 119, US 34 and SH 14. Because of the limited access/egress points, the lanes would be used by long-distance travelers. Deficient interchanges as well as locations with deficient vertical/horizontal alignments along I-25 would be upgraded. Other optional highway improvements that could be included in this package to improve operation of I-25 or to sufficiently meet the purpose and need of the project include parallel arterials and upgrading US 85.

Transit Description:

Commuter bus service would operate from Fort Collins to Denver and the airport along:

- Harmony Road from Mason Street to I-25
- I-25 from Harmony Road to DUS;
- E-470 from I-25 to Pena;
- Pena from E-470 to DIA.

Transit service would be in shared lanes at all times. (The nature of the limited access lanes makes it impracticable for the bus to enter and exit the limited access lanes.) Operations assume a service that alternates southern endpoints between DUS and DIA.

Transit service also includes feeder bus service east and west to connect the northern Colorado communities to the I-25 transit service.

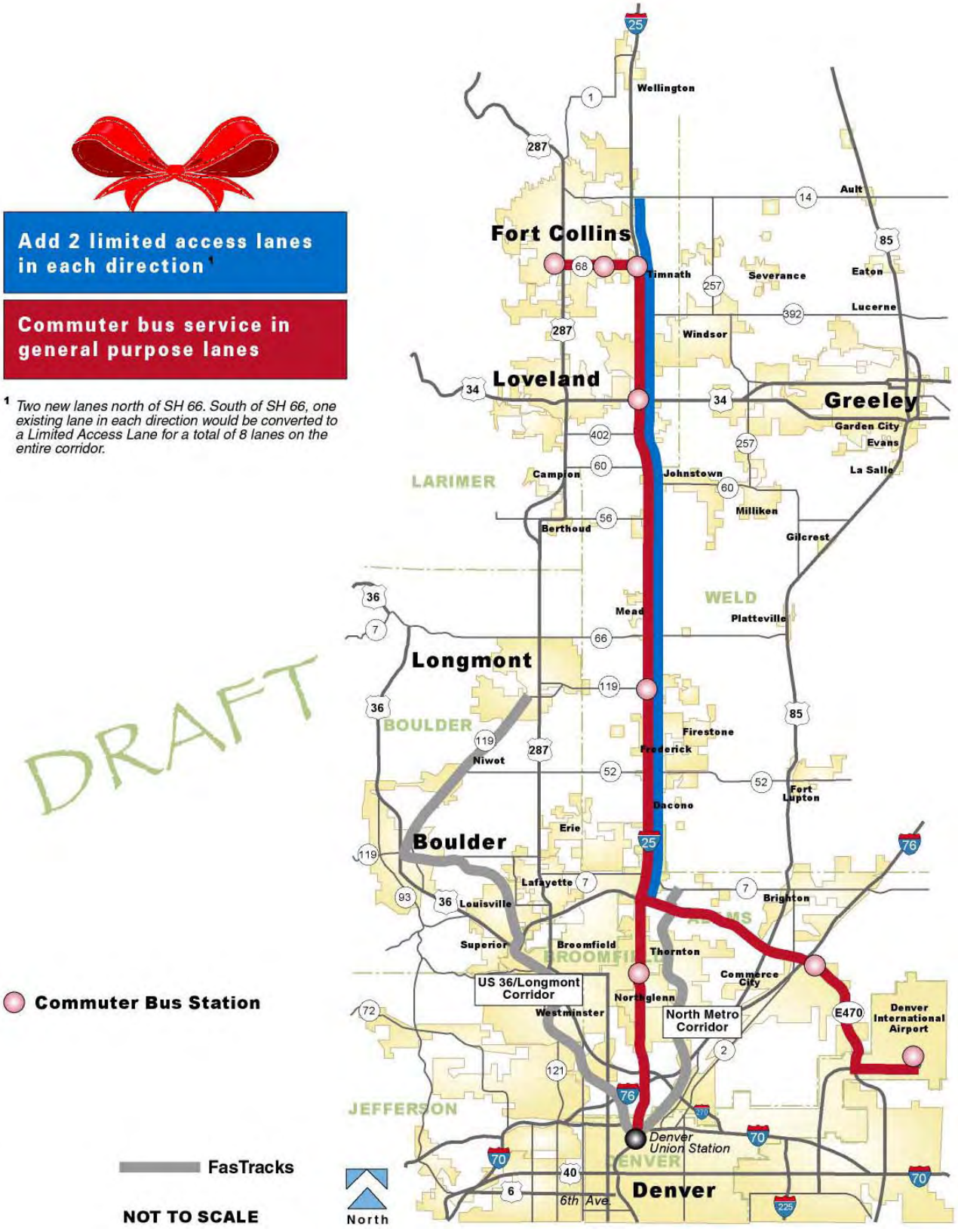
Congestion Management:

Throughout Study Area:	On I-25:
Carpool	Variable message signing
Vanpool	Incident management
Telecommuting	Ramp metering
Support sustainable growth	

Background:

When compared with Package 1, this alternative tests the incremental difference in ridership between service to DUS only and service to DUS and DIA using I-25. In addition, it tests the difference in ridership to DIA between a central and eastern alignment. From a highway perspective, this package compares the demand on I-25 created by long-distance travelers that would benefit from limited-access lanes to the demand for shorter trips.

Figure 4-4 Package 4: Limited-Access Lanes with Commuter Bus



4.1.8.5 PACKAGE 5 – 6 GENERAL PURPOSE LANES, 2 EXPRESS LANES WITH BUS RAPID TRANSIT

Highway Description:

This package would extend the **six-lane** widening on **I-25** from SH 66 to SH 14 and **add one buffer-separated express lane in each direction** to create an eight-lane cross section. The two express lanes could be high-occupancy vehicle lanes, high-occupancy/toll lanes, toll lanes or limited access lanes. Deficient interchanges as well as locations with deficient vertical/horizontal alignments along I-25 would be upgraded.

Transit Description:

BRT service would operate from Fort Collins to Denver along:

- Harmony Road from Mason Street to I-25; and
- I-25 from Harmony Road to DUS.

BRT service would operate in shared lanes along Harmony Road, and within the barrier-separated managed lanes on I-25 from Harmony Road to DUS.

Commuter bus service would also operate in shared lanes along US 287 from Fort Collins to Longmont and on US 85 from Greeley to DUS.

If ridership projections and cost estimates indicate that service to DIA is viable, a bus transit line to DIA could be added to this package.

Transit service also includes feeder bus service east and west to connect the northern Colorado communities to the I-25 transit service.

Congestion Management:

Throughout Study Area:	On I-25:	On US 287 and US 85:
Carpool	Variable message signing	Transit signal priority
Vanpool	Incident management	Signal coordination
Telecommuting	Ramp metering	Bus queue jump
Support sustainable growth	Pedestrian/bike improvements	

Background:

This alternative is comparable to Package 2 and, especially to Package 3. This alternative will test the difference in transit ridership when there are fewer highway alternatives compared to transit alternatives. This will directly compare the utilization of lanes whose use requires that a toll be paid, compared to the utilization of lanes whose use requires carpooling (2 or more passengers).

Figure 4-5 **Package 5: 6 General Purpose Lanes, 2 Express Lanes with Bus Rapid Transit**

4.1.8.6 PACKAGE 6 – 6 GENERAL PURPOSE LANES WITH CENTRAL COMMUTER RAIL

Highway Description:

This package would complete the six-lane widening on I-25 from SH 66 to SH 14. Deficient interchanges as well as locations with deficient vertical/horizontal alignments along I-25 would be upgraded. Other optional highway improvements that could be included in this package to improve operation of I-25 or to suitably meet the purpose and need of the project include parallel arterials, upgrading US 85 and climbing lanes on I-25.

Transit Description:

Commuter rail service along I-25 would operate on the western side of I-25 (within the right-of-way) from Harmony Road to approximately SH 119, cross I-25 north of Frederick/Firestone and continue on the east side of I-25 to Dacono, where it would connect to the Dent line, becoming a "FasTracks" service at the North Metro end-of-line station, and continuing to DUS. Commuter rail improvements also include extending the rail service across SH 119 into Longmont. It is assumed that the rail service would provide a single seat ride from Fort Collins to downtown Denver via the North Metro FasTracks line. A transfer would be required at SH 119 to access Longmont and Boulder.

If ridership projections and cost estimates indicate that a spur to Greeley is viable, a rail transit line to Greeley could be added to this package.

Transit service includes feeder bus service east and west to connect the northern Colorado communities to the I-25 transit service.

Congestion Management:

Throughout Study Area:	On I-25:
Carpool	Variable message signing
Vanpool	Incident management
Telecommuting	Ramp metering
Support sustainable growth	

Background:

This alternative pairs the highest quality transit service with less invest on the highway when compared to Package 1. It is comparable to Package 7 and 8 which test commuter rail on the western side of the study corridor.

Figure 4-6 Package 6: 6 General Purpose Lanes + Central Commuter Rail

4.1.8.7 PACKAGE 7 – 6 GENERAL PURPOSE LANES WITH WESTERN COMMUTER RAIL

Highway Description:

This package would complete the six-lane widening on I-25 from SH 66 to SH 14. Deficient interchanges as well as locations with deficient vertical/horizontal alignments along I-25 would be upgraded. Other optional highway improvements that could be included in this package to improve operation of I-25 or to suitably meet the purpose and need of the project include parallel arterials, upgrading US 85 and climbing lanes on I-25.

Transit Description:

Commuter rail would operate along the BNSF right-of-way from Fort Collins to Longmont, becoming FasTracks service in Longmont and continuing to Denver via Boulder.

If ridership projections and cost estimates indicate that a spur to Greeley is viable, a rail transit line to Greeley could be added to this package. The rail improvement could also include extending the North Metro line north along I-25 and east along SH 119 to connect into the proposed line, if ridership and cost estimates indicate this extension viable. A transfer would be required in Longmont to access the North Metro line.

Commuter bus service would operate in shared lanes along US 85 from Greeley with alternating endpoints at DUS and DIA.

Transit service includes feeder bus service east and west to connect the northern Colorado communities to the I-25 transit service.

Congestion Management:

Throughout Study Area:	On I-25:	On US 85:
Carpool	Variable message signing	Transit signal priority
Vanpool	Incident management	Signal coordination
Telecommuting	Ramp metering	Bus queue jump
Support sustainable growth	Pedestrian/bike improvements	

Background:

This alternative will test the ridership difference with rail on the western side, and bus service on the eastern side but no transit service directly along I-25.

Figure 4-7 Package 7: 6 General Purpose Lanes with West Commuter Rail

4.1.8.8 PACKAGE 8 – WEST COMMUTER RAIL, HIGH-OCCUPANCY VEHICLE LANES WITH BUS RAPID TRANSIT

Highway Description:

This package would add one buffer-separated, high-occupancy vehicle (HOV) lane in each direction along I-25 between US 36 and SH 14. North of SH 66 there would be a total of six lanes. South of SH 66 there would be a total of eight lanes. Deficient interchanges as well as locations with deficient vertical/horizontal alignments along I-25 would be upgraded. Other optional highway improvements that could be included in this package to improve operation of I-25 or to suitably meet the purpose and need of the project include parallel arterials, upgrading US 85 and climbing lanes on I-25.

Transit Description:

Commuter rail would operate along the BNSF right-of-way and provide a one-seat ride between Fort Collins and downtown Denver via Longmont and Boulder. The North Metro line would be extended north along I-25 and east along SH 119 to connect into the proposed BNSF line. A transfer would be required in Longmont to access the North Metro line.

If ridership projections and cost estimates indicate that a spur to Greeley is viable, a rail transit line to Greeley could be added to this package.

BRT service would operate from Fort Collins to Denver along:

- Harmony Road from Mason Street to I-25; and
- I-25 from Harmony Road to DUS.

BRT service would operate in shared lanes along Harmony Road, and within the barrier-separated HOV lanes on I-25 from Harmony Road to DUS.

Commuter bus service would operate in shared lanes along US 85 from Greeley to DUS, and along shared lanes on US 85, E-470 and Pena Boulevard from Greeley to DIA.

Congestion Management:

Throughout Study Area:	On I-25:	On US 85:
Carpool	Variable message signing	Transit signal priority
Vanpool	Incident management	Signal coordination
Telecommuting	Ramp metering	Bus queue jump
Support sustainable growth	Pedestrian/bike improvements	

Background:

This alternative includes the most capacity and highest quality transit services with a limited highway improvement. The commuter rail alignment will compare with Package 6, which offered a “one-seat-ride” to both Denver and Boulder, but along a central alignment.

Figure 4-8 **Package 8: West Commuter Rail, High Occupancy Vehicle Lanes with Bus Rapid Transit**

4.2 ALTERNATIVES SCREENING

Evaluation was conducted by package as well as by the individual package components in order to identify the most effective elements and repackage them as appropriate for the DEIS. Level Three evaluation criteria are listed below

4.2.1 Evaluation Criteria

Level Three packages were evaluated on using new quantifiable criteria available from the travel demand model, engineering costs estimates, how well they address the project's purpose and need, their practicability and their potential to impact environmental resources, and other detailed sources of data. The evaluation criteria used to evaluation the improvement packages and their components are described below.

4.2.2 Purpose and Need Criteria

Purpose and need evaluation looks at an alternative's ability to address safety concerns along I-25, replace aging infrastructure along I-25, address mobility and accessibility needs and provide modal alternatives. Each criterion is described below.

Highway Safety
Accident projections were based on existing, historical accident information provided by the Colorado Department of Transportation, Traffic and Safety Engineering department. The methodology used three key data inputs, and two analysis methodologies to estimate the expected accident experience for the year 2030. The available accident history for the previous five-years (1999 - 2003), the average annual daily traffic (AADT) volumes for each year, and the roadway geometry and length are the primary data required to create the baseline from which projections can be made.

For each of the alternatives involving 4 lanes in each direction with no physical barrier separating any travel lanes in the same direction, an average accident rate methodology was used. In this method, an accident rate was derived using the historical accident data, segment length, and AADT for each of the five-year history. These rates were averaged in order to provide an estimate of accident experience that will scale with changes to the AADT. Using this derived rate, and the projected 2030 AADT, the potential future accident experience was calculated.

For each of the alternatives involving 3 lanes in each direction, or when a physical barrier is present separating travel-lanes in the same direction, a more advanced methodology is available. CDOT has derived Safety Performance Functions (SPF) that relate the number of Accidents per Mile per Year (APMPY) to the AADT based on an analysis of accident experience along state highways that share similar characteristics such as number of lanes and urban or rural characteristics. Using the relationship described by the SPF methods, the historical data and AADT are used to define a curve that scales expected APMPY as the AADT changes for each lane-configuration. Therefore, for a 2-lane section separated by a barrier from a 3-lane section, the historic accident data and AADT are used to define SPF curves separately for the 2-lane and 3-lane portions. Once defined, the AADT projected for the year 2030 is applied to the individual functions and added together to describe the expected future year accident experience for the complex facility arrangement.

Aging Highway Infrastructure
Four different criteria were used to evaluate an alternative's ability to replace aging infrastructure. The criteria used included the following:

- Ability to replace aging infrastructure, which was considered a benefit.
- Need to replace new structures, which was considered a drawback.
- Ability to replace deficient pavement, which was considered a benefit.
- Need to replace good pavement, which was considered a drawback.

Transit and Highway Mobility
A number of criteria were used to evaluate an alternative's ability to address mobility needs in 2030; these included congestion on the highway, transit ridership and travel time.

Highway Congestion: Highway congestion was evaluated using two measurements. The first was miles of congestion which was measured by identifying the number of miles on I-25 general purpose lanes from SH 14 to E-470 that have a volume to capacity ratio of 0.90 used in Level 3 or higher during the PM peak hour in 2030. Hours of congestion were the second congestion criteria; this was an estimate of the number of hours of the day each segment of I-25 would have a volume to capacity ratio over 0.90, averaged over all I-25 segments between SH-14 and E-470.

Transit Ridership: Transit mobility was evaluated by comparing the number of northern Colorado riders using the proposed transit alternative.

Highway and Transit Travel Time: For highway alternatives travel time was evaluated by comparing the PM peak hour private auto travel time, in minutes, on I-25 general purpose lanes between E-470 and SH 14 in 2030. For transit alternatives travel time was measured from the new Fort Collins South Transit Center to Denver Union Station in 2030.

Transit and Highway Accessibility
Accessibility was used to evaluate both highway and transit elements.

Highway accessibility was evaluated by comparing the reduction the vehicle hours of travel to increases in vehicle miles of travel compared to the no action alternative. Ideally, alternatives should reduce the vehicle hours of travel without a disproportionate increase in vehicle miles of travel in 2030.

Transit accessibility was evaluated by comparing the 2030 population and employment located within a half-mile of potential transit stations. Transit lines with high population and employment in the vicinity were consider more desirable.

Modal Options
Modal options was evaluated based on the percentage of the total work trips from northern Colorado (the study area north of SH 66) to the Denver metropolitan area using transit vs. private autos.

4.2.3 Practicability Criteria

Practicability criteria include capital cost, operating and maintenance costs, logistics of expandability and constructability. The practicability criteria are described below.

4.2.3.1 HIGHWAY AND TRANSIT CAPITAL COSTS

Capital cost estimates were based on present day construction costs. Estimates were calculated using a combination of calculated construction quantities multiplied by applicable unit prices, plus percentages of the quantified costs for imprecise items such as utility relocates and construction traffic control. All costs were considered inclusive of all materials, equipment and labor associated with each construction item.

Unit costs and percentages were based on the following:

Roadway – CDOT construction bid data from January 1, 2005 thru October 28, 2005 plus select projects bid prior to this time period.

Commuter Rail - Recent projects and studies (I-70 EIS, US 36, I-225, North Metro Corridor and the I-595 Project) with costs adjusted for inflation, plus information from rail suppliers.

Transit Stations – Cost data from recent RTD and CDOT projects.

Rail Fleet – 1999 RTD guidance manual + 6 years of 2% inflation; unit costs do not include fleet replacement.

Bus Fleet – North American Bus Industries; unit costs include the present cost of fleet replacement in twelve years.

ROW – Assessors' 2005 property data information from Adams, Boulder, Broomfield, Larimer and Weld Counties.

Replacement of the rail and bus fleets was considered as part of the Level Three capital cost estimates. To be consistent with the methodology used for calculating user costs, i.e. capital costs spread over twenty-five years, using the current prime interest rate of seven percent (n = 25 years, I = 7%); fleet replacement costs were calculated using the same time period and interest rate.

Based on a twenty-four year life expectancy for the rail fleet, and twelve-year life expectancy for the bus fleet, replacement of the rail fleet was not included in the capital cost estimates, and one replacement of the bus fleet was included in the estimates. Unit cost of the bus fleet was calculated as the initial cost plus the present value of fleet replacement.

Total rail and bus fleet capital costs were based on additional fleet requirements above and beyond the no-build alternative.

Highway Maintenance Costs

Roadway maintenance cost estimates were based on actual maintenance costs of the I-25 corridor from milepost 243 to milepost 269 for the years 2001 through 2005; average cost equaled $14,150 per lane mile plus an escalation of $1,000 per lane mile per year.

Maintenance costs were calculated by multiplying the additional I-25 lane miles per package times the average cost per lane mile (adjusted for the yearly escalation) times twenty-five years. The time period of twenty-five years and an interest rate of seven percent were used in these calculations to be consistent with the methodology used for calculating average user costs.

Transit Operating and Maintenance Costs

Maintenance and operating cost for transit alternatives were based on annual revenue hour projections multiplied by the cost per revenue hour. For feeder, local and commuter bus service the cost per revenue hour factor of $68.85 was based on the existing data reported by each of the three primary transit providers in northern Colorado. This factor was increased for more premium service to $90.64 per revenue hour. Operating and maintenance cost for rail service was based on the cost estimating method use for the US 36 Corridor DEIS.[3]

Transit Cost per User

The total capital cost amortized over 25 years and annual operations and maintenance costs of the transit system divided by the total number of annual transit users.

Highway Expandability

Two different criteria were used to screen for expandability, which included the following:

- Potential to phase the investment to meet the region's needs (within the 2030 study horizon)
- Ability to increase capacity to meet longer-term needs (beyond the 2030 study horizon)
- Packages and components that could best meet both of these criteria were considered favorable.

Transit Operational Expandability

A qualitative measure of the physical capacity of the line to accommodate increased services; and the potential additional costs of the subsequent expansions (i.e. larger platforms, additional train sets or bus vehicles, etc).

Transit and Highway Constructability

Impact to existing users and adjacent property owners was used as the criteria for this measure. More detailed information is necessary to provide a quantitative analysis and summary; therefore, a qualitative summary was used for this evaluation. The construction of specific segments of each package was reviewed to determine which would be the most disruptive to both existing users and property owners. Segment criteria were ranked from the most disruptive to the least disruptive and have been identified below.

- Commuter Rail (CR) along US 287 - this segment is highly urbanized and has high traffic volumes and would include significant improvements.
- Segment length of overall improvements – more impacts with longer segments due to number of properties impacted and longer construction duration.
- Commuter Bus (CB) along US 287 - this segment is highly urbanized and has high traffic volumes; however, not as many impacts as CR.
- Commuter Bus (CB) along US 85 - this segment is urbanized and has relatively high traffic volumes; however, not as many impacts as US 287 CB.

Based on the above criteria, the packages that were the least disruptive were considered favorable.

[3] Transit Operating Plans, Operating Statistics and O&M Costs for Level 3 North I-25 Packages, Manuel Padron and Associates, 12-30-05.

Environmental Criteria

The Level Three environmental evaluation coupled the previous quantitative evaluation with more qualitative criteria. Evaluation at this level was done by package only and not component. The evaluation criteria are listed below in **Table 4-1**.

Table 4-1 Environmental Evaluation Criteria

SUBJECT	CRITERIA
4(f)	What number of known parks and recreation and/or wildlife refuges properties will the proposed transportation improvements impact? Of the properties impacted, which ones will incur impacts to important property features?
Air Quality	Will the alternative affect air quality?
Archaeology	Would any known archaeological resources be impacted from the proposed transportation improvements?
Bicycle and Pedestrian	To what degree will the alignment alternative disrupt existing and proposed bike and pedestrian circulation? Will the transit station locations be easily accessible from existing and proposed bike and pedestrian facilities?
Paleontology	Would any known or unknown paleontological resources be impacted from the proposed transportation improvements?
Economic	Will the alternative provide access to existing and future employment and economic activity areas in the study area? To what degree will the alternative disrupt existing employment/economic activity areas?
Energy	How much fuel will be consumed per day (compared among alternatives)?
Environmental Justice	Will the alternative enhance or split the communities sense of place? Will the proposed alternative enhance or split specifically definable community groups or their community resources?
Geology	Would any known underground mine (potential subsidence) areas be impacted from the proposed transportation improvements?
Hazardous Materials	What type of hazardous material sites will be encountered by the proposed transportation improvements? Of the sites encountered, how many would incur substantial clean up costs (liability) or pose a threat to worker health and safety?
Historic Resources	How many known historic sites would be impacted by the proposed transportation improvements?
Land Use and Zoning	Are the proposed transportation improvements compatible with general land use? What impact does the proposed transportation improvement have on existing residential areas? Does the proposed improvement provide greater access to planned mixed use development?

Table 4-1 Environmental Evaluation Criteria (Cont'd)

Subject	Criteria
Noise (Roadway)	How many sensitive noise receivers would be impacted by the proposed transportation improvements?
Noise (Bus/CR)	What is the maximum number of potentially-affected noise sensitive receivers that could be impacted by the proposed transportation improvements? Is there a possibility of a severe impact (as defined by FTA)?
Parks and Recreation	Would there be direct impacts to any park and recreation areas directly adjacent to proposed corridors?
Prime and Unique Farmland	To what degree will the alternative require the conversion of farmlands to transportation uses?
Right-of-Way	What is the total number of properties that the proposed transportation improvements potentially impact?
Safety and Security	Are there safety and security issues of concern?
Social	Will the alternative accommodate planned growth in the study area? Will the proposed improvements enhance access to social centers and community resources for neighborhoods/residential population areas? Will the proposed improvements bisect or create a barrier within a high density residential area?
T&E Species/Wildlife	How many known or potential areas of state threatened and endangered and/or species of concern habitat are impacted by the proposed transportation improvements? What number of these areas could be classified as high quality?
Vibration (CR)	What is the maximum number of potentially affected receivers that could be impacted by vibration?
Visual	How many viewsheds will be impacted by the proposed improvement? Which of these has a high level of scenic integrity?
Water	What is the number of impacts to water resources, including drinking water associated with the proposed transportation improvements? What number of these impacted resources could be classified as sensitive?
Wetlands	How much wetland area will the proposed corridor impact? What is the quality of the wetlands being impacted?
Safety and Security	Are there safety and security issues of concern?

4.2.3.2 PACKAGE EVALUATION

Table 4-2 summarizes the results of the purpose and need and practicability evaluation. **Table 4-3** summarizes the results of the main differentiators for the environmental evaluation; **Table 4-4** summarizes the results of the other environmental evaluation that were conducted but not considered a differentiator in the comparison of packages.

The results of the package analysis are summarized below.

Safety: The safety evaluation attempted to compare safety for the various packages and improvement components by predicting accidents in 2030 between SH 14 and E-470. However, the differing methodologies needed to predict accidents for different cross sections did not provide a consistent comparison between them. All alternatives equally addressed and improved safety concerns associated with substandard geometric configurations such as sight distance, horizontal alignments, and vertical curves. Based on this, the accident prediction was completed but not used to evaluate or screen alternatives. All alternatives were considered to equally address safety concerns associated with geometric deficiencies.

Aging infrastructure: Packages with longer improvements on I-25 would replace more aging structures along I-25 then those off I-25.

Mobility: Packages 1 through 5 resulted in fewer miles of congestion than packages 6 through 8. There is less difference in hours of congestion among the alternatives. However, expanding to an 8-lane cross section with managed or general purpose lanes results in the lowest private auto travel time (Package 1, 4, and 5). Transit travel times were lowest using managed lanes.

Accessibility: Package 8, serving the western side of the study area with rail served the highest amount of population and employment concentrations. Packages 1, 4 and 6, with improvements primarily along I-25, serve the least amount of population and employment.

Modal Options: Packages with more transit capacity (6, 7 and 8) attracted more transit users, and a greater share of the commuting market to Denver.

Practicability: Packages 3 and 7 (with the most complex components) had the highest capital costs. The recently constructed E-470 directional interchange and the 136th Avenue interchange as well as the 144th Avenue interchange (currently under construction) limit the cross-section that can be extended from the north. Two additional barrier-separated travel lanes in each direction would require design variances at each of these new interchanges; for this reason two barrier-separated lanes (Package 3) were considered impracticable south of E-470. Packages 6, 7 and 8 with a rail component had double the operating and maintenance costs of other packages. All the packages could be phased as well as expanded.

Environment: The Level Three environmental evaluation revealed that there were several analysis areas where the impacts associated with the packages resulted in similar impacts to the natural environment and the built environment, this analysis is shown in **Table 4-4**. There were a number of analysis areas where there were a large range of impacts between packages associated with each of the resources, these area served as the main differentiators and are shown on **Table 4-3**. Conclusions drawn from that analysis are summarized below:

Generally, the packages which utilized existing corridors, Package 1, 2 and 4 had the least potential to impact resources because the proposed improvements were in or on existing transportation corridors.

- *Package 1*, eight general purpose lanes and commuter bus on I-25 had the least impact to resources, because much of the improvement could occur on existing right-of-way.
- *Package 8*, western commuter rail plus HOV/BRT had the most impacts to resources because there were improvements on several alignments including western commuter rail. Impacts associated with these alignments resulted in impacts to stream crossings, wetlands area and potential noise and vibration impacts associated with commuter rail.
- *Packages 7 and 8* with western commuter rail provided the most increased access to existing and future economic and employment centers in the study area.

Table 4-2 Level Three Package Evaluation

	Safety	Aging	Mobility				Accessibility			Modal Options		Practicability						
Packages	Safety	Number of aging structures replaced on I-25	Miles of Congestion (PM NB/SB)	Hours of Congestion (Daily NB/SB)	Transit Travel Time (minutes)	Private Auto Travel Time (minutes)	Change in Vehicle Miles of Travel	Change in Vehicle Hours of Travel	Population and Employment	Transit Share of Work Trips	Daily Transit Users	Capital Cost (billions)	Transit Operating & Maintenance Costs (millions)	Highway Maintenance Costs (millions)	Cost per New Transit Trip (dollars)	Phasing	Expandability	Constructability
na	1,050	0	26/21	6/6	na	56/63	9,633,000	197,800	na	na	na	na	na	na	na	na	na	na
1 - 8 GP	1,150	54	0/0	2/3	90	40/40	606,000	-8,500	13,000/17,000	41/2	2,100	1.17	$7	$3	$6	√	√	Minimally disruptive
2 - Toll	1,350	57	0/4	4/4	90	43/46	164,000	-6,200	41,000/52,000	44/3	3,400	1.70	$12	$4	$10	√		
3 - HOT	1,350	68	0/2.5	3/3	83	43/46	240,000	-8,400	45,000/50,000	38/3	3,600	1.99	$13	$4	$9	√		
4 - LAL	1,100	57	0/2	3/3	90	41/42	395,000	-11,300	14,000/29,000	40/2	2,300	1.51	$9	$3	$9	√		Minimally disruptive
5 - 6GP+2 ML	1,100	54-65	0-4/0-2	2/3	83	41/42	416,000	-9,100	44,000/51,000	39/3	3,600	1.74	$13	$4	$8	√	√	
6 - 6GP+CCR	1,000	54	4/10	3/4	82	46/48	365,000	-6,000	9,000/13,000	47/3	3,800	1.57	$25	$1	$11	√	√	Least disruptive
7 - 6GP+WCR	1,000	54	4/5	3/3	97	45/47	223,000	-9,400	38,000/60,000	48/7	4,600	1.22	$21	$1	$13	√	√	
8 - HOV+WCR	1,000	65	7/14	4/5	83	46/52	128,000	-5,500	56,000/87,000	45/7	6,000	2.34	$32	$3	$17	√	√	Most disruptive

Note: Evaluation measures are based on 2030 conditions, costs are in 2005 dollars.

Table 4-3 Level Three Environmental Evaluation - Main Differentiators

	4(f) - Known Parks, Known Wildlife, and Open Space	Archaeology	Economic	Environmental Justice	Hazardous Materials	Historic Resources	Land Use and Zoning	Noise (CR) and Vibration (CR)	T&E Species/Wildlife	Water	Wetlands
No Action	No Anticipated Impacts to 4(f) Areas	No Known Eligible Sites Would be Impacted	128K 2030 Jobs Served by System	No Anticipated Impacts to EJ Communities	No Impacts Anticipated	No Known Eligible Sites Would be Impacted	No Impacts Anticipated	No Noise Impacts Anticipated No Vibration Impacts Anticipated	No Impacts Anticipated	No Impacts Anticipated	No Impacts Anticipated
Package 1	7 Parcels Impacted 2 of these have Facilities	18 Known NRHP Eligible Archaeological Sites.	167K 2030 Jobs Served by System 22 Activity Centers within 1/2 Mile Poor Rating 52990 2000 Jobs Adjacent to Construction Moderate Rating	Potential adverse effects to 45 blocks or block groups. Potential mobility benefits to 38 blocks or block groups. No adverse effects to community resources. Potential mobility benefits to 1 community resource.	49 Sites with Environmental Concerns	1 Historic Resource Impacted	1 Mile of Existing Residential Landuse Within 100 FT. Buffer	N/A N/A	Sites with Sensitive Species Habitat Impacted. 5 Sites with High Quality Sensitive Species Habitat Impacted.	63 Stream Crossings	38 Acres Potentially Impacted. 9 Station Areas with Potential Moderate to High Wetland Impacts.
Package 2	10 Parcels Impacted 3 of these have Facilities	18 Known NRHP Eligible Archaeological Sites.	202K 2030 Jobs Served by System 27 Activity Centers within 1/2 Mile Moderate Rating 78,438 2000 Jobs Adjacent to Construction Moderate Rating	Potential adverse effects to 104 blocks or block groups. Potential mobility benefits to 161 blocks or block groups. No adverse effects to community resources. Potential mobility benefits to 2 community resources.	232 Sites with Environmental Concerns	1 Historic Resource Impacted	1 Mile of Existing Residential Landuse Within 100 FT. Buffer	N/A N/A	6 Sites with Sensitive Species Habitat Impacted. 5 Sites with High Quality Sensitive Species Habitat Impacted.	63 Stream Crossings	45 Acres Potentially Impacted. 4 Station Areas with Potential Moderate to High Wetland Impacts.
Package 3	12 Parcels Impacted 5 of these have Facilities	21 Known NRHP Eligible Archaeological Sites.	202K 2030 Jobs Served by System 30 Activity Centers within 1/2 Mile Moderate Rating 79,000 2000 Jobs Adjacent to Construction Moderate Rating	Potential adverse effects to 95 blocks or block groups. Potential mobility benefits to 164 blocks or block groups. No adverse effects to community resources. Potential mobility benefits to 1 community resource.	281 Sites with Environmental Concerns	14 Historic Resources Impacted	5.8 Miles of Existing Residential Landuse Within 100 FT. Buffer	N/A N/A	7 Sites with Sensitive Species Habitat Impacted. 5 Sites with High Quality Sensitive Species Habitat Impacted.	77 Stream Crossings	55 Acres Potentially Impacted. 15 Station Areas with Potential Moderate to High Wetland Impacts.
Package 4	10 Parcels Impacted 3 of these have Facilities	18 Known NRHP Eligible Archaeological Sites.	213K 2030 Jobs within TAZ 23 Activity Centers within 1/2 Mile Moderate Rating 70,708 2000 Jobs Adjacent to Construction Moderate Rating	Potential adverse effects to 49 blocks or block groups. Potential mobility benefits to 38 blocks or block groups. No adverse effects to community resources. Potential mobility benefits to 1 community resource.	52 Sites with Environmental Concerns	1 Historic Resource Impacted	1 Mile of Existing Residential Landuse Within 100 FT. Buffer	N/A N/A	6 Sites with Sensitive Species Habitat Impacted. 5 Sites with High Quality Sensitive Species Habitat Impacted.	62 Stream Crossings	43 Acres Potentially Impacted. 9 Station Areas with Potential Moderate to High Wetland Impacts.
Package 5	11 Parcels Impacted 3 of these have Facilities	21 Known NRHP Eligible Archaeological Sites.	201K 2030 Jobs within TAZ 30 Activity Centers within 1/2 Mile Moderate Rating 78,635 2000 Jobs Adjacent to Construction Moderate Rating	Potential adverse effects to 115 blocks or block groups. Potential mobility benefits to 166 blocks or block groups. No adverse effects to community resources. Potential mobility benefits to 2 community resources.	269 Sites with Environmental Concerns	14 Historic Resources Impacted	5.1 Miles of Existing Residential Landuse Within 100 FT. Buffer	N/A N/A	7 Sites with Sensitive Species Habitat Impacted. 5 Sites with High Quality Sensitive Species Habitat Impacted.	78 Stream Crossings	45 Acres Potentially Impacted. 8 Station Areas with Potential Moderate to High Wetland Impacts.
Package 6	25 Parcels Impacted 4 of these have Facilities	23 Known NRHP Eligible Archaeological Sites.	134K 2030 Jobs Served by System 11 Activity Centers within 1/2 Mile Poor Rating 18,486 2000 Jobs Adjacent to Construction Good Rating	Potential adverse effects to 33 blocks or block groups. Potential mobility benefits to 7 blocks or block groups. No adverse effects to community resources. No known mobility benefits to community resources.	125 Sites with Environmental Concerns	2 Historic Resources Impacted	5.5 Miles of Existing Residential Landuse Within 100 FT. Buffer	300 Potential Noise Impacts. Using SH 119 301 Potential Noise Impacts Using GWRR. 33 Potential Vibration Impacts Using SH 119 56 Potential Vibration Impacts Using GWRR.	Sites with Sensitive Species Habitat Impacted. 5 Sites with High Quality Sensitive Species Habitat Impacted.	102 Stream Crossings	48 Acres Potentially Impacted. 10 Station Areas with Potential Moderate to High Wetland Impacts.
Package 7	22 Parcels Impacted 3 of these have Facilities	32 Known NRHP Eligible Archaeological Sites.	270K 2030 Jobs Served by System 18 Activity Centers within 1/2 Mile Moderate Rating 68,171 2000 Jobs Adjacent to Construction Moderate Rating	Potential adverse effects to 109 blocks or block groups. Potential mobility benefits to 235 blocks or block groups. Adverse effects to 1 community resource. Potential mobility benefits to 8 community resources.	126 Sites with Environmental Concerns	1 Historic Resource Impacted	10.5 Miles of Existing Residential Landuse Within 100 FT. Buffer	2738 Potential Noise Impacts. 1054 Potential Vibration Impacts.	10 Sites with Sensitive Species Habitat Impacted. 8 Sites with High Quality Sensitive Species Habitat Impacted.	78 Stream Crossings	39 Acres Potentially Impacted. 1 Station Area with Potential Moderate to High Wetland Impacts.
Package 8	25 Parcels Impacted 4 of these have Facilities	37 Known NRHP Eligible Archaeological Sites.	317K 2030 Jobs within TAZ 35 Activity Centers within 1/2 Mile Good Rating 149,218 2000 Jobs Adjacent to Construction Poor Rating	Potential adverse effects to 150 blocks or block groups. Potential mobility benefits to 272 blocks or block groups. Adverse effects to 1 community resource. Potential mobility benefits to 8 community resources.	193 Sites with Environmental Concerns	15 Historic Resources Impacted	16.0 Miles of Existing Residential Landuse Within 100 FT. Buffer	2894 Potential Noise Impacts Using SH 119 2887 Potential Noise Impacts Using GWRR. 1055 Potential Vibration Impacts Using SH 119 1078 Potential Vibration Impacts Using GWRR.	Sites with Sensitive Species Habitat Impacted. 9 Sites with High Quality Sensitive Species Habitat Impacted.	119 Stream Crossings	55 Acres Potentially Impacted. 8 Station Areas with Potential Moderate to High Wetland Impacts.

Legend

= Alternative with least impacts to resource

= Alternative with most impacts to resource

Table 4-4 Level Three Environmental Evaluation - Other Analysis Areas

	Air Quality	Bicycle & Pedestrian	Paleontology	Energy	Geology	Noise (Roadway)	Prime & Unique Farmland	Right-of-Way	Safety & Security	Social	Visual
No Action	Least VMT* Highest VHT** Lowest Speeds	No Impacts to Existing or Proposed Bicycle and Pedestrian Facilities	No Known or Unknown Resources Would be Impacted	1,242,544 Gallons of Fuel Used Per Day	No Impacts Anticipated	743 Receivers Impacted in 2030	No Impacts Anticipated	No Right-of-Way Impacts Anticipated	No Impacts Anticipated	No Impacts Anticipated	No Impacts Anticipated
Package 1	Package 1 VMT increases 1.5% over the No Action VMT, but VHT decreases 3.2%	6,213 FT. Regional Facilities Impacted - Good 94,555 FT. of Total Facilities Impacted - Good 31 Local Facilities within 1 Mile of Station Sites - Poor 4 Regional Facilities within 1 Mile of Station Sites - Poor	Yes, known and unknown resources may be impacted	1,260,696 gallons of fuel used per day.	Mine Subsidence & Related Issues Throughout.	719 Receivers Impacted	2436 Acres of Prime & Important Farmland Impacted.	Continuous ROW takes along I-25 only; no additional ROW for stations (same as Package 4).	Transit: No new railroad grade crossings; (See P&N Safety analysis for highway).	62K 2030 HH Served by Improvements (Poor). 13 Community Resources within 1 Mile (Poor).	4 Views Impacted 3 Highly Scenic Views
Package 2	There is virtually no overall change in VMT between No Action and Package 2	8,831 FT. of Regional Facilities Impacted - Moderate 102,751 FT. of Total Facilities Impacted - Moderate 69 Local Facilities within 1 Mile of Station Sites - Moderate 9 Regional Facilities within 1 Mile of Stations Sites - Moderate	Yes, known and unknown resources may be impacted	1,242,068 gallons of fuel used per day	Mine Subsidence & Related Issues Throughout.	750 Receivers Impacted	2747 Acres of Prime & Important Farmland Impacted.	Continuous ROW takes along I-25, with additional intermittent ROW takes along 287 and 85 (queue jumps); no additional ROW for stations.	Transit: No new railroad grade crossings; (See P&N Safety analysis for highway).	88K 2030 HH Served by Improvements (Moderate). 41 Community Resources within 1 Mile (Moderate).	8 Views Impacted 5 Highly Scenic Views
Package 3	Package 3 VMT decreases 0.1% over the No Action VMT, and VHT decreases 3.9%	17,566 FT. of Regional Facilities Impacted - Poor 127,216 FT. of Total Facilities Impacted - Poor 91 Local Facilities within 1 Mile of Station Sites - Moderate 13 Regional Facilities within 1 Mile of Station Sites - Good	Yes, known and unknown resources may be impacted	1,241,448 gallons of fuel used per day	Mine Subsidence & Related Issues Throughout.	671 Receivers Impacted	2828 Acres of Prime & Important Farmland Impacted.	Continuous ROW takes along I-25 with additional ROW required for stations; and intermittent ROW takes along 287 and 85 (queue jumps).	Transit: No new railroad grade crossings; (See P&N Safety analysis for highway).	90K 2030 HH Served by Improvements (Moderate). 41 Community Resources within 1 Mile (Moderate).	10 Views Impacted 5 Highly Scenic Views
Package 4	Package 4 VMT decreases 0.5% over the No Action VMT, and VHT decreases 4.1%	8,047 FT. of Regional Facilities Impacted - Moderate 101,746 FT. of Total Facilities Impacted - Poor 31 Local Facilities within 1 Mile of Station Sites - Poor 4 Regional Facilities within 1 Mile of Station Sites - Poor	Yes, known and unknown resources may be impacted	1,248,261 gallons of fuel used per day	Mine Subsidence & Related Issues Throughout.	739 Receivers Impacted	2661 Acres of Prime & Important Farmland Impacted.	Continuous ROW takes along I-25 only; no additional ROW for stations (same as Package 1).	Transit: No new railroad grade crossings; (See P&N Safety analysis for highway).	76K 2030 HH Served by Improvements (Moderate). 13 Community Resources within 1 Mile (Poor).	4 Views Impacted 3 Highly Scenic Views
Package 5	Package 5 VMT decreases 0.6% over the No Action VMT, and VHT decreases 3.8%	16,400 FT. of Regional Facilities Impacted - Poor 120,976 FT. of Total Facilities Impacted - Moderate 91 Local Facilities within 1 Mile of Station Sites - Moderate 13 Regional Facilities within 1 Mile of Station Sites - Good	Yes, known and unknown resources may be impacted	1,249,690 gallons of fuel used per day	Mine Subsidence & Related Issues Throughout.	741 Receivers Impacted	2557 Acres of Prime & Important Farmland Impacted.	Continuous ROW takes along I-25 with additional ROW required for stations along I-25 (same as Package 3, with smaller footprint south of 66); and intermittent ROW takes along 287 and 85 (queue jumps) .	Transit: No new railroad grade crossings; (See P&N Safety analysis for highway)	90K 2030 HH Served by Improvements (Moderate). 41 Community Resources within 1 Mile (Moderate).	3 Views Impacted 3 Highly Scenic Views
Package 6	Package 6 VMT decreases 0.6% over the No Action VMT, and VHT decreases 3.1%	4,611 FT. of Regional Facilities Impacted - Good 99,105 FT. of Total Facilities Impacted - Good 26 Local Facilities within 1 Mile of Station Sites - Poor 6 Regional Facilities within 1 Mile of Station Sites - Poor	Yes, known and unknown resources may be impacted	1,249,690 gallons of fuel used per day	Mine Subsidence Issues Throughout.	731 Receivers Impacted	2112 Acres of Prime & Important Farmland Impacted.	Continuous ROW takes along I-25 and SH 119 with additional ROW required for stations.	Transit: New grade crossings along SH 119; I-25 crossings will be grade-separated.	55K 2030 HH Served by Improvements (Poor). 3 Community Resources within 1 Mile (Poor).	3 Views Impacted 2 Highly Scenic Views
Package 7	Package 7 VMT decreases 0.2% over the No Action VMT, and VHT decreases 4%	2,583 FT. of Regional Facilities Impacted - Good 132,900 FT. of Total Facilities Impacted - Poor 95 Local Facilities within 1 Mile of Station Sites - Good 9 Regional Facilities within 1 Mile of Station Sites - Moderate	Yes, known and unknown resources may be impacted	1,240,257 gallons of fuel used per day	No construction planned through mined areas (I-25 MM 230.5 to 236.9).	712 Receivers Impacted	1772 Acres of Prime & Important Farmland Impacted.	Continuous ROW takes along BNSF (plus additional ROW for stations); Continuous ROW takes along I-25 (though less than any other I-25 alt); and intermittent ROW takes along 85 (queue jumps).	Transit: More frequent grade crossings along BNSF (higher incident probability).	142K 2030 HH Served by Improvements (Good). 43 Community Resources within 1 Mile (Moderate).	3 Views Impacted 0 Highly Scenic Views
Package 8	Package 8 VMT decreases 0.1% over the No Action VMT, and VHT decreases 3.2%	17,187 FT. of Regional Facilities Impacted - Poor 177,106 FT. of Total Facilities Impacted - Poor 135 Local Facilities within 1 Mile of Station Sites - Good 16 Regional Facilities within 1 Mile of Station Sites - Good	Yes, known and unknown resources may be impacted	1,241,448 gallons of fuel used per day	Mine Subsidence & Related Issues Throughout.	698 Receivers Impacted	2789 Acres of Prime & Important Farmland Impacted.	Continuous ROW takes along BNSF and Sh 119 with addition ROW required for stations; Continuous ROW takes along I-25 with additional ROW required for stations; Intermittent ROW takes along 85 (queue jumps).	Transit: New grade crossings along SH 119; more frequent grade crossings along BNSF Note: Personal security at station areas will be evaluated in the DEIS	172K 2030 HH Served by Improvements (Good). 53 Community Resources within 1 Mile (Good).	7 Views Impacted 3 Highly Scenic Views

* VMT = vehicle miles traveled
** VHT = vehicle hours traveled

THIS PAGE LEFT BLANK INTENTIONALLY

4.3 SCREENING RESULTS

The Level Three evaluation was designed to answer a specific set of questions. Each of these questions is answered below:

Which type of transit service is most effective: commuter bus vs. BRT vs. commuter rail?

- Effectiveness was measured in two ways: the alternative's ability to attract riders, and the number of riders attracted compared to the cost of the alternative. Commuter rail attracted the most riders, generating ridership ranging between 3500 and 4500 riders. By contrast, BRT generated between 2500 and 3000 riders and commuter bus generated between 1500 and 2000 riders. When the ridership is compared to cost, the bus options were much more cost effective: Commuter Bus packages cost less than half for each new transit trip than commuter rail packages ($6 per new transit trip vs. $11 to $13 per new transit trip.) New passenger trips on BRT packages cost about a third less than commuter rail packages ($8 to $9 per trip.)

Can a transit connection to Denver International Airport be justified?

- Service to DIA attracted approximately 20% more riders than transit service to DUS only. Therefore, bus service to DIA was retained as a justified service. Rail service to DIA was not considered, due to the RTD service planned as part of the FasTracks system, and the comparatively small transit market to DIA compared to DUS. Compared to overall North Front Range travel patterns, only 2-3% of all NFR trips travel to the Denver area. An even smaller percent travel to DIA. Whereas 20% more ridership on bus was justifiable compared to the cost, 20% more on rail was too low to merit the rail extension in a corridor where rail is already being extended.

Which commuter rail alignment works best: central or west?

- Commuter rail lines along the BNSF and I-25 attracted similar levels or ridership, but the I-25 alignment would cost twice as much, largely due to the need for all new right-of-way and the need for all new bridges and other crossing treatments. By comparison, the BNSF line allowed the use of an existing track (halving the cost of a new double-track alignment), and the crossings are already built.

Does a commuter rail connection between the northern areas of Denver and Longmont improve effectiveness?

- The Longmont/North metro connection did not substantially improve ridership (adding between 10% and 20% more riders), and compared to its cost likely another 2/3 the cost of the BNSF alignment, was not considered justified. However, stakeholder meetings held at the conclusion of Level Three produced large public interest in an alternative connection to Denver that would not force them to travel through Boulder. Therefore, it was carried into the DEIS for additional screening.

Can a commuter rail spur to Greeley be justified?

- When the Western alignment was selected over the Central alignment, the feasibility of a spur to Greeley decreased substantially due to the additional cost, and the service to a market that is not directly related to the purpose and need. There is a proven transit market between Greeley and Loveland and Greeley and Fort Collins. However, serving that market is

secondary to serving the transit demand to Denver. Whereas a bus alternative would travel directly south from Greeley to Denver, a rail alternative would force Greeley passengers to travel out-of-direction to the Western side of the corridor to then go south. The trip demand from Greeley to Denver could be served more directly and more efficiently with a bus service.

Where do volumes merit six lanes, eight lanes and / or auxiliary lanes on I-25?

- Travel demand estimates generated using the travel forecasting model during Level Three indicated that six general purpose lanes would be sufficient along much of I-25 in 2030; eight lanes and/or auxiliary lanes would be required south of SH 52 and through the Fort Collins/Loveland area.

Which is better, managed lanes or general purpose lanes?

- General purpose lanes are less expensive, better utilized, and have fewer environmental impacts than the managed lanes (limited access lanes, toll, HOT or HOV). However, HOT and HOV lanes enable multimodal travel.

Which is better: HOV, HOT, Toll or limited access lanes?

- Of the express-lane alternatives, HOT lanes would provide the most reduction in congestion of the general purpose lanes and would have the highest utilization of the three types of managed lanes considered.

Which is better for managed lanes: a single buffer-separated lane or two barrier-separated lanes?

- A single buffer-separated express lane would accommodate travel demand in most of the corridor. Two barrier-separated lanes would be necessary to accommodate demand through the Fort Collins/Loveland area. Two barrier-separated lanes would require a wider cross section and would have more potential to negatively impact environmental resources. Barrier-separated lanes would cost more.

Where on I-25 are managed lanes optimal?

- Managed lanes have the highest demand and utilization in the Denver metro area and through the Fort Collins/Loveland area.

In addition, through the Level Three analyses, the following was determined:

- Greeley is best served by an independent Commuter Bus or Bus Rapid Transit alignment, rather than a rail spur. A rail spur would require coordinating operating plans to match the 30 minute service to the FasTracks end-of-line in Thornton. To match the 30 minute service, trains from both Greeley and Fort Collins would have to depart every 60 minutes, which decreases ridership, or a train from Greeley to the main line would have to depart every 30 minutes, and passengers would have to transfer to the main line. Forcing transfers also decreases ridership. By contrast, commuter bus service could leave every 30 minutes along the US85 corridor, or every 30 minutes along the I-25 corridor, and still be much more cost effective than rail service.
- Fort Collins is best served by the western alignment with the northern terminus at the North Transit Center. Because the Central alignment was not selected, a spur to Fort Collins did not require analysis. The North Transit Center is easily accessible by both the street system as well as transit services, and is located immediately south of an existing freight yard which would allow the commuter rail vehicles to turn around easily.

- Service to DIA should be retained as it adds ridership to the main line. For Commuter Bus along US 85 services to DIA attracted an additional 500 riders; which equates to an increase in ridership of approximately 20%.

4.4 LEVEL THREE LESSONS LEARNED

The following conclusions were drawn and used to help identify the best improvement packages for evaluation in the DEIS.

- Additional lanes would be necessary on I-25 regardless of the transit improvements provided.
- Regardless of the highway improvement selected, interchanges and structures require improvement along the I-25 alignment.
- Transit services along I-25 and either US 85 or US 287 compete for ridership. Either all transit should be concentrated along the central alignment, or transit service would be offered along the western alignment and US 85 alignment. In this way the services avoid drawing riders from similar geographic areas.

4.4.1 Highway Lessons Learned

- Limited access lanes would provide capacity comparable to 8 general purpose lanes but would not be as well utilized and would cost more than general purpose lanes. Capital cost for the limited-access lanes was $1.44 billion. The comparable eight general purpose lanes were $1.10 billion. Limited access lanes were dropped from further consideration
- High Occupancy Vehicle Lanes would experience seven to 14 miles of congestion in the PM peak hour northbound and southbound, respectively. A comparable six general purpose lane cross section would have about half as much congestion. HOV lanes were dropped from further consideration.
- For managed-lanes, two barrier-separated lanes may be necessary along sections of the corridor but a single buffer-separated lane in each direction provides adequate capacity along much of the corridor and costs less than a barrier-separated section.
- Of the managed-lane alternatives, high-occupancy/toll lanes would provide the most congestion relief and would have the highest utilization of the express-lane options.
- Eight general purpose lanes may be necessary in select locations while six lanes would be adequate along much of the corridor.
- A combination of barrier and buffer-separated express lanes were forwarded into the DEIS for further consideration.

4.4.2 Transit Lessons Learned

- Western commuter rail attracted similar ridership as well as market share to Denver when compared to central commuter rail, but the transit elements cost less and attracted more riders to Boulder. For these reasons, Western commuter rail was forwarded to the DEIS; the Central Commuter Rail alignment was dropped from further consideration
- I-25 BRT attracted 30% fewer riders than rail alternatives but also cost about 80% less, and so Bus Rapid Transit along I-25 was retained for further consideration in the DEIS

- I-25 Commuter Bus attracted the least amount of ridership. Commuter Bus on US 85 attracted the highest ridership, but the commuter bus service on US 287 attracted the least of all the transit components. Therefore, the Western and Central Commuter Bus alignments were dropped from further consideration, but Commuter Bus service along US 85 was forwarded to the DEIS.

5.0 DEIS ALTERNATIVES DEVELOPMENT

5.1 DEIS PACKAGE DEVELOPMENT

Alternatives evaluated in the DEIS were a culmination of three levels of evaluation and screening. This section describes the development of alternatives that will be evaluated in the DEIS.

5.1.1 Highway Assumptions

In Level Three, evaluation of various packaged transit and highway improvements indicated that I-25 would need to be widened to accommodate future development regardless of the transit improvements provided. I-25 could be widened in two basic ways: additional general purpose lanes or with express lanes.

- Using general purpose lanes, a six-lane cross section is sufficient in much of the area while eight lanes and or auxiliary lanes would be required in select locations. Based on travel demand identified in the previous rounds of screening, the DEIS alternatives include a combination of six/eight general purpose lanes along I-25.
- Of the express-lane alternatives, HOT lanes were found to provide the most reduction in congestion of the general purpose lanes and would have the highest utilization. However, the Executive Oversight Committee recommended that the project not limit the potential management options without additional consideration. Based on this, the DEIS alternatives include express lanes that could be managed in three distinct ways. The first is to toll all vehicles. The second is to toll single occupant vehicles and allow high occupancy vehicles to use the lanes for free and the third is to toll single occupant vehicles and allow high occupancy vehicles to use the lanes at a discount.
- Regardless of the tolling mechanism used, an action of the Colorado Tolling Enterprise changed the nomenclature of the express lanes to “Tolled Express Lanes” (TEL). Therefore, the DEIS will refer to TEL rather than to managed or express lanes.

5.1.2 Transit Assumptions

In Level Three, transit modes were advanced largely based on the number of riders they attracted compared to their costs.

- Commuter rail attracted the highest level of ridership, but bus alternatives were the most cost effective.
- Commuter rail service along the BNSF was less expensive than building commuter rail along I-25. It also provided both benefits and potential impacts to the communities.
- It was also found that transit lines on I-25 competed for riders with proximate transit service along US 287 and US 85. Transit services along US 287 and US 85 do not compete for riders.
- Bus transit service to DIA attracted substantial ridership and appeared to have the potential to improve the cost effectiveness of bus service.

5.1.3 CONGESTION MANAGEMENT ASSUMPTIONS

During the DEIS Development process, several agencies were interviewed to determine how the congestion management elements that were advanced from Level Three Screening would best be applied within the study area. As a result, the congestion management elements were refined, and applied to each Alternative package, as shown in **Table 5-1.**

Table 5-1 Congestion Management Elements Considered in DEIS Development

Congestion Management Strategies	Level 3 Recommendation	DEIS DRAFT RECOMMENDATION
Local Transit Service	Re-route local routes to include stops that connect to rail service, commuter bus service and express transit service	INCLUDE in DEIS Alternatives A and B
	Extend Foxtrot service from Loveland to Longmont	INCLUDE in DEIS Alternative B
Express Transit Service	Consider a new route from Greeley to Fort Collins	INCLUDE in DEIS Alternatives A and B Test in Feeder Bus Networks with Alternatives A and B
Carpool and Vanpool	Support NFRMPO ridesharing programs	Include the following in DEIS; Initiate discussions regarding cooperative purchasing; Consider providing funds for marketing of vanpooling during construction (e.g. bus passes; satellite parking and transit service)
	Maintain and enhance existing carpool lots along I-25	INCLUDE in DEIS Alternatives A and B Provide equal or greater carpool lot capacity and amenities in addition to station area park-and-ride capacity and amenities
	Consider development of a Transportation Management Organization (TMO)	INCLUDE in DEIS Alternatives A and B Consider providing seed money to support the development of a TMO along the North I-25 project area
Telecommuting	Support NFRMPO program	**DO NOT INCLUDE in DEIS**

Table 5-1 Congestion Management Elements Considered in DEIS Development (Cont'd)

Congestion Management Strategies	Level 3 Recommendation	DEIS DRAFT RECOMMENDATION
Support Land Use Policies	Support local Sustainable Growth policies	Include the following in DEIS; Initiate cooperative support of Sustainable Growth Land Use policies; include study of Cumulative Land Use Impacts and Induced Growth in DEIS; Consider hosting a two-day conference on land use and transportation
Incident Management Program	Adhere to and update existing Region 4 Incident Management Plan	INCLUDE in DEIS Alternatives A and B Include the capital and operating costs of a courtesy patrol from SH 14 to SH 7
Signal Coordination and Prioritization	US 85 from 8th Ave and 8th St Transit Center to Denver Union Station; Harmony from South Transit Center to I-25	INCLUDE in DEIS Alternatives A and B (US 85- access management plan implementation and signal coordination) INCLUDE in DEIS Alternative B (Harmony – signal coordination)
Ramp Metering	Include where warranted by volumes and queue lengths	INCLUDE in DEIS Alternatives A and B Implement as applicable to predicted congestion after build-out
Real Time Transportation Information	Variable messaging signs at all Commuter Rail and BRT stations, plus 8th and 8th, Brighton, 84th Street Regular updates on transit agency website	INCLUDE in DEIS Alternatives A and B Add VMS to all transit stations; Implement Region 4 ITS Plan, and include all improvements north of SH 66 in addition to fiber conduit from 120th Ave to SH 14.
Bicycle/Pedestrian Facilities	Station areas along transit alignments	INCLUDE in DEIS Alternatives A and B Provide links to bicycle and pedestrian facilities surrounding station areas

Packaging Assumptions

Based on the findings in Level Three, two packages of improvements and the No-Action Alternative were developed for further evaluation in the DEIS.

Package A distributed improvements across the project area.

- On I-25, one additional general purpose lane would be added in each direction with additional auxiliary lane from SH 402 to SH 60. As general purpose lanes do not provide an operating environment conducive to high quality transit service, this package included transit service to both sides of I-25.
- As the most successful transit alternative in attracting ridership, commuter rail service along the BNSF was advanced for further analysis in the DEIS.
    - Understanding that It would not serve the eastern project area residents, however, and that transit service must be carefully spaced to maximize ridership, it was paired with a commuter bus service on US 85. The commuter bus service assumed that vehicles would operate in the general purpose lanes of US 85. (As the eastern side of the study area has the least amount of communities to serve, commuter bus service provides a reliable transit option without providing too much capacity.)
    - Level 3 results supported including service to DIA due to the additional ridership it attracts. Therefore, the commuter bus service was planned with two alternating destinations from Greeley: downtown Denver and Denver International Airport.

Package B concentrated improvements along I-25.

- TEL provided the most relief to general purpose lanes, and the highest utilization of the managed lane options.
- TEL on I-25 provide a reliable guideway for a BRT system; therefore this is a natural pairing of highway and transit improvements.
    - With focused transit service on I-25 there is no competing service along US 85 or US 287.
    - In order to directly serve the communities which are offset from the interstate, BRT legs to Fort Collins and Greeley, and to both DIA and DUS were provided. This combination of improvements is referred to as DEIS Package B.

5.2 ALTERNATIVES DEVELOPMENT

5.2.1 No-Action Alternative

The No-Action Alternative was defined previously as a conservative estimate of safety and maintenance improvements that will need to be constructed if the build alternatives are not built. For the DEIS locations were better defined where those improvement types would be needed.

Maintenance of Structures
CDOT determines eligibility for bridge replacements or rehabilitations based on the structure's sufficiency rating; 100 is the maximum sufficiency rating a bridge can achieve. In general, a bridge with a sufficiency ratings of 50 or less can be considered for replacement; and a bridge with a sufficiency rating of 51 to 80 should be considered for rehabilitation if a roadway construction project involves that particular structure. To warrant a stand-alone bridge replacement project, a structure's sufficiency rating would have drop to 25 or less.

- For the purposes of determining which bridges within the North I-25 Corridor will require replacement or rehabilitation before 2030 the following assumptions were made:
- Structures will lose one (1) sufficiency rating point every five (5) years due to normal deterioration for a total of five (5) points over the next 24 years.
- Structures with a current sufficiency rating of 30 or less will be considered as requiring replacement before 2030.
- Structures with a current sufficiency rating of 31 to 50 will be considered as requiring major rehabilitation before 2030.
- Structures with a current sufficiency rating of 51 to 80 will be considered as requiring minor rehabilitations before 2030.
- Structures located from SH 66 to SH 52 are assumed to be replaced as part of the general purpose lane widening in CDOT Region 4 as part of a separate action.
- Based on the above criteria, from US 36 to SH 1, no structures will require replacement, three (3) structures will require major rehabilitation and twenty-five (25) structures will require minor rehabilitation. These are listed in **Table 5-2.**

Table 5-2 No Action Structure Replacement/Rehabilitation

DESCRIPTION	YEAR BUILT	SUFFICIENCY RATING	REPLACE	REHAB MAJOR	REHAB MINOR
US 36 WB HOV Ramp over I-25 SB	1972	49.90		**	
US 36 WB Ramp over I-25 SB	1998	90.70		**	
US 36 WB over I-25	1998	95.50		**	
84th Avenue over I-25	1959	42.10		yes	
Pedestrian Underpass	1955	76.10			yes
88th Avenue over I-25	1972	67.50			yes
Thornton Pkwy over I-25	1985	75.10			yes
104th Avenue over I-25	1962	45.80		yes	
Pedestrian Overpass	1976	N.A.			
I-25 over Farmers Highline Canal	1954	69.00			yes
Community Center Drive over I-25	2003	New			
Wagon Rd HOV Ramp R	1992	88.80			
Pedestrian Underpass	1954	75.90			yes
120th Avenue (SH 128) over I-25	1962	New			
128th Avenue over I-25	1962	57.80			yes
I-25 over Big Dry Creek	1956	81.40			
136th Avenue over I-25	2003	New			
I-25 over Bull Canal	1956	75.70			yes
144th Avenue over I-25 (Under Construction)	2006	New			
Ramp F Flyover I-25 SB to E-470 EB	2003	New			
I-25 NB over Northwest Parkway (NWP)	2003	New			
I-25 SB over Northwest Parkway (NWP)	2003	New			
Ramp D Flyover E-470 WB to I-25 SB	2003	New			
Ramp H Flyover NWP EB to I-25 NB	2003	New			
Ramp B Flyover I-25 NB to NWP WB	2003	New			
160th Avenue over I-25	2003	New			
SH 7 over I-25	1987	98.20			
I-25 NB over WCR 6	2004	New			
I-25 SB over WCR 6	2004	New			
I-25 over Bull Canal	2003	New			
WCR 8 over I-25	2004	New			
Draw	2004	New			

Table 5-2 No Action Structure Replacement/Rehabilitation (Cont'd)

DESCRIPTION	YEAR BUILT	SUFFICIENCY RATING	REPLACE	REHAB MAJOR	REHAB MINOR
I-25 NB over WCR 10	2005	New			
I-25 SB over WCR 10	2005	New			
Draw	2005	New			
Draw (Service Road)	1936	78.30			yes
SH 52 over I-25	1999	New	*		
Channel MD-B under W Frontage Road Entrance Ramp	2000	New	*		
Channel MD-B under NW @ I-25/SH 52	2000	New	*		
Channel MD-B under E Frontage Road	2000	New	*		
Lower Boulder Ditch under I-25 & Frontage Roads	2000	New	*		
WCR 20 Underpass	1959	67.60	*		
I-25 NB over SH 119	1998	96.20	*		
I-25 SB over SH 119	1998	96.20	*		
I-25 NB over St. Vrain Creek	1958	83.30	*		
I-25 SB over St. Vrain Creek	1958	83.30	*		
I-25 Service Road over St. Vrain Creek	1999	93.60	*		
WCR 28 Underpass	1959	69.60	*		
SH 66 over I-25	1958	60.50	*		
I-25 NB over WCR 32	1961	89.90			
I-25 SB over WCR 32	1961	89.90			
WCR 34 over I-25	1961	83.90			
Draw	1961	79.80			yes
I-25 NB over GWRR	1961	91.90			
I-25 SB over GWRR	1961	80.70			
WCR 38 over I-25	1960	85.30			
I-25 NB over Access Road (Valley Dirt Riders)	1961	89.90			
I-25 SB over Access Road (Valley Dirt Riders)	1961	89.90			
I-25 NB over Little Thompson River	1961	93.00			
I-25 SB over Little Thompson River	1961	93.00			
I-25 Service Road over Little Thompson River (Historic)	1938	61.30			N.A.
SH 56 over I-25	1961	68.50			yes
I-25 NB over WCR 46	1961	89.90			
I-25 SB over WCR 46	1962	89.90			

Table 5-2 No Action Structure Replacement/Rehabilitation (Cont'd)

DESCRIPTION	YEAR BUILT	SUFFICIENCY RATING	REPLACE	REHAB MAJOR	REHAB MINOR
I-25 NB over GWRR	1961	89.90			
I-25 NB over GWRR	1961	89.90			
I-25 SB over GWRR	1962	89.90			
SH 60 (East) over I-25	1962	80.20			
SH 60 (East) over I-25	1962	80.20			
I-25 NB over LCR 14 (SH 60 West)	1962	94.00			
I-25 SB over LCR 14 (SH 60 West)	1962	91.90			
* Denotes structures replaced under a separate action.					
**Denotes structures studied under a separate action.					
I-25 NB over LCR 16	1962	91.90			
I-25 SB over LCR 16	1962	91.90			
Draw	1961	74.60			yes
Draw (Service Rd)	1941	79.00			yes
I-25 NB over SH 402	1962	96.60			
I-25 SB over SH 402	1962	96.60			
LCR Underpass (Hillsboro Ditch Access Road)	1963	66.00			yes
I-25 NB over Big Thompson River	1962	93.00			
I-25 SB over Big Thompson River	1962	93.00			
I-25 Service Road over Big Thompson River	1942	95.70			
LCR 20E over I-25	1962	76.60			yes
GWRR over I-25	1962	N.A.			
US 34 EB over I-25	1962	75.30			yes
US 34 WB over I-25	1962	75.30			yes
Greeley-Loveland Ditch	1947	94.00			
I-25 NB over UPRR	1965	91.30			
I-25 SB over UPRR	1965	91.30			
I-25 NB over Crossroads Blvd. (LCR 26 / Airport Dr)	1965	93.20			
I-25 SB over Crossroads Blvd. (LCR 26 / Airport Dr)	1965	82.20			
SH 392 over I-25	1965	75.30			yes
LCR 36 over I-25	1965	87.80			
Harmony Road (SH 68) over I-25	1999	94.30			
I-25 NB over Cache la Poudre River	1948	97.00			

Table 5-2 No Action Structure Replacement/Rehabilitation (Cont'd)

DESCRIPTION	YEAR BUILT	SUFFICIENCY RATING	REPLACE	REHAB MAJOR	REHAB MINOR
I-25 SB over Cache la Poudre River	1965	79.50			Yes
I-25 NB over BNSF Spur (CSRR)	1966	76.60			yes
I-25 SB over BNSF Spur (CSRR)	1966	96.20			
Prospect Road over I-25	1966	66.60			yes
Lake Canal	1966	79.40			yes
Prospect Road over I-25	1966	66.60			yes
Lake Canal	1966	79.40			yes
Timnath Ditch	1966	79.40			yes
Box Elder Creek	1968	79.40			yes
SH 14 EB over I-25	1966	84.10			
SH 14 WB over I-25	1966	82.10			
I-25 NB over BNSF	1966	94.20			
I-25 SB over BNSF	1966	94.20			
LCR 48 over I-25	1966	83.60			
I-25 NB over Windsor Res. Canal Ditch	1950	97.40			
I-25 SB over Windsor Res. Canal Ditch	1966	97.40			
I-25 Service Road over Windsor Res. Canal Ditch	1966	86.70			
Brewery Road over Box Elder Creek Overflow	1985	80.00			
Mountain Vista Drive (Brewery Rd) over I-25	1985	99.60			
I-25 NB over Flood Drainage	1950	81.90			
Ramp to I-25 NB over Box Elder Creek Overflow	1985	80.00			
I-25 NB over Flood Drainage	1950	81.90			
Ramp to I-25 NB over Flood Drainage	1950	97.10			
I-25 Service Road over Flood Drainage	1950	81.90			
LCR 52 over I-25	1966	85.10			
I-25 NB over Larimer County Canal	1950	97.50			
I-25 SB over Larimer County Canal	1966	96.10			
I-25 Frontage Road over Larimer County Canal	1966	88.70			
I-25 Service Road over Larimer County Canal	1966	88.20			
LCR 58 over I-25	1966	97.20			
I-25 ML & Service Road over Box Elder Creek	1989	77.30			Yes
SH 1 over I-25	1966	76.90			yes
* Denotes structures replaced under a separate action.					
**Denotes structures studied under a separate action.					

Maintenance of Pavement

- **Table 5-3** summarizes the current pavement condition and action likely needed by 2030. Pavement north of SH 66 is currently rated as poor and fair; pavement between US 36 and 88th Avenue is currently rated fair. Based on these low ratings, replacement of the pavement is assumed to be needed by 2030 and is included in the No-Action Alternative. Replacement of the pavement is assumed to include milling and replacing the top six (6) inches of pavement.
- Pavement between SH 52 and SH 66 will be upgraded as part of a separate action.

Table 5-3 No Action Pavement Replacement/Rehab

I-25 Segment	Length (Miles)	Pavement Condition	Replace/Rehab by 2030
US 36 to 88th Ave.	2	Fair	Yes
88th Ave. to Thornton Pkwy	¾	Good	No
Thornton Pkwy to E-470	8	Good	No
E-470 to SH 66	15	Good	No
SH 66 to US 34	14	Poor	Yes
US 34 to SH 1	14	Fair	Yes
Note: Segments with fair or poor pavement conditions as identified by CDOT are considered sub-standard			

Safety Considerations

A few locations along I-25 are considered to have particularly unsafe traffic operating conditions today or in 2030. Specifically, any location where ramp traffic backs up into the mainline in 2030 is expected to require some modifications in the No-Action Alternative. These locations include interchanges that currently have a single-lane ramp terminal and/or are unsignalized. Improvements would likely include widening the ramp terminal to provide an additional left or right turn lane, modifying the current signal timing or signalizing a stop-sign controlled ramp terminal. **Table 5-4** lists the interchange locations where minor improvements may be necessary to address safety concerns.

The US 34/I-25 interchange will be upgraded to address safety concerns as part of a separate action.

Table 5-4 No Action Safety Upgrades

I-25 Interchange	Single-Lane Ramp Terminal?	Minor Safety Modifications Necessary?
US 36	No	No
84th Avenue	No	No
Thornton Parkway	No	No
104th Avenue	No	No
120th Avenue	No	No
136th Avenue	No	No
144th Avenue	No	No
E-470	No	No
SH 7	No	No
CR 8	No	No
SH 52	No	No
SH 119	No	No
SH 66	No	No
CR 34	Yes	No
SH 56	Yes	Yes
SH 60	Yes	Yes
CR 16	Yes	No
SH 402	No	separate action
US 34	No	separate action
Crossroads	Yes	No
SH 392	Yes	Yes
Harmony Road	No	No
Prospect	No	No
SH 14	No	No
CR 50	No	Yes
SH 1	Yes	Yes

5.2.2 Package A

Package A contains 3 major transportation improvement types (additional general purpose lanes on I-25; commuter rail along the BNSF corridor; and commuter bus along US 85). It is pictured in **Figure 5-1**. Detailed information on this package and its associated supporting elements is included in the DEIS. Supporting elements that required design and further definition for the DEIS included:

Additional General Purpose and Auxiliary Lane Supporting Elements:

- Design and Cross-Section
- Interchange design
- Carpool lots
- Congestion management strategies
- Drainage improvements (including design and capacity for run-off retention)
- Retaining walls
- Safety features

Commuter Rail Supporting Elements

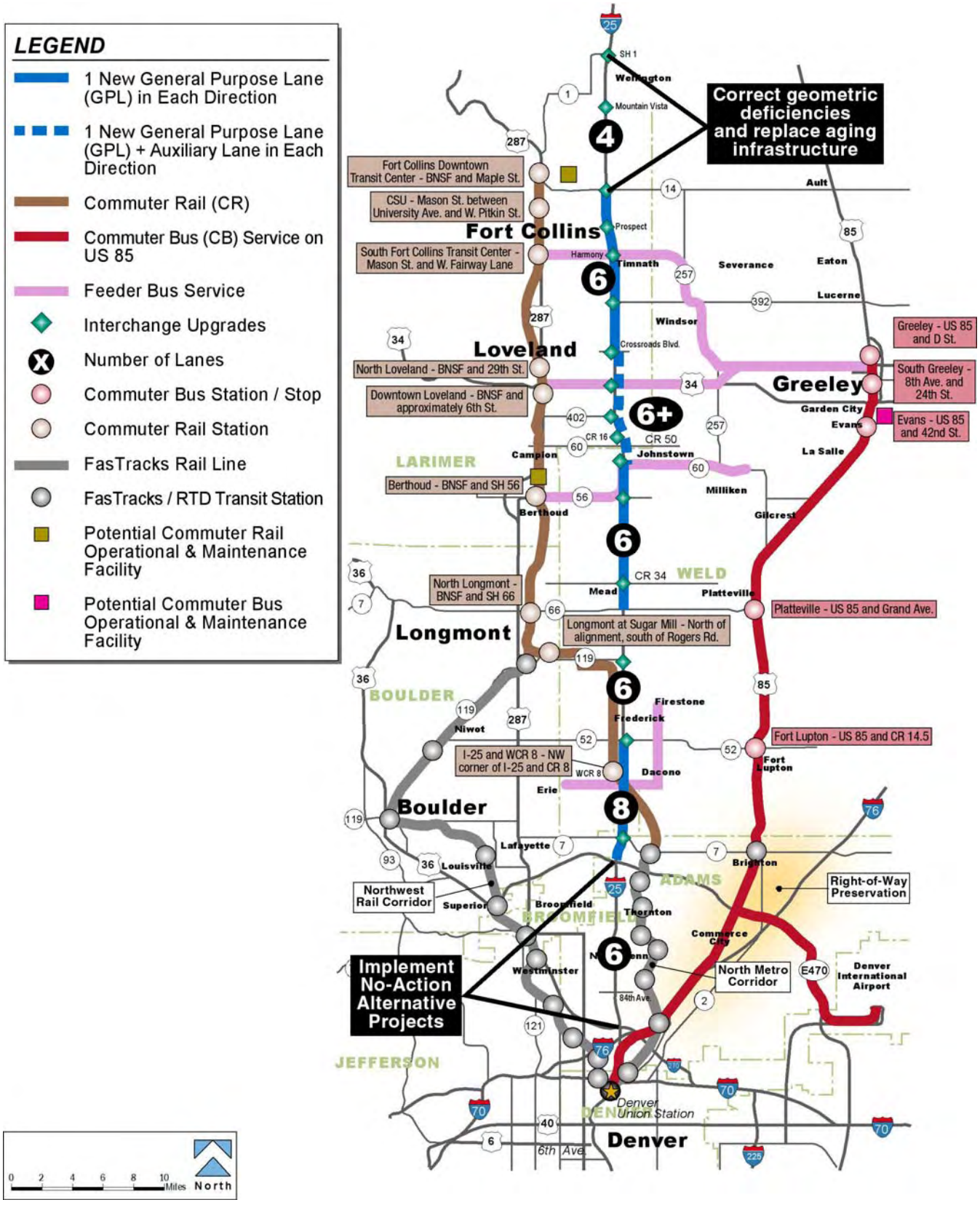
When the results of Level Three were shared with the public, the request was made to study an additional commuter rail connection from Longmont to Thornton, such that rather than having to go through Boulder via the US 36 FasTracks line, trains could turn east and utilize the North Metro FasTracks line. Therefore, a new and additional alignment was developed and screened according to its potential for environmental impact, cost, travel time, and service to communities. A screening summary of the commuter rail connection was completed in 2006 and is available for review in **Appendix F**.

After reviewing the two DEIS packages that were proposed, the NFR MPO requested that the team provide information on minimal rail alternatives that could be implemented as an initial phase. Two minimal rail alternatives were developed and evaluated. The memo, describing this development and evaluation effort, is included in Appendix I.

In addition, for the purposes of the DEIS, the following elements would have to be better defined and specifically sited:

- Design and cross-section
- Operating Plan – included in **Appendix H**
- Feeder bus service
- Stations and park-and-rides
- Maintenance facility locations
- At-grade crossings along the railroad line
- Drainage improvements (including design and capacity for run-off retention)

Figure 5-1 Package A



Commuter Bus Supporting Elements

For the purposes of the DEIS, the following elements would have to be better defined and specifically sited:

- Stations and park-and rides
- Operating plan
- Maintenance facility locations
- Queue jumps
- Drainage Improvements (including design and capacity for run-off retention)

Technical reports related to Stations Screening, Maintenance and Storage Facilities, Congestion Management, Interchange Design, Water Quality Design, and Avoidance and Minimization of 4(f) Resources are all available for review.

5.2.3 Package B

Package B includes two major transportation improvements concentrated along I-25 (Tolled Express Lanes and Bus Rapid Transit). Package B is illustrated in **Figure 5-2.** Detailed information on this package and its associated supporting elements is included in the DEIS. Supporting elements that required design and further definition for the DEIS included:

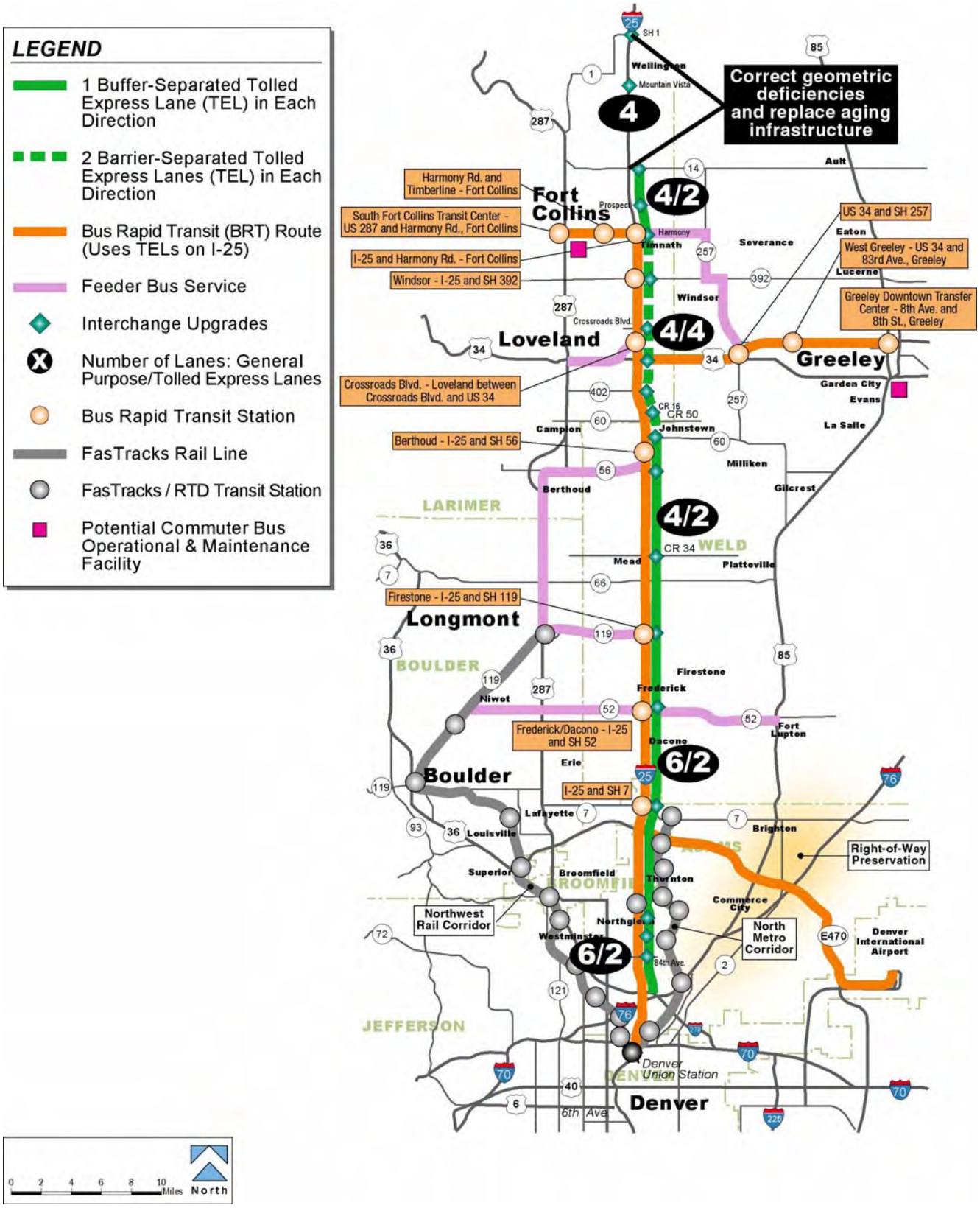
Supporting Elements for Tolled Express Lanes

- Design and cross section
- Management plan
- Interchange design
- Carpool lots
- Access and egress locations to TEL
- Congestion management strategies
- Drainage Improvements (including design and capacity for run-off retention)
- Retaining Walls
- Safety Features

Supporting Elements for Bus Rapid Transit

- Design and cross-section
- Operating plan
- Feeder bus service
- Stations and park-and-rides (including interfaces with interchanges and carpool lot locations)
- Maintenance facility locations
- Drainage improvements (including design and capacity for run-off retention
- Retaining walls

Figure 5-2 Package B



THIS PAGE LEFT BLANK INTENTIONALLY

APPENDICES

Appendix A: Project Termini Memoranda

Appendix B: Congestion Management Alternative

Appendix C: Station Design Strategy

Appendix D: Operations and Maintenance Facility Siting

Appendix E: Access Planning Memorandum

Appendix F: Longmont – North Metro Connection Alternative Evaluation

Appendix G: Travel Demand Forecasting Memoranda

Appendix H: Transit Operating Statistics Report

Appendix I: Minimal Rail Alternative Request

THIS PAGE LEFT BLANK INTENTIONALLY