

North I-25, US 36 to SH 7 Planning and Environmental Linkages Study

Project: CO 253-219 (18215)

prepared for:



COLORADO
Department of
Transportation

REGION 1

July 2014

Updated December 2014



NORTH I-25 PEL REPORT

Prepared for:

Colorado Department of Transportation

Prepared by:

Felsburg Holt & Ullevig
6300 South Syracuse Way, Suite 600
Centennial, CO 80111
303/721-1440

In association with:

Jacobs Engineering
Hartwig and Associates
Apex Design Group
Hermsen Consultants
CDR Associates
Two Hundred

FHU Reference No. 11-166-01
July 2014
Updated December 2014

TABLE OF CONTENTS

	<u>Page</u>
LIST OF ACRONYMS AND ABBREVIATIONS -----	viii
1.0 INTRODUCTION -----	1-1
1.1 Study Description and Location	1-1
1.2 Study Background and Context	1-1
1.2.1 Transportation Investment Generating Economic Recovery IV, 2012	1-1
1.2.2 North I-25 Environmental Impact Statement and Record of Decision, 2011	1-3
1.2.3 North Metro Environmental Impact Statement and Record of Decision, 2011	1-3
1.2.4 North Metro Transportation Study, 2001	1-4
1.3 Logical Termini	1-4
1.4 Purpose of the Transportation Improvements	1-4
1.5 Need for the Transportation Improvements	1-4
1.5.1 Mobility Problem	1-5
1.5.2 Safety Problem: Higher Than Expected Crashes due to Traffic Congestion	1-13
1.5.3 Multimodal Problem: Overcapacity Multimodal Facilities	1-16
1.6 Project Goals	1-16
2.0 ALTERNATIVES DEVELOPMENT AND EVALUATION -----	2-1
2.1 Description of Process	2-1
2.2 Recommended Alternative	2-3
2.2.1 Recommended Alternative Roadway	2-5
2.2.2 Recommended Alternative Transit	2-6
2.2.3 Recommended Alternative Complementary Projects and Strategies	2-7
2.2.4 Recommended Alternative Construction Cost Estimates	2-10
2.3 Prioritization and Phasing	2-13
2.3.1 Roadway Phasing	2-13
2.3.2 Transit Phasing	2-16
2.3.3 Complementary Projects and Strategies	2-18
2.4 No Action Alternative	2-18
2.4.1 Managed Lanes between US 36 and 120 th Avenue	2-18
2.4.2 SH 7 Carpool Lot	2-18
2.4.3 Thornton park-n-Ride Expansion	2-18
2.4.4 North Metro Rail Line	2-18
2.5 Other Potential Corridor Projects	2-20
2.5.1 Managed Lane Extension 120 th Avenue to SH 66	2-20
2.5.2 SH 7 / I-25 Interchange	2-20
2.5.3 DRCOG Metro Vision	2-20
2.6 Potential Long-Term Cross Sections for Future Consideration	2-20
2.6.1 Managed Lanes North from 120 th Avenue to SH 7	2-21
2.6.2 General Purpose Lanes North from 84 th Avenue to SH 7	2-21
2.6.3 Reversible Managed Lanes North from US 36 to SH 7	2-21
2.6.4 Two Managed Lanes North from US 36 to SH 7	2-21
2.6.5 128 th Median Station	2-21

2.7	Components Eliminated	2-21
2.7.1	Roadway	2-22
2.7.2	Transit	2-24
2.7.3	Complementary Projects and Strategies	2-25
3.0	TRANSPORTATION ANALYSIS	3-1
3.1	Tools and Methodologies	3-1
3.1.1	DRCOG TransCAD Travel Demand Model	3-1
3.1.2	DynusT Dynamic Traffic Assignment Model	3-1
3.1.3	VISSIM Microsimulation Model	3-2
3.1.4	Synchro Operations Tool	3-2
3.1.5	Transit Routing Travel Time Savings Calculations	3-2
3.1.6	Conceptual Design	3-2
3.2	North Metro Line Sensitivity Analysis	3-3
3.3	Roadway Component Analysis	3-3
3.3.1	Peak Travel Time and Congestion Duration	3-4
3.3.2	Vehicle-Hours Traveled	3-5
3.3.3	Cost-Benefit	3-6
3.3.4	Safety	3-7
3.4	Transit Component Analysis	3-7
3.4.1	Park-and-Rides	3-7
3.4.2	Bus Travel Time	3-11
3.5	Complementary Projects and Strategies Component Analysis	3-11
3.5.1	Additional Crossings of I-25	3-11
3.5.2	Travel Demand Management	3-12
3.5.3	Transportation Systems Management	3-13
3.5.4	Intelligent Transportation Systems	3-13
3.5.5	Upgrade Ramp Merge and Diverge Sections to Meet Current Design Standards	3-14
3.5.6	70th Avenue / Washington Street Intersection	3-14
4.0	ENVIRONMENTAL CONSEQUENCES	4-1
4.1	Air Quality	4-1
4.1.1	Environmental Consequences	4-1
4.1.2	Mitigation Strategies and Next Steps	4-2
4.2	Environmental Justice	4-2
4.2.1	Environmental Consequences	4-3
4.2.2	Mitigation Strategies and Next Steps	4-4
4.3	Floodplains and Floodways	4-4
4.3.1	Environmental Consequences	4-5
4.3.2	Mitigation Strategies and Next Steps	4-5
4.4	Hazardous Materials	4-7
4.4.1	Environmental Consequences	4-7
4.4.2	Mitigation Strategies and Next Steps	4-8
4.5	Historic Resources	4-8
4.5.1	Environmental Consequences	4-10
4.5.2	Mitigation Strategies and Next Steps	4-12

4.6	Land Use	4-12
4.6.1	Environmental Consequences.....	4-13
4.6.2	Mitigation Strategies and Next Steps.....	4-13
4.7	Traffic Noise	4-14
4.7.1	Environmental Consequences.....	4-14
4.7.2	Mitigation Strategies and Next Steps.....	4-15
4.8	Parks and Recreational Resources	4-15
4.8.1	Environmental Consequences.....	4-16
4.8.2	Mitigation Strategies and Next Steps.....	4-20
4.9	Wildlife/Threatened and Endangered Species.....	4-20
4.9.1	Environmental Consequences.....	4-20
4.9.2	Mitigation Strategies and Next Steps.....	4-22
4.10	Wetlands and Other Waters of the US	4-22
4.10.1	Environmental Consequences.....	4-22
4.10.2	Mitigation Strategies and Next Steps.....	4-24
4.11	Right-of-Way.....	4-25
4.11.1	Environmental Consequences.....	4-25
4.11.2	Mitigation Strategies and Next Steps.....	4-26
4.12	Cumulative Impacts	4-26
4.12.1	Land Use	4-26
4.12.2	Water Quality.....	4-27
4.12.3	Wildlife.....	4-28
4.12.4	Wetlands	4-28
4.12.5	Air Quality.....	4-29
4.12.6	Historic Properties and Districts.....	4-30
5.0	AGENCY COORDINATION AND PUBLIC INVOLVEMENT -----	5-1
5.1	Agency Coordination	5-1
5.1.1	Project Management Team	5-1
5.1.2	Stakeholder Interviews	5-2
5.1.3	Executive Committee and Technical Advisory Committee.....	5-3
5.1.4	Visioning Workshop.....	5-5
5.1.5	Resource Agency Scoping	5-6
5.2	Public Involvement	5-7
5.2.1	Mailing List Development and Mass Mailing.....	5-7
5.2.2	Open House Public Meetings	5-7
5.2.3	Public Comments	5-8

6.0	Next Steps: Road Map to Implementation-----	6-1
6.1	Long-Term Cross Sections	6-1
6.2	Road Map to Implementation.....	6-2
	6.2.1 Identification of Funding	6-2
	6.2.2 Environmental Planning.....	6-3
	6.2.3 Regional Planning	6-3
	6.2.4 Scoping, Preliminary and Final Design.....	6-4
	6.2.5 Right-of-Way Acquisition	6-4
	6.2.6 Construction	6-5
6.3	Potential Funding Strategies.....	6-5
	6.3.1 Cities along the Corridor	6-5
	6.3.2 North Area Transportation Alliance.....	6-5
	6.3.3 Taxing District.....	6-5
	6.3.4 Regional Transportation District	6-6
	6.3.5 State Infrastructure Bank.....	6-6
	6.3.6 High Performance Transportation Enterprise	6-6
	6.3.7 Non-federal Dollars.....	6-6
	6.3.8 Value-Capture Area.....	6-6
	6.3.9 Shadow Tolls.....	6-7
	6.3.10 Public Private Partnership	6-7
7.0	REFERENCES -----	7-1

LIST OF APPENDICES

Appendix A	FHWA Colorado Division Planning/Environmental Linkages Questionnaire
Appendix B	Corridor Conditions Report
Appendix C	Alternatives Evaluation and Conceptual Design Information
Appendix D	Breakpoint Analysis Results Memorandum
Appendix E	Dynamic Traffic Assignment Methods and Assumptions and Model Calibration Results
Appendix F	Agency Coordination and Public Involvement

LIST OF FIGURES

	<u>Page</u>
Figure 1-1	Study Area ----- 1-2
Figure 1-2	Congestion along North I-25----- 1-5
Figure 1-3	Existing and Future Daily Volumes ----- 1-6
Figure 1-4	Southbound I-25 Speeds on a Typical Day----- 1-7
Figure 1-5	Northbound I-25 Speeds on a Typical Day ----- 1-8
Figure 1-6	Duration of Existing Peak Period Congestion ----- 1-9
Figure 1-7	Duration of 2035 Peak Period Congestion----- 1-10
Figure 1-8	Southbound I-25 Congestion – a.m. Peak Period (Incident-Related Congestion Analysis)----- 1-11
Figure 1-9	Northbound I-25 Congestion – p.m. Peak Period (Incident-Related Congestion Analysis)----- 1-12
Figure 1-10	Safety Performance Along the North I-25 PEL Study Area----- 1-13
Figure 1-11	Crashes by Segment and Type----- 1-14
Figure 1-12	Southbound I-25 Crashes and Congestion – 120 th Avenue to US 36----- 1-15
Figure 1-13	Northbound I-25 Crashes and Congestion – US 36 to 120 th Avenue ----- 1-15
Figure 1-14	Existing park-n-Rides, with an Aerial View of the Wagon Road park-n-Ride----- 1-16
Figure 2-1	Alternatives Development, Evaluation, and Screening Process----- 2-2
Figure 2-2	Recommended Alternative----- 2-4
Figure 2-3	Phasing Scenarios ----- 2-15
Figure 2-4	Transit Phasing Scenario----- 2-17
Figure 3-1	Base Year and 2035 DRCOG Model Daily Park-and-Ride Demand ----- 3-9
Figure 3-2	Wagon Road Park-n-Ride User Origin Survey----- 3-10
Figure 4-1	Floodplain and Floodway Impacts ----- 4-6
Figure 4-2	Hazardous Materials – Sites with Potential or Recognized Environmental Conditions ---- 4-9
Figure 4-3	Impacted Historical Sites ----- 4-11
Figure 4-4	Existing and Proposed Trails----- 4-17
Figure 4-5	Parks, Open Space, and Outdoor Recreation Areas ----- 4-18
Figure 4-6	Sensitive Species Potential Habitat and Movement ----- 4-21
Figure 4-7	Wetlands and Potential Wetlands ----- 4-23
Figure 6-1	Example Road Map for Implementation of Components ----- 6-2

LIST OF TABLES

	<u>Page</u>
Table 2-1	Recommended Alternative Conceptual Construction Cost Estimates (by Component) - 2-10
Table 2-2	Phasing Scenario----- 2-19
Table 3-1	Daily Traffic Forecasts – With and Without North Metro----- 3-3
Table 3-2	2035 Peak Travel Time and Duration Congestion ----- 3-4
Table 3-3	2015 Peak Travel Time and Duration Congestion ----- 3-5
Table 3-4	2015 Vehicle-Hours of Delay ----- 3-5
Table 3-5	Cost and Effectiveness of 2015 Phasing Plans----- 3-6
Table 3-6	Reported and Expected Three-year Crash Experience----- 3-7
Table 3-7	TDM Strategy Categorization ----- 3-12
Table 3-8	Transportation Systems Management Analysis ----- 3-13
Table 3-9	Ramp Metering Status ----- 3-14
Table 4-1	Drainageway Floodplain Summary ----- 4-4
Table 4-2	Hazardous Materials – Sites with Recognized and Potential Environmental Conditions-- 4-7
Table 4-3	Summary of Park-and-Ride Target Locations and Land Uses----- 4-14
Table 4-4	Summary of Potential Impacted Parks, Open Space and Trail Impacts ----- 4-16
Table 4-5	Summary of Park-and-Ride Target Locations and Potential Impacts on Parks, Open Space, and Trails----- 4-19
Table 4-6	Summary of Park-and-Ride Target Locations and Potential Impacts on Wetlands and Waters ----- 4-24
Table 4-7	Potential Property Acquisitions for ROW ----- 4-25
Table 5-1	Key Stakeholder Interviews----- 5-2
Table 5-2	EC Members ----- 5-3
Table 5-3	TAC Members----- 5-4

LIST OF ACRONYMS AND ABBREVIATIONS

a.m.	morning
ASTM	American Society for Testing and Materials
ATM	active traffic management
BMP	best management practices
BNSF	Burlington Northern Santa Fe Railway
CDOT	Colorado Department of Transportation
CLOMR	Conditional Letter of Map Revision
CMF	crash modification factor
CM/GC	Construction Management/General Contractor
CO	carbon monoxide
CPW	Colorado Parks and Wildlife
DB	Design Build
DBB	Design Bid Build
DRCOG	Denver Regional Council of Governments
EA	Environmental Assessment
EC	executive committee
EIS	Environmental Impact Statement
FASTER	Funding Advancement for Surface Transportation and Economic Recovery
FEMA	Federal Emergency Management Administration
FHU	Felsburg Holt & Ullevig
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GMP	Guaranteed Maximum Price
HOV	high occupancy vehicle
HPTE	High Performance Transportation Enterprise
I-25	Interstate 25
I-76	Interstate 76
I-270	Interstate 270
IMP	Incident Management Plan
ITS	Intelligent Transportation Systems
LOMR	Letter of Map Revision
LOS	level of service
LUST	leaking underground storage tank
mph	miles per hour
NAAQS	National Ambient Air Quality Standards
NATA	North Area Transportation Alliance
NEPA	National Environmental Policy Act
NO _x	nitrogen oxides
NRHP	National Register of Historic Places
O ₃	ozone
PEC	potential environmental condition
PEL	Planning and Environmental Linkages
p.m.	afternoon and evening

RAMP	Responsible Acceleration of Maintenance and Partnerships
RCRA	Resource Conservation and Recovery Act
REC	recognized environmental condition
RMFS	Ramp Metering Feasibility Study
ROD	Record of Decision
ROW	right-of-way
RTD	Regional Transportation District
RTP	Regional Transportation Plan
SB 40	Senate Bill 40
SH 7	State Highway 7
SH 66	State Highway 66
SHPO	State Historic Preservation Officer
SIB	State Infrastructure Bank
SOV	single occupancy vehicle
SPF	safety performance function
TAC	technical advisory committee
TDM	travel demand management
TELS	tolled express lanes
TIGER	Transportation Investment Generating Economic Recovery
TIP	Transportation Improvement Program
UP	Union Pacific Railroad
US 36	US Highway 36
USACE	US Army Corps of Engineers
USDOT	US Department of Transportation
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
VHT	vehicle hours of travel

This page intentionally left blank.

1.0 INTRODUCTION

This report documents the North I-25 Planning and Environmental Linkages (PEL) Study conducted by the Colorado Department of Transportation (CDOT) in conjunction with the Federal Highway Administration (FHWA). The PEL questionnaire provided in **Appendix A** outlines the framework supporting this PEL. The completed questionnaire helps to ensure that information collected and decisions made during the PEL Study can be used during any subsequent National Environmental Policy Act (NEPA) processes.

1.1 *Study Description and Location*

CDOT and FHWA conducted the North I-25 PEL Study to identify transportation improvements on the Interstate 25 (I-25) corridor that could relieve congestion, improve safety, and enhance multimodal travel in the near term. The study developed a Purpose and Need Statement, evaluated alternatives, and recommended a potential implementation plan for improvements. The PEL Study is intended to be a precursor to conducting a NEPA process to further evaluate and recommend specific improvements once funding is identified for corridor improvements.

Figure 1-1 illustrates the North I-25 PEL Study Area boundaries. As shown, the boundary extends from US Highway 36 (US 36) to State Highway 7 (SH 7) along I-25. The boundary also captures the major north/south parallel arterials on either side of I-25 including Huron Street and Washington Street. The communities of Broomfield, Erie, Federal Heights, Northglenn, Westminster, and Thornton, as well as unincorporated Adams County, are represented along the corridor.

The land uses along the I-25 corridor vary from a mixture of developed commercial, agricultural, and vacant land in the north (SH 7 to 136th Avenue) to suburban commercial, retail, and residential uses in the middle (136th Avenue to 120th Avenue), to completely built-out commercial, retail, and residential uses in the south (120th Avenue to US 36). Many municipal land use plans in the Study Area identify the I-25 corridor as being the biggest area of change within their jurisdictions.

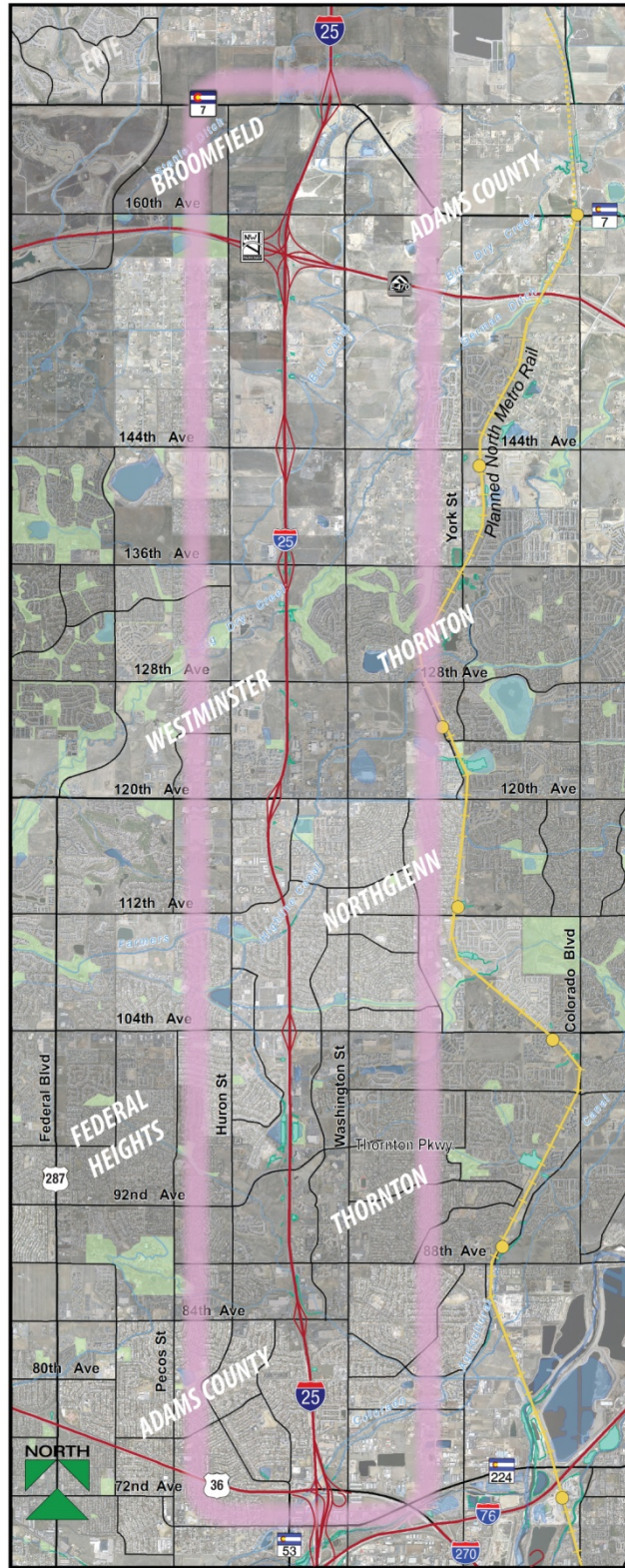
1.2 *Study Background and Context*

Over the last several years, this section of I-25 has been included in several previous transportation studies. These studies have provided a look into regional transportation solutions with a context bigger than just the corridor. This section briefly describes these studies and how they inform and set the stage for the North I-25 PEL Study. Most notably, the North I-25 PEL Study considers nearer term, lower cost alternatives not fully analyzed in the previous studies. The list below describes the most recent project first.

1.2.1 **Transportation Investment Generating Economic Recovery IV, 2012**

The United States Department of Transportation (USDOT) awarded CDOT a \$15 million Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grant in March 2012. The grant from FHWA completes the funding package for the I-25 North Managed Lanes Extension and Express Bus project, a \$44 million investment to provide one new tolled express lane (TEL) in each direction of I-25 from US 36 to 120th Avenue. This is an interim improvement that will be replaced with full lanes and shoulders in the 2030 timeframe when funding is identified in the Denver Regional Council of Governments (DRCOG) *Metro Vision Regional Transportation Plan* in Chapter 5, *Fiscally Constrained Plan (Metro Vision Fiscally Constrained Plan)*.

Figure 1-1 Study Area



The *Phase 1 Record of Decision (ROD)* of the *North I-25 Environmental Impact Statement (EIS)* includes the addition of TELs in this segment of I-25; however, the lanes constructed with the TIGER funding are considered an interim improvement until funding is identified to construct the improvement with full lanes and shoulder. DRGOG identifies funding in the 2030 timeframe for construction of the complete project in its *Metro Vision Fiscally Constrained Plan*. Design for the interim lane TIGER project is underway, and construction is expected to be complete by 2015.

1.2.2 North I-25 Environmental Impact Statement and Record of Decision, 2011

The *North I-25 Final EIS*, completed by CDOT and FHWA, evaluated multimodal improvements between the Town of Wellington and the Denver metropolitan area to address the transportation needs of the rapidly growing communities along the corridor. The Preferred Alternative for this section of I-25 includes the addition of TELs (one buffer-separated lane in each direction) and enhanced bus service on I-25 between US 36 and SH 7. Additional improvements identified in the *Final EIS* include commuter rail, TELs extending north along I-25 and SH 14, and enhanced bus service along I-25 and US 85.

The *North I-25 EIS Phase 1 ROD* provided a NEPA decision on a portion of the Preferred Alternative. Within the North I-25 PEL Study Area, this includes TELs (one buffer-separated lane in each direction) on I-25 between US 36 and SH 7, a portion of which is addressed in **Subsection 1.2.1**. DRCOG's *2035 Metro Vision Regional Transportation Plan (Metro Vision RTP)* identifies funding for construction of this improvement in 2030.

1.2.3 North Metro Environmental Impact Statement and Record of Decision, 2011

The Regional Transportation District (RTD) initiated the *North Metro EIS (2011a)* to evaluate rail transit alternatives between Denver Union Station and SH 7/162nd Avenue in Thornton. The preferred alignment is an 18.4-mile-long commuter rail line that runs adjacent to and just east of the Burlington Northern Santa Fe (BNSF) mainline (Brush Subdivision). **Figure 1-1** illustrates the preferred commuter rail line, which is located east of I-25. The alignment connects with the Union Pacific (UP) Boulder Branch right-of-way (ROW) near west 70th Avenue. Eight stations are planned along the line. The Federal Transit Administration (FTA) issued a ROD for this project in April 2011 (RTD, 2011b). RTD anticipates completing construction of this line to 124th Avenue in 2018, with further construction to 162nd Avenue to be initiated as funds become available.

1.2.4 North Metro Transportation Study, 2001

The *North Metro Transportation Study*, prepared for RTD, was a Major Investment Study for the North I-25/Northeast Corridor in the Denver metropolitan area. The study developed and evaluated multimodal transportation investments to address the needs of the northeast metropolitan area through the year 2020.

The Locally Recommended Alternative included the following elements related to this PEL project:

- ▶ Bus/High Occupancy Vehicle (HOV) lanes on I-25:
 - US 36 to 92nd Avenue, one lane, reversible barrier separated
 - 92nd to 120th Avenue, one lane in each direction buffer separated
 - 120th Avenue to SH 7, one peak hour HOV lane in each direction buffer separated
- ▶ General purpose widening on I-25 and Interstate 76 (I-76):
 - US 36 to 120th Avenue, one lane in each direction
- ▶ Light rail/diesel multiple unit rail along UP Boulder Branch
 - Union Station to 124th Avenue (technology to be determined)
- ▶ Transportation management elements

1.3 Logical Termini

CDOT and FHWA set the termini for the North I-25 PEL based on the observed and modeled areas of congestion now and in the future, as well as the boundaries of other major corridors where improvements are being made. Demand and congestion on I-25 drop off substantially north of SH 7; therefore, SH 7 was identified as the northern logical terminus. On the southern end of the corridor, congestion drops off southbound south of 84th Avenue as a result of increased capacity. However, US 36 was identified as the southern terminus to address congestion caused by the I-270, US 36 merge onto northbound I-25.

1.4 Purpose of the Transportation Improvements

The purpose of the transportation improvements is to reduce congestion and improve safety on I-25 between US 36 and SH 7 by implementing near term, multimodal, and cost-effective transportation improvements that are compatible with long-term options and the recently constructed interchange structures at 84th Avenue, 120th Avenue, 128th Avenue, 136th Avenue, and 144th Avenue.

There may be unmet mobility needs beyond the near-term horizon. To account for these needs, all near-term improvements considered were evaluated for compatibility with the potential long-term cross sections to minimize throwaway and increase cost-effectiveness.

1.5 Need for the Transportation Improvements

Three problem areas highlight the need for the transportation improvements: mobility, safety, and multimodal. The following text describes these problems. **Appendix B** provides detailed technical information characterizing each problem in the *Corridor Conditions Report*.

1.5.1 Mobility Problem

There is a need to reduce the duration and extent of peak period congestion along the corridor (**Figure 1-2**). The corridor regularly experiences extreme and prolonged congestion resulting from high traffic volumes and/or incidents. Recurring congestion is observed repeatedly during peak travel periods at predictable locations and results from high traffic volumes and/or a physical condition that causes the travel speed on the corridor to be reduced. Crashes, work zones, weather, or special events also cause congestion along the corridor. Both types of congestion are described below.

Figure 1-2 Congestion along North I-25



1.5.1.1 High Volume Related Congestion

Figure 1-3 illustrates existing and future daily traffic volumes along the corridor. As shown, during peak travel periods, south of 120th Avenue, I-25 currently operates at or above capacity. By 2035 most of the corridor is expected to operate at or above capacity. When traffic volumes reach or exceed the comfortable carrying capacity of the road, congestion occurs and the travel speed along the corridor is reduced.

CDOT's Doppler radar speed data document the reduction of travel speed. To identify a representative day for evaluation of high-volume congestion, speed data were gathered and summarized from 20 Doppler radar speed sensors between 58th Avenue and SH 7 for two consecutive weeks. Crash data for this period were also reviewed to eliminate days when an incident was reported during peak travel periods. The pattern of reduction in speeds is consistent among days of similar traffic levels and lack of incidents. For presentation purposes, Wednesday, September 28, 2011, was identified as a representative day.

Figure 1-3 Existing and Future Daily Volumes

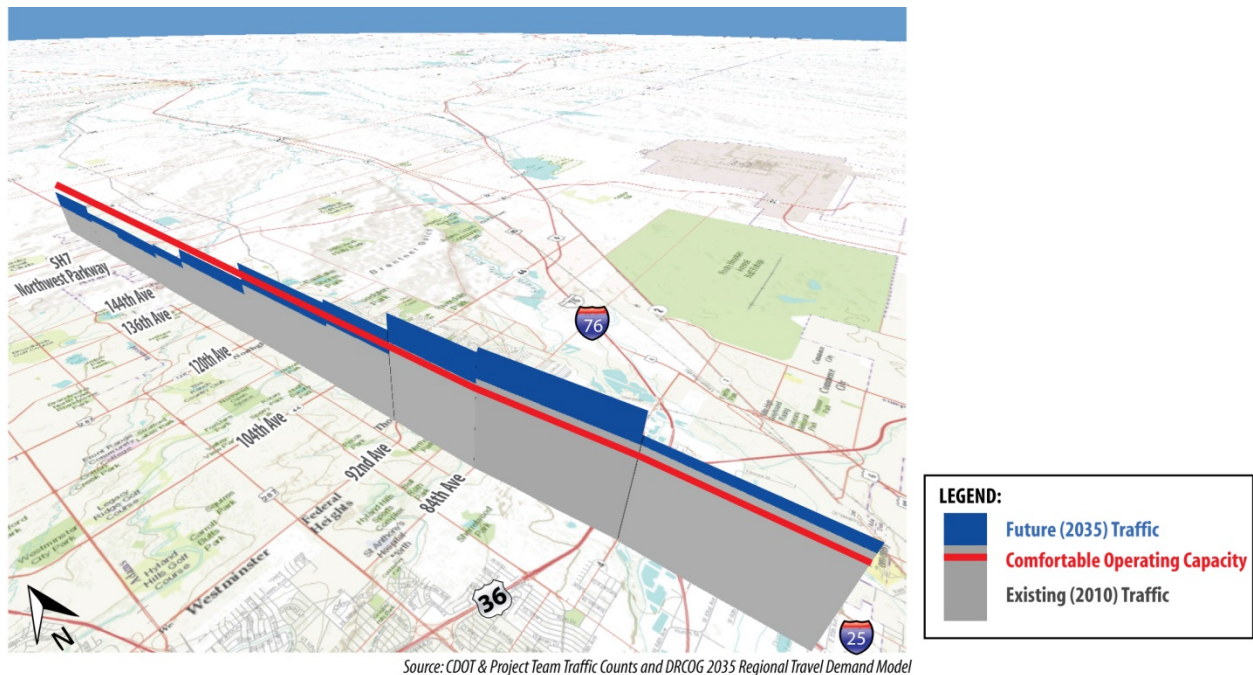


Figure 1-4 illustrates the Doppler speed data recorded on September 28, 2011, southbound on I-25. On this typical day, no peak period incidents were reported on I-25, but speeds still dropped to below 30 miles per hour (mph) at Thornton Parkway (92nd Avenue) between 6:30 a.m. and 8:30 a.m. Additionally, no weather-related issues, such as rain or snow, were reported. The speed drop initiates near Thornton Parkway (likely south of Thornton Parkway) and then propagates upstream through 120th Avenue. Congestion occurs upstream at 120th Avenue starting around 6:30 a.m. but typically recovers by about 8:30 a.m.

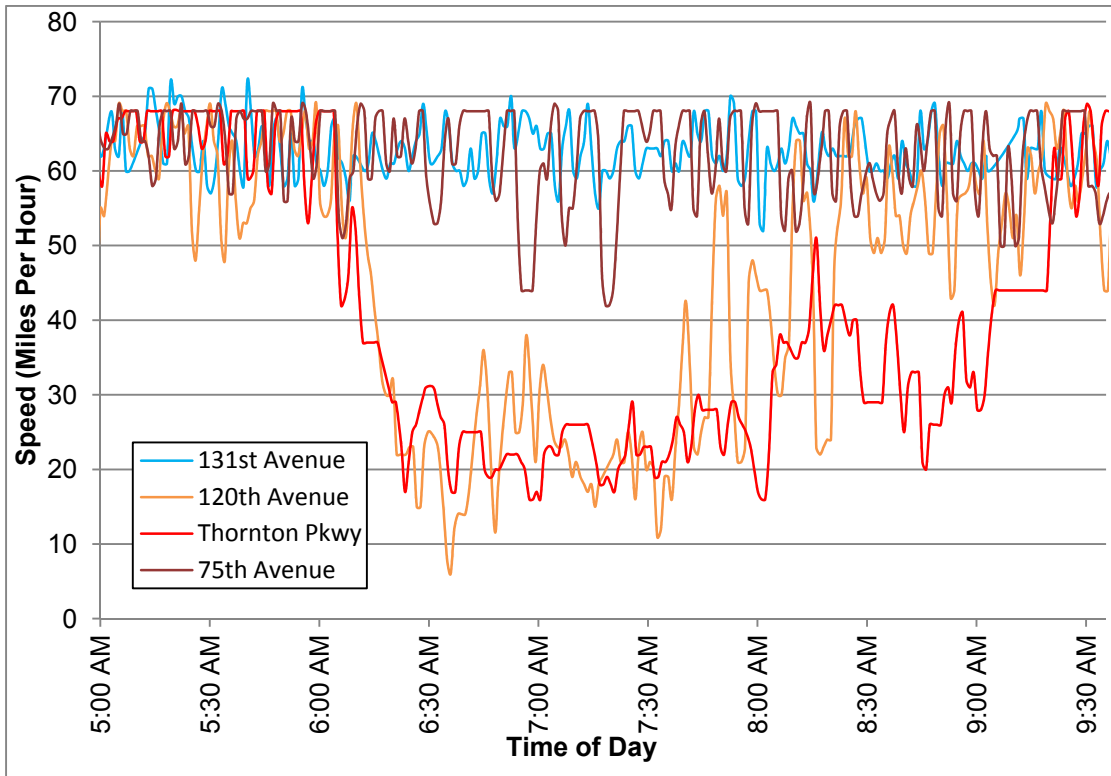
The poor southbound morning operation of I-25 between US 36 and 88th Avenue can be attributed to several factors including:

- ▶ A significant amount of southbound volume entering the I-25 corridor between Thornton Parkway and 84th Avenue (nearly 2,000 vehicles per hour during peak morning flows). The high volume of merging on-ramp traffic, coupled with the high volume on the I-25 mainline, causes mainline I-25 traffic to slow at merge/diverge points, resulting in vehicular queues that extend north through 120th Avenue.
- ▶ A significant amount of traffic (nearly 4,000 vehicles per hour) leaving I-25 south of 84th Avenue at one of four exit points. The weaving and lane changing activity that occurs as vehicles position themselves to exit I-25 contributes to poor operation of I-25 during the morning peak period.

The DynusT Dynamic Traffic Assignment Model was used to develop a sub-area model focusing on the I-25 PEL Study Area. Dynamic traffic assignment models are a relatively new modeling tool that blends the more traditional macroscopic traffic forecasting process and microscopic simulation models. The benefit of this type of model is its ability to model dynamic, time-dependent trip departures to understand in greater detail the relationship between trip departures and minute-by-minute congestion on roadway facilities.

Appendix E provides information about the development and calibration of the DynusT model.

Figure 1-4 Southbound I-25 Speeds on a Typical Day



Source: CDOT Doppler Radar September 28, 2011.

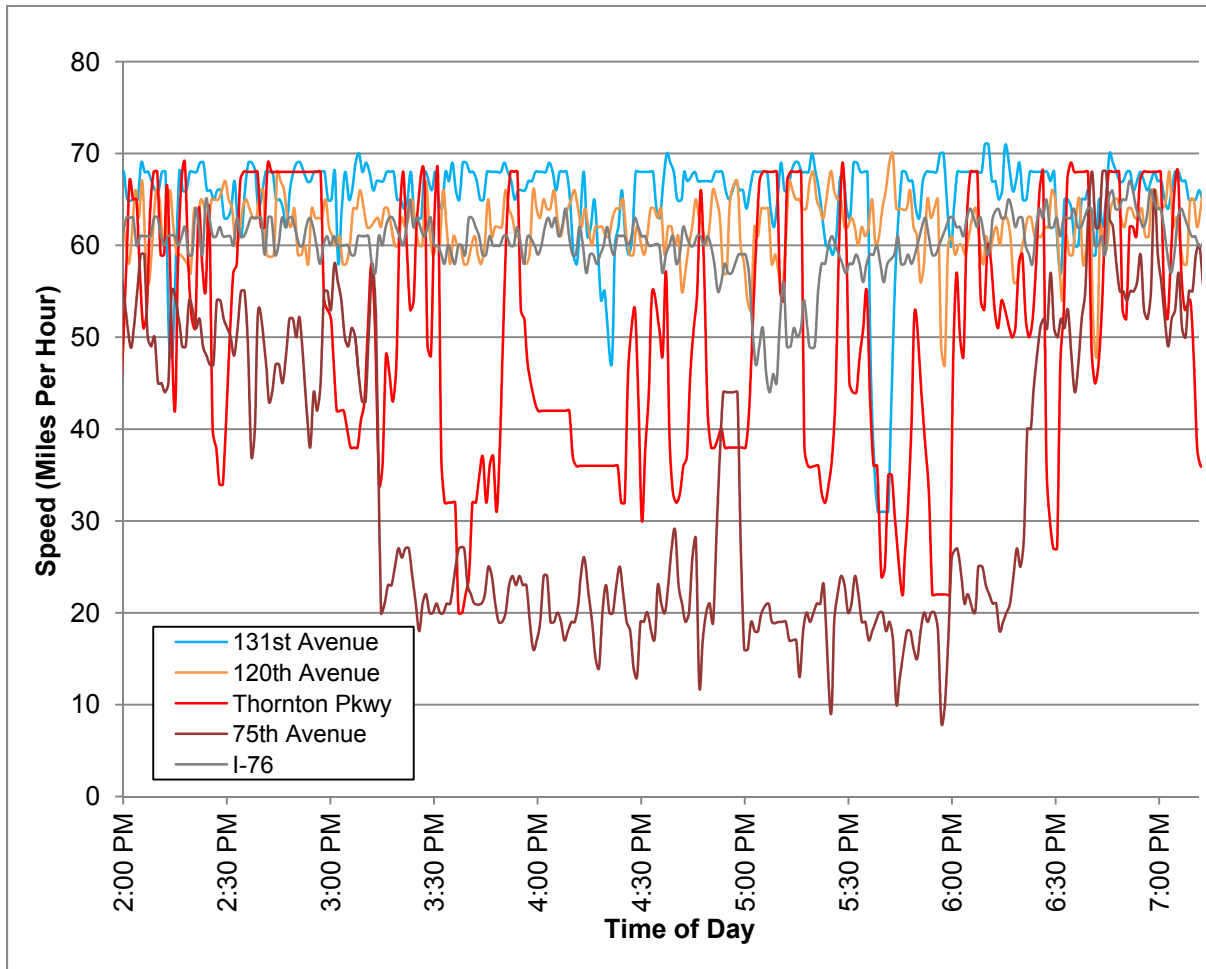
The 2035 No Action DynusT model predicts that travel time throughout the corridor in 2035 will increase to 43 minutes on southbound I-25 during the morning peak period and the congestion will extend from SH 7 to US 36. Existing travel time through the corridor from SH 7 to US 36 is 23 minutes. The 2035 No Action DynusT model is used as the baseline condition that is compared to various improvements in the corridor to identify the effectiveness of such improvements. **Subsection 2.4** and **Subsection 3.3** describe the 2035 No Action DynusT model.

Northbound I-25 experiences similar congestion issues. **Figure 1-5** illustrates the speeds recorded on I-25 northbound during the evening peak period on September 28, 2011. On this day, no incidents were reported. Speeds at 75th Avenue are consistently around 20 mph between 3:30 p.m. and 6:30 p.m. Farther north near Thornton Parkway, speeds are very volatile varying between 20 mph and over 60 mph. This variability may be causing some higher than expected rear-end collisions described later in this chapter.

Once vehicles travel north through 75th Avenue, speeds fluctuate between 30 mph and 45 mph past Thornton Parkway, and I-25 northbound at Thornton Parkway experiences some lingering effects of congestion until about 6:30 p.m. Congestion typically does not extend north past 120th Avenue. Traffic conditions along the entire corridor return to free flow by about 7:00 p.m.

The poor northbound operation of I-25 at 75th Avenue can be attributed to approximately 3,000 vehicles per hour entering I-25 northbound within less than 2,000 feet (I-76/US 36, HOV/toll lane, and Interstate 270 [I-270]).

Figure 1-5 Northbound I-25 Speeds on a Typical Day



Source: CDOT Doppler Radar September 28, 2011.

The 2035 No Action DynusT model predicts that travel time in 2035 will increase to 24 minutes on northbound I-25 between US 36 and SH 7 during the evening peak period and the congestion will extend from US 36 to 120th Avenue. Existing travel time through the corridor from US 36 to SH 7 is 20 minutes.

Figure 1-6 summarizes the span of congestion estimated along the corridor based on the calibrated DynusT model for existing conditions. As shown, southbound traffic was stop-and-go for about three hours in the morning between 120th Avenue and US 36. In the afternoon, northbound traffic experienced similar low speed conditions from US 36 to Thornton Parkway.

Figure 1-6 Duration of Existing Peak Period Congestion

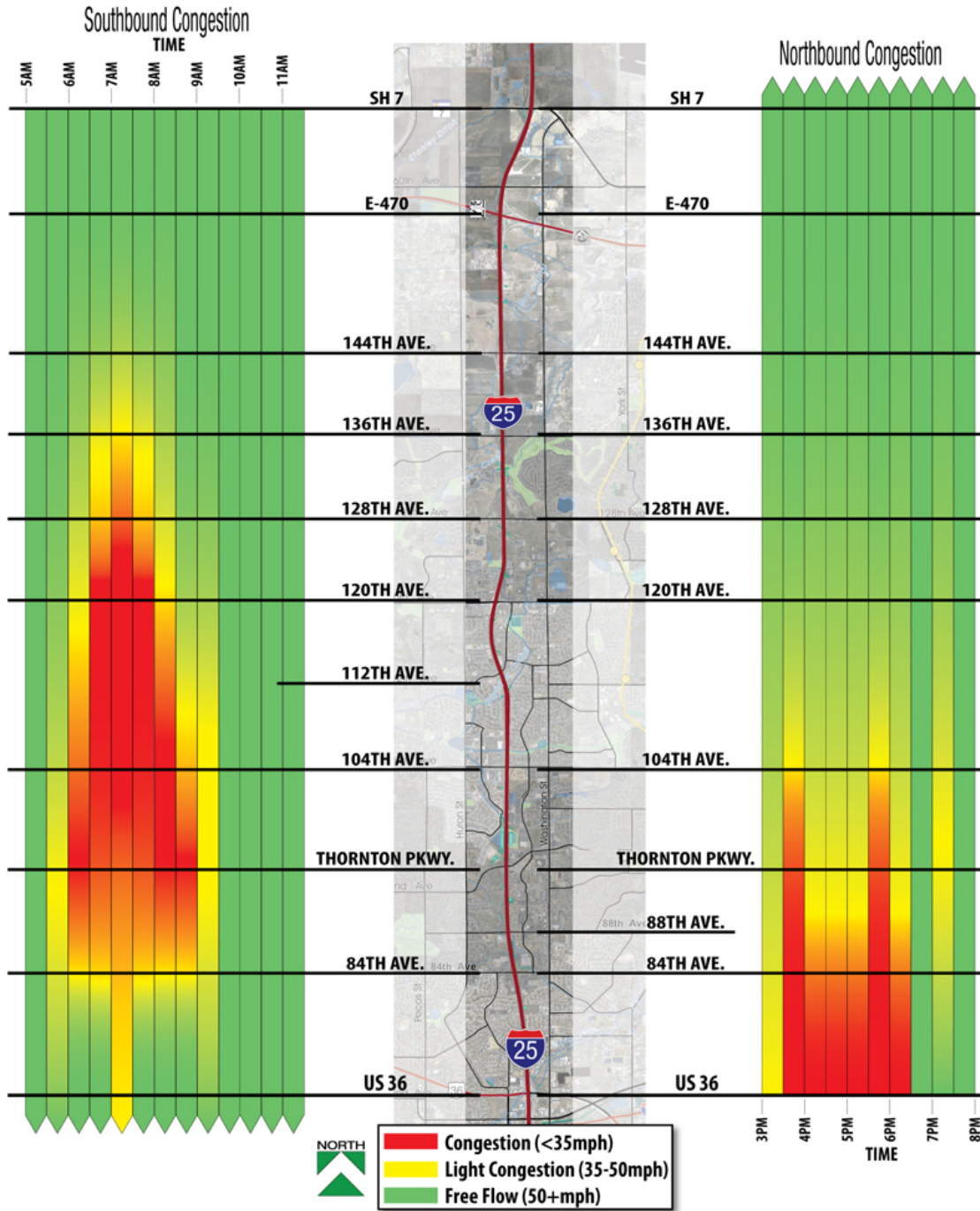
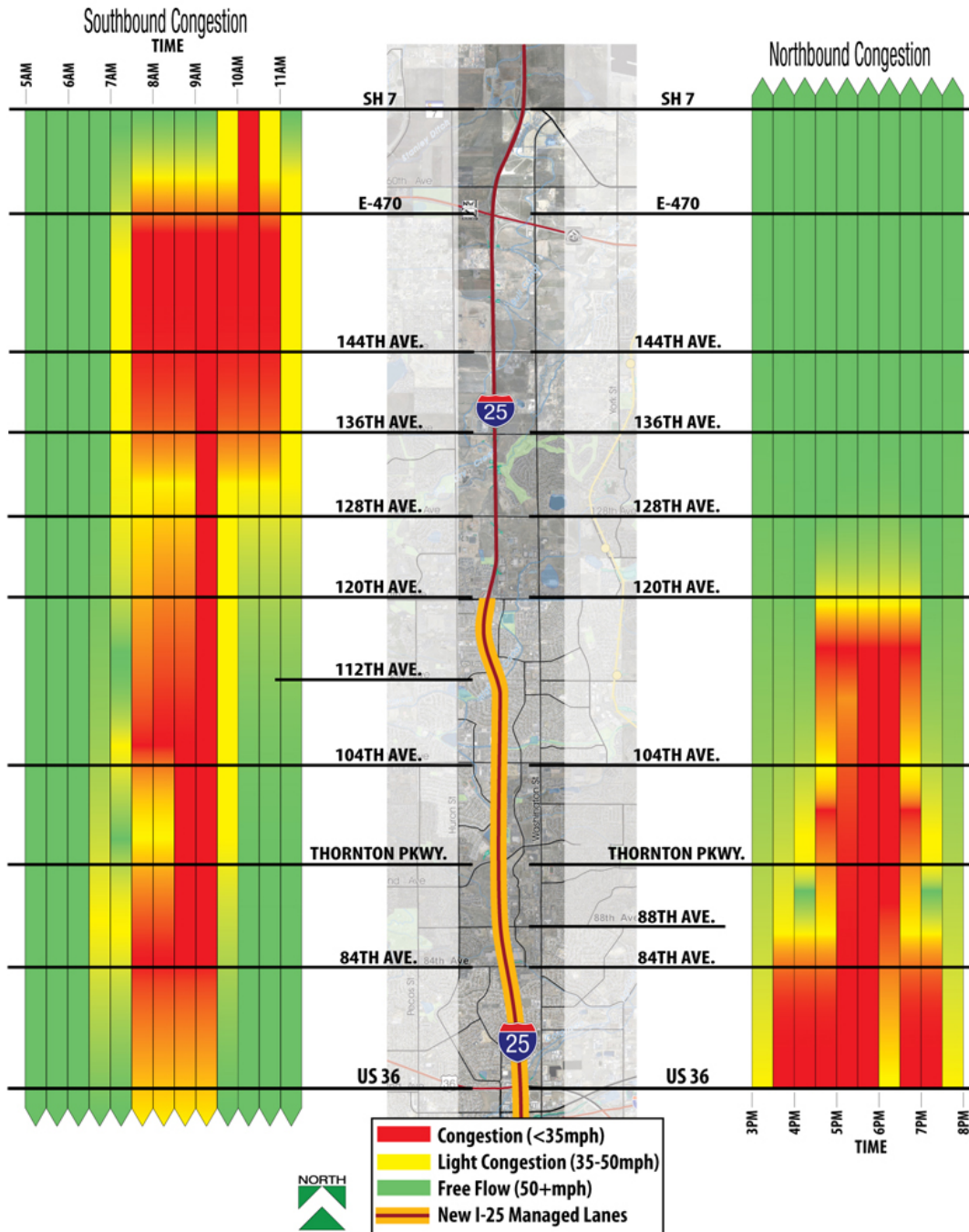


Figure 1-7 summarizes the span of congestion predicted along the corridor based on the 2035 DynusT model. As shown, southbound traffic is expected to be stop-and-go for more than five hours in the morning between 136th Avenue and E-470. This shift of congestion to the north reflects the addition of the managed lanes (that is, toll lanes, HOV/bus lanes) between US 36 and 120th Avenue included in the 2035 model. In the afternoon, northbound traffic would experience a long space of congestion between US 36 and 84th Avenue.

Figure 1-7 Duration of 2035 Peak Period Congestion



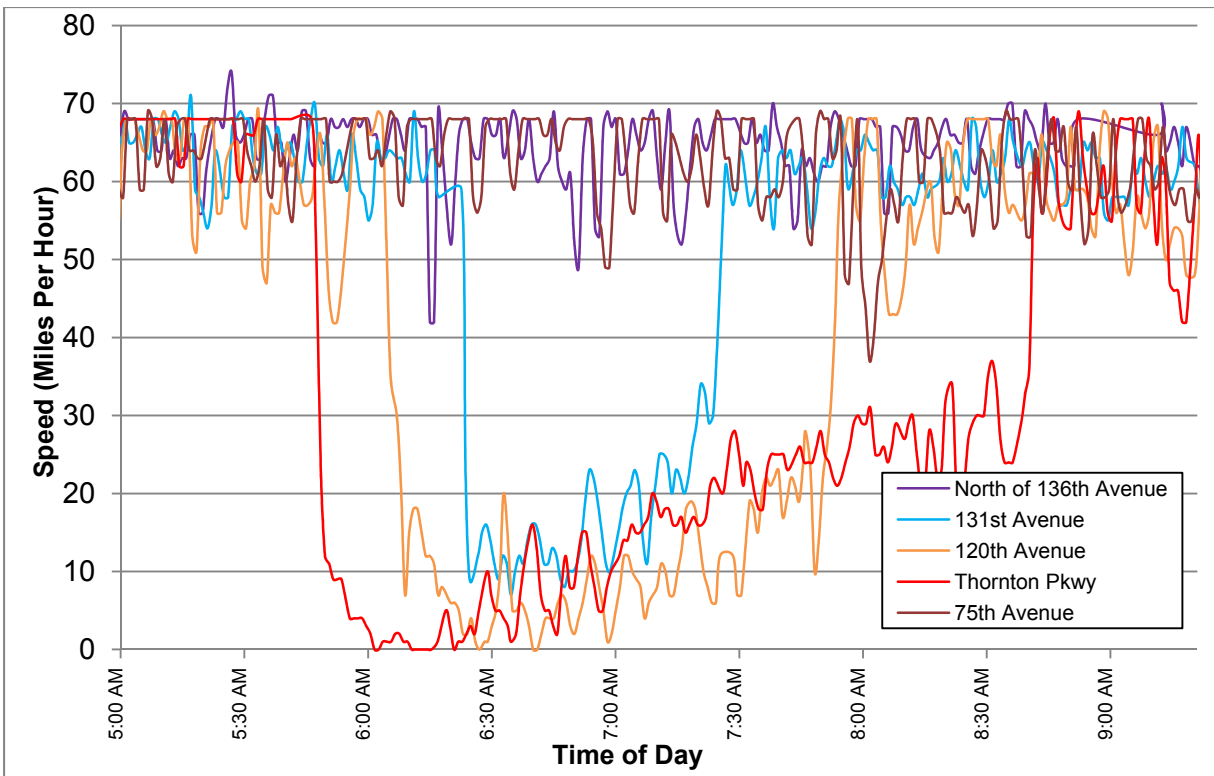
1.5.1.2 Incident-Related Congestion

Incident-related congestion also represents a significant portion of the congestion along a corridor. A review of 2011 crashes along I-25 through the Study Area revealed that a crash happened along mainline I-25 on 296 of the 365 days. Based on this sampling, the probability of a crash happening in the Study Area on a given day is 81 percent. In addition, approximately 18 percent of all crashes happen during the morning and evening peak hours. While some crashes are likely to result from an earlier incident on the corridor, the crash listing does not contain information on whether the crash may have been a secondary crash caused by a nearby incident.

Impacts of non-recurring congestion upon the I-25 PEL Study Area were evaluated by reviewing the crash and speed history for September 2011. September 22, 2011 was identified as an appropriate day for representing incident-related congestion because multiple crashes occurred during the peak travel periods.

The presence of two incidents along southbound I-25 during the morning peak period (5:44 a.m. at 84th Avenue and 6:10 a.m. near 88th Avenue) caused speeds to be reduced even more and the queue to extend farther than on a typical day. In comparison with a typical day, speed drops extended farther north (more than 1 mile) and speeds decreased by an additional 15 to 20 mph. **Figure 1-8** shows the corresponding southbound speed plot.

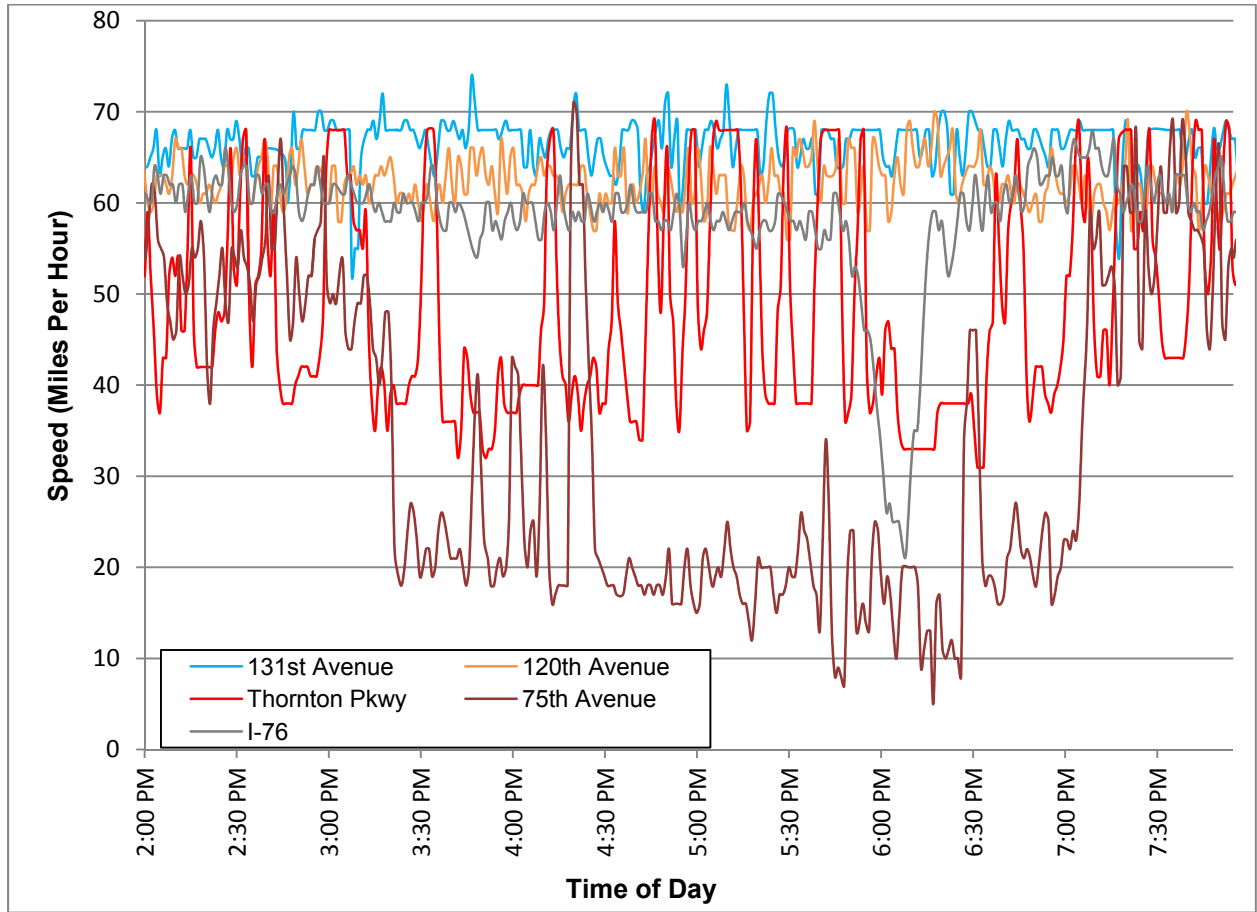
Figure 1-8 Southbound I-25 Congestion – a.m. Peak Period (Incident-Related Congestion Analysis)



Source: CDOT Doppler Radar September 22, 2011.

The Doppler speed data for northbound I-25 were plotted to determine the location where vehicular traffic slowed during the afternoon peak period on September 22, 2011 (**Figure 1-9**). The data show that vehicles traveling at free-flow speeds slowed down to 20 mph at 75th Avenue (maroon line) beginning at 3:15 p.m. An incident in the northbound direction at approximately 5:11 p.m. at 88th Avenue increased congestion in comparison with recurring levels.

Figure 1-9 Northbound I-25 Congestion – p.m. Peak Period (Incident-Related Congestion Analysis)



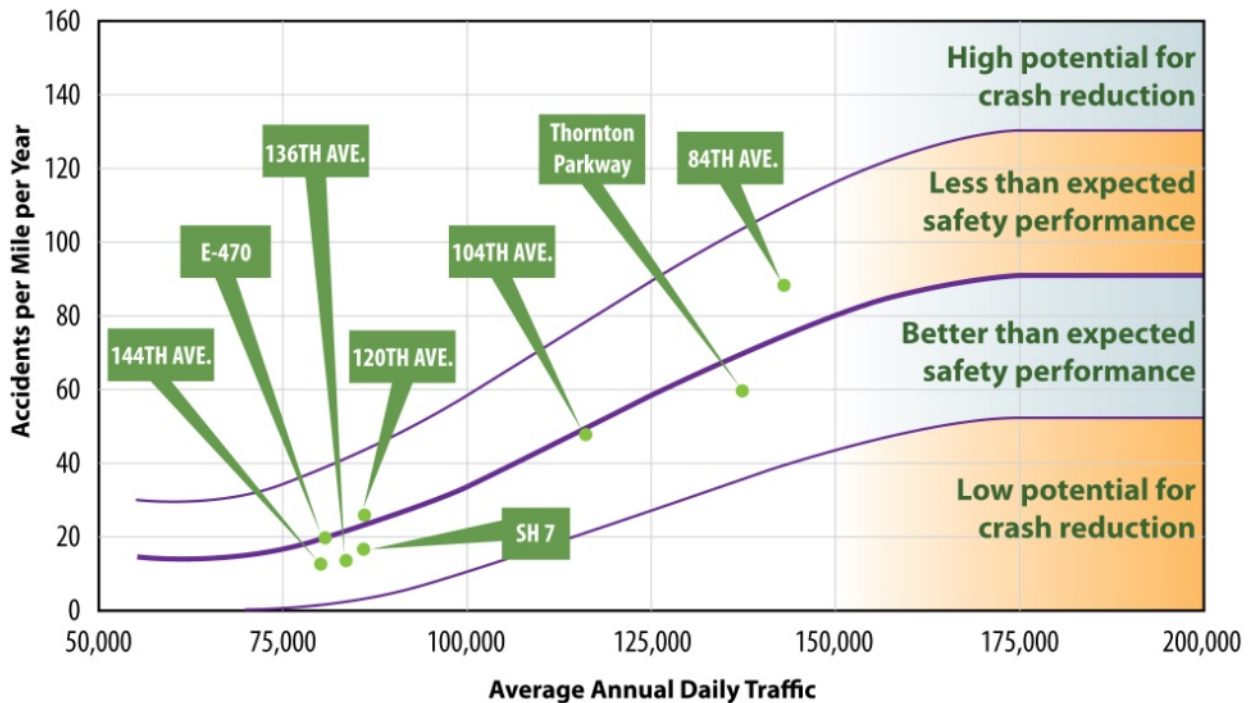
Source: CDOT Doppler Radar September 22, 2011.

1.5.2 Safety Problem: Higher Than Expected Crashes due to Traffic Congestion

The assessment of the magnitude of safety problems on select highway sections has been refined through the use of Safety Performance Function (SPF) methodology. The SPF reflects the complex relationship between exposure (measured in Average Daily Traffic) and the crash count for a section of roadway measured in accidents per mile per year. The SPF models estimate the expected crash frequency for each interchange influence area, for a range of average daily traffic, among similar facilities. SPFs are limited to mainline crashes only and as such do not include crashes that occur on ramps. SPF analyses were completed for I-25 and are discussed in more detail in the following sections.

Figure 1-10 illustrates the resulting SPF analysis of I-25 segments. As shown, the SPF analysis indicates that I-25 at 84th Avenue and I-25 at 120th Avenue experience less than expected safety performance.

Figure 1-10 Safety Performance Along the North I-25 PEL Study Area

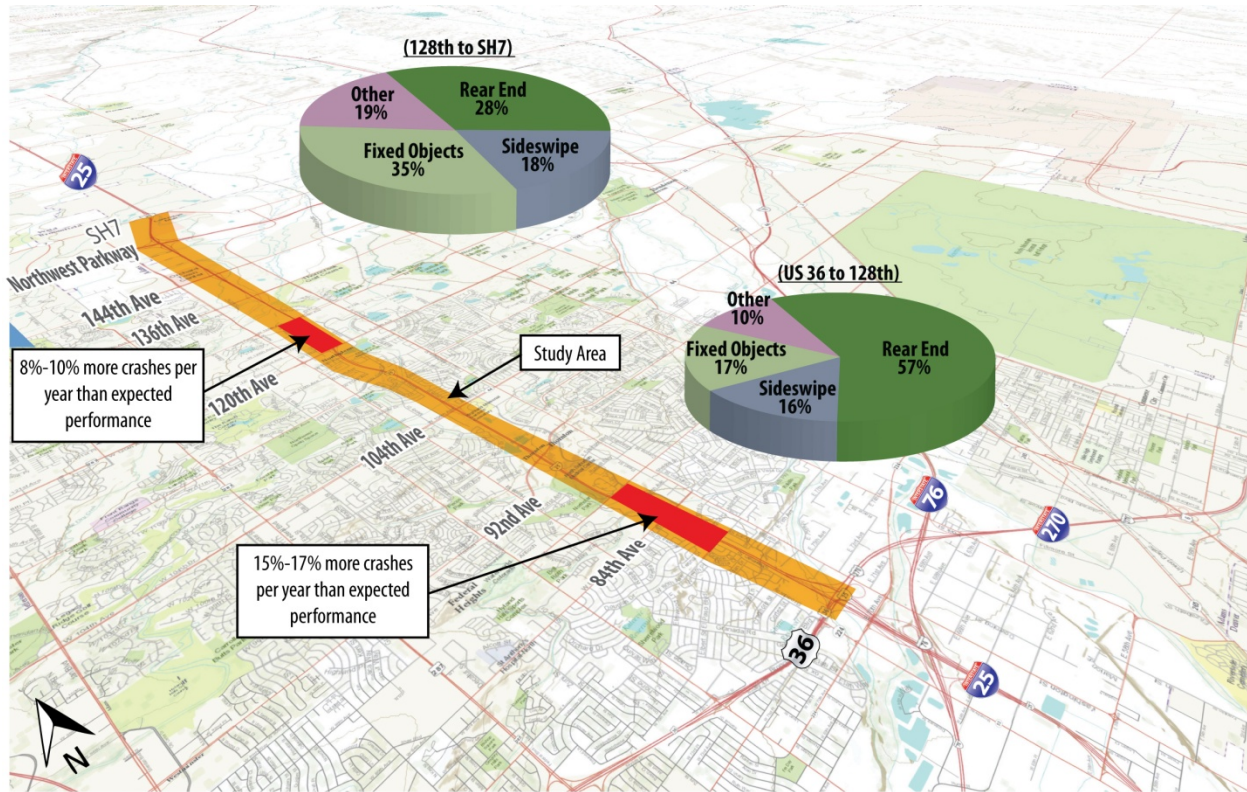


A safety review conducted for the North I-25 PEL Study Area found the following:

- ▶ Rear end and sideswipe type crashes coincided with the a.m. and p.m. peak hours.
- ▶ Sideswipe crashes were primarily related to weaving/lane changes between US 36 and 84th Avenue.
- ▶ Incidents involving concrete barrier crashes primarily occurred at night or during inclement weather.

Figure 1-11 summarizes crashes by type along the corridor for a three-year period (2008 to 2010).

Figure 1-11 Crashes by Segment and Type



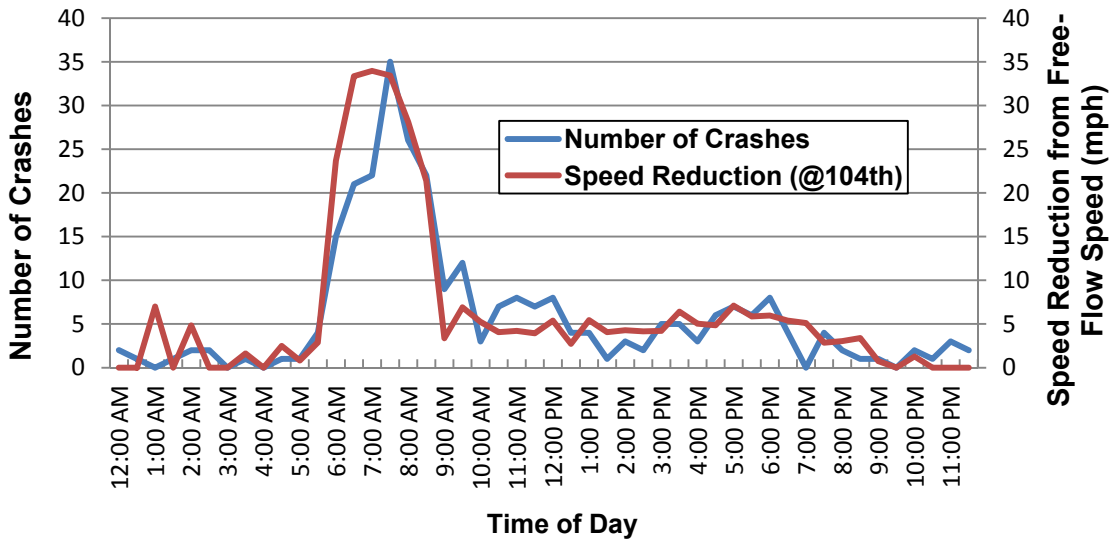
Source: CDOT Safety and Traffic Engineering Branch, Safety and Crash Data

Data show a strong correlation between crash frequency and traffic congestion along I-25. **Figure 1-12** and **Figure 1-13** demonstrate this link. The figures depict the number of weekday (Tuesday, Wednesday, Thursday) crashes and congestion observed by time of day for the southbound and northbound directions. Congestion is measured as the average recorded drop in mph below free-flow conditions (60 mph) during a given ½ hour time interval. For example, an average recorded speed of 40 mph registers as a 20 mph speed reduction. Crashes are measured as the total number of crashes that occurred during the same ½ hour time interval along southbound I-25 between 120th Avenue and US 36 during the 3 years between 2009 and 2011.

As shown on **Figure 1-12**, the temporal pattern of crashes recorded along southbound I-25 (in blue) closely tracks with the temporal pattern of speed reductions observed along southbound I-25 at 104th Avenue (in red). It can be inferred from this consistency that congestion is a significant factor in causing crashes along North I-25.

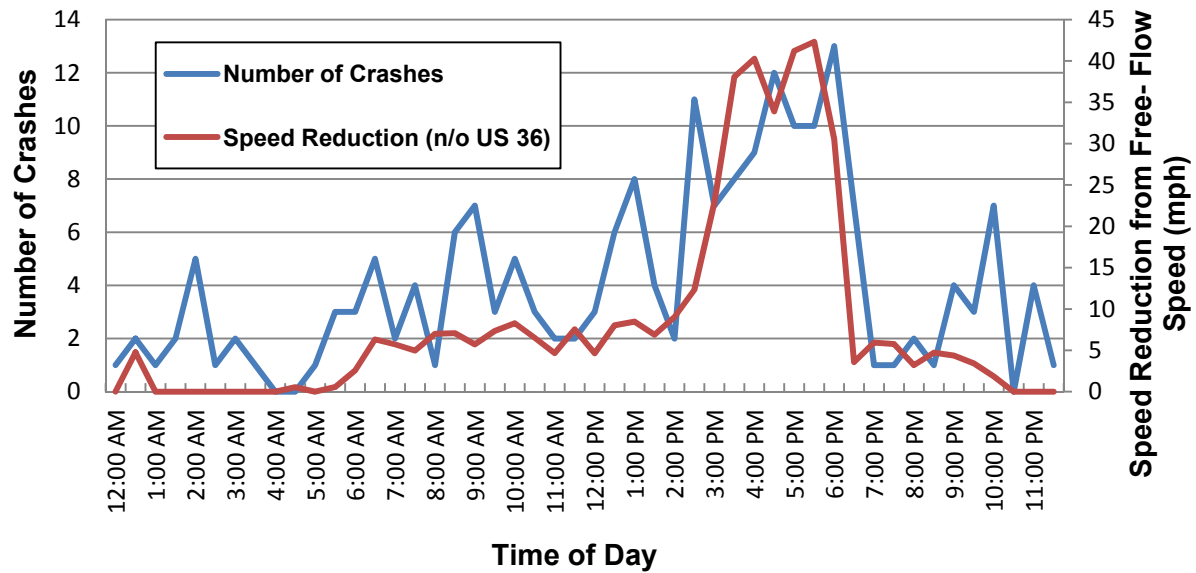
Figure 1-13 depicts a relationship between northbound crash experience and peak congestion on a typical day. It can be inferred that congestion is a significant factor in causing crashes along North I-25.

Figure 1-12 Southbound I-25 Crashes and Congestion – 120th Avenue to US 36



Sources: CDOT Doppler Radar September 28, 2011, CDOT I-25 crash listing 2009 – 2011.

Figure 1-13 Northbound I-25 Crashes and Congestion – US 36 to 120th Avenue



Sources: CDOT Doppler Radar September 28, 2011, CDOT I-25 crash listing 2009 – 2011.

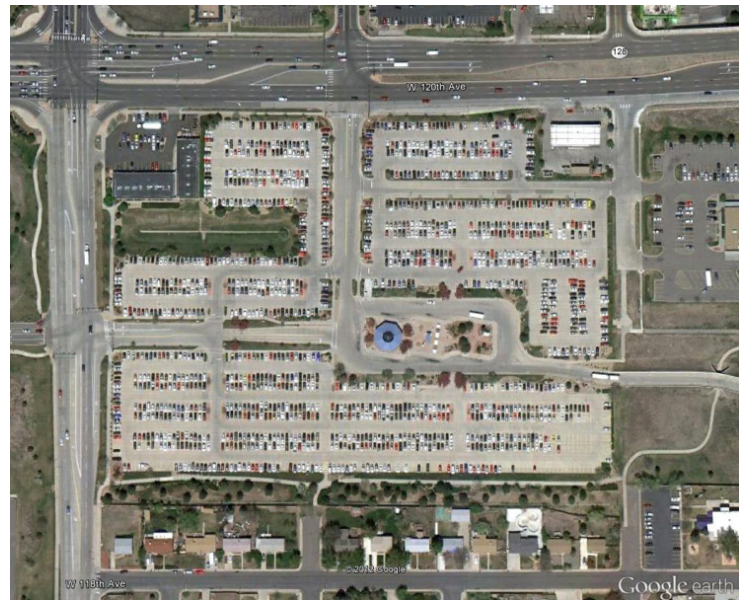
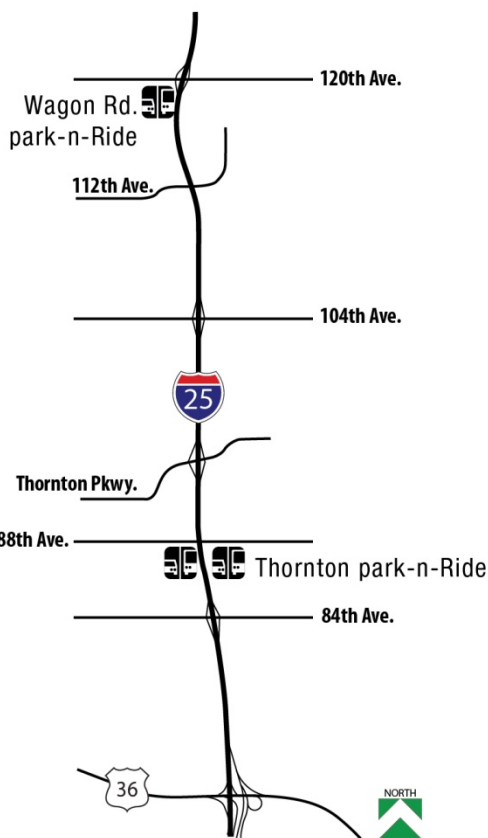
1.5.3 Multimodal Problem: Overcapacity Multimodal Facilities

Transit parking demand exceeds supply at the Wagon Road park-n-Ride and the eastern Thornton park-n-Ride. In addition, some Express Bus trips along the corridor operate at or over capacity.

RTD's Express Bus routes 120X and 122X both travel along I-25 south of 120th Avenue serving the Wagon Road park-n-Ride and downtown Denver. In 2010, they carried 53.1 and 71.0 boardings per service hour, respectively, compared to the RTD 2010 average for express routes of 41.4.

Since 2006, the Wagon Road park-n-Ride has had an average occupancy of 90 percent or greater, which is considered fully occupied. **Figure 1-14** illustrates the locations of the existing park-n-Rides in the North I-25 PEL Study Area, as well as a typical day occupancy at the Wagon Road park-n-Ride. In 2035 demand for park-and-rides in the Study Area will increase. Demand at the Wagon Road (120th Avenue) and Thornton (88th Avenue) park-n-Rides are projected to increase by 140 percent and 40 percent over current levels, respectively¹. I-25 general purpose lanes are also overcapacity as described in the mobility section of this document (**Subsection 1.5.1**). Buses, private automobiles, and trucks traveling on I-25 are all exposed to the overcapacity condition present today in the general purpose lanes.

Figure 1-14 Existing park-n-Rides, with an Aerial View of the Wagon Road park-n-Ride



¹ Assumes the RTD North Metro Rail Line would not yet be in place by 2035. Since the time the PEL Study was conducted, RTD has programmed the expansion of its North Metro Rail Line to 124th Avenue by 2018. The close proximity of the North Metro line is expected to provide substantial relief to parking demand at both the Wagon Road and Thornton park-n-Rides.

1.6 *Project Goals*

The following goals were developed in conjunction with the project's Technical Advisory Committee and were based on desires and fiscal realities of CDOT and project stakeholders. While the goals are not project needs or the project purpose, they provided guidance for alternatives development and evaluation throughout the PEL process.

Alternatives should:

1. Expand/enhance transportation options.
2. Maximize the use of existing infrastructure.
3. Complement and use services and goals of the newly formed Transportation Management Organization, Smart Commute Metro North.
4. Avoid and minimize impacts on environmental and cultural resources.
5. Identify and prioritize improvements that can proceed independently.
6. Coordinate with local plans and projects.
7. Maximize sustained benefits.
8. Minimize throwaway projects.

This page intentionally left blank.

2.0 ALTERNATIVES DEVELOPMENT AND EVALUATION

Section 2.0 provides information about the alternatives development and evaluation process used to identify a Recommended Alternative. The Alternatives Evaluation and Conceptual Design Information provided in **Appendix C** supplements information in this section with detailed results of the evaluation on each potential improvement (referred to as a component). It describes how alternatives were developed, how they were evaluated on their ability to meet the project's Purpose and Need, their design characteristics, and their potential to impact select environmental resources.

The process of developing and screening alternatives took the following into account:

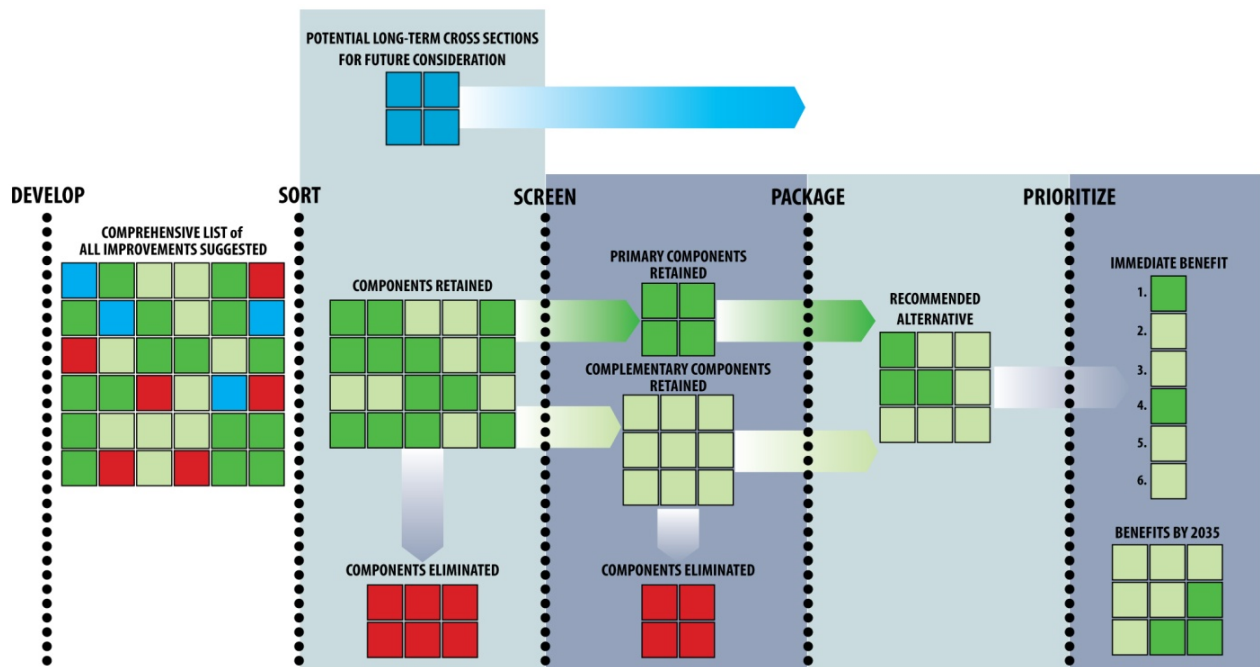
- ▶ State and federal requirements
- ▶ Purpose and Need for the project
- ▶ Reasonableness of an alternative
- ▶ CDOT's Managed Lanes Policy Directive
- ▶ Ability to avoid or minimize environmental impacts
- ▶ Project goals
- ▶ Public input

2.1 *Description of Process*

A wide range of components were identified through a comprehensive set of stakeholder interviews, a public scoping meeting, and a technical operational analysis of I-25. The initial set of components included I-25 capacity enhancements such as continuous acceleration/deceleration lanes, collector/distributor roads, braided ramps, park-and-ride lots, inline transit stations, ramp metering, and a large set of transportation demand management measures. Each component went through a four-step evaluation process. The evaluation process is described below and illustrated in **Figure 2-1**.

- ▶ **Step A. Sorting** – During Step A, all identified components were sorted into three categories:
 - **Long-Term Improvements for Future Consideration** – This category includes improvements that have the potential to meet the long-term needs and fit within the *Metro Vision RTP* (a 202-foot corridor cross section). These components typically address needs along the entire length of the corridor but are not immediately implementable.
 - **Components Retained** – This category contains components that could potentially contribute to addressing the Purpose and Need but may or may not completely address all of the needs.
 - **Components Eliminated** – This category includes improvements that were identified as having a fatal flaw. These include improvements that would require reconstruction of recently constructed structures, were considered and eliminated in a previous NEPA study, or would cause operational problems and, therefore, would not contribute to meeting the Purpose and Need.
- ▶ **Step B. Level 1 Screening** – During Step B, components retained in Step A were divided into two categories: primary and complementary. Primary components are those that have the potential to substantially address the project's purpose and one or more of the identified needs. Complementary components, such as travel demand management (TDM) measures, are those that are not expected to substantially address the project's Purpose and Need but could support other components. Other components identified as complementary are those that were retained to use with a specific primary component (for example, the shoulder busway north of 120th Avenue would be considered only if enhanced bus service north of 120th Avenue and additional park-and-ride locations are recommended).

Figure 2-1 Alternatives Development, Evaluation, and Screening Process



Component Types

- I-25 Mainline
- Transit Infrastructure
- Park and Ride
- Other Infrastructure
- Intelligent Transportation Systems
- Travel Demand Management
- Transportation Systems Management

Environmental Resources Evaluated

- Air Quality
- Environmental Justice
- Floodplains
- Hazardous Material Sites
- Historic Sites
- Land Use (Existing & Future)
- Noise
- Parks and Trails
- Wetlands
- Wildlife

Once components were divided, a quantitative and qualitative assessment of the primary components was conducted to determine which best address the Purpose and Need and project goals. Operational benefits of primary components were evaluated using the DynusT model (or other evaluation tools as appropriate), and the potential to impact environmental resources was identified. In this screening step, the environmental analysis determined if a component is expected to have an impact on a resource but the impact was not quantified. All components were checked to ensure compatibility with long-term cross sections. Step B resulted in retention or elimination of the primary components:

- **Primary Components Retained** – Components that address the needs and best achieve project goals.
- **Eliminated** – Primary components that do not meet the needs identified for this study or are not compatible with potential long-term options. **Subsection 2.6** describes potential long-term cross sections. **Subsection 2.7** describes the components that were eliminated.

- ▶ **Step C. Packaging** – Primary components, along with complementary components, were combined into a Recommended Alternative that addresses the problems identified along the corridor and meets the project goals. A single package was developed because all of the remaining components were retained after Step B. These components:
 - Contributed to addressing the Purpose and Need
 - Did not conflict with each other
 - Did not preclude the long-term options

As a result, no additional screening was warranted beyond Level 1.

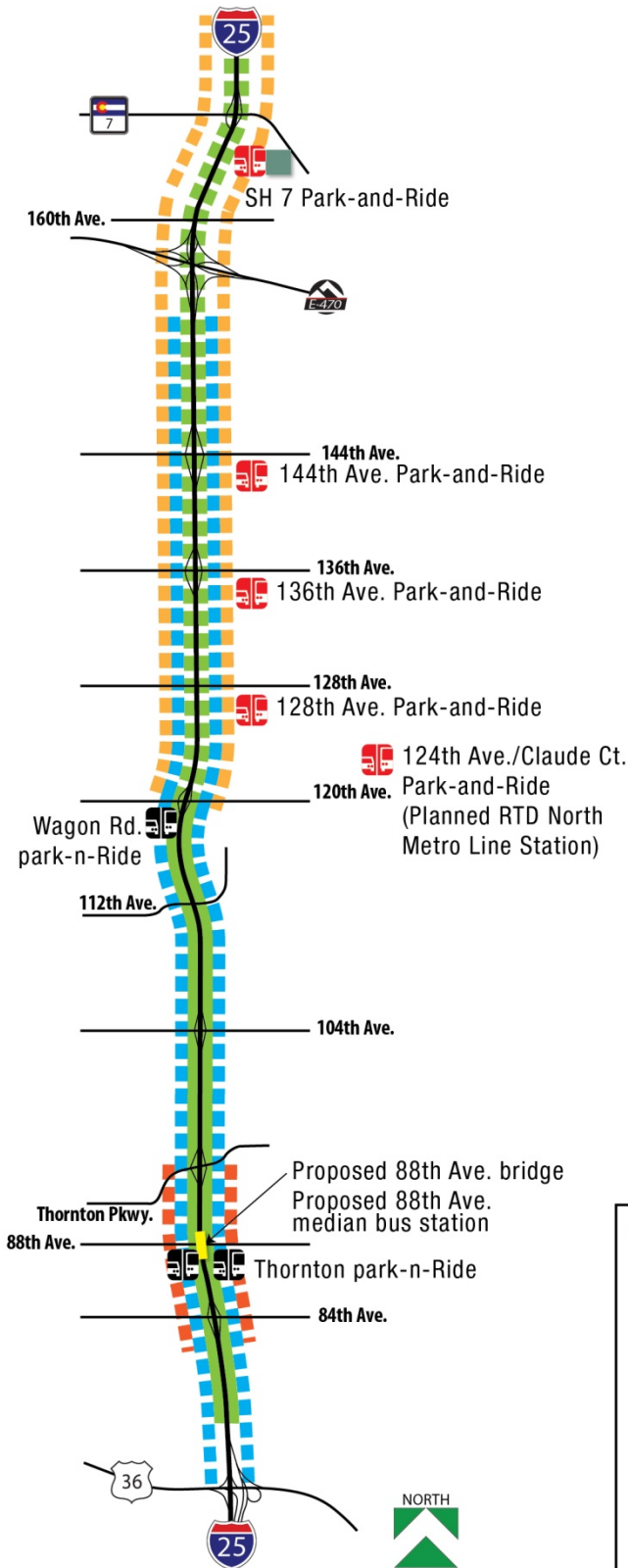
- ▶ **Step D. Prioritization** – During Step D, components in the Recommended Alternative were prioritized based on four guiding principles developed in conjunction with the Technical Advisory Committee. The principles state that components will be given a higher priority if they:
 - Reduce near-term congestion while minimizing adverse operational impacts
 - Expand transportation options
 - Are more easily delivered
 - Are cost effective

Components that had the potential to provide near-term congestion relief were included in near-term phasing packages. Two near-term phasing packages were identified. The first package illustrates how the near-term components could be constructed over time if there were no fiscal or policy constraint. The second near-term package takes into account CDOT's current ability to allocate funds to each component.

2.2 *Recommended Alternative*

The Recommended Alternative includes a collection of roadway components, transit components, and complementary strategies to address the project's Purpose and Need. Each component included in the Recommended Alternative is described below and displayed in **Figure 2-2**.

Figure 2-2 Recommended Alternative



LEGEND

- Planned Managed Lanes (opening Fall 2015)
- Planned Managed Lanes (construction 2020)
- Proposed Continuous Acceleration/Deceleration Lanes
 - US 36/I-270 to 84th Ave.
 - 84th Ave. to Thornton Pkwy.
 - Thornton Pkwy. to 104th Ave.
 - 104th Ave. to 120th Ave.
 - 120th Ave. to 136th Ave.
 - 136th Ave. to 144th Ave.
 - 144th Ave. to E-470
- Proposed General Purpose Lanes
 - Segment between 84th Ave. and Thornton Pkwy.
- Proposed Additional Transit Service
- Proposed Park-and-Ride Options
- Existing park-n-Ride
- Proposed Median Station and Bridge
- Planned Carpool Lot

Additional Potential Components:

- | | |
|--|---|
| • Intelligent Transportation System | • Two lane exit ramps |
| • Travel Demand Management | • Physical improvements to ramp merge/diverge |
| • Transportation Systems Management | • Additional I-25 crossings |
| • Reversible transit tunnel at Wagon Rd. Park-and-Ride | |
| • 70th Ave. and Washington St. intersection improvements | |

2.2.1 Recommended Alternative Roadway

To significantly reduce the congestion currently experienced on the corridor and projected to occur in the future, comprehensive roadway improvements along the I-25 PEL Study Corridor are required. The following roadway components are included in the Recommended Alternative based on each component's ability to reduce congestion along the corridor. Consistent with CDOT's Managed Lanes Policy Directive, managed lanes were strongly considered and are included along the entire corridor length. Locations where additional general purpose capacity is recommended (either as general purpose lanes or auxiliary lanes) are in addition to and complement managed lanes along the corridor. In addition, **Section 2.6, Potential Long-Term Cross Sections for Future Consideration**, identifies the potential for two managed lanes in each direction along this stretch of I-25. Additional study of this potential improvement would be needed to determine how to seamlessly connect with the existing reversible managed lanes south of 84th Avenue.

2.2.1.1 Additional General Purpose Lane Segments

- ▶ **Thornton Parkway to 84th Avenue, Southbound** – Traveling south along I-25, the Thornton Parkway on-ramp would be extended (eliminating the required merge into mainline I-25) south under the bridge at 88th Avenue, through the off-ramp exit at 84th Avenue, and under the existing bridge at 84th Avenue, extending into the on-ramp from 84th Avenue (eliminating the existing continuous acceleration/deceleration lane from 84th Avenue and creating a mandatory merge from the 84th Avenue on-ramp into the new I-25 general purpose lane segment). This component would require replacement of the 88th Avenue bridge, construction of a new pedestrian overpass to replace the existing culvert underpass at the Thornton park-n-Ride, which must be reconstructed with the highway widening, and lowering of I-25. Buses accessing the Thornton park-n-Ride would do so via ramp connections to and from this new general purpose lane segment. It is also possible to combine this component with the Inline Median Station at 88th Avenue described below to accommodate buses.
- ▶ **84th Avenue to Thornton Parkway, Northbound** – Traveling north along I-25, the existing exit lane to 84th Avenue would be extended through the interchange (creating a shared through and right exit lane), continue north under the 84th Avenue bridge, extending into the on-ramp from 84th Avenue (eliminating the existing continuous acceleration/deceleration lane from 84th Avenue and creating a mandatory merge from the on-ramp into the new general purpose lane segment, continuing north under the bridge at 88th Avenue, and merging with the existing exit lane to Thornton Parkway. The new general purpose lane segment would extend north of the off ramp to Thornton Parkway to just beyond the Thornton Parkway bridge over I-25. This component would require replacement of the 88th Avenue bridge, construction of a new pedestrian overpass to replace the existing culvert underpass at the Thornton park-n-Ride, which must be reconstructed with the highway widening, and lowering of I-25. Buses accessing the Thornton park-n-Ride would do so via a ramp connection from this new general purpose lane segment, and would re-enter I-25 with a lane addition that would terminate into the Thornton Parkway off-ramp. It is also possible to combine this component with the Inline Median Station at 88th Avenue described below to accommodate buses.

2.2.1.2 Continuous Acceleration/Deceleration Lanes

Continuous acceleration/deceleration lanes are additional travel lanes located between the on-ramp and off-ramp of two adjacent freeway interchanges. The continuous acceleration/deceleration lane eliminates the termination of the previous freeway on-ramp providing more merge and diverge distance for vehicles entering and leaving the roadway and lessens the effect of bottlenecks experienced when forced merge sections occur on freeways.

The Recommended Alternative includes continuous acceleration/deceleration lanes for the following locations:

- | <u>Northbound</u> | <u>Southbound</u> |
|------------------------------------|------------------------------------|
| ▶ US 36/I-270 to 84th Avenue | ▶ 84th Avenue to US 36 |
| ▶ 84th Avenue to Thornton Parkway | ▶ Thornton Parkway to 84th Avenue |
| ▶ Thornton Parkway to 104th Avenue | ▶ 104th Avenue to Thornton Parkway |
| ▶ 104th Avenue to 120th Avenue | ▶ 120th Avenue to 104th Avenue |
| ▶ 120th Avenue to 136th Avenue | ▶ 136th Avenue to 120th Avenue |
| ▶ 136th Avenue to 144th Avenue | ▶ 144th Avenue to 136th Avenue |
| ▶ 144th Avenue to E-470 | ▶ E-470 to 144th Avenue |

2.2.1.3 Ramp Meters

Ramp meters are located on freeway on-ramps and include dynamically controlled signals. They are used during the morning and evening peak periods to meter traffic accessing the freeway from the adjacent arterial roadways. For freeway ramps that also provide RTD bus access, buses would be provided alternate freeway access (i.e., the Wagon Road park-n-Ride bus tunnel) or queue bypass lanes designed so that buses do not wait at the ramp meters. The following locations provide ramp meters included in the Recommended Alternative:

- | | |
|--------------------------------|----------------------------|
| ▶ Thornton Parkway, Northbound | ▶ 120th Avenue, Southbound |
| ▶ 104th Avenue, Northbound | ▶ 136th Avenue, Southbound |
| ▶ 120th Avenue, Northbound | ▶ 144th Avenue, Southbound |
| ▶ 136th Avenue, Northbound | ▶ SH 7, Southbound |
| ▶ 144th Avenue, Northbound | |

2.2.1.4 70th Avenue / Washington Street Intersection Improvements

The 70th Avenue / Washington Street intersection improvements extend the eastbound dual left-turn lane to better accommodate evening peak flows at the intersection of 70th Avenue and Washington Street. This route is used as a diversion for local traffic avoiding congestion on the I-270 ramp at the I-25 merge.

2.2.2 Recommended Alternative Transit

The Recommended Alternative also includes transit improvements designed to enhance access and service for users. The Recommended Alternative includes the following transit components based on their ability to enhance and expand multimodal travel along the corridor.

2.2.2.1 Convert Tunnel at Wagon Road park-n-Ride to Bi-Directional Tunnel

At the Wagon Road park-n-Ride on the southwest corner of 120th Avenue and I-25, an existing bus-only tunnel provides a direct connection to the park-n-Ride for northbound buses from the inside lane of I-25. The Recommended Alternative would modify use of this tunnel to provide southbound buses a similar direct connection to the inside lane of southbound I-25. This connection would reduce travel time and mileage for these routes. Buses exiting the park-n-Ride would no longer be routed through the traffic signals and mixed traffic on 120th Avenue. Furthermore, this improvement complements the upcoming interim implementation of managed lanes on the inside shoulders of I-25, as southbound buses from Wagon Road would not need to weave across the general purpose lanes to enter the new managed lanes.

2.2.2.2 Construct Inline Median 88th Avenue Station

The Recommended Alternative includes the construction of a median station at the Thornton park-n-Ride. The park-n-Ride facility currently consists of parking facilities on both the east and west sides of the interstate, with pedestrian connections provided via a box culvert under I-25. This improvement would provide a new bus station in the median of I-25 and direct accesses for buses to the station from the planned managed lanes, eliminating the need for buses to weave across several general purpose lanes of I-25 to access the managed lanes. This improvement would reduce transit passenger travel times by allowing buses to take full advantage of the managed lanes on I-25, and would allow passengers efficient pedestrian access to either the east or west side of the park-n-Ride.

2.2.2.3 New Park-and-Rides and Bus Service

The Recommended Alternative would address the need to reduce demand at the overcapacity Wagon Road park-n-Ride at 120th Avenue and I-25. The Recommended Alternative would include new park-and-ride and additional corridor bus service at the following locations:

- ▶ 124th Avenue and Claude Court at Eastlake
- ▶ 128th Avenue and I-25
- ▶ 136th Avenue and I-25
- ▶ 144th Avenue and I-25
- ▶ SH 7 and I-25

2.2.3 Recommended Alternative Complementary Projects and Strategies

The Recommended Alternative would include many complementary projects and strategies. These components are different types of TDM, transportation systems management, and Intelligent Transportation Systems (ITS). These projects are strategies that can be implemented independently or as part of larger infrastructure projects and target the purpose for trip making and mode decision with the goal of lessening peak period travel congestion and eventually overall travel by private automobile. The following discussion represents a broad array of potential strategies for application along the corridor.

2.2.3.1 Additional I-25 Crossings

Multimodal connections across I-25 are contemplated at locations between interchanges where a connection could provide some relief to traffic at the existing I-25 interchanges. Seven potential locations could cross I-25 between:

- ▶ US 36 and 84th Avenue
- ▶ Thornton Parkway and 104th Avenue
- ▶ 120th and 128th Avenues
- ▶ 136th and 144th Avenues
- ▶ 144th and Northwest Parkway
- ▶ Northwest Parkway and SH 7
- ▶ North of SH 7

2.2.3.2 Shoulder Busway North of 120th Avenue

As new park-and-rides are added north of 120th Avenue along the I-25 corridor, the Recommended Alternative would provide a shoulder busway. This busway would allow buses to use the shoulder to bypass congestion in the general purpose lanes. The shoulder busway would be provided as an interim condition before the I-25 cross section is rebuilt with inside managed lanes north of 120th Avenue to SH 7 and beyond. This component would be considered in conjunction with implementation of new park-and-rides north of 120th Avenue.

2.2.3.3 Two Lane Exit Ramps

As continuous acceleration/deceleration lanes are constructed between interchanges, two lane exit ramps can be installed to enhance freeway operations. The continuous acceleration/deceleration lane would serve as an exclusive exit lane and the adjacent lane as a shared through/exit lane.

2.2.3.4 Correct Northbound 84th Avenue On-Ramp Superelevation

The northbound 84th Avenue on-ramp to I-25 possesses a minor geometric deficiency near its merge with mainline I-25. This component would correct this deficiency.

2.2.3.5 Implement Active Traffic Management 120th Avenue to SH 7

This component would add Active Traffic Management (ATM) features, such as overhead gantry signs with lane assignment and variable speed limits, and real-time traffic monitoring along I-25 north of 120th Avenue to provide benefit to traffic operations and safety. The managed lanes extension project will be implementing ATM features along I-25 south of 120th Avenue in the southbound direction and signing in select locations in the northbound direction.

2.2.3.6 Travel Demand Management Measures

Travel demand management is a term used to describe a set of strategies focused on reducing private auto travel during the peak periods of congestion. The Recommended Alternative would include the following TDM measures:

- ▶ **Bike Map** – This online map provides up-to-date bicycle information for travelers in the corridor, including the location and condition of bike routes and paths.
- ▶ **Bike Share Program** – A bike share program provides bicycles to the public for hourly or daily check-out for a small fee. The bicycles are docked at various activity centers. In Denver, the B-Cycle bike share program operates in downtown, Cherry Creek, and other areas.

- ▶ **Carpool Lots** – The provision of parking lots designated for carpooling would encourage carpooling. The location of the carpool lots is important to provide convenience. Lighting is also important to provide security.
- ▶ **Commuter Cash Program** – The commuter cash program provides a subsidy for travelers to introduce them to alternative modes of transportation for a set period of time, to potentially alter long-term travel mode choices.
- ▶ **Corridor Transit Guide** – This strategy provides a user-friendly guide to transit services in the corridor to educate travelers who may not be familiar with public transit use.
- ▶ **Employee Outreach** – Employee outreach programs are directed at large employers to promote and provide education regarding TDM strategies.
- ▶ **First or Final Mile Programs** – First and/or final mile programs address a typical gap in a journey by transit, the leg between a transit stop and the commuter's origin or destination. This strategy provides a shuttle service to connect transit stops or stations with a traveler's point of origin or final destination.
- ▶ **Flexible Work Schedule Resources** – Promotion of off-peak work schedules, or flex-time, could result in reduced congestion during peak hours.
- ▶ **Education Campaign to Instruct Drivers on Appropriate Use of Buffer-Separated Managed Lane** – This strategy would provide a user-friendly guide and/or website to corridor travelers regarding proper use of the buffered separated managed lane.
- ▶ **Master Eco-Pass Contract** – This program would provide an Eco-Pass to all residents of a geographic area or all employees of a geographic area. An EcoPass allows unlimited rides on RTD services.
- ▶ **Peak Hour Bus-Only Lanes/Transit Priority** – Peak hour bus-only lanes and/or queue jumps provide a lane for transit vehicles to bypass the queue at congested intersections. These improvements help to maintain transit level of service (LOS) and may promote transit usage in a congested corridor.
- ▶ **Pool Program Subsidies** – Providing additional funds to increase the potential of forming carpools could reduce congestion and aid the shift from SOV to HOV travel.
- ▶ **Secure Bike Facilities** – The lack of secure bike parking facilities has been shown to deter bicycle travel in many cities. Secure bike lockers are typically located at park-and-rides.
- ▶ **Telework Recognition Awards** – Telework recognition awards recognize employers who support reduced travel by promoting work-at-home programs for their employees.
- ▶ **Transit Subsidies** – Transit subsidies include programs to incentivize transit ridership that temporarily provide free or reduced fares to introduce transit to commuters who are accustomed to travel by driving alone.
- ▶ **Travel Demand Management Marketing** – Potential marketing mechanisms to promote TDM strategies include websites, phone hotlines, newspaper and radio advertising, social networks including Twitter, Facebook, mailout campaigns, etc.

2.2.3.7 Transportation System Management Strategies

Transportation system management is a term used to describe a set of measures that could be implemented to improve operations and efficiency of the transportation network. One of these strategies includes developing and implementing an incident management plan for this stretch of I-25 (an incident management plan has been developed for the HOV/toll lanes south of 84th Avenue [CDOT May 2006]). It is included in the Recommended Alternative. An incident management plan includes recommendations on emergency access and response procedures, use of courtesy patrol vehicles, and other measures to reduce the impact an incident has on the operations of the transportation network. They have proven to be an effective strategy for reducing congestion that occurs as a result of incidents, especially during construction, when construction activities can hinder emergency access and response.

2.2.4 Recommended Alternative Construction Cost Estimates

Planning level conceptual construction cost estimates were developed for each of the roadway infrastructure components included in the Recommended Alternative. **Table 2-1** lists these cost estimates. The cost estimates do not include ROW acquisition or engineering design. **Appendix C** provides the cost estimate worksheets for each component. Cost estimates for park-and-rides and complementary strategies were not developed as part of the study.

Table 2-1 Recommended Alternative Conceptual Construction Cost Estimates (by Component)

Improvement ID	Title	Description	Est. Construction Cost (millions)	Comments
N.3	Auxiliary Lane – I-270 to 84 th	Provide an acceleration/deceleration lane from northbound I-270/US 36/ I-76 ramp to 84 th Avenue on-ramp	\$1.86	
N.6	84 th to Thornton Parkway – NB	Construct a continuous acceleration/ deceleration lane between interchanges; requires replacement of 88 th Avenue bridge	\$1.09+	
N.7	Thornton Parkway to 104 th – NB	Construct a continuous acceleration/deceleration lane between interchanges	\$1.39	
N.8	104 th to 120 th – NB	Construct a continuous acceleration/deceleration lane between interchanges	\$7.86	
N.9	120 th to 136 th – NB	Construct a continuous acceleration/deceleration lane between interchanges	\$1.98	
N.10	136 th to 144 th – NB	Construct a continuous acceleration/deceleration lane between interchanges	\$0.16	

Improvement ID	Title	Description	Est. Construction Cost (millions)	Comments
N.11	144 th to E-470 – NB	Construct a continuous acceleration/deceleration lane between interchanges	\$0.9	
N.15	General Purpose Lane – 84 th to Thornton Pkwy	Extend 4 th travel lane north to Thornton Parkway Interchange; requires replacement of 88 th Avenue bridge	\$3.7+	
S.4	84 th to US 36 – SB	Widen I-25 to provide 5 southbound travel lanes between 84 th Avenue and US 36	\$3.1	
S.5	E-470 to 144 th – SB	Construct a continuous acceleration/deceleration lane between interchanges	\$1.1	
S.6	144 th to 136 th – SB	Construct a continuous acceleration/deceleration lane between interchanges	\$0.26	
S.7	136 th to 120 th – SB	Construct a continuous acceleration/deceleration lane between interchanges	\$3.17	
S.8	120 th to 104 th – SB	Construct a continuous acceleration/deceleration lane between interchanges	\$6.95	
S.9	104 th to Thornton Parkway – SB	Construct a continuous acceleration/deceleration lane between interchanges	\$1.4	
S.10	Thornton Parkway to 84 th – SB	Construct a continuous acceleration/deceleration lane between interchanges; requires replacement of 88 th Avenue bridge	\$1.52+	
S.15	General Purpose Lane – Thornton Parkway to 84 th	Extend 4 th travel lane north to Thornton Parkway Interchange; requires replacement of 88 th Avenue bridge	\$2.14+	
ITS.1	New Ramp Meter at 104 th Ave NB	Ramp meter to control the flow from the on-ramp to the highway	\$0.1	
ITS.2	New Ramp Meter at 120 th Ave NB	Ramp meter to control the flow from the on-ramp to the highway	\$0.1	
ITS.4	New Ramp Meter at 144 th Ave SB	Ramp meter to control the flow from the on-ramp to the highway	\$0.1	
ITS.3	New Ramp Meter at 136 th Ave SB	Ramp meter to control the flow from the on-ramp to the highway	\$0.1	

Improvement ID	Title	Description	Est. Construction Cost (millions)	Comments
ITS.20	New Ramp Meter at 120 th Ave SB	Ramp meter to control the flow from the on-ramp to the highway	\$0.1	Requires two-way bus tunnel to Wagon Road or queue bypass
ITS.21	New Ramp Meter at Thornton Parkway NB	Ramp meter to control the flow from the on-ramp to the highway	\$0.1	
ITS.22	New Ramp Meter at 136 th Ave NB	Ramp meter to control the flow from the on-ramp to the highway	\$0.1	
ITS.23	New Ramp Meter at 144 th Ave NB	Ramp meter to control the flow from the on-ramp to the highway	\$0.1	
ITS.24	New Ramp Meter at SH 7 SB	Ramp meter to control the flow from the on-ramp to the highway	\$0.1	
I.5	70 th /Washington Intersection	Extend eastbound dual left-turn lane to better accommodate evening peak flows	\$0.14	
TI.1	Bi-directional Wagon Road tunnel	Convert the tunnel to a reversible bus-only connection	\$0.5	
TI.6	88 th Avenue Median Station	Inline station to eliminate bus weaving; requires replacement of 88 th Avenue bridge	\$8.45+	Incremental cost = \$5.7 M if built in addition to adjacent I-25 improvements
I-270 to 88 th Auxiliary Lane and General Purpose Lane (NB)		Provide additional laneage to assist major freeway merge movements	\$4.96*	Includes new pedestrian bridge over I-25 due to impacts on current pedestrian culvert
Thornton Parkway to 88 th Auxiliary Lane (SB)		Provide additional merge distance for Thornton Parkway on-ramp traffic	\$0.84**	
88 th Avenue bridge replacement, new pedestrian overpass, lowering of I-25		Cost inherent with constructing any improvements that extend between 84 th Avenue and Thornton Parkway	\$24.4	

Note: Appendix C contains detailed planning level cost estimates for each component

+Implementation of this component would require 88th Avenue bridge replacement, new pedestrian overpass, and lowering of I-25

*=Includes all of component N.15 and a portion of component N.6

**=Includes northernmost portion of component S.15

NB = Northbound SB = Southbound

2.3 *Prioritization and Phasing*

Based on the prioritization principles described in **Subsection 2.1**, components included in the Recommended Alternative were separated into two categories: (1) components that reduce near-term congestion thus having “Benefits Now” and (2) components that provide transportation benefit in the future, called “Benefits by 2035.” After the components were separated into these two categories, a phasing sequence for the components in the “Benefits Now” was developed. See **Section 6.0** for a description (“road map”) of the implementation process for components.

Roadway components identified in the “Benefits Now” category include:

- ▶ General purpose lanes
 - Southbound and northbound 84th Avenue to Thornton Parkway
- ▶ Continuous acceleration/deceleration lanes
 - Southbound 84th Avenue to US 36
 - Southbound and northbound Thornton Parkway to 84th Avenue
 - Northbound I-270 to 84th Avenue
 - Southbound and northbound Thornton Parkway to 104th Avenue
 - Southbound and northbound 104th Avenue to 120th Avenue
- ▶ Ramp meters
 - Southbound – 120th Avenue, 136th Avenue, 144th Avenue
 - Northbound – Thornton Parkway, 104th Avenue, 120th Avenue
- ▶ 70th Avenue and Washington Street intersection improvements

In addition, if implementation of the managed lanes from 120th Avenue to State Highway 66 (SH 66) is delayed (described in **Subsection 2.4**), the northbound and southbound continuous acceleration/deceleration lanes between 120th Avenue and 136th Avenue would move into the “Benefits Now” category.

Transit components identified in the “Benefits Now” category include:

- ▶ New park-and-rides
 - 124th Avenue and Claude Court
 - 144th Avenue and I-25
 - SH 7 and I-25
- ▶ Wagon Road park-n-Ride bidirectional bus tunnel
- ▶ Inline median station 88th Avenue

2.3.1 *Roadway Phasing*

Conceptual design revealed that the 88th Avenue bridge would need to be replaced to implement many of the roadway components identified in the “Benefits Now” category. However, the existing 88th Avenue bridge is not currently categorized as being structurally deficient, which limits the funding sources available to replace the structure. Despite its satisfactory condition, the bridge is operationally deficient and serves as

a major obstacle in providing additional roadway capacity on I-25 between the 84th Avenue and Thornton Parkway interchanges. To proceed with roadway improvements through the southernmost section of the North I-25 PEL Study Area, this bridge must be replaced and widened.

To account for the limitations of the 88th Avenue bridge structure funding, two phasing scenarios were identified for implementation of the components identified in the “Benefits Now” category. The first scenario assumes that funding sources can be identified and the 88th Avenue bridge can be replaced. The second scenario assumes that funding is not available and recommends a phasing plan that can be started without reconstruction of the 88th Avenue bridge.

2.3.1.1 Phasing Scenario 1 – 88th Avenue Bridge Replacement

Phasing Scenario 1 assumes funding for the replacement of the 88th Avenue bridge has been successfully identified. **Figure 2-3** identifies the project phasing. This phasing plan provides an ideal construction order for all roadway components with “Benefits Now” along the corridor. The major characteristic of this phasing plan is the recognition that available funding should be used to (1) target the southern end of the North I-25 PEL Study Area, south of Thornton Parkway and (2) target the southbound direction, followed by the northbound direction. This phasing process reflects the existing conditions and traffic modeling analyses, which clearly identify the southbound direction south of Thornton Parkway as the section most needing congestion relief. Additional information regarding the efficacy of the improvements in this phasing scenario over various time periods between current conditions and 2035 are presented in **Appendix D**.

2.3.1.2 Phasing Scenario 2 – No 88th Avenue Bridge Replacement

Phasing Scenario 2 assumes that funding for the replacement of the 88th Avenue bridge has not or cannot be identified. This phasing scenario provides a construction order for all roadway components with “Benefits Now” along the corridor that can be constructed without replacing the 88th Avenue bridge. Three projects would be eliminated completely, and two projects could implement only portions of the improvements (either north or south of 88th Avenue), as a result of the limitations of the 88th Avenue bridge. **Figure 2-3** calls out these projects.

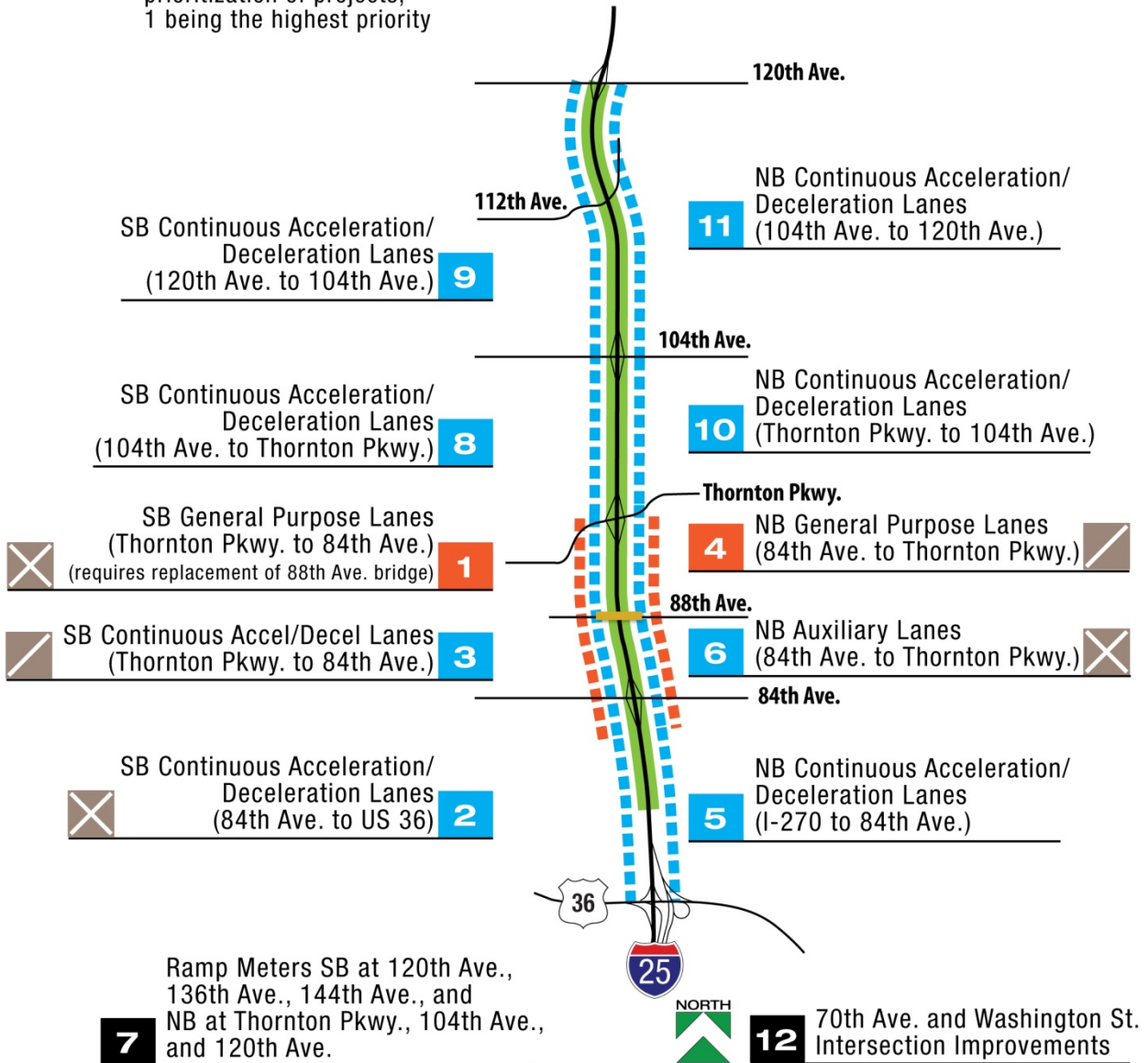
The first project recommended is partial construction of the continuous acceleration/deceleration lane southbound between Thornton Parkway and 88th Avenue. The second project recommended is the partial construction of the general purpose lanes between 84th and 88th Avenue northbound, along with the continuous acceleration/deceleration lane northbound between I-270 and 84th Avenue. These two projects represent construction within the south end of the corridor that could be immediately implemented to reduce congestion, but that would ultimately need to be reconstructed with replacement of the 88th Avenue bridge and reconstruction of the complete roadway segment between US 36 and Thornton Parkway as defined in the full phasing plan.

Figure 2-3 Roadway Phasing Scenarios

LEGEND

- Planned Managed Lanes (opening Fall 2015)
- Proposed General Purpose Lanes
- Proposed Continuous Acceleration/Deceleration Lanes
- Numbers represent prioritization of projects, 1 being the highest priority

- Projects Removed from the Phasing Plan if 88th Ave. Bridge Replacement does not occur
- Projects Partially Constructed if 88th Ave. Bridge Replacement does not occur (i.e., project can be completed north or south of 88th Ave., but not through 88th Ave.)
 - #3 SB continuous Acceleration/Deceleration Lanes (Thornton Pkwy. to 88th Ave.)
 - #4 NB General Purpose Lanes (84th Ave. to 88th Ave.)



2.3.2 Transit Phasing

Each transit project included in the phasing plan has been identified below, along with the recommended order and reasoning. **Figure 2-4** identifies the transit phasing scenario.

2.3.2.1 Priority 1 – Park-and-Ride at 124th Avenue and Claude Court

The park-and-ride at 124th Avenue and Claude Court is a planned rail station along the North Metro Rail Line that will be constructed and provide transit access to the upcoming commuter rail and parking to meet this study's Purpose and Need. Implementation of the park-and-ride and bus service in advance of the opening of the rail line would serve some transit patrons who currently drive to Wagon Road, thereby relieving the overcapacity conditions at Wagon Road. Bus service would be extended from the I-25 corridor to the 124th Avenue and Claude Court location to provide a single seat ride to downtown. Coordination would be needed with RTD and its North Metro design team.

2.3.2.2 Priority 2 – Bi-Directional Tunnel to Wagon Road park-n-Ride

The modification of the bi-directional tunnel would provide southbound buses a direct connection to the inside lane of southbound I-25 to reduce transit travel time, while maintaining the northbound connection. Buses exiting the park-n-Ride would no longer be routed through the traffic signals and mixed traffic on 120th Avenue. Furthermore, this improvement complements the upcoming interim implementation of managed lanes on the inside shoulders of I-25, as southbound buses from Wagon Road would not need to weave across the general purpose lanes to enter the new managed lanes. Coordination would be needed with RTD and CDOT.

2.3.2.3 Priority 3 – Inline Median 88th Avenue Station

This improvement would provide a new bus station in the median of I-25 and direct accesses for buses to the station from the planned managed lanes, eliminating the need for buses to weave across several general purpose lanes of I-25. This improvement would reduce transit passenger travel times by allowing buses to take full advantage of the managed lanes on I-25 and would allow passengers efficient access to either the east or west sides of the park-and-ride. Coordination would be needed with RTD and CDOT.

2.3.2.4 Priority 4 – Park-and-Ride at 144th Avenue and I-25




A new park-and-ride in the immediate vicinity of the 144th Avenue and I-25 interchange would serve some patrons of the Wagon Road park-n-Ride, thereby relieving the overcapacity conditions at Wagon Road. Bus service would be extended up I-25. Coordination will be needed with RTD and local jurisdictions, and additional study will be needed after the North Metro Rail Line opens to determine the amount of parking capacity needed at this location.

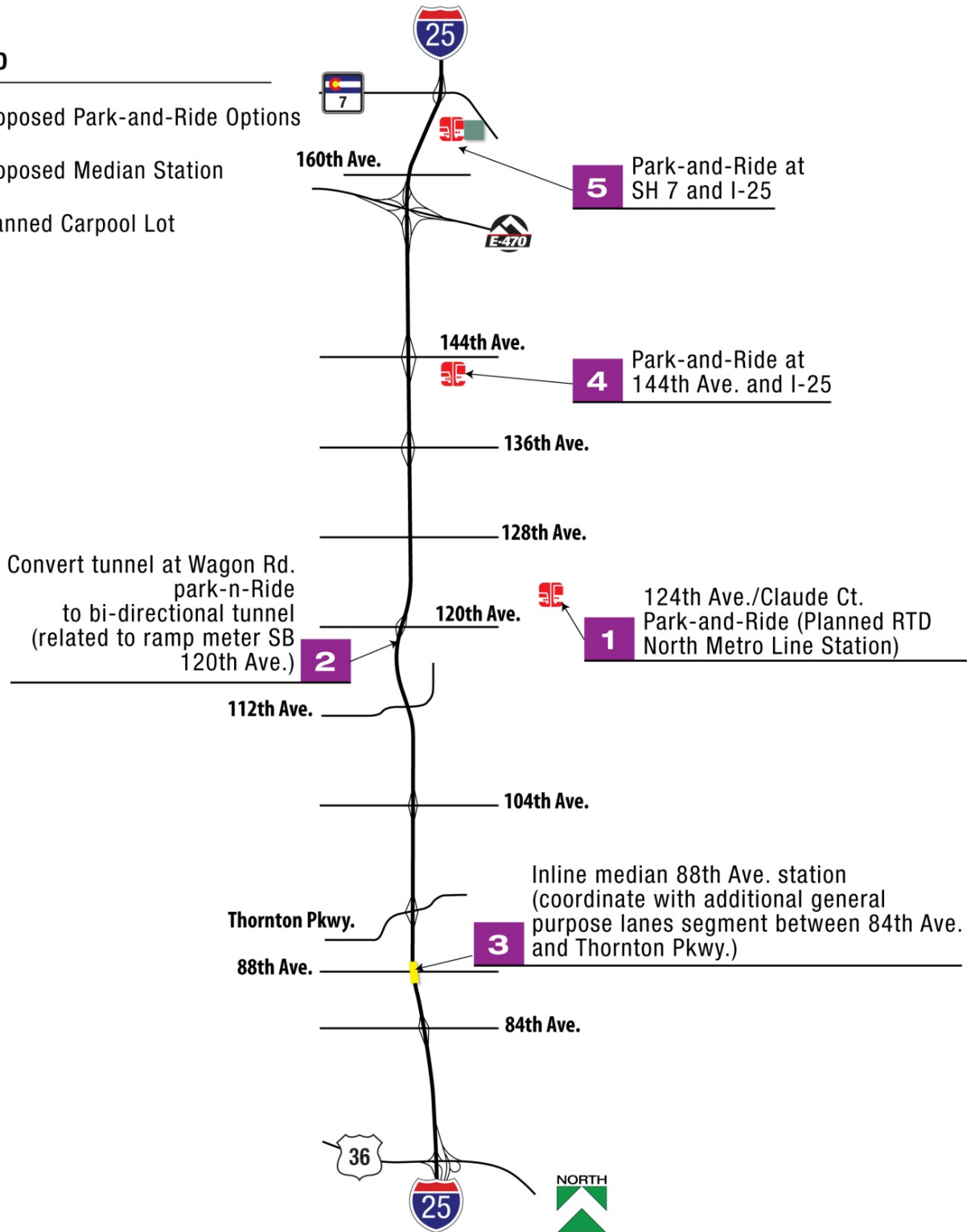
2.3.2.5 Priority 5 – Park-and-Ride at SH 7 and I-25

A new park-and-ride in the immediate vicinity of the SH 7 and I-25 interchange would serve some patrons of the Wagon Road park-n-Ride, thereby relieving the overcapacity conditions at Wagon Road. Bus service would be extended up I-25. Coordination will be needed with RTD and local jurisdictions in the RTD district, and additional study will be needed after the North Metro Rail Line opens to determine the amount of parking capacity needed at this location.

Figure 2-4 Transit Phasing Scenario

LEGEND

-  Proposed Park-and-Ride Options
-  Proposed Median Station
-  Planned Carpool Lot



2.3.3 Complementary Projects and Strategies

Complementary projects and strategies were evaluated to determine which components could be expected to provide “Benefits Now” and “Benefits by 2035.” Ultimately, the projects included in the Complementary Projects and Strategies classification represent a very diverse spectrum of component types, likely to be funded and implemented by various sources and agencies. For this reason, determining a phasing order for this classification would not benefit the project listing. Instead, **Table 2-2** has a complete list of the recommended “Benefits Now” components for review and implementation.

2.4 *No Action Alternative*

The No Action Alternative represents a conservative estimate of improvements that would occur if a build alternative were not constructed. It would include those projects that are funded and expected to be constructed in the next several years. It is presented for comparison with the build alternatives. The following list of projects is included in the No Action Alternative for the purpose of this study.

2.4.1 Managed Lanes between US 36 and 120th Avenue

In 2011 CDOT was awarded TIGER funds to construct interim managed lanes along I-25 between US 36 and 120th Avenue. This project is using the existing pavement cross section to the extent possible and restriping I-25 to provide the additional lane in each direction with somewhat narrower lanes and shoulders. The additional lanes will be limited to use by vehicles with two or more passengers or single occupancy vehicles (SOVs) willing to pay a toll to use the facility. FHWA allowed this improvement as an interim project until the 2030 timeframe when funds are identified in DRCOG's *Metro Vision Fiscally Constrained Plan* to construct this section of I-25 with full lanes and shoulders. Project construction is expected to begin in 2014 and to be complete in fall 2015.

2.4.2 SH 7 Carpool Lot

During development of the I-25 PEL, CDOT awarded the City of Thornton Funding Advancement for Surface Transportation and Economic Recovery (FASTER) funds to construct a 170-space carpool lot in the southeast quadrant of I-25 and SH 7. FASTER is a funding mechanism from motor vehicle registrations in Colorado. Project design is expected to be completed in 2015 and construction complete in fall 2015.

2.4.3 Thornton park-n-Ride Expansion

During development of the I-25 PEL, CDOT awarded RTD FASTER funds to expand the east side of the existing Thornton park-n-Ride near 88th Avenue by 200 spaces. This project is expected to be complete by 2015.

2.4.4 North Metro Rail Line

DRCOG's *Metro Vision RTP* includes the 18.4-mile North Metro Rail Line from downtown Denver to SH 7. DRCOG's *Metro Vision Fiscally Constrained Plan* includes construction of an initial segment of the North Metro Rail Line to 124th Avenue. However, the No Action Alternative includes the North Metro Rail Line from downtown Denver to 72nd Avenue. During development of the I-25 PEL, RTD issued a request for proposals to design and build the complete line to SH 7. During development of the North I-25 PEL, RTD programmed the expansion of its North Metro Rail Line to 124th Avenue by 2018. Because of this, the PEL conducted a sensitivity test on recommended improvements to determine their need and viability both with and without the North Metro Rail Line to SH 7. **Section 3.0** of this document describes the results of this sensitivity analysis.

Table 2-2 Phasing Scenario

	Roadway	Transit	Complementary Strategies
BENEFITS NOW	<p>Listed in order of priority:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> 1. SB general purpose lanes segment 84th Ave. to Thornton Pkwy. [Requires replacement of 88th Ave. bridge] <input checked="" type="checkbox"/> 2. Continuous acceleration/deceleration lane SB 84th Ave. to US 36 <input checked="" type="checkbox"/> 3. Continuous acceleration/deceleration lane SB Thornton Pkwy. to 84th Ave. <input checked="" type="checkbox"/> 4. NB general purpose lanes segment 84th Ave. to Thornton Pkwy. 5. Continuous acceleration/deceleration lane NB I-270 to 84th Ave. <input checked="" type="checkbox"/> 6. Continuous acceleration/deceleration lane NB 84th Ave. to Thornton Pkwy. 7. Ramp meters SB at 120th Ave., 136th Ave., 144th Ave., and NB at Thornton Pkwy., 104th Ave., and 120th Ave. 8. Continuous acceleration/deceleration lane SB 104th Ave. to Thornton Pkwy. 9. Continuous acceleration/deceleration lane SB 120th Ave. to 104th Ave. 10. Acceleration/deceleration lane NB Thornton Pkwy. to 104th Ave. 11. Acceleration/deceleration lane NB 104th Ave. to 120th Ave. 12. 70th Ave. & Washington St. intersection improvements <p><i>Extend I-25 managed lane from 120th Ave. to SH 7 (RAMP funding)</i></p>	<p>Listed in order of priority:</p> <ul style="list-style-type: none"> 1. New Park-and-Ride at 124th Ave. and Claude Ct. at Eastlake 2. Convert tunnel at Wagon Road Park-and-Ride to bi-directional tunnel (related to ramp meter SB 120th Ave.) 3. Construct inline median 88th Ave. station (coordinate with additional GP lanes segment between 84th Ave. and Thornton Pkwy.) 4. New Park-and-Ride at 144th Ave. and I-25 5. New Park-and-Ride at SH 7 and I-25 	<ul style="list-style-type: none"> • Bike map • Carpool lots • Commuter cash program • Corridor transit guide • Incident management plan • Implement education campaign to instruct drivers on appropriate use of buffer-separated managed lane • Peak hour bus-only lanes/transit priority • Pool program subsidies • Secure bike facilities • TDM marketing • Transit subsidies
BENEFITS BY 2035	<ul style="list-style-type: none"> • Additional I-25 crossings • Correct NB 84th Ave. on-ramp superelevation • Implement Active Traffic Management 120th Ave. to SH 7 • Continuous acceleration/deceleration lane NB 120th Ave. to 136th Ave.* • Continuous acceleration/deceleration lane NB 136th Ave. to 144th Ave. • Continuous acceleration/deceleration lane NB 144th Ave. to E-470 • Continuous acceleration/deceleration lane SB E-470 to 144th Ave. • Continuous acceleration/deceleration lane SB 144th Ave. to 136th Ave. • Continuous acceleration/deceleration lane SB 136th Ave. to 120th Ave.* • Ramp meters NB 136th Ave. and 144th Ave., and SB SH 7 	<ul style="list-style-type: none"> • New Park-and-Ride at 128th Ave. and I-25 • New Park-and-Ride at 136th Ave. and I-25 • Shoulder Busway north of 120th Ave.* 	<ul style="list-style-type: none"> • Bike share program • Employer outreach • First or final mile programs • Flexible work schedule resources • Master Eco-pass contract • Telework recognition awards
	<p>* Would have immediate benefit without extension of I-25 managed lanes</p>	<p><input checked="" type="checkbox"/> Projects removed from the Phasing Plan if 88th Ave. bridge reconstruction does not occur</p>	<p><input checked="" type="checkbox"/> Projects partially constructed if 88th Ave. bridge reconstruction does not occur</p> <ul style="list-style-type: none"> • #3 SB continuous acceleration/deceleration lanes (Thornton Pkwy. to 88th Ave.) • #4 NB GP lanes (84th Ave. to 88th Ave.)

2.5 *Other Potential Corridor Projects*

In addition to the North Metro Rail Line, CDOT is currently studying and pursuing a number of other projects in the North I-25 PEL Study Area. These are described below.

2.5.1 *Managed Lane Extension 120th Avenue to SH 66*

During development of the I-25 PEL, CDOT Region 4 applied for and was awarded Responsible Acceleration of Maintenance and Partnerships (RAMP) funding to extend the interim managed lanes (described previously) from their planned terminus at 120th Avenue north to SH 66 (north of the North I-25 PEL Study Area). Design of this project will begin immediately, and construction could be complete as early as 2020. Because of this, the North I-25 PEL Study conducted a sensitivity test on recommended improvement to determine their need and viability, both with and without the extension of these managed lanes. **Section 3.0** of this document describes the results of this sensitivity analysis. This is considered an interim improvement until full lanes and shoulders can be implemented.

2.5.2 *SH 7/ I-25 Interchange*

During the development of the I-25 PEL, CDOT was also conducting a SH 7 PEL. The SH 7 PEL evaluated potential interchange configurations at the I-25/SH 7 interchange, the I-25 PEL's northern terminus. The SH 7 PEL determined that both a diverging diamond configuration and a partial cloverleaf configuration were viable designs. Communities adjacent to this interchange support implementation of the diverging diamond; however, the *North I-25 Record of Decision* (December 2011) cleared the partial cloverleaf configuration. As a result, a revised ROD will be necessary to clear and implement a diverging diamond at this location. An Interstate Access Request would be needed to implement either interchange configuration. Both configurations were found to be compatible with the improvements recommended in the I-25 PEL.

2.5.3 *DRCOG Metro Vision*

The DRCOG *Metro Vision RTP* (unconstrained) identifies an ultimate 202-foot cross section for I-25 between US 36 and SH 7. The 202-foot cross section would allow 24 feet of additional capacity in each direction of I-25 over existing conditions. All recently constructed structures over I-25 (84th Avenue, 120th Avenue, 128th Avenue, 136th Avenue, and 144th Avenue) have been built to accommodate the 202-foot cross section. The *North I-25 EIS Preferred Alternative* included managed lanes along the entire corridor leaving 12 feet in each direction for additional capacity. No long-term planning or NEPA study has been initiated to determine the composition of the ultimate 202-foot cross section in this Study Area. The long-term components identified by this I-25 PEL Study identified several potential combinations of lane types for future consideration.

2.6 *Potential Long-Term Cross Sections for Future Consideration*

Potential long-term cross sections were considered during the project planning process to further inform the component development and evaluation to ensure an understanding of potential conflicts between the PEL recommendations and the long-term cross sections along the corridor. See **Section 6.0** for a description ("road map") of the implementation process for these potential long-term cross sections. The following describes several of the potential cross sections under evaluation in this study, along with relevant project details.

2.6.1 Managed Lanes North from 120th Avenue to SH 7

The addition of a managed lane in each direction would extend the HOV/toll lane from its programmed end at 120th Avenue. The managed lanes would be buffer-separated from the general purpose lanes. This addition would fit within the current planned width of a 202-foot cross section for north I-25 as identified in *MetroVision RTP* and, therefore, would not require reconstruction of recently constructed structures. This improvement would include full lanes and shoulders and would replace the planned interim improvement.

2.6.2 General Purpose Lanes North from 84th Avenue to SH 7

The addition of a general purpose lane in each direction would widen the recommended cross section and would fit within the current planned width of a 202-foot cross section for north I-25 as identified in *MetroVision RTP* and, therefore, would not require reconstruction of recently constructed structures.

2.6.3 Reversible Managed Lanes North from US 36 to SH 7

The addition of reversible managed lanes would extend the current reversible HOV/toll lanes from US 36 to the north. The managed lanes would be barrier-separated from the general purpose lanes. This addition would fit within the current planned width of a 202-foot cross section for north I-25 as identified in *MetroVision RTP* and, therefore, would not require reconstruction of recently constructed structures.

2.6.4 Two Managed Lanes North from US 36 to SH 7

The addition of two managed lanes in each direction would extend from US 36 to SH 7. The managed lanes would be buffer-separated from the general purpose lanes. This addition would fit within the current planned width of a 202-foot cross section for north I-25 as identified in *MetroVision RTP* and, therefore, would not require reconstruction of recently constructed structures.

2.6.5 128th Median Station

This improvement would construct a bus station in the median of I-25 in the vicinity of 128th Avenue. It would allow the buses to remain on the planned inside managed lanes of I-25, instead of requiring a weave across general purpose lanes. This transit facility would be implemented in conjunction with the reconstruction of the I-25 cross section to include managed lanes north of 120th Avenue, along with the eventual building of a park-and-ride at 128th Avenue. The improvement can be considered in the long term during planning of the I-25 cross section expansion.

2.7 *Components Eliminated*

As a result of the component evaluation process, several components were eliminated based on their inability to meet the project's Purpose and Need. The following discussion identifies each eliminated component by category, describes the intent of the project, and briefly discusses why the project has been eliminated.

2.7.1 Roadway

The following roadway components were eliminated from further consideration in this PEL.

2.7.1.1 Pre-Mainline Merge [Merge All Ramps (I-270, US 36, and I-76) Prior to I-25 Northbound Entry]

This component would cause three major entry ramps to northbound I-25 to merge before joining mainline I-25. Through operational modeling, it was determined that this component would reduce capacity of the merge point and result in longer queues on the merging facilities and, therefore, would not contribute to meeting the Purpose and Need.

2.7.1.2 Convert Left-Side I-270 Flyover to Right-Side Ramp

Currently, the flyover ramp joining southbound I-25 with eastbound I-270 departs from the left side of mainline I-25. This component would demolish the current ramp and construct a new ramp departing from the right side of mainline I-25.

Analysis of existing and future traffic operation indicates that the left side ramp is not the primary source of congestion on southbound I-25. In addition, a review of the crash data does not indicate that the left side ramp is a safety concern. As a result, converting the left side I-270 flyover to a right-side ramp does not address this project's Purpose and Need.

2.7.1.3 84th Avenue Interchange T-Ramp

This component would add a ramp connection to and from I-25 south from the 84th Avenue bridge, exclusively accessing the managed lanes. These ramps would no longer force managed lane users to weave across three lanes of mainline I-25 to access 84th Avenue.

VISSIM travel model analysis of existing and future traffic operation indicates that the weave between the managed lanes and the 84th Avenue on and off ramps is not the primary source of congestion and would provide minimal travel time improvement or congestion relief. In addition, the extension of the managed lanes north to 120th Avenue (currently under construction) will reduce the number of vehicles merging from the managed lanes at 84th Avenue into the general purpose lanes. Based on this analysis, this component does not address this project's Purpose and Need.

2.7.1.4 Construct New North/South Route for Trucks Parallel to I-25

This component would construct a new north-south route exclusively for truck use parallel to I-25. A review of crash data indicates that trucks are not a disproportionate safety issue in this area. While this component could potentially reduce congestion on I-25, it would need to be studied in a larger, long-distance context to understand how regional truck traffic could be diverted from I-25 and if measurable congestion relief could be attained. This component may have merit for consideration under a separate study.

2.7.1.5 Northbound Braided Ramps US 36 to 84th Avenue

This component would eliminate the weaving movements that currently occur on northbound I-25 between US 36 and 84th Avenue by grade separating the on-ramps from I-76/US 36/I-270 from the off-ramp to 84th Avenue.

Analysis of existing and future traffic operation indicates that the high merge volume from I-76/US 36/I-270 onto northbound I-25 impacts capacity and operation of northbound I-25 between US 36 and 84th Avenue.

While there is a weave in this location, it is not the primary source of congestion and providing a braided ramp does not measurably reduce congestion. Based on this analysis, a northbound braided ramp between US 36 and 84th Avenue does not meet the Purpose and Need.

2.7.1.6 Collector-Distributor System US 36 to 84th Avenue, Northbound

This component would shift the weaving movements that currently occur on northbound mainline I-25 between US 36 and 84th Avenue to a collector-distributor roadway parallel and adjacent to mainline I-25, thereby relieving weaving activity on mainline I-25. Operational modeling demonstrated that this component provided no measureable mobility improvement and, therefore, would not meet the Purpose and Need.

2.7.1.7 Collector-Distributor System 84th Avenue to US 36, Southbound

This component would shift the weaving movements that currently occur on southbound mainline I-25 to a collector-distributor roadway parallel and adjacent to mainline I-25. Because the US 36 and 84th Avenue weave movements are not the cause of congestion, this component provided no measureable mobility improvement and would not meet the Purpose and Need.

2.7.1.8 I-76 Direct Connection to I-25 Upstream of Current Connection

The ramp connecting eastbound I-76 with northbound I-25 currently runs alongside I-25 for some distance before merging with the eastbound US 36 loop ramp to northbound I-25 and subsequently connecting to northbound I-25, adding a fourth mainline travel lane. This component would shift the I-76 ramp entry point farther upstream. Operational modeling demonstrated that this component would provide no measureable mobility improvement and, therefore, would not meet the Purpose and Need.

2.7.1.9 88th Avenue T-Ramp

88th Avenue currently crosses over mainline I-25, but no connections are provided from I-25 to 88th Avenue. This component would provide ramp connections from 88th Avenue to the managed lanes along I-25. Operational modeling indicated that this component provided no measureable mobility improvement and, therefore, does not meet the Purpose and Need.

2.7.1.10 Collector-Distributor System Along Northbound I-25 between 144th Avenue and SH 7

This component would provide a northbound collector-distributor system parallel and adjacent to mainline I-25 between 144th Avenue and SH 7. The presence of this system would require drivers seeking to reach E-470/Northwest Parkway from I-25 to exit well south, near 144th Avenue. The northbound collector-distributor system would negatively impact mobility for I-25 to E-470/Northwest Parkway users by eliminating the direct connection from I-25 to E-470/Northwest Parkway and would not contribute to meeting the Purpose and Need.

2.7.1.11 Collector-Distributor System Along Southbound I-25 between 144th Avenue and SH 7

This component would provide a southbound Collector-Distributor system parallel and adjacent to mainline I-25 between SH 7 and 144th Avenue. The presence of this system would require drivers seeking to reach E-470/Northwest Parkway from I-25 to exit well north, near SH 7. This component would negatively impact mobility for I-25 to E-470/Northwest Parkway users by eliminating the direct connection from I-25 to E-470/Northwest Parkway and would not contribute to meeting the Purpose and Need.

2.7.2 Transit

The following transit components were eliminated from consideration in this PEL.

2.7.2.1 Light Rail on I-25

This transit facility expansion would extend light rail from downtown Denver to the north along the I-25 corridor. This component was considered as an alternative during an extensive study of the North Metro corridor. This alternative was not considered as favorable as the commuter rail solution ultimately identified in the Environmental Impact Statement and was, therefore, eliminated from further consideration in the study.

2.7.2.2 120th Avenue Median Station

This component would construct a bus station in the median of I-25 in the vicinity of 120th Avenue. It would allow future buses traveling to and from north of 120th Avenue to remain on the planned inside managed lanes of I-25 and board and alight passengers from the I-25 median instead of, or in addition to, boarding and alighting at the Wagon Road park-n-Ride.

This component would not accommodate the high volume of end-of-line bus activity (where the bus turns around) that occurs today and will continue to occur in the future. It does not address the overcapacity parking demand at the Wagon Road park-n-Ride. Therefore, this component does not meet the project's Purpose and Need.

2.7.2.3 Add Structure to 120th Avenue Bus Tunnel to Facilitate Bus Access to the Managed Lanes (To/From the North)

This improvement would create a new tunnel providing access to and from I-25 north of 120th Avenue. This component could improve bus travel time and capacity of future routes that travel north of 120th Avenue when congestion is present. However, north of 120th Avenue, there is minimal congestion today, and in the future, congestion is projected to be relatively limited. As a result, this component does not address this project's Purpose and Need but may merit additional study in the future.

2.7.2.4 Shift 120th Avenue Bus Tunnel from Left Side to Right Side of Northbound I-25

For northbound buses to the Wagon Road park-n-Ride, the movement of the tunnel access from the right lanes of I-25 (instead of from the inside lanes) would eliminate the buses weaving from the right general purpose lanes to the inside lane, in the current configuration. Because the extension of the managed lanes north to 120th Avenue (opening Fall 2015) would allow the buses to enter the bus tunnel from the inside lane without changing lanes, this component would create an unnecessary weave on I-25. This would not address the Purpose and Need to enhance multimodal options.

2.7.2.5 Expand Wagon Road park-n-Ride

The Wagon Road park-n-Ride could be expanded by adding surface parking spaces or a multi-level parking garage structure could be built. Since the initiation of this PEL Study, RTD has programmed the expansion of its North Metro Rail Line to 124th Avenue by 2018. The close proximity of the Wagon Road park-n-Ride to the 124th Avenue end-of-line North Metro Station will substantially relieve parking demand at the Wagon Road park-n-Ride. For this reason, the expansion of the Wagon Road park-n-Ride was eliminated.

2.7.3 Complementary Projects and Strategies

The following complementary projects and strategies were eliminated from consideration in this PEL.

2.7.3.1 Limit Large Trucks and Buses from Use of the Left Lane on I-25

This component would prevent trucks and buses from using the leftmost general purpose lane along mainline I-25. This lane is adjacent to the new managed lane extension from US 36 to 120th Avenue, and trucks and buses will frequently use the leftmost general purpose lane to enter and exit the managed lane. As a result, this limitation is not compatible with the new managed lanes north to 120th Avenue and would not contribute to meeting the Purpose and Need.

2.7.3.2 Designate Inside Lane of I-25 for Trucks Only

This component would disallow private vehicles from the leftmost general purpose lane along I-25. This lane is adjacent to the new managed lane extension from US 36 to 120th Avenue, and private vehicles will frequently use the leftmost general purpose lane to enter and exit the managed lane. Because this limitation is not compatible with the new managed lanes north to 120th Avenue, it would not contribute to meeting the Purpose and Need.

2.7.3.3 Implement \$2 Toll All Day

This component would charge a \$2 toll all day for vehicles operating in the managed lanes between downtown Denver and the northern terminus of the managed lanes. Tolling and revenue studies completed on this corridor indicate that a \$2 toll is not sufficient to maintain a high level of service for vehicles traveling in the managed lanes. This would result in congestion in the managed lanes, increasing travel times for private autos and buses in the managed lanes and, therefore, does not meet this project's Purpose and Need.

This page intentionally left blank.

3.0 TRANSPORTATION ANALYSIS

The North I-25 PEL Study Area represents a 12-mile segment of I-25 with varying levels of congestion, increasing from the north to south ends. Different bottlenecks in the northbound and southbound directions occur based on the operating conditions, design, merge and diverge volumes, and volumes along the North I-25 PEL Study Area. **Section 3.0** describes the various tools and methods used to evaluate potential transportation improvements along the North I-25 PEL Study Area and the results of the analysis. **Appendix C** provides supporting information and transportation findings for each component.

3.1 *Tools and Methodologies*

The project team used various tool and methodologies designed specifically to evaluate conditions in the North I-25 PEL Study Area. The project team also used these tools and methodologies to screen, sort, prioritize, and phase components. Tools included the DRCOG TransCAD Travel Demand Model, a sub-area DynusT Dynamic Traffic Assignment Model, a corridor VISSIM Model, select Synchro operations analyses, transit routing travel time savings calculations, and conceptual design.

3.1.1 DRCOG TransCAD Travel Demand Model

The project team used the DRCOG TransCAD Travel Demand Model to forecast daily volumes and to analyze transit during the study. The project team used the latest version of the DRCOG model (Compass 4.0). The model includes the fiscally constrained roadway, transit network, and the currently adopted land use projections; it is consistent with planning projects identified in the latest version of DRCOG *Metro Vision RTP*. For transit modeling, the project team used the 2035 forecast year model to evaluate the effect of transit enhancements such as new park-and-rides and new transit services along the North I-25 PEL Study Area. The DRCOG TransCAD Travel Demand Model serves as the starting point for the DynusT Dynamic Traffic Assignment Model described in **Subsection 3.1.2**.

3.1.2 DynusT Dynamic Traffic Assignment Model

The project team used the DynusT Dynamic Traffic Assignment Model to develop a sub-area model focusing on the North I-25 PEL Study Area. The model input for the DynusT Model process began with the DRCOG TransCAD Travel Demand Model. The sub-area DynusT Model served as the basis for evaluating travel speed, travel time, and congestion duration on mainline I-25.

Dynamic traffic assignment models are a relatively new modeling tool that blends the more traditional macroscopic traffic forecasting process with microscopic simulation models. The benefit of this type of model is its ability to model dynamic time dependent on trip departures to understand in greater detail the relationship between trip departures and minute-by-minute congestion on roadway facilities.

This project relied on the finer level of detail afforded by Dynamic Traffic Assignment to understand not only the peak travel times experienced through the North I-25 PEL Study Area but also the duration and location of congestion during the peak periods. For this analysis, the project team developed separate a.m. and p.m. models to evaluate the component impacts on the southbound and northbound directions during the typical weekday peak periods.

The project team developed and used six DynusT models for the I-25 PEL:

- ▶ **2010 base year model a.m. and p.m. peak periods** – Calibrated to current traffic volumes and travel speeds
- ▶ **2015 model a.m. and p.m. peak periods** – Updated the 2010 calibrated model to include the extension of the managed lanes north to 120th Avenue to reflect conditions in 2015
- ▶ **2035 model a.m. and p.m. peak periods** – Included extension of the managed lanes north to 120th Avenue and adopted land use through 2035

Appendix E provides additional detail about the DynusT model development process. It includes the *North I-25 PEL Dynamic Traffic Assignment (DTA) Methods and Assumptions* document and the *North I-25 PEL Dynamic Traffic Assignment 2010 Model Calibration Results* document.

3.1.3 VISSIM Microsimulation Model

Because it can replicate individual car-following behavior, the VISSIM Microsimulation Model served as the basis for detailed operational analyses completed for mainline I-25 weaving, merge and diverge movements. Components evaluated using the VISSIM Model included the 88th Avenue Inline Median Station and sensitivity analyses of individual roadway components to better understand their potential benefits. The base VISSIM Model was developed for the design of the managed lanes between US 36 and 120th Avenue. The original purpose of the model was to inform design of the ingress and egress locations and spacing for the new managed lane scheduled to open in fall 2015 and included as part of the No Action Alternative for this project.

3.1.4 Synchro Operations Tool

Synchro served as the basis for intersection operations analyses completed for the component evaluation. Evaluation focused on the 70th Avenue and Washington Street intersection component to address concerns about left-turn lane storage length during the p.m. peak period.

3.1.5 Transit Routing Travel Time Savings Calculations

The project team calculated transit routing travel time savings to evaluate the potential benefit of transit infrastructure improvement to reduce bus travel time during the peak periods. The evaluation focused on the bi-directional tunnel component at the Wagon Road park-n-Ride and quantified bus travel time savings with the ability to re-enter southbound mainline I-25 without using the 120th Avenue on-ramp and with the elimination of associated vehicle weaving.

3.1.6 Conceptual Design

Conceptual design of components was completed during the study to assess potential impacts on environmental resources, develop conceptual cost estimates, and determine viable phasing for implementation of components. The conceptual design process was helpful when determining the required spacing and impacts of many of the alternatives through the congested North I-25 PEL Study Area. The conceptual costs developed through this process focus on capital construction costs and do not include the potential costs for ROW impacts and environmental clearances. The conceptual costs were used to evaluate the cost-effectiveness of the Recommended Alternative and phasing scenarios.

3.2 North Metro Line Sensitivity Analysis

The project team conducted a sensitivity test to understand whether the full completion of RTD’s North Metro Rail Line (north to 162nd Avenue) would alter the traffic forecasts used for the analyses of the No Action Alternative and transportation components. The DRCOG Regional Travel Demand Model revealed that, during the three-hour a.m. peak period (6:00 a.m. to 9:00 a.m.), the North Metro line is projected to carry approximately 3,200 southbound passengers in the Year 2025. This increase in transit ridership would open up some capacity along I-25. Much of this capacity would be filled by latent vehicular demand, and model findings indicate that volumes on southbound I-25 would drop by less than 1 percent. Because this change would not significantly affect transportation modeling findings, future-year transportation modeling efforts proceeded with the base assumption that RTD’s North Metro line would extend to 72nd Avenue by the Year 2035.¹ **Table 3-1** provides traffic forecasts on I-25 and Washington Street at two locations in the corridor, comparing future daily traffic forecasts with and without full completion of the North Metro line.

Table 3-1 Daily Traffic Forecasts – With and Without North Metro

Location	2025 Without North Metro			2025 With North Metro			Difference		
	SB	NB	Total	SB	NB	Total	SB	NB	Total
I-25									
North of US 36	10,689	6,623	17,312	10,647	6,636	17,283	-0.39%	0.20%	-0.17%
120 th Avenue	6,031	4,863	10,894	6,017	4,854	10,871	-0.23%	-0.19%	-0.21%
Washington Street									
North of US 36	1,992	685	2,677	1,998	697	2,695	0.30%	1.72%	0.67%
120 th Avenue	1,284	1,510	2,794	1,269	1,493	2,762	-1.18%	-1.14%	-1.16%
NB = Northbound		SB = Southbound							

3.3 Roadway Component Analysis

During the development of the Recommended Alternative, the project team evaluated individual roadway components based on the project’s ability to reduce peak travel time and congestion duration through the North I-25 PEL Study Area. Based on the analysis results, components that had the potential to reduce congestion and improve safety were retained.

Due to the desire to implement near-term projects that can provide immediate improvement to I-25 mobility, additional analysis was completed to prioritize and phase the components of the Recommended Alternative. The prioritization process focused on dividing the Recommended Alternative between “Benefits Now” and “Benefits by 2035.” This process tested each Recommended Alternative component individually in the 2015 model and recorded its effectiveness. Components that provided benefit were characterized as immediate and carried forward to the phasing process. The phasing process was completed using additional analysis tools, including the vehicle-hours traveled, cost-benefit, and safety. **Appendix E** contains details about the performance of individual components.

¹ During development of the I-25 PEL, RTD programmed expansion of its North Metro Rail Line to 124th Avenue because the sensitivity analysis had already been completed to 72nd Avenue.

The following discussion provides the results of the Recommended Alternative compared to the No Action Alternative. This analysis focuses on the benefits to mobility and safety anticipated through implementation of the Recommended Alternative. All reported results reflect the operational and safety benefits of vehicles using the general purpose lanes along I-25 within the study area.

3.3.1 Peak Travel Time and Congestion Duration

Peak travel time and congestion duration served as key analysis tools by which the Recommended Alternative was identified. Peak travel time and congestion duration are two key parameters for which the DynusT Model was particularly useful in evaluating and characterizing future operating conditions along the North I-25 PEL Study Area.

Travel time was described as the amount of time taken to drive through the complete North I-25 PEL Study Area, US 36 to SH 7. The analysis was performed for each component in the southbound direction in the morning and in the northbound direction in the afternoon. The DynusT Model was able to report the dynamic travel time experienced by each user for every departure minute during the peak period for travelers, which created a travel time curve and resulting peak travel time experienced through the corridor.

Congestion duration was the second analysis parameter available from the model to describe travel during the peak periods. This evaluation was also based on the travel time curve and focused on describing the length of time during each peak period when travel time through the North I-25 PEL Study Area is expected to be longer than the free-flow travel time. Combining these two parameters allowed the project team to collect great detail about the ability for components to save peak travel time and reduce the period of congestion along the North I-25 PEL Study Area.

To demonstrate the results of the peak travel time and congestion duration analyses, the following subsections describe the 2035 analysis and 2015 analysis completed for the No Action Alternative and Recommended Alternative.

3.3.1.1 2035 Analysis

All roadway components within the Recommended Alternative were evaluated independently in the 2035 model and shown to provide peak travel time or congestion duration savings (see **Appendix C**). **Table 3-2** provides the results of the complete roadway Recommended Alternative compared to existing conditions and the No Action Alternative.

Table 3-2 2035 Peak Travel Time and Duration Congestion

	Existing	2035 No Action ¹	2035 Recommended Alternative ¹
a.m. Southbound Peak Travel Time	23 min	43 min	23 min
a.m. Southbound Congestion Duration	3 hr 42 min	4 hr	3 hr 5 min
p.m. Northbound Peak Travel Time	20 min	24 min	14 min
p.m. Northbound Congestion Duration	4 hrs 30 min	4 hr 32 min	3 hr 40 min

¹Alternative includes new managed lanes in each direction between US 36 and 120th Avenue.

As shown, the model results indicated that northbound p.m. peak travel time is less than southbound a.m. peak travel time, while northbound p.m. congestion duration exceeds southbound a.m. duration. This comparison also can be observed from existing traffic data provided in **Section 1.0**. Though peak travel

time is less, the afternoon duration is greater because afternoon/evening traffic flows remain steadily high over a sustained period of time, making recovery from congestion difficult.

3.3.1.2 2015 Analysis

The project team used the 2015 DynusT Model analysis to evaluate each roadway component from the Recommended Alternative. All roadway components within the Recommended Alternative that showed improvement to the peak travel time or congestion duration savings were identified and ordered to develop roadway phasing scenarios. Due to the large expense and the uncertain availability of funding for the 88th Avenue bridge replacement, two phasing scenarios were developed. **Table 3-3** provides the results of the roadway phasing scenarios (with and without the 88th Avenue bridge) compared to existing conditions and the No Action Alternative.

Table 3-3 2015 Peak Travel Time and Duration Congestion

	Existing	2015 No Action Alternative ¹	2015 Phasing Scenario without 88 th Avenue Bridge Replacement ¹	2015 Phasing Scenario with 88 th Avenue Bridge Replacement ¹
a.m. Southbound Peak Travel Time	23 min	21 min	17 min	14 min
a.m. Southbound Congestion Duration	3 hr 42 min	3 hr 16 min	2 hr 28 min	59 min
p.m. Northbound Peak Travel Time	20 min	21 min	16 min	15 min
p.m. Northbound Congestion Duration	4 hrs 30 min	3 hrs 27 min	3 hrs 29 min	3 hrs 27 min

¹Alternative includes new managed lanes in each direction between US 36 and 120th Avenue.

3.3.2 Vehicle-Hours Traveled

To provide a measure of operations along the entire North I-25 PEL Study Area, the project team calculated vehicle-hours traveled for the phasing scenarios. Vehicle-hours traveled represents the total amount of travel time used by all vehicles using the North I-25 PEL Study Area during the period. For this analysis, the vehicle-hours traveled was converted to a vehicle-hours of delay; vehicle-hours of delay describes the amount of delay experienced by all vehicles during the study period and represents the absolute amount of delay that can be eliminated from the system if no vehicles experience delay.

For this analysis, the DynusT Model results from the 2015 a.m. and p.m. peak periods have been used; this analysis provides the technical operational analyses for the cost-benefit described in **Subsection 3.3.3**. **Table 3-4** provides a basis for comparing the existing, No Action Alternative, and the two phasing scenarios (with and without the 88th Avenue bridge replacement).

Table 3-4 2015 Vehicle-Hours of Delay

	Existing	2015 No Action Alternative ¹	2015 Phasing Plan without 88 th Avenue Bridge Replacement ¹	2015 Phasing Plan with 88 th Avenue Bridge Replacement ¹
a.m. Southbound Vehicle-Hours of Delay	3,150 hrs	1,440 hrs	695 hrs	210 hrs
p.m. Northbound Vehicle-Hours of Delay	6,410 hrs	1,970 hrs	1,430 hrs	900 hrs

¹Alternative includes new managed lanes in each direction between US 36 and 120th Avenue.

3.3.3 Cost-Benefit

Cost-benefit analyses were completed for the 2015 model results to understand the operational improvements realized from the two phasing scenarios (with and without the replacement of the 88th Avenue bridge). By incorporating cost into the analyses, the effects of long-lasting, higher-cost components such as the replacement of the 88th Avenue bridge can be compared with the lower cost continuous acceleration/deceleration lane projects to determine how available construction funding should be used along the North I-25 PEL Study Area. The cost-benefit metric has been developed to consider the effectiveness for the first year of project use (2015) and relies on the vehicle-hours of delay described in **Subsection 3.3.2** converted into an annual vehicle-hours of savings (by multiplying daily delay by 300 days/year), along with annualized costs of the proposed phasing alternatives.

Table 3-5 illustrates detailed information about the cost and cost-effectiveness for each of the 2015 phasing scenarios (with and without the replacement of the 88th Avenue bridge). To account for the longer term benefits realized from replacement of the 88th Avenue bridge, those improvements that require the bridge replacement have been calculated with a 50-year life. This assumption recognizes that reconstruction of the bridge will allow the reconstruction of I-25 mainline to be designed and built to the standards set in the *North I-25 EIS* and will include major investment, including the construction of a pedestrian bridge at the Thornton Parkway and the lowering of I-25 to accommodate the ultimate cross section.

Other components in the phasing plan (north of Thornton Parkway) and those projects in the 88th Avenue vicinity that could be constructed in the interim but that would need to be reconstructed with the 88th Avenue bridge replacement and associated highway reconstruction have been calculated with a 20-year life. This assumption recognizes that these project types will need to be reconstructed when the full reconstruction of I-25 occurs and essentially will all be throwaway when I-25 is constructed to its ultimate cross section.

The costs included in **Table 3-5** do not include ROW costs, NEPA analysis/mitigation, or maintenance costs; the cost of the 88th Avenue bridge replacement and new pedestrian bridge has been included entirely in the southbound direction since this is phased to be the first segment completed. An inflation rate of 3 percent annually has been applied.

Table 3-5 Cost and Effectiveness of 2015 Phasing Plans

	2015 Phasing Plan without 88 th Avenue Bridge Replacement	2015 Phasing Plan with 88 th Avenue Bridge Replacement
Southbound Cost	\$ 9.2 M	\$ 40.4 M
Southbound 2015 Cost-Effectiveness	\$ 2.78 / VHT	\$ 4.97 / VHT
Northbound Cost	\$ 14.3 M	\$ 21.0 M
Northbound 2015 Cost-Effectiveness	\$5.93 / VHT	\$ 3.81 / VHT
Total Cost	\$ 23.5 M	\$ 61.4 M
Total 2015 Cost-Effectiveness	\$ 4.10 / VHT	\$ 4.43 / VHT

M = million
VHT = vehicle hours traveled

The cost-benefits identified in **Table 3-5** account for the effectiveness of each phasing plan identified in **Section 2.0**. While these results suggest that the 2015 phasing plan without the 88th Avenue bridge

replacement may provide the greater use of funds, the more comprehensive phasing plan is relatively close in Total Lifetime Cost-Effectiveness despite the much higher cost.

A separate analysis was completed to evaluate the 88th Avenue bridge replacement and all roadway laneage projects south of Thornton Parkway to determine how these components would compare. This analysis focused on implementation of the first six components from the roadway phasing plan. The results were a total 2015 cost-effectiveness of \$2.36/VHT. This high level of performance is achievable despite the high cost of the bridge replacement due to the large amount of vehicle-hours of delay the components are expected to save drivers. This analysis reiterates the previous phasing discussions that recommend moving forward to identify funding for replacement of the 88th Avenue bridge and then completion of the mainline I-25 improvements from south (US 36) to north (136th Avenue).

3.3.4 Safety

Crash modification factors (CMF) provided in the online CMF clearinghouse (www.cmfclearinghouse.org), maintained by FHWA, were used to evaluate the safety performance of roadway components. A CMF is a multiplicative factor used to compute the expected number of crashes after implementing a given component at a specific site. The CMF computation compared the number of crashes that actually occurred from 2008 through 2010 and the expected number of crashes that would have occurred if the component had been in place during that timeframe. **Table 3-6** summarizes the expected reduction in crashes associated with component groupings.

Table 3-6 Reported and Expected Three-year Crash Experience

	Reported Crashes 2008–2010	Crashes with No Action Alternative ¹ in place	# of Crashes-Phasing Scenario w/o 88 th Avenue Bridge Replacement ¹	# of Crashes-Phasing Scenario with 88 th Avenue Bridge Replacement ¹
Southbound I-25 Crashes	927	868	824	790
Northbound I-25 Crashes	737	697	667	649
Total Crashes	1,664	1,565	1,491	1,439

¹Alternative includes new managed lanes in each direction between US 36 and 120th Avenue.

As shown, 99 fewer crashes are expected to occur over a three-year period with the completion of the managed lanes extension. Completion of improvements without the 88th Avenue bridge replacement would further reduce crashes by 74, and an additional 52 fewer crashes would be expected with implementation of the phasing scenario with the 88th Avenue bridge replacement.

3.4 Transit Component Analysis

The transportation analysis evaluated the ability of transit components to address overcapacity conditions at the Wagon Road park-n-Ride and improve transit travel time along I-25. The results were used to identify priority transit actions that will deliver immediate benefits.

3.4.1 Park-and-Rides

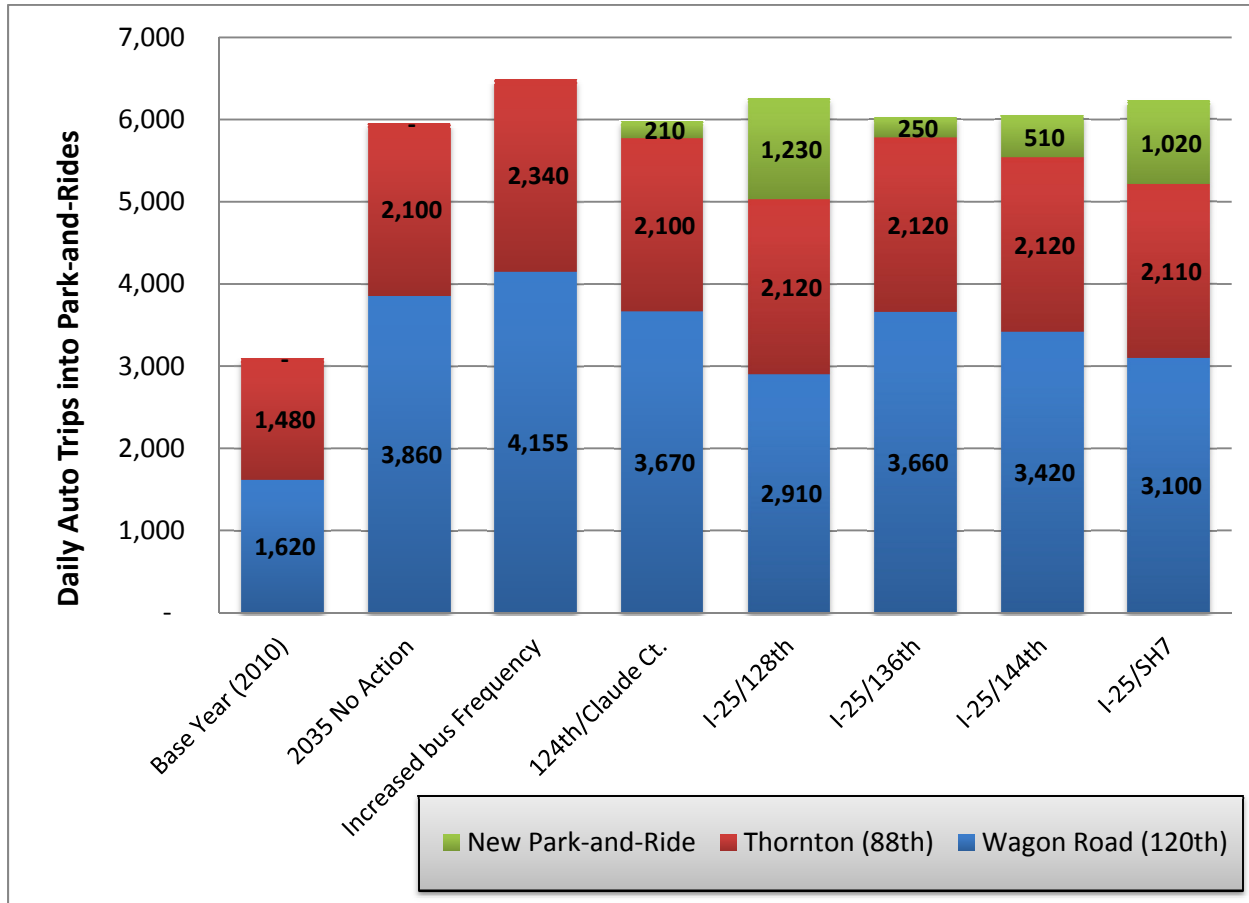
The analysis of park-and-rides focused on the potential of the component to address the overcapacity conditions at the Wagon Road park-n-Ride at 120th Avenue and I-25. The range of park-and-ride

components included expanding the Wagon Road facility and constructing new additional park-and-ride facilities. New potential park-and-rides were generally located in the North I-25 PEL Study Area at the interchanges in the study area north of 120th Avenue. The analysis used a combination of quantitative and qualitative factors. The DRCOG TransCAD Travel Demand Model provided an estimate of North I-25 PEL Study Area-level parking demand but cannot provide detailed forecasts at site-specific locations.

- ▶ **Physical expansion of Wagon Road park-n-Ride** – The Wagon Road park-n-Ride could be expanded by either adding surface parking or building a parking garage structure. The existing parking lot is confined by Huron Street, 120th Avenue, and developed residential and commercial properties. Since the initiation of this PEL Study, RTD has programmed the expansion of its North Metro Rail Line to 124th Avenue by 2018. The close proximity of the Wagon Road park-n-Ride to the 124th Avenue end-of-line North Metro Station will substantially relieve parking demand at the Wagon Road park-n-Ride. For this reason, the expansion of Wagon Road was eliminated.
- ▶ **The feasibility of constructing a parking structure** on the Wagon Road park-n-Ride property was also evaluated. The parking structure would be large, as the current surface facility has more than 1,500 parking spaces, and the footprint of the garage and its access and entry roadways would require a sizable portion of the existing property. Since the initiation of this PEL Study, RTD has programmed the expansion of its North Metro Rail Line to 124th Avenue by 2018. The close proximity of the Wagon Road park-n-Ride to the 124th Avenue end-of-line North Metro Station will substantially relieve parking demand at the Wagon Road park-n-Ride. For this reason, the expansion of Wagon Road was eliminated.
- ▶ **New Park-and-Rides** – RTD has identified in long range plans a new park-and-ride north of 120th Avenue, but a specific park-and-ride is not programmed. Potential new locations include the I-25 interchanges of 136th Avenue, 144th Avenue, and SH 7. The planned park-and-ride for the North Metro Commuter Rail Line at 124th Avenue and Claude Court was identified as a potential location to address the overcapacity conditions at Wagon Road. Median stations could be added at locations between major interchanges (such as 128th Avenue) in the long-term future (beyond the current planning horizon of 2035) when the I-25 cross section is eventually rebuilt.

The project team used the DRCOG TransCAD Travel Demand Model to analyze several potential park-and-ride locations. The analysis was conducted for the year 2035, when the anticipated development of the northern part of the North I-25 PEL Study Area has largely occurred. The travel demand model indicated that the park-and-rides further north generally would attract the most demand and would be the most effective at relieving Wagon Road. **Figure 3-1** depicts the number of daily auto trips into each park-and-ride location. Each new park-and-ride location shows the potential to reduce demand at Wagon Road.

Figure 3-1 Base Year and 2035 DRCOG Model Daily Park-and-Ride Demand

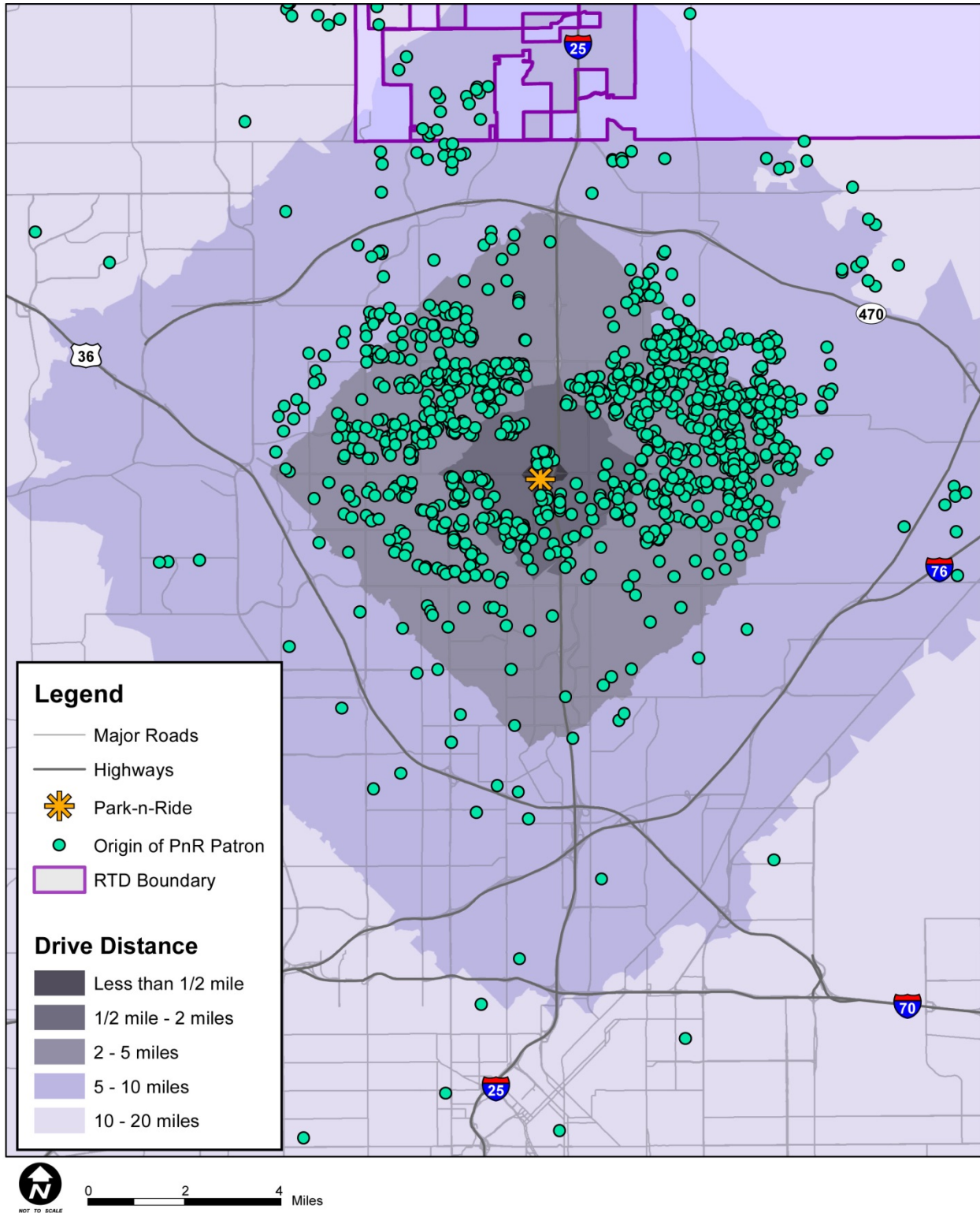


It was recognized that these locations have merit as new park-and-rides, and the North I-25 PEL Study Area may need several additional park-and-rides in the future. With the study goal to address the capacity conditions at Wagon Road in the near term, current day considerations were used to prioritize park-and-ride projects.

From observed data of park-and-ride users at Wagon Road depicted on **Figure 3-2**, it appears that most cars come from within a 3- to 5-mile radius, a minority from about 5 to 7 miles, and a small number from as far as 10 miles. The proposed park-and-ride at 124th Avenue and Claude Court is the most proximate to Wagon Road among the potential locations. Furthermore, it is located in a current residential development area. The other locations of 136th Avenue, 144th Avenue, and SH 7 do not have a similar development density in the current day. For this reason, 124th Avenue and Claude Court is identified as the top priority for a new park-and-ride facility to relieve Wagon Road.

Since the initiation of this PEL Study, RTD has programmed the expansion of its North Metro Rail Line to 124th Avenue by 2018. The close proximity of the Wagon Road park-n-Ride to the 124th Avenue end-of-line North Metro Station will substantially relieve parking demand at the Wagon Road park-n-Ride. However, modeling data also indicate a sizeable demand for parking north to SH 7 that should be studied again after the North Metro rail line opens.

Figure 3-2 Wagon Road Park-n-Ride User Origin Survey



3.4.2 Bus Travel Time

RTD buses currently use general purpose lanes along I-25 to travel through the study area. With completion of the managed lanes extension, buses will exclusively use the managed lane. However, three locations would remain where buses would be required to enter I-25 general purpose lanes: entering and exiting the Thornton park-n-Ride in both directions, entering and exiting 104th Avenue in both directions, and exiting the Wagon Road park-n-Ride to reach southbound I-25.

The project team developed components to eliminate the need for buses to enter general purpose lanes at two of these locations, thereby reducing bus travel time along the North I-25 PEL Study Area; the 88th Avenue median station and conversion of the one-way bus tunnel from northbound I-25 to the Wagon Road park-n-Ride to two-way operations, allowing southbound buses to directly enter I-25 from the park-and-ride rather than navigating through several surface street intersections and an on-ramp.

3.4.2.1 88th Avenue Inline Median Station

The project team used the VISSIM Traffic Simulation Model to calculate average peak hour bus travel time between 70th Avenue and 120th Avenue with and without the 88th Avenue median station. It was found that northbound buses would save up to 1 minute in the p.m. peak hour and southbound buses up to 2.5 minutes in the a.m. peak hour with the median station.

3.4.2.2 Two-way Bus Tunnel at 120th Avenue

Buses leaving the Wagon Road park-n-Ride currently navigate through multiple surface street intersections to reach southbound I-25. Modifying the bus tunnel to facilitate direct southbound I-25 access would reduce this travel distance, reducing bus travel time.

3.5 Complementary Projects and Strategies Component Analysis

3.5.1 Additional Crossings of I-25

Adding multimodal crossings of I-25 could relieve through traffic from the ramp terminal intersections at nearby interchange and improve operations.

Several potential crossings were evaluated using the DRCOG TransCAD Travel Demand Model. These were identified based on the following criteria:

- ▶ Potential connectivity to the surrounding roadway network
- ▶ Available land
- ▶ Near-term travel demand

Analysis showed that while additional crossings have some potential to provide arterial congestion relief at adjacent interchanges, additional crossings would not provide measureable congestion relief to mainline I-25. In addition, the Technical Advisory Committee felt that additional study was merited to identify specific locations and more fully understand the implications to adjacent land uses. Because the crossings were not shown to provide measureable congestion relief to I-25, they would not meet this project's Purpose and Need and were, therefore, not included as part of the Recommended Alternative.

3.5.2 Travel Demand Management

The project team identified and considered a wide range of TDM measures for potential inclusion as part of future project implementation on the North I-25 PEL Study Area. Smart Commute Metro North, this region’s transportation management organization, provides TDM services for this corridor in partnership with DRCOG. Smart Commute Metro North actively promotes DRCOG’s regional programs, including Guaranteed Ride Home, ride matching services and employer resources, as well as RTD transit programs to reduce congestion along I-25. DRCOG currently has some TDM strategies in place as regional programs. These include Guaranteed Ride Home, telework employer resources, and carpool, vanpool, and school pool matching programs. These current regional programs were not advanced as corridor-specific strategies for this I-25 PEL. The remaining TDM strategies were found to have merit for consideration upon individual project implementation.

For purposes of prioritization, the TDM strategies were categorized into near term and long term. Employer-based strategies were categorized as long term. These types of strategies will be most effective for the North I-25 PEL Study Area when future development in the corridor includes larger employers. Strategies that are not employer-based are categorized as near term. **Table 3-7** provides a list of TDM strategies and categorization.

Table 3-7 TDM Strategy Categorization

TDM Strategy	Category
Commuter cash program	Near Term
Flexible work schedule resources	Near Term
Pool program subsidies	Near Term
Carpool lots	Near Term
Peak hour bus-only lanes/transit priority	Near Term
Bike Map	Near Term
Marketing, including websites, hotlines, advertising, social networking, etc.	Near Term
Corridor Transit Guide	Near Term
Secure bike facilities	Near Term
Transit subsidies	Near Term
Telework recognition awards	Long Term
First or Final Mile Programs – pool bikes, employer fleet vehicles, shuttles	Long Term
Bike share program	Long Term
Employer outreach	Long Term
Master EcoPass contract	Long Term

3.5.3 Transportation Systems Management

The project team analyzed Transportation Systems Management components quantitatively for feasibility. **Table 3-8** summarizes and explains the feasibility findings.

Table 3-8 Transportation Systems Management Analysis

Component	Analysis Findings	Recommendation
Designate inside lane of I-25 for trucks only	Incompatible with new managed lanes, which will not be restricted to trucks only	Eliminate
\$2 toll all day	Would not provide the dynamic capability to maintain reliable and consistent travel times in the managed lanes during the peak periods	Eliminate
Implement education campaign to instruct drivers on appropriate use of buffer-separated managed lane	Valuable tool for maximizing capacity and safety associated with buffer-separated managed lane	Recommended now
Limit large trucks and buses to the rightmost three lanes of I-25	Would not allow buses to access the inside managed lanes on I-25 due to open in 2015. Analysis of existing and future traffic indicates that recurring congestion caused by trucks in the left lane is negligible.	Eliminate
Incident Management Plan (IMP)	A tool widely used in the Denver metro area and deemed applicable to the North I-25 study area; no current IMPs for I-25 in the area	Recommended now

3.5.4 Intelligent Transportation Systems

ITS components included additional ramp metering locations, traveler information elements, monitoring/data collection equipment, and Active Traffic Management (ATM) implementation. From the initial list of ITS strategies, it was recognized that some are already programmed as a part of the managed lanes extension from US 36 to 120th Avenue scheduled to be complete by fall of the Year 2015. These included upgrades to travel time indicators, variable message signs and closed-caption television cameras, along with new travel time indicators within the managed lanes extension area. ATMs will be in place for southbound I-25 with the managed lanes extension project.

Beyond those already programmed, ITS components demonstrate the potential to deliver benefits to I-25 travel within the North I-25 PEL Study Area. A summary of ITS component analyses and recommendations is provided as follows:

- ▶ **Active Traffic Management (ATM)** – The programmed installation of ATM along southbound I-25 between 120th Avenue and US 36 will provide a template for further implementation throughout the remainder of the North I-25 PEL Study Area in both directions. Because ATM is a relatively new ITS technology, limited information about the potential benefits is available. However, early findings from global applications note safety and traffic flow benefits. Presuming that ATM provides clear

benefits when installed south from 120th Avenue, it should be implemented more broadly in the near term.

- ▶ **Ramp Metering** – Using the Dynamic Traffic Assignment Model, the project team found that additional ramp metering locations could deliver measurable travel time savings to I-25 travelers. Potential new ramp meters were also evaluated as a part of CDOT’s recent *Ramp Metering Feasibility Study* (RMFS) – *Denver Metro Area* (June 2012). The RMFS identified a current need for new ramp meter installations at several ramps along I-25 within the study area. Based on information gleaned from the DynusT model and the RMFS, six locations were prioritized for immediate implementation, and an additional three locations for long-term consideration. **Table 3-9** summarizes the ramp meter recommendations.

Table 3-9 Ramp Metering Status

Southbound		Northbound	
On-ramp	Status	On-ramp	Status
State Highway 7	Recommended by 2035	84 th Avenue	Exists
144th Avenue	Recommended now	Thornton Parkway	Recommended now
136th Avenue	Recommended now	104th Avenue	Recommended now
120th Avenue	Recommended now	120th Avenue	Recommended now
104 th Avenue	Exists	136 th Avenue	Recommended by 2035
Thornton Parkway	Exists	144 th Avenue	Recommended by 2035
84 th Avenue	Exists	State Highway 7	Not yet recommended

3.5.5 Upgrade Ramp Merge and Diverge Sections to Meet Current Design Standards

The project team conducted a corridor-wide audit of ramp merge and diverge areas to determine whether any locations needed updating. The audit showed that the northbound 84th Avenue on-ramp currently possesses a substandard superelevation. It is recommended that this deficiency be corrected at the time of reconstruction of I-25 adjacent to the ramp.

3.5.6 70th Avenue / Washington Street Intersection

The 70th Avenue/Washington Street intersection receives significant traffic seeking to bypass I-25 congestion. In particular, the eastbound to northbound left-turn movement through the intersection receives an influx of afternoon traffic. The project team used the Synchro traffic analysis tool to evaluate potential capacity improvements to the intersection to better accommodate these peak afternoon flows. The project team found that the intersection currently operates at an overall LOS of D during the p.m. peak hour. Future growth will likely worsen intersection operations. Extending the eastbound dual left-turn lanes at the intersections to provide approximately 500 feet of storage length was evaluated as a means of enhancing intersection operations. Analyses using traffic simulation software indicated that this lengthening would reduce intersection delay by approximately 10 seconds per vehicle during the afternoon peak hour.

4.0 ENVIRONMENTAL CONSEQUENCES

Section 4.0 summarizes the potential environmental effects for the Recommended Alternative. The resources that were analyzed were selected based on the characteristics of the project area and on stakeholder input. The environmental consequences identified in this section should be regarded as preliminary to be further assessed during NEPA analysis.

A separate *North I-25 Corridor Conditions Report (Appendix B)* includes additional detail for the North I-25 PEL Study Area in regard to environmental resources. The resources analyzed were considered “red flag” environmental resources with separate regulatory drivers, such as the Endangered Species Act or Clean Water Act, or are typically resources of concern for the general public, such as traffic noise. The *North I-25 Corridor Conditions Report* presents the results of the analysis for each resource, the methodology, and the existing conditions in the North I-25 PEL Study Area.

The following sections present the following for each evaluated environmental resource:

- ▶ **Environmental Consequences** – Discusses the impacts on the resource that would be expected under the Recommended Alternative.
- ▶ **Next Steps/Mitigation Strategies** – Describes the next steps that are necessary for assessment of this environmental resource for NEPA and recommended mitigation strategies that have been identified to address adverse impacts that would be expected with the Recommended Alternative.

4.1 Air Quality

The North I-25 PEL Study Area is within the Denver metropolitan area, which has been designated a nonattainment area for the 8-hour ozone (O₃) National Ambient Air Quality Standard (NAAQS) and a maintenance area for the carbon monoxide and particulate matter NAAQSs. Due to these past and present air quality issues, major infrastructure projects must be analyzed for certain air quality conformity requirements under the Clean Air Act before they can proceed.

- ▶ **Regional Conformity** – Regional conformity requirements are covered through regional planning activities. The *Metro Vision RTP and the 2012–2017 Transportation Improvement Program (TIP)* are the currently adopted fiscally-constrained and air quality conforming plan and program for DRCOG, which covers the Study Area. Regionally significant projects need to be included in the current RTP and TIP before a NEPA decision document can be signed.
- ▶ **Local Conformity** – Local conformity is demonstrated through assessing whether future traffic conditions may cause an exceedence of a NAAQS within a smaller localized area. The proposed project must not lead to violations of a NAAQS. Carbon monoxide and particulate matter are the pollutants that may be analyzed for local conformity during the NEPA process.

4.1.1 Environmental Consequences

The primary air quality issues of concern for this project are pollutants associated with the operation of vehicles on roadways. These issues include direct emissions of pollutants from vehicles, including road dust, and secondary pollutants formed from the direct emissions, such as O₃. Air quality issues related to road construction are also a potential short-term concern.

Potential effects on air quality result primarily from congested traffic during peak periods and other traffic-related activities. Vehicles idling at intersections are a major source of local air pollution. Actions that alleviate congestion and vehicle idling will improve regional and local air quality.

Because the Recommended Alternative is expected to improve traffic operations on I-25, overall vehicle pollutant emissions in the North I-25 PEL Study Area are expected to decrease, which improves air quality.

4.1.2 Mitigation Strategies and Next Steps

Planned transportation projects must meet certain air quality requirements before they can proceed. Regional analysis is accomplished through the RTP and TIP approval processes. An air quality impact assessment will need to be prepared during the NEPA process, which may include a hot spot analysis for carbon monoxide at intersections with a LOS of D, E, or F.

Neighboring areas could be exposed to construction-related emissions. Particular attention should be given to minimizing total emissions near sensitive areas such as homes. To address the temporary elevated air emissions that may be experienced during construction, standard construction mitigation measures should be incorporated into construction contracts. These include following BMPs and relevant CDOT construction specifications, such as:

- ▶ Keep engines and exhaust systems on construction equipment in good working order. Construction equipment shall be maintained on a regular basis, and equipment subject to inspection by the project manager to ensure maintenance.
- ▶ Control fugitive dust systematically through implementation of CDOT's Standard Specifications for Road and Bridge Construction, particularly Sections 107.24, 209, and 250, and Air Pollution Control Division's Air Pollutant Emission Notification requirements.
- ▶ Allow no excessive idling of inactive equipment or vehicles.
- ▶ Use construction equipment and vehicles that use low-sulfur fuel to reduce pollutant emissions.
- ▶ Locate stationary equipment as far from sensitive receivers as possible (when conditions allow).
- ▶ Implement more strict dust control measures near schools during school hours.
- ▶ Retrofit older construction vehicles to reduce emissions.

4.2 Environmental Justice

Environmental justice is a public policy goal of promoting the fair treatment and meaningful involvement of all people in decision-making for transportation programs and projects. Satisfying this goal means ensuring that minority and low-income communities receive an equitable distribution of the benefits of transportation activities without suffering disproportionately high and adverse effects. Within the Study Area, environmental justice populations are generally located south of 120th Avenue; however, small areas of environmental justice populations were found southwest and southeast of the E-470 and I-25 interchange as shown in **Figure 6.2-1** in the *Corridor Conditions Report* in **Appendix B**.

Within the Study Area, census blocks with a higher percentage of minorities than the respective county blocks are not generally located directly adjacent to I-25 (see **Figure 6.2-1** in the *Corridor Conditions Report* in **Appendix B**).

However, five areas of minority populations directly adjacent to I-25 were identified and include:

- ▶ Southwest quadrant of the E-470 and I-25 interchange
- ▶ West of I-25 between 120th Avenue and 112th Avenue
- ▶ East of I-25 between 112th Avenue and 104th Avenue (with one small area on the west side of I-25)
- ▶ East of I-25 between Thornton Parkway and 88th Avenue
- ▶ Between 84th Avenue and the I-25 and US 36 interchange

Census block groups with an average household income below that of the respective county are located adjacent to I-25 along much of the North I-25 PEL Study Area between 120th Avenue to south of the US 36 interchange (see **Figure 6.2-1** in the *Corridor Conditions Report* in **Appendix B**). Low-income block groups are also located south and west of the I-25 and E 470 interchange. For more detailed information about the environmental justice populations in the Study Area, see **Subsection 6.2** of the **Appendix B Corridor Conditions Report**.

4.2.1 Environmental Consequences

To assess the impacts of the Recommended Alternative on environmental justice populations, an analysis of the potential for disproportionately high and adverse effects on minority or low-income populations will be conducted during the NEPA process. The determination of the potential for disproportionately high and adverse effects on minority or low-income populations begins with comparing the impacts on environmental justice populations to those on the general population in the Study Area. A disproportionately high and adverse effect would be:

- ▶ Predominantly borne by minority and/or low-income populations; or
- ▶ Suffered by minority and/or low-income populations and is appreciably more severe or greater in magnitude than the adverse effect suffered by the non-minority population and/or non-low-income population.

Throughout the Study Area, conceptual designs indicate that the areas of physical disturbance associated with the Recommended Alternative would be predominantly located within CDOT ROW; however, approximately 14 acres of additional ROW may be necessary. North of Thornton Parkway, potential impacts on environmental justice populations could occur between 120th Avenue and Thornton Parkway due to the acquisition of property for ROW for the proposed continuous acceleration/deceleration lanes component of the Recommended Alternative. South of Thornton Parkway, potential impacts on environmental justice populations could occur along the entire I-25 corridor between Thornton Parkway and US 36 due to the acquisition of property for ROW for the proposed continuous acceleration/deceleration lanes and the proposed general purpose lanes components of the Recommended Alternative.

Potential indirect impacts on environmental justice populations adjacent to the highway include both adverse and beneficial impacts associated with changes in traffic. Projected traffic increases between now and 2035 could result in traffic-related impacts (noise, visual, air emissions). These types of indirect impacts would be similar in nature to existing conditions and would be limited to the homes immediately surrounding or adjacent to I-25. As a result of the Recommended Alternative, nearby populations would benefit from reduced congestion, improved mobility, and improved multimodal transportation. For these reasons, the Recommended Alternative would not be anticipated to result in deterioration of neighborhoods in the Study Area.

Overall, potential disproportionately high and adverse impacts as a result of the Recommended Alternative could occur to environmental justice populations south of 120th Avenue due to the acquisition of property for ROW for the proposed continuous acceleration/deceleration lanes and general purpose lanes components of the Recommended Alternative. The potential for these impacts will depend on the implementation and construction phasing of these components of the Recommended Alternative.

Minority/low-income populations are not located adjacent to potential park-and-ride locations at the interchanges of SH 7 and I-25, 144th Avenue and I-25, 136th Avenue and I-25, and 124th Avenue and Claude Court. However, potential park-and-rides at 144th Avenue and I-25, 136th Avenue and I-25, and 124th Avenue and Claude Court could positively benefit nearby environmental justice populations located within the northern section of the Study Area by facilitating multimodal transportation.

4.2.2 Mitigation Strategies and Next Steps

As part of future design decisions and NEPA studies, potentially affected census blocks or census block groups with identified environmental justice populations would be evaluated for disproportionately high and adverse effects and selected for outreach. Potential mitigation strategies could include specialized outreach to environmental justice populations and measures to reduce construction-related impacts and/or permanent impacts on environmental justice populations. Any ROW acquisition would comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. The purpose of this act is to provide fair and equitable treatment for all persons displaced from their homes, businesses, or farms. Owners of acquired property would be compensated at fair market value for their property.

4.3 Floodplains and Floodways

The North I-25 PEL Study Area has 12 identified floodplains and floodways, as summarized in **Table 4-1**. The Federal Emergency Management Administration (FEMA) regulates floodways and floodplains through the consideration of changes in the floodway and floodplain limits. Of primary concern regarding these resources is the ability to convey stormwater flows and potential encroachment on property and structures.

Table 4-1 Drainageway Floodplain Summary

I-25 Mile Marker	Name	FEMA Zone	Existing Structure Comments
228.546	S. Fork Preble Creek	A	Not Adequate
227.733	Sack Creek S.	A	Not Adequate
227.335	Mustang Run	A	Not Adequate
226.729	Shay Ditch	A	Not Adequate
225.646	McKay Lake Drainageway	A	Not Adequate
224.675	Big Dry Creek	AE / Floodway	Adequate
224.470	Tanglewood Creek	AE / Floodway	Not Adequate
221.434	Un-named Trib. to Grange Hall Creek	X	Not Adequate
221.228	Grange Hall Creek	AE / Floodway	Not Adequate
220.762	Grange Hall Creek, S. Fork	AE / Floodway	Not Adequate
218.943	Niver Creek	A	Not Adequate
218.731	Niver Creek Tributary "L"	A	Not Adequate

4.3.1 Environmental Consequences

The Recommended Alternative would result in an impact on four floodplains in the Study Area (two of which include floodways), as illustrated in **Figure 4-1**:

- ▶ Niver Creek
- ▶ South Fork of Grange Hall Creek, which has a floodway
- ▶ Big Dry Creek, which has a floodway
- ▶ McKay Lake Drainageway

All of these impacts would result from widening parts of I-25, which, in turn, could require widening the existing drainage structures or placing fill in the floodplain. Affecting the floodplains in this way could cause increases and decreases in the water surface elevations near I-25 and affect any properties that are currently located in or near the floodplains.

Existing drainage structures that are currently inadequate to pass the 100-year flow would be analyzed in detail to determine if the current structure is overtopped and if that situation can be corrected. Replacing the existing structure with an adequately sized structure often decreases the water surface elevations upstream of the structure, but can increase water surface elevations downstream of the structure. This can also be a potentially negative impact on downstream property owners if water surface elevations are increased on their property or they are impacted by a wider floodplain limits. Adequacy can also be addressed by adding additional culverts to the existing structure to increase capacity. This may not have a large effect on the water surface elevations, but can have an impact on the width of the floodplain both up and downstream of the structures. This could negatively impact adjacent properties.

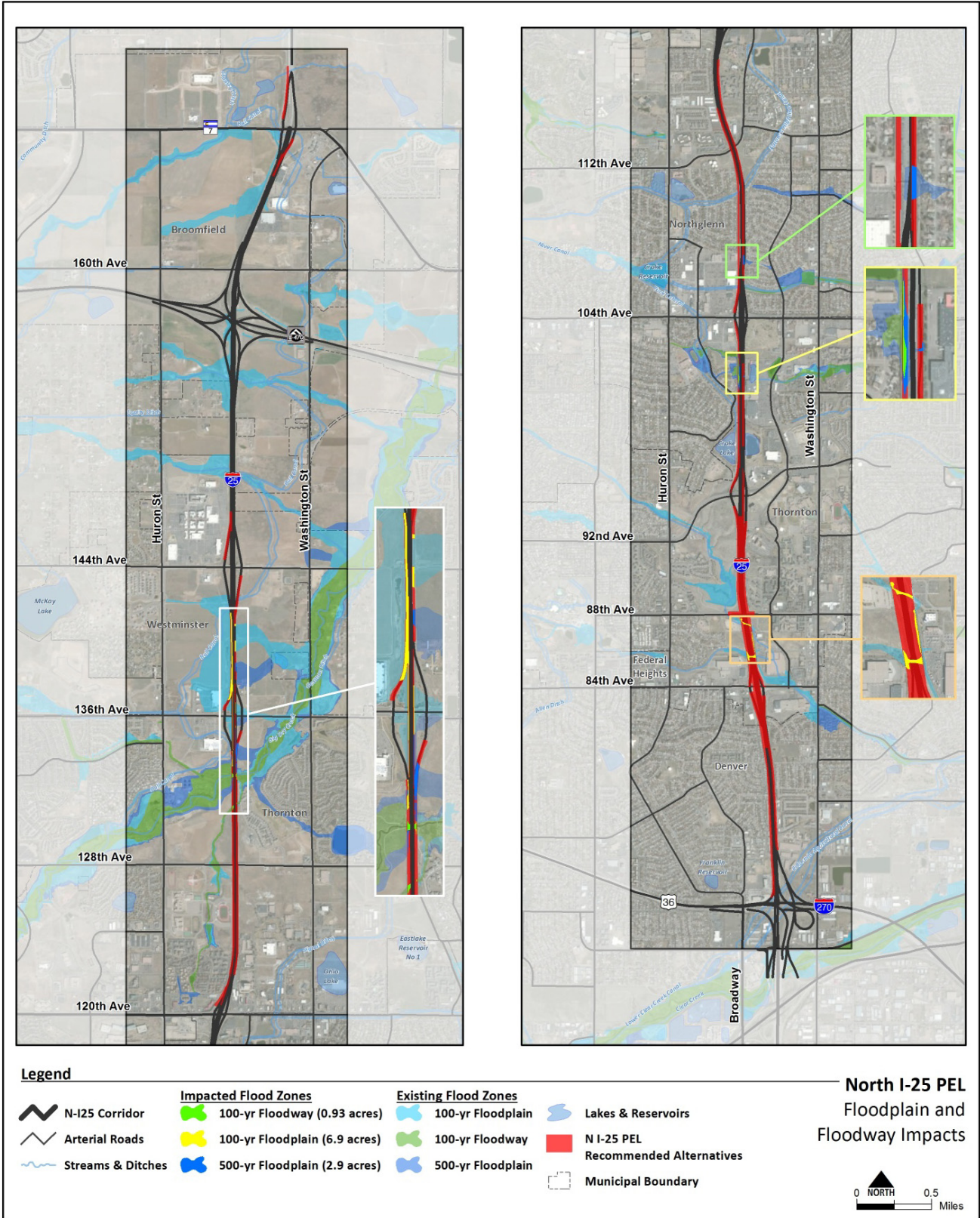
A floodplain is present in the southwest quadrant of the potential park-and-ride location at the SH 7/I-25 and 144th/I-25 interchanges. Current information shows floodplains present in all four quadrants of the 136th/I-25 interchange. Any areas that could be developed for a park-and-ride would have to acknowledge and adjust designs to accommodate the floodplains present.

4.3.2 Mitigation Strategies and Next Steps

A common way to mitigate the placement of fill in the floodplain or floodway is to create another area of cut in the floodway to balance the fill within the floodplain. This is an involved process to ensure that the new cut area will function as desired and produce the proper decrease in water surface elevations. Mitigating for a wider floodplain from additional culverts or a new structure can be more difficult. Channel improvements can be made to try to redefine the floodplain limits in the desired areas, but this can be difficult and can often require impacting a substantial part of the established channel.

A detailed existing conditions and proposed conditions analysis should be performed for each affected floodplain during design. The comparison of these analyses would then dictate the full impact from the improvements and the type of action that may be needed to mitigate. This type of analysis commonly uses a Hydrologic Engineering Centers River Analysis System floodplain model. All work in the floodplains would require a floodplain development permit and, depending on the extent of the impact, a Conditional Letter of Map Revision (CLOMR)/Letter of Map Revision (LOMR) process could also be required. The impacts on the floodways of the South Fork of Grange Hall Creek and Big Dry Creek will probably require the CLOMR/LOMR process.

Figure 4-1 Floodplain and Floodway Impacts



4.4 Hazardous Materials

This report distinguishes hazardous material sites within the Study Area (within 500 feet of I-25 mainline) as sites having either recognized or potential environmental conditions. Sites with known (current and historic) soil or groundwater contamination are sites with recognized environmental conditions, as defined by ASTM. Sites with recognized environmental conditions are sites where “the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property” (ASTM, 2005). Sites with the potential for soil and/or groundwater contamination that could not be confirmed without additional inspection or investigation are distinguished as sites with potential environmental conditions.

4.4.1 Environmental Consequences

Table 4-2 identifies a total of 8 sites with recognized or potential environmental conditions within 500 feet of the I-25 mainline. **Figure 4-2** presents the locations of the sites with recognized or potential environmental conditions and their relation to the North I-25 PEL Study Area.

No known hazardous materials sites are located adjacent to potential park-and-ride locations at the interchanges of SH 7/I-25, 144th Avenue/I-25, 136th Avenue/I-25, and 124th Avenue/Claude Court.

Table 4-2 Hazardous Materials – Sites with Recognized and Potential Environmental Conditions

Site Address/Name	Distance from I-25 Centerline	Site Type	Site Description
12299 Grant St., Thornton/BMC Millwork	Within 500 feet	Recognized Environmental Condition (REC)	Closed Leaking Underground Storage Tank (LUST) site. Residual soil and/or groundwater contamination could be present.
16375 N. Washington St., Thornton/Costco	Within 500 feet	Potential Environmental Condition (PEC)	Underground Storage Tank and Resource Conservation and Recovery Act (RCRA) Small Quantity Generator (no reported violations) site.
12121 Grant St., Thornton/Morgan Reed (former Data Processing Center)	Within 500 feet	REC	Closed LUST, RCRA Small Quantity Generator (no reported violations), aboveground storage tank site. Three underground storage tanks containing diesel fuel are currently in use (two 15,000-gallon and one 1,000-gallon). Residual soil and/or groundwater contamination could be present.
45 E. 120 th Ave., Thornton/Starbucks (former Larry’s Texaco Gas Station)	Within 500 feet	REC	Closed LUST. Residual soil and/or groundwater contamination could be present.
11450 Cherokee St., Northglenn/Kwal Paint	Within 500 feet	PEC	RCRA Small Quantity Generator (No Reported Violations). Unknown paint/chemical storage, handling, and disposal practices.
333 E. 76 th Ave., Denver/Performance Mobility Inc.	Within 500 feet	PEC	Automotive service with unknown chemical and material handling, storage, and disposal practices.

Site Address/Name	Distance from I-25 Centerline	Site Type	Site Description
7320 N. Broadway, Denver/Auto Nation Chevrolet North	Within 500 feet	PEC	Automotive dealership and service center with unknown chemical and material handling, storage, and disposal practices. One operating used oil tank (1,000-gallon).
Del Norte St., Denver/CDOT Northern Maintenance Facility	Within 500 feet	PEC	Uncertain past chemical and material handling, storage, and disposal practices.

4.4.2 Mitigation Strategies and Next Steps

Hazardous materials are most likely to be encountered during ground-disturbing activities near sites with recognized environmental conditions. The most fundamental management for hazardous materials is the avoidance of contaminated sites, when feasible. Wherever possible, known hazardous materials issues at properties targeted for ROW acquisition should be investigated further before acquisition/construction. Knowing what hazardous materials issues exist before construction begins is critical because proper management during construction requires special materials management, handling, disposal, and worker health, and safety practices. The types of sites described in this section appear to be similar to those that CDOT often encounters.

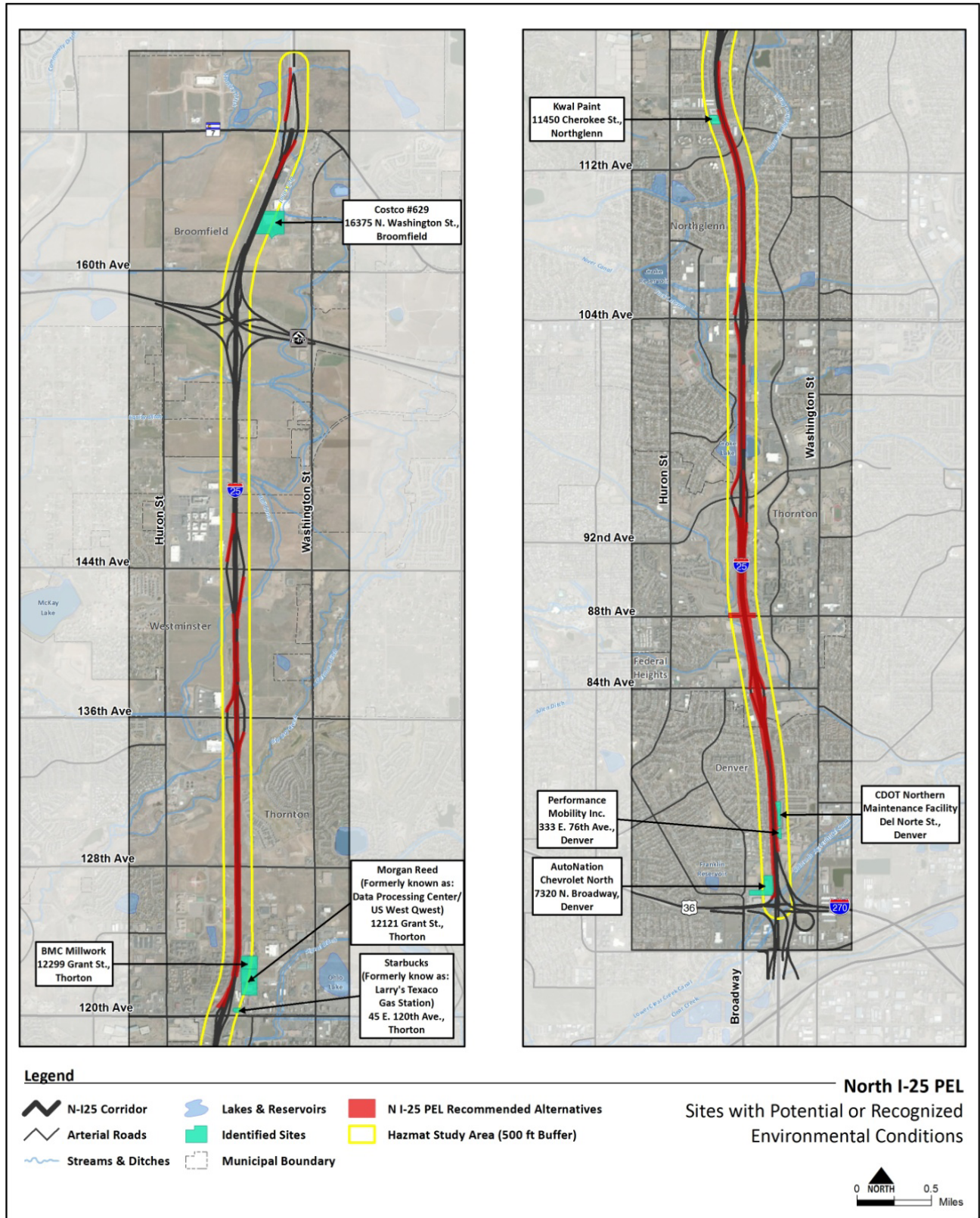
During future NEPA and design stages, hazardous material site information will be updated and evaluated for the potential to impact project activities. Appropriate avoidance and/or mitigation measures will be established at that time.

4.5 Historic Resources

The Front Range was settled after the discovery of gold in 1858 at the mouth of Little Dry Creek on the South Platte River. The discovery of gold in conjunction with a long period of wet weather during the late nineteenth and early twentieth century led to a revolution in agricultural development for the region. Many advances in irrigation technology were made in the late nineteenth century, which led to the development of a regional ditch system that supplied water to areas east of the Front Range. Crops such as wheat, oats, corn, beans, and alfalfa were grown to supply the new settlements that sprung up across the region.

By the mid-twentieth century, communities like Thornton, Northglenn, Broomfield, and Westminster were being developed as the post World War II economy brought additional job opportunities to the Front Range. Facilities like the Federal Center and Rocky Flats Plant attracted workers from outside the region, spurring the need for housing and converting agricultural land to residential neighborhoods. As a result, many historic farms were sold or subdivided to make way for the new roadways and bridges that were needed to facilitate movement between these new communities. I-25 was constructed during the 1960s and connected with the Valley Highway in Denver, which was completed in 1958.

Figure 4-2 Hazardous Materials – Sites with Potential or Recognized Environmental Conditions



4.5.1 Environmental Consequences

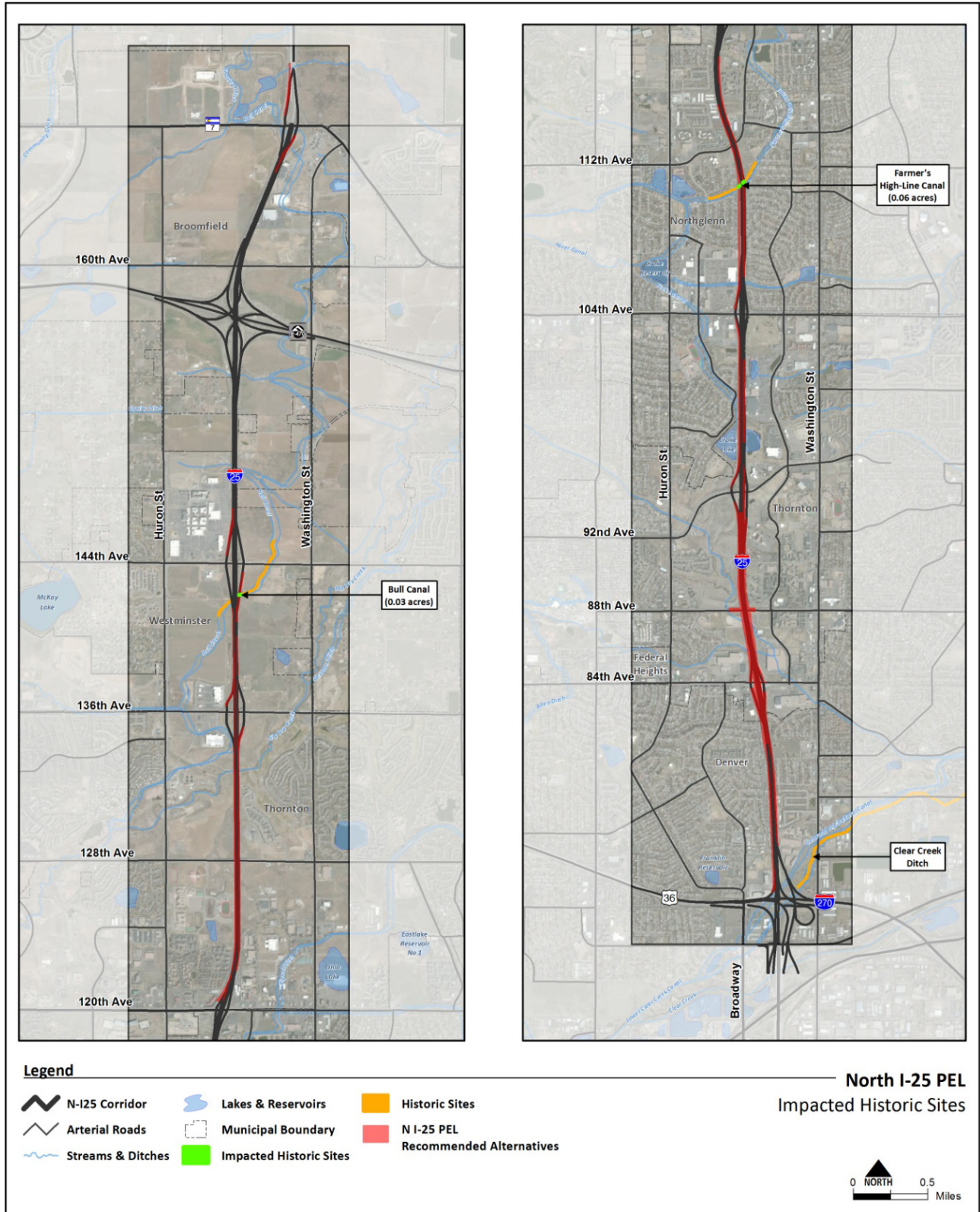
The Recommended Alternative would affect two previously recorded linear historic resources, which are directly adjacent to I-25 (see **Figure 4-3**). These linear ditch segments are part of the National Register of Historic Places (NRHP)-eligible historic resources:

- ▶ **5AM457.9 – Bull Canal (Segment Supports overall NRHP Eligibility)** – This segment of the Bull Canal was assessed as Eligible for the NRHP in 2007, partially due to its association with the historic Standley Lake Irrigation System. This segment has also maintained its historic alignment. Where the canal segment crosses beneath I-25 at the Exit 226 northbound off-ramp, the Recommended Alternative could affect a small length of ditch by widening the off-ramp. Proposed roadway improvements would require extending the existing box culvert located beneath the off-ramp toward the east. These improvements would likely not affect the integrity of the canal segment because the alignment would not change.

The Bull Canal is present in the southern two quadrants of the 144th Avenue/I-25 interchange. Any development of a park-and-ride in this area must consider potential impacts on this eligible historic resource during the NEPA and/or design phase of the project. No other historic or potentially historic sites are located adjacent to potential park-and-ride locations at the interchanges of SH 7/I-25, 136th Avenue/I-25, and 124th Avenue/Claude Court.

- ▶ **5AM1291.3 – Farmer’s High-Line Canal (Segment Supports overall NRHP Eligibility)** – The Farmer’s High-Line Canal was determined to be eligible for the NRHP in 2007. This canal system has been in existence for well over 100 years. Overall, the system continues to function as a water delivery system and is maintained in excellent working condition. The segment that is within the Study Area retains integrity of design, setting, and location and thus supports the eligibility of the entire canal. The proposed roadway improvements would require extending the existing box culvert on both the east and west sides of I-25. These improvements would likely not affect the integrity of the canal segment because the alignment would not change.

Figure 4-3 Impacted Historical Sites



4.5.2 Mitigation Strategies and Next Steps

Not all historic sites within this large North I-25 PEL Study Area have been previously surveyed; therefore, it is important to identify potential historic sites during subsequent project development phases. Potential historic sites include:

- ▶ Properties that have been previously surveyed and field assessed as eligible or as needing more data, but have not been given an official determination
- ▶ Properties that have been previously surveyed many years ago and assessed as not eligible, but with the passage of time may now be potentially assessed as historic
- ▶ Local historic landmarks
- ▶ Properties over 50 years of age that have not yet been surveyed but appear to possess qualities that make them eligible for the NRHP based on visual reconnaissance

All of the properties below will need additional research to determine whether or not they are eligible for the NRHP. Potential historic resources within the North I-25 PEL Study Area include the following:

- ▶ 5AM80.1 – Clear Creek Ditch (Segment Supports overall NRHP Eligibility)
- ▶ 5AM1760.1 – Denver-Boulder Turnpike US 36 (Not Eligible – Officially)
- ▶ 5AM2073 – Northglenn First Filing (Needs Data – Officially)
- ▶ 5AM2074 – Northglenn Second Filing (Needs Data – Officially)
- ▶ Ditch between Thornton Parkway and 104th Avenue on west side of I-25
- ▶ Ditch just north of Clear Creek Ditch on east side of I-25
- ▶ Private Residence (4185 WCR 2)
- ▶ Private Residence/Historic Farm (501 E. 80th Avenue)
- ▶ Private Residence/Historic Farm (7381 Washington Street)
- ▶ Private Residence (7261 Washington Street)

If any archaeological materials (such as artifacts, potential human remains, and faunal remains) or features are encountered or unearthed during construction, work will be halted immediately in the vicinity of the find, and the CDOT archaeologist and State Historic Preservation Officer (SHPO) will be promptly notified. The site of the find will be secured. Work will remain halted until a qualified professional archaeologist can evaluate and/or remove the materials. If warranted, additional archaeological testing or data recovery may be necessary before work can be resumed in the vicinity of the find. If potential human remains are discovered, the county coroner will be summoned, if necessary, to determine the relative age and ethnicity of the individual(s) represented. Work will not resume in the vicinity of the find until CDOT grants clearance.

4.6 Land Use

The predominant land uses within the Study Area are residential (approximately 36 percent), commercial (approximately 23 percent), agricultural (approximately 23 percent) and vacant (approximately 18 percent) as shown in **Figure 6.6-1** of the *Corridor Conditions Report* in **Appendix B**. As mentioned in **Subsection 6.6.2.2** of the *Corridor Conditions Report* in **Appendix B**, land uses along the North I-25 PEL Study Area vary from developing commercial, agricultural, and vacant land in the north (SH 7 to 136th Avenue) to suburban commercial, retail and residential uses in the middle (136th Avenue to 120th Avenue), to completely built-out commercial, retail, and residential uses in the south (120th Avenue to US 36). Municipal land use plans in the Study Area have identified the North I-25 PEL Study Area as being

the biggest area of change within their jurisdictions. For more detailed information about land uses in the Study Area, see **Subsection 6.2** of the *Corridor Conditions Report* in **Appendix B**.

4.6.1 Environmental Consequences

Implementation of the Recommended Alternative would result in the permanent conversion of approximately 13 acres of residential, commercial, agricultural, and vacant land to transportation use for I-25 widening. Approximately 1 acre of park/open space land could also be impacted. These are estimates based on the current level of conceptual design and will likely change during subsequent levels of design.

Throughout the Study Area, most of the land impacted by the Recommended Alternative would be small slivers of land located adjacent to the mainline and on- and off-ramps of I-25. Between SH 7 and 128th Avenue, impacted land uses include mainly agricultural and vacant land. South of 128th Avenue, impacted land uses include commercial, residential, park/open space, and vacant land.

I-25 has existed in its current alignment since the mid-1960s. Adjacent communities and municipalities have planned current and future land uses adjacent to the interstate corridor to be compatible with this transportation use. Given the relatively small amount of land converted to a transportation use (approximately 13 acres), the Recommended Alternative would not likely result in widespread land use changes or change current land use trends in the Study Area. In addition, the Recommended Alternative supports local land use plans by reducing congestion, improving multimodal transportation, and improving regional access to existing and future commercial areas within the Study Area.

Construction of new park-and-ride facilities at the interchanges of SH 7 and I-25, 144th Avenue and I-25, 136th Avenue and I-25, and 124th Avenue and Claude Court would result in the permanent conversion of approximately 16 to 18 acres of agricultural, commercial, vacant, and parks/open space land uses to a transportation use. **Table 4-3** identifies the current and future land use designations of the suitable quadrants of land surrounding these interchanges. Future NEPA studies would evaluate park-and-ride compatibility with surrounding land uses when the park-and-ride locations and sizes are determined.

4.6.2 Mitigation Strategies and Next Steps

The Recommended Alternative is not incompatible with local land uses; any inconsistencies found with local comprehensive and land use plans can be resolved through the typical planning processes at the local government level. These processes can include public involvement and visioning, amendments to comprehensive plans, and zoning changes.

Table 4-3 Summary of Park-and-Ride Target Locations and Land Uses

Park-and-Ride Target Locations	Approximate Park-and-Ride Size	Potential Park-and-Ride Sites	Current Site Land Use	Future Site Land Use
SH 7 & I-25	400 spaces 5.0 to 5.5 acres (217,800 to 239,580 sq.ft.)	SH 7 & I-25 NE Quadrant	Agriculture	Open Space/Parks/ Employment Area
		SH 7 & I-25 NW Quadrant	Agriculture	Open Space/Parks/ Employment Area
		SH 7 & I-25 SW Quadrant	Agriculture	Open Space/Parks/ Employment Area
		SH 7 & I-25 SE Quadrant	Vacant	Employment Area
144 th Avenue & I-25	300 spaces 3.75 to 4.25 acres (163,350 to 185,130 sq.ft.)	144 th Avenue & I-25 NE Quadrant	Agriculture	Employment Area
		144 th Avenue & I-25 SE Quadrant	Agriculture	Employment Area
136 th Avenue & I-25	300 spaces 3.75 to 4.25 acres (163,350 to 185,130 sq.ft.)	136 th Avenue & I-25 NE Quadrant	Employment Area / Agriculture	Employment Area
		136 th Avenue & I-25 SE Quadrant	Vacant	Employment Area
124 th Avenue & Claude Court	275 spaces 3.5 to 4.0 acres (152,460 to 174,240 sq.ft.)	124 th Avenue & Claude Court NW Quadrant	Vacant	Employment Area
		124 th Avenue & Claude Court SE Quadrant	Open Space/Parks	Open Space/Parks

4.7 Traffic Noise

The potential for noise impacts from vehicles to the receptors (that is, properties) near transportation facilities is a concern to the public and state and federal transportation agencies. State and federal transportation agencies have established thresholds for determining noise impacts to evaluate the conditions. When impacts are identified from a project, mitigation actions for the affected receptors must be considered for the project design, although mitigation actions are not guaranteed. Many noise-sensitive properties are located along the North I-25 PEL Study Area and may be affected by I-25 noise. Many residential neighborhoods (Land Use Category B) are along I-25. Likewise, the PEL Study Area contains Category C areas (parks, schools, churches, etc.).

Traffic noise modeling was performed for the *North I-25 Final EIS*, which included the PEL Study Area. I-25 currently is (and will remain) a major noise source within the North I-25 PEL Study Area. Many receptors near I-25 were found to be impacted. Many neighborhoods already have noise walls along I-25 as a noise abatement action—several more were recommended by the *North I-25 Final EIS* for the PEL Study Area.

4.7.1 Environmental Consequences

Prospective future (2035) traffic noise conditions were evaluated from the findings of the *North I-25 Final EIS* and based on examination of predicted I-25 traffic volumes from the PEL. Generally speaking, traffic volumes must change by a factor of two for a 3-decibel change in noise levels. As a result, a substantial difference in traffic volumes is needed for there to be a meaningful difference in traffic noise between two conditions.

The peak traffic noise hour for highways occurs when the greatest numbers of vehicles can travel at the highest speeds. This happens when the highway operates near LOS C or D conditions. During peak traffic volume hours, I-25 is predicted to be congested and over the LOS C/D volumes with or without the PEL Recommended Alternative. As a result, the peak noise hours are during the shoulder periods when volumes are lower and I-25 operates better.

During these times, hourly traffic volumes for the No Action and Recommended Alternatives are estimated to be nearly identical—differing at most by approximately 6 percent. Because this difference correlates to approximately 0.3 decibels, which is a trivial difference in the noise levels, the predicted traffic noise conditions for the PEL Recommended Alternative would mirror those for the No Action Alternative and the Recommended Alternative from the *North I-25 Final EIS* and *Record of Decision*. The impacted areas under these different conditions are estimated to be the same. Noise impacts are expected for parts of the following neighborhoods for the North I-25 PEL Study Area:

- ▶ Thorncreek Village
- ▶ Huron Heights
- ▶ Huron Crossing
- ▶ Stone Mountain Apartments
- ▶ Greens of Northglenn
- ▶ Webster Lake Terrace
- ▶ Reserve at Northglenn
- ▶ Northglenn
- ▶ Knox
- ▶ Summit at Thornton
- ▶ Sherrelwood Estates
- ▶ Brittany Ridge

4.7.2 Mitigation Strategies and Next Steps

The CDOT *Noise Analysis and Abatement Guidelines* (CDOT 2013) specify that a noise analysis study is required for all Type I projects if noise sensitive receptors are present within the project area. A Type I project consists of a proposed Federal or Federal-Aid or CDOT-administered highway project for construction of a highway on a new location or the physical alteration of an existing highway that significantly changes either the horizontal or vertical alignment or increases the number of through lanes. Construction of the PEL Recommended Alternative will be a Type I project, and a traffic noise study will need to be prepared during the NEPA process.

Traffic noise abatement evaluations previously were performed for the *North I-25 Final EIS* and *Record of Decision*. Those studies recommended the following abatement actions in the PEL Study Area:

- ▶ Maintain/replace existing noise barriers in the North I-25 PEL Study Area
- ▶ Add a new barrier at Thorncreek Village
- ▶ Add a new barrier at Stone Mountain Apartments
- ▶ Add a new barrier at Greens of Northglenn
- ▶ Extend the Badding Reservoir barrier
- ▶ Extend the Brittany Ridge barrier

Construction noise will be subject to relevant local regulations and ordinances, and any construction activities would be expected to comply with them.

4.8 Parks and Recreational Resources

There are 17 trails, 4 parks, and 1 recreational facility located within the Study Area. Ten of the trails cross the North I-25 PEL Study Area via grade-separated trail crossings or along grade-separated roadways. In addition, 2 parks and 9 trails are planned as part of municipal master plans. For more information on the

parcs and recreational resources in the Study Area, see **Subsection 6.8** of the *Corridor Conditions Report* in **Appendix B**.

4.8.1 Environmental Consequences

Implementation of the Recommended Alternative would result in approximately 1 acre of disturbance to parks, recreational facilities, and open space, as well as approximately 1 mile of trails. **Table 4-4** summarizes the potential impacts of the Recommended Alternative on parks and recreational resources. **Figure 4-4** and **Figure 4-5** depict the location of the impacted parks and recreational resources to the North I-25 PEL Study Area. While the design of the Recommended Alternative is still preliminary, the potential direct impacts on parks and recreational resources could include loss of land in parks/open space adjacent to the interstate, trail realignment, and temporary trail closures and/or detours. Potential indirect impacts could include visual impacts, increased noise levels, and changes in park, open space, or trail access.

Table 4-4 Summary of Potential Impacted Parks, Open Space and Trail Impacts

Parks, Open Space and Trails	Type of Impact	Resource Type/Description	Existing or Proposed
Bull Ditch Trail	Potential trail realignment if constructed before project construction begins	Local off-street trail east of I-25 between SH 7 and 144 th Ave.	Proposed
Thornton #1	Potential trail realignment if constructed before project construction begins	Local off-street trail east of I-25 north near the proposed Bull Ditch Trail.	Proposed
Big Dry Creek Trail	Potential extension of underpass structure	Regional off-street bike trail with trail underpass of I-25	Existing
Westminster #4	Potential trail realignment if constructed before project construction begins	Local off-street bike trail west of I-25 north and south of 128 th Ave.	Proposed
Farmer's Highline Canal Trail	Potential extension of underpass structure	Regional off-street multi-use path with trail underpass of I-25	Existing
Lincoln St. (Northglenn Dr.)	Potential temporary trail realignment or detour	Regional off-street trail	Existing
Kennedy St Trail/Path over I-25	Potential reconstruction of overpass structure	Local off-street multi-use path with trail overpass of I-25	Existing
Civic Center Park (Thornton)	Approximately 0.45 percent of resource converted to transportation use	Community park and recreation facility with pond, trails, and picnic area	Existing
Tuck Lateral	Potential trail realignment if constructed prior to project construction	Off-street trail west of I-25 between 104 th Ave. and Thornton Parkway	Proposed
Niver Creek Open Space	Approximately 1 percent of resource converted to transportation use	Open space and detention area with trails	Existing
88 th Avenue Multi-use Path	Potential temporary trail realignment or detour	Local off-street, multi-use path	Existing
Coronado Parkway Trail	Potential extension of underpass structure and potential trail realignment	Local off-street trail with trail underpass of I-25	Existing

Figure 4-4 Existing and Proposed Trails

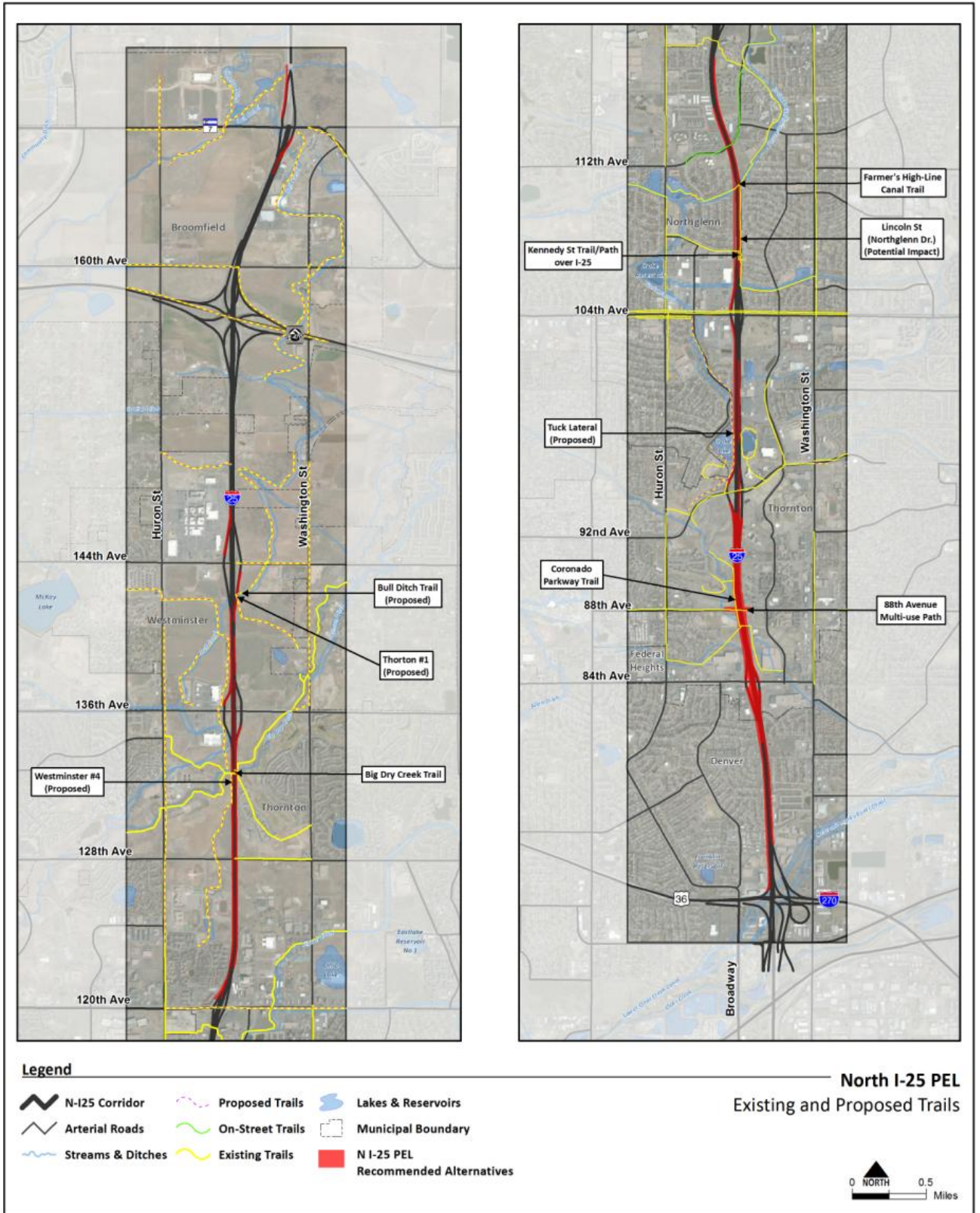
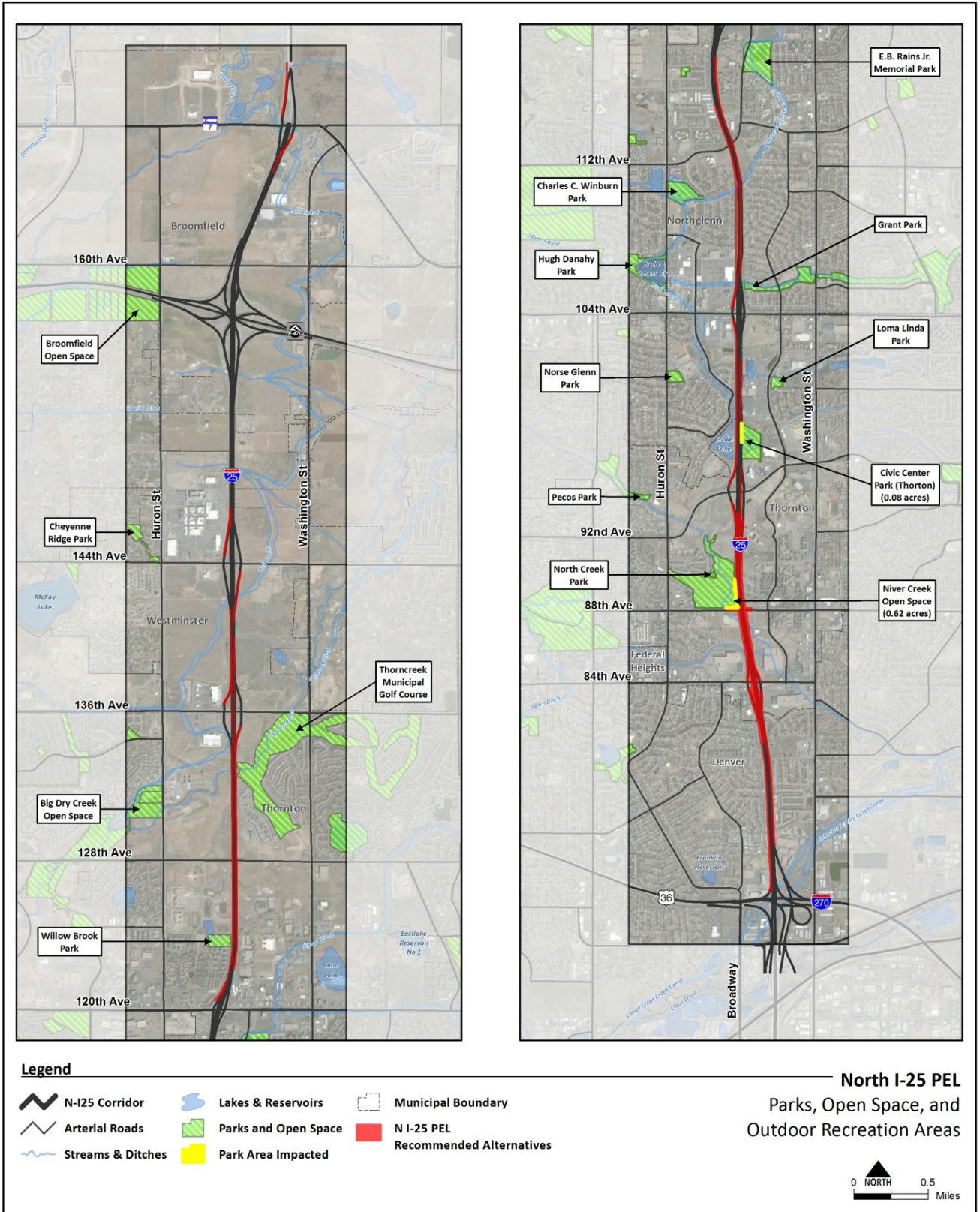


Figure 4-5 Parks, Open Space, and Outdoor Recreation Areas



Section 4(f) of the Department of Transportation Act of 1966 is applicable to publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historic sites. A Section 4(f) evaluation will be required for the existing Farmer’s Highline Canal Trail and other qualified recreational resources in the Study Area. The necessary Section 4(f) evaluation will summarize impacts on each resource individually.

Because there are no recreational properties along the North I-25 PEL Study Area developed with Land and Water Conservation Funds, no properties protected under Section 6(f) of the Land and Water Conservation Fund Act (36 Code of Federal Regulations 59) would be affected.

Construction of new park-and-ride facilities at the interchanges of SH 7 and I-25, 144th Avenue and I-25, and 124th Avenue and Claude Court could have an impact on two existing recreational facilities and two proposed recreational facilities. **Table 4-5** summarizes the impacts of the potential parks and recreational resources that could be affected in the vicinity of the targeted park-and-ride locations. However, the trails could be incorporated into the park-and-ride designs and could serve as a beneficial component to the trails and park-and-ride. An evaluation of potential impacts on parks and recreational resources should be evaluated during future NEPA studies once the park-and-ride location and sizes are determined.

Table 4-5 Summary of Park-and-Ride Target Locations and Potential Impacts on Parks, Open Space, and Trails

Park-and-Ride Target Locations	Approximate Park-and-Ride Size	Potential Park-and-Ride Sites	Impacted Parks, Open Space, and Trails	Proposed or Existing Facility
SH 7 & I-25	400 spaces 5.0 to 5.5 acres (217,800 to 239,580 sq.ft.)	SH 7 & I-25 NE Quadrant	None	–
		SH 7 & I-25 NW Quadrant	Region 5 Trail	Proposed
		SH 7 & I-25 SW Quadrant	None	–
		SH 7 & I-25 SE Quadrant	Bull Ditch Trail	Proposed
144 th Avenue & I-25	300 spaces 3.75 to 4.25 acres (163,350 to 185,130 sq.ft.)	144 th Avenue & I-25 NE Quadrant	Bull Ditch Trail	Proposed
		144 th Avenue & I-25 SE Quadrant	Bull Ditch Trail	Proposed
136 th Avenue & I-25	300 spaces 3.75 to 4.25 acres (163,350 to 185,130 sq.ft.)	136 th Avenue & I-25 NE Quadrant	None	–
		136 th Avenue & I-25 SE Quadrant	None	–
124 th Avenue & Claude Court	275 spaces 3.5 to 4.0 acres (152,460 to 174,240 sq.ft.)	124 th Avenue & Claude Court NW Quadrant	None	–
		124 th Avenue & Claude Court SE Quadrant	Eastlake Village Open Space	Existing

4.8.2 Mitigation Strategies and Next Steps

Section 4(f) stipulates that FHWA and other Department of Transportation agencies cannot approve the use of land from publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historic sites unless there is no feasible and prudent alternative to the use of land, and the action includes all possible planning to minimize harm to the property resulting from use. During future NEPA studies, evaluations of publicly-owned parks, trails, and open space lands will be conducted to determine properties that qualify for protection under Section 4(f) and if the potential impacts could be considered *de minimis* impacts. Additionally, coordination with Colorado Parks and Wildlife (CPW) is needed to reconfirm the status of recreational resources in the Study Area with respect to Section 6(f) of the Land and Water Conservation Fund Act.

4.9 Wildlife/Threatened and Endangered Species

Special status species habitat that is present in the project area includes habitat for the Colorado butterfly plant (*Gaura neomexicana coloradensis*), the Ute ladies'-tresses orchid (*Spiranthes divullialis*), the common shiner (*Notropis cornutus*), the Preble's meadow jumping mouse (*Zapus hudsonius preblei*), the Bald Eagle (*Haliaeetus leucocephalus*), the black-tailed prairie dog (*Cynomys ludovicianus*), and the Western Burrowing Owl (*Athene cunicularia*). The primary drainages that were identified from the field survey and that contained suitable habitat for these species include Big Dry Creek and its tributaries, Farmer's Highline Canal, Bull Canal, and Niver Creek.

A field survey noted major wildlife corridors that facilitate wildlife movement. These corridors primarily include Big Dry Creek and its nearby tributaries, Bull Canal, and Farmer's Highline Canal.

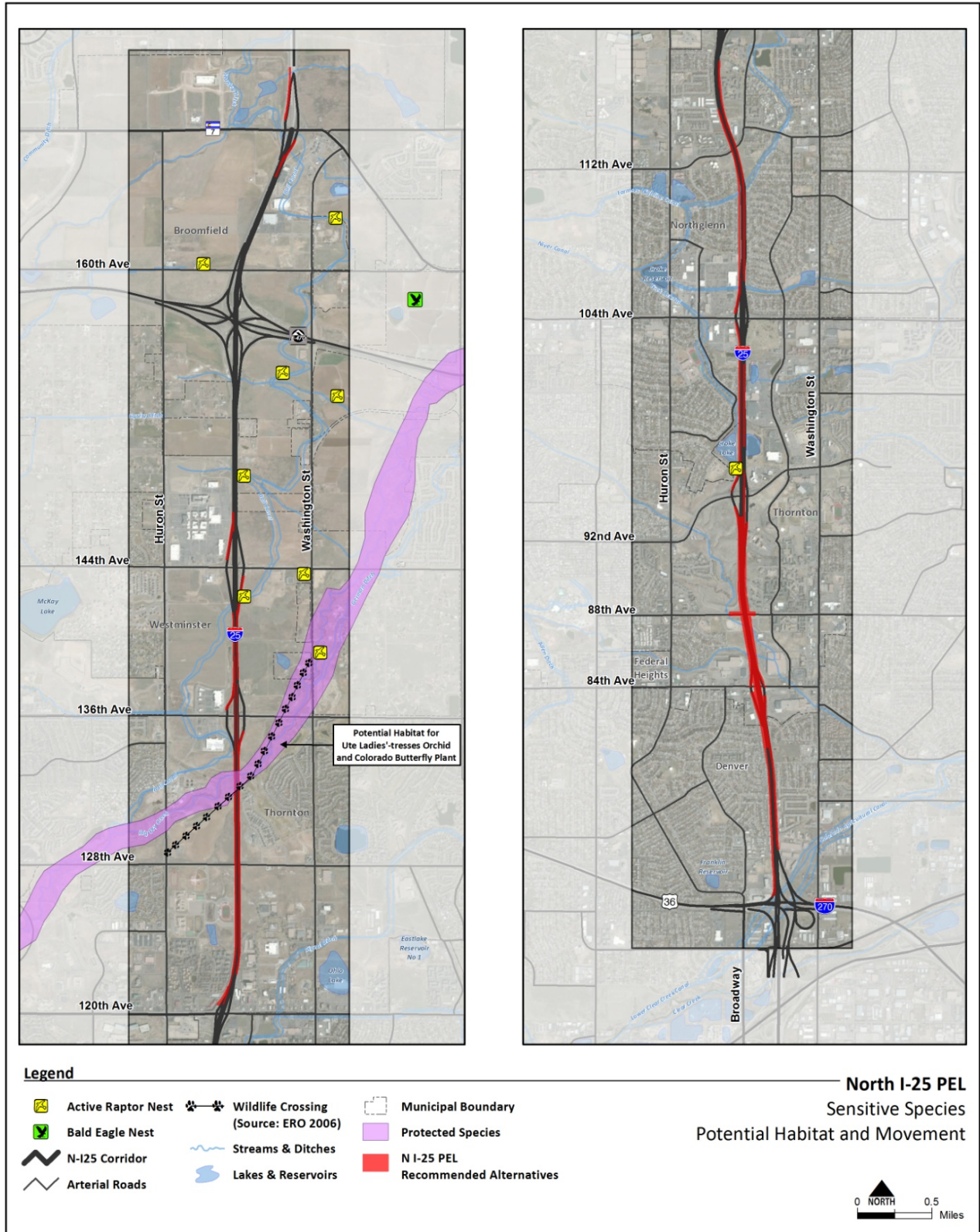
Wildlife habitat in the Study Area would be expected to be reduced with highway expansion, residential and commercial development, and the decrease of open lands that are either vacant or used for agriculture. Residential and commercial development also will contribute to habitat fragmentation and further reduce open areas used as movement corridors for wildlife.

Various federal laws have been established to protect wildlife, including the Endangered Species Act, the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act. In addition, a Programmatic Biological Opinion signed by both state and federal agencies includes protections for state-listed species (Short-Grass Prairie Initiative), as well as downstream water depletions in the Platte River Basin.

4.9.1 Environmental Consequences

Habitat fragmentation, high traffic volumes, high traffic noise, the encroachment of residential and commercial development, and changes in natural hydrology of the North I-25 PEL Study Area negatively impact wildlife habitats and the ability for wildlife to move through the landscape (see **Figure 4-6**). The addition of proposed managed lanes, proposed continuous acceleration/deceleration lanes, and general purpose lanes as part of the Recommended Alternative may impact potential special status species habitat along Big Dry Creek and its tributaries, Farmer's Highline Canal, Bull Canal, and Niver Creek and major wildlife corridors along Big Dry Creek and its nearby tributaries, Bull Canal, and Farmer's Highline Canal through the reconstruction and expansion of existing bridge and culvert structures. Black-tailed prairie dog (state species of special concern) habitat loss, which exists inside and directly outside the existing I-25 ROW in multiple areas may be impacted by the addition of proposed managed lanes, proposed continuous acceleration/deceleration lanes, and general purpose lanes as part of the Recommended Alternative.

Figure 4-6 Sensitive Species Potential Habitat and Movement



The only known sensitive species consideration with regard to potential park-and-ride locations is in the southeast quadrant of the 144th Avenue/I-25 interchange, where an active raptor nest is present in a nearby cottonwood tree adjacent to the northbound off-ramp. Both landscaped and adjacent vegetation to potential park-and-ride locations are suitable nesting habitat for raptors. At the time of the field review, these locations did not have any known sensitive species habitat or act as a wildlife movement corridor.

4.9.2 Mitigation Strategies and Next Steps

A biological survey of special status species, including aquatic species, will be required. Coordination with the US Department of Interior Fish and Wildlife Service (USFWS) and CPW would be necessary to mitigate potential impacts on special status species habitat, per the Endangered Species Act.

Senate Bill 40 (SB 40) wildlife certification will be required for the crossing of riparian corridors in the project. Formal or programmatic certification may be required depending on SB 40 guidelines, which will be determined by CPW.

If the proposed construction is planned to occur during the primary nesting season for migratory birds in Colorado (typically between April 1 and August 31, but some species may nest outside this period), a qualified biologist will survey the project area to verify if any active nests are present. If no active nests are present, clearing and grubbing can occur. However, if active migratory bird nests are identified and cannot be avoided by proposed construction activities, the USFWS field office will be contacted to help determine the appropriate mitigation action, which may include removing nests before the initiation of egg laying or ceasing construction until all nestlings have fledged per the Migratory Bird Treaty Act and CPW's raptor recommendations.

If projects are developed in the Big Dry Creek area that require the manipulation of the box culvert, then it is recommended that the resulting structure be designed to accommodate wildlife movements as much as possible per Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users.

4.10 Wetlands and Other Waters of the US

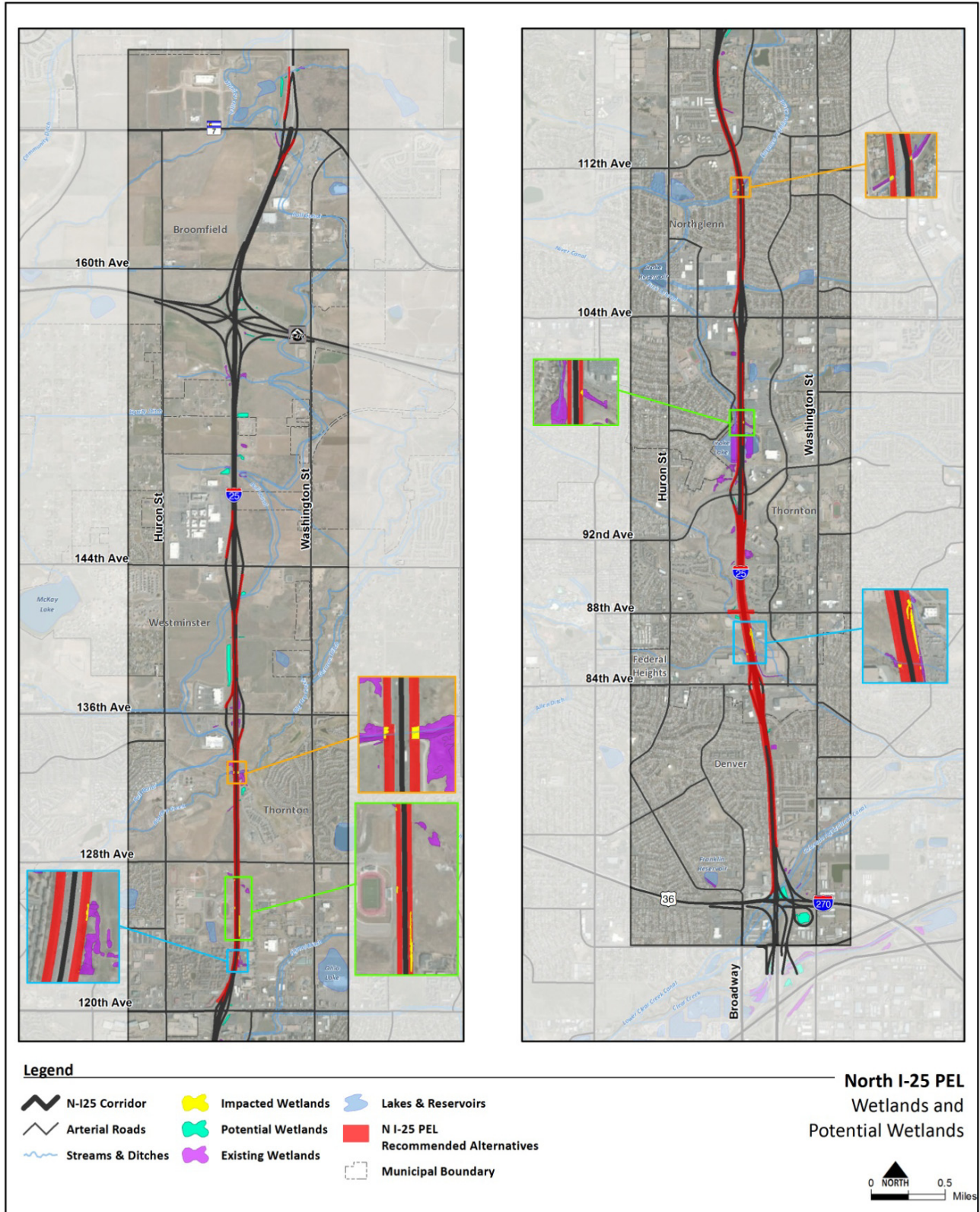
Most of the wetlands identified within the Study Area are palustrine emergent and palustrine scrub/shrub wetlands that generally occur along streams, roadside ditches, irrigation ditches and canals, and at pond margins. In addition, a mix of perennial intermittent waterways, ditches, and ponds exists throughout the Study Area.

For more information on the wetlands and other waters of the US in the Study Area, see **Subsection 6.10** of the *Corridor Conditions Report* in **Appendix B**.

4.10.1 Environmental Consequences

Implementation of the Recommended Alternative would result in approximately 0.82 acre of wetlands and minimal (approximately 0.05 acre) open water disturbance. These estimates are based on the current level of conceptual design and will likely change during subsequent levels of design. Palustrine scrub/shrub and palustrine emergent wetlands, as well as several canals, ditches, and creeks, could be impacted as a result of the Recommended Alternative. **Figure 4-7** displays the wetlands and other waters of the US impacted by the Recommended Alternative.

Figure 4-7 Wetlands and Potential Wetlands



Potential direct effects would occur as a result of construction-related activities requiring the grading, vegetation removal, or placement of fill in wetlands or other aquatic sites. Potential indirect effects would result from the increase in impervious surface associated with the construction of new lanes, ramps, and the 88th Avenue bridge. This increase in impervious surface could increase runoff and surface flows in nearby streams. Roadway runoff could contain pollutants and sediment from road use and maintenance that could degrade water quality and impact wetland vegetation. Additional sediment and erosion could be expected in disturbed areas during and after construction. While wetlands and other aquatic areas located adjacent to I-25 already experience the indirect effects mentioned above, the magnitude and intensity could increase with the increase in impervious surface.

Two potential park-and-ride locations could have an impact on wetlands and other waters of the US as displayed in **Table 4-6**. Construction of a new park-and-ride facility at the SH 7/I-25 interchange could have an impact on a wetland in the southwest quadrant of the interchange. A park-and-ride at the interchange of 144th Avenue and I-25 could have an impact on Bull Ditch in the southeast and northeast quadrants of the interchange. No impacts on wetlands or waters are expected from the construction of a park-and-ride at 136th Avenue and I-25. The park-and-ride at 124th Avenue and Claude Court would fall outside the Study Area boundary and no impacts on wetland or other waters are anticipated at this location. Potential impacts on wetlands and other waters of the US should be evaluated during future NEPA studies once the park-and-ride locations and sizes are determined.

Table 4-6 Summary of Park-and-Ride Target Locations and Potential Impacts on Wetlands and Waters

Park-and-Ride	Approximate Park-and-Ride Size	Potential Park-and-Ride Sites	Potentially Impacted Wetlands	Potentially Impacted Waters
SH 7 & I-25	400 spaces 5.0 to 5.5 acres (217,800 to 239,580 sq.ft.)	SH 7 & I-25 NE Quadrant	No	No
		SH 7 & I-25 NW Quadrant	No	No
		SH 7 & I-25 SW Quadrant	Yes	No
		SH 7 & I-25 SE Quadrant	No	No
E. 144 th Avenue & I-25	300 spaces 3.75 to 4.25 acres (163,350 to 185,130 sq.ft.)	144 th Avenue & I-25 NE Quadrant	No	Yes (Bull Ditch)
		144 th Avenue & I-25 SE Quadrant	No	Yes (Bull Ditch)
E. 136 th Avenue & I-25	300 spaces 3.75 to 4.25 acres (163,350 to 185,130 sq.ft.)	136 th Avenue & I-25 NE Quadrant	No	No
		136 th Avenue & I-25 SE Quadrant	No	No
E. 124 th Avenue & Claude Court	275 spaces 3.5 to 4.0 acres (152,460 to 174,240 sq.ft.)	124 th Avenue & Claude Court NW Quadrant	No	No
		124 th Avenue & Claude Court SE Quadrant	No	No

4.10.2 Mitigation Strategies and Next Steps

If the Recommended Alternative involves temporary or permanent filling of wetlands and other water bodies, including intermittent drainages, a Section 404 Permit would be needed. Prior to application for a permit, a wetland delineation survey would be conducted to determine wetland boundaries and a

determination of impacts would be made. Impacts on wetlands under 0.5 acre typically require a Nationwide Permit. Impacts greater than 0.5 acre would require an Individual Permit. Generally, mitigation would be required under either permit type for impacts exceeding 0.1 acre of jurisdictional Waters of the US, including wetlands and open water features. If the entirety of the Recommended Alternative is constructed at one single time, it is likely that an Individual Section 404 Permit will be required because of the greater than 0.5 acre of anticipated impacts. However, this amount could be reduced during minimization measure applied during design.

Under Section 404 of the Clean Water Act, impacts on Waters of the US, including wetland and open water features, must be avoided and minimized to ensure that there is no net loss of functions and values of jurisdictional wetlands. To the extent practicable, future design should incorporate avoidance and minimization of impacts to known wetland and aquatic areas. Where avoidance and minimization are not practicable, appropriate mitigation for wetland impacts must be completed.

CDOT considers wetlands regardless of US Army Corps of Engineers (USACE) jurisdiction and requires a CDOT Wetland Findings Report if permanent wetland impacts exceed 500 square feet or if temporary impacts exceed 1,000 square feet.

4.11 Right-of-Way

There are potential ROW impacts based on preliminary findings in the PEL Study Area.

4.11.1 Environmental Consequences

The Recommended Alternative may have an impact on approximately 80 parcels, totaling approximately 14 acres.

Most or all of the ROW acquisitions associated with the project would be partial acquisitions; however, full acquisition of some parcels may be required due to access and/or space considerations. This will be further assessed during future NEPA and design phases. The current level of design does not allow for such determination at this time. **Table 4-7** identifies the number of parcels associated with the Recommended Alternative.

Table 4-7 Potential Property Acquisitions for ROW

Approximate Number of Parcels	Approximate ROW Acquisition (acre)	Current Uses
Highway 36 to East 84th Ave		
20	1	Residential, Commercial and Public School
East 84th Ave to 120th Ave		
30	9	Municipal property and Retail
120th Ave to SH 7		
30	4	Municipal property and Vacant property
80	14	TOTALS

4.11.2 Mitigation Strategies and Next Steps

Property acquisition for ROW will conform to the requirements set forth in the Uniform Relocation Assistance and Real Property Acquisitions Policies Act of 1970 (Public Law 91-646, as amended).

For all property acquired, CDOT must offer the property owner just compensation. Also, under Colorado Revised Statute 38-1-121, CDOT is required to pay the reasonable cost of the property owner's appraisal, as long as certain conditions are met. CDOT may also provide relocation benefits to eligible displacees.

Relocation Planning

Prior to relocation, CDOT staff will prepare a relocation analysis that will enable the relocation activities to be planned so that the problems associated with the displacement of individuals, families, and businesses are recognized, and solutions are developed to minimize the adverse impacts of displacement. The scope of planning will be based on the complexity and nature of the anticipated displacing activity, including the evaluation of program resources available to carry out timely and orderly relocations.

4.12 Cumulative Impacts

NEPA and its implementing regulations require federal agencies to identify and analyze the direct, indirect, and cumulative impacts of a proposed action in sufficient detail to make an informed decision. Cumulative impacts result when the impacts of an action are added to or interact with the impacts of other actions in a particular place and within a particular time. It is the combination of these impacts, and any resulting environmental degradation, that is the focus of the cumulative impact analysis. While impacts can be differentiated by direct, indirect, and cumulative impacts, the concept of cumulative impacts takes into account all disturbances because cumulative impacts result in the compounding of the impacts of all actions over time. The cumulative impacts of an action can be viewed as the total impacts on a resource, ecosystem, or human community of that action and all other activities affecting that resource no matter what entity (federal, non-federal, or private) is taking the action.

A cumulative impact analysis was conducted for most environmental resources for the *North I-25 EIS*, which fully encompassed the North I-25 PEL Study Area (FHWA and CDOT, 2011a). The east-west boundaries of the North I-25 EIS Study Area extended from US 85 and the UP rail line to approximately 3 miles west of US 287 and the BNSF rail line. The north-south boundaries of the Study Area extended from Wellington to US 6 in Denver. The Study Area spanned portions of seven counties and included more than 38 incorporated cities and towns. The timeframe for the North I-25 EIS cumulative impacts analysis extended from 1950 to 2035. The identified areas of particular concern within the North I-25 EIS Study Area were land use (growth), water quality, wildlife, wetlands, air quality, and historic properties and districts (FHWA and CDOT, 2011a). Because the North I-25 PEL Study Area is located entirely within the North I-25 EIS Study Area and a cumulative impact analysis was previously conducted for this area, a detailed cumulative analysis was not conducted for the North I-25 PEL Study. The following summarizes the North I-25 EIS cumulative impacts analysis.

4.12.1 Land Use

In the early twentieth century, the North I-25 PEL Study Area mostly contained small farming or mining communities. Larger cities with various land use activities included Denver and Boulder. Population growth and increased water availability contributed to the expanding development that occurred throughout the 1950s as communities began to devote more agricultural land to residential and employment uses.

Construction of I-25 north out of Denver began in the early 1960s. By the time the final segment between Fort Collins and the Town of Wellington was completed in 1968, low-density, suburban residential development was expanding outward from major city centers along the highway. Expansion of I-25 helped spur development north of Denver and contributed to land use change in the years that followed.

Currently, the predominant land uses within the Study Area are residential (36 percent), commercial (23 percent), agricultural (23 percent), and vacant (18 percent). Land uses along the North I-25 PEL Study Area vary from predominantly agricultural and vacant land in the north (SH 7 to 136th Avenue) to suburban commercial, retail, and residential uses in the middle (136th Avenue to 120th Avenue), to completely built-out commercial, retail, and residential uses in the south (120th Avenue to US 36). Many municipal land use plans in the Study Area have identified the North I-25 PEL Study Area as being the biggest area of change within their jurisdictions.

The northern Denver metropolitan area has seen a significant amount of growth, which is forecasted to accelerate as the economy continues to improve. While residential development has been proposed and approved, many municipalities along the corridor are planning for a mix of land uses along the I-25 corridor. Their development somewhat depends on significant infrastructure investments moving forward, including the construction of the North Metro commuter corridor, as well as interchange improvements North I-25 PEL Study Area. In the long term, a significant amount of commercial development is planned for the areas adjacent to I-25.

Based on the near-term planned development, it is expected that the general pattern of urbanization will continue along the North I-25 PEL Study Area and more agricultural land will be converted for employment and residential uses. This pattern of growth is expected to occur regardless of whether the improvements considered in the North I-25 PEL Study are implemented. Likely major impacts resulting from development are increased impervious surfaces (for example, roads, driveways, rooftops, parking lots), loss of agricultural lands, loss and fragmentation of wildlife habitat, degradation of air and water quality, loss of wetlands and aquatic resources, and stress on infrastructure, water availability, and water supply. Under the No Action condition, anticipated development along I-25 would continue based on market forces and in accordance with city and county plans. Conversion of agricultural and open lands into urban uses will continue regardless of whether the Recommended Alternative is implemented or not. The southern portion of the North I-25 PEL Study Area is fully developed and no substantial changes are anticipated. The construction of the Recommended Alternative will not contribute noticeably to cumulative land use impacts in comparison to what is already anticipated through land development projects and other roadway improvements. Preliminary conclusions will be further assessed and confirmed in the future during NEPA analysis.

4.12.2 Water Quality

Before land cultivation for agriculture, the natural ecosystem was largely unaffected by human activity. Agricultural activity and urbanization have an impact on water quality. Cumulative impacts on water quality would primarily result from changes in hydrologic conditions caused by development already planned in the regional Study Area. Development rapidly consumes and converts natural landscapes to impervious surfaces such as parking lots, roads, and rooftops. Water runs off these impervious surfaces, often carrying pollutants directly into water bodies instead of allowing for the natural filtering of pollutants through the soil. Impacts that follow include species loss, oxygen depletion, lower groundwater levels, increased peak flows, and flooding. Impacts associated with additional impervious surface area are typically mitigated through the implementation of BMPs, such as the installation of permanent water quality ponds.

Implementation of the Recommended Alternative would facilitate future development along I-25, consistent with future land use planning efforts, and would result in additional impervious surfaces as a result of highway widening, transit stations, and parking lots. Future impacts on water quality could arise from maintenance activities, such as snow plowing, sanding, and deicing. The additional impervious surface area would contribute minimally to water quality impacts when compared to what is expected from planned development. These impacts on water quality would be reduced through implementation of maintenance programs and BMPs in both construction and design.

Based on information identified during the North I-25 PEL process for water quality, the Recommended Alternative is not anticipated to contribute to cumulative impacts when combined with other past, present, and reasonably foreseeable actions. Preliminary conclusions will be further assessed and confirmed in the future during NEPA analysis.

4.12.3 Wildlife

Past actions affecting wildlife distribution and movement corridors in the Study Area include commercial development, residential development, and road construction. These activities have directly displaced wildlife habitat, increased habitat fragmentation, and altered wildlife movements.

Land uses that provide habitat for wildlife include agriculture, open space, parks, surface water areas, and vacant lands. Residential and commercial land uses are less likely to provide habitat for wildlife because they are more developed. Lands protected or enhanced for wildlife would help to offset some of the impacts of overall habitat loss.

General wildlife habitat in the North I-25 PEL Study Area would be expected to decline with highway expansion, residential and commercial development, and the decrease of open lands used for agriculture. Residential and commercial development, especially in the northern portion of the Study Area, will also contribute to habitat fragmentation and further reduce open areas used as movement corridors by wildlife.

Planned transportation and development actions will contribute to further loss and degradation of wildlife habitat within the North I-25 PEL Study Area. In addition to the interstate impacts, the expansion of commercial developments and residential areas will contribute to further loss and degradation of wildlife habitat. This would occur regardless of whether the Recommended Alternative is implemented, resulting in cumulative impacts on wildlife, wildlife habitat, and other biological resources in the North I-25 PEL Study Area.

Based on information identified during the North I-25 PEL process for wildlife distribution and movement corridors and on additional review for black-tailed prairie dog habitat within or adjacent to the Recommended Alternative footprint, it is not anticipated that the Recommended Alternative will contribute substantially to cumulative impacts when combined with other past, present, and reasonably foreseeable projects. Preliminary conclusions will be further assessed and confirmed in the future during NEPA analysis.

4.12.4 Wetlands

Wetlands in the North I-25 PEL Study Area are primarily associated with natural drainages, ponded sites, and irrigation and roadside ditches. Although there is no concise inventory of historical wetlands in Colorado, national estimates, taken from data collected by the National Wetlands Inventory in conjunction with status and trends reports, have shed some light on wetland loss and degradation. It is estimated that

Colorado experienced a 50 percent loss of wetlands from the 1700s into the latter part of the twentieth century. Rapid urbanization, mining, and agriculture have had an impact on wetlands in the regional Study Area greatly since 1940.

Planned development is likely to result in further direct and indirect impacts on wetland communities. Wetland degradation and loss is anticipated to continue as growth and development continue to occur in undeveloped areas, regardless of the implementation of the Recommended Alternative.

Impacts on any wetlands would be mitigated on a one-for-one basis, resulting in no net loss of wetlands. Because CDOT requires mitigation on a one-for-one basis for any wetland impact (regardless of jurisdictional status), there would be no net loss of wetlands as a result of CDOT actions.

Based on information identified during the North I-25 PEL process for wetlands, the Recommended Alternative is not anticipated to contribute to cumulative impacts when combined with other past, present, and reasonably foreseeable projects. Preliminary conclusions will be further assessed and confirmed in the future during NEPA studies.

4.12.5 Air Quality

Ambient air quality monitoring began along the Front Range in the 1960s. Data since that time show that pollution emissions controls and programs instituted as a result of the Clean Air Act and its amendments have been successful in reducing criteria pollutant levels. Effective November 20, 2007, the US Environmental Protection Agency (USEPA) designated the Denver metropolitan area and the North Front Range as a non-attainment area for the 8-hour O₃. O₃ is not directly emitted into the atmosphere but is created by a chemical reaction of various pollutants (nitrogen oxides [NO_x] and hydrocarbons) with sunlight. The pollutants that contribute to the generation of O₃ are referred to as "precursors."

Rigorous adherence to reduction programs and precursor emissions controls will prevent future air quality deterioration. Future mobile source pollutant emissions of carbon monoxide (CO), NO_x, particulate matter, and toxics are expected to decline as a result of new low sulfur fuel requirements, stricter retrofit and engine exhaust emission controls, and engine efficiency improvements.

Transportation projects that might exacerbate air quality problems must meet certain requirements before they can proceed. Particularly, a regional air quality conformity analysis is needed to show that projects are compatible with the State Implementation Plan. In addition, a local hot spot analysis for CO is needed to show that an action will not cause violations of the NAAQS. Potential CO and particulate matter hot spots were identified through evaluation of intersections in the regional Study Area.

While the number of pollution sources is expected to grow, pollution emissions are not expected to increase proportionately due to implementation of stricter regulatory controls such as evaporative emissions controls applied to area oil and gas production facilities, development of wind and renewable energy sources for large scale electrical power generation, and continued conversion of fossil fuel burning to unconventional fuels and fuel hybrids. Any incremental emissions impacts on air quality from the Recommended Alternative would be small compared to current pollutant emissions levels. Additionally, transit facilities and service would not contribute to direct air quality impacts and would act to reduce the growth of SOV use, lowering vehicle miles traveled and traffic emissions for the region overall.

Based on information identified during the North I-25 PEL process for air quality, the Recommended Alternative is not anticipated to substantially contribute to cumulative impacts when combined with other

past, present, and reasonably foreseeable projects. Preliminary conclusions will be further assessed and confirmed in the future during NEPA studies.

4.12.6 Historic Properties and Districts

In the early twentieth century, most of the North I-25 PEL Study Area was used for agricultural and coal mining purposes. Individual farmsteads were usually one or two quarter sections of land (160 or 320 acres). As the automobile and tractor replaced the horse and carriage, roads were built. Road access facilitated additional development. Much of the new development was auto-related with service stations and restaurants built to serve the motoring public. Many small settlements were established throughout the region, many serving as supply and social centers, as well as produce shipping points for dispersed farms.

The late 1960s brought more residential development, with the development of large-scale subdivisions beginning in the 1980s. These residential developments have put pressure on many of the country roads that were never envisioned to carry the amount of traffic generated by large-scale development. The small downtowns of many of the historic settlements are now experiencing renewed activity as a result of development of nearby residential subdivisions. As land becomes more valuable for development, farmers are increasingly pressured to sell or develop their land.

Cumulative impacts on historic properties and districts have occurred and will continue to occur in the northern North I-25 PEL Study Area due to the conversion of agricultural lands and farmsteads to urban land uses and limited local historic preservation regulations. Planned transportation and development actions will, over time, result in the additional loss of historic properties and will alter the historic character of small farming operations. These impacts will occur regardless of whether or not the Recommended Alternative is implemented. The construction of the Recommended Alternative would not contribute to cumulative impacts on historic resources in comparison to what is already anticipated through land development projects and other roadway improvements. For reasonably foreseeable future actions that are federally funded or require a federal action, federal legislation protects historic resources [National Historic Preservation Act of 1966, as amended and Section 4(f) of the USDOT Act of 1966] and requires that adverse impacts be mitigated.

Based on information identified during the North I-25 PEL process for historic resources, the Recommended Alternative is not anticipated to substantially contribute to cumulative impacts when combined with other past, present, and reasonably foreseeable projects. Preliminary conclusions will be further assessed and confirmed in the future during NEPA studies.

5.0 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

Section 5.0 discusses the various activities where the project team coordinated with other agencies, local jurisdictions, and the public regarding the intent and progress of the North I-25 PEL. CDOT's direction set during the initial stage of the project was to provide an open and clear discussion with stakeholders in the North I-25 PEL Study Area, with the understanding that this type of coordination and involvement is crucial to a successful project.

Appendix F provides meeting materials, attendance lists, and other information documenting the public and agency activities.

5.1 Agency Coordination

This subsection describes the teams, committees, and major actions taken to coordinate with agencies and local jurisdictions during the North I-25 PEL project. The following are the teams, committees, and major actions taken to coordinate with agencies and local jurisdictions during North I-25 PEL development. These are described in additional detail in the following subsections:

- ▶ Project Management Team
- ▶ Stakeholder Interviews
- ▶ Executive Committee (EC) and Technical Advisory Committee (TAC)
- ▶ Visioning Workshop
- ▶ Resource Agency Scoping

5.1.1 Project Management Team

To lead the project toward the development of a Recommended Alternative, CDOT and FHWA established the Project Management Team. These agencies worked in coordination with the project consultants to develop the Recommended Alternative. CDOT, as lead agency, held primary responsibilities that included:

- ▶ Provide oversight in managing the overall project, process, and issue resolution
- ▶ Participate in Project Management Team meetings
- ▶ Make the decision regarding Purpose and Need used in the PEL Study and range of alternatives evaluated, in consultation with the other agencies, and after consideration of input from the Executive Committee/Technical Advisory Committee (EC/TAC), regional partners, and the public
- ▶ Identify local agencies and regional partners
- ▶ Provide opportunities for participating agency involvement in:
 - Defining the Purpose and Need
 - Determining the range of alternatives
 - Determining methodologies for screening alternatives
 - Determining level of detail for the analysis of alternatives
 - Determining the final recommendations for the prioritization of improvements

- ▶ Provide information to serve as a basis for EC/TAC, regional partner, and public input on key decisions by CDOT
- ▶ Review and approve all public involvement initiatives, strategies, efforts, and materials developed by the consultants

FHWA acted as a participating and supporting agency to CDOT. FHWA had the following responsibilities:

- ▶ Assume (on request from CDOT) responsibility for providing information and respond to analyses in which the agency has special expertise
- ▶ Review preliminary recommendations and provide input
- ▶ Identify, as early as practicable, any issues of concern regarding potential impacts or any issues that could substantially prevent an agency from granting approval.

5.1.2 Stakeholder Interviews

In November and December 2011, individual interviews were conducted with key stakeholders to understand the interests, goals, and desired outcomes for the North I-25 PEL. **Appendix F** includes an interview template. **Table 5-1** identifies the key stakeholders interviewed.

Table 5-1 Key Stakeholder Interviews

Agency	Representatives
FHWA	Monica Pavlik, Shaun Cutting
FTA	David Beckhouse, Larry Squires
CDOT Region 1 Planning and Environment	Jon Chesser, Lizzie Kemp
CDOT Region 1 Engineering	Jay Hendrickson, Andrew Stratton
CDOT Region 1 Traffic	Steve Hersey, Leela Rajasekar
CDOT Region 4 Planning, Environment and Engineering	Carol Parr, Myron Hora, Long Nguyen
City and County of Broomfield	Debra Baskett, Kevin Standbridge
City and County of Denver	Crissy Fanganello, Brian Mitchell
Adams County	Jeanne Shreve
City of Northglenn	Brook Svoboda, Travis Reynolds, Joliette Woodson, Pam Acre, Ofc. Rick Kellogg
City of Thornton	Gene Putman
City of Westminster	Aric Oetzelberger, Mayor Nancy McNally, Dave Downing, Matt Lutkus
RTD	Mike Turner, Lee Cryer
DRCOG	Steve Rudy, Steve Cook, Fred Sandal

Note: CDOT regions were changed in July 2013. The PEL Study Area is now entirely in Region 1.

Stakeholders emphasized the following points and concerns:

- ▶ Clearly define and communicate the relationship between the PEL and the *North I-25 EIS* to the stakeholders and general public
- ▶ Promote the PEL Study as a long-term vision with near-term opportunities to address operations and safety
- ▶ Upgrade park-and-ride facilities along I-25 to accommodate significant and increasing demand
- ▶ Recognize future projects and plans within the study area and coordinate with local agencies
- ▶ Analyze impacts and consider future improvements to parallel roads
- ▶ Coordinate project development and design with the SH 7 PEL
- ▶ Implement TDM to enhance service and develop strategies to increase mass transit use with the support of the Transportation Management Organization
- ▶ Coordinate and involve the North Area Transportation Alliance with project updates and EC/TAC meetings

5.1.3 Executive Committee and Technical Advisory Committee

As a means of working with the North I-25 PEL Study Area’s local communities and regional partners, an EC and TAC were formed. EC and TAC members included local agency officials, consisting of elected officials and technical staff.

5.1.3.1 Executive Committee

The EC provided input on a range of issues, including the corridor vision, alternatives, and improvement phasing priorities. The EC included elected officials or senior-level staff from the North I-25 PEL Study Area communities, along with representatives from federal and state government agencies. Meetings were scheduled around key project milestones. **Table 5-2** identifies EC members invited to participate in the PEL process.

Table 5-2 EC Members

Local Stakeholders	Executive Committee	Alternate
City of Brighton	Mayor Dick McLean	Wayne Scott
City and County of Broomfield	Mayor Pat Quinn	Kevin Standbridge
City of Commerce City	Mayor Sean Ford	Jason McEldowney
City of Dacono	Mayor Charles Sigman	A.J. Euckert
City and County of Denver	Brian Mitchell	Michael Finochio
Town of Erie	Mayor Pro Tem Cheryl Hauger	Gary Behlen
Town of Firestone	Mayor Chad Auer	Wes LaVanchy
Town of Frederick	Mayor Eric Doering	Gary Barbour
City of Longmont	Dennis Coombs	Phil Greenwald
City of Northglenn	Mayor Joyce Downing	Brook Svoboda
City of Thornton	Mayor Heidi Williams	Joyce Hunt
City of Westminster	Mayor Nancy McNally	Aric Otselberger
Adams County	Jim Robinson	Erik Hansen
Metro North Chamber	Jonathan Perlmutter	Deb Obermeyer

Local Stakeholders	Executive Committee	Alternate
CDOT Region 1	Reza Akhavan, Tony DeVito	Steve Olson
CDOT Region 4	Myron Hora	Johnny Olson
FHWA	Shaun Cutting	Monica Pavlik
RTD	Lee Kemp	Larry Hoy
FTA	David Beckhouse	Larry Squires
DRCOG	Steve Rudy	Steve Cook
Broomfield Economic Development Council	Stephanie Salazar	
Broomfield Chamber	Jennifer Kerr	

5.1.3.2 Technical Advisory Committee

The TAC included staff from the North I-25 PEL Study Area communities; local, state, and federal government agencies; and other regional partners. The TAC met at various times throughout the project—approximately every 6 to 8 weeks to 6 months—with CDOT providing technical input for the development of the PEL Study. TAC members kept their respective organizations, constituent groups, or elected officials on the EC updated. TAC members served as the primary point of communication and provider of information for their respective communities or organizations. **Table 5-3** identifies TAC members invited to participate in the PEL process.

Table 5-3 TAC Members

Affiliation	Technical Advisory Committee Representative
City of Brighton	Annette Marquez, Joe Smith
City and County of Broomfield	Debra Baskett/Kevin Standbridge
City of Commerce City	Daren Sterling
City of Dacono	A.J. Euckert
City and County of Denver	Emily Silverman
Town of Erie	Gary Behlen, Russell Pennington
Town of Firestone	Dave Lindsay
Town of Frederick	Richard Leffler
City of Longmont	Phil Greenwald
City of Northglenn	Brook Svoboda
City of Thornton	Gene Putman
City of Westminster	Dave Downing
Adams County	Jeanne Shreve
FTA	Larry Squires
FHWA	Monica Pavlik
CDOT Region 4	Carol Parr, Jennifer Gorek, Long Nguyen, Karen Schneiders
CDOT Region 1	Steve Olson, Andrew Stratton, Jon Chesser, Lizzie Kemp, Jay Hendrickson, Leela Rajasekar, Steve Hersey, Chuck Attardo
RTD	Lee Cryer, Nataly Erving
DRCOG	Fred Sandal, Steve Cook
Smart Commute TMO	Karen Stuart

Affiliation	Technical Advisory Committee Representative
Broomfield Chamber	Jennifer Kerr
Broomfield Economic Development Council	Stephanie Salazar
North Metro Chamber	Deb Obermeyer

5.1.3.3 EC and TAC Responsibilities and Decision Making

The EC and TAC held similar responsibilities. These responsibilities included the following:

- ▶ Attended and provided input at EC/TAC meetings
- ▶ Provided oral comment at the meetings or written comment within the requested number of days of receipt of information
- ▶ Reviewed EC/TAC meeting materials and provided comment on “red flag issues” or issues of concern
- ▶ Participated in the PEL Study, as appropriate, starting at the earliest possible time
- ▶ Generated and evaluated options to address the needs of their respective jurisdiction
- ▶ Participated in the issue-resolution process

Regional Partners received information about the PEL Study so that they could monitor and participate as necessary. Regional Partners included the following:

- ▶ Adams County Economic Development Corporation
- ▶ Adams County Movers
- ▶ Colorado Motor Carriers Association
- ▶ North Area Transportation Alliance
- ▶ Denver Metro Chamber of Commerce
- ▶ Urban Drainage and Flood Control District

The EC and TAC participated in issue identification and collaborative problem solving during project milestones. Meetings were regularly scheduled meetings, or as appropriate, enabling CDOT to move forward with the study.

5.1.4 Visioning Workshop

The Visioning Workshop, held February 2, 2012, involved the Project Management Team, the EC, and the TAC mentioned above. The purpose of the workshop was to:

- ▶ Confirm the goals and outcomes of the North I-25 PEL
- ▶ Outline operating protocols for dialogue among the working groups: EC, TAC, and the public
- ▶ Obtain initial input on improvement ideas

CDOT officials led the Visioning Workshop and clarified the objectives of the PEL Study. The PEL Study aided in the identification of multimodal objectives and jurisdiction visions for the North I-25 PEL Study Area. The PEL Study was identified as being completed in accordance with the FHWA PEL Process. The

Study is being conducted to identify existing and future problem areas and issues of importance. Likewise, recommendations included phased improvements to maximize periodic funding and estimations of costs.

The results of the Visioning Workshop included:

- ▶ Appropriate times and methods of public outreach and comment
- ▶ Importance of communications with the stakeholders along the corridor (that is, businesses, the public, property owners, and the North Area Transportation Alliance)
- ▶ The focus of the PEL on nearer term improvements, while not precluding the *DRCOG MetroVision RTP*
- ▶ **I-25 Main Line** – Look at various ways to reduce congestion surrounding interchange ramps, weaving motions, and park-and-ride capacities. Ideas discussed included additional managed lanes, increased park-and-ride capacity, center loading bus station at 88th Avenue, and additional transit opportunities
- ▶ **Parallel Arterials** – Consider the various arterials that become congested during incidents on I-25 through increased variable message signs/ITS infrastructure and spot improvements along the arterials
- ▶ **Transit, Bicycle, and Pedestrian** – Issues of overcapacity park-and-rides and bus delays could be alleviated through additional and expanded park-and-rides, closer coordination with RTD, and other transit options, such as bus rapid transit
- ▶ **Intelligent Transportation Systems and Travel Demand Management** – ITS solutions discussed developing an IMP, using adaptive signal timing at interchanges, extending courtesy patrol further north, and increasing ITS signage, while TDM suggestions included encouraging staggered work hours among employers, vanpool program expansion, neighborhood EcoPass program, and Cash for Commuters

5.1.5 Resource Agency Scoping

Including resource agencies early in the process is an important part of a successful PEL process. The resource agency scoping process identifies any concerns or thoughts that an agency may have at the time of the study, which could affect decision making. The Transportation Environmental Resource Council (TERC) is a collection of agencies that routinely participate in transportation improvement projects, through project development, permitting, or approvals. The TERC established an agreement to have these agencies participate in PEL studies. The following resource agencies were asked to attend an initial scoping meeting early in project development (March 26, 2012) to comment on any particular concerns in the project area and the project's Purpose and Need:

- ▶ RTD – Regional Transportation District
- ▶ SHPO – State Historic Preservation Officer
- ▶ USACE – US Army Corps of Engineers
- ▶ USFWS – US Fish and Wildlife Service
- ▶ CPW – Colorado Division of Parks and Wildlife
- ▶ UDFCD – Urban Drainage and Flood Control District
- ▶ CDPHE – Colorado Department of Public Health and Environment
- ▶ USEPA – US Environmental Protection Agency

Staff representatives from SHPO, USACE, USFWS, and USEPA attended. The agency representatives present did not have any initial concerns with the PEL or the draft Purpose and Need but asked for further coordination as the project progresses. The agencies typically comment and provide input on proposed actions or project alternatives. Because these had not been developed at the time of the meeting, the agencies did not feel they had enough information to provide input on the project. They typically comment or provide input on a specific action that is being advanced. The consensus among the agencies is that CDOT and FHWA are the experts in the identification of needs of the transportation system and the agencies would rely on them to properly identify the project's Purpose and Need.

The agencies asked to be contacted only after an action has been identified and the public has had a chance to comment on the project. Each agency will be provided the PEL document and will continue to be consulted as projects identified in the PEL are pursued. The next phase of project development will be the NEPA process, where these agencies can provide formal comments and consultation. The agencies can then discuss and consult on more detailed project information and its relationship to their respective resources.

5.2 *Public Involvement*

Public outreach consisted of the following activities that were intended to provide multiple ways of participating in the study process and to provide access to it by different segments of the public. These activities also link public involvement to study decision-making and focus outreach on the issues. These activities included:

- ▶ Project webpage: <http://www.coloradodot.info/projects/northI25PEL>
- ▶ Media outreach and advisories
- ▶ Social media outreach
- ▶ Project Point of Contact: Andrew Stratton
- ▶ Email, mailing list, and contact database
- ▶ Issue and public comment tracking

5.2.1 *Mailing List Development and Mass Mailing*

The PEL used mailing lists provided by the local agencies and stakeholders. FHU managed and updated the list, as needed. Direct communications announcing the beginning of the study, notifications of all public meetings, and study development updates were sent via email and/or mail.

5.2.2 *Open House Public Meetings*

Two public open house meetings were scheduled for the PEL Study. Public meetings are open to any community member and are attended by members of the EC, TAC, and the lead agencies.

At the first open house meeting, held on May 9, 2012, information included describing the PEL Study approach, identifying North I-25 PEL Study Area issues, coordinating with the North I-25 EIS, and establishing the Purpose and Needs of the study.

The second open house public meeting was held on August 27, 2013, when the results of the PEL were presented.

5.2.3 Public Comments

Public comments during the first open house held on May 9, 2012, and via the webpage were concerned about the following items:

- ▶ Increased traffic noise
- ▶ Support for additional capacity
- ▶ Support for operational improvements
- ▶ Support for transit improvements
- ▶ Coordination with planned corridor improvements
- ▶ I-25 Express lanes use policy
- ▶ Concern about RTD FasTracks schedule

Twenty-eight people signed in at the second open house held on August 27, 2013. Attendees expressed that they were glad to see that CDOT and the communities were looking at improvements on this congested corridor.

Public comments during the second open house expressed the following:

- ▶ Support for proposed improvements
- ▶ Support for proposed phasing of improvements
- ▶ Support for RTD's extension of the North Metro Rail Line
- ▶ Questions about timing of implementation of proposed improvements
- ▶ Support for implementing improvements soon

6.0 NEXT STEPS: ROAD MAP TO IMPLEMENTATION

At the conclusion of this North I-25 PEL Study, many necessary steps must be taken before a project can actually be implemented on the I-25 corridor. This “road map” demonstrates the overall process for project implementation.

This North I-25 PEL Study identifies a corridor vision and a Recommended Alternative composed of several improvement components. Among other improvements, in particular, it identifies that replacing the 88th Avenue bridge over I-25 would be “beneficial now” for highway operations (see **Subsection 2.3**). The North I-25 PEL Study has been conducted as a precursor to a NEPA study. A future NEPA study will reference the PEL Study for its corridor vision, Purpose and Need, alternative development, and public and agency outreach. This road map analysis charts the next steps through the NEPA and planning process for implementing components on the North I-25 corridor.

6.1 Long-Term Cross Sections

The DRCOG *Metro Vision Plan* recognizes a future 202-foot cross section for I-25 north of US-36, which is greater than the highway’s current cross section. **Subsection 2.6** identifies a set of long-term options of potential lane types that could make up the future full cross section. The paths forward for these potential long-term options differ because some have been through the NEPA process and others have not. The identified long-term options or any combination thereof, include:

- ▶ **Managed Lanes north from 120th Avenue to SH 7** – One managed lane (TEL) in each direction from US 36 north to the Fort Collins area is part of the Preferred Alternative in the *North I-25 EIS*. In the *North I-25 ROD*, FHWA approved the selection of a portion of the Preferred Alternative for implementation as part of Phase 1. Phase 1 includes one managed lane in each direction from US 36 to 120th Avenue. Currently, these managed lanes are being implemented in an interim configuration using the inside shoulder of the existing cross section. Construction is expected to be complete in 2015. A second ROD is being completed to include interim managed lanes from 120th to SH 66. Subsequent phases of the Preferred Alternative from the *North I-25 EIS* can be implemented as additional funding is identified and included in the *Metro Vision RTP*. For each subsequent phase of the Preferred Alternative, a ROD will be issued detailing the phase to be implemented.
- ▶ **General Purpose Lanes north from 84th Avenue to SH 7** – Additional general purpose lanes were not included in the Preferred Alternative from the *North I-25 EIS* and implementation of these projects by CDOT would require inclusion in the *Metro Vision Fiscally Constrained Plan* and NEPA clearance.
- ▶ **Reversible Managed Lanes north from US 36 to SH 7** – Reversible managed lanes were not included in the Preferred Alternative from the *North I-25 EIS* and implementation of these projects by CDOT would require inclusion in the *Fiscally Constrained RTP* and NEPA clearance.
- ▶ **Two Managed Lanes north from US 36 to SH 7** – Because the *North I-25 EIS* Preferred Alternative did not include two managed lanes by direction north from US 36 to SH 7, implementing two managed lanes instead of one would require additional study and NEPA clearance.

The steps outlined in the road map need to be applied for implementing any of these long-term corridor options. The NEPA process would be of longer duration, as an EIS would be required.

6.2 Road Map to Implementation

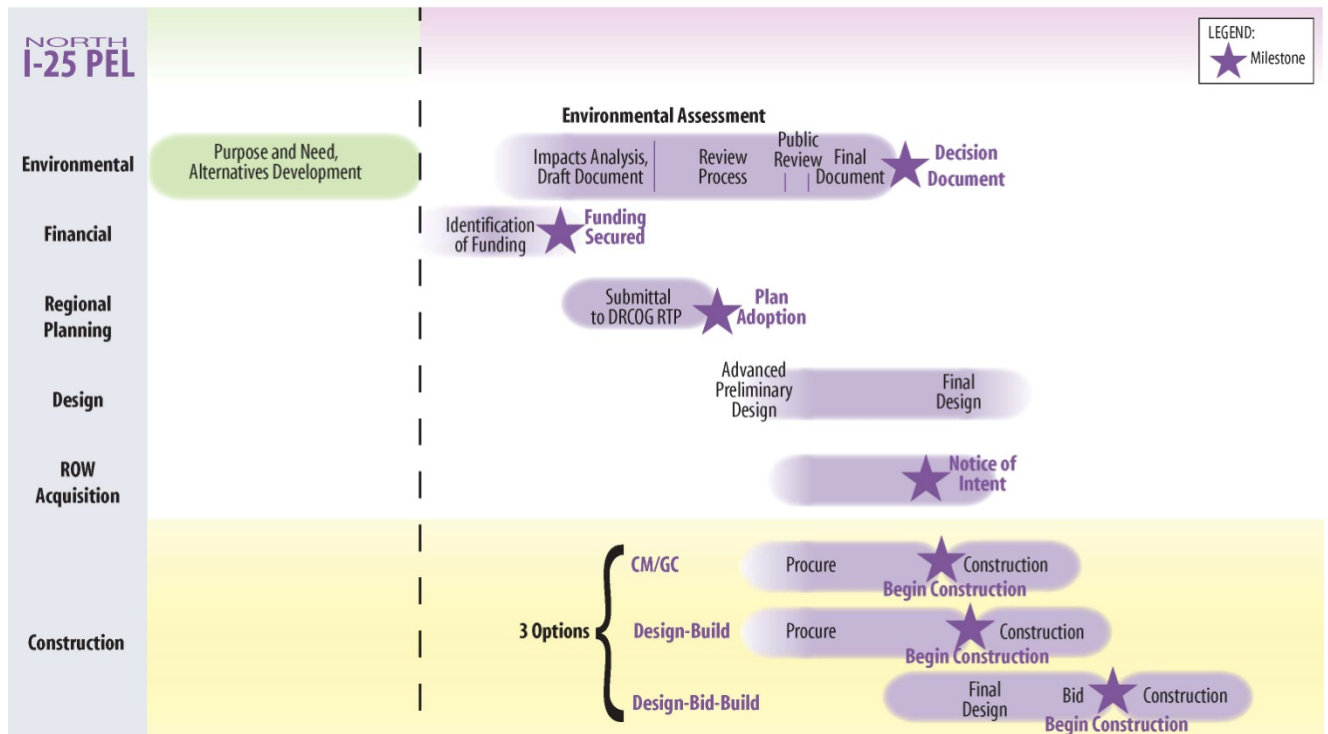
Figure 6-1 displays the overall process for implementation of recommendations made in this PEL. In general, there are sequential steps that involve different disciplines: financing, environmental planning, regional planning, design, and construction. While there can be variations regarding scale of environmental analysis and delivery methods, project implementation will require addressing all of these steps to some degree. Also, individual components or a package of components could move forward through the implementation process. The process is briefly summarized below.

6.2.1 Identification of Funding

The first step after completion of the PEL Study is to identify funding. This milestone will allow submittal for inclusion in the *Metro Vision Fiscally Constrained Plan* and the launching of an environmental process that concludes with a signed decision document.

Subsection 6.3, **Potential Funding Strategies**, identifies several strategies for consideration for funding planned improvements.

Figure 6-1 Example Road Map for Implementation of Components



6.2.2 Environmental Planning

Once funding is secured, the environmental planning process can be initiated. The environmental process will build on the environmental work, public outreach, and agency outreach conducted by the North I-25 PEL Study and the *North I-25 EIS*.

To carry out any or all of the recommendations from this PEL, CDOT has committed to applying NEPA. Through the NEPA process, CDOT will conduct a tailored public involvement process and analyze specific resource impacts associated with the planned improvements for each project initiated under this PEL. Resources likely impacted include private property, parks and recreational resources, Waters of the U.S., and floodplains. The NEPA processes that would be anticipated could be either an Environmental Assessment (EA) or a Categorical Exclusion (CatEx).

CatExs are the most common NEPA documents and are for actions that do not individually or cumulatively have a significant environmental impact, are excluded from the requirement to prepare an EA or an EIS, and do not have substantial public controversy. CatExs are defined in 23 CFR 771.117 and meet the definition from the Council on Environmental Quality in 40 CFR 1508.4 and are based on the past experience with similar actions of FHWA.

An EA would be prepared and submitted through the successive review processes of CDOT Region 1, CDOT Environmental Programs Branch, and FHWA. The public would have 30 days to review and comment before FHWA makes its final decision. CDOT will consider use of a streamlined EA template for this project to accelerate the timeline for the environmental process, while still allowing for appropriate agency coordination and public involvement. If, at any point in the EA process, FHWA determines that the action would likely have a significant impact on the environment, that EA process would stop and the preparation of an EIS would be required. If FHWA agrees the action would have no significant impacts on the environment, FHWA would prepare a Finding of No Significant Impact to serve as the decision document for the proposed action.

6.2.3 Regional Planning

Once funding has been identified, a submittal application for inclusion in the *Metro Vision Fiscally Constrained Plan* can be made to DRCOG. DRCOG offers a twice yearly process for amendments to the *Metro Vision Fiscally Constrained Plan*. One amendment cycle typically begins in August ending in January, and a second cycle typically begins in January ending in August. The amendment process includes the determination of air quality conformity of the amended RTP and a public hearing prior to adoption by the DRCOG Board. The inclusion of planned improvements in the adopted RTP must occur before the signing of the environmental decision document. The applicant could be CDOT or a member government of DRCOG.

After inclusion in the RTP, the project is eligible for the TIP. The TIP identifies all federally funded transportation projects in the Denver region over a six-year period. The TIP is prepared every four years but is a dynamic document. As more project implementation details are known, the TIP is amended to modify current projects or to add new ones. Amendments are categorized as administrative and processed monthly, or policy, requiring approval by the DRCOG Board and processed quarterly.

6.2.4 Scoping, Preliminary and Final Design

After project funding has been identified and the project is included in the TIP, a planning level estimate is prepared to determine how much funding is needed for each project phase: ROW, Utilities, Environmental, Design and Construction.

A project scoping meeting can be held before or after the selection of a project delivery method to establish the project objectives; to identify the design standards, funding sources and amounts, the required resources necessary to complete the project, and the schedule; and to complete the preliminary survey request.

Once the project goals and constraints are defined, the delivery schedule, complexity, and innovation opportunities can be used to determine the appropriate project delivery method. These methods include Design-Bid-Build (DBB), Design-Build (DB), and Construction Management/General Contractor (CM/GC). A risk assessment will be conducted given each delivery method's opportunities and obstacles. Once the delivery method is selected, the level of design, contractor selection process, and participation can be initiated.

If the project delivery method is DBB, after the design level survey is received, the preliminary design phase of the project begins. A Field Inspection Review meeting is held to review the site conditions with 30% plans complete. The plans are reviewed with all of the specialty units, the local governments if applicable, and representatives from the utility companies to identify the tasks needed to complete the project. The preliminary cost estimate is developed and compared to the available budget. Once the design is at the stage that the ROW limits can be identified, plans can be prepared and acquisition initiated. Final Design proceeds until the Plans, Specification and Estimate package is 95% complete. A Final Office Review meeting is then completed to complete the review process. The project funding is then obligated and authorized once all clearances are obtained and then the project is advertised for construction.

If the project delivery method is DB and if the owners have the capabilities to perform the design effort, the plans are developed to approximately the 30% level to be used to select a DB team of designers and contractors to complete the project. An engineering firm may be contracted to develop the 30% design plans. The factors used in the selection of the DB team include qualifications, duration, price, and innovation.

Finally, if the project delivery method is CM/GC, the agency contracts separately with a designer and a construction manager. The agency can perform design or contract with an engineering firm to provide a facility design. A contractor is selected to give construction management input during the design process, perform construction management services and construction work. The CM/GC contractor will have the first rights to bid the project within the Guaranteed Maximum Price (GMP); otherwise, the project is advertised for competitive bidding.

6.2.5 Right-of-Way Acquisition

The limits of the existing ROW for the planned improvements will be determined from record information and field surveys. The preferred or final design alternatives will then be overlaid on the ROW base to determine impacts that will require additional ROW fee or easement acquisitions. When acquisitions are necessary, a title report is ordered and used to prepare property descriptions, exhibits, and ROW plans to support the acquisition process. Once these documents clearly define the impact, property appraisal is then ordered to determine the value of the property to be acquired. The acquisition process will commence after

all of this information has been compiled. Typically, the timeframe between identification and transfer of ownership takes about 18 months to meet all of the requirements of the Uniform Relocation Act. However, it may be possible to obtain possession earlier based on project needs. In worst cases, if the property is rendered unusable or if it is a total take, relocation services may be necessary.

6.2.6 Construction

Construction delivery options include DBB, CM/GC, and DB. CM/GC and DB typically provide shortened delivery times. These two delivery methods usually start the procurement process during the end stages of the environmental planning processes. The three delivery methods have different allocations of risk between the owner and contractor.

In the CM/GC process, CDOT contracts directly with the engineering consultant and, therefore, has more control over the design of the project, but also requires more robust coordination among CDOT, the engineer, and the contractor. In the typical DB process, CDOT releases most of the risk to the contractor in designing the project but also establishes a stricter contracting process, leading to a longer procurement time. In DB, the engineering consultant is a member of the contractor's team.

6.3 *Potential Funding Strategies*

There are many options worth exploring for suitability for funding planned improvements. These strategies require coordination and participation among local, state, and regional agencies. A concerted team effort will most likely result in successfully securing funds for the project. A champion to guide the effort is important.

The strategies outlined below are proposed for consideration. It is likely that a mix of the strategies will form a final funding package for the bridge replacement. A general assumption is that CDOT will directly provide about half of the approximately \$40 million project; these strategies would provide the remainder.

6.3.1 Cities along the Corridor

Cities along the corridor could directly dedicate funds from their Capital Improvement Programs.

6.3.2 North Area Transportation Alliance

Multiple north metropolitan jurisdictions and business and economic development organizations have joined together to focus on transportation issues. The mission of the North Area Transportation Alliance (NATA) and its TMO, Smart Commute Metro North, is to identify, develop, advocate, and lobby for transportation solutions that will enhance mobility, drive economic development, and reduce traffic congestion in the north metropolitan area.

NATA has identified north I-25 as its top transportation priority and its members are actively working to implement the recommendations identified in the North I-25 PEL.

6.3.3 Taxing District

A new nonprofit has undertaken the effort to investigate the feasibility of bringing together businesses and metropolitan jurisdictions to create a special taxing district in an area along the I-25 corridor that would have the ability to authorize bonds for infrastructure, streetscape, and other projects. A local authority with the ability to issue bonds would provide a structure for the local governments to partner with CDOT for

capitalizing the planned improvements. The authority would dedicate a small amount of its revenue for the planned improvements.

6.3.4 Regional Transportation District

The planned improvements will benefit RTD and RTD operations. For example, in 2015, the I-25 corridor express buses will have a managed lane from downtown Denver to the Wagon Road park-n-Ride at 120th Avenue. With this configuration, the express buses will need to weave across congested general purpose lanes to and from the park-and-ride slip ramps south of 88th Avenue. The implementation of a median bus station at 88th Avenue would greatly benefit the safety and the travel time of the express buses, and therefore reduce operating costs for RTD. A benefit-cost analysis by RTD could identify a reasonable amount of funds for contribution to the planned improvements by the transit agency, which would realize a long-term net savings.

6.3.5 State Infrastructure Bank

The State Infrastructure Bank (SIB) is in effect a bank funded by the state. It provides loans for infrastructure projects at a low rate of interest. For planned improvements, the SIB could provide the up-front capital to form a local match against CDOT dollars. The potential NATA Authority could then pay back the SIB by dedicating a small amount of its revenues over a period of several years.

6.3.6 High Performance Transportation Enterprise

The State formed the High Performance Transportation Enterprise (HPTE) to aggressively pursue innovative means of efficiently financing important infrastructure projects. The HPTE has an interest in the I-25 corridor as part of its planned expansion of the managed lane network in the Denver metropolitan area. Planned improvements will further the readiness of the corridor for an ultimate cross section, including managed lanes built to standard design specifications.

The HPTE has access to capital for innovative funding of projects that can be completed in a reasonable amount of time, allow more efficient movement of people and goods, and accelerate the economic condition of the State. For planned improvements included in this PEL, the HPTE could provide the up-front capital to form a local match against CDOT dollars. The potential NATA Authority could then pay back the HPTE by dedicating a small amount of its revenues over a period of several years.

6.3.7 Non-federal Dollars

CDOT has access to funds that are non-federalized. An example is the FASTER funds enabled by the SB09-108 legislation. These funds come with different restrictions than federal dollars, but are available for infrastructure improvement projects.

6.3.8 Value-Capture Area

A value-capture area could be defined for an area buffering the I-25 corridor. Within this area, a small portion of the State sales tax could temporarily be dedicated to paying back capital issued to the SIB, HPTE, or the potential NATA Authority; 2.5 percent of the total 2.9 percent sales tax is available for possible temporary diversion. The economic improvements that would be realized from reducing the congestion in a strategic corridor such as I-25 would raise the overall tax base, resulting in a long-term net benefit to the State. This option would require legislation to allow the sales tax to be used for this purpose.

6.3.9 Shadow Tolls

A shadow toll could be set up to structure the pay-back process of repaying the loans. For example, if the NATA Authority provides the initial capital, CDOT would repay NATA some or all of the funds. The rate of payment from CDOT to the NATA Authority to repay the loan is indexed based on observed traffic volumes on I-25 after the planned improvements have been made, over a period of several years until the loan is paid.

6.3.10 Public Private Partnership

A Request for Proposal would be issued and a concessionaire would issue the bond. The public partners (NATA, CDOT, HPTE, RTD) would then pay back the private entity through a scheduled payment plan or through a shadow toll.



This page intentionally left blank.

7.0 REFERENCES

- CH2MHill. 2000. *Niver Creek Tributary L Project Final Design Report*. January.
- City and County of Broomfield. 2005a. *City and County of Broomfield Comprehensive Plan*.
- City and County of Broomfield. 2005b. *Open Space, Parks, Recreation and Trails Master Plan*.
- City of Northglenn. 2010a. *Open Space Management Plan*.
- City of Northglenn. 2010b. *The Northglenn Comprehensive Plan*.
- City of Thornton. 2007. *City of Thornton Comprehensive Plan*.
- City of Thornton. 2009. *Thornton Parks and Open Space Master Plan* (approved in 2010).
- City of Westminster. 2001. *Trails Master Plan Map*.
- City of Westminster. 2008. *City of Westminster Comprehensive Plan*.
- City of Westminster. 2009. *Parks and Recreation Master Plan 2010 to 2014*.
- Colorado Department of Transportation (CDOT). 2005. *CDOT's Title VI and Environmental Justice Guidelines for NEPA Projects – Rev.3*. May 27.
- Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA). 2011a. *North I-25 Final Environmental Impact Statement*. August.
- Colorado Department of Transportation. 2011b. *North I-25 EIS Record of Decision (ROD)*. December.
- Colorado Department of Transportation. 2012. *Ramp Metering Feasibility Study – Denver Metro Area*. June.
- Colorado Department of Transportation. 2013. *Noise Analysis and Abatement Guidelines*. February.
- Colorado Division of Wildlife (CDOW). 2008. *CDOW Raptor Guidelines*. February.
- Colorado State Parks. 2012. Email correspondence from Melanie Gose dated March 13, 2012.
- Cowardin, L.M., et al. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. United States Fish and Wildlife Service. Biological Services Program; FWS/OBS-79/31.
- Denver Regional Council of Governments. 2011. *Metro Vision Regional Transportation Plan*.
- ERO Resources. 2008. *North I-25 EIS: Wildlife Technical Report*.
- Jacobs. 2008. *North I-25 Wetland Technical Report*. Prepared for the North I-25 EIS.
- Jacobs. 2011a. *Technical Memorandum: Environmental Justice*. Prepared for the North I-25 EIS.
- Jacobs. 2011b. *Technical Memorandum: Land Use Conditions and Impacts*. Prepared for the North I-25 EIS.
- Kiowa Engineering Corporation. 2001. *McKay Lake and Quail Creek Outfall Systems Planning Study Preliminary Design Report*. October.
- Natural Diversity Information Source (NDIS). 2011. Website:
<http://ndis.nrel.colostate.edu/conservationcnty.asp?cnty=031>.

- Olsson Associates. 2005. *Design Report for Rehabilitation Maintenance of Grange Hall Creek I-25 to Grant Drive*. August.
- Regional Transportation District. 2011a. *North Metro Corridor Final Environmental Impact Statement and Final Section 4(f) Evaluation*. January.
- Regional Transportation District. 2011b. *Record of Decision, North Metro Corridor Project, Denver, Commerce City, Thornton, Northglenn, and Adams County, Colorado*. April.
- Regional Transportation District. 2001. *North Metro Transportation Study*. October.
- United States Environmental Protection Agency. 2012. National Ambient Air Quality Standards. Available at: www.epa.gov/air/criteria.html/ (accessed February 2012).
- United States Fish & Wildlife Service (USFWS). 2011. Information, Planning, and Conservation System (IPaC) internet mapping tool website:
<http://ecos.fws.gov/ipac/wizard/trustResourceList!prepare.action>
- Wright Water Engineers Inc. 2007. *Outfall Systems Planning Update of Big Dry Creek Northern Tributaries: Conceptual Preliminary Design Report*. March.

