Alternatives Development and Screening Report

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3.2.4 Transit Screening

Level 2A Screening used readily available data to screen the transit alternatives within their modal categories in order to narrow the total number that would undergo travel demand forecasting. Therefore, the best of high-speed rail alternatives, commuter rail alternatives, BRT and light rail alternatives were selected based on the transit screening. Level 2A Screening narrowed the potential options to the following:

- Bus Rapid Transit A and C
- Commuter Rail A-F
- High Speed Rail A

Due to the range of transit options still being considered, the northern termini varied, and would be tested further in Level 2B screening. **Figures 3-22** through **Figure 3-25** illustrate the major findings and results of 2A Transit Screening. No Light Rail alternatives were advanced because the travel times were so high (over two hours on each line tested) and both project advisory committees (the TAC and the RCC) agreed that it was a poor choice of technology to select over such a long distance when other more efficient transit technologies were available.

Other transit alternatives that were screened out include:

BRT B and BRT D – Compared to other BRT alternatives, it caused out-of-direction travel for passengers trying to reach Denver, which would lengthen the travel time, and faster, more direct, and more cost-effective options were available on either I-25 or US 287. The alternatives also had the potential to negatively impact future land use, wildlife and hazardous materials.

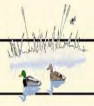
BRT E – This alignment serves very few population centers, and uses no direct highway routes to reach Denver. In addition, as with BRT B and D, more direct and cost-effective alignments were available along existing roadways that would not require railroad ROW conversion to a BRT guideway. The alternatives also had the potential to negatively impact future land use, wildlife and hazardous materials.

BRT F – In the highway alternatives analysis, it was decided that US 85 would be upgraded only as a supplement to the improvement selected along I-25. Therefore, without substantial upgrades, BRT service was considered to be unfeasible along US 85. By contrast, BRT could be possible in special-purpose or managed lanes along I-25. Similarly, communities along the US 287 corridor were supportive of widening or converting lanes in certain areas to support transit improvements, though a continuous BRT-only lane would not be possible.

Commuter Rail G – Compared to other commuter rail alternatives, this alignment would require out-of-direction travel for passengers from the Western side of the corridor trying to reach Denver. There would also be a prohibitive amount of coordination with the UP for track space and time along the main line as well as through the Sand Creek Junction that enables railroad access into Denver Union Station.

HSR B- Of the three HSR alternatives, this alignment had the most potential to impact natural resources, due to proximity to wetlands. It also served the least number of population and employment centers.

Figure 3-21 Measurements Used for Environmental Screening

Resource Category	Measurement Used
Section 4(f) Resources (parks and wildlife areas) 	• Total number of Section 4(f) resources potentially impacted
Land Use 	• Rating of compatibility with existing land use and planned future land use; • Potential to induce growth
Economic 	• Provision of access to future economic activity centers
Air Quality 	• Rating of potential to affect congestion or potential to affect vehicle miles or hours of travel
Traffic Noise 	• Developed land within 600 feet of the transportation improvement, number of sensitive receptors
Transit Noise and Vibration 	• Proximity of residential uses to the transit improvement
Water Resources 	• Total number of lakes and streams potentially impacted
Wildlife/Threatened, Endangered or Rare Species   	• Bald eagle nests within half mile; • Bald eagle communal roosts within half mile; • Preble's mouse known habitat; • Mountain plover habitat; • Swift fox known range; • Potential impact to rare fish species
Wetlands	• Potential impact to wetlands and streams
Environmental justice 	• Potential to provide direct access to low income and/or minority; • Potential to have an adverse impact on low income and/or minority
Visual 	• Potential impact to highly scenid views; • Potential impact from added pavement width
Historic Resources 	• Number of existing and potential historic sites within 1000 feet of corridor
Hazardous Materials 	• Number of known hazardous materials sites (Superfund, Resource Conservation and Recovery Act or Comprehensive Environmental Response, Compensation and Liability Information Systems) that could be potentially impacted
Social 	• Number of communities potentially bisected; • Potential for improved travel time; • Improvement in accessibility?, alternative mode of transportation added?
Bicyclists and Pedestrians 	• Number of regional trail crossings; • Measure of impact to local routes; • Potential impact to planned trails

3.2.3 Transit Criteria

In Level 2A transit alternatives were evaluated using various available data such as Census information and National Transit Database information on peer transit systems. For example, reliability of each operating environment was qualitatively described based on the physical condition of each alignment (exclusive, grade-separated, shared, etc). A general description of the evaluation criteria is provided below:

3.2.3.1 Purpose and Need and Practicability

Safety– Alternatives were compared to determine which had the fewest number of at-grade road crossings.

Improve Mobility, Provide Modal Options and Support Economic Development – Alternatives were compared to determine which:

- Served the highest concentration of employment and population centers in the study area: Analyzed through the use of 2000 Census numbers for communities along each alignment
- Connected to other transit systems: Analyzed through mapping other transit systems (TransFort, The Bus, FoxTrot and RTD)
- Had the fastest travel times: Analyzed through measuring the distance of each alignment and applying the average operating speed of each transit mode (no station dwell time allowance was included at this level of screening)
- Served anticipated trip patterns: Analyzed through comparing the alignments to the Census 2000 Journey to Work data

Practicability – Alternatives were compared to determine which was the most cost effective (based on an average cost per mile and cost of technology obtained through peer systems), and was a proven technology.

3.2.3.2 Environmental Criteria

The data sources used in the evaluation of Level 2A alternatives were readily available data from Census, file review, field reconnaissance and county and municipality planning documents. Both quantitative and qualitative measures were used to evaluate the potential for the highway or transit alternatives being evaluated to adversely impact natural and built environment resources. The evaluation criteria are shown in **Figure 3-21**.

Figure 3-20 Level 2A Preliminary Screening Results – New Arterial Road

I-25 Parallel Arterials (2 recent studies)

Alternative A

ADVANTAGES
- Would increase vehicular capacity to serve most of the future demand north of SH 7
- Alt A would serve more population & employment centers on both sides of I-25
- Would divert trips off of I-25
- Could support economic development

DISADVANTAGES
- Would not serve long regional trips
- Would not serve trips south of SH 7
- Would not address aging infrastructure on I-25
- Less access control and longer travel times than I-25

Not Advanced

WCR 13 (Co. Blvd. extension)

Alternative B

ADVANTAGES
- Would increase vehicular capacity, but not fully serve future demand for I-25 north of SH 7
- Would divert trips off of I-25
- Could support economic development
- Less potential impact to natural environment than Alt. A

DISADVANTAGES
- Would not serve long regional trips
- Would not serve trips south of SH 7
- Would not address aging infrastructure on I-25
- Less access control and longer travel times than

Not Advanced

Level One Alternative # 43

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Figure 3-19 Level 2A Preliminary Screening Results – New Highway

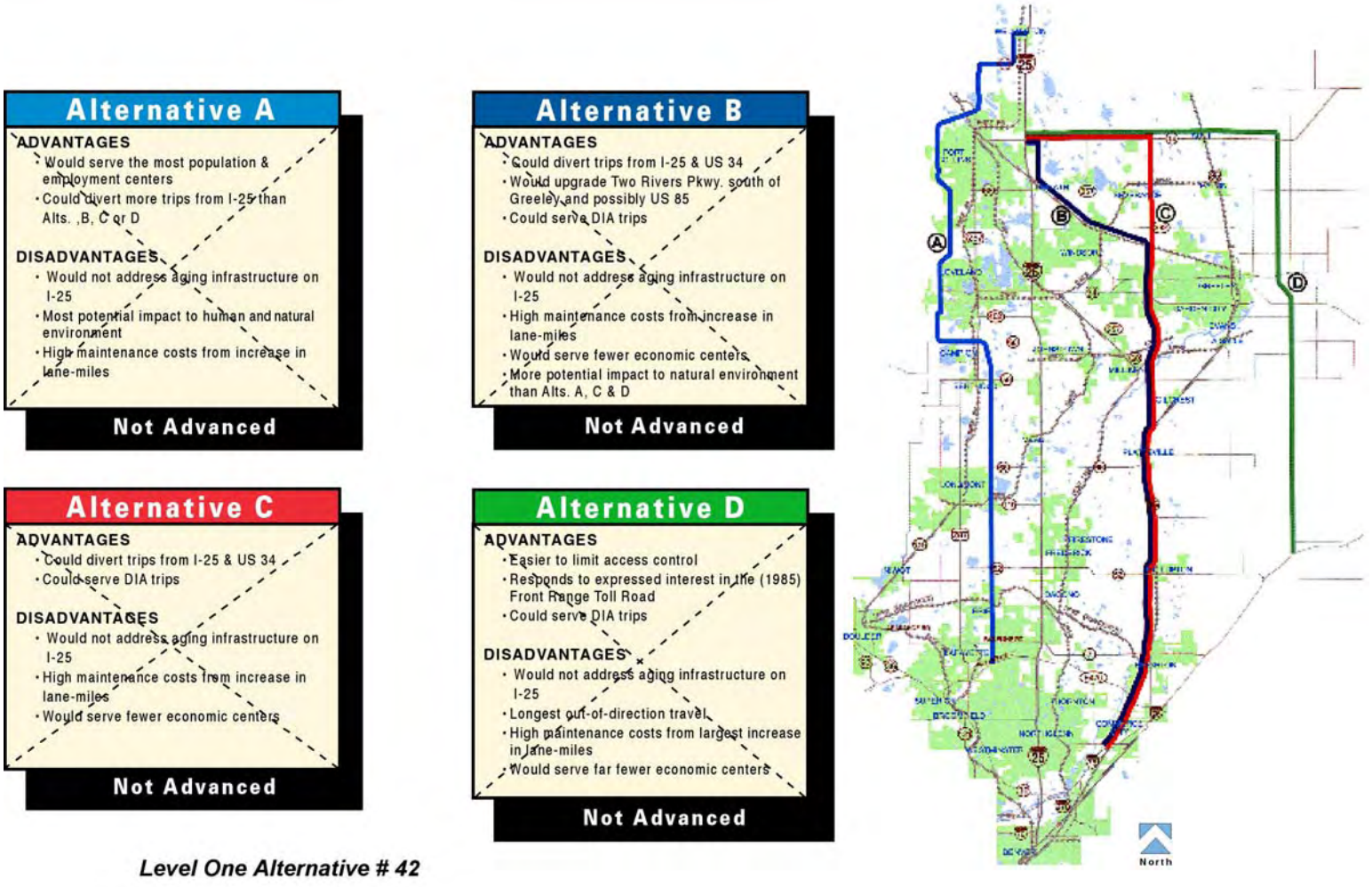


Figure 3-18 Level 2A Preliminary Screening Results – Limited Access Lanes on I-25

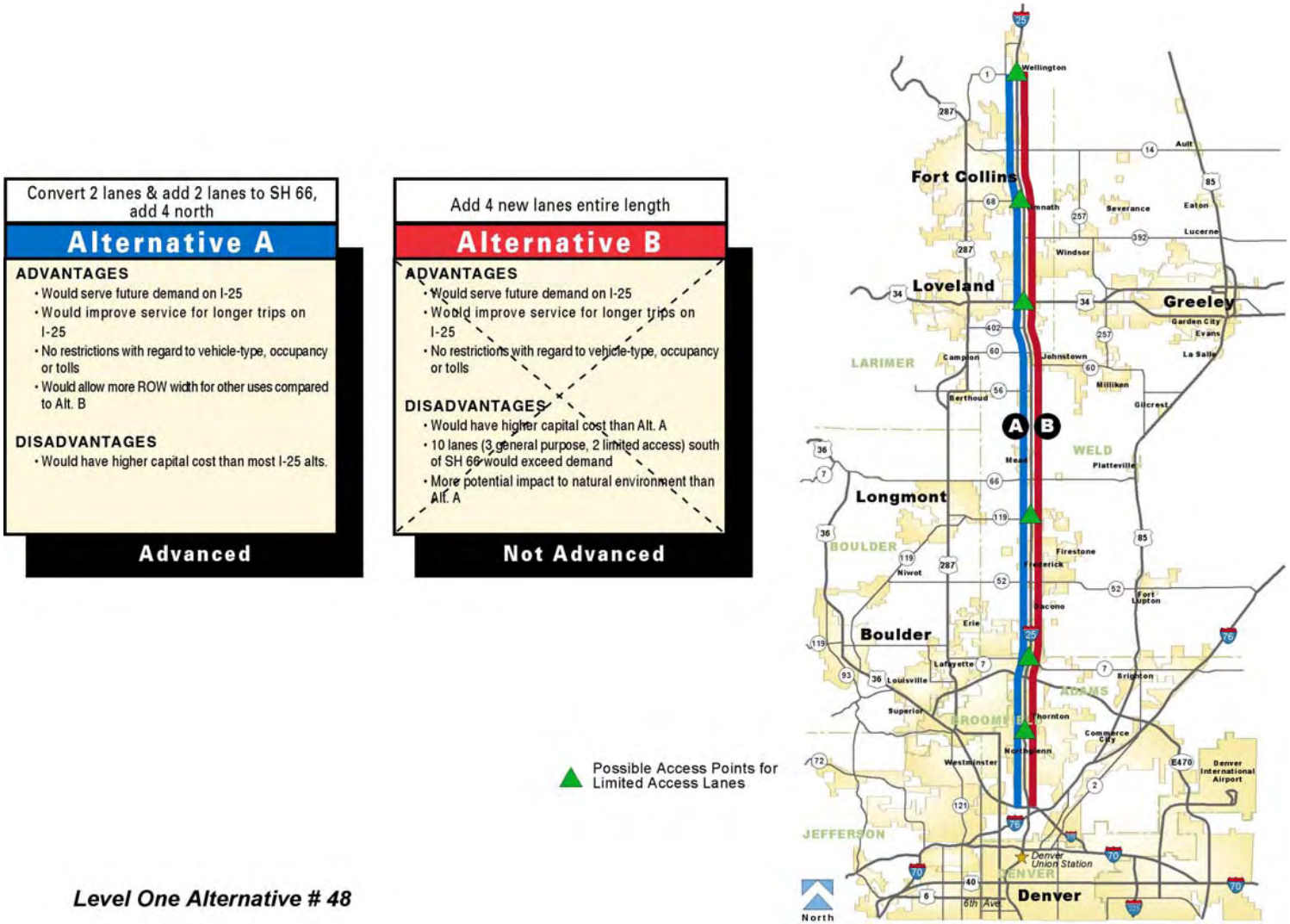
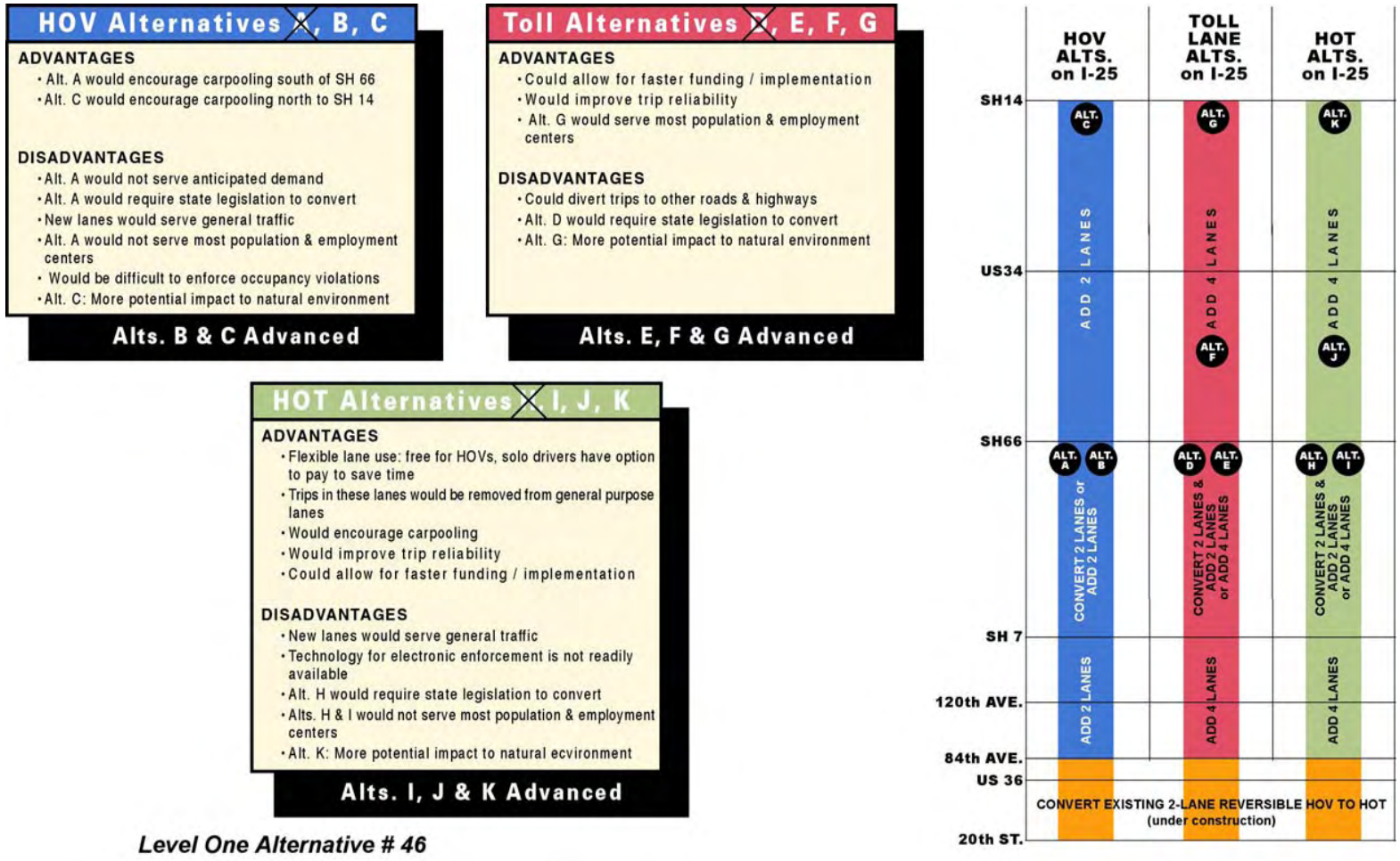


Figure 3-17 Level 2A Preliminary Screening Results – Express Lanes on I-25



Level One Alternative # 46

Figure 3-16 Level 2A Preliminary Screening Results – Upgrade Highway Classification

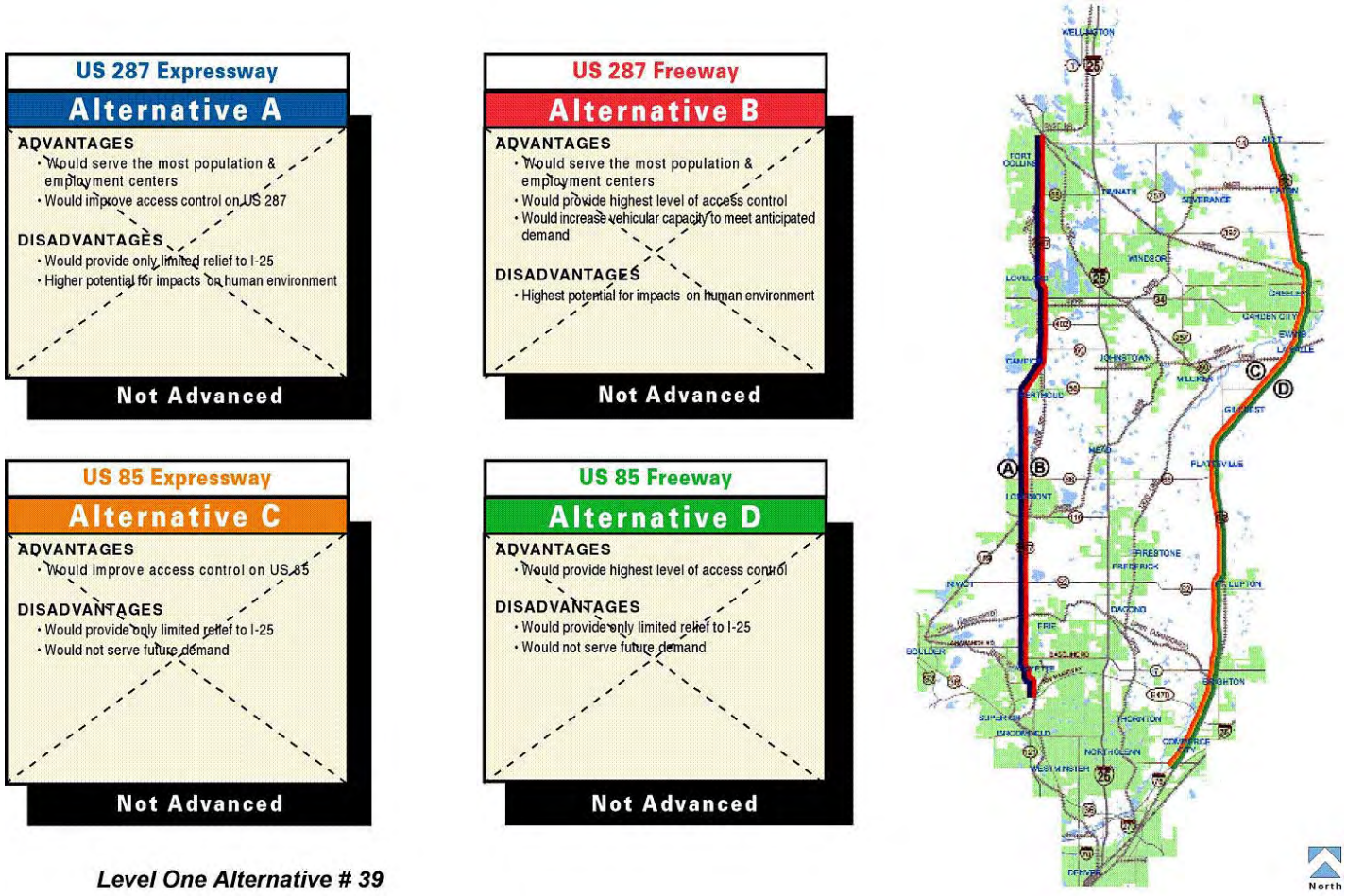
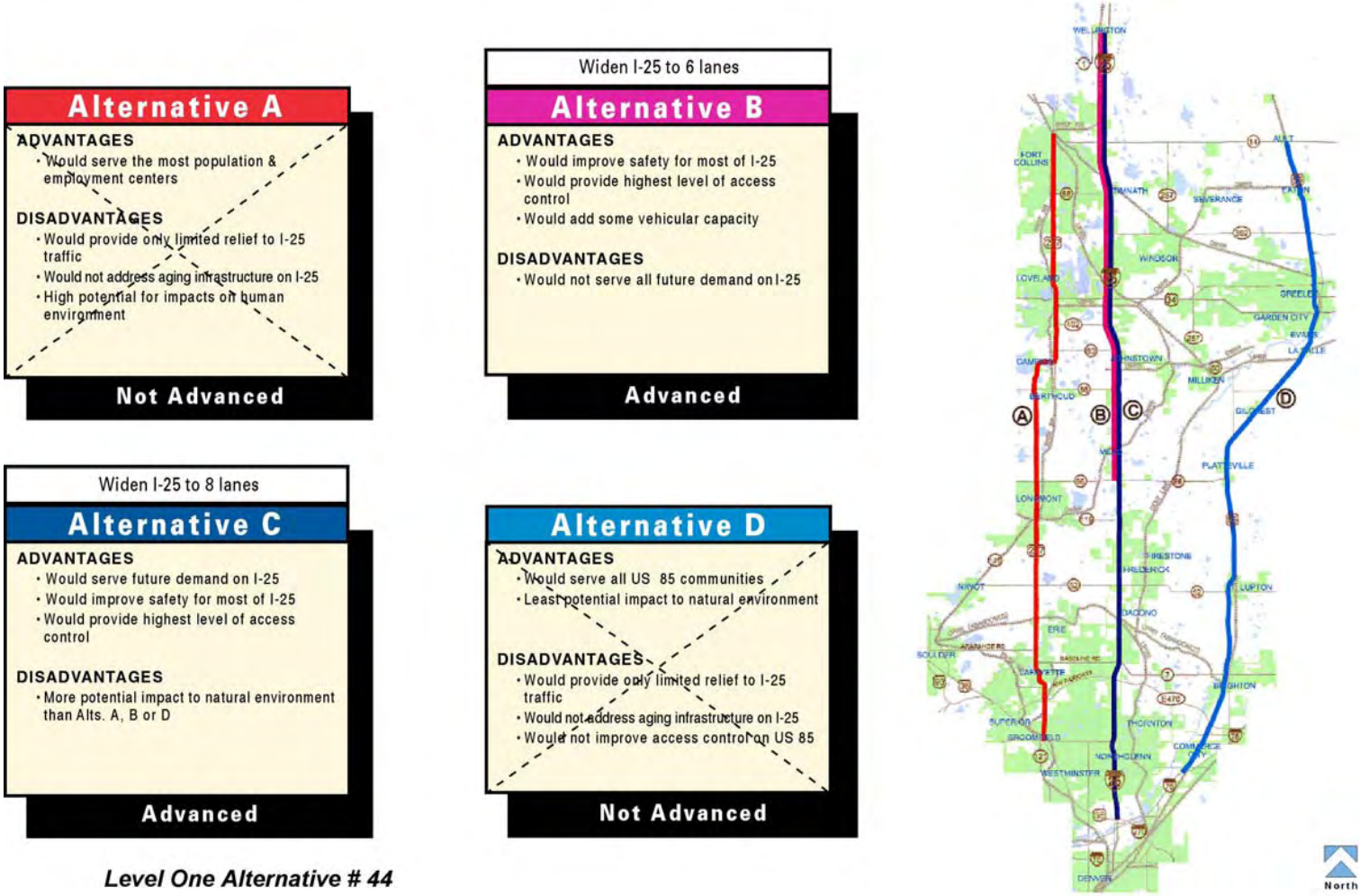


Figure 3-15 Level 2A Preliminary Screening Results – Additional Lanes



3.2.2 Highway Screening

The following section describes the key findings from the Level 2A highway screening. **Figures 3-15** through **Figure 3-20** illustrate the results of the Level 2A highway screening.

Additional Lanes ─ Adding lanes on US 287 or US 85 would reduce I-25 travel by four percent to ten percent. This reduction is not adequate to address the mobility needs along I-25 in 2030. In addition, these alternatives would not address safety concerns on I-25 or replace aging infrastructure on I-25. In general, impacts to environmental resources were not discerning at this level. Alternatives were conceptual and could potentially be designed to avoid environmental resources. Alternatives with additional lanes on I-25 were retained for additional evaluation.

Upgrade Parallel Roadways ─ Alone, upgrading on US 287 and US 85 would not adequately address mobility needs along I-25. However, based on community support, the US 85 expressway alternative was retained for further evaluation in Level 2B. The other three alternatives were screened out in part due to their impacts to the human environment along the corridor and their limited ability to address mobility along I-25.

Express Lanes ─ Alternatives of shorter lengths would not adequately address safety concerns, capacity needs or replace aging infrastructure along I-25 in the northern portion of the study area. While the HOV lane alternative to SH 14 addressed many of these concerns, it would require additional capacity to address the mobility needs; it was retained for additional evaluation in Level 2B. HOT and Toll lane alternatives to SH 14 were also retained.

Limited Access Lanes - Alternative B, two additional lanes in each direction, would have more environmental impacts than converting one lane and adding one lane south of SH 66 to a limited-access lane (Alternative A). The wide cross-section required for this alternative impacted vegetation, wetland, and wildlife. Alternative A was retained as a more appropriate solution for tying into the existing lane configuration on the south end of the study area and adequately addressing mobility needs on I-25.

New Highway Alignments ─ Four new highway alignments were evaluated. All four were eliminated from further consideration as they did not improve safety on I-25, divert sufficient traffic from I-25 to sufficiently improve mobility, and they had the most potential to impact farmland, hazardous materials and were inconsistent with planned land use.

New Arterials─ Neither diverted enough traffic to improve mobility sufficiently on I-25. In addition, these alternatives would not address safety concerns on I-25 or replace aging infrastructure on I-25. However, either alternative could potentially be combined with other stand-alone highway improvements. Both were retained as candidates to complement other transportation improvements and improve accessibility along the corridor.

Figure 3-14 Measurements Used for Environmental Screening in Level Two

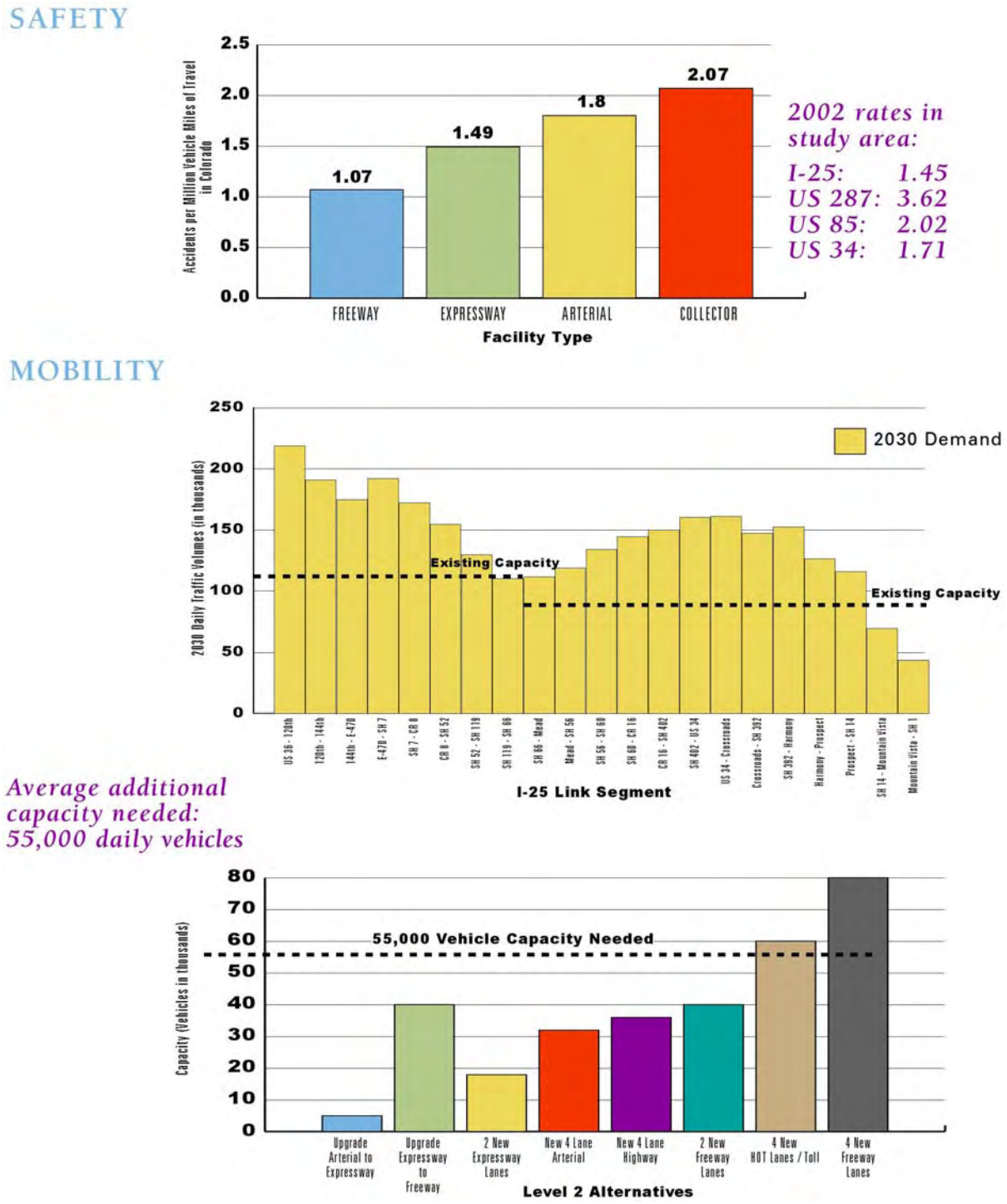
Resource Category	Measurement Used
Section 4(f) Resources (parks and wildlife areas)	• Total number of Section 4(f) resources potentially impacted
Land Use	• Rating of compatibility with existing land use and planned future land use; • Potential to induce growth
Economic	• Provision of access to future economic activity centers
Air Quality	• Rating of potential to affect congestion or potential to affect vehicle miles or hours of travel
Traffic Noise	• Developed land within 600 feet of the transportation improvement, number of sensitive receptors
Transit Noise and Vibration	• Proximity of residential uses to the transit improvement
Water Resources	• Total number of lakes and streams potentially impacted
Wildlife/Threatened, Endangered or Rare Species	• Bald eagle nests within half mile; • Bald eagle communal roosts within half mile; • Preble's mouse known habitat; • Mountain plover habitat; • Swift fox known range; • Potential impact to rare fish species
Wetlands	• Potential impact to wetlands and streams
Environmental justice	• Potential to provide direct access to low income and/or minority; • Potential to have an adverse impact on low income and/or minority
Visual	• Potential impact to highly scenid views; • Potential impact from added pavement width
Historic Resources	• Number of existing and potential historic sites within 1000 feet of corridor
Hazardous Materials	• Number of known hazardous materials sites (Superfund, Resource Conservation and Recovery Act or Comprehensive Environmental Response, Compensation and Liability Information Systems) that could be potentially impacted
Social	• Number of communities potentially bisected; • Potential for improved travel time; • Improvement in accessibility?, alternative mode of transportation added?
Bicyclists and Pedestrians	• Number of regional trail crossings; • Measure of impact to local routes; • Potential impact to planned trails

Figure 3-13 Purpose and Need Evaluation – Aging Infrastructure

Alternative	Number of Deficient Railroad Structures Replaced	Number of Deficient Drainage Structures Replaced	VMT on Poor/ Fair Pavement
No Action	●	●	●
HOV to SH 66	●	●	●
HOV to SH 14	◔	◑	○
Toll to SH 66	●	●	●
Toll to US 34	◑	◕	◑
Toll to SH 14	◔	◑	○
HOT to SH 66	●	●	●
HOT to US 34	◑	◕	◑
HOT to SH 14	◔	◑	○
Limited Access Lanes to SH 1	○	○	○
6 General Purpose Lanes	○	○	○
8 General Purpose Lanes	○	○	○

○ Best Rating ● Worst Rating

Figure 3-12 Purpose and Need – Safety and Mobility



3.2 LEVEL 2A SCREENING – BUILD ALTERNATIVES

In Level 2A, highway alternatives were compared to each other, and transit alternatives were compared to each other to determine which could better meet purpose and need, would be more practicable and would have less potential for negative environmental impacts. Alternatives that performed well in a majority of analysis areas were advanced to Level 2B.

3.2.1 Highway Criteria

The Level 2A evaluation and screening criteria for highway alternatives are described below:

3.2.1.1 PURPOSE AND NEED AND PRACTICABILITY CRITERIA

The safety, mobility, and aging highway infrastructure criteria are used to determine how well each alternative addresses the project's purpose and need.

- ***Safety*** – Evaluation of safety was based on the functional classification of each alternative. Alternatives with a higher functional classification would have fewer crossings (restricted access) and therefore fewer conflicts. Alternatives with less access control were not considered as safe. **Figure 3-12** compares crash rates for different facility types.
- ***Mobility*** – Improving the mobility of travelers between northern Colorado communities and the Denver metropolitan area can be accomplished by increasing capacity of I-25, US 85 or US 287 or by reducing the vehicular demand along these routes. **Figure 3-12** compares the vehicular capacity for different facility types.
    - Preliminary 2030 traffic projections along I-25, US 287 and US 85 between SH 7 and SH 1 were developed with the North Front Range MPO 2030 travel model and the DRCOG 2030 travel model. Based on these preliminary projections, the 2030 unmet demand is approximately 55,000 vehicles daily on I-25. Alternatives with the ability to accommodate this unmet demand were retained for additional evaluation.
- ***Aging Highway Infrastructure*** – Alternatives were compared to determine which would replace the most aging infrastructure along I-25. **Figure 3-13** compares the amount of aging infrastructure replaced with different alternatives along I-25.
- ***Practicability*** – Alternatives were compared to determine which was the most cost effective, and was a proven technology.

3.2.1.2 ENVIRONMENTAL CRITERIA

The data sources used in the evaluation of Level 2A alternatives were readily available data from census, file review, field reconnaissance and county and municipality planning documents. Both quantitative and qualitative measures were used to evaluate the potential for and of the highway or transit alternatives being evaluated to adversely impact natural and built environment resources. The evaluation criteria are shown in **Figure 3-14.**

Modes that served specifically local transit needs, or operated in such a way that would make them unattractive to a regional commuter, were characterized as complementary transit alternatives. As such they became candidate alternatives for combining with build alternatives later in the study if needed. However, designation as a complementary alternative did not guarantee future selection of use.

Complementary transit improvements include:

- *Local Bus Service:* Local buses typically stop every few blocks on local streets in order to provide the most access to neighborhoods and employment centers. While inappropriate for fulfilling a regional transit need, they can be very effective as “feeders” or connector services to more mainline, higher-capacity services.
- *Express Bus Service*: Express Transit Service typically operates in shared lanes on existing highways with fewer stops than local transit service, but it provides no travel time advantage and is very often unreliable, due to operating in shared lanes that are subject to roadway congestion. Although it can be operated as a north-south transit service (similar to the Front Range Express, operating from Colorado Springs to Denver) it seats approximately 40 people per bus, which is too little capacity to act as a stand-alone alternative in the study area.
- Regional/Commuter Bus Service: Although it is designed for long-distance trips, Regional/Commuter Bus service was considered to have insufficient capacity to serve the level of trip demand being generated in the project area. (However, as a complementary alternative, it was retained for future combination with other build alternatives.)
- *East/West Transit Service:* The purpose and need specifically describes the need to connect the North Front Range to the Denver area. Therefore, east-west mobility is secondary to serving north-south travel needs; however, it will be designed and tested as a supporting system to facilitate access to the main north-south transit service.
- *City-to-City Rail:* The purpose and need specifically describes the need to connect the North Front Range to the Denver area, therefore, city-to-city rail that stops short of connecting to Denver will not serve the regional mobility need, but need not be precluded by the design of the regional transit service.
- *Demand Responsive/Call-n-Ride:* This service is typically operated in rural and ex-urban areas to serve passengers with special needs, and is not designed to serve a regional, higher-capacity commuter need across large distances. Although impracticable as a stand-alone alternative, it can certainly be encouraged among communities to facilitate access to a higher capacity fixed guideway alternative.

3.1.4 Build Alternatives - Congestion Management

Although by definition congestion management measures do not include major capacity improvements, an analysis of congestion management elements was initiated during Level Two Screening to ascertain (and document) whether the congestion management strategies could manage I-25 capacity efficiently enough to preclude consideration of building additional capacity. The analysis was conducted considering each of the congestion management strategies independently as well as in combination with the others as an overall group. Travel Demand Management, Intelligent Transportation Systems and Transportation System Management strategies advanced from Level One were evaluated in Level Two.

Figure 3-11 Level Two Alternatives – High Speed Rail

High-Speed Rail typically provides intercity service, operating on an exclusive guideway system of steel tracks that can be located at-grade, elevated or below ground. Power is usually provided by overhead electrical cables.

CHARACTERISTICS:

Operating Cost: $300 to $400 per revenue hour

Capital Cost: $25 million to $75 million per mile
(depending on the amount of right-of-way and new infrastructure needed)

New Capacity: 540 to 1,080 people per hour per direction
(2 to 4 3-car trains per hour)

ALTERNATIVE	A	B	C
DESCRIPTION	I-25 / UPRR -SH 14 to Denver through Mead and Thornton	UPRR / Dent Line / UPRR - Fort Collins to Denver through Milliken and Thornton	GWRR / UPRR - Fort Collins to Denver through Greeley and Brighton
LENGTH (miles)	61	69	77
ACCESS	3 Stations	3 Stations	3 Stations
RIGHT-OF-WAY (ROW)	Widening of freight rail and highway corridor anticipated	May require acquisitions to restore corridor	Widening of freight rail corridor anticipated
TRAVEL TIME	Limited stations provide improved travel time; exclusive corridor would provide good travel time reliability	Limited stations provide improved travel time; exclusive corridor would provide good travel time reliability	Limited stations provide improved travel time; exclusive corridor would provide good travel time reliability

Level One Alternative # 31, 32 & 33

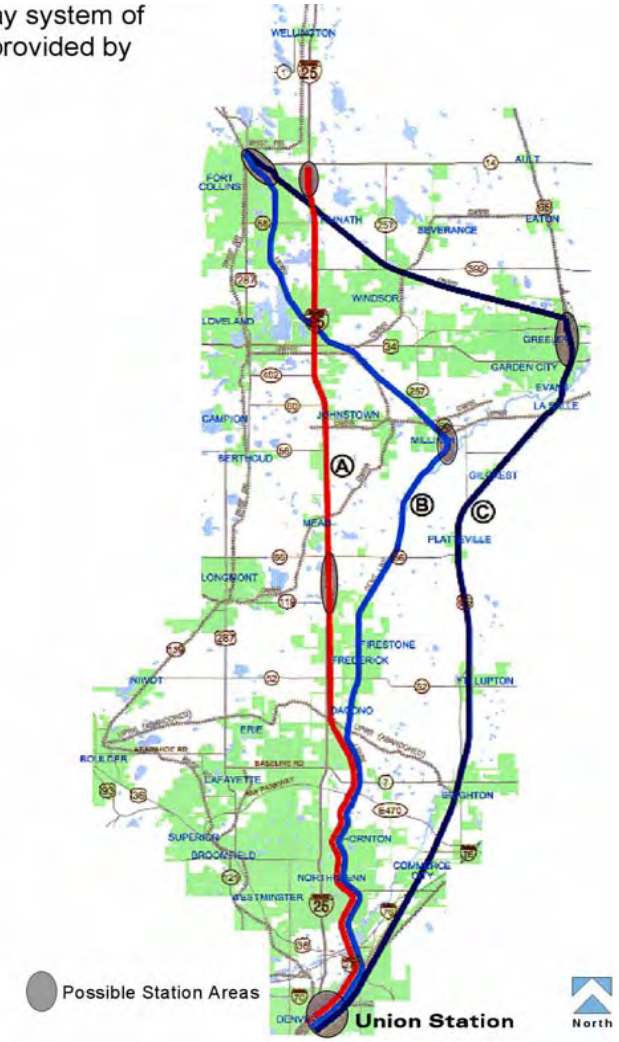


Figure 3-10 Level Two Alternatives – Light Rail

Light Rail Transit (LRT) provides service in urban areas connecting major population, employment and activity centers. Light Rail can operate in exclusive rights-of-way or share city streets. Power is generally provided by overhead electrical lines.

CHARACTERISTICS:

Operating Cost: $200 to $350 per revenue hour
Capital Cost: $25 million to $60 million per mile
New Capacity: 360 to 1,800 people per hour per direction
(2 to 10 3-car trains per hour)

ALTERNATIVE	A	B	C	D
DESCRIPTION	BNSF and US 287 from Fort Collins to Broomfield	US 287 from Fort Collins to Broomfield	I-25 from Fort Collins to 120th Ave.	I-25 from Fort Collins to Denver
LENGTH (miles)	48	48	65	77
ACCESS	20-30 Stations	20-30 Stations	20-25 Stations	20-25 Stations
RIGHT-OF-WAY (ROW)	Requires new track and coordination for use of the freight rail ROW	May require the conversion of general purpose lanes to light rail track or additional ROW for new track	May require the conversion of general purpose lanes to light rail track or additional ROW for new track	May require the conversion of general purpose lanes to light rail track or additional ROW for new track
TRAVEL TIME	Reliable but increases as number of stops increases	Reliable but increases as number of stops increases	Reliable but increases as number of stops increases	Reliable but increases as number of stops increases

Level One Alternative # 25 & 26

Figure 3-9 Level Two Alternatives – Commuter Rail

Typically operates in freight rail right-of-way, uses shared freight track or its own track. May use locomotives with passenger cars or self-propelled passenger cars, known as diesel multiple unit (DMUs). Serves long distance commute trips (longer than 10 miles).

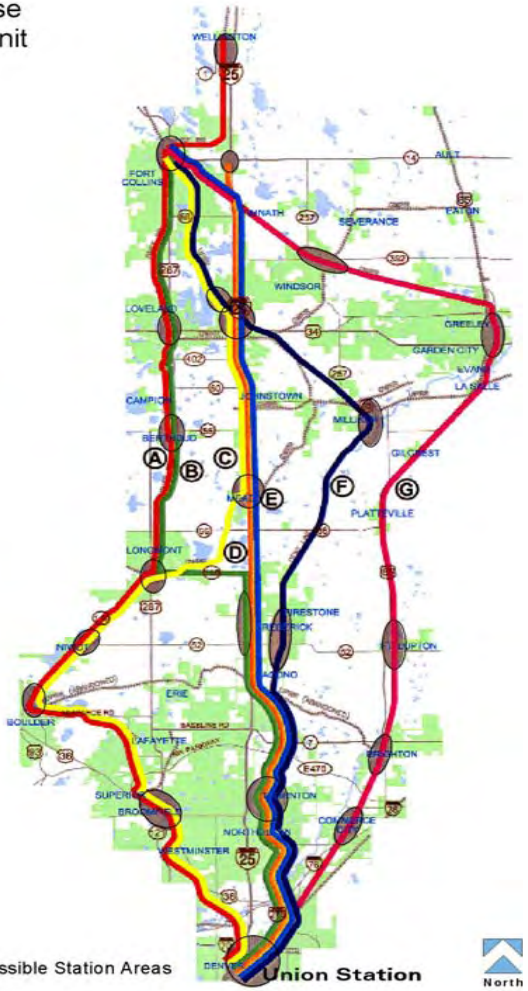
CHARACTERISTICS:

Operating Cost: $250 to $400 per revenue hour

Capital Cost: $2 million to $15 million per mile
(depending on the amount of right-of-way and new infrastructure needed)

New Capacity: 540 to 2,700 people per hour per direction
(2 to 6 3-car trains per hour; 90 to 150 passengers per car)

ALTERNATIVE	A	B	C	D	E	F	G
DESCRIPTION	BNSF RR - Wellington to Denver through Fort Collins and Boulder	BNSF RR / SH 119 / I-25 / UPRR - Fort Collins to Denver through Longmont and Thornton	UPRR / I-25 / GWRR / BNSF RR - Fort Collins to Denver through Mead and Boulder	I-25 / UPRR - SH 14 to Denver through Mead and Thornton	GWRR / I-25 / UPRR - Fort Collins to Denver through Mead and Thorton	UPRR / Dent Line / UPRR - Fort Collins to Denver through Milliken and Thornton	GWRR / UPRR - Fort Collins to Denver through Greeley and Brighton
LENGTH (miles)	74	68	73	61	64	69	77
ACCESS	6-10 Stations	5-9 Stations	5-9 Stations	4-8 Stations	4-8 Stations	4-8 Stations	5-9 Stations
RIGHT-OF-WAY (ROW)	May require widening of freight rail corridor	May require widening of freight rail & roadway corridors	May require widening of freight rail & roadway corridors	May require widening of highway corridor	May require widening of highway & freight rail corridors	May require acquisitions to restore corridor	May require widening of freight rail corridor
TRAVEL TIME	Requires operations with freight, possibly affecting travel time reliability	Requires operations with freight, possibly affecting travel time reliability	Requires operations with freight, possibly affecting travel time reliability	Exclusive corridor would provide good travel time reliability	Exclusive corridor would provide good travel time reliability	Exclusive corridor would provide good travel time reliability	Requires operations with freight, possibly affecting travel time reliability



Level One Alternative # 14, 15 &16

Figure 3-8 Level Two Alternatives – Bus Rapid Transit

Bus Rapid Transit (BRT) is a system that combines features of a passenger rail system with the flexibility of a bus system. It travels in exclusive lanes such as a separated travel way or a high occupancy vehicle lane.This type of technology could be implemented along existing or proposed travel corridors or along an existing freight rail line.

CHARACTERISTICS:

Operating Cost: $75 to $90 per revenue hour

Capital Cost: $0.5 million to $20 million per mile
(depending on the amount of right-of-way and new infrastructure needed)

New Capacity: 180 to 600 people per hour per direction
(assumes 3 to 10 buses per hour)

ALTERNATIVE	A	B	C	D	E	F
DESCRIPTION	US 287 from Fort Collins to Broomfield in new exclusive lanes	Fort Collins to Denver along rail corridors and I-25 in new exclusive lanes	I-25 - Wellington to Denver	Wellington to Denver via I-25 and the Dent Line	Ault to Denver via US 85, Dent Line and I-25	Ault to Denver via US 85 in new exclusive lanes
LENGTH (miles)	48	66	66	64	71	63
ACCESS	5-8 Stations	6-10 Stations	6-10 Stations	6-10 Stations	6-10 Stations	5-8 Stations
RIGHT-OF-WAY (ROW)	2 new bus lanes	2 new bus lanes	New busway	New busway	New busway	New busway
TRAVEL TIME	Reliable but increases as number of stops increase	Reliable but increases as number of stops increase	Reliable but increases as number of stops increase	Reliable but increases as number of stops increase	Reliable but increases as number of stops increase	Influenced by level of congestion and number of stops

Level One Alternative # 6, 7 & 8

By evaluating a variety of alignment options for both bus and rail service, Level Two Screening determined which kind of operating environment would provide the most benefits for each type of technology option. Operating characteristics such as number of stops and frequency of service were refined from the generalized Level One definition to more effectively fit the particular study corridor selected, but were still assigned based on a general station spacing only. (Exact station locations and parking allowances were not defined until Level 3 Screening.)

I-25, US 85 and US 287 were analyzed as potential alignments for both bus and rail technologies. On existing highways it was assumed that the existing right-of-way would be expanded, or that lanes could be converted or shared for specific transit service.

The Burlington Northern Santa Fe line on the west side of the corridor; the Great Western Railroad lines in the central part of the corridor; and the Union Pacific lines throughout the corridor were all analyzed. Each of these lines had right-of-way, and in some cases, track, that could be utilized by passenger rail service. In addition, a new alignment along the I-25 corridor was also developed for analysis.

New corridors that would require all new construction were also evaluated for bus and rail service. However, where an existing transportation corridor was available, it was considered a preferable alignment, due to the probability for fewer impacts.

Due to the many alignments suggested, a range of northern termini were analyzed, but, after the FasTracks program Passed in November 2005, Denver Union Station was generally regarded as the most preferable southern terminus due to its wide variety of connection possibilities and its access to downtown Denver employment.

The following section includes descriptions and figures of Level Two stand-alone and complementary transit alternatives. **Figures 3-8** through **3-11** illustrate the stand-alone transit alternatives (those with the ability to serve regional trips in the project area) including:

- **Bus Rapid Transit**
- **Commuter Rail**
- **Light Rail**
- **High Speed Rail**

Other highway alternatives carried forward from Level One were acknowledged to provide benefits in a study area but did not have the capacity to meet the project area's mobility goals or to substantially address other elements of the project's purpose and need. As such they became candidates for future use in project development if the stand-alone alternatives selected had the potential to be benefited by them. Designation as a complementary alternative did not guarantee inclusion in an alternative however.

Complementary highway improvements included:

East-West Highway Improvements: These would connect communities on the east or west side of the corridor with the main north-south highway facilities. Alone, these improvements would not address the project purpose of connecting northern Colorado to the Denver Metro area.

Interchange Replacement/Upgrade: These alternatives would include improving or reconstructing existing interchanges that currently operate inefficiently or are expected to have operational deficiencies in the future. These improvements alone would not have the ability to address mobility needs along I-25.

Horizontal and Vertical Alignment Improvements: These would improve the roadway alignment to meet current standards to improve safety and capacity. Alone, they would not have the ability to address mobility needs along I-25.

Climbing Lanes: Lanes added in the uphill direction along the highway to allow faster vehicles to pass slower ones in order to achieve a better level of service and to improve safety. This type of improvement would be used in locations where long grades, high traffic volumes and heavy vehicles combine to reduce travel speeds. Alone, these would not provide enough capacity to substantially address the project's mobility needs.

Frontage Road Improvements: These would address the need to improve the capacity, the safety and the layout of the frontage roads along I-25. These would not provide enough capacity to substantially address the project's mobility needs.

New Interchanges: New interchange would be built along the existing highway corridors to provide additional access or to reduce congestion at an existing intersection. These improvements alone would not have the ability to address mobility needs along I-25.

Truck Lanes: Exclusive lanes used by only truck traffic. They may be separated from general purpose lanes, and may provide only limited access to local intersections or interchanges. Alone, these would not substantially address the project's mobility needs.

3.1.3 Build Alternatives - Transit

Like the highway alternatives, transit alternatives were classified as stand-alone or complementary based on their capacity to meet the project area's mobility needs. This was interpreted as having the ability to provide service to regional commuters, to be able to respond to the regional nature of travel in the study area. The project study area includes both active and abandoned railroad right-of-way. It also includes I-25 as well as connecting highways and arterials. Therefore, there were a variety of potential operating environments and alignments to consider in the transit alternatives development phase.

Figure 3-7 Level Two Alternatives – New Arterial Road

The New Arterial Roads category is defined as improvements to county and local roads within four miles of I-25. This includes Weld and Larimer County parallel arterial roads and WCR 13. Alternatives would connect to existing state highways near the north and south project limits, and could be built over segments of county roads. This alternative would have less access control and be closer to I-25 than New Highway alternatives.

CHARACTERISTICS:

Capital Cost: $1 million to $2 million per lane mile (excludes right-of-way)

New Capacity: 2,400 to 2,800 people per hour per direction

ALTERNATIVE	A	B
DESCRIPTION	Weld County Parallel Arterial Study and the I-25 Corridor Plan roads	WCR 13 from SH 14 to Colorado Blvd. in Thornton
LENGTH (miles)	43 westside 42 eastside	42
ACCESS	Intersections	Intersections
RIGHT-OF-WAY (ROW)	4 lanes	4 lanes
TRAVEL TIME	Would provide options for local trips	Would provide options for local trips

NOTE: Combinations of these alignments could be viable

Level One Alternative # 43

Figure 3-6 Level Two Alternatives – New Highway

New highway has been defined as potential alignments for new four-lane limited-access expressways that in part could be built along new alignments. They could be built over segments of county roads, and could also connect to existing state highways that could be upgraded, with or without new lane additions. Alignments more than four miles from I-25 will be considered.

CHARACTERISTICS:

Capital Cost: $2 million to $4 million per lane mile (excludes right-of-way)

New Capacity: 3,700 to 4,000 people per hour per direction

ALTERNATIVE	A	B	C	D
DESCRIPTION	SH 1 west of Fort Collins to LCRs 14, 19, 21 and WCR 1	SH 14, GWRR, Two Rivers Pkwy. and upgrade US 85	SH 14, Two Rivers Pkwy. and upgrade US 85	WCR 49 from Ault to I-76
LENGTH (miles)	60	56	60	33
ACCESS	Interchanges and Intersections	Interchanges and Intersections	Interchanges and Intersections	Interchanges and Intersections
RIGHT-OF-WAY (ROW)	4 new lanes total	4-6 lanes total	4-6 lanes total	4 new lanes total
TRAVEL TIME	Would improve travel time on I-25 by providing an alternate route	Would improve travel time on I-25 by providing an alternate route	Would improve travel time on I-25 by providing an alternate route	Would improve travel time on I-25 by providing an alternate route

Level One Alternative # 42

Figure 3-5 Level Two Alternatives – Limited Access Lanes

Limited access lanes are physically separated from general highway lanes to segregate long distance and short distance travel within a corridor. Limited access lanes allow motorists that are going longer distances to travel more freely than motorists using general highway lanes because there are less conflicting movements caused by vehicles entering or exiting a highway. Limited access lanes carry motorists through portions of the corridor without providing the ability to get on or off the facility at all locations where the general highway lanes have access. Limited access lanes have access points to the general highway lanes at locations where a high amount of trip origination/destination are generated (cities and/or highways). Minimizing access points will be a major factor in the overall operations of the access lanes. The more access points, the less efficient the Limited Access Facility will be. This type of improvement could be applied to the existing highway corridors. Limited Access Lanes have grade separated crossings of intersecting roadways.

CHARACTERISTICS:

Capital Cost: $4 to $5 million per lane mile (excludes right-of-way)

New Capacity: 4,800 to 5,300 people per hour per direction

ALTERNATIVE	A	B
DESCRIPTION	Widen I-25 and provide access and egress at Wellington, SH 68, US 34, SH 119, SH 7 and 120th Ave.	Widen I-25 and provide access and egress at Wellington, SH 68, US 34, SH 119, SH 7 and 120th Ave.
LENGTH (miles)	52	52
ACCESS	slip ramps	slip ramps
RIGHT-OF-WAY (ROW)	Convert 2 lanes and add 2 lanes to SH 66, add 4 lanes north of SH 66	Add 4 new lanes entire length
TRAVEL TIME	Improved for inter-regional trips	Improved for inter-regional trips

Level One Alternative # 48

Figure 3-4 Level Two Alternatives – Express Lane

Express lanes include toll lanes, high-occupancy vehicle lanes (HOV) and high-occupancy toll lanes (HOT). HOV lanes are available only to buses and other high occupancy vehicles during peak travel periods but typically can be used as general purpose lanes outside of the peak periods. HOT lanes are available to buses and other high occupancy vehicles at no charge and to single-occupant vehicles that pay a toll. Toll lanes are available to all motorists willing to pay a toll. These types of improvements are focused along I-25.

CHARACTERISTICS:

Capital Cost: $4 million to $8 million per lane mile (excludes right-of-way)

New Capacity: Toll Lanes: 3,000 to 4,000 people per hour per direction
HOT Lanes: 4,100 to 7,300 people per hour per direction
HOV Lanes: 4,300 to 7,200 people per hour per direction

ALTERNATIVE	A B	C D E F	G H I J
DESCRIPTION	HOV Lane from SH 14 or SH 66 to 84th Ave.	Toll lanes from SH 14, US 34 or SH 66 to 84th Ave.	HOT lanes from SH 14, US 34 or SH 66 84th Ave.
LENGTH (miles)	50	50	50
ACCESS	slip ramps	slip ramps	slip ramps
RIGHT-OF-WAY (ROW)	Possible conversion of new lanes between SH 7 and SH 66	Possible conversion of new lanes between SH 7 and SH 66, 2 additional lanes would be needed for a total of 4 lanes	Possible conversion of new lanes between SH 7 and SH 66, 2 additional lanes would be needed for a total of 4 lanes
TRAVEL TIME	More reliable than general purpose lanes but less reliable than toll or HOT lane	Very reliable, Dynamic toll increases as demand increases	Very reliable, Dynamic toll increases as demand increases

Level One Alternative # 46

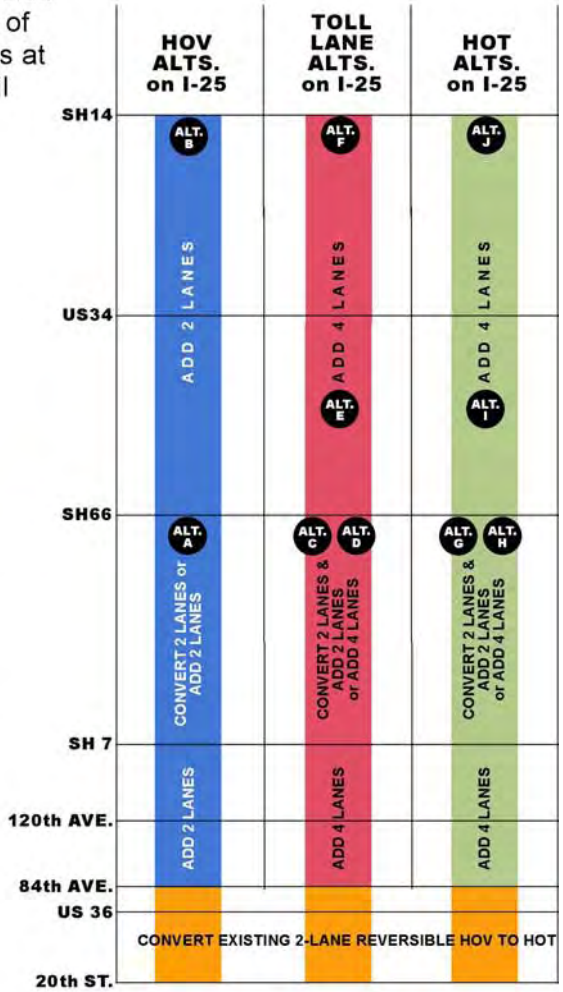


Figure 3-3 Level Two Alternatives – Upgrade Highway Classification

Upgrade Highway Classification is defined as improving an existing highway alignment to a multiple-lane limited access facility. Existing highways considered in this alternative would parallel I-25 and be at least four miles from I-25. Potential existing highways to reclassify and upgrade would be US 85 to the east and US 287.

CHARACTERISTICS:

Capital Cost: $3 million to $7 million per lane mile (excludes right-of-way)

New Capacity: 750 to 1,300 people per hour per direction

ALTERNATIVE	A	B	C	D
DESCRIPTION	Improve US 287 from Arterial to Expressway	Improve US 287 from Arterial to Freeway	Improve US 85 from Arterial to Expressway	Improve US 85 from Arterial to Freeway
LENGTH (miles)	43	43	53	53
ACCESS	Interchanges and Intersections	Interchanges	Interchanges and Intersections	Interchanges
RIGHT-OF-WAY (ROW)	Additional ROW at interchange	Additional ROW at interchange	Additional ROW at interchange	Additional ROW at interchange
TRAVEL TIME	Faster and more reliable than today's configuration	Faster and more reliable than an expressway	Faster and more reliable than today's configuration	Faster and more reliable than an expressway

Level One Alternative # 39

Figure 3-2 Level Two Alternatives – Additional Lanes

Additional lanes are the most common method of adding travel capacity along a corridor. Lanes could be added to any existing road in the corridor.

CHARACTERISTICS:

Capital Cost: $3 million to $5 million per lane mile (excludes right-of-way)

New Capacity: 1,300 to 2,600 people per hour per direction

ALTERNATIVE	A	B	C	D
DESCRIPTION	US 287 from Fort Collins to Broomfield	I-25 from Wellington to SH66	I-25 from Wellington to US 36	US 85 from Ault to I-76
LENGTH (miles)	49	35	61	52
ACCESS	Intersections	Interchanges	Interchanges	Interchanges and Intersections
RIGHT-OF-WAY (ROW)	4-6 lanes total	4-6 lanes total	4-6 lanes total	4-6 lanes total
TRAVEL TIME	Would improve travel time compared to the no action alternative	Would improve travel time compared to the no action alternative	Would improve travel time compared to the no action alternative	Would improve travel time compared to the no action alternative

Level One Alternative # 44

Safety Considerations

Minor improvements would be necessary to address safety concerns along I-25. A small amount of improvement can be realized through the installation of traffic signals at ramp terminals that are currently unsignalized. This improvement is included in the No-Action Alternative at SH 1, Mountain Vista, SH 56, SH 60 and WCR 34. At Prospect, widening the I-25 off-ramps is included to minimize queuing into the I-25 mainline.

The following section includes descriptions of Level Two stand-alone and complementary build alternatives. All the stand-alone alternatives listed were screened in Level 2A, the remaining alternatives were analyzed further in Level 2B. Complementary alternatives were held from screening, but available for further analysis later in the study process if needed.

3.1.2 Build Alternatives - Highway

Figures 3-2 through **Figure 3-7** illustrate the highway alternatives that were considered to be stand-alone alternatives because they had sufficient capacity to meet the project area's mobility goals. They include:

- Additional Lanes
- Upgrade Highway Classification
- Express Lanes
- Limited Access Lanes
- New Highway
- New Arterial Road

As shown in the figures, a range of both northern and southern termini was developed for each alternatives, and evaluated as part of the alternatives screening. The termini are discussed in detail in the **Southern Terminus Technical Memorandum**, *November 28, 2007 V6* and the **Northern Terminus Assessment**, *October, 2004*. Both of these can be found in **Appendix A**.

Potential northern termini included: US 34, SH 14 and SH 1

Potential southern termini included: SH 66, SH 7, E-470, I-76, US 36/84th Avenue

Figure 3-1 No-Action Alternative

3.0 LEVEL TWO

In Level Two Screening, the reasonable range of alternatives was revised by defining further the No-Action Alternative, as well as stand-alone and complementary Build Alternatives. "Stand-alone alternatives" were defined as improvements that, on their own, would provide sufficient capacity to meet mobility goals. Other, "complementary", improvements, those that were not considered to add sufficient capacity, could be packaged with stand-alone improvements to fully meet the purpose and need of the project. In addition, stand-alone highway and transit alternatives were developed and evaluated separately by doing comparisons of alternatives within their same grouping. In this way, the best of each group would emerge for more detailed testing in future steps of the analysis.

By definition congestion management measures either enhance build alternatives or are used in combinations instead of them. For this reason, congestion management alternatives were evaluated independently and as a group to determine their assignment to either the stand-alone or complementary categories.

The Level Two analysis was conducted in two stages, Level 2A and Level 2B. Level 2A utilized existing and available data; Level 2B utilized criteria and data that were generated by the travel demand model.

3.1 LEVEL TWO ALTERNATIVES DEVELOPMENT

3.1.1 No-Action

The No-Action Alternative is a conservative estimate of safety improvements and maintenance requirements that would be necessary if a build alternative were not constructed. The No-Action Alternative is presented for comparison with the build alternatives in accordance with NEPA requirements. Because it will eventually be analyzed for impacts in the DEIS, it is assumed to pass through all levels of Alternatives Development and Screening. No-Action Alternative improvements are described below and graphically summarized in **Figure 3-1.**

Maintenance of Structures

From US 36 to SH 1, two structures (at 84th Avenue and 104th Avenue) would require major rehabilitation and 25 structures would require minor rehabilitation by 2030. These are evaluated as part of the No-Action Alternative.

Maintenance of Pavement

Pavement north of SH 66 would need to be replaced by 2030. Replacement of the pavement is assumed to include milling and replacing the top 6 inches of pavement. Pavement between SH 52 and SH 66 will be upgraded as part of a separate action. This pavement maintenance is included and evaluated as part of the No-Action Alternative.

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2.3.3 Congestion Management

With the exception of reversible lanes, signal coordination and prioritization along I-25, signage along I-25, and bicycle and pedestrian facilities along I-25 these strategies met the tests for purpose and need, practicability and environment. However, they were also acknowledged to have limited potential to meet elements of the purpose and need such as improving mobility, replacing aging infrastructure, and increasing accessibility. Therefore, it was decided in Level Two Screening they should be analyzed both independently and as a group to determine their potential effect on the corridor's mobility needs.

2.2.1 Highway

Level One evaluation of the potential highway alternatives found that all but two highway alternatives should advance to Level Two screening. Restriping the lanes along I-25 to accommodate additional lanes with narrower shoulders within the existing cross section failed because it would substantially compromise safety on I-25 by creating a geometric configuration that would be considered substandard according to accepted industry practices. Double-decking I-25 failed because it was considered impractical due to its order of magnitude cost and complexity of construction. All other highway alternatives were retained for further evaluation in Level Two.

2.2.2 Transit

Level One screening narrowed the range of alternative transportation improvements to those that were physically and functionally suited to the 70-mile study area and numerous population centers. Therefore, mag-lev, heavy rail, automated guideway transit, and super high-speed rail were screened from further analysis. (Individual white papers on these technologies and their lack of suitability to the North I-25 Corridor are available.) Commuter rail, bus rapid transit (BRT), light rail and high-speed rail technologies on various alignments were advanced to Level Two for further consideration.

2.2.3 Congestion Management

The strategies screened from further analysis in Level One include: reversible lanes, signal prioritization and coordination, signage and bicycle and pedestrian facilities. Preliminary traffic information did not exhibit a directional rush hour along the northern portion of the North I-25 corridor, making reversible lanes impracticable. Similarly, I-25 is not a signalized facility, making signal treatments impracticable. Signage and bicycle and pedestrian facilities were considered to be impracticable due to the size and scale of an interstate versus the limited localized influence of signage and bicycle and pedestrian facilities.

2.3 LEVEL ONE LESSONS LEARNED

2.3.1 Highway

The large study area provided a large range of possibilities for highway improvements. A variety of alternatives along US 287, US 85, I-25 and new corridors were retained for additional evaluation in Level Two.

2.3.2 Transit

In Level One, it was found that transit technology candidates must be able to serve both local and regional mobility needs. Although stakeholders expressed interest in transit services, especially rail with the capability of operating at high speeds, other stakeholders expressed an interest in serving multiple station areas to allow more access to the service. In addition, technologies requiring an exclusive corridor, whether elevated or not, were not considered feasible over the corridor's full length, due to the additional order of magnitude cost of construction and maintenance required.

Table 2-2 Level One Screening Results (cont'd)

Alternative	Description/ Location	Responsiveness to Purpose & Need	Likelihood of Irresolvable Environmental Impacts	Practicability	Pass to Level Two or Reason for Failing
Transportation System Management	Corridor Wide	Pass	Pass	Pass	Pass
Bike & Pedestrian	Corridor Wide	Pass	Pass	Fail	Pass
Travel Demand Management	I-25	Pass	Pass	Pass	Pass (With the exception of reversible lanes n/o SH7)
Intelligent Transportation Systems	I-25	Pass	Pass	Pass	Pass
Transportation System Management	I-25	Pass	Pass	Pass	Pass (With the exception of signage and signal improvements)
Bike & Pedestrian	I-25	Fail	Pass	Fail	Impractical for a corridor of this length.

Table 2-2 Level One Screening Results (cont'd)

Alternative	Description/ Location	Responsiveness to Purpose & Need	Likelihood of Irresolvable Environmental Impacts	Practicability	Pass to Level Two or Reason for Failing
Super High Speed Rail >125 mph	Freight Rail Corridors	Pass	Pass	Fail	This technology was screened due to its order of magnitude cost and complexity of construction. The technology is not readily available in the United States and is impracticable for this project.
Super High Speed Rail >125 mph	New Alignment	Pass	Pass	Fail	This technology was screened due to its order of magnitude cost and complexity of construction. The technology is not readily available in the United States and is impracticable for this project.
Super High Speed Rail < 125 mph	Existing Highway Corridors	Pass	Pass	Fail	This technology was screened due to its order of magnitude cost and complexity of construction. The technology is not readily available in the United States and is impracticable for this project.
Mag-Lev	New Sealed Corridor	Pass	Pass	Fail	This technology was screened due to its order of magnitude cost and complexity of construction. The technology is not readily available and is impracticable for this project.
Rail Transport Cars	Existing Freight Rail Corridors	Pass	Pass	Fail	This type of technology has not been proven in the United States. Its relatively experimental nature makes it impracticable for this project.
Travel Demand Management	Corridor Wide	Pass	Pass	Pass	Pass
Intelligent Transportation Systems	Corridor Wide	Pass	Pass	Pass	Pass

Table 2-2 Level One Screening Results (cont'd)

Alternative	Description/ Location	Responsiveness to Purpose & Need	Likelihood of Irresolvable Environmental Impacts	Practicability	Pass to Level Two or Reason for Failing
Light Rail	Freight Rail Corridors	Pass	Pass	Pass	Pass
Light Rail	New Alignment	Pass	Pass	Pass	Pass
Automated Guideway Transit (Including Monorail)	Existing Highway Corridors	Pass	Pass	Fail	This type of technology would cost substantially more and have lower speeds than alternative transit technologies. Complexity and cost of higher speed technology would render it impracticable for this project.
Automated Guideway Transit (Including Monorail)	Freight Rail Corridors	Pass	Pass	Fail	This type of technology would cost substantially more and have lower speeds than alternative transit technologies. Complexity and cost of higher speed technology would render it impracticable for this project.
Automated Guideway Transit (Including Monorail)	New Alignment	Pass	Pass	Fail	This type of technology would cost substantially more and have lower speeds than alternative transit technologies. Complexity and cost of higher speed technology would render it impracticable for this project.
High Speed Rail 79-125 mph	Existing Highway Corridors	Pass	Pass	Pass	Pass
High Speed Rail 79-125 mph	Freight Rail Corridors	Pass	Pass	Pass	Pass
High Speed Rail 79-125 mph	New Alignment	Pass	Pass	Pass	Pass

Table 2-2 Level One Screening Results (cont'd)

Alternative	Description/ Location	Responsiveness to Purpose & Need	Likelihood of Irresolvable Environmental Impacts	Practicability	Pass to Level Two or Reason for Failing
Personal Rapid Transit (PRT)	Freight Rail Corridors	Pass	Pass	Fail	This type of technology has not been proven in revenue service. Complexity and cost render it impracticable for this project.
Personal Rapid Transit (PRT)	New Alignment	Pass	Pass	Fail	This type of technology has not been proven in revenue service. Complexity and cost render it impracticable for this project.
Heavy Rail	Subway or Below Grade	Pass	Pass	Fail	This technology and alignment was screened due to its order of magnitude cost and complexity of construction. These characteristics make it impracticable for this project.
Heavy Rail	Elevated	Pass	Pass	Fail	This technology and alignment was screened due to its order of magnitude cost and complexity of construction. These characteristics make it impracticable for this project.
Heavy Rail	Existing Highway Corridors	Pass	Pass	Fail	This technology and alignment was screened due to its order of magnitude cost and complexity of construction. These characteristics make it impracticable for this project.
Heavy Rail	Freight Rail Corridors	Pass	Pass	Fail	This technology and alignment was screened due to its order of magnitude cost and complexity of construction. These characteristics make it impracticable for this project.
Heavy Rail	New Alignment	Pass	Pass	Fail	This technology and alignment was screened due to its order of magnitude cost and complexity of construction. These characteristics make it impracticable for this project.
Light Rail	Existing Highway Corridors	Pass	Pass	Pass	Pass

Table 2-2 Level One Screening Results (cont'd)

Alternative	Description/ Location	Responsiveness to Purpose & Need	Likelihood of Irresolvable Environmental Impacts	Practicability	Pass to Level Two or Reason for Failing
Bus Rapid Transit Exclusive Lanes	Freight Rail Corridors	Pass	Pass	Pass	Pass
Bus Rapid Transit Exclusive Lanes	New Alignment	Pass	Pass	Pass	Pass
Express Bus	Existing Highway Corridors	Pass	Pass	Pass	Pass
Regional Bus	Existing Highway Corridors	Pass	Pass	Pass	Pass
Local Bus	Corridor Wide	Pass	Pass	Pass	Pass
Demand Responsive Bus	Corridor Wide	Pass	Pass	Pass	Pass
Jitney Service	Existing Highway Corridors	Fail	Pass	Pass	This type of technology has not been proven in revenue service. Complexity of operation in an interstate environment would render it impracticable for this project.
Commuter Rail	Existing Highway	Pass	Pass	Pass	Pass
Commuter Rail	Freight Rail Corridors	Pass	Pass	Pass	Pass
Commuter Rail	New Alignment	Pass	Pass	Pass	Pass
Personal Rapid Transit (PRT)	Existing Highway Corridors	Pass	Pass	Fail	This type of technology has not been proven in revenue service. Complexity and cost render it impracticable for this project.

Table 2-2 Level One Screening Results (cont'd)

Alternative	Description/ Location	Responsiveness to Purpose & Need	Likelihood of Irresolvable Environmental Impacts	Practicability	Pass to Level Two or Reason for Failing
Double Deck I-25	I-25	Pass	Pass	Fail	This technology and alignment was screened due to its order of magnitude cost and complexity of construction. These characteristics make it impracticable for this project.
Express Lanes	Existing Highway Corridors	Pass	Pass	Pass	Pass
Climbing Lanes	Existing Highway Corridors	Pass	Pass	Pass	Retained as potential Congestion Management Strategy.
Truck Lanes	Existing Highway Corridors	Pass	Pass	Pass	Retained as potential Congestion Management Strategy.
Limited Access Lanes	Existing Highway Corridors	Pass	Pass	Pass	Pass
New Highway	Corridor Wide	Pass	Pass	Pass	Pass
New Local Road	Corridor Wide	Pass	Pass	Pass	Pass
New Interchange	Existing Highway Corridors	Pass	Pass	Pass	Pass
Transit					
Bus Rapid Transit Mixed Use Lanes	Existing Highway Corridors	Pass	Pass	Pass	Pass
Bus Rapid Transit Exclusive or Semi Exclusive Lanes	Existing Highway Corridors	Pass	Pass	Pass	Pass

Table 2-2 Level One Screening Results

Alternative	Description/ Location	Responsiveness to Purpose & Need	Likelihood of Irresolvable Environmental Impacts	Practicability	Pass to Level Two or Reason for Failing
No Action					
No-Action	Corridor Wide	N/A	N/A	N/A	Pass
Highway					
Additional Lanes	Existing Highway Corridors	Pass	Pass	Pass	Pass
Interchange Replacement/ Upgrade	Existing Highway Corridors	Pass	Pass	Pass	Pass
Horizontal & Vertical Alignment Improvements	I-25	Pass	Pass	Pass	Pass
Intersection Upgrades /Upgrades Highway Classification	Corridor Wide	Pass	Pass	Pass	Pass
Frontage Road Revisions	I-25	Pass	Pass	Pass	Pass
Lane Width Reconfiguration	I-25	Fail	Pass	Pass	This alternative is not responsive to purpose and need because it would substantially compromise safety on I-25 by creating a geometric configuration that would be considered substandard according to accepted industry practices.

2.1.5.4 BICYCLE/PEDESTRIAN FACILITIES

These facilities would provide sidewalk and bike facility connectivity between residential areas and employment or activity centers; adequate shoulder space or bike lanes along major arterials; and adequate street features to encourage their use. Additional features can include lighting, trash receptacles, bike lockers, shade structures, crosswalks, landscaping, etc.

2.2 LEVEL ONE SCREENING

Level One screening was a fatal flaw evaluation to determine if the alternative was responsive to the project's purpose and need, if it was practicable and if it was likely to have irresolvable environmental impacts. These criteria are described in greater detail below.

Responsive to Purpose and Need – This criterion stated that alternatives that address the needs identified in the Purpose and Need Statement should be carried forward to Level Two screening. The needs included the potential to improve safety, replace aging infrastructure, address mobility and accessibility and provide multi modal travel options.

Practicability – This criterion evaluated the feasibility of an alternative based on cost, logistics and technology reliability. While detailed costs were not available at Level One of screening, general costs from peer systems or projects were available for comparison. These costs were applied to the range of alternatives as applicable, for comparison based on their order of magnitude. Therefore, alternatives that would likely cost substantially more than others and would provide a similar function were screened out. Similarly, if the logistics of construction or operation rendered an alternative infeasible, or if the alternative technology was not available, it was also screened out.

Likelihood of Irresolvable Environmental Impacts – This criterion screened alternatives that would have the potential for substantial environmental impacts and for which an alternative was clearly available. Level One Screening eliminated alternatives with impacts of such probable magnitude that NEPA approval or other permits would not be achievable.

Table 2-2 lists the range of alternatives developed and the results of the Level One screening evaluation.

Vanpools – More formal agreements between groups of 6 to 15 participants to lease a van from a regional transportation authority, designate a driver, and use the van to reach their common destination. Vans are procured and maintained, and participants can be matched and organized by regional transportation agencies, as they currently are through the NFRMPO and DRCOG. Employers can also initiate and sponsor vanpool services for their employees as a benefit.

Telecommuting – Arranging the capability to work offsite, thereby avoiding driving during peak-hour traffic, or perhaps avoiding having to make the trip to work at all.

Land Use Policies – The implementation and enforcement of land use policies intended to encourage/require development to increase mobility for residents and businesses by creating land use-transportation connections. Example policies include creating a range of housing choices; creating walkable neighborhoods; encouraging community collaboration; mixing land uses; preserving open spaces; providing a variety of transportation choices; and strengthening and directing development towards existing communities.

2.1.5.2 INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

Real Time Transportation Information – Can include static or dynamic information related to traffic conditions, real-time transit service or information on trip planning and transportation options accessible to the public. Information is disseminated on a variety of media including radio, websites, or variable message signs. Dynamic information relies on global positioning satellite (GPS) transponders, cameras, and other devices to relay information to the traveler.

2.1.5.3 TRANSPORTATION SYSTEM MANAGEMENT (TSM)

Reversible Lanes – Conversion of a general purpose lane to a special purpose or restricted access lane based on peak hour traffic flows. The lane may be designated as a High Occupancy Vehicle (HOV) lane, a limited access lane, a High Occupancy Toll (HOT) lane, or some combination of the three. Having been designated, the lane is open to peak hour traffic that meets its usage criteria. The lane is operated in the peak hour direction and reverses each peak period to serve the dominant flow of traffic.

Incident Management Program – A response program developed to reduce delay by removing obstructions caused by incidents (accidents, debris, stalled vehicles, etc.) through the use of a comprehensive incident management service, including towing, alternative route designation, call boxes, traffic control, etc.

Signal Coordination and Prioritization – Traffic signals can be timed to aid peak hour traffic flows. In addition, signals can be programmed to change for approaching transit vehicles to ensure that transit vehicles are not delayed at intersections.

Ramp Metering – Signals can be placed at freeway ramps to regulate the flow of traffic accessing a highway facility. This reduces delay along the freeway by reducing congestion related to ramp merging.

Signage – Way finding can help reduce driver confusion and consequent delay or incidents by clearly marking entrances, exits, or approaching landmarks and popular destinations.

2.1.4.1 NON-FIXED GUIDEWAY

Bus Rapid Transit – Powered by diesel fuel, natural gas, or hybrid power sources. Bus Rapid Transit operates in semi-exclusive (HOV, HOT, Toll) or exclusive roadway lanes (bus lanes) for at least 50% of its route (though it is physically capable of operating within shared lanes.) On freeway-based applications, it stops every 5 to 10 miles to function as a collector or distributor service at its ends-of-line. Local road applications have more frequent stops, ½ mile to 2 mile spacing. The average capacity is 20 to 100 seated passengers per bus.

Traditional Bus – The most common type of public transit, due largely to its flexibility, relatively low capital costs, and ability to serve a wide-range of travel markets. Buses typically operate in mixed traffic along roadways. Power is provided by a variety of sources including diesel fuel, compressed natural gas, and electricity along with hybrid combinations of power sources. Traditional buses can operate as express bus, regional bus, local bus and demand responsive bus service.

- ***Local Service –*** Provides the most access to riders as it can operate on large arterials or neighborhood-scale streets and stops the most frequently.
- ***Express Service –*** Runs in large arterial streets or freeways and stops infrequently, providing a travel time advantage over local bus service. With the addition of park-and-ride facilities, it can expand the capture area of transit service from within a quarter mile up to anywhere within five miles of the service route.
- ***Regional and/or Commuter Bus* service -** A commuter-oriented long distance transit service operating between regions with limited stops in order to operate faster than other bus services. This type of transit service usually operates on roads designated as arterials or higher and has park and-ride facilities located at its stops.
- ***Demand Response and Jitney services*** - Operate within a city or town but do not connect to other cities. Demand-responsive services provide curb-to-curb service within a specific geographic area for special needs population groups or for the general public as applicable. Jitneys typically involve passenger cars or shuttle vans operating on fixed routes (sometimes with minor deviations) as demand warrants without fixed schedules or fixed stops.

2.1.4.2 FIXED GUIDEWAY

Commuter Rail – Fueled by either diesel or electricity, commuter rail typically operates in freight rail corridors at speeds up to 90 mph with stops every 2 to 10 miles. Average capacity of a rail car is 75 to 250 seated passengers, and service is typically provided in corridors between 5 and 100 miles in length.

Personal Rapid Transit – These systems are designed to provide personalized service between specific origin and destination stations. PRT is an automated system of small vehicles that travel on elevated guideways and operate on demand.

Heavy Rail – Powered by electricity, heavy rail operates at a maximum speed of approximately 70 mph in exclusive underground or elevated corridors. Stops are typically located every half-mile to mile in dense urban areas, and approximately five miles in more suburban parts of the service area. The average capacity is 60 to 80 seated passengers per rail car.

Light Rail – Fueled by either diesel or electricity, light rail can operate in rail corridors or on city streets at speeds of up to 70 mph, with stops every half-mile to two miles. Average capacity of a

2.1.4.1 NON-FIXED GUIDEWAY

Bus Rapid Transit – Powered by diesel fuel, natural gas, or hybrid power sources. Bus Rapid Transit operates in semi-exclusive (HOV, HOT, Toll) or exclusive roadway lanes (bus lanes) for at least 50% of its route (though it is physically capable of operating within shared lanes.) On freeway-based applications, it stops every 5 to 10 miles to function as a collector or distributor service at its ends-of-line. Local road applications have more frequent stops, ½ mile to 2 mile spacing. The average capacity is 20 to 100 seated passengers per bus.

Traditional Bus – The most common type of public transit, due largely to its flexibility, relatively low capital costs, and ability to serve a wide-range of travel markets. Buses typically operate in mixed traffic along roadways. Power is provided by a variety of sources including diesel fuel, compressed natural gas, and electricity along with hybrid combinations of power sources. Traditional buses can operate as express bus, regional bus, local bus and demand responsive bus service.

- ***Local Service –*** Provides the most access to riders as it can operate on large arterials or neighborhood-scale streets and stops the most frequently.
- ***Express Service –*** Runs in large arterial streets or freeways and stops infrequently, providing a travel time advantage over local bus service. With the addition of park-and-ride facilities, it can expand the capture area of transit service from within a quarter mile up to anywhere within five miles of the service route.
- ***Regional and/or Commuter Bus* service -** A commuter-oriented long distance transit service operating between regions with limited stops in order to operate faster than other bus services. This type of transit service usually operates on roads designated as arterials or higher and has park and-ride facilities located at its stops.
- ***Demand Response and Jitney services*** - Operate within a city or town but do not connect to other cities. Demand-responsive services provide curb-to-curb service within a specific geographic area for special needs population groups or for the general public as applicable. Jitneys typically involve passenger cars or shuttle vans operating on fixed routes (sometimes with minor deviations) as demand warrants without fixed schedules or fixed stops.

2.1.4.2 FIXED GUIDEWAY

Commuter Rail – Fueled by either diesel or electricity, commuter rail typically operates in freight rail corridors at speeds up to 90 mph with stops every 2 to 10 miles. Average capacity of a rail car is 75 to 250 seated passengers, and service is typically provided in corridors between 5 and 100 miles in length.

Personal Rapid Transit – These systems are designed to provide personalized service between specific origin and destination stations. PRT is an automated system of small vehicles that travel on elevated guideways and operate on demand.

Heavy Rail – Powered by electricity, heavy rail operates at a maximum speed of approximately 70 mph in exclusive underground or elevated corridors. Stops are typically located every half-mile to mile in dense urban areas, and approximately five miles in more suburban parts of the service area. The average capacity is 60 to 80 seated passengers per rail car.

Light Rail – Fueled by either diesel or electricity, light rail can operate in rail corridors or on city streets at speeds of up to 70 mph, with stops every half-mile to two miles. Average capacity of a

Intersection Upgrades – Upgrades that address lane configurations and safety issues at existing intersections and access points. This could include, but is not limited to, adding turn lanes, signalizing or restricting movements at an intersection.

Frontage Road Revisions – Improve the capacity and layout of the frontage roads along I-25.

Lane Width Reconfiguration – Restripe I-25 to provide additional lanes within the existing cross section. This improvement would create narrower lanes and shoulders.

Double Deck I-25 – Create additional lanes using the existing right-of-way by adding an elevated, limited access expressway on a viaduct over the existing lanes.

2.1.3.1 Special Purpose Lanes

Tolled Express Lanes/Managed Lanes – Lanes whose demand is managed to maintain reliable, fast operation even during peak periods. The lanes are managed by allowing use only by single-occupant vehicle drivers willing to pay a toll or by high-occupant vehicles. The lanes are separated from general purpose lanes by a striped buffer or a raised median barrier.

Climbing Lanes – Lanes added to the upgrade direction of a road where high traffic volumes and heavy truck traffic combine to cause delays and platooning along the facility. This type of improvement could be applied to any highway facility throughout the corridor.

Truck Lanes – Truck lanes would provide a new, exclusive lane in each direction reserved for large trucks to improve safety and capacity in the general traffic lanes. They could be separated from or adjacent to general purpose lanes and could provide only limited access to local intersections or interchanges. This type of improvement was considered along existing highway corridors.

Limited Access Lanes –Grade-separated lanes that carry motorists through an intersection or interchange without the ability to get on or off the facility at that location.

2.1.3.2 New Facilities

New Highway – Construction of a new, high-capacity highway alignment anywhere within the study area.

New Local Road – Construction of a new road with less capacity and more access than a “New Highway” anywhere within the study area.

New Interchanges – Grade separated access points between a highway and a local street or between two highways. New interchanges could be built along any of the existing highway corridors.

2.1.4 Transit

Transit alternatives considered in Level One fell into two categories: non-fixed guideway and fixed guideway. For this initial screening phase, no specific station areas were assigned to any of the transit modes. Rather characteristic station spacing and ridership capacity were assumed. The range of transit alternatives is described below.

Table 2-1 Level One Improvement Alternatives and Corridors (cont'd)

Alternative	Location
34. Heavy Rail	Freight Rail Corridors
35. Heavy Rail	New Alignment
36. Light Rail	Existing Highway Corridors
36. Light Rail	Existing Highway Corridors
37. Light Rail	Freight Rail Corridors
38. Light Rail	New Alignment
39. Automated Guideway Transit (Including Monorail)	Existing Highway Corridors
40. Automated Guideway Transit (Including Monorail)	Freight Rail Corridors
41. Automated Guideway Transit (Including Monorail)	New Alignment
42. High Speed Rail 79-125 mph	Existing Highway Corridors
43. High Speed Rail 79-125 mph	Freight Rail Corridors
44. High Speed Rail 79-125 mph	New Alignment
45. Super High Speed Rail >125 mph	Existing Highway Corridors
46. Super High Speed Rail >125 mph	Freight Rail Corridors
47. Super High Speed Rail >125 mph	New Alignment
48. Mag-Lev	New Exclusive Corridors
49. Rail Transport Cars	Light Rail Corridors
Congestion Management	
50a. Travel Demand Management	Corridor Wide
50b. Intelligent Transportation Systems	Corridor Wide
50c. Transportation System Management	Corridor Wide
50d. Bike and Pedestrian Facilities	Corridor Wide

2.1.1 No-Action

The National Environmental Policy Act (NEPA) process requires analysis of a "No-Action Alternative". This alternative is fully assessed in the NEPA documentation and used as a baseline against which build alternatives are evaluated. The No-Action Alternative addresses acute safety and maintenance concerns that would need to be addressed if a build alternative is not selected. This alternative is required to be retained for comparative purposes throughout the screening process.

2.1.2 Highway

Highway improvements considered in Level One fell into three categories: modifying existing facilities, special purpose lanes, and new facilities. Each is described below.

2.1.3 Modifying Existing Facilities

Additional Lanes – Lanes added to any existing road in the study area. This is the most common method of adding travel capacity along a corridor.

Interchange Replacement/Upgrade – Includes improving or reconstructing existing interchanges that currently operate inefficiently or are expected to have operating deficiencies in the future.

Horizontal and Vertical Alignment – Improvements that address specific stretches of a road that have been identified as having inadequate or unsafe geometric configurations. This includes, but is not limited to, sight distance considerations and super elevation.

Table 2-1 Level One Improvement Alternatives and Corridors

Alternative	Location
No Action	
01. No Action	Corridor Wide
Highway	
02. Additional General Purpose Lanes	Existing Highway Corridors
03. Interchange Replacement/Upgrade	Existing Highway Corridors
04. Horizontal and Vertical Alignment Improvements	I-25
05. Intersection Upgrades	Corridor Wide
06. Frontage Road Revisions	I-25
07. Lane Width Reconfiguration	I-25
08. Double Deck Freeway	I-25
09. Express Lanes	Existing Highway Corridors
10. Climbing Lanes	Existing Highway Corridors
11. Truck Lanes	I-25
12. Limited Access Lanes	Existing Highway Corridors
13. New Highway	Corridor Wide
14. New Local Road	Corridor Wide
15. New Interchange	Existing Highway Corridors
Transit	
16. Bus Rapid Transit	Existing Highway Corridors in General Purpose Lanes
17. Bus Rapid Transit	Existing Highway Corridors in Exclusive or Semi Exclusive Lanes
18. Bus Rapid Transit	Freight Rail Corridors in Exclusive lanes
19. Bus Rapid Transit	New Alignment in Exclusive lanes
20. Express Bus	Existing Highway Corridors
21. Regional Bus	Existing Highway Corridors
22. Local Bus	Corridor Wide
23. Demand Responsive Bus	Corridor Wide
24. Jitney Service	Existing Highway Corridors
25. Commuter Rail	Existing Highway Corridors
26. Commuter Rail	Freight Rail Corridors
27. Commuter Rail	New Alignment
28. Personal Rapid Transit	Existing Highway Corridors
29. Personal Rapid Transit	Freight Rail Corridors
30. Personal Rapid Transit	New Alignment
31. Heavy Rail	Subway or Below Grade
32. Heavy Rail	Elevated
33. Heavy Rail	Existing Highway Corridors

2.0 LEVEL ONE

2.1 LEVEL ONE ALTERNATIVES DEVELOPMENT

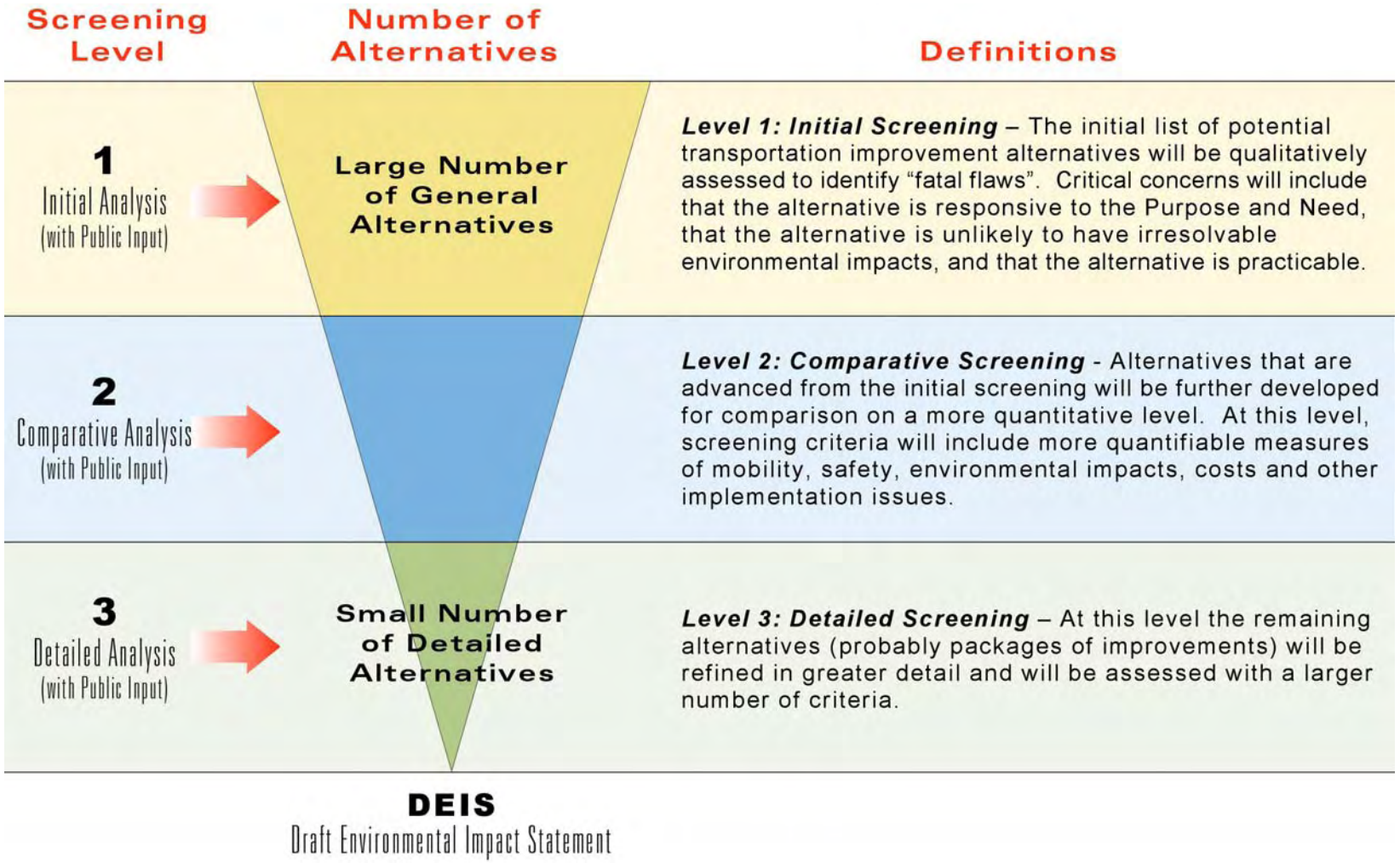
The North I-25 EIS project team developed a wide range of potential transportation alternatives to address the project's Purpose and Need Statement using the following information:

- Existing and planned road network
- State and federal requirements
- Section 404 of the Clean Water Act
- Section 106 of the National Historic Preservation Act
- Clean Air Act Amendments of 1990
- Section 4(f) of the US Department of Transportation Act
- Existing and future land uses
- Existing environmental resources
- Existing and future travel patterns
- Previous studies conducted in the area
- Mason Transportation Corridor
- Transportation Alternatives Feasibility Study (TAFS)
- Interstate 25, SH 7 to SH 66 Environmental Assessment
- US 85 Access Control Plan
- DRCOG Metro Vision
- RTD FasTracks
- Rail "Loop" Plan
- Front Range Rail
- Prairie Falcon Parkway
- Information provided by advisory committees
- Public input received during the scoping process

A total of 50 transportation technologies were identified that could have been implemented along I-25, US 287, US 85 or on a new travel corridor. These alternatives represented a reasonable range of alternatives. If an improvement type was not included in Level One, it was considered outside the reasonable range of alternatives.

Table 2-1 lists the transportation technologies considered and the corridors where they were considered. Descriptions of each of the alternatives are included after the table.

Figure 1-2 Alternatives Screening Process



1.2 ALTERNATIVES SCREENING

The alternatives evaluation and screening process consisted of qualitative and then progressively detailed and quantitative analyses of alternatives relative to evaluation criteria. The criteria at every level of analysis described below were based on three areas of analysis: the purpose and need of the project, the alternatives' practicability, and the alternatives' potential effect on human and natural environmental resources. As the study progressed, the criteria became more specific, but still related to the three areas of analysis. The alternatives screening process is depicted in **Figure 1-2**. The three levels of screening prior to evaluation in the Draft EIS were:

Level One screening was primarily a qualitative "fatal flaw" assessment. It eliminated alternatives that were not practicable for implementation based on substantial faults related to cost, logistics, technology reliability or other characteristics that made them unreasonable in the study area and therefore unnecessary to study further.

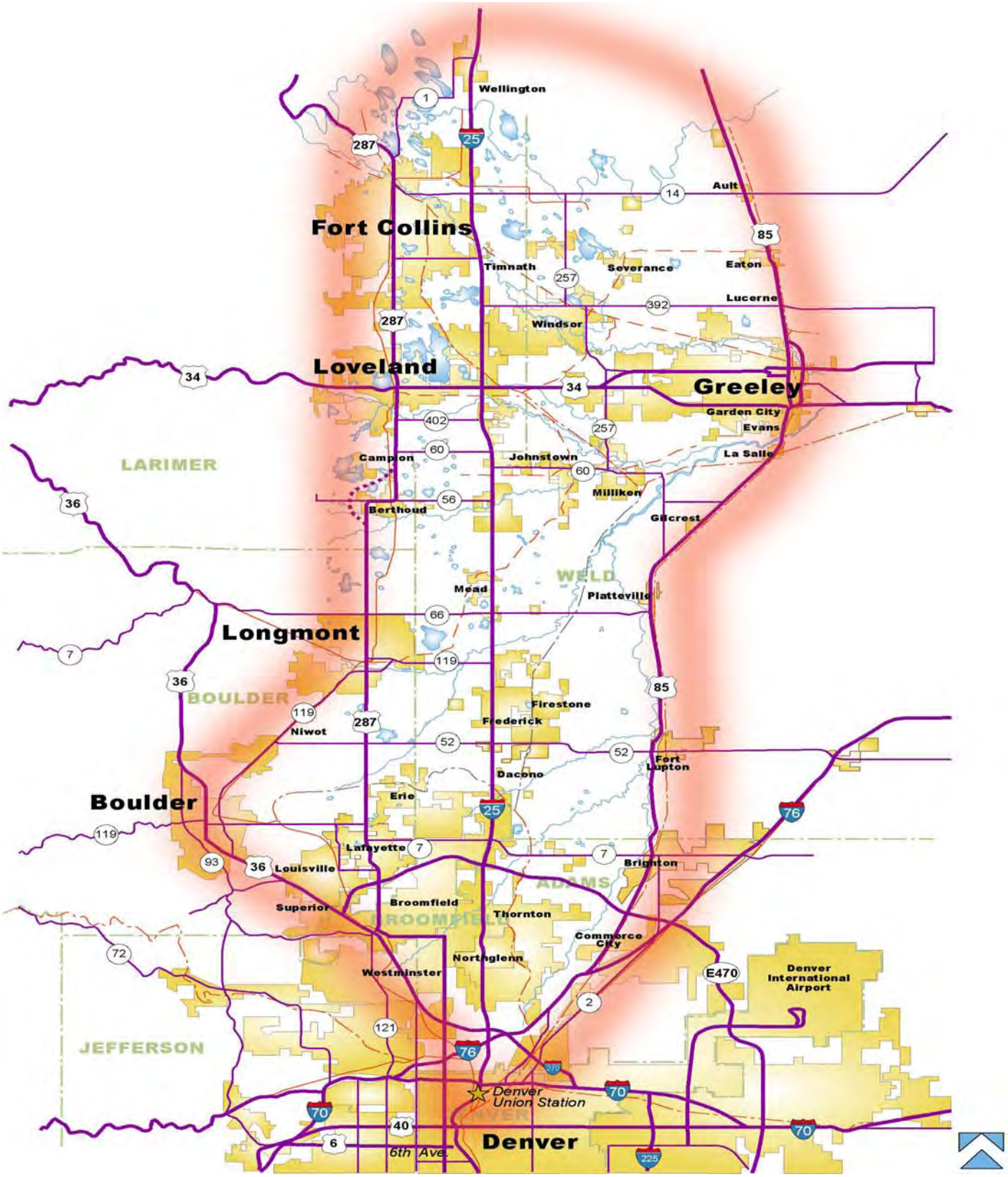
Level Two screening separated alternatives into categories by improvement type (e.g. highway expansion-general purpose lanes, light rail, etc.) and, after some additional data collection and quantification, screened out those within each category that did not compare as well with others in meeting purpose and need, addressing practicability issues, or avoiding impacts to environmental resources. Evaluation used readily available information at this level to identify differences between alternatives within each category.

> **Level 2A** screening used existing data to assess the practicability of the remaining alternatives, and their potential to serve corridor travel patterns and markets.
>
> **Level 2B** screening used the initial results from Level 2A screening and supplemented them with analysis from the travel demand model to comparatively analyze the remaining alternatives. The alternatives that performed best not only within categories, but overall were advanced to Level 3.

Level Three alternatives were packaged with the components advanced from Level 2B. The Level 2B components were refined and packaged in such a way as to measure discernable differences between a smaller number of alternatives.

At each of these levels, input was actively sought from the general public, the Regional Coordination Committee (RCC elected officials), the Technical Advisory Committee (TAC), and state and federal resource agencies.

Figure 1-1 Study Area



1.0 INTRODUCTION

This report is a detailed compilation of the alternatives development and evaluation effort that took place as part of the North I-25 EIS study process. The North I-25 EIS study area is illustrated in **Figure 1-1**.

1.1 ALTERNATIVES DEVELOPMENT

The North I-25 EIS project purpose is defined as "…meeting long-term travel needs between the Denver metropolitan area and the rapidly growing population centers along the I-25 corridor north to the Fort Collins-Wellington area." The need for action identifies concerns about highway safety, mobility and accessibility, aging highway infrastructure, the lack of alternative interregional travel modes and the need to address economic growth demands. The complete Purpose and Need Statement is included in the North I-25 Draft EIS.

The purpose and need for the project and stakeholder input provided the framework for alternatives development. The alternatives evaluation and screening process was conducted by defining a broad range of alternatives, and then conducting increasingly detailed evaluations of them as they were refined and narrowed down to the most promising solutions. A wide range of alternatives was developed: multiple transit technologies, on various feasible alignments, and highway improvements on both existing and new alignments.

Alternatives analysis was completed in three separate levels of screening. While highway and transit alternatives were evaluated separately in Levels One and Two, a combination of highway and transit improvements are necessary to fully address the project's purpose and need. In Level Three, transit and highway alternatives were combined to create packages of improvements that comprehensively address the project's purpose and need. After all three levels of screening were complete, alternatives were refined and presented for analysis in the DEIS.

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LIST OF APPENDICES

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