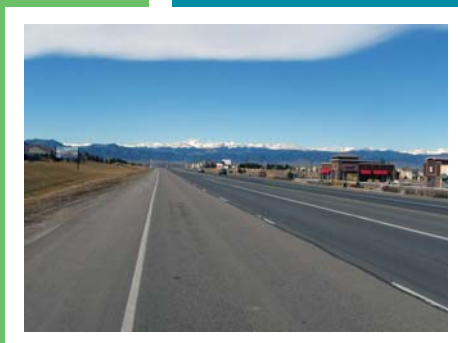
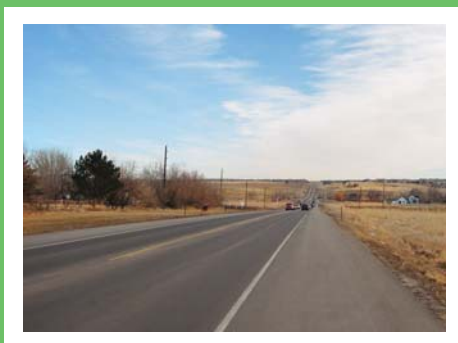


State Highway 7 Planning and Environmental Linkages (PEL) Study



February 2014



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CDR Associates

ArLand Land Use Economics
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**STATE HIGHWAY 7 (SH 7)
PLANNING AND ENVIRONMENTAL LINKAGES (PEL) STUDY**

CDOT PROJECT NO. STA 007A-012 (16725)

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LIST OF ACRONYMS AND ABBREVIATIONS

AM	morning
BGPA	Bald and Golden Eagle Protection Act
BNSF	Burlington Northern Santa Fe Railway
BMP	best management practice
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CPW	Colorado Department of Natural Resources Parks and Wildlife
CFR	Code of Federal Regulations
CLOMR	Conditional Letter of Map Revision
dB	decibels
DDI	diverging diamond interchange
DRCOG	Denver Regional Council of Governments
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FFS	free flow speed
FHWA	Federal Highway Administration
HCM	Highway Capacity Manual
HOT	high occupancy toll
HOV	high occupancy vehicle
I-25	Interstate 25
I-76	Interstate 76
IAR	Interstate Access Request
IGA	intergovernmental agreement
LOMR	Letter of Map Revision
LOS	level of service
LOSS	level of service of safety
LUST	leaking underground storage tank
MBTA	Migratory Bird Treaty Act
MP	milepost
mph	miles per hour
MS4	Municipal Separate Storm Sewer System
MUTCD	Manual of Uniform Traffic Control Devices
NEPA	National Environmental Policy Act
NPS	US Department of Interior National Park Service
NR-A	Non-Rural Principal Highway access category
NR-B	Non-Rural Arterial access category
NR-C	Non-Rural Arterial access category (least restrictive access category)
NRHP	National Register of Historic Places
O3	ozone
PDO	property damage only
PEL	Planning and Environmental Linkages
PM10	particulate matter less than 10 microns in size
PM	evening
PMT	project management team
R-A	Regional Highway access category
RAMP	Responsible Acceleration of Maintenance and Partnerships Program
ROD	Record of Decision
ROW	right-of-way



RTD	Regional Transportation District
RTP	Regional Transportation Plan
SH 7	State Highway 7
SHPO	State Historic Preservation Officer
SOV	single occupancy vehicle
STIP	Statewide Transportation Improvement Program
STP	Statewide Transportation Plan
SWMP	Stormwater Management Plan
TAZ	transportation analysis zone
TDM	travel demand management
TIP	Transportation Improvement Program
TSM	transportation system management
TWG	technical working group
UPRR	Union Pacific Railroad
US 36	US Highway 36
US 85	US Highway 85
US 287	US Highway 287
USACE	US Army Corps of Engineers
USDOT	US Department of Transportation
USEPA	US Environmental Protection Agency
USFWS	US Department of Interior Fish and Wildlife Service
v/c	volume to capacity ratio
VMT	vehicle miles traveled
vpd	vehicles per day

EXECUTIVE SUMMARY

Why is a Planning and Environmental Linkages (PEL) study being conducted for SH 7?



State Highway 7 (SH 7) is a critical east-west arterial in the roadway system serving the north Denver metro area, providing a connection between the major north-south highways of US 287, Interstate 25 (I-25), and US 85. Each of the communities on the corridor between Lafayette and Brighton is growing rapidly, and a major activity center is planned at the interchange of I-25/SH 7. In addition, a key station on the planned North Metro FasTracks Corridor will be located just north of SH 7 in the vicinity of Colorado Boulevard. These factors all contribute to the fact that SH 7 is expected to serve significantly greater travel demand in the future. Yet the corridor is one of much diversity, including both present and future land uses, physical characteristics of

the roadway, travel characteristics, and community goals. Hence, the Colorado Department of Transportation (CDOT) conducted this Planning and Environmental Linkages (PEL) study on SH 7 to establish existing conditions, to identify future transportation challenges (using the year 2035 as a planning horizon), and to create a vision that will serve as a blueprint for future multimodal transportation improvements in this approximately 16-mile corridor. This study developed a Recommended Alternative for multimodal transportation improvements along the entire length of the corridor and presents an approach to the prioritization and funding of those improvements.

What are the purposes of the improvements?

The purposes of the recommended transportation improvements in the SH 7 corridor are to improve safety, reduce existing and future traffic congestion, provide efficient access for existing and future development, and improve multimodal mobility and connectivity along the corridor.

Why are the improvements needed?

Transportation improvements are needed along SH 7 to address:

- ▶ **Safety Problem:** Several intersections along the SH 7 corridor experience a higher than expected number of rear-end and approach turn/broadside crashes, primarily due to traffic congestion that occurs at these intersections.
- ▶ **Traffic Operational Problem:** Traffic operations along the corridor are inadequate today and are expected to worsen by 2035 due to local and regional population and employment growth.
- ▶ **Access Problem:** Access as currently provided and designed contributes to traffic operational and safety deficiencies in the corridor. Furthermore, the access currently provided and allowed does not meet the needs of existing and future planned development (both near-term and by 2035) along the corridor.
- ▶ **Alternative Travel Modes Problem:** Infrastructure for and connectivity among alternative travel modes do not meet the existing or future (2035) needs of the communities along SH 7.

Section 1.4 provides more information on the need for improvements in the corridor.

How was the public involved in the SH 7 PEL study?

Coordination with all affected governmental agencies and input from the public were important throughout the PEL study. Key elements of the agency coordination and public involvement program took many forms, as described below:

- ▶ Conducting early in the planning process a series of agency scoping meetings with local, state, and federal resource agencies; local municipalities; and CDOT.
- ▶ Conducting regular coordination meetings approximately monthly with a Technical Working Group (TWG) to provide a forum for discussion and guidance in the decision-making process. The TWG included representatives from Federal Highway Administration (FHWA), CDOT Environmental Programs Branch, CDOT Region 4, CDOT Region 6, Adams County, Boulder County, Weld County, City and County of Broomfield, City of Boulder, City of Lafayette, Town of Erie, City of Thornton, City of Brighton, Regional Transportation District (RTD), and Denver Regional Council of Governments (DRCOG).
- ▶ Establishing small working groups to efficiently address key issues that primarily affected a subset of the communities in the corridor.
- ▶ Inviting elected officials in the corridor to participate in two workshops to provide input on the corridor vision and to review the Recommended Alternative.
- ▶ Conducting open houses with the general public at two key points in the process to provide information on the existing corridor conditions, purpose and need, alternatives development and evaluation process, and identification of the Recommended Alternative. Each time, one open house was held in the east end of the corridor and another was held in the west end.
- ▶ Hosting community presentations and meetings with local neighborhood and business groups to address concerns and to field questions about the study.
- ▶ Establishing a website that was regularly updated to provide public access to information on the project.

Chapter 6.0 includes a more detailed description of the agency coordination and public involvement program.

How was the Recommended Alternative identified?

The study used a thorough four-level evaluation process to develop and evaluate alternative improvements (**Chapter 2.0**), beginning with the development of a broad range of corridor-wide elements and the identification of a series of evaluation criteria. The process started with a full complement of ideas and improvements focusing on cross-sectional elements by mode (roadway, transit, bicycle and pedestrian), access categories, I-25/SH 7 interchange options, possible realignments for the western and eastern sections of the SH 7 corridor, and transportation system management (TSM) and travel demand management (TDM) elements. Early levels of the process evaluated the alternatives with the broadest criteria. As the list of alternatives was refined in subsequent levels of evaluation, the

Categories of Evaluation Criteria

- ▶ Safety
- ▶ Access
- ▶ Traffic Operations
- ▶ Alternative Travel Modes
- ▶ Community
- ▶ Environmental and Cultural Resources
- ▶ Implementability

criteria similarly became more defined. To meet the needs and desires of the communities along the corridor, the cross-sectional elements were evaluated and combined to create cross-sections in defined segments of the corridor, each with its unique characteristics. The cross-sections were then combined with the other elements and refined to develop the Recommended Alternative.

What improvements are included in the Recommended Alternative?

The improvements included in the Recommended Alternative (**Chapter 3.0**) were developed segment by segment and were then combined to ensure consistency and compatibility throughout the corridor. However, each segment includes common elements, as appropriate. Common elements include intersection improvements (turn lanes); transit amenities (stops, shelters) and priority treatments (queue jumps, signal priority); bicycle improvements (signing, striping); and pedestrian crossing treatments (crosswalks, signals). The following sections describe the unique recommendations for each roadway segment and for other elements of the Recommended Alternative.

Roadway Cross-sections

Segment 1: US 287 to 119th Street

Segment 1 is the section of SH 7 that runs through the developed area of Lafayette. Because of the sensitive nature of many of the adjoining land uses (single family residences, small businesses, and a community school) and the constricted right-of-way (ROW) (approximately 60 feet), the roadway cross-section, for the most part, will remain unchanged, providing one travel lane in each direction. West of Public Road, the turn lanes that exist will remain, and all signalized intersections will be retained. East of Public Road, the two-lane cross-section with bike lanes will remain, with two possible exceptions. In the future, consideration will be given to minor widening in the vicinity of the intersections at Iowa Avenue and at Burlington Avenue to provide left turn lanes, a roundabout or other intersection improvements to enhance safety and efficiency of turning vehicles, including school buses at the Iowa intersection, and to retain the bike lanes.

Segment 2: 119th Street to Sheridan Parkway

Segment 2 will be expanded to two 12-foot (ft) travel lanes in each direction, a center median, and 12-ft shoulders on each side. However, the character of the roadway will differ in two portions of Segment 2. From 119th Street to a relocated County Line Road, the design will retain a rural character; thus, the 12-ft median will be painted and roadside ditches instead of curb and gutter will handle drainage. From County Line Road to Sheridan Parkway, the character of the road will be more urban. Hence, there will be a 16-ft raised median, and there will be curb and gutter on the outside edge of the shoulders. Throughout Segment 2, bike lanes will be provided on the shoulders, and shared use paths (for both bicyclists and pedestrians) will be provided.

Segment 3: Sheridan Parkway to York Street

Segment 3, which includes the interchange with I-25, will experience the greatest amount of growth projected in the corridor. By 2035, Segment 3 will require three 12-ft travel lanes in each direction. In addition, the design will include a 30-ft raised median to accommodate double left turn lanes at key intersections. The section will also include 12-ft shoulders/bike lanes, curb and gutter, and 10-ft shared use paths on both sides of the road, as illustrated in **Figure ES.1**.

Figure ES.1 Typical Cross-section – Segment 3



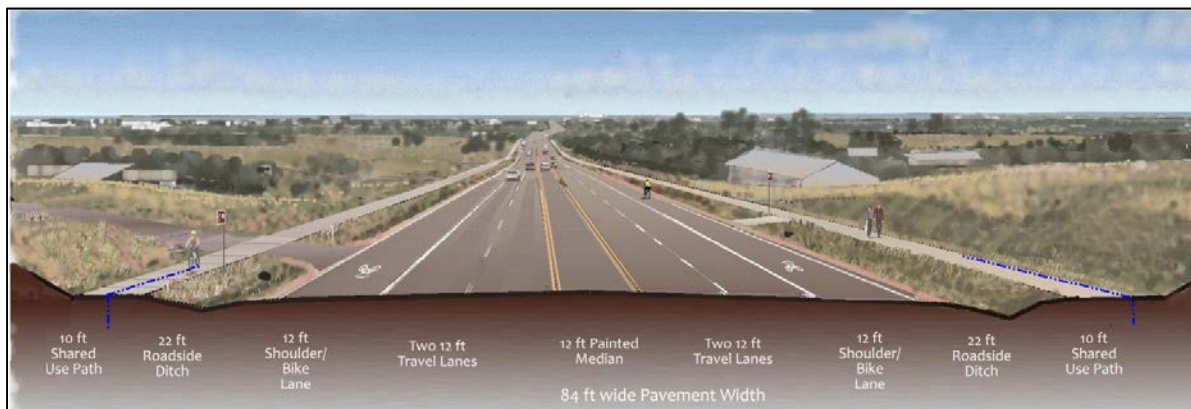
Segment 4: York Street to Holly Street

The 2035 traffic projections on Segment 4 indicate a need for two travel lanes in each direction. Because of the type of development expected in this area, the cross-section will also include 12-ft shoulders with bike lanes, curb and gutter, and 10-ft shared use paths. It should be noted that the post-2035 development projections, which include significant transit-oriented development in the vicinity of the future station on the North Metro FasTracks Corridor, suggest that three travel lanes in each direction may be needed from the relocated Colorado Boulevard intersection west to York Street. Hence, it is recommended that sufficient ROW be preserved for such future widening.

Segment 5: Holly Street to US 85

Much of the development along Segment 5 is expected to be low density residential in nature (single family homes). The communities would prefer to retain a rural character in this section of the corridor. Therefore, the recommended cross-section will include two 12-ft travel lanes in each direction, a painted median, 12-ft shoulders/bike lanes, roadside ditches for drainage, and 10-ft shared use paths (**Figure ES.2**). To minimize bridge needs, the median will not be carried across the bridge over the South Platte River. On the easternmost portion of Segment 5, from Miller Avenue to US 85, the cross-section narrows to an urban section without shoulders to reflect the restricted ROW in this area.

Figure ES.2 Typical Cross-section – Segment 5



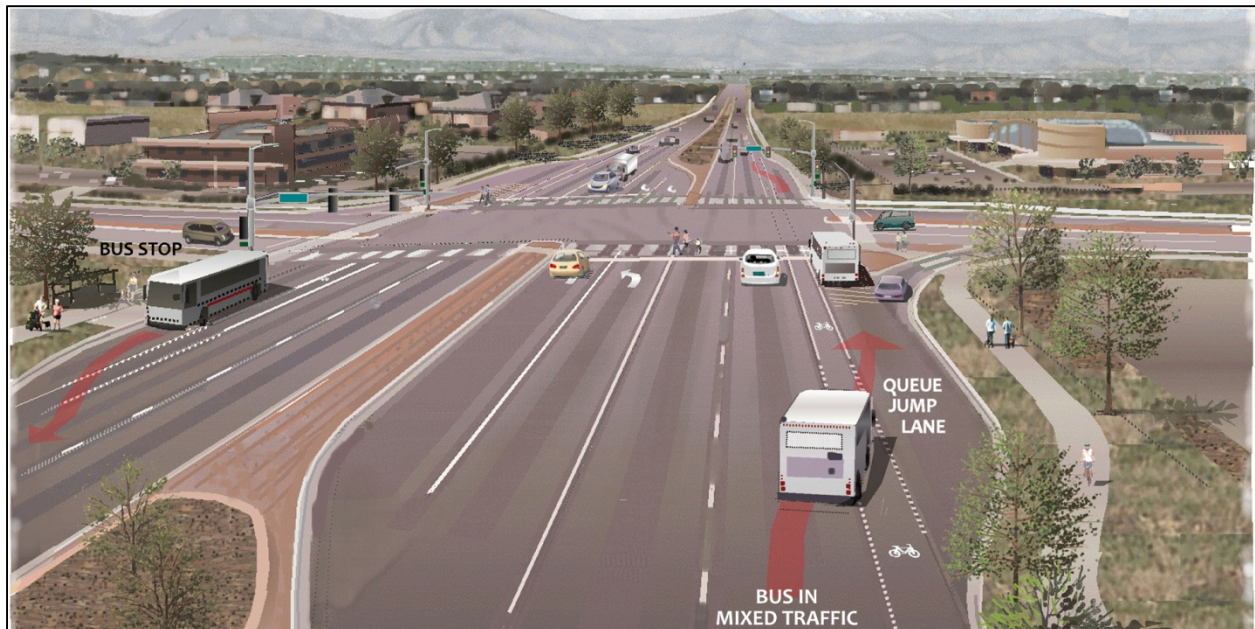
To accommodate these future cross-sections, it is recommended that 170 feet of ROW be preserved for the four-lane segments and 190 feet be preserved for the six-lane segments.

Transit

With the exception of a short segment of SH 7 in Lafayette, no transit service currently operates along the SH 7 study corridor. However, to accommodate future transit service in the corridor and connectivity to the planned regional transit service along I-25, the Recommended Alternative includes the following:

- ▶ The installation of transit amenities (such as bus stops and shelters) should be coordinated with RTD to best accommodate near-term and long-term transit service in the corridor.
- ▶ Sidewalks or shared use paths should connect directly to transit amenities.
- ▶ Queue jump lanes should be implemented at major signalized intersections to allow buses to bypass queued vehicles at the intersection approach, as shown in **Figure ES.3**.
- ▶ The standard width of the shoulder for the roadway cross-section was extended from 10-ft to 12-ft to allow for potential use in the future for bus/high occupancy vehicle (HOV) hard shoulder running lanes.
- ▶ The I-25/SH 7 interchange and the area in the vicinity of the station (near Colorado Boulevard) on the North Metro FasTracks Corridor should be designed to maximize pedestrian access to these regional transit facilities and to best facilitate connections between local service along SH 7 and the regional transit services along I-25 and the North Metro FasTracks Corridor.

Figure ES.3 Illustrative Example of Intersection with Queue Jump Lanes



Bicycle and Pedestrian Accommodations

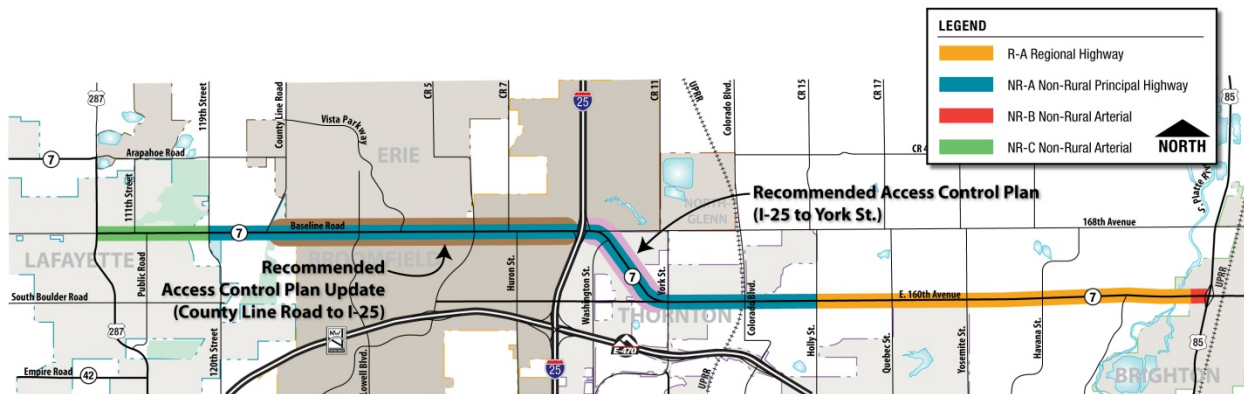
The Recommended Alternative includes bicycle and pedestrian facilities along the full length of the SH 7 corridor to accommodate different types of bicyclists and pedestrians. Along most of the corridor, a 12-ft shoulder is recommended. Bicyclists who are comfortable riding adjacent to motorized traffic can use this 12-ft shoulder. The Recommended Alternative also includes 10-ft shared use paths along most of the corridor to accommodate less confident bicyclists, as well as pedestrians.

All signalized intersections along the corridor will include at-grade crossing treatments to enhance the safety and convenience for bicyclists and pedestrians. In addition to the at-grade intersection crossing enhancements, the Recommended Alternative identifies five potential locations for bicycle/pedestrian underpasses that will be accommodated in the roadway design.

Access Recommendations

CDOT assigns access categories to all state highways, which correlate to the access spacing and design standards in the State Highway Access Code. Only one change to the assigned access categories is recommended: the category on the segment from I-25 east to Holly Street should change from R-A to NR-A. This would result in the categories illustrated by **Figure ES.4**. Also, as shown on **Figure ES.4**, an update to the existing Access Control Plan among the Town of Erie, City and County of Broomfield, and CDOT is recommended from County Line Road to I-25 to address the communities' current development plans. In addition, development of an Access Control Plan is recommended among the City and County of Broomfield, City of Thornton, Adams County, and CDOT from I-25 to York Street.

Figure ES.4 Recommended Access Categories



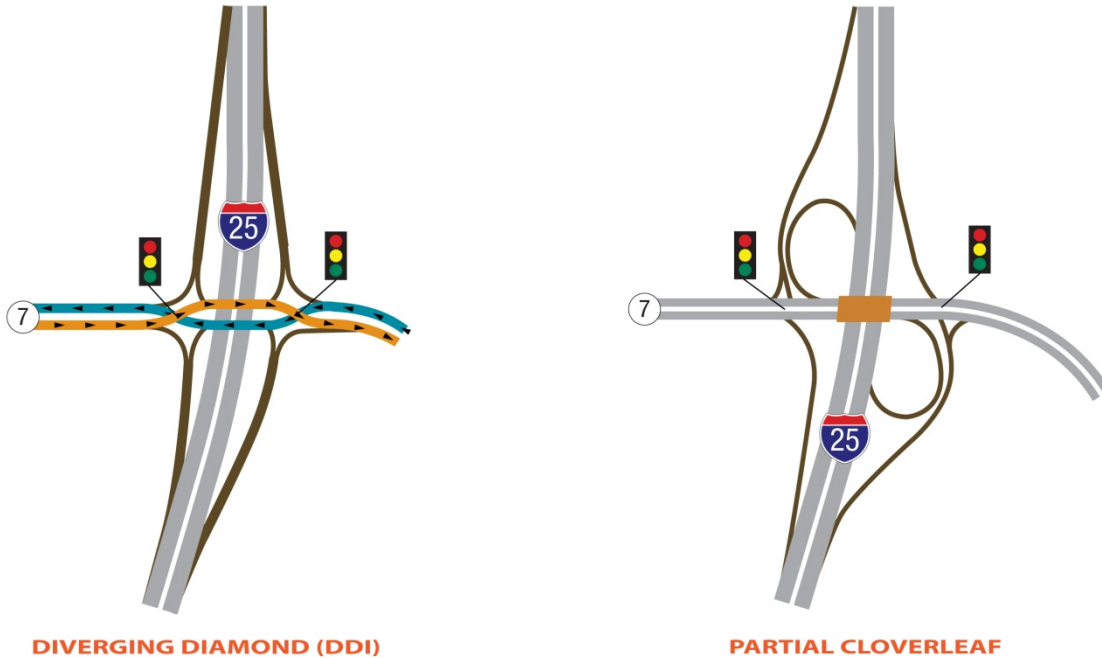
I-25/SH 7 Interchange

Phase 1 of the Preferred Alternative selected in the North I-25 Record of Decision includes a partial cloverleaf configuration of the I-25/SH 7 interchange. Subsequently through the SH 7 PEL process, an optional concept for an improved interchange at this location was proposed for evaluation. The diverging diamond interchange (DDI) concept is a recently emerging interchange type aimed at handling heavy turning movements at an interchange more cost-effectively. During this planning process, the communities and the general public expressed considerable support for a DDI.

After conducting a comparative analysis, it is recommended that the DDI alternative be retained as a viable option in addition to the partial cloverleaf, as illustrated in **Figure ES.5**. A National Environmental Policy (NEPA) Document Reevaluation (CDOT Form 1399), a System Level Study (CDOT 1601) and an

Interstate Access Request (IAR) with CDOT and FHWA approval will be required before either the partial cloverleaf interchange or the DDI can be implemented.

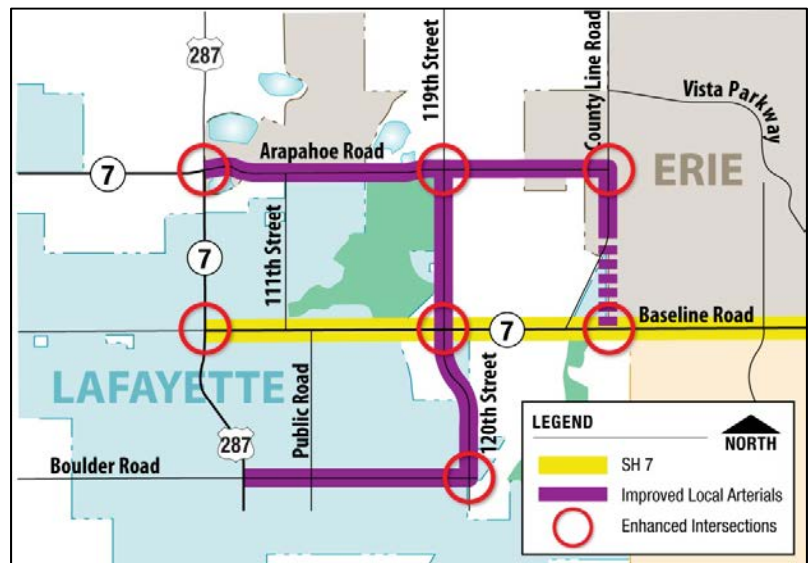
Figure ES.5 I-25/SH 7 Interchange Options



West End Concept Plan

Throughout this study, the Town of Erie, the City of Lafayette, Boulder County, and CDOT worked collaboratively to develop and agree on a conceptual plan for improvements in the west end of the SH 7 project corridor (**Figure ES.6**). This conceptual plan keeps SH 7 on its current alignment and improves a series of intersections and local arterial roads to make a supporting network that provides alternate routes for traffic to disperse through this area. The plan includes a relocated SH 7/County Line Road intersection with a new County Line Road alignment in a due north-south direction and improvements, as necessary, to existing County Line Road, 119th Street, 120th Street, Arapahoe Road, and South Boulder Road (Boulder Road).

Figure ES.6 West End Concept Plan



How will the proposed improvements be prioritized for implementation?

Experience has shown that an articulate and a thoughtful implementation plan will help increase the probability of funding success for a project. Keys to successful project prioritization include good information, collaboration, broad support, and readiness to proceed to construction. With this understanding, the study team developed a project prioritization process that is easy to use, objective, and easy to replicate (**Chapter 7.0**).

The process began with the appropriate identification of potential projects, which was completed with the assistance of CDOT and the local entities. After projects were identified, the study team evaluated each project using a series of defined criteria based on corridor stakeholder goals and objectives. To simplify the evaluation, the approach was more qualitative than quantitative, though the study team used the extensive information available through this PEL study in rating projects. This evaluation was designed to provide decision-makers the key information required to effectively understand the project, its benefits, and the readiness to encumber transportation funds; this information also allows them to match projects with the chosen strategy for implementation.

Project Strategies

- ▶ Keep projects advancing
- ▶ Focus on intersections first
- ▶ Enhance transit
- ▶ Preserve right-of-way
- ▶ Maximize the use of incremental investments

To be effective, this action plan must remain dynamic, reflecting current conditions and goals and objectives. Because the full corridor has been evaluated during this phase of work, the initial evaluations will need to be reviewed regularly to ensure that the data used in the evaluation are current.

How does the PEL study relate to future NEPA requirements?

This PEL study provides the framework for the long-term implementation of the Recommended Alternative as funding becomes available. The study has identified issues that will require additional evaluation in any future NEPA documentation and can be used as a resource for such future documentation.

The identification of a Recommended Alternative for the entire corridor in this PEL study is consistent with the FHWA's objective of analyzing and selecting transportation solutions on a broad enough scale to provide meaningful analysis and avoid segmentation. Clearly, due to funding constraints, the improvements included in the Recommended Alternative will be implemented in phases over time. Each phase will require an appropriate level of NEPA analysis and documentation. As this work is conducted, each phase should meet these criteria:

- ▶ **Independent Utility/Logical Termini:** Each phase should have independent utility and logical termini to the extent that the phase provides a functional transportation system even in the absence of other phases.
- ▶ **Elements of Purpose and Need:** Each phase should contribute to meeting the purpose and need for the entire project.
- ▶ **Environmental Impacts:** Individual phases should avoid the introduction of substantial additional environmental impacts that cannot be mitigated.

1.0 INTRODUCTION AND PURPOSE AND NEED

This report presents the results of a Planning and Environmental Linkages (PEL) study conducted to assess existing conditions, to identify anticipated problem areas, and to develop and evaluate multimodal improvements to reduce congestion, improve operations, and enhance the safety of State Highway 7 (SH 7) between US Highway 287 (US 287) in the City of Lafayette and US Highway 85 (US 85) in the City of Brighton. The Colorado Department of Transportation (CDOT), in cooperation with the Federal Highway Administration (FHWA), prepared this PEL study in accordance with FHWA and CDOT PEL guidance for improving and streamlining the environmental process for transportation projects by conducting corridor planning activities before the start of the National Environmental Policy Act (NEPA) process.

PEL studies and the potential transportation projects under review do not need to be in the fiscally-constrained *2035 Metro Vision Regional Transportation Plan* (DRCOG, 2007; as amended) and can be initiated at any time. Traffic analysis is generally required for the anticipated opening year and the long-range planning horizon year (2035). Construction funding must be identified to meet fiscal-constraint before FHWA and CDOT can approve further NEPA documentation. This PEL study is intended to provide the framework for future NEPA processes once funding is available.

The study team prepared a separate *SH 7 PEL Corridor Conditions Assessment Report* (see **Appendix A**) to document current and future conditions of the SH 7 corridor with regard to land use, the transportation system, and environmental resources (CDOT, 2012a). The information presented in the *SH 7 PEL Corridor Conditions Assessment Report* was the basis for developing and evaluating possible transportation improvements in the corridor.

FHWA defines PEL as a voluntary approach to transportation decision-making that considers environmental, community, and economic goals early in the planning stage and carries them through project development, design, and construction (FHWA, 2008). The PEL process can lead to a better decision-making process that minimizes duplication of effort, promotes environmental stewardship, and reduces delays in project delivery (CDOT, 2013).

The FHWA PEL questionnaire is intended to act as a summary of the PEL process and to be used for the transition from the planning study to a NEPA analysis. The PEL questionnaire for the SH 7 study is included in **Appendix B**.

The following NEPA process principles were followed for this PEL:

- ▶ Preparation of a purpose and need statement
- ▶ Evaluation of alternatives and identification of a Recommended Alternative
- ▶ Evaluation of environmental impacts and conceptual mitigation strategies
- ▶ Coordination with federal, state, and local agencies
- ▶ Public involvement

NEPA establishes a mandate for federal agencies to consider the potential environmental consequences of their proposed action, to document the analysis, and to make the information available to the public for comment before implementation.

1.1 Study Location and Description

SH 7 is an east-west principal arterial roadway that is under CDOT jurisdiction. SH 7 spans approximately 25 miles between US Highway 36 (US 36) on the west and US 85 on the east in the northern portion of the Denver metropolitan area. SH 7 provides access to many major north-south roadways, including US 85, Interstate 25 (I-25), US 287, and US 36 (**Figure 1.1**).

The study area extends approximately 16 miles along SH 7 from the intersection of Arapahoe Road/SH 7/US 287 (milepost [MP] 60.68) on the north side of the City of Lafayette to US 85 (MP 76.98) on the west side of the City of Brighton (**Figure 1.2**). East of I-25, the study area extends approximately 2 miles north of SH 7 to include 168th Avenue, with E-470 as the southern boundary. The study area included 168th Avenue as an alternate east-west roadway east of I-25 that runs parallel to SH 7. West of I-25, the study area extends approximately 1 mile north of SH 7, with Northwest Parkway as the southern boundary.

1.2 Purpose

The purposes of the proposed transportation improvements in the SH 7 corridor are to improve safety, reduce existing and future traffic congestion, provide efficient access for existing and future development along the corridor, and improve multimodal mobility and connectivity.

1.3 Need

These transportation improvements are needed to address:

- ▶ **Safety Problems:** There is a higher than expected number of certain crash types at several intersections along the SH 7 corridor, primarily due to traffic congestion that occurs at these intersections.
- ▶ **Traffic Operational Problems:** Traffic operations along the corridor are inadequate today and are expected to worsen by 2035 due to local and regional population and employment growth.
- ▶ **Access Problems:** Access as currently provided and designed contributes to traffic operational and safety deficiencies in the corridor. Furthermore, the access currently provided and allowed does not meet the needs of existing and future planned development (both near term and by 2035) along the corridor.
- ▶ **Alternative Travel Modes Problems:** Infrastructure for and connectivity among alternative travel modes do not meet the existing or future (2035) needs of the communities along SH 7.

Figure 1.1 Study Corridor and Vicinity Map

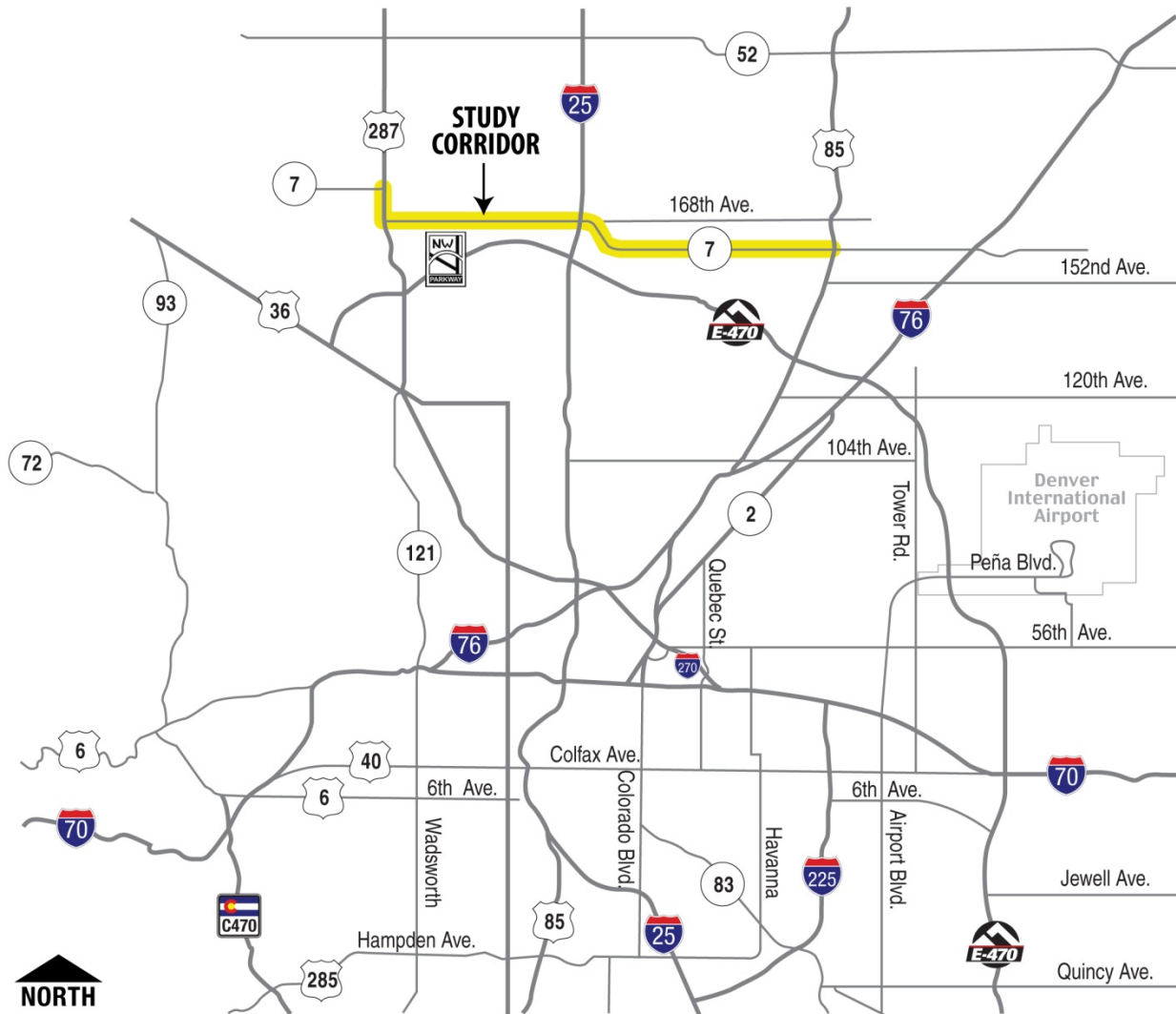
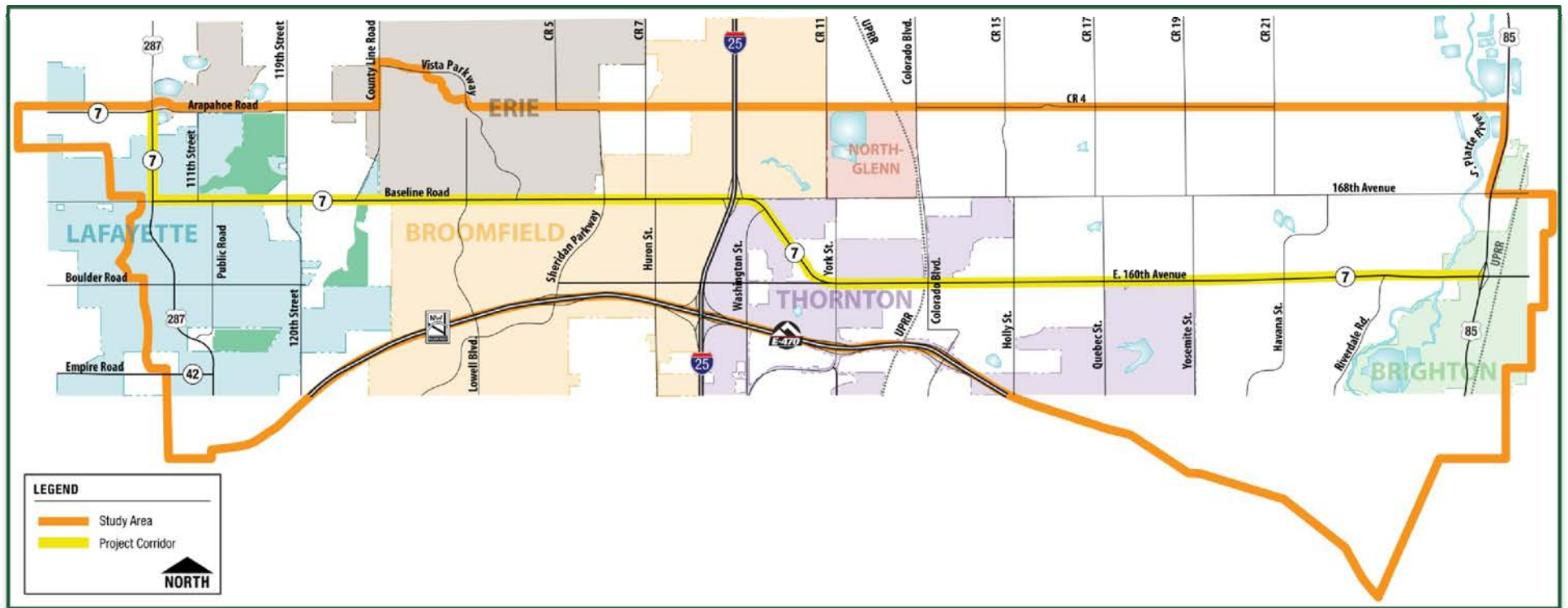


Figure 1.2 Study Area





Differential speeds and short auxiliary lanes contribute to a high number of rear-end crashes.

Safety

The crash history for a recent three-year period (January 1, 2008, through December 31, 2010) reveals that there were 675 reported crashes in the study corridor. As shown in **Figure 1.3**, most crashes (about 90 percent) were property damage only (PDO) crashes. Of the remaining crashes, there were 61 injury crashes and 2 fatal crashes. Both fatal crashes occurred in 2008; one involved a broadside crash at the SH 7/Holly Street unsignalized intersection, and the other a sideswipe crash of two vehicles traveling in opposite directions east of Quebec Street on SH 7. Through the public involvement process, the study team learned of another fatal crash that occurred on the corridor in December 2012 at the intersection of SH 7 and Mountain

View Boulevard. The crash involved two pedestrians who were struck by a southbound to westbound right turning vehicle. One of the pedestrians was severely injured and the other died.

Rear-end type crashes were the predominant crash type (52 percent), followed by broadside type crashes (15 percent).

Safety analyses indicate that some intersections along SH 7 experience higher than expected rear-end and approach turn/broadside crashes when compared to other similar facilities. This comparison was completed using CDOT diagnostic norms based on location (urban versus rural), number of approach lanes, traffic control, and the number of approach legs. **Figure 1.3** shows the significant crash types (higher than expected number of crashes by crash type) for each intersection.

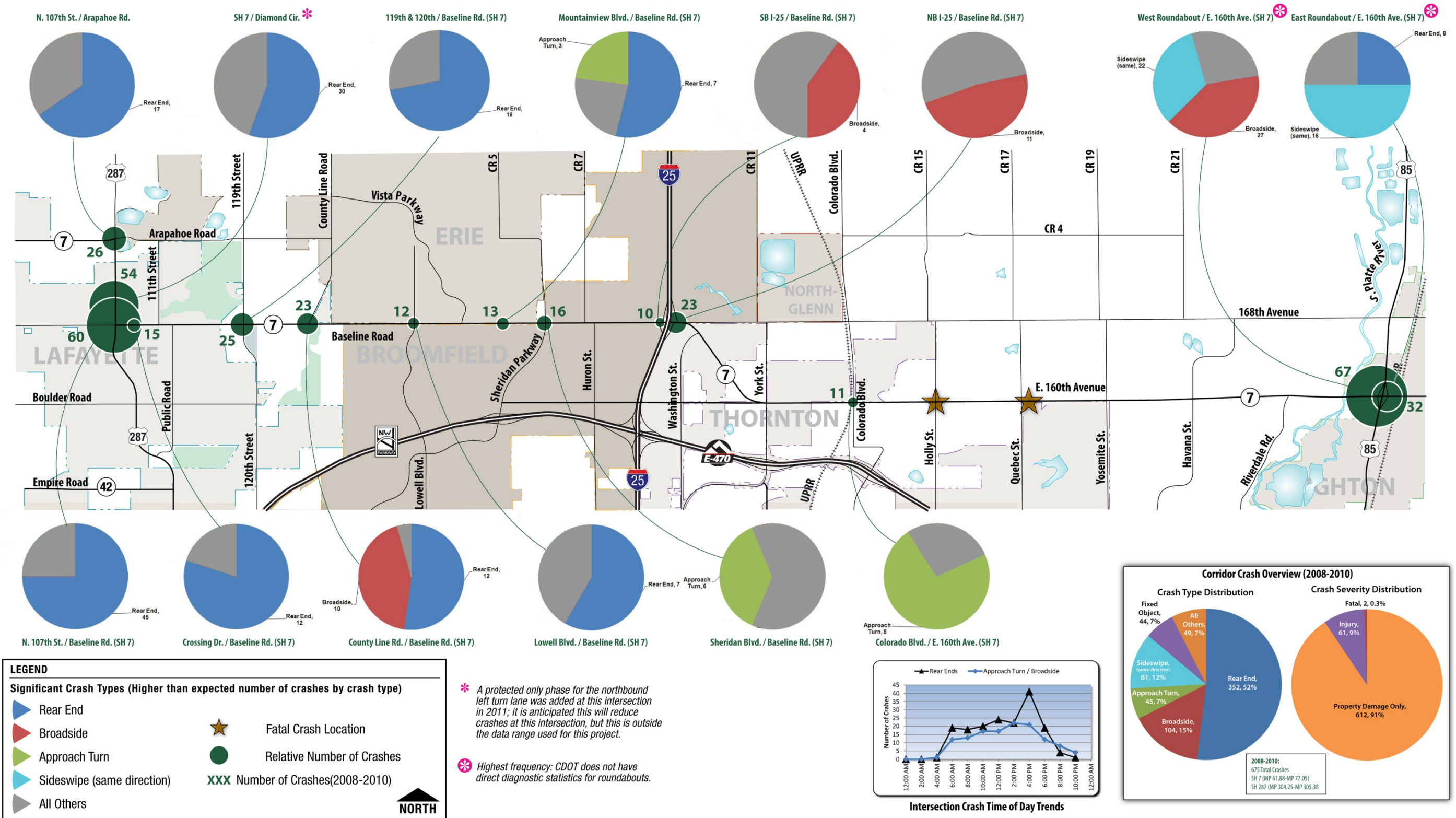
Based on the predominant observed crash patterns, it appears that the lengths of auxiliary lanes at some intersections are too short, resulting in rear-end crashes due to turning queues blocking through traffic during the morning (AM) and evening (PM) peak hours. In addition, the posted speed limits along SH 7 vary from 55 to 60 miles per hour (mph) in rural areas, 40 to 50 mph in suburban areas, and 30 to 40 mph in more urban areas. Speed differentials between vehicles traveling at or above the posted speed and stopped or slow moving vehicles queued at intersections result in rear-end crashes, especially during the AM and PM peak hours.

Finally, an approach turn crash occurs when one vehicle unsafely turns left in front of a vehicle traveling in the opposite direction, resulting in a front to side collision. Infrequent and small gaps in oncoming traffic for left-turning vehicles and the lack of protected left turn movements at most intersections along the corridor result in a high number of approach turn/broadside crashes.



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Figure 1.3 Safety



LEGEND

Significant Crash Types (Higher than expected number of crashes by crash type)

- Rear End
- Broadside
- Approach Turn
- Sideswipe (same direction)
- All Others

★ Fatal Crash Location
● Relative Number of Crashes
XXX Number of Crashes(2008-2010)

NORTH

* A protected only phase for the northbound left turn lane was added at this intersection in 2011; it is anticipated this will reduce crashes at this intersection, but this is outside the data range used for this project.

* Highest frequency: CDOT does not have direct diagnostic statistics for roundabouts.

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Traffic Operations

The existing daily traffic volumes along SH 7 range from about 11,400 vehicles per day (vpd) on the west end of the study area through Lafayette to 22,000 vpd in the vicinity of I-25. Daily traffic volumes through Broomfield and Erie are approximately 18,000 to 19,000 vpd, while through Adams County and Thornton daily volumes are about 15,000 vpd.

As shown on **Figure 1.4**, most major intersections along the corridor are signalized, and most of these intersections operate well during the AM and PM peak hours. Three intersections (SH 7/US 287/Baseline Road, SH 7/US 287/Arapahoe Road, and SH 7/119th Street), however, currently experience long delays and queues reflective of level of service (LOS) E or F during the AM and/or PM peak hours.

Figure 1.4 identifies these intersections as existing traffic operations hot spots.

The unsignalized intersections along SH 7 are two-way stop-controlled, with the exception of the on and off-ramp intersections at US 85 that are designed as roundabouts. Due to the amount of through traffic on SH 7 during the peak hours, drivers from the side streets at unsignalized intersections have difficulty finding gaps in traffic and, therefore, experience increased delays.

Due to the forecasted household and employment growth along the SH 7 corridor and the surrounding area, traffic volumes through the corridor are projected to increase substantially. By 2020 the traffic volumes in most of the corridor are expected to exceed the existing capacity. The only exceptions are the eastbound section of the study area between Sheridan Parkway and Lowell Boulevard and the westbound section of the study area between Riverdale Road and Havana Street. Both of these sections have two lanes in each direction, providing adequate capacity for the 2035 travel demands.

In some sections of the corridor, the travel demand is projected to more than double by 2035. If no operational improvements are made to the corridor, most signalized intersections are projected to be over capacity in both the AM and PM peak periods. Most of these future traffic operations hot spots are locations where regional arterials that provide north-south connectivity through the area intersect with SH 7. The traffic volumes on these regional facilities are also projected to increase, which will result in intersections that are over capacity. As congestion at intersections increases, travel times also increase, and corridor travel speeds are reduced. As traffic increases along the corridor, turning movements from unsignalized intersections and accesses onto SH 7 will become increasingly more difficult.

Traffic Operations Level of Service (LOS) Categories

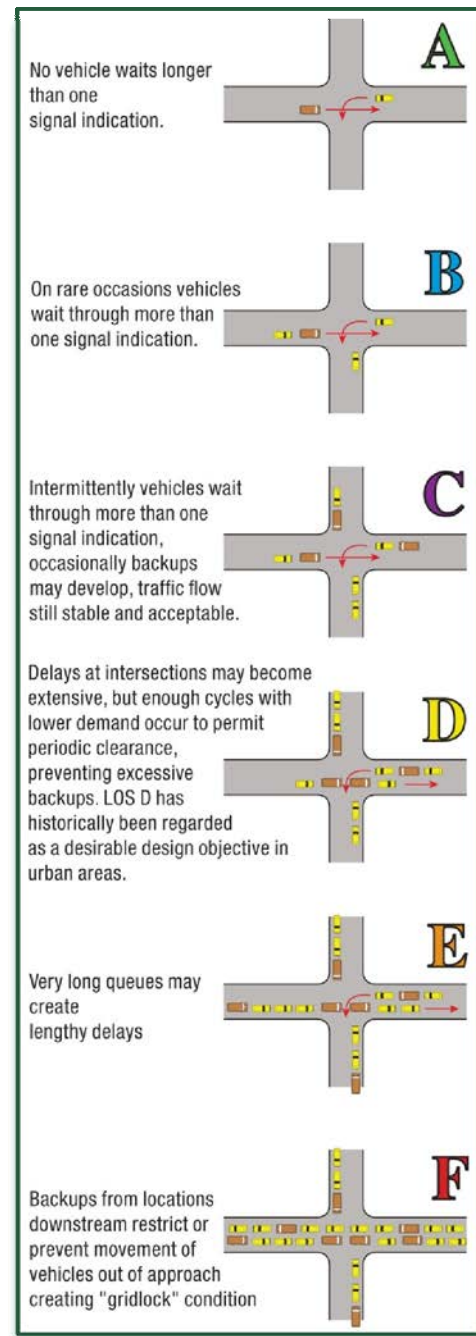
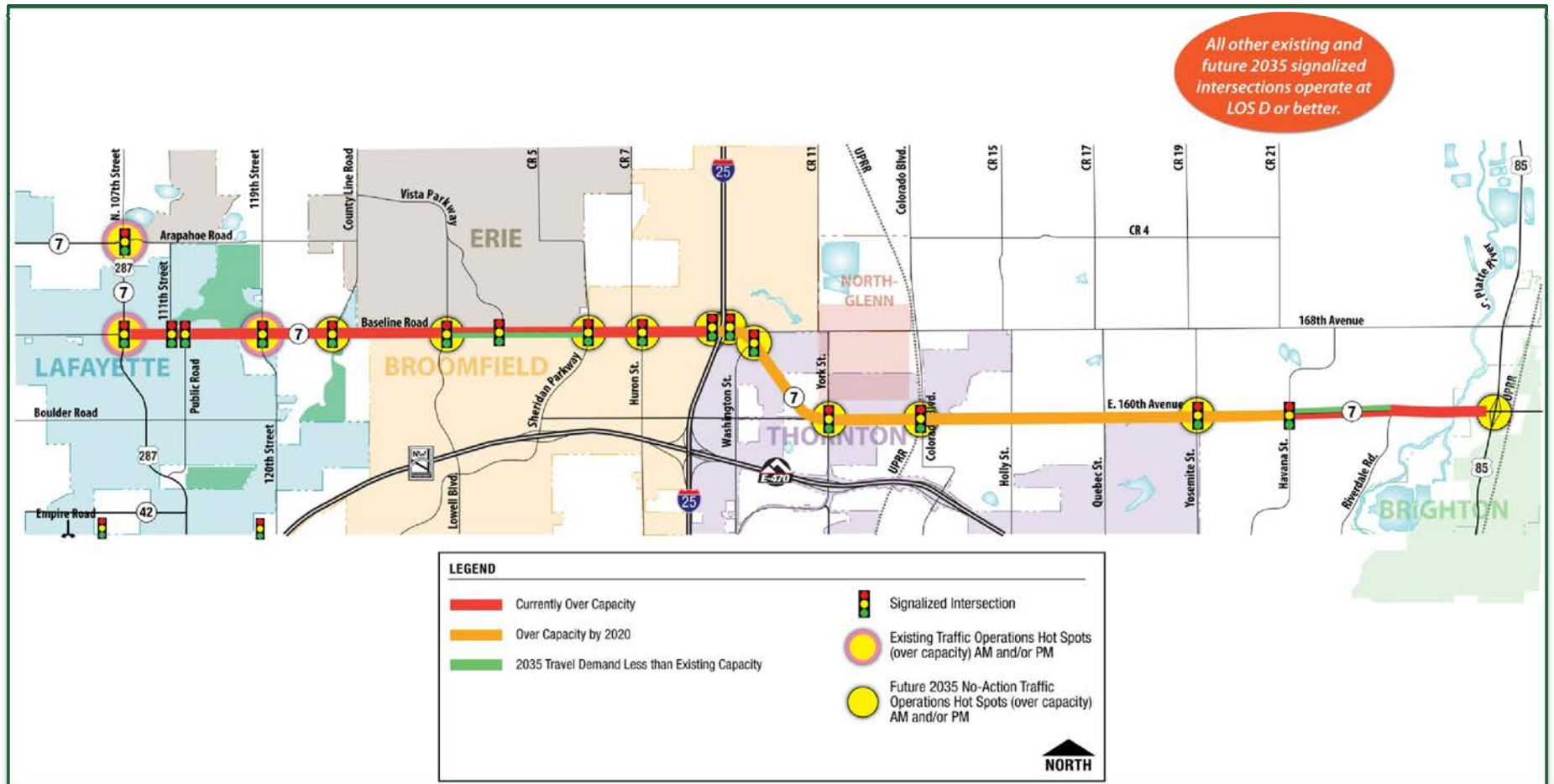


Figure 1.4 Traffic Operations



Access

Some existing accesses to SH 7 are closely spaced along the corridor and are not designed to appropriate standards for roadway geometry, which contributes to safety and traffic operational issues in the corridor.

In addition, the applicable access standards vary across the corridor. CDOT currently categorizes SH 7 east of I-25 as a Regional Highway (R-A). Most of the western half of the corridor is categorized as Non-Rural Principal Highway (NR-A), which is similar to R-A, but for more urban/suburban settings. R-A and NR-A are the highest access categories along the corridor (and the most restrictive in terms of allowable access). A small segment of SH 7 in Brighton is categorized as Non-Rural Arterial (NR-B). The segment through Lafayette is Non-Rural Arterial (NR-C), which is the least restrictive category and is generally assigned to state highway segments in downtown areas. **Figure 1.5** includes the characteristics of each access category and depicts these locations along the corridor.

Access category means one of eight categories described in the State Highway Access Code to determine the degree to which access to a state highway is controlled.

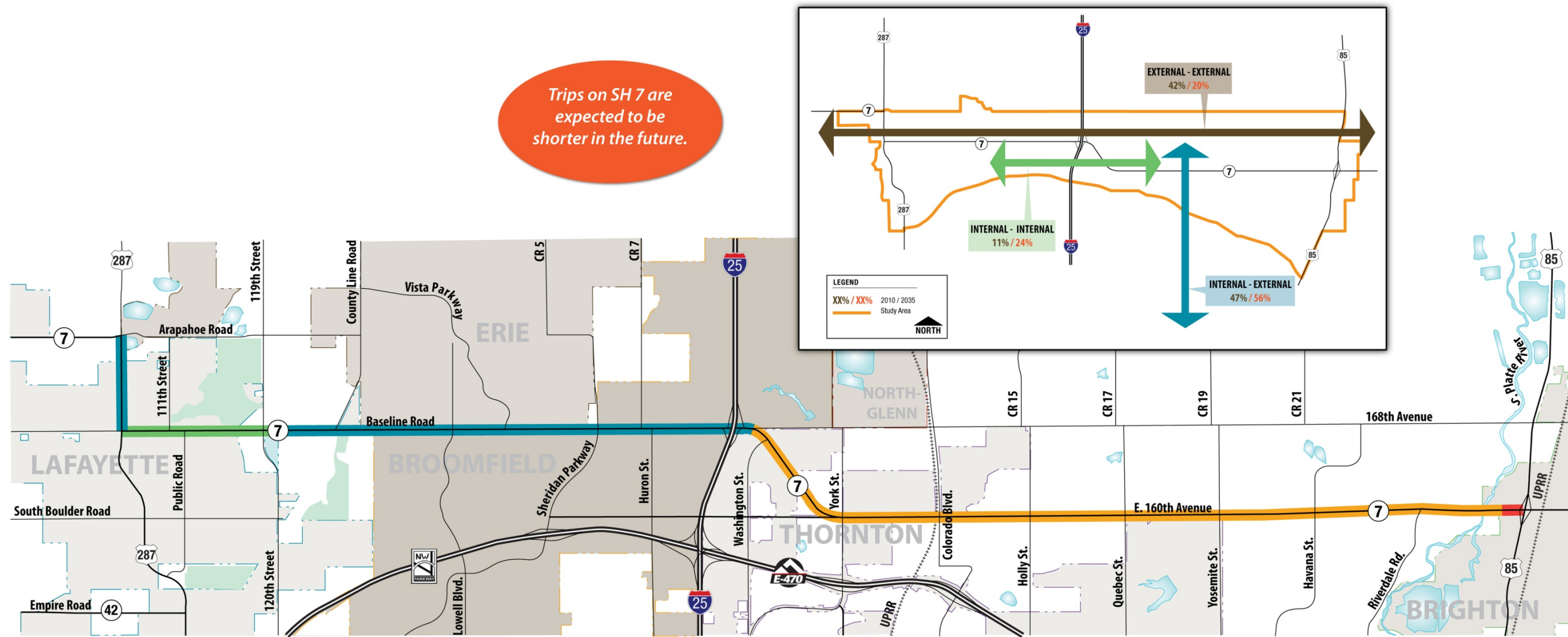
Future access for parcels along SH 7 will be permitted in accordance with the *State Highway Access Code* (Colorado, 1998; as amended). To determine the appropriate access standards for the corridor, it is important to understand the scale and type of future development and its effects on the travel patterns in the corridor. The area in and around the SH 7 corridor is forecast for significant growth, with expected employment increases of particular note. By 2035, the DRCOG projections show a 177 percent increase in households (28,000 households) and a 333 percent increase in jobs (43,000 jobs) in the study area.

The DRCOG 2035 regional travel demand model was used to develop 2035 traffic forecasts. A comparison of the 2010 and 2035 trip distribution patterns reveals a decrease in the percentage of trips traveling through the study area (neither originating nor terminating within the study area) over time; by 2035, 80 percent of the trips using the corridor are expected to have at least one trip end (origin and/or destination) within the study area (compared to 58 percent in 2010). Thus, as development occurs along the corridor, trips on SH 7 are expected to be shorter with a higher proportion of local origins and destinations. These future land uses along the corridor will require additional access, which must be balanced with the corridor's mobility function.



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Figure 1.5 Access



LEGEND

- R-A Regional Highway
- NR-A Non-Rural Principal Highway
- NR-B Non-Rural Arterial
- NR-C Non-Rural Arterial

NORTH

	Setting	Speeds	Volumes	Distances	Travel Types	Priority Movement	Access per Parcel	½ mi. Spacing Exceptions and Unsignalized Left Turns	Auxiliary Lane Thresholds
R-A	Rural	Medium / High	Medium / High	Medium / Long	Inter-regional Intra-regional Inter-city	Through	1	Limited	Lower
NR-A	Urban / Suburban	Medium / High	Medium / High	Medium / Long	Inter-regional Intra-regional Inter-city Intra-city	Through	1	Limited	Lower
NR-B	Urban / Suburban	Medium	Medium / High	Medium / Short	Inter-city Intra-city Inter-community	Through with more direct access	1+	Moderate	Higher
NR-C	Urban / Downtown	Low / Medium	Medium	Medium / Short	Inter-city Intra-city Inter-community	Balanced	1+	Less Restrictive	Higher

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Alternative Modes

The current configuration of SH 7 limits the ability of alternative travel mode options (transit, pedestrian, and bicycle) to address future travel demands, as illustrated in **Figure 1.6**.

Transit

With the exception of the shared stretch of roadway with US 287 and a short segment of SH 7 in Lafayette, no transit service currently operates along the SH 7 study corridor. Regional Transportation District (RTD) bus routes do serve each terminus of the corridor, as both Lafayette and Brighton have park-n-Ride facilities close to their respective ends of the study corridor. East-west transit service between Brighton and Lafayette and infrastructure to support efficient transit operations do not exist along SH 7.

Several planned regional transit projects will bring high frequency and regional transit service to the SH 7 area in the future. The North Metro FasTracks Corridor project is a proposed 18-mile, high-capacity fixed-guideway transit corridor between downtown Denver and the SH 7 area. When the North Metro Corridor project is implemented, the fixed-guideway rapid transit system will become the main trunk service for transit riders into downtown Denver from the area. RTD has planned local, limited, and regional bus routes to serve the end of the line station at SH 7.

Express bus service connecting Fort Collins and Greeley to downtown Denver and the Denver International Airport is planned to be implemented as part of Phase 1 of the North I-25 Environmental Impact Statement (EIS) Preferred Alternative. As part of Phase 1, a park-n-Ride transit station will be constructed at the I-25/SH 7 interchange for the planned express bus service.

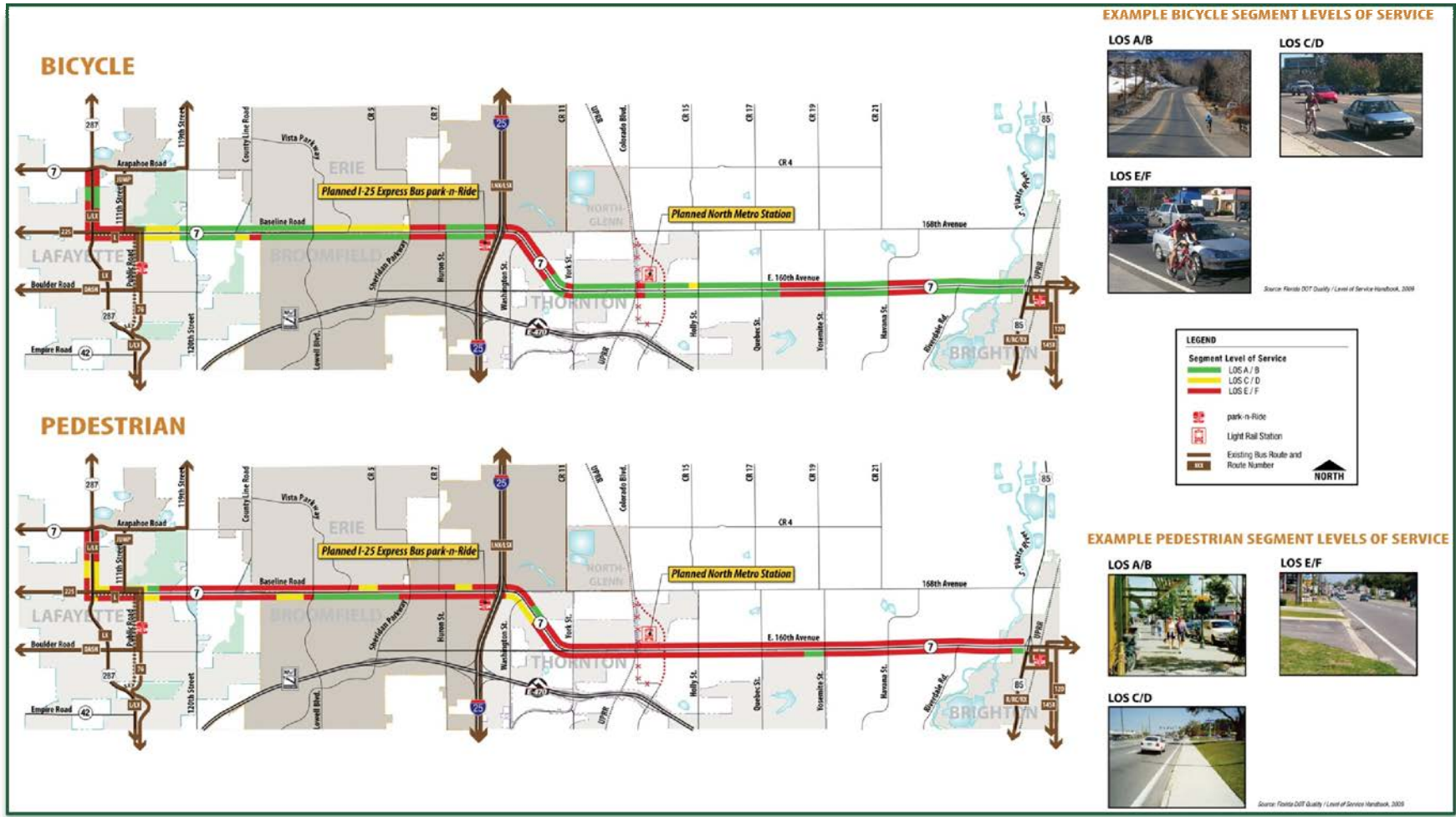
Connections do not exist for pedestrians and bicyclists to existing bus service in Lafayette and Brighton, the planned I-25 express bus service at the I-25/SH 7 park-n-Ride, the planned North Metro Station at SH 7, or other key corridor destinations.

Pedestrian

Continuous pedestrian facilities and local connections to these facilities are missing or deficient along the corridor. Through Lafayette, detached sidewalks exist along both sides of the street in most locations; however, where the right-of-way (ROW) is constrained, the sidewalk is attached to the curb. Detached sidewalks also exist in short stretches along other segments of the corridor, including the area adjacent to the Larkridge Shopping Center east of I-25. Along the south side of SH 7 in Broomfield, a wide multiuse trail exists adjacent to the Anthem neighborhood. The meandering trail is separated from the road by 20 to 40 feet.

Pedestrian level of service (LOS) can be quantified to reflect the comfort experienced by pedestrians. Most of the corridor experiences LOS F because no sidewalks are provided and because there are high traffic volumes and high speeds.

Figure 1.6 Alternative Modes



Bicycle

The *2035 Metro Vision Regional Transportation Plan* (DRCOG, 2007; as amended) designates SH 7 as a regional and community bicycle corridor. Today, shoulders along SH 7 accommodate bicycle travel. While much of the corridor has wide shoulders, they are typically used as auxiliary lanes at intersections, resulting in a lack of bicycle accommodation in proximity to intersections. Bicycle LOS scores are a measure of a bicyclist's comfort and perceived safety in using the facility. Much of SH 7 has a good bicycle LOS (D or better), but this methodology does not account for the lack of bicycle accommodation at intersections. Sections of SH 7 with low LOS scores (E or F) typically have narrow shoulders with high traffic volumes and/or speeds, or have no shoulders at all.

1.4 Project Goals

The DRCOG transportation vision for the Denver metropolitan area is of a balanced, sustainable multimodal transportation system that includes a regional roadway system, local streets, bicycle and pedestrian facilities, and a regional bus and rail transit system. The SH 7 PEL study is designed to establish a vision of how the future multimodal transportation system along SH 7 between the cities of Brighton and Lafayette will fit with the regional vision and will serve the people and businesses of the northern Denver metropolitan area. The goals of the SH 7 PEL study vision are based on the local goals identified in the *2035 Metro Vision Regional Transportation Plan* (DRCOG, 2007; as amended), on the national goals established for the Federal highway programs, and on the goals of the local agencies and the public. The goals of the transportation improvements for the SH 7 corridor are to:

- ▶ Decrease traffic fatalities and serious injuries
- ▶ Reduce congestion
- ▶ Improve the efficiency of the transportation system
- ▶ Integrate with and support the social, economic, and physical land use plans of the northern metropolitan region
- ▶ Provide mobility choices for people and goods that are safe, environmentally sensitive, efficient, and sustainable
- ▶ Protect and enhance the natural environment while improving the performance of the transportation system



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2.0 ALTERNATIVES DEVELOPMENT AND EVALUATION

The alternatives development and evaluation process, as illustrated in **Figure 2.1**, consisted of a four-level iterative process and focused on the diverse elements of the SH 7 cross-section, the complexity of the I-25/SH 7 interchange, the challenges of access, and the potential to realign the western and eastern sections of SH 7. The fundamental philosophy in the screening process was to systematically identify the notable positive and negative characteristics and tradeoffs among alternatives, and to evaluate alternatives one by one as the determinations were made. If a certain attribute (or attributes) of an alternative showed promise, an attempt was made to retain the individual attribute.

This chapter documents the process, including evaluation criteria, and presents the No-Action Alternative and evaluation results. The No-Action Alternative does not address the purpose and need for this study, but it is being carried through the analysis as a baseline for comparison.

Agency coordination and public involvement played a major role in this process, as summarized in **Chapter 6.0**. Agency involvement activities included regular progress committee meetings with agency participants and a series of resource agency scoping meetings. To ensure that the needs and concerns of affected entities and groups would be heard and considered in the alternatives development and evaluation process, a Technical Working Group (TWG) was formed. The TWG, as further described in **Chapter 6.0**, was involved at each step of the evaluation process, as well as during the development of alternatives and alternative refinement.

2.1 *Alternatives Development*

The alternatives development and evaluation process began with the identification of 32 corridor-wide elements. These elements included a broad range of ideas and improvements focusing on multimodal cross-sectional elements (roadway, transit, bicycle, and pedestrian), access categories, I-25/SH 7 interchange options, alignments for the western and eastern sections of the SH 7 corridor, and transportation system management (TSM)/travel demand management (TDM) elements.

The study team evaluated and combined the roadway, transit, bicycle, and pedestrian elements to create proposed cross-sections. Then the study team evaluated the proposed cross-sections by corridor segment. The cross-sections and the other elements were then joined to create a Combined Alternative, which was further refined and recommended for NEPA analysis. Several options at specific intersections along the corridor remain as part of the Recommended Alternative.

The characteristics and needs along the 16-mile length of the SH 7 corridor are diverse. To effectively focus on alternatives that could address the local issues and transportation needs of the corridor as noted above, the following five corridor segments were identified and are illustrated in **Figure 2.2**:

- ▶ **Segment 1:** US 287 to 119th Street
- ▶ **Segment 2:** 119th Street to Sheridan Parkway
- ▶ **Segment 3:** Sheridan Parkway to York Street
- ▶ **Segment 4:** York Street to Holly Street
- ▶ **Segment 5:** Holly Street to US 85

Figure 2.1 Alternatives Development and Evaluation

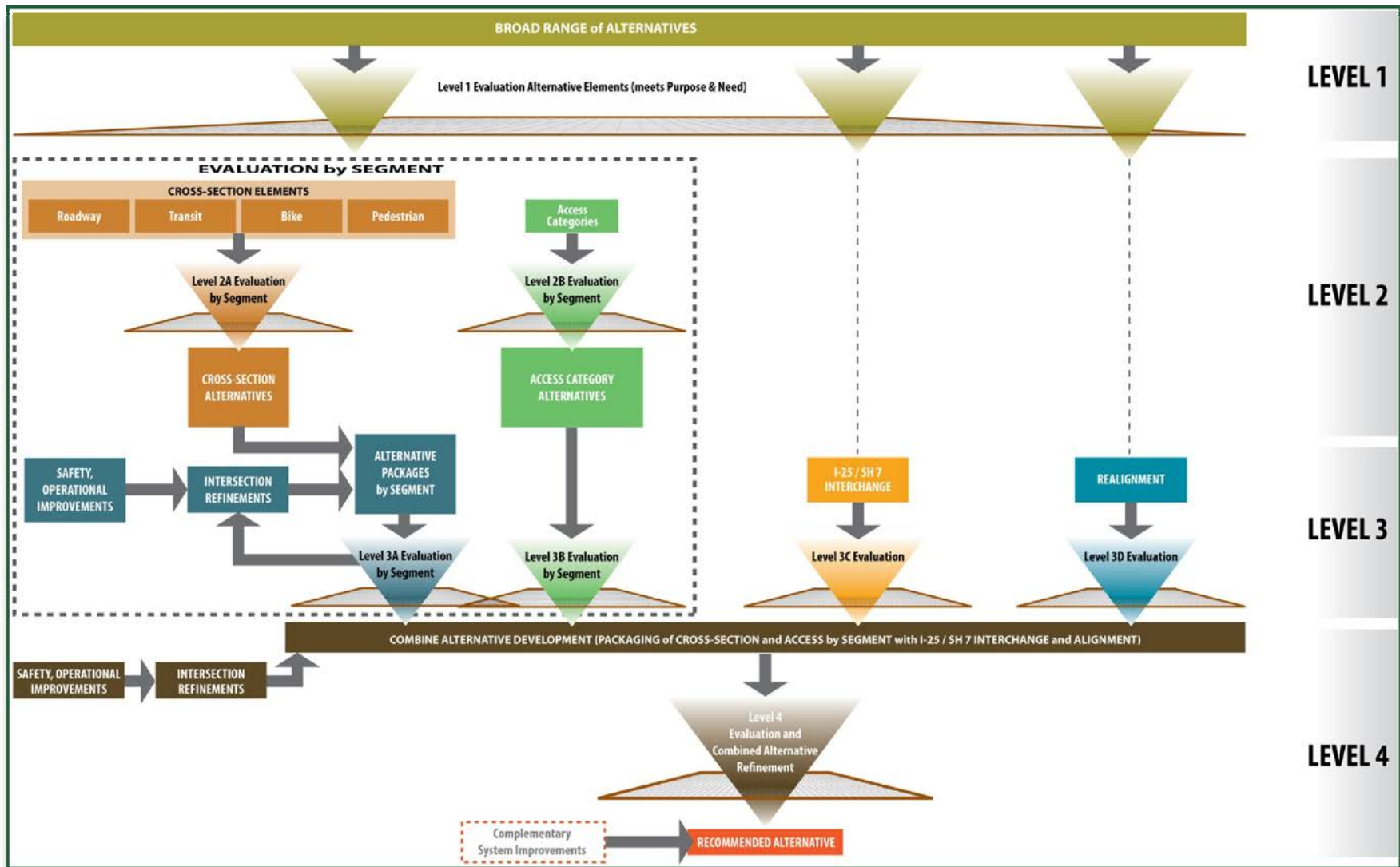
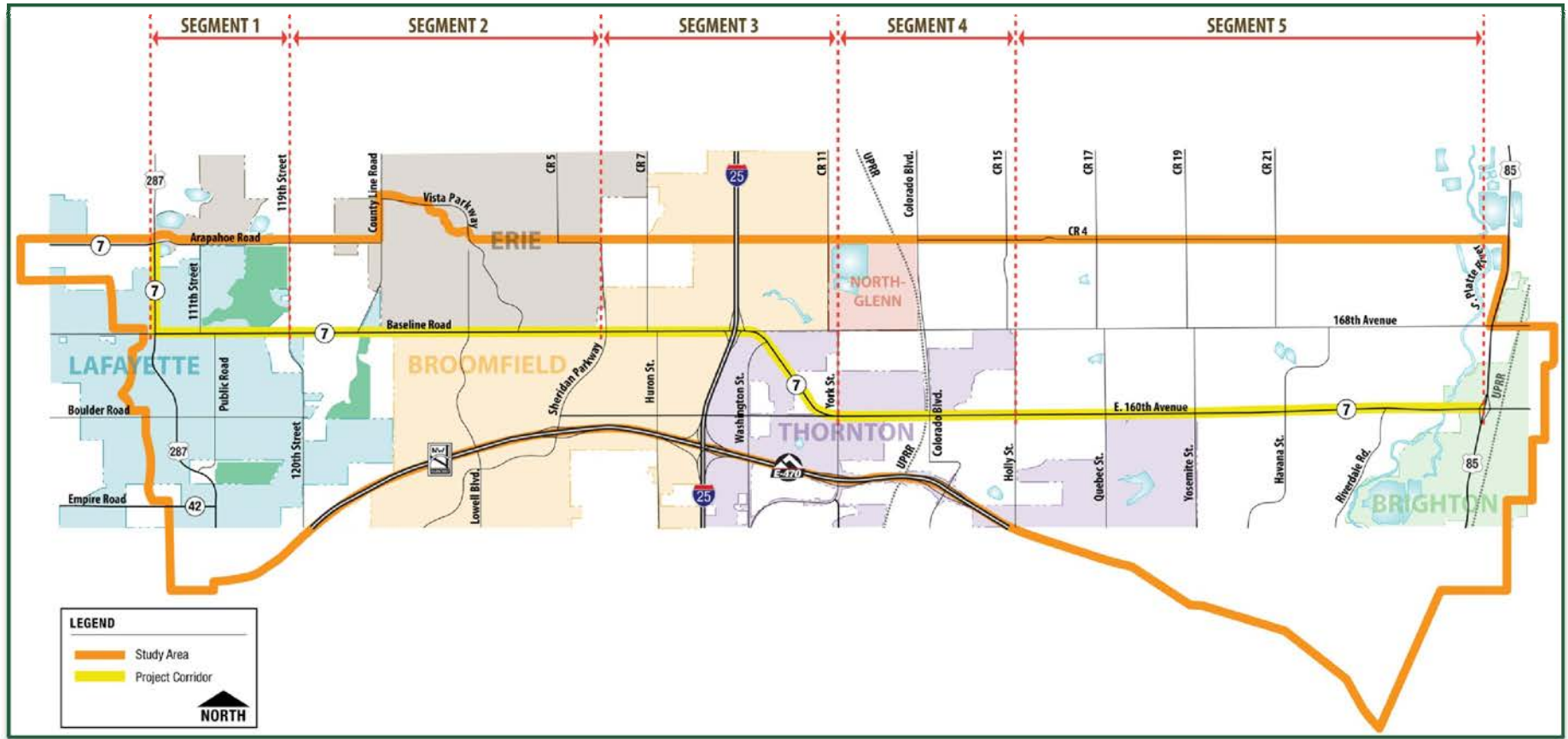


Figure 2.2 Alternatives Analysis - Segments



These five segments were established based on several factors including adjacent land uses, current and future traffic volumes, physical constraints, logical termini, and independent utility. They provided a framework for evaluating alternatives responsive to both corridor-wide and local needs. For each segment, the proposed transportation improvements to SH 7 could be completed based on the recommendations in this PEL study. The completion of transportation improvements by segments would provide a functional transportation system even in the absence of other transportation improvements along the corridor. Individual projects, such as intersection improvements, will need to show that there will be a functioning transportation system even without any other transportation improvements along the corridor.

Total funding for the corridor improvements has not been identified at this time. Implementation is typically determined during NEPA and final design; however, construction funding must be identified for each phase to meet the requirements of fiscal constraint for FHWA and CDOT to approve NEPA documentation.

In cases where a project is implemented in more than one phase, care must be taken to ensure that the transportation system operates acceptably at the conclusion of each phase. This is referred to as “independent utility,” the ability of each phase to operate on its own. Additionally, it must be demonstrated that air quality conformity will not be jeopardized. Any mitigation measures needed in response to project impacts must be implemented with the phase in which the impacts occur, rather than deferred to a later phase. The project list is broken up by segments, and various types of improvements have been identified for each segment, such as cross-section, intersection, transit, and alternative mode improvements.

Chapter 7.0 presents an Action Plan and a process to identify and prioritize projects so that the leadership of CDOT and the local entities have a basis for consideration and ultimate selection and funding of projects.

Furthermore, individual projects for the Recommended Alternative should meet these criteria:

- ▶ **Independent Utility/Logical Termini:** Each phase should have independent utility and logical termini to the extent that the phase provides a functional transportation system even in the absence of other phases.
- ▶ **Elements of Purpose and Need:** Each phase should contribute to meeting the purpose and need for the entire project.
- ▶ **Environmental Impacts:** Individual phases should avoid the introduction of substantial additional environmental impacts that cannot be mitigated.

2.2 Alternatives Evaluation Process

As shown on **Figure 2.1**, a four-level evaluation process resulted in the development of a Recommended Alternative and the No-Action Alternative for further evaluation in this PEL study. The following is a general overview of the alternatives evaluation process.

Level 1 of the evaluation process assessed the corridor-wide elements against the purpose and need. Due to the complexity of the corridor, no single Level 1 alternative fully met the purpose and need for the full length of the corridor; therefore, the alternatives retained were not treated as stand-alone improvements. Instead, the study team assessed them as part of a package of improvements as the process continued.

The study team then evaluated the alternatives that were advanced from the Level 1 evaluation in the following subsequent levels:

- ▶ **Level 2A Evaluation:** Combined and evaluated the multimodal cross-sectional elements (roadway, transit, bicycle, and pedestrian) by segment.
- ▶ **Level 2B Evaluation:** Evaluated access categories for each segment.
- ▶ **Level 3A Evaluation:** Assembled and evaluated the cross-section elements that were advanced from the Level 2A evaluation into corridor-wide packages.
- ▶ **Level 3B Evaluation:** Evaluated and recommended access categories for the corridor.
- ▶ **Level 3C Evaluation:** Comparatively evaluated the partial cloverleaf interchange and the diverging diamond interchange (DDI).
- ▶ **Level 3D Evaluation:** Evaluated a potential realignment of the eastern section of SH 7 from approximately Riverdale Road east to US 85, as well as the realignment of SH 7 from approximately County Line Road west to US 287.
- ▶ **Level 4 Evaluation and Refinement:** Repackaged the remaining alternatives from this evaluation process to create a Combined Alternative for the entire corridor. Refined the Combined Alternative based on feedback from the TWG, elected officials, and the public.

Alternatives were eliminated that did not meet purpose and need or due to the magnitude of a combination of negative (quantified) impacts on community and environmental and cultural resources when there was another alternative that met purpose and need and avoided or minimized these impacts.

Alternatives were not recommended when the capacity of the alternative exceeded the need (anticipated 2035 travel demand) or due to the magnitude of a combination of negative (not quantified) impacts on community and environmental and cultural resources when there was another alternative that met purpose and need and avoided or minimized these impacts. Alternatives that are not recommended may be reconsidered in the future.

Section 2.5 summarizes the alternatives evaluation process by level. In each evaluation level the process and the results of the evaluation are discussed. **Appendix C** includes the detailed matrices that document the evaluation results in more detail.

2.3 Evaluation Criteria

Criteria for developing and evaluating alternatives were established through a public process that was responsive to the purpose and need of the project, project goals that are consistent with DRCOG's 2035 Metro Vision Regional Transportation Plan (DRCOG, 2007; as amended), the potential for transportation benefits, and environmental resources within the study corridor. To evaluate the alternatives, a list of evaluation criteria based on the purpose and need, project goals, and input from the TWG was developed. These criteria focused on seven categories: safety, access, traffic operations, alternative travel modes, community, environmental and cultural resources, and implementability. For each level of the alternatives evaluation process, the study team chose evaluation criteria from these categories and prepared evaluation measures for each criterion.

The evaluation criteria focused on seven categories: safety, access, traffic operations, alternative travel modes, community, environmental and cultural resources, and implementability.

To assist with the alternatives evaluation process, the study team assigned each evaluation criterion a code, such as S-1 and S-2 for safety-related evaluation criteria, A-1 and A-2 for access-related evaluation criteria, etc. These codes were keyed to the evaluation criteria presented in the matrices for each evaluation level (**Appendix C**). The purpose and need questions were used only in the Level 1 evaluation. Level 2, 3, and 4 evaluations used purpose and need criteria (safety [S-1 and S-2], access [A-1 and A-2], traffic operations [TO-1, TO-2, TO-3, and TO-4], and alternative modes [ATM-1, ATM-2, ATM-3, ATM-4, and ATM-5]).

In the evaluation process, the study team developed criteria as appropriate for the evaluation level being conducted and the alternatives being considered. For each level, the evaluation criteria and corresponding measures were applied uniformly to each alternative. **Appendix C** includes these criteria and measures, along with the summary evaluation matrix for each level. The responsiveness of each alternative to the criteria determined whether or not the alternative was advanced for further evaluation.

Evaluation Criteria

The following criteria were identified for each of the seven categories of interest.

Safety

- ▶ **Purpose and Need:** Does the alternative improve existing and future conditions that contribute to higher than expected crash rates?
- ▶ S-1: Address unsafe physical or operational conditions at intersections to reduce crash rates.
- ▶ S-2: Reduce the number of potential conflict points.

Access

- ▶ **Purpose and Need:** Does the alternative improve existing access deficiencies and accommodate future access needs?
- ▶ A-1: Identify segments with existing accesses that are not designed to appropriate standards.
- ▶ A-2: Provide reasonable access that adequately supports local land use planning.

Traffic Operations

- ▶ **Purpose and Need:** Can the alternative improve existing and future traffic operations?
- ▶ TO-1: Provide roadway capacity to meet 2035 travel demand.
- ▶ TO-2: Improve vehicle or person throughput at intersections during future (2035) peak hours.
- ▶ TO-3: Allow intersections to operate at a LOS D or better during future (2035) peak hours.
- ▶ TO-4: Improve future (2035) travel time along the corridor.

Alternative Travel Modes

- ▶ **Purpose and Need:** Does the alternative include infrastructure for alternative travel modes that is consistent with the existing and future needs of the communities?
- ▶ ATM-1: Provide a balanced multimodal system consistent with future (2035) travel demands.
- ▶ ATM-2: Enhance regional multimodal transportation options.
- ▶ ATM-3: Provide interconnectivity between the various travel modes (pedestrian, bicycle, automobile, and transit).
- ▶ ATM-4: Improve the ability of the transportation system to effectively move people.
- ▶ ATM-5: Support regional sustainability initiatives through alternative travel modes.

Community

- ▶ C-1: Minimize impacts on existing residents, businesses, and properties, as well as future planned land use.
- ▶ C-2: Facilitate development or redevelopment and support future planned growth.
- ▶ C-3: Improve the ability of local residents to access community facilities both across and along SH 7.
- ▶ C-4: Enhance local community character by creating opportunities for entrance treatments into communities.
- ▶ C-5: Receive general public support for the transportation improvements.
- ▶ C-6: Provide for aesthetic/visual treatments that differentiate local communities.
- ▶ C-7: Minimize properties to be acquired for right-of-way and business and resident displacements and compatibility with future land use.

Environmental and Cultural Resources

- ▶ E-1: Avoid and minimize impacts on environmental and cultural resources:
 - Parks, open space, and trails and maintain rural character where appropriate
 - Traffic noise
 - Previously identified and potential historic sites
 - Floodplains
 - Wetlands and waters of the US
 - Threatened and endangered species habitat
 - Air quality
 - Hazardous materials sites
 - Oil and gas facilities

Implementability

- ▶ I-1: Maximize the use of existing infrastructure and minimize the addition of lane miles to the State Highway System.
- ▶ I-2: Minimize construction cost.
- ▶ I-3: Identify and prioritize improvements that can proceed independently.
- ▶ I-4: Enhance corridor continuity.
- ▶ I-5: Match capacity to be consistent with demand.

2.4 No-Action Alternative

The No-Action Alternative would essentially leave SH 7 as it currently is and would not provide any major capacity improvements; however, the No-Action Alternative would include safety and maintenance activities that would be required to sustain an operational transportation system. The No-Action Alternative does not meet the purpose and need but is used as a baseline to compare alternatives for evaluation and environmental analysis purposes.

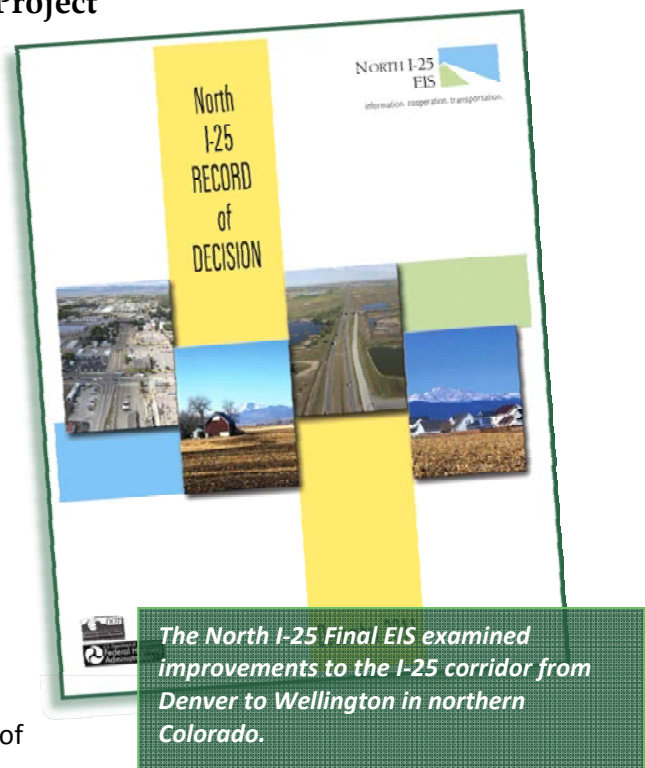
For the purpose of forecasting travel demand and identifying resource impacts directly related to traffic volume (such as noise), the No-Action Alternative includes transportation projects currently planned in the project vicinity. These other transportation projects have committed or identified funds for construction and would be built regardless of any improvements that are identified as part of the SH 7 PEL study. Travel demand forecasting predicts traffic conditions that are expected to occur on the transportation system in the design year (2035). Committed fiscally-constrained regional improvements that are included in the travel demand forecasting for the No-Action Alternative are discussed below.

North I-25 (Denver to Wellington, Colorado) Project

FHWA and CDOT completed a Final EIS to examine improvements to the I-25 corridor from Denver to Wellington in northern Colorado (FHWA and CDOT, 2011a). The improvements are needed to provide modal alternatives; correct geometric deficiencies; improve safety, mobility and accessibility; and replace aging and obsolete infrastructure. A Record of Decision (ROD) for Phase 1 of the Preferred Alternative was signed in December 2011 (FHWA and CDOT, 2011b).

Projected changes to the area surrounding I-25/SH 7 include:

- ▶ I-25 traffic volumes for the horizon-year 2035 are projected to be much higher than existing conditions in the area between SH 1 and SH 7 interchanges.
- ▶ The SH 7 bus station at I-25 is predicted to generate higher-than-average ridership activity.
- ▶ The SH 7 commuter rail station is predicted to be one of the most active stations in northern Colorado.



Future North I-25 improvements at the SH 7 interchange include a widened bridge and additional ramps that would accommodate multiple turn and through lanes for higher traffic volumes (FHWA and CDOT, 2011a; FHWA and CDOT, 2011b). A partial cloverleaf interchange configuration at I-25/SH 7 is included in Phase 1 of the Preferred Alternative selected in the North I-25 Record ROD (FHWA and CDOT, 2011b).

North Metro Corridor Project

The North Metro Corridor project is a proposed 18-mile high-capacity fixed-guideway transit corridor between Denver Union Station and the SH 7 area. RTD has planned local, limited, and regional bus routes to serve the end of the line station at SH 7/Colorado Boulevard. In support of the planned station and the surrounding mixed-use development, Colorado Boulevard is planned to be relocated approximately one-half mile to the east of its current intersection with SH 7. This reconfiguration will be a local project with funds from sources other than the North Metro Corridor project. The North Metro Corridor project commuter rail, supporting bus service, and the associated roadway infrastructure improvements have been included in the SH 7 PEL study's No-Action Alternative travel demand model.

Other Fiscally-Constrained Regional Improvements

The DRCOG regional travel demand model has been used to develop 2035 traffic forecasts for SH 7, accounting for growth along the corridor and throughout the Denver region. DRCOG's fiscally-constrained *2035 Metro Vision Regional Transportation Plan* (DRCOG, 2007; as amended) has several projects within the SH 7 area that are included in the model:

- ▶ Extend Boulder Road from 120th Street to Sheridan Parkway
- ▶ Widen the following roadways to four lanes: Erie Parkway, 144th Avenue, Sheridan Parkway, Huron Street, Washington Street, 152nd Avenue, York Street, Colorado Boulevard, and Quebec Street
- ▶ Widen E-470 to six lanes

2.5 Evaluation Results

The following sections describe the approach, the evaluation criteria, and the results of the evaluation for each level.

Level 1 Evaluation - Purpose and Need

The alternatives development process began with the development of 32 corridor-wide elements. These elements included a broad range of improvements that had been developed to address the study's needs: safety, traffic operations, access, and alternative travel modes. The elements included a broad range of multimodal cross-sectional elements (roadway, transit, bicycle, and pedestrian), access categories, I-25/SH 7 interchange options, alignments for the western and eastern sections of the SH 7 corridor, and TSM/TDM elements. The intent at Level 1 analysis was to develop a series of elements that did not necessarily address all of the study's needs as stand-alone improvements but could be combined with other elements as part of a thematic package. **Table 2.1** summarizes the elements developed by category and the development rationale for each.

Thirty-two corridor-wide elements were developed and assessed relative to their ability to meet the purpose and need for the study.

Table 2.1 Summary of Level 1 Elements

Category	Element	Development Rationale
Roadway	2 lanes (plus auxiliary lanes)	Developed to evaluate improvements to existing and future safety conditions and existing and future traffic operations.
	2 lanes (plus auxiliary lanes and painted or raised median)	
	4 lanes (plus auxiliary lanes and painted or raised median)	
	6 lanes (plus auxiliary lanes and painted or raised median)	
Transit	Fixed Guideway (Light Rail or Streetcar)	Developed to evaluate infrastructure improvements for alternative travel modes consistent with the existing and future needs of the communities.
	Bus Only Lane	
	Bus/High Occupancy Vehicle (HOV) Lane/High Occupancy Toll (HOT) Lane	
	Transit Priority (queue jumps, etc.)	
	Transit Amenities (bus stops, shelters, pull outs, etc.)	
Bicycle Accommodation	Shoulders	Developed to evaluate infrastructure improvements for alternative travel modes consistent with the existing and future needs of the communities.
	Bike Lanes	
	Shared Lanes (“Sharrows”)	
	Cycle Tracks	
	Shared Use Path	
	Intersection Treatments (signing, striping)	
Pedestrian Accommodation	Attached Sidewalk	Developed to evaluate infrastructure improvements for alternative travel modes consistent with the existing and future needs of the communities.
	Detached Sidewalk	
	Shared Use Path	
	At-grade Crossing Treatments	
	Grade Separated Crossing	
Access Categories	Regional Highway (R-A)	Developed to evaluate existing access deficiencies and accommodate future access needs.
	Non-Rural Principal Highway (NR-A)	
	Non-Rural Arterial (NR-B)	
	Non-Rural Arterial (NR-C)	
I-25/SH 7 Interchange	Partial Cloverleaf	Included in Phase 1 of the Preferred Alternative selected in the North I-25 ROD.
	Diverging Diamond Interchange (DDI)	Evaluated at the request of the TWG.
SH 7 Realignment	West End (Northern Alignment)	Evaluated at the request of the Town of Erie and the City of Lafayette.
	West End (Southern Alignment)	
	East End (Northern Alignment)	Evaluated at the request of the City of Brighton and Adams County.
Other Elements	Intersection Improvements	Developed to evaluate improvements to existing and future safety conditions and existing and future traffic operations.
	Transportation System Management (signal timing, etc.)	Developed to evaluate improvements to existing and future traffic operations.
	Travel Demand Management (alt. modes, rideshare programs, etc.)	

Level 1 Evaluation Criteria

In Level 1 evaluation, these elements were evaluated solely on their ability to effectively provide improvements for the transportation problems described in the purpose and need statement. The following questions were used to screen the elements:

- ▶ **Safety:** Does the element improve existing and future conditions that contribute to higher than expected crash rates?
- ▶ **Traffic Operations:** Can the element improve existing and future traffic operations?
- ▶ **Access:** Does the element improve existing access deficiencies and accommodate future access needs?
- ▶ **Alternative Travel Modes:** Does the element include infrastructure for alternative travel modes that is consistent with existing and future needs of the communities?

Level 1 Evaluation Results

Elements that did not meet the purpose and need were eliminated from further consideration. Three of the 32 elements were eliminated in the Level 1 evaluation. The 2-lane roadway, fixed guideway (light-rail or streetcar) and the Non-Rural Arterial (NR-C) access category elements were eliminated because they would not meet the purpose and need for these reasons:

Three elements did not meet the purpose and need criteria and were eliminated in the Level 1 evaluation.

Twenty-nine elements were retained for further evaluation.

- ▶ Would not improve existing and future (2035) conditions that contribute to higher than expected crash rates
- ▶ Would not improve existing and future (2035) traffic operations
- ▶ Would not improve existing access deficiencies and accommodate future (both near-term and by 2035) access needs
- ▶ Would not include infrastructure for alternative travel modes that is consistent with existing and future (2035) needs of the communities

Appendix C documents the Level 1 evaluation process for the elements.

Due to the complexity of the corridor, no single Level 1 element fully met the purpose and need for the full length of the corridor; therefore, the elements that were retained were not viewed to be stand-alone improvements but rather became a part of a package of improvements later in the process. In addition, several elements, such as the access categories, TSM, and TDM, were included as corridor management strategies. **Table 2.2** includes the Level 1 retained elements and indicates how the remaining 29 Level 1 elements were assessed in future evaluation levels.

Table 2.2 Level 1 Evaluation – Retained Elements and Next Steps

Category	Alternative Element	Next Steps
Roadway	2 lanes (two 12-foot [ft] travel lanes and one 12-ft center turn lane/painted or raised median and auxiliary lanes)	These elements were evaluated by corridor segment in Level 2A evaluation.
	4 lanes (four 12-ft travel lanes and one 12-ft center turn lane/painted or raised median and auxiliary lanes)	
	6 lanes (six 12-ft travel lanes and one 12-ft center turn lane/painted or raised median and auxiliary lanes)	
Transit	Bus Only Lane (one 12-ft lane in each direction assumed to be outside general purpose lanes)	
	Bus/HOV/HOT Lane (one 12-ft lane in each direction assumed to be outside general purpose lanes)	
	Transit Priority (queue jumps, signal priority treatments, etc.)	
	Transit Amenities (bus stops, shelters, pull outs, etc.)	
Bicycle Accommodation	Shoulders (two 10-ft shoulders)	
	Bike Lanes (two 5-ft bike lanes located on the shoulders)	
	Shared Lanes (bicycle markings indicating a shared use located in the right travel lane)	
	Cycle Tracks	
	Shared Use Path (two 10-ft paths and 5-ft tree lawns/buffer)	
	Intersection Treatments (signing, striping, bike activated signals)	
Pedestrian Accommodation	Attached Sidewalk (two 5-ft attached sidewalks)	
	Detached Sidewalk (two 5-ft sidewalks and 6-ft tree lawns)	
	Shared Use Path (two 10-ft paths and 5-ft tree lawns)	
	At-grade Crossing Treatments (crosswalks, pedestrian activated signals, signing, etc.)	
	Grade Separated Crossing (underpass or overpass)	
Access Categories	Regional Highway (R-A)	These elements were evaluated by corridor segment in Level 2B evaluation.
	Non-Rural Principal Highway (NR-A)	
	Non-Rural Arterial (NR-B)	
I-25/SH 7 Interchange	Partial Cloverleaf	These elements were evaluated in the Level 3C evaluation.
	Diverging Diamond Interchange	
Alignment	West End (Northern Alignment)	These elements were evaluated in the Level 3D evaluation.
	West End (Southern Alignment)	
	East End (Northern Alignment)	
Other Elements	Intersection Improvements	These elements were combined with the results of the Levels 2B, 3A, 3B, 3C, and 3D evaluations to create a Combined Alternative for evaluation in Level 4.
	Transportation System Management (signal timing, etc.)	
	Travel Demand Management (alt. modes, rideshare programs, etc.)	

Level 2A Evaluation – Cross-Section Elements

The Level 2A evaluation assessed the applicability of the various cross-section elements for each corridor study segment. The elements included the number of general purpose lanes (roadway) and different configurations for transit, bicycle, and pedestrian accommodation. The fundamental approach in the Level 2A evaluation process involved identifying notable positive and negative characteristics of the alternatives, as well as evaluating the alternatives one by one as the determinations were made.

Level 2A Evaluation Criteria

Each cross-section element for each corridor segment was evaluated for roadway, transit, bicycle, and pedestrian accommodations against a series of evaluation criteria based on the purpose and need, project goals, and TWG input. **Section 2.3** includes details on the evaluation criteria, and **Appendix C** includes specific measures for the Level 2A criteria.

Level 2A Evaluation Results

Of the 29 elements that were retained from the Level 1 evaluation, 18 were appropriate for evaluation as cross-section elements in each of the five corridor segments, creating a total of 90 Level 2A elements. Of the 90 Level 2A elements, 30 elements were eliminated or not recommended for further evaluation. These elements were eliminated or not recommended as alternatives because they did not meet purpose and need, they were not considered to be reasonable due to the magnitude of a combination of negative impacts, or their capacity exceeded the need (the anticipated 2035 travel demand) as summarized in **Table 2.3**. **Appendix C** documents the results of the Level 2A evaluation process.

Eighteen Level 1 elements were evaluated for each of the five corridor segments, creating a total of 90 Level 2A elements.

Sixty elements were retained for further evaluation in Level 3A.

In accordance with the CDOT Managed Lanes Policy (CDOT 2012b), managed lanes (bus-only lanes and bus/HOV/HOT lanes) were evaluated for the SH 7 PEL corridor. The bus-only lanes and the bus/HOV/HOT lanes were eliminated in the Level 2A evaluation for Segment 1 through the City of Lafayette due to the magnitude of a combination of negative impacts on the community and environmental and cultural resources. For the remaining segments of the corridor, the bus-only lanes were not recommended for further evaluation because the capacity of the bus-only lanes alternatives in corridor Segments 2, 3, 4 and 5 exceeded the need (anticipated 2035 transit demand). However, this alternative was retained for future consideration when the anticipated demand (post-2035) may require this type of facility. To accommodate the potential for implementation of a managed lane strategy and based on feedback from the TWG, the standard shoulder for the roadway cross-section was extended from 10 feet to 12 feet to allow for peak period shoulder lanes (sometimes referred to as hard shoulder running) for bus-only or bus/HOV/HOT use at a later date. The bus/HOV/HOT lanes were retained for further evaluation in Level 3A.

Table 2.3 Level 2A Evaluation Results and Next Steps

Category	Element	Segment	Result ¹
Roadway	2 lanes (two 12-ft travel lanes and a 12-ft center turn lane/median and auxiliary lanes)	1	Retained
		2	
		3	Eliminated in the Level 2A evaluation for this segment because this element would not address the project purpose and need to reduce existing and future (2035) traffic congestion. The element would not improve traffic operations and would not fully address 2035 travel demand.
		4	Retained
		5	
	4 lanes (four 12-ft travel lanes and a 12-ft center turn lane/median and auxiliary lanes)	1	Eliminated in the Level 2A evaluation for this segment due to the magnitude of a combination of negative impacts on the community and environmental and cultural resources. This element would require the acquisition of property from 137 parcels and would have an impact on 1.3 acres of parks and open space, 104 previously identified and potentially historic sites, and the large wetland complex at Coal Creek. The combination of these impacts is considered irresolvable for the following reasons, and there is another alternative that meets purpose and need and avoids or minimizes these impacts: <ul style="list-style-type: none"> • The magnitude of negative impact on park and open space land. • The impacts on the previously identified and potentially historic sites would result in negative effects under the Section 106 process. It should be noted that substantial opposition is anticipated from the local community because of the need for extensive acquisition of property for ROW and because of expressed public concerns related to the loss of tree lawns.
		2	Retained
		3	
		4	
		5	

Table 2.3 Level 2A Evaluation Results and Next Steps (Continued)

Category	Element	Segment	Result ¹
Roadway (Continued)	6 lanes (six 12-ft travel lanes and a 12-ft center turn lane/median and auxiliary lanes)	1	<p>Eliminated in the Level 2A evaluation for this segment due to the magnitude of a combination of negative impacts on the community and environmental and cultural resources. This alternative would require the acquisition of property from 144 parcels and would have an impact on 1.53 acres of parks and open space, 104 previously identified and potentially historic sites, and the large wetland complex at Coal Creek. The combination of these impacts is considered irresolvable for the following reasons, and there is another alternative that meets purpose and need and avoids or minimizes these impacts:</p> <ul style="list-style-type: none"> • The magnitude of negative impact on park and open space land. • The impacts on the previously identified and potentially historic sites would result in negative effects under the Section 106 process. <p>It should be noted that substantial opposition is anticipated from the local community because of the need for extensive acquisition of property for ROW.</p>
		2	Not Recommended ² in the Level 2A evaluation for this segment. The capacity of 6 lanes exceeds the need (the anticipated 2035 travel demand) for this segment; however, the 6 lane element was retained for future consideration when the anticipated travel demand may require this type of facility.
		3	Retained
		4	Not Recommended ² in the Level 2A evaluation for these segments. The capacity of 6 lanes exceeds the need (the anticipated 2035 travel demand) for these segments; however, the 6 lane element was retained for future consideration when the anticipated travel demand may require this type of facility.
		5	

Table 2.3 Level 2A Evaluation Results and Next Steps (Continued)

Category	Element	Segment	Result ¹
Transit	Bus Only Lane (one 12-ft lane in each direction assumed to be on the outside of general purpose lanes)	1	<p>Eliminated in the Level 2A evaluation for this segment due to the magnitude of a combination of negative impacts on the community and environmental and cultural resources. This element would require the acquisition of property from 137 parcels and would have an impact on 1.3 acres of parks and open space, 104 previously identified and potentially historic sites, and the large wetland complex at Coal Creek. The combination of these impacts is considered irresolvable for the following reasons, and there is another alternative that meets purpose and need and avoids or minimizes these impacts:</p> <ul style="list-style-type: none"> • The magnitude of negative impact on park and open space land. • The impacts on the previously identified and potentially historic sites would result in negative effects under the Section 106 process. <p>It should be noted that substantial opposition is anticipated from the local community because of the need for extensive acquisition of property for ROW and because of expressed public concerns related to the loss of tree lawns.</p>
		2	<p>Not Recommended² in the Level 2A evaluation for these segments. The capacity of bus-only lanes exceeds the need (the anticipated 2035 transit demand) for these segments; however, the bus-only lanes were retained for future consideration when the anticipated transit demand (post-2035) may require this type of facility.</p>
		3	
		4	
		5	
	Bus/HOV/HOT Lane (one 12-ft lane in each direction assumed to be outside general purpose lanes)	1	<p>Eliminated in the Level 2A evaluation for this segment due to the magnitude of a combination of negative impacts on the community and environmental and cultural resources. This element would require the acquisition of property from 137 parcels and would have an impact on 1.3 acres of parks and open space, 104 previously identified and potentially historic sites, and the large wetland complex at Coal Creek. The combination of these impacts is considered irresolvable for the following reasons, and there is another alternative that meets purpose and need and avoids or minimizes these impacts:</p> <ul style="list-style-type: none"> • The magnitude of negative impact on park and open space land. • The impacts on the previously identified and potentially historic sites would result in negative effects under the Section 106 process. <p>It should be noted that substantial opposition is anticipated from the local community because of the need for extensive acquisition of property for ROW and because of expressed public concerns related to the loss of tree lawns.</p>
		2	Retained
		3	Retained
		4	Retained
		5	Retained

Table 2.3 Level 2A Evaluation Results and Next Steps (Continued)

Category	Element	Segment	Result ¹
Transit	Transit Priority (queue Jumps, signal priority treatments, etc.)	1	Retained
		2	Retained
		3	Retained
		4	Retained
		5	Retained
	Transit Amenities (bus stops, shelters, pull outs, etc.)	1	Retained
		2	Retained
		3	Retained
		4	Retained
		5	Retained
Bicycle Accommodation	Shoulders (two 10-ft shoulders)	1	Not Recommended ³ in the Level 2A evaluation for this segment due to the magnitude of negative impacts on the community. This element would require acquisition of property from adjacent properties and would not support the community's desire to maintain the existing character of the community. Most of the residences along SH 7 in Lafayette are situated approximately 15 to 20 feet from the edge of the ROW line. The acquisition of property from these parcels would place the edge of ROW within 5 to 10 feet of the residences, substantially affecting the residents and potentially requiring full acquisition of the property for ROW.
		2	Retained
		3	Retained
		4	Retained
		5	Retained
	Bike Lanes (two 5-ft bike lanes located on the shoulders)	1	Retained
		2	Retained
		3	Retained
		4	Retained
		5	Retained

Table 2.3 Level 2A Evaluation Results and Next Steps (Continued)

Category	Element	Segment	Result ¹
Bicycle Accommodation (Continued)	Shared Lanes (bicycle markings indicating a shared use located in the right travel lane)	1	Retained
		2	Eliminated in the Level 2A evaluation for these segments because this element would not address the purpose and need to improve safety along the corridor because the traffic speeds and volumes are too high for safe application of this element.
		3	
		4	
		5	
	Cycle Tracks (two 6-ft one-way cycle tracks with a 4-ft buffer)	1	Not Recommended ³ in the Level 2A evaluation for this segment due to the magnitude of negative impacts on the community. This element would require acquisition of property from adjacent properties and would not support the community's desire to maintain the existing character of the community. Most of the residences along SH 7 in Lafayette are situated approximately 15 to 20 feet from the edge of the ROW line. The acquisition of property from these parcels would place the edge of ROW within 5 to 10 feet of the residences, substantially affecting the residents and potentially requiring full acquisition of the property for ROW.
		2	Not Recommended ² in the Level 2A evaluation for these segments. The capacity of cycle tracks exceeds the need (the anticipated 2035 bicycling demand) for these segments; however, the cycle tracks were retained for future consideration when the anticipated bicycling demand (post-2035) may require this type of facility.
		3	
		4	
		5	
	Shared Use Path (two 10-ft paths and 5-ft tree lawns/buffer)	1	Not Recommended ³ in the Level 2A evaluation for this segment due to the magnitude of negative impacts on the community. This element would require acquisition of property from adjacent properties and would not support the community's desire to maintain the existing character of the community. Most of the residences along SH 7 in Lafayette are situated approximately 15 to 20 feet from the edge of the ROW line. The acquisition of property from these parcels would place the edge of ROW within 5 to 10 feet of the residences, substantially affecting the residents and potentially requiring full acquisition of the property for ROW.
	Shared Use Path (two 10-ft paths and 5-ft tree lawns/buffer)	2	Retained
		3	Retained
		4	Retained
		5	Retained
	Intersection Treatments (signing, striping, bike activated signals)	1	Retained
		2	Retained
		3	Retained
		4	Retained
		5	Retained

Table 2.3 Level 2A Evaluation Results and Next Steps (Continued)

Category	Element	Segment	Result ¹
Pedestrian Accommodation	Attached Sidewalk (two 5-ft attached sidewalks)	1	Retained
		2	Eliminated in the Level 2A evaluation for these segments because the element does not address the purpose and need to improve safety along the corridor. The CDOT standard for sidewalks requires a minimum 5-ft buffer between the sidewalk and the roadway. There is sufficient space to construct other pedestrian alternatives without major community impacts.
		3	
		4	
		5	
	Detached Sidewalk (two 5-ft sidewalks and 6-ft tree lawns)	1	Not Recommended ³ in the Level 2A evaluation for this segment due to the magnitude of negative impacts on the community. This element would require acquisition of property from adjacent properties and would not support the community's desire to maintain the existing character of the community. Most of the residences along SH 7 in Lafayette are situated approximately 15 to 20 feet from the edge of the ROW line. The acquisition of property from these parcels would place the edge of ROW within 5 to 10 feet of the residences, substantially affecting the residents and potentially requiring full acquisition of the property for ROW.
		2	Retained
		3	Retained
		4	Retained
		5	Retained
	Shared Use Path (two 10-ft paths and 5-ft tree lawns)	1	Not Recommended ³ in the Level 2A evaluation for this segment due to the magnitude of negative impacts on the community. This element would require acquisition of property from adjacent properties and would not support the community's desire to maintain the existing character of the community. Most of the residences along SH 7 in Lafayette are situated approximately 15 to 20 feet from the edge of the ROW line. The acquisition of property from these parcels would place the edge of ROW within 5 to 10 feet of the residences, substantially affecting the residents and potentially requiring full acquisition of the property for ROW.
		2	Retained
		3	Retained
		4	Retained
		5	Retained

Table 2.3 Level 2A Evaluation Results and Next Steps (Continued)

Category	Element	Segment	Result ¹
Pedestrian Accommodation (Continued)	At-grade Crossing Treatments (crosswalks, pedestrian activated signals, signing, etc.)	1	Retained
		2	Retained
		3	Retained
		4	Retained
		5	Retained
	Grade Separated Crossing (underpass or overpass)	1	Eliminated in the Level 2A evaluation for this segment because of the magnitude of negative impacts on the community, and there is another alternative that meets purpose and need and avoids or minimizes these impacts. This element would require acquisition of property from adjacent properties in downtown Lafayette and would not support the community's desire to maintain the existing character of the community. Most of the residences and commercial properties along SH 7 in Lafayette are situated approximately 15 to 20 feet from the edge of the ROW line. The construction of grade separated crossings (underpass or overpass) would potentially require full acquisition of properties on the north/south streets, such as 111 th Street and Public Road, and the displacement of the residents and businesses.
		2	Retained
		3	Retained
		4	Retained
		5	Retained

- (1) Next Steps – The retained elements were combined to create proposed cross-sections, which were evaluated by corridor segment and packaged by theme in Level 3A evaluation.
- (2) Not Recommended – These elements were not recommended at this time for these corridor segments because their capacity exceeds the need for the corridor (**Section 1.3**). The purpose and need was developed based on existing conditions and the long-range planning horizon of year 2035.
- (3) Not Recommended – These elements were not recommended at this time for these corridor segments due to the magnitude of negative impacts on the community and the potential acquisition of property for ROW. Further analysis is necessary to determine the number of residential and commercial displacements and parcels impacted by these elements and if these impacts would be considered irresolvable for elimination of these elements.

Level 2B Evaluation – Access Categories

Concurrent with the Level 2A evaluation, the access category for each segment was evaluated (Level 2B evaluation). The access category evaluation was conducted separately from the Level 2A evaluation because, by their nature, access categories do not have physical effects. Consequently, separate evaluation criteria were developed to evaluate the access category for each segment.

Level 2B Evaluation Criteria

Each access category for each corridor segment was evaluated against a series of evaluation criteria based on the purpose and need (safety, traffic operations, and access) and community criteria.

Appendix C includes the specific measures used for the Level 2B criteria.

Level 2B Evaluation Results

In the Level 2B evaluation, three access categories were evaluated for each of the five corridor segments (**Figure 2.2**) for a total of 15 Level 2B elements. Of the 15 Level 2B elements, 4 elements were eliminated. These elements were eliminated from further consideration because they did not meet purpose and need, as summarized in **Table 2.4**. **Appendix C** documents the detailed Level 2B evaluation process. For Segment 1, the No-Action Alternative (Access Category NR-C) was retained.

Table 2.4 Level 2B Evaluation Results and Next Steps

Category	Element	Segment	Result	Next Steps
Access Category	Regional Highway (R-A)	1	Eliminated because this element would not address the project purpose and need to meet existing or future planned development access requirements. The restrictions associated with this access category would require substantial changes to existing accesses and would not support the urban residential and commercial land uses in this segment.	The retained elements were evaluated in the Level 3B evaluation.
		2	Eliminated because this element would not address the project purpose and need to meet existing and future planned development (both near term and by 2035) access requirements due to the community desire to transition away from rural character and would conflict with planned future land use.	
		3	Retained	
		4	Retained	
		5	Retained	
	Non-Rural Principal Highway (NR-A)	1	Eliminated because this element would not address the project purpose and need to meet existing or future planned development access requirements. The restrictions associated with this access category would require substantial changes to existing accesses and would not support the urban residential and commercial land uses in this segment.	
		2	Retained	
		3	Retained	
		4	Retained	
		5	Retained	
	Non-Rural Arterial (NR-B)	1	Eliminated because this element would not address the project purpose and need to meet existing or future planned development access requirements. The restrictions associated with this access category would require substantial changes to existing accesses and would not support the urban residential and commercial land uses in this segment.	
		2	Retained	
		3	Retained	
		4	Retained	
		5	Retained	

Level 3A Evaluation – Cross-Section Packages

Level 3A evaluation included the development of cross-section thematic packages for each corridor study segment. A thematic package is an alternative that includes improvements for the entire corridor packaged to achieve specific goals and to offer a reasonable range of choices to be analyzed and evaluated together. These thematic packages were developed from the

elements that were retained from the Level 2A evaluation (59 Level 2A elements retained) as an efficient way to evaluate the elements corridor-wide. The packages were created to illustrate a range of cross-section combinations so that all elements could be considered in an appropriate package.

Fifty-nine Level 2A elements were incorporated into three Level 3A thematic packages.

Level 3A Package Development

All 59 Level 2A elements were incorporated into three Level 3A packages: *Meet Basic Needs*, *Maximize Mobility/Flexibility*, and *Encourage Alternative Modes*. These packages were developed based on a working session with the TWG on October 17, 2012, and are described below. **Appendix C** includes detailed package descriptions and cross-sections.

- ▶ **Meet Basic Needs:** This package aimed to provide the most economical and readily implemented cross-sections to meet the 2035 travel demands and accommodate bicycle, pedestrian, and transit travel modes. As such, this package included a paved median, no separate bicycle facilities, no transit priority treatments, and a roadside ditch for drainage. It should be noted that although this package included only the basic elements, it did not represent a minimum ROW requirement because of the roadside ditches.
- ▶ **Maximize Mobility/Flexibility:** This package aimed to provide cross-sections that maximize the mobility for all travel modes while providing flexibility to transform the corridor in response to evolving travel demands. Consistent with its theme, this package included raised medians, bike lanes, a shared use path, and transit priority treatments. This package also included curb and gutter and a stormwater drainage system that minimize ROW requirements.
- ▶ **Encourage Alternative Modes:** This package aimed to encourage alternative travel modes (transit, bicycling, and walking) by providing cross-sections that provide favorable travel times and levels of accommodation for non-single occupant vehicle (SOV) travel. Thus, this package included the use of one travel lane in each direction for bus/HOV travel only; the outside lane was designated for such use to best provide for local bus service. Due to this lane usage, this package would not only encourage the use of other modes but also discourage the use of SOVs in this corridor. The package also included a raised median, bike lanes, and shared use paths. To reduce the ROW requirements, this package included curb and gutter.

Level 3A Evaluation Criteria

Each package was evaluated against a series of evaluation criteria based on the purpose and need, project goals, and TWG input. The fundamental philosophy in the evaluation process involved identifying notable positive and negative characteristics of the packages, as well as evaluating the packages based on these characteristics. **Section 2.3** includes details on the evaluation criteria, and **Appendix C** includes specific measures for the Level 3A criteria.

Level 3A Evaluation Results

In the Level 3A evaluation, the three packages were evaluated for each of the five corridor segments for a total of 15 segment packages. Of the 15 packages, five segment packages were eliminated because they did not meet purpose and need (**Table 2.5**). **Appendix C** documents the detailed Level 3A evaluation process.

The bus/HOV/HOT lanes were eliminated as part of the Level 3A package, *Encourage Alternative Modes*, because the package would not address the project purpose and need to reduce existing and future (2035) traffic congestion and because the capacity of bus/HOV/HOT lanes exceeded the need (anticipated 2035 travel demand). However, this alternative was retained for future consideration when anticipated travel demand (post-2035) may require this type of facility. To accommodate the potential for implementation of a managed lane strategy and based on feedback from the TWG on November 7, 2012, the standard shoulder for the roadway cross-section was extended from 10 feet to 12 feet to allow for peak period shoulder lanes (sometimes referred to as hard shoulder running) for bus/HOV/HOT use at a later date.

Three Level 3A packages were evaluated for five corridor segments or a total of 15 alternatives.

Ten Level 3A packages were retained for further consideration.

Table 2.5 Level 3A Evaluation Results and Next Steps

Package	Segment	Result ¹
Meet Basic Needs	1	Eliminated because the package does not meet the purpose and need to provide infrastructure of alternative modes. The package does not provide transit priority for buses to encourage transit use.
	2	Retained
	3	Retained
	4	Retained
	5	Retained
Maximize Mobility and Flexibility	1	Retained
	2	Retained
	3	Retained
	4	Retained
	5	Retained
Encourage Alternative Modes	1	Retained
	2	Eliminated because this package would not address the project purpose and need to reduce existing and future traffic congestion. SH 7 would continue to exceed roadway capacity with a volume to capacity (v/c) ratio of 1.58 to 1.62.
	3	Eliminated because this package would not address the project purpose and need to reduce existing and future traffic congestion. SH 7 would continue to exceed roadway capacity with a v/c ratio of 1.63 to 1.7.
	4	Eliminated because this package would not address the project purpose and need to reduce existing and future traffic congestion. SH 7 would continue to exceed roadway capacity with a v/c ratio of 1.62.
	5	Eliminated because this package would not address the project purpose and need to reduce existing and future traffic congestion. SH 7 would continue to exceed roadway capacity with a v/c ratio of 1.23 to 1.58.

(1) Next Steps: These retained elements were combined with the results of the Level 3B, 3C, and 3D evaluations to create a Combined Alternative for evaluation in Level 4.

Of the remaining Level 3A packages by segment, the following elements were retained:

Corridor-wide Elements

- ▶ Transit: Transit Amenities (bus stops, shelters, pull outs, etc.)
- ▶ Transit Priority Treatments (queue jumps, signal priority)
- ▶ Bicycle Accommodation: Intersection Treatments (signing, striping, bike activated signals)
- ▶ Pedestrian Accommodation: At-grade Crossing Treatments (crosswalks, pedestrian activated signals, signing, etc.)

Segment 1:

- ▶ Roadway: 2 Lanes (2 general purpose travel lanes and a center left turn lane in a portion)
- ▶ Bicycle Accommodation: Bike Lanes or Shared Lanes
- ▶ Pedestrian Accommodation: Attached Sidewalks

Segment 2:

- ▶ Roadway: 4 Lanes (4 travel lanes, center left turn lane/median, and auxiliary lanes, assumed to have standard shoulders)
- ▶ Bicycle Accommodation: Shoulder for Bicycling or Bike Lanes
- ▶ Pedestrian Accommodation: Detached Sidewalk or Shared Use Path
- ▶ Potential Grade Separated Bicycle/Pedestrian Crossing (underpass or overpass)

Segment 3:

- ▶ Roadway: 6 Lanes (6 travel lanes, center left turn lane/median, and auxiliary lanes, assumed to have standard shoulders)
- ▶ Bicycle Accommodation: Shoulder for Bicycling or Bike Lanes
- ▶ Pedestrian Accommodation: Detached Sidewalk or Shared Use Path
- ▶ Potential Grade Separated Bicycle/Pedestrian Crossing (underpass or overpass)

Segment 4:

- ▶ Roadway: 4 lanes (4 travel lanes, center left turn lane/median, and auxiliary lanes, assumed to have standard shoulders)
- ▶ Bicycle Accommodation: Shoulder for Bicycling or Bike Lanes
- ▶ Pedestrian Accommodation: Detached Sidewalk or Shared Use Path
- ▶ Potential Grade Separated Bicycle/Pedestrian Crossing (underpass or overpass)

Segment 5:

- ▶ Roadway: 4 lanes (4 travel lanes, center left turn lane/median, and auxiliary lanes, assumed to have standard shoulders)
 - ▶ Bicycle Accommodation: Shoulder for Bicycling or Bike Lanes
 - ▶ Pedestrian Accommodation: Detached Sidewalk or Shared Use Path
 - ▶ Potential Grade Separated Bicycle/Pedestrian Crossing (underpass or overpass)
-

Level 3B Evaluation – Access Categories

Eleven elements retained after the Level 2B evaluation were further assessed in Level 3B. As part of the Level 3B evaluation, the corridor segments were redefined to coincide with existing and planned land uses along the corridor:

- ▶ US 287 to 119th Street (No-Action Alternative: Access Category NR-C)
- ▶ 119th Street to I-25 (No-Action Alternative: Access Category NR-A)
- ▶ I-25 to Holly Street (No-Action Alternative: Access Category R-A)
- ▶ Holly Street to McCann Ditch in Brighton (No-Action Alternative: Access Category R-A)
- ▶ McCann Ditch in Brighton to US 85 (No-Action Alternative: Access Category NR-B)

Level 3B Evaluation Criteria

Each access category for each corridor segment was evaluated against a series of evaluation criteria based on the purpose and need (safety, traffic operations, and access) and community criteria.

Appendix C includes the specific measures for the Level 3B criteria.

Level 3B Evaluation Results

Of the nine access categories, four were eliminated after the Level 3B evaluation. The following access categories were eliminated because they did not meet purpose and need for the following reasons:

Nine access categories were evaluated in Level 3B.

Five categories were retained.

- ▶ Non-Rural Arterial (NR-B) for 119th Street to I-25
 - This access category would not address the project purpose and need to address access and its contribution to traffic operational and safety deficiencies. This alternative would not encourage a connected local street system, would result in more conflict points, would have lower design standards, and would result in increased delays.
- ▶ Regional Highway (R-A) for I-25 to Holly Street
 - This access category does not address the project purpose and need to address access and meet the needs of existing and planned development along the corridor. This access category is inconsistent with existing and planned land uses that are non-rural.
- ▶ Non-Rural Arterial (NR-B) for I-25 to Holly Street
 - This access category would not address the project purpose and need to address access and its contribution to traffic operational and safety deficiencies. This access category would not encourage a connected local street system, would result in more conflict points, would have lower design standards, and would result in increased delays.
- ▶ Regional Highway (NR-A) for Holly Street to McCann Ditch in Brighton
 - This access category does not address the project purpose and need to address access and meet the needs of existing and planned development along the corridor. This access category is inconsistent with existing and planned land uses that are primarily rural.

The five retained access categories were combined with the results of Levels 3A, 3C, and 3D evaluations to create a Combined Alternative for evaluation in Level 4. **Appendix C** documents the detailed Level 3B evaluation process. The five retained access categories were:

- ▶ US 287 to 119th Street: NR-C (No change from the No-Action Alternative)
- ▶ 119th Street to I-25: NR-A (No change from the No-Action Alternative)
- ▶ I-25 to Holly Street: NR-A (A recommended change from the No-Action Alternative Access Category of R-A)
- ▶ Holly Street to McCann Ditch in Brighton: R-A (No change from the No-Action Alternative)
- ▶ McCann Ditch in Brighton to US 85: NR-B (No change from the No-Action Alternative)

Level 3C Evaluation – I-25/SH 7 Interchange Options

The Level 3C evaluation compared the partial cloverleaf interchange and the diverging diamond interchange (DDI) options at the juncture of I-25 and SH 7.

The partial cloverleaf interchange is included in Phase 1 of the Preferred Alternative selected in the North I-25 ROD (FHWA and CDOT, 2011b). Operational analyses in the North I-25 EIS resulted in a finding that the existing diamond interchange would not provide sufficient capacity to meet future 2035 travel demand (FHWA and CDOT, 2011a). Through coordination with the local communities and other key stakeholders in the area during preparation of the EIS, the partial cloverleaf interchange was selected as the Preferred Alternative configuration for the I-25/SH 7 interchange.

The DDI is recommended to move forward as a viable option to the partial cloverleaf when the I-25/SH 7 interchange is funded for final engineering design and construction.

Subsequently through the SH 7 PEL process, an optional concept for interchange improvements was proposed for evaluation at the I-25/SH 7 interchange. The DDI concept is a recently emerging interchange type aimed at handling heavy turning movements at an interchange in a more cost-effective manner. A DDI option was not evaluated in the North I-25 EIS.

As part of the SH 7 PEL study, the partial cloverleaf interchange and the DDI were both evaluated. No other additional interchange options were analyzed because of the previous analysis that was conducted for the interchange as part of the North I-25 EIS. **Table 2.6** provides a summary comparison of the key characteristics of the two interchange types. Based on this analysis, both the partial cloverleaf interchange and the DDI are viable options for the I-25/SH 7 interchange.

A NEPA Document Reevaluation (CDOT Form 1399), System Level Study (CDOT 1601 Process) and an Interstate Access Request (IAR) with CDOT and FHWA approval will be required before implementing either the partial cloverleaf interchange or the DDI. It is recommended that the DDI option be retained as a viable option to the partial cloverleaf when the I-25/SH 7 interchange is funded and ready to move ahead with final engineering design.

Table 2.6 I-25/SH 7 Interchange – Comparison of Alternatives

Characteristic	Partial Cloverleaf	Diverging Diamond Interchange (DDI)
<p>Compliance with North I-25 ROD Ability to fit within the footprint of the Preferred Alternative identified in the North I-25 ROD without requiring substantial reevaluation of environmental impacts.</p>	<p>The partial cloverleaf is included in Phase 1 of the Preferred Alternative selected in the North I-25 ROD. When this interchange is funded and in final engineering design, a NEPA Document Reevaluation (CDOT Form 1399) will be required because the project is proceeding to the next major approval. It is unlikely with this option that there will be any substantial changes in the social, economic, or environmental impacts of the Preferred Alternative that would substantially impact the quality of the human, socio-economic, or natural environment; therefore, the ROD will likely remain valid.</p> <p>A System Level Study (1601 Process) and IAR with CDOT and FHWA approval will also be required before implementation.</p>	<p>When the I-25/SH 7 interchange is funded and in final engineering design, a NEPA Document Reevaluation (CDOT Form 1399) will be required for this interchange. If the ROD is determined to be no longer valid or more information is required based on the NEPA Document Reevaluation because of a change in the Preferred Alternative to this type of interchange, additional documentation (Supplemental Environmental Impact Statement or revised ROD) would be required. Based on the conceptual engineering design, the DDI does not appear to have substantial additional impacts on the quality of the human, socio-economic, or natural environment. Additional public involvement and agency coordination would be required.</p> <p>A System Level Study (1601 Process) and an IAR with CDOT and FHWA approval will also be required before implementation.</p>
<p>Traffic Operations Ability to adequately serve the 2035 peak hour projected traffic volumes.</p>	<p>Free right turn movements are allowed onto the ramps, but left turns off the ramps are signal controlled.</p> <p>Configuration necessitates additional lanes on the bridge to accommodate 2035 travel demands.</p> <p>Through movements (from ramp to ramp) are accommodated, which is a useful tool to divert traffic during incident management on the mainline.</p> <p>Ramp terminal intersections are projected to operate at LOS B or better during PM peak hour with 2035 forecasts.</p> <p>Nearest signalized intersections (Huron and Washington) are projected to operate at acceptable LOS.</p> <p>Frontage Road connection to SH 7 will be recommended. The existing frontage road would be relocated to connect to 168th Avenue.</p> <p>There is approximately 690 feet of stacking distance between the SB ramp terminal intersection and locally proposed Palisades Parkway intersection; 50th percentile queue length of 375 feet (95th percentile queue length of 425 feet) for the EB approach to the interchange.</p>	<p>Both free left and free right turn movements are allowed at ramps.</p> <p>The DDI operates with two-phase signals and shorter cycle lengths than the partial cloverleaf interchange.</p> <p>Configuration allows for accommodation of 2035 travel demands without additional lanes on bridge.</p> <p>U-turns from the highway are accommodated well, but through movements (from ramp to ramp) are not accommodated.</p> <p>DDI provides better functionality during power outages than the partial cloverleaf interchange.</p> <p>Cross-over intersections are projected to operate acceptably during PM peak hour with 2035 forecasts.</p> <p>Nearest signalized intersections (Huron and Washington) are projected to operate at acceptable LOS.</p> <p>Frontage Road connection to SH 7 will be recommended. The existing frontage road would be relocated to connect to 168th Avenue.</p> <p>There is approximately 880 feet of stacking distance between the SB ramp terminal intersection and locally proposed Palisades Parkway intersection; average queue length of 175 feet (maximum queue length of 600 feet) for the EB approach to the interchange.</p>

Table 2-6 I-25/SH 7 Interchange – Comparison of Alternatives (Continued)

Characteristic	Partial Cloverleaf	Diverging Diamond Interchange (DDI)
<p>Transit Accommodations Ability to efficiently accommodate bus service along SH 7 and on I-25, as well as the connection between these services.</p>	<p>Regional bus service (along I-25) could use ramps with bus pull outs on south side of SH 7. Regional buses could incur delays at signalized ramp terminal intersections.</p> <p>Connections between local bus service (along SH 7) and regional bus service could be accommodated at the park-n-Ride(s) or via pedestrian connections from SH 7 to the regional bus stop south of SH 7.</p> <p>A future park-n-Ride could be accommodated in the southwest quadrant of the interchange; the loop ramp limits the size of a potential park-n-Ride in the southeast quadrant of the interchange.</p> <p>Conceptual design could accommodate future (post-2035) hard shoulder running for buses on SH 7 with lane and median reconfigurations.</p>	<p>Conceptual design includes bus-only pull outs for regional buses (along the I-25 corridor) to stop south of SH 7 with pedestrian connections under ramps. Regional buses would not be routed through the ramp terminal intersections but would instead proceed directly back onto the highway from the pull out.</p> <p>Connections between local bus service (along SH 7) and regional bus service could be accommodated at the park-n-Ride(s) or via pedestrian connections from SH 7 to the regional bus stop south of SH 7.</p> <p>A future park-n-Ride could be accommodated in the southwest and/or southeast quadrant of the interchange.</p> <p>Conceptual design does not accommodate future (post-2035) hard shoulder running for buses on SH 7 and would require further widening of the bridge.</p>
<p>Pedestrian/Bicycle Accommodations Provision for safe and efficient movement of pedestrians and bicyclists through the interchange.</p>	<p>Pedestrians would be accommodated on a traditional sidewalk (consistent with expectations). There would be two crossings at signalized intersections and four uncontrolled crossings at ramps.</p> <p>Bicyclists would be accommodated on either bike lanes or a wide sidewalk on both sides of the bridge.</p> <p>Pedestrian connections between local and regional transit should be designed to be as easy and as direct as possible; configuration to be determined in later project development phases.</p>	<p>Pedestrians would be accommodated in the middle of the structure (which is barrier protected but is unexpected for pedestrians). There would be two crossings at signalized intersections (vehicles are approaching from an unexpected direction) and four uncontrolled crossings at ramps.</p> <p>Bicyclists would be accommodated on the wide barrier protected walkway in the center of the structure for the length between the cross-over intersections. Bike lanes could be provided in this segment, but they would be placed between the travel lane and the center barrier, an unexpected position.</p> <p>An option (more expensive) would be to accommodate both pedestrians and bicyclists on separate bridge structures over I-25 on either side of the SH 7 bridge.</p> <p>Pedestrian connections between local and regional transit should be designed to be as easy and direct as possible; configuration to be determined in later project development phases.</p>
<p>Safety Reduction of conflict points and the ability to meet driver expectations.</p>	<p>This interchange concept has 20 vehicular conflict points (8 crossing conflicts, 4 merging conflicts, and 8 diverging conflicts).</p> <p>Speeds tend to be higher for through movements.</p> <p>There is a potential for wrong way entry to ramps.</p>	<p>This interchange concept has only 14 vehicular conflict points (2 crossing conflicts, 6 merging conflicts, and 6 diverging conflicts).</p> <p>Speeds tend to be lower, and traffic calming features can be included.</p> <p>Wrong way entry to ramps is very difficult.</p> <p>History at US's first DDI in Springfield, Missouri (compared to pre-construction diamond interchange) has shown overall crash rates down 46 percent in the first year. Left turn right angle crashes were down 72 percent. (Minimum of three years of crash data needed to fully assess safety benefits.)</p> <p>Design is critical to eliminate driver confusion.</p>

Table 2-6 I-25/SH 7 Interchange – Comparison of Alternatives (Continued)

Characteristic	Partial Cloverleaf	Diverging Diamond Interchange (DDI)
<p>Use of Existing Infrastructure Ability to make maximum use of existing infrastructure, particularly the bridge. Ability to eventually replace the bridge without redesigning the entire interchange.</p>	<p>The structure over I-25 would have to be widened significantly. With the design concept shown in the North I-25 EIS, this widening would be up to 72 feet to accommodate a wide median. By reducing the median, this width could be reduced. The existing structure could be used for an interim condition if the median is eliminated in this condition. The widening could then be done when the bridge needs to be reconstructed for either physical condition reasons or traffic operations reasons. All of the ramps in this option would require reconstruction.</p>	<p>The existing structure over I-25 would be required to be widened up to approximately 13 feet to accommodate the center shared use path and three travel lanes in each direction. The existing structure could be used in an interim condition that would include a middle pedestrian sidewalk and two travel lanes in each direction until traffic demands warrant a third travel lane in each direction. The existing ramp infrastructure could not be used effectively in an interim scenario because the turning movements at SH 7 would be very tight. All of the ramps in this option would require reconstruction.</p>
<p>Right-of-Way Acquisition Minimize the acquisition of property for ROW and its associated cost.</p>	<p>Approximately 11.2 acres of ROW would be required, with substantial amounts required in the loop ramp quadrants (northwest and southeast).</p>	<p>Approximately 3.0 acres of ROW would be required, which would mainly affect the southwest and the southeast quadrants.</p>
<p>Compatibility with Local Land Uses Minimize impacts on existing land uses and provide opportunities for potential future development.</p>	<p>The partial cloverleaf interchange will require the acquisition of property mainly from the northwest and southeast quadrants of the existing interchange. These lands are currently vacant, but future land use for these quadrants consists of high density mixed-use and commercial land use. The partial cloverleaf interchange will reduce the available land for future development.</p>	<p>This concept will also require acquisition of property for ROW, although to a much lesser extent. The acquisitions necessary would be relatively narrow strips of land in the southeast and southwest quadrants. While these properties are currently undeveloped, future land uses call for commercial uses in these quadrants.</p>
<p>Cost Estimated construction cost to implement the option.</p>	<p>\$25.2 million</p>	<p>\$13.2 million</p>
<p>Constructability Ability to phase the improvement in such a way that impacts on the travelling public and adjacent property owners are minimized.</p>	<p>The SB and NB off-ramps would have to be constructed first so that these new ramps could be used for traffic while the loop ramps (which will require removal of the existing ramps) are constructed. Traffic could use the existing left turns on SH 7, along with the existing ramps, until the proposed northwest and southeast ramps are constructed. This may require two closely spaced signalized intersections on SH 7 on both the west and east sides of I-25 during this construction phase.</p>	<p>The proposed ramps would be in close proximity to the existing ramps, which should allow for easier transitions to occur from the existing to the proposed ramps. The challenge of this option would be the phased construction of the improvements within SH 7, particularly at the ramp terminals where the DDI crossovers occur. Switching traffic to the DDI configuration should be completed as late in the construction process as possible. After this switch is made, the last aspect to be constructed would be the final median improvements within SH 7.</p>

Level 3D Evaluation – SH 7 Realignments

The study evaluated potential realignments of SH 7 at both ends of the corridor, as requested by the local jurisdictions. All alignments were retained as a result of the Level 1 evaluation.

Level 3D - Eastern Realignment Evaluation

The City of Brighton requested consideration of a potential realignment of SH 7 diverging from its current alignment at some point west of the South Platte River and connecting with US 85 at the 168th Avenue (Baseline Road) intersection. **Figure 2.3** shows an area of the potential realignment option.

The stated goals of this realignment are:

- ▶ Reduce traffic volumes on Bridge Street through the downtown area, thereby making the downtown more pedestrian friendly.
- ▶ Enhance regional connectivity by providing a convenient route via 168th Avenue for through traffic (particularly truck traffic) to travel between I-76 and points west on SH 7.
- ▶ Reduce congestion and improve safety at the roundabouts at the SH 7/US 85 interchange.

Based on a review of this and other information, the following summarizes the benefits and impacts of the realignment.

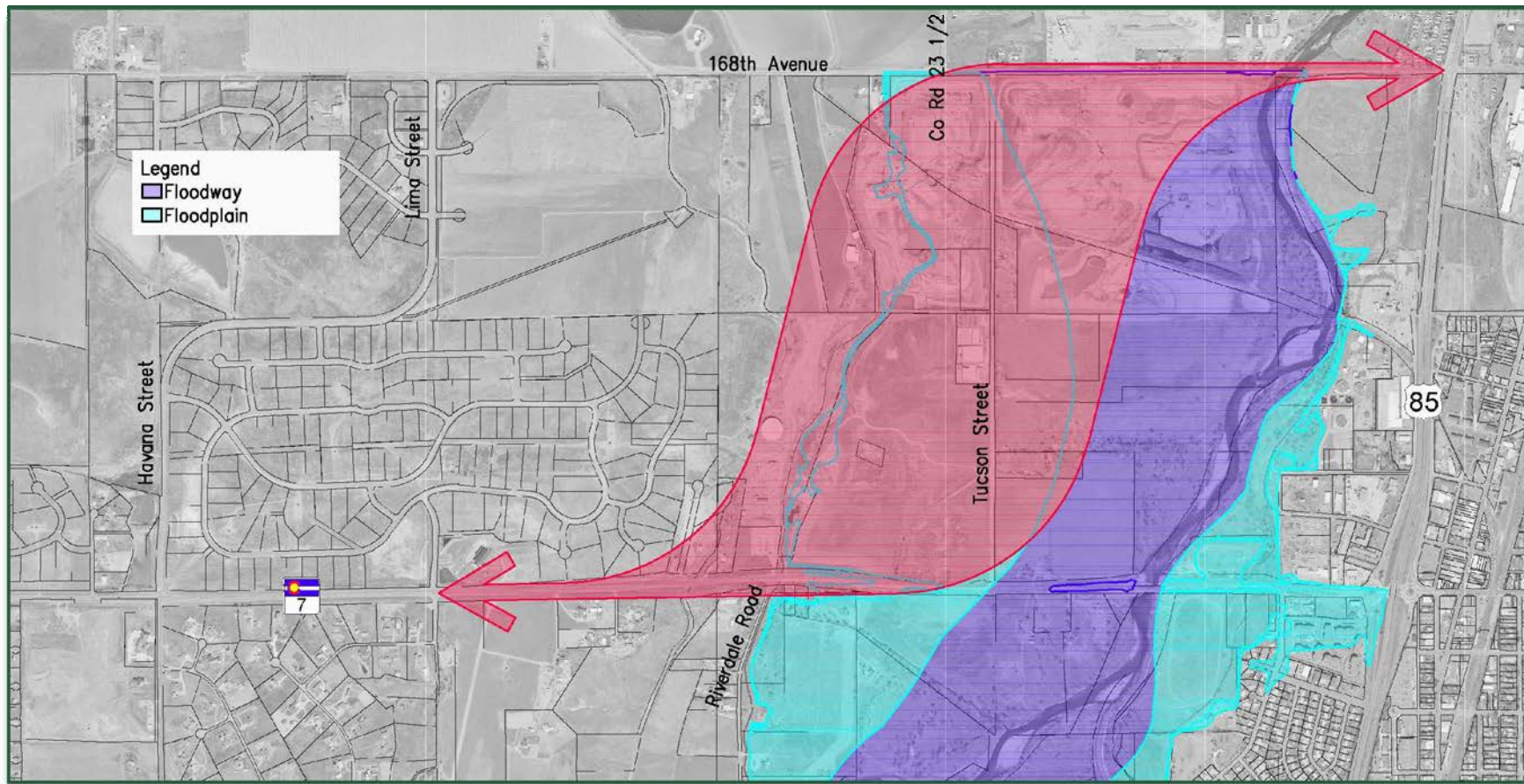
Benefits

- ▶ Would reduce the volume of traffic entering the roundabouts at US 85/SH 7 by about 18 percent.
- ▶ Would reduce traffic on Bridge Street in the downtown Brighton area by approximately 4 percent in 2035 (although only by about 1,200 vpd).
- ▶ Would encourage (albeit to a limited degree) use of 168th Avenue as a regional connector from I-76 to SH 7.
- ▶ Would extend the time before the existing bridge on SH 7 over the South Platte River would need to be widened.

Impacts

- ▶ Would accelerate the need for improvements at the intersection of 168th Avenue/US 85 and replacement/widening of the bridge on 168th Avenue over the South Platte River.
- ▶ Would involve the addition of a small amount of lane-miles to the State Highway System, which would require approval of the Transportation Commission.
- ▶ Would likely require acquisition of private property for roadway ROW.
- ▶ Depending on the specific route chosen, could be a challenging and expensive realignment project due to floodplain issues in the area.
- ▶ Would require access control along the realigned portion of SH 7, thereby limiting development along it.

Figure 2.3 Area for Eastern Realignment Option



The City of Brighton envisions this realignment as a longer term improvement (post 2035) but would like to ensure that the opportunity for the realignment is preserved. A consensus was not reached as to the location of this realignment. Thus, the City would like to recognize this option in the PEL study so that landowners and developers can be informed of potential future ROW requirements as they create development plans.

Level 3D - Western Realignment Evaluation

The Town of Erie and the City of Lafayette requested consideration of a potential realignment of SH 7 diverging north from its current alignment at some point west of the existing SH 7/Airport Drive intersection and connecting with US 287 at Arapahoe Road (SH 7). To ensure that the needs and concerns of the affected entities could be heard and considered in the western realignment evaluation, a small group was formed consisting of representatives and elected officials from the Town of Erie, City of Lafayette, Boulder County, CDOT, and the study team. This small group was involved at each step of the evaluation, as well as during the development of the alignment alternatives. The small group met five times: June 13, 2012; September 11, 2012; September 26, 2012; November 16, 2012; and January 9, 2013.

To evaluate the potential realignments, a set of evaluation criteria was developed from the criteria prepared for the corridor by the TWG, as well as local criteria based on the stated goals of the communities and CDOT. The stated goals of each of the entities were:



- ▶ Create an aesthetically pleasing “gateway” into the community from the south that attracts travelers to Erie and avoids the wastewater treatment plant as its “front door.”
- ▶ Identify mobility improvements to improve east-west connectivity and traffic operations along SH 7.
- ▶ Create economic development opportunities for Erie that can be served by a realigned SH 7.
- ▶ Maintain access to the Erie Airport from SH 7.



- ▶ Maintain open space between communities.
- ▶ Maintain the corridor’s rural character, where present.
- ▶ Determine the ways in which SH 7 can best move people and increase person trips in the east-west direction, as well as how it can connect to north-south facilities for improved mobility.
 - Understand and recognize the opportunities and constraints.
 - Understand how regional connections can be made.
- ▶ Enhance transit opportunities.
 - Understand what transit facilities and connections would make the most sense and where.



- ▶ Attract visitors to Lafayette’s downtown.
- ▶ Develop and enhance the downtown area while maintaining its character.
- ▶ Improve safety along Lafayette’s segment of SH 7.
- ▶ Minimize traffic impacts on Lafayette.
 - Reroute truck traffic.
 - Develop a solution for traffic traveling from the east and desiring to go to the south of Lafayette.
- ▶ Enhance community aesthetics by developing corridor improvements east of Lafayette.
- ▶ Improve corridor mobility.
- ▶ Develop consistency and continuity throughout the corridor into Lafayette by identifying and carrying through improvements to bicycle and pedestrian facilities.



- ▶ Improve mobility within the corridor while addressing access and development needs.
- ▶ Understand community needs to disperse traffic in ways that meet those needs.
- ▶ Identify broadly supported alternatives and reach consensus based recommendations reflective of community needs.

Level 3D Western Realignment Evaluation Criteria

The study team created a series of evaluation criteria based on the purpose and need and the goals of the Town of Erie, the City of Lafayette, Boulder County, and CDOT. These criteria included safety, traffic operations, access, alternative travel, community, environmental and cultural resources, and implementability. **Appendix C** includes the specific measures for the Level 3D criteria.

Level 3D Western Realignment Evaluation Results

The two basic elements of a northern or southern realignment were expanded to a series of potential SH 7 realignment locations (**Figure 2.4**), as well as improved local arterials not requiring redesignation as SH 7. The improved local arterials would consist of transportation improvements to the local arterial network, with SH 7 maintaining the existing alignment and designation. A combination of improved local arterials to the north and south would reduce traffic volumes in the downtown Lafayette area by approximately 25 percent. **Appendix C** documents the Level 3D evaluation process.

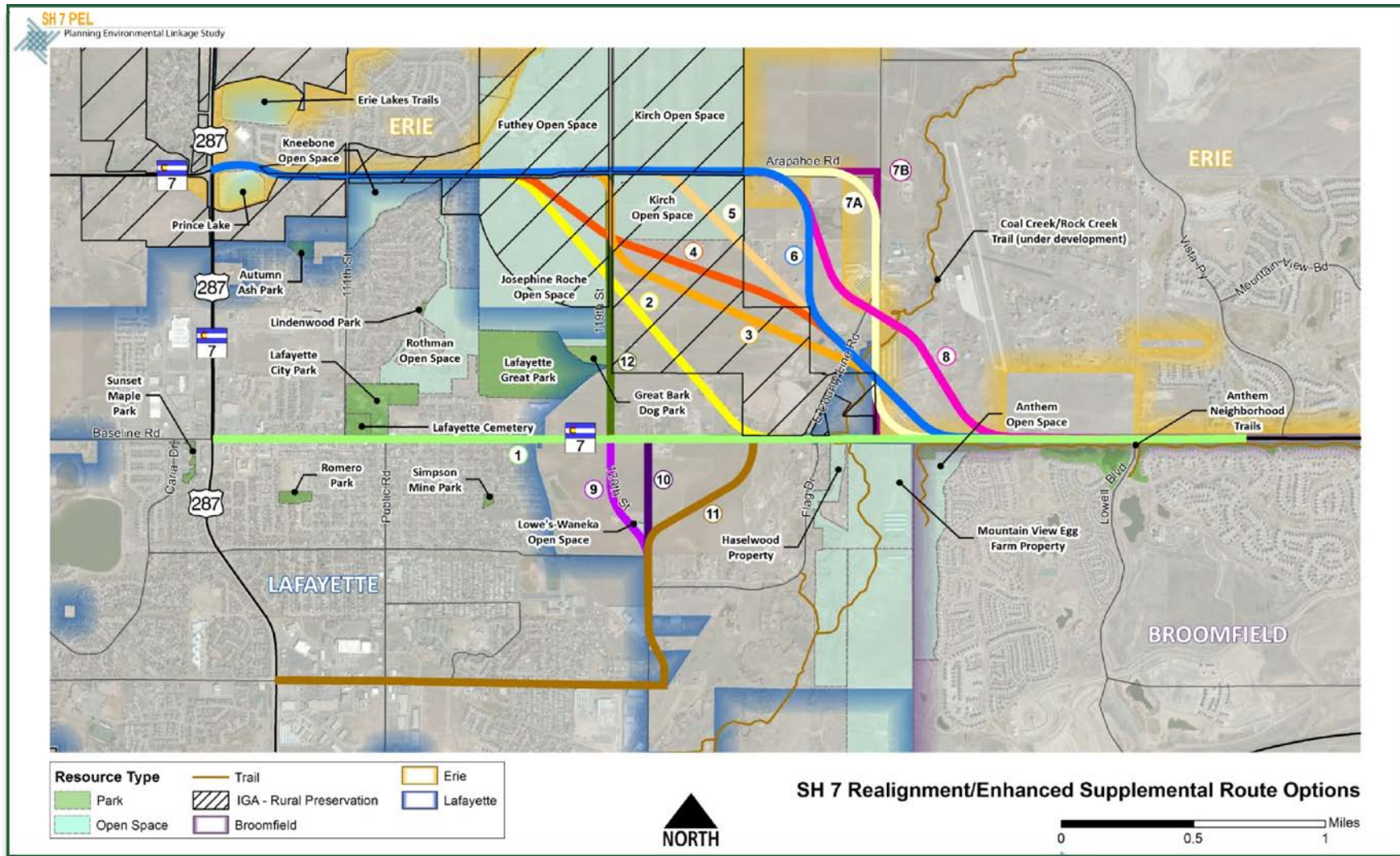
In the Level 3D evaluation, seven of the alignments were not recommended for further consideration because they had negative community and environmental/cultural resource impacts greater than other alternatives that also met the purpose and need and avoided or minimized these impacts. They were either eliminated or not recommended for the following reasons:

- ▶ Alternatives 2, 3, 4, and 5 were eliminated due to the magnitude of a combination of negative impacts on community and environmental resources. These included impacts on parks and open space, and acquisition of property for ROW of a new alignment. Furthermore, these alternatives would present limited development opportunity because they would be located outside both Erie's and Lafayette's urban growth boundary in an area of rural preservation.
- ▶ Alternatives 6, 7A, and 8 were not recommended as realignment alternatives because these alternatives would have negative impacts on community resources due to the reduction of access to downtown Lafayette and potential impact on the economic vitality of the downtown. The City of Lafayette considered these impacts to be unable to be mitigated and of such probable magnitude that local approval would not be achievable. However, these alternatives were retained as improved local arterials.
- ▶ Alternatives 10 and 11 were retained as alternative alignments but not recommended because they would have negative impacts on community resources due to acquisition of property for ROW of a new alignment and the need for additional major access points on SH 7.

Alternative 1 involved the widening of existing SH 7 to three lanes through Lafayette, as evaluated as Segment 1 in Levels 1, 2A, 2B, and 3A. Alternatives 6, 7, 8, 9, and 12 were retained as improved local arterials. Some of these alternatives were combined to become the conceptual plan agreed to by the Town of Erie, City of Lafayette, Boulder County, and CDOT and recommended for the western realignment conceptual plan.

This conceptual plan keeps SH 7 on its current alignment and improves a series of intersections and local arterial roads, to create a supporting network that provides alternate routes for traffic to disperse through this area. The plan includes a relocated SH 7/County Line Road intersection, a new County Line Road roadway in a due north-south direction and improvements, as necessary, to existing County Line Road, 119th Street, 120th Street, and Arapahoe Road. **Chapter 3.0** further discusses the conceptual plan.

Figure 2.4 West End Alignment Alternatives



Level 4 Evaluation – Combined Alternative

The results of the Level 3A, 3B, 3C, and 3D evaluations were then brought together with the three remaining Level 1 elements (intersection improvements, TSM [signal timing, etc.], and TDM [alternative modes, rideshare programs, etc.]) to create a Combined Alternative to be assessed through Level 4 evaluation. Because the Level 3C evaluation did not result in the identification of an alternative for the I-25/SH 7 interchange, the Combined Alternative included both interchange options. The Combined Alternative is a multimodal transportation solution that includes roadway, transit, and bicycle and pedestrian accommodation, as well as access category recommendations, a system of improved intersections and local arterials to supplement SH 7 on the west end, and a potential realignment option on the east end.

To provide further guidance on the development of the Combined Alternative, TWG meetings on November 7, 2012, and December 12, 2012, included specific discussions focused on the following:

- ▶ Drainage – Curb and gutter (suburban/urban) or drainage ditch (rural)
- ▶ Median – Raised (suburban/urban) or painted (rural) at intersections and mid-block treatments
- ▶ Pedestrian Accommodation – Shared use path or detached sidewalk
- ▶ Bicycle Accommodation – Shoulder, bicycle lane, or shared use path

Adams County and Boulder County requested that both urban and rural cross-section options be considered in the Combined Alternative within their jurisdictions: Segment 2 (119th Street to County Line Road) – Boulder County and Segments 4 and 5 (York Street to US 85) – Adams County.

Appendix C describes in detail the resulting Combined Alternative.

Following development of the Combined Alternative, the study team conducted a verification analysis, which is also summarized in **Appendix C**. The goal of the verification analysis was to assess the Combined Alternative on a corridor-wide basis (which had not been done previously during the alternatives evaluation process) and to refine the Combined Alternative, as appropriate.

Based on the verification analysis and feedback received from the TWG at their meeting on January 15, 2013, the following refinements were made to the Combined Alternative:

- ▶ Identify locally-proposed access along the entire length of the corridor.
- ▶ Provide approach lanes and auxiliary lane lengths based on estimated traffic volumes at intersections along the corridor.
- ▶ Connect the east-west shared use path to the South Platte River Trail and the Coal Creek Trail.
- ▶ Remove the center-turn lane/median at the bridge crossing of the South Platte River to reduce the need for replacement of the existing structure, at the request of the City of Brighton and Adams County.
- ▶ Include the Miller Street connection as a parallel route to US 85, at the request of the City of Brighton.

- ▶ Combine the off-set existing intersections at SH 7/Ulster Street to a single intersection, at the request of Adams County.
- ▶ Provide bicycle/pedestrian grade separation options for the crossing of I-25 with the I-25/SH 7 interchange concepts, at the request of the City of Thornton and the City and County of Broomfield.
- ▶ Redirect alignment to the north around the National Register of Historic Places (NRHP)-eligible Wanaka Farm (5BL.1994) between 119th Street and County Line Road.
- ▶ Maintain the existing cross-section in downtown Lafayette except at the SH 7/Iowa Avenue and SH 7/Burlington Avenue intersections at the request of the City of Lafayette. At these locations, it may be appropriate in the future to consider adding left turn lanes or roundabouts to enhance safety for turning vehicles, especially school buses at the Iowa Avenue intersection.

In addition, due to cost considerations, compatibility with the types of development anticipated and, most importantly, a strong desire to maintain more of a rural character in the segments of Boulder and Adams Counties, the TWG supported the rural cross-section in the segments of SH 7 from 119th Street to the relocated County Line Road and from Holly Street east to Riverdale Road.

This study recommends that the Combined Alternative, as modified to reflect the changes noted above, move forward into NEPA as the Recommended Alternative. **Chapter 3.0** describes the Recommended Alternative in detail.



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3.0 RECOMMENDED ALTERNATIVE

Chapter 3.0 describes the Recommended Alternative resulting from the extensive alternatives development and evaluation process conducted in this PEL study. **Appendix D** includes the conceptual engineering plans and the cost estimates for the Recommended Alternative.

3.1 Cross-Sections

A recommended cross-section has been identified for each segment of the corridor, as described below.

Corridor-wide Elements

The following elements are included, as appropriate, in each segment of the corridor:

- ▶ Transit amenities (bus stops, shelters, pull outs, etc.)
- ▶ Transit priority treatments (queue jumps, signal priority)
- ▶ Bicycle intersection treatments (signing, striping, bike activated signals)
- ▶ Pedestrian at-grade crossing treatments (crosswalks, pedestrian activated signals, signing, etc.)
- ▶ Intersection improvements
- ▶ Transportation System Management (signal timing, coordination, etc.)
- ▶ Travel Demand Management (alternative modes, rideshare programs, etc.)

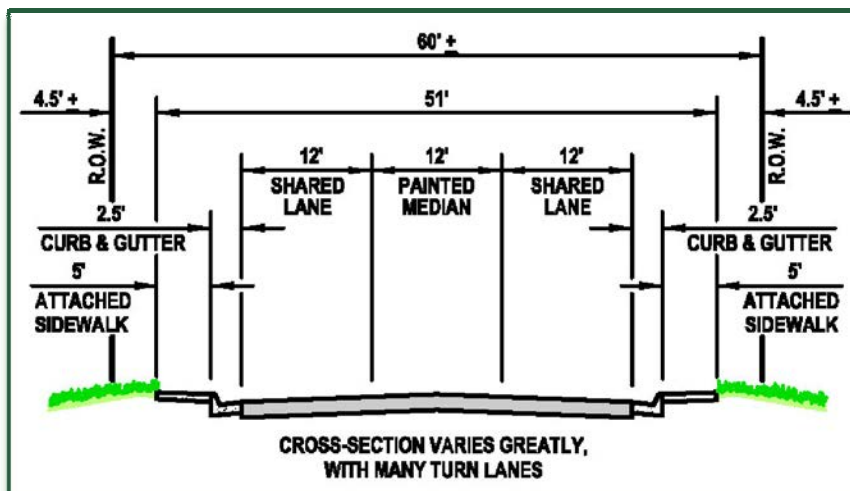
Segment 1 - US 287 to 119th Street

Because of the wide range of conditions in Segment 1, there are two typical cross-sections for two different stretches of this segment.

US 287 to Public Road (Figure 3.1):

- ▶ Roadway: 2 lanes (2 general purpose travel lanes, a center left turn lane/painted median, and curb and gutter)
- ▶ Bicycle: shared lanes (optional “sharrow” markings)
- ▶ Pedestrian: attached sidewalks
- ▶ Access Category Recommendation: NR-C

Figure 3.1 Segment 1 - US 287 to Public Road Cross-Section



Public Road to 119th Street (Figures 3.2 and 3.3):

- ▶ Roadway: 2 lanes (2 general purpose travel lanes and curb and gutter)
- ▶ Bicycle: Bicycle lanes
- ▶ Pedestrian: Attached sidewalks
- ▶ Access Category Recommendation: NR-C

Figure 3.2 Segment 1 - Public Road to 119th Street Cross-Section

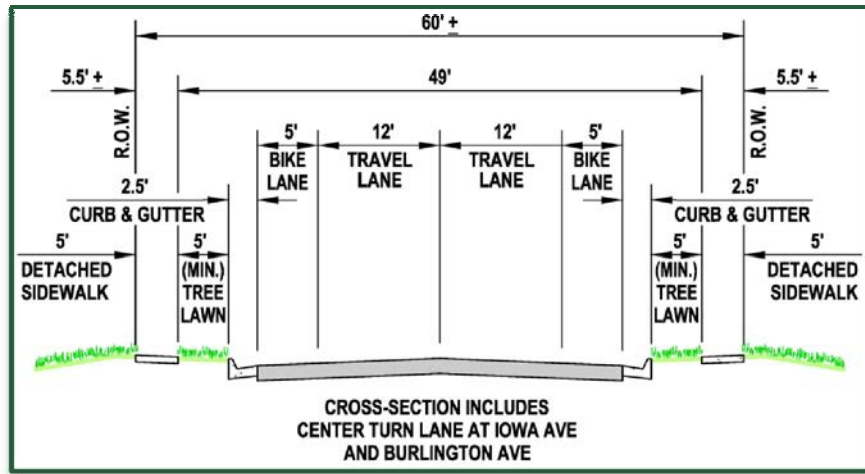
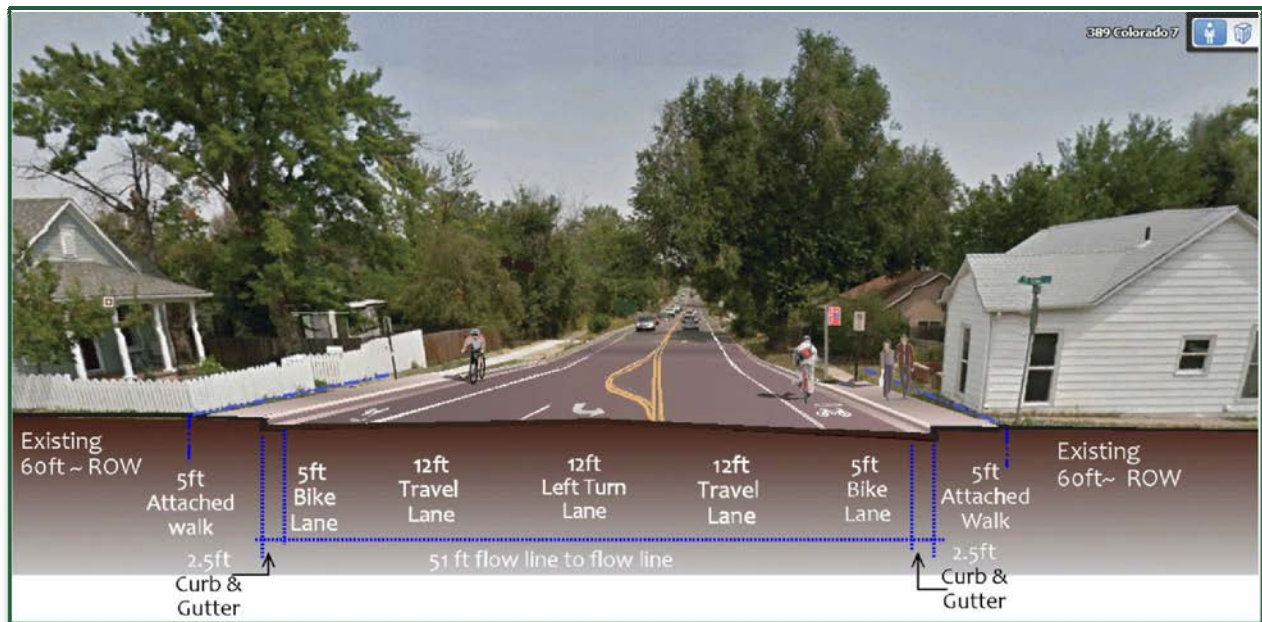


Figure 3.3 Illustrative View to East, Just East of Iowa Avenue



Segment 2 - 119th Street to Sheridan Parkway

Segment 2 also has two different recommended cross-sections to fit the varying characteristics in the segment.

119th Street to Relocated County Line Road (Figures 3.4 and 3.5)

- ▶ Roadway: 4 lanes (4 travel lanes, center left turn lane/median, auxiliary lanes, and 12-ft shoulders)
- ▶ Bicycle: Bike lanes on shoulders, shared use paths
- ▶ Pedestrian: Shared use paths
- ▶ Grade separated bicycle/pedestrian crossing (underpass) at Coal Creek (existing)
- ▶ Drainage: Drainage ditch
- ▶ Median: Painted median
- ▶ Access Category Recommendation: NR-A

Figure 3.4 Segment 2 - 119th Street to Relocated County Line Road Cross-Section

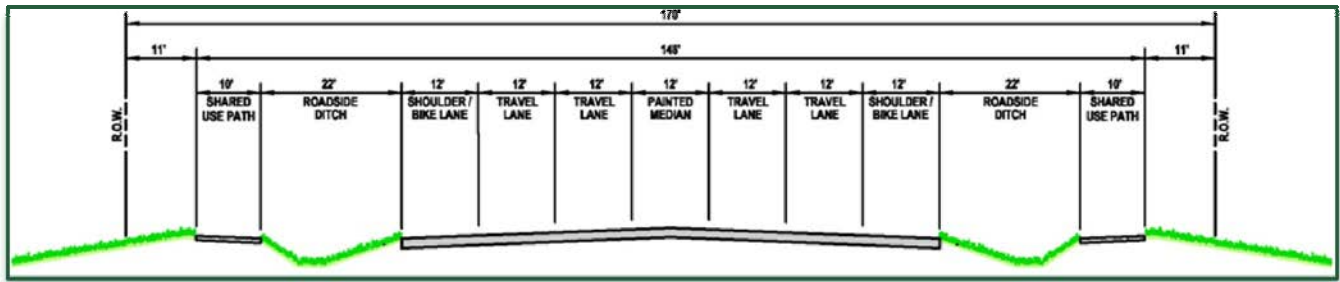
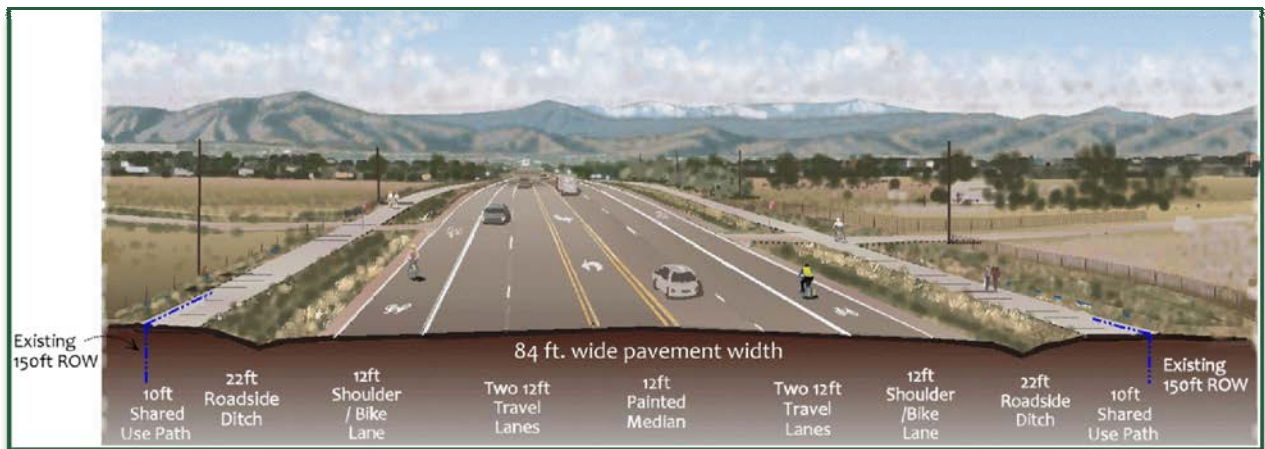


Figure 3.5 Illustrative View to West, West of Existing County Line Road



Relocated County Line Road to Sheridan Parkway (Figures 3.6 and 3.7)

- ▶ Roadway: 4 lanes (4 travel lanes, raised median, auxiliary lanes, and 12-ft shoulders)
- ▶ Bicycle: Bike lanes on shoulders, shared use paths
- ▶ Pedestrian: Shared use paths
- ▶ Drainage: Curb and gutter
- ▶ Median: Raised median
- ▶ Access Category Recommendation: NR-A

Figure 3.6 Segment 2 - Relocated County Line Road to Sheridan Parkway Cross-Section

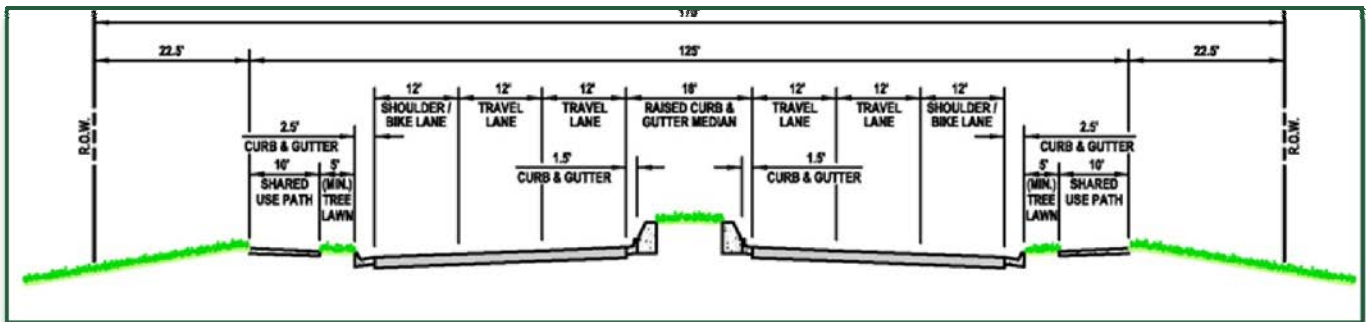


Figure 3.7 Illustrative View to West, at Lowell Boulevard



Segment 3 - Sheridan Parkway to York Street (Figures 3.8, 3.9 and 3.10)

- ▶ Roadway: 6 lanes (6 travel lanes, raised median, auxiliary lanes, and 12-ft shoulders)
- ▶ Bicycle: Bike lanes on shoulders, shared use paths
- ▶ Pedestrian: Shared use path or detached sidewalks (only in commercial areas)
- ▶ Accommodation for grade separated bicycle/pedestrian crossing (underpass) in the vicinity of Huron Street
- ▶ Drainage: Curb and gutter
- ▶ Median: Raised median
- ▶ Access Category Recommendation: NR-A

Figure 3.8 Segment 3 - Sheridan Parkway to York Street Cross-Section

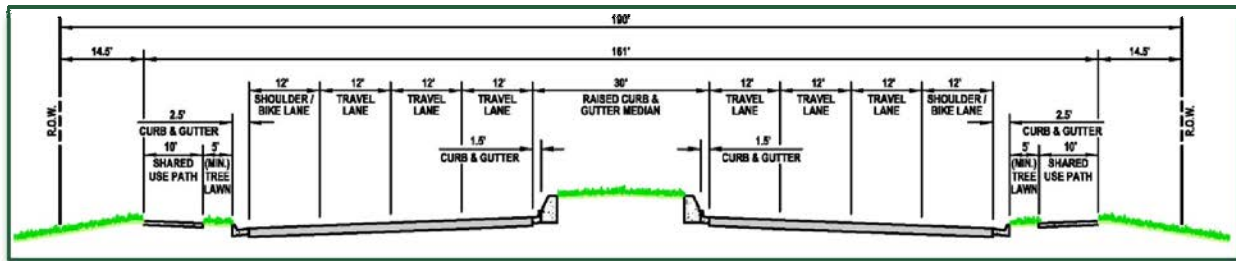


Figure 3.9 Illustrative View to West, Near Huron Street



Figure 3.10 Illustrative View to East, East of I-25



Segment 4 - York Street to Holly Street (Figures 3.11 and 3.12)

- ▶ Roadway: 4 lanes (4 travel lanes, raised median, auxiliary lanes, and 12-ft shoulders)
- ▶ Bicycle: Bike lanes on shoulders, shared use paths
- ▶ Pedestrian: Shared use paths
- ▶ Accommodation for grade separated bicycle/pedestrian crossing (underpass) west of Jackson Street
- ▶ Drainage: Curb and gutter
- ▶ Median: Raised median
- ▶ Access Category Recommendation: NR-A

Figure 3.11 Segment 4 - York Street to Holly Street Cross-Section

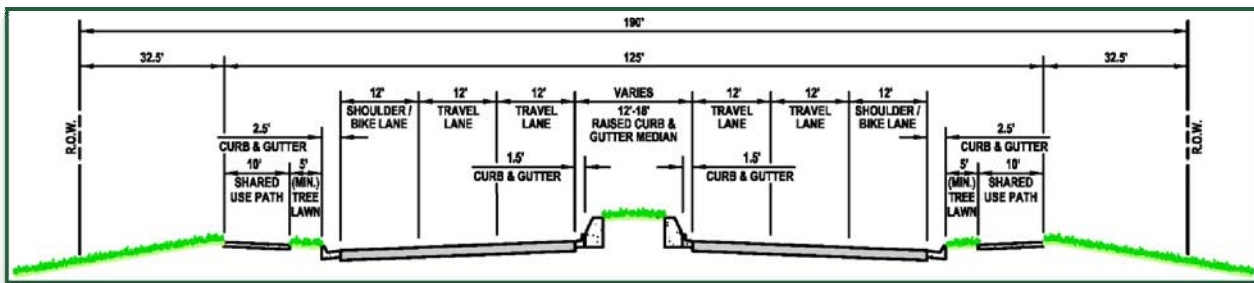


Figure 3.12 Illustrative View to East, Just West of Colorado Boulevard



Segment 5 - Holly Street to US 85

On the east end of Segment 5, existing development restricts ROW opportunities. Thus, there are two recommended cross-sections in Segment 5.

Holly Street to Riverdale Road (Figures 3.13 and 3.14)

- ▶ Roadway: 4 lanes (4 travel lanes, center left turn lane/median, auxiliary lanes, and 12-ft shoulders)
- ▶ Bicycle: Bike lanes on shoulders, shared use paths
- ▶ Pedestrian: Shared use paths
- ▶ Accommodation for grade separated bicycle/pedestrian crossing (underpass) west of Quebec Street
- ▶ Drainage: Drainage ditch
- ▶ Median: Painted median
- ▶ Access Category Recommendation: R-A

Figure 3.13 Segment 5 - Holly Street to Riverdale Road Cross-Section

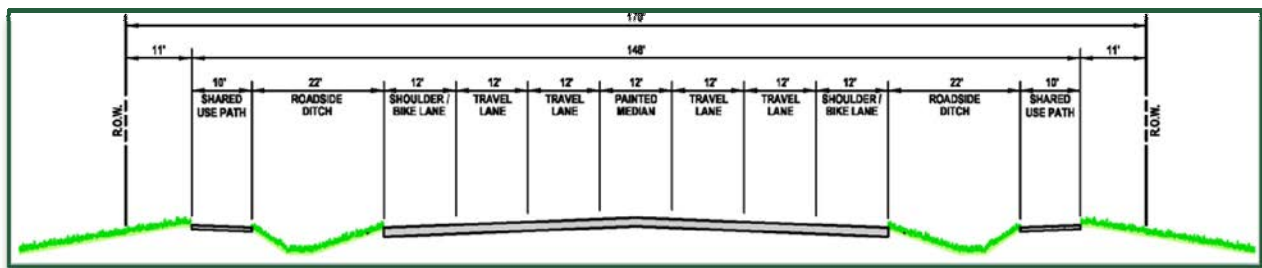


Figure 3.14 Illustrative View to East, Just West of the South Platte River

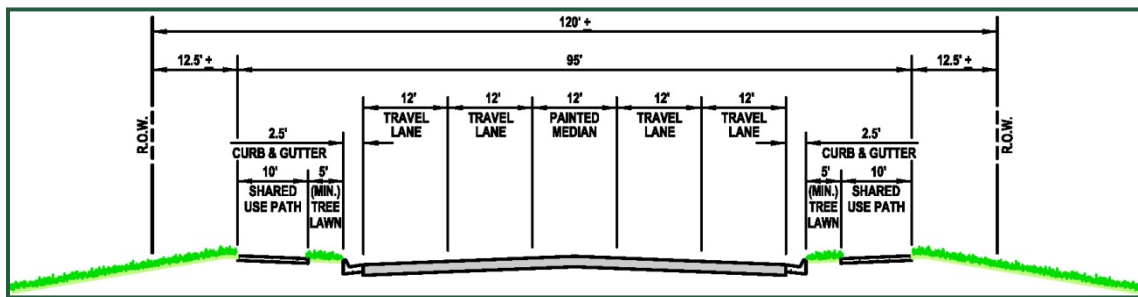


Riverdale Road to US 85 (Figure 3.15)

At Riverdale Road the cross-section transitions to an urban section with the following characteristics:

- ▶ Roadway: 4 lanes (4 travel lanes, center left turn lane/median, auxiliary lanes, and 12-ft shoulders)
- ▶ Bicycle: Bike lanes on shoulders, shared use paths
- ▶ Pedestrian: Shared use paths
- ▶ Grade separated bicycle/pedestrian crossing (underpass) at South Platte River (existing)
- ▶ Drainage: Curb and gutter
- ▶ Median: Painted median
- ▶ Access Category Recommendation: R-A from Riverdale Road to McCann Ditch; NR-B from McCann Ditch to US 85

Figure 3.15 Segment 5 - Riverdale Road to South Platte River Bridge Cross-Section



The cross-section transitions between Riverdale Road and the South Platte River bridge to a narrower cross-section that does not include a median across the bridge. From Miller Avenue east to US 85, the cross-section narrows to an urban section without shoulders to reflect the restricted ROW in this area.

3.2 *Alternative Travel Modes*

Transit

RTD, as the regional transit agency, is charged with planning, developing, and operating transit systems within the Denver metropolitan area. With the exception of a short segment of SH 7 in Lafayette, no transit service currently operates along the SH 7 study corridor. RTD bus routes serve each terminus of the corridor, as both Lafayette and Brighton have park-n-Ride facilities close to their respective ends of the study corridor.

Bus service along SH 7 is anticipated to be implemented in the short term, before the North Metro Corridor project. RTD will be working with the communities over the next year or two to define the actual service need, to conduct origin/destination studies, to collect data for determining population density, and to address infrastructure needs responsive to near-term development. Once RTD collects those data, service planners will assess what type of service would make most sense, such as an express route during AM/PM peak times only, a one-directional route, or a bi-directional route. In association with this type of service, they will also identify locations for stops. Once RTD has made these decisions, it will most likely be another year or two before a route and improvements along SH 7 are actually implemented.

The installation of transit amenities along the corridor (bus stops, shelters, pull outs, etc.) shall be coordinated with RTD to best accommodate near term and long term transit service along the corridor. In addition, the installation of the sidewalk or shared use paths should accommodate and connect directly to transit amenities along the corridor.

The Recommended Alternative includes queue jump lanes at major signalized intersections to allow buses to bypass queued vehicles at the intersection approach. For the purpose of ROW preservation, it is assumed that queue jumps could be implemented at any major signalized intersection along the corridor; the best and most effective locations for the queue jumps should be determined during the design phase. **Figures 3.16 and 3.17** provide an example intersection configuration with queue jump lanes. The configuration of each intersection will need to be individually designed to consider and address elements such as:

- ▶ Surrounding land uses
- ▶ Interaction with the bike lane
- ▶ Bus stop location: near side versus far side of the intersection (RTD's preference is for far side stops)
- ▶ Need for right turn acceleration lane
- ▶ Pedestrian connections to bus stops

In addition to the transit amenities and treatments to enhance future transit service along the SH 7 corridor, there is also a need to provide strong connections between SH 7 and the future regional transit service along the North Metro commuter rail line and the future commuter bus service along I-25. The I-25/SH 7 interchange and the area in the vicinity of the North Metro Station (near Colorado Boulevard) shall be designed to maximize pedestrian access to these regional transit facilities and to best facilitate connections between local service along SH 7 and the regional transit services.

Figure 3.16 Example Intersection with Queue Jump Lanes

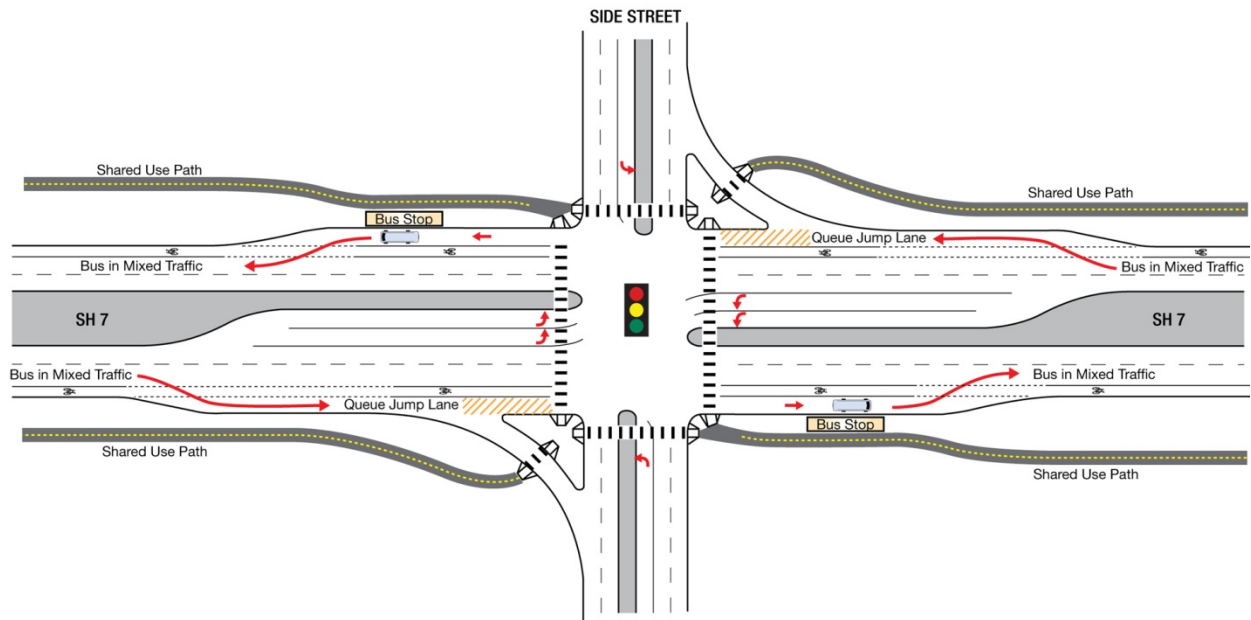
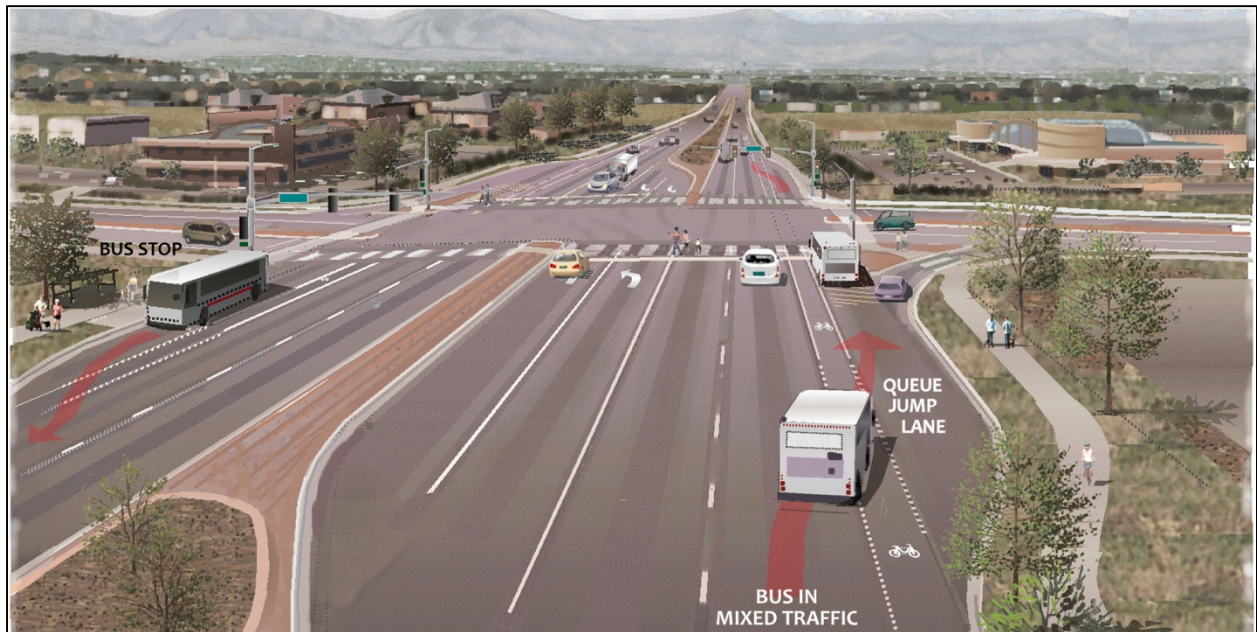


Figure 3.17 Illustration of Intersection with Queue Jump Lanes



Bicycle and Pedestrian Accommodations

The Recommended Alternative includes bicycle and pedestrian facilities along the full length of the SH 7 corridor to accommodate different types of bicyclists and pedestrians. Most of the corridor includes a wide 12-ft shoulder that can be used by bicyclists who are comfortable riding adjacent to motorized traffic. There are three optional striping configurations for the shoulders:

- ▶ Stripe as a shoulder only; no specific bike lane signing or striping.
- ▶ Stripe the shoulder as a full width (12-ft) bike lane with pavement markings and signing per CDOT *Road Design Guide and Manual of Uniform Traffic Control Devices* (MUTCD) standards.
- ▶ Stripe the shoulder as a buffered bike lane per CDOT Road Design Guide specifications.

Recreational and less confident bicyclists, including children, are less comfortable riding immediately adjacent to motorized travel lanes. The Recommended Alternative includes 10-ft shared use paths along most of the corridor to accommodate these less confident bicyclists, as well as pedestrians.

Bicyclists and pedestrians will find it more difficult to cross SH 7 when the roadway is widened. All signalized intersections along the corridor should include at-grade crossing treatments to enhance the safety and convenience for bicyclists and pedestrians. As shown on **Figure 3.18**, these treatments could include:

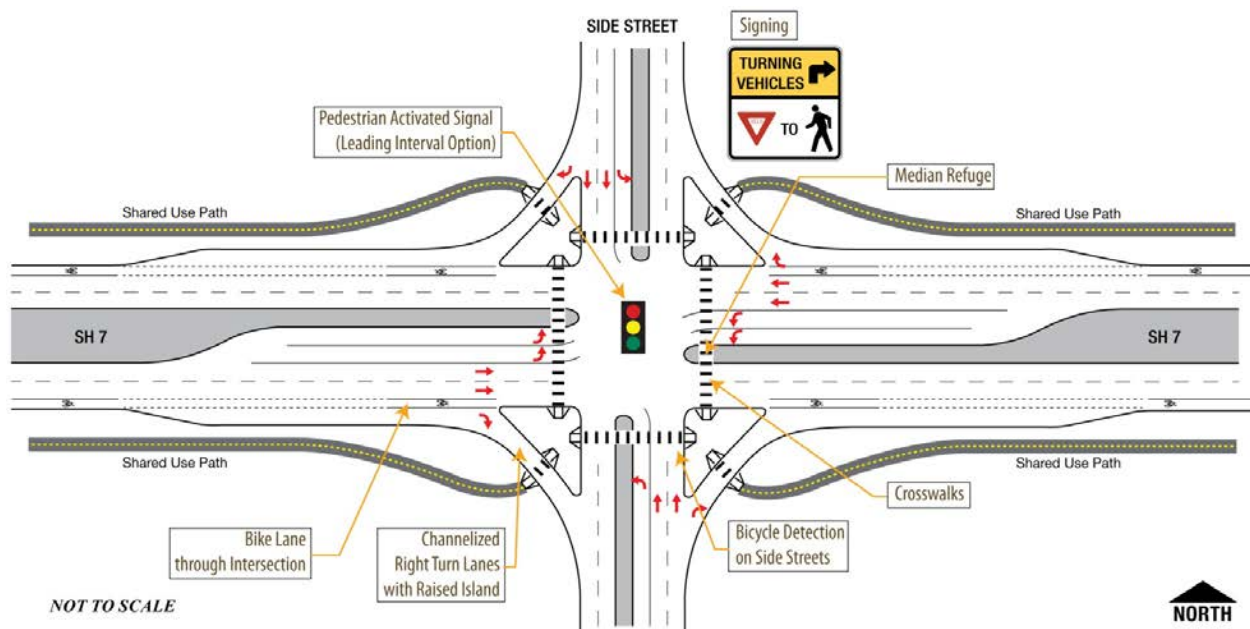
- ▶ Pedestrian crosswalks
- ▶ Use of TURNING VEHICLES YIELD TO PEDESTRIANS signs (MUTCD R10-15) to remind right-on-green and permissive left-turn movements of their obligation to yield to pedestrians in the crosswalk
- ▶ Pedestrian activated signals (with the option of a leading pedestrian interval)
- ▶ Channelized right turn lanes with raised islands to allow pedestrians to cross the right turning traffic independently of the rest of the intersection; the design should encourage low vehicle turning speeds and should provide unobstructed sight lines between pedestrians and motorists
- ▶ Proper bike lane striping to avoid the right lane conflict with right turning vehicles
- ▶ Bicycle detection (particularly on the side street approaches)

In addition to the at-grade intersection crossing enhancements, the local agencies have identified five potential locations for bicycle/pedestrian underpasses:

- ▶ Coal Creek (existing)
- ▶ West of Quebec Street
- ▶ Near Huron Street
- ▶ South Platte River (existing)
- ▶ West of Jackson Street

The Recommended Alternative includes accommodation for these underpasses, which would be initiated and constructed by the local agencies.

Figure 3.18 Example Intersection with Enhanced Bicycle and Pedestrian Crossing Treatments



3.3 Right-of-Way Preservation

Figure 3.19 depicts recommended ROW widths for preservation along the SH 7 corridor.

3.4 Access Recommendations

CDOT has assigned access categories for all segments of each state highway in Colorado. These categories relate to the requirements and thresholds for access spacing and auxiliary lane requirements documented in the *State Highway Access Code*. This study recommends one change to the assigned access categories for SH 7. As illustrated in **Figure 3.20**, it is recommended that the category change from R-A to NR-A on the segment from I-25 east to Holly Street.

Also, as shown in **Figure 3.20**, an update to the existing Access Control Plan among the Town of Erie, City and County of Broomfield, and CDOT is recommended from County Line Road to I-25 to address the communities' current development plans. In addition, development of an Access Control Plan is recommended among the City and County of Broomfield, City of Thornton, Adams County, and CDOT from I-25 to York Street.

Furthermore, this study included a thorough inventory of all accesses in the corridor, as illustrated in **Figures 3.21, 3.22, and 3.23**. These graphics include all existing and approved accesses, as well as those that the local municipalities have proposed along SH 7. These locally proposed access locations are also shown on the SH 7 PEL Conceptual Design Plan Set (**Appendix D**). However, these locally proposed accesses are not expressly recommended as part of the Recommended Alternative, nor has CDOT accepted them at this time. An access permit in accordance with the State Highway Access Code would be necessary before implementation. It is recommended that CDOT and the local entities review and evaluate these proposed accesses through the access control planning processes recommended above.

Figure 3.19 Recommended Right-of-Way Preservation

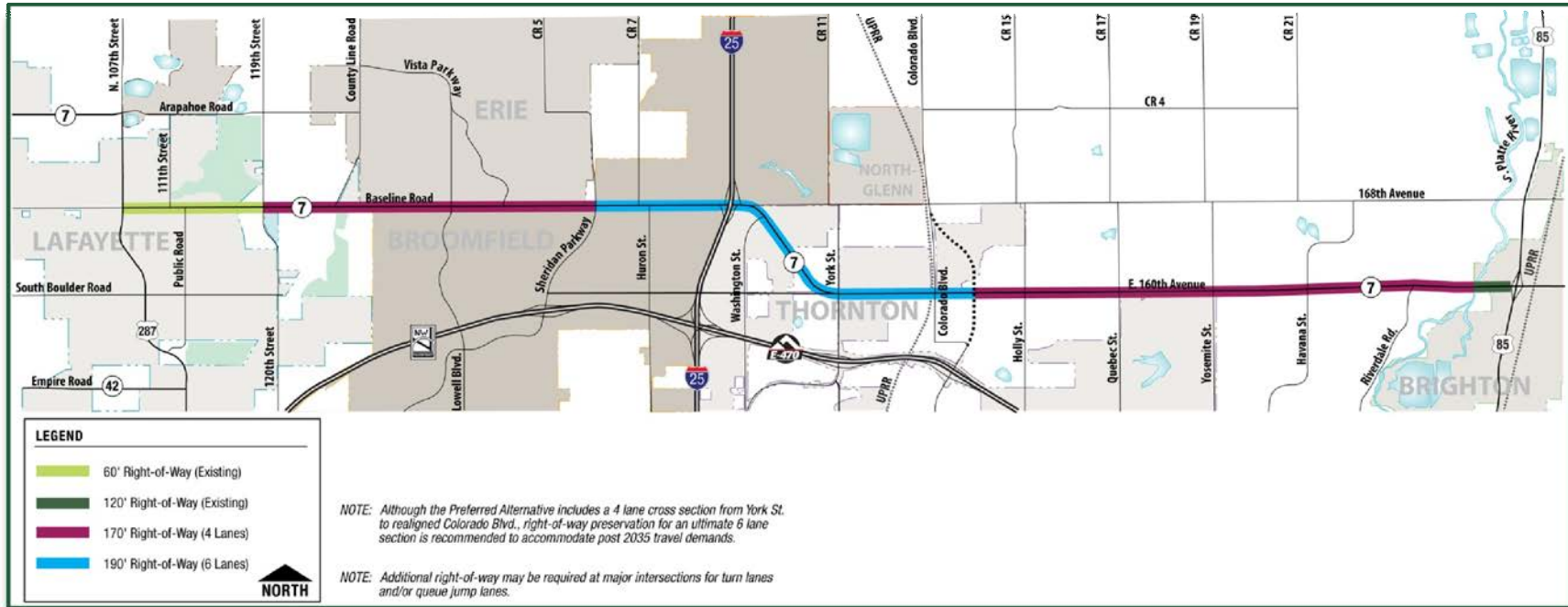
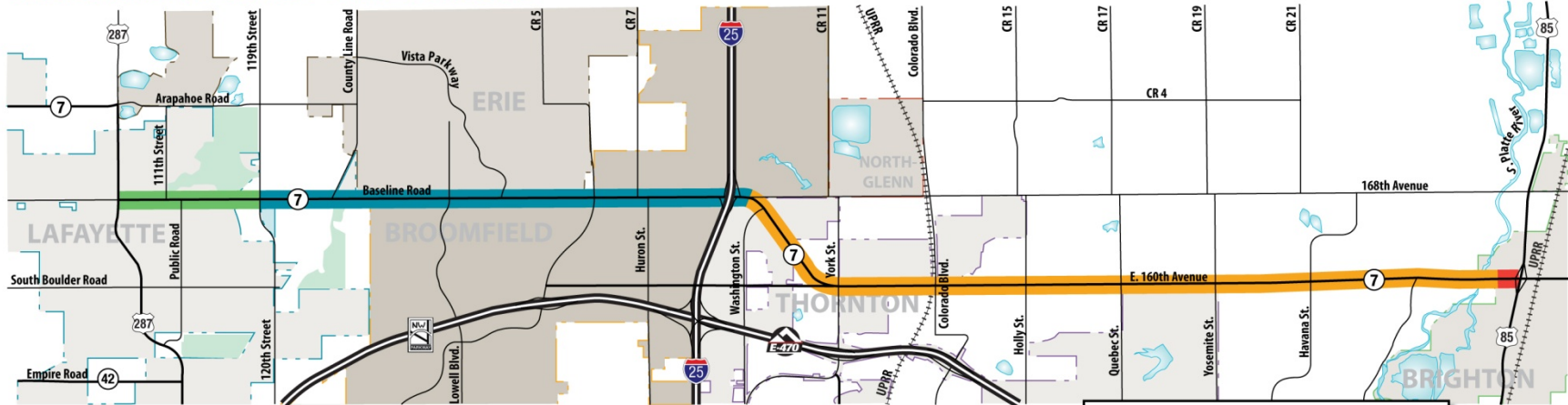


Figure 3.20 Recommended Access Categories

EXISTING ACCESS CATEGORIES



LEGEND

- R-A Regional Highway
- NR-A Non-Rural Principal Highway
- NR-B Non-Rural Arterial
- NR-C Non-Rural Arterial

NORTH

RECOMMENDED ACCESS CATEGORIES

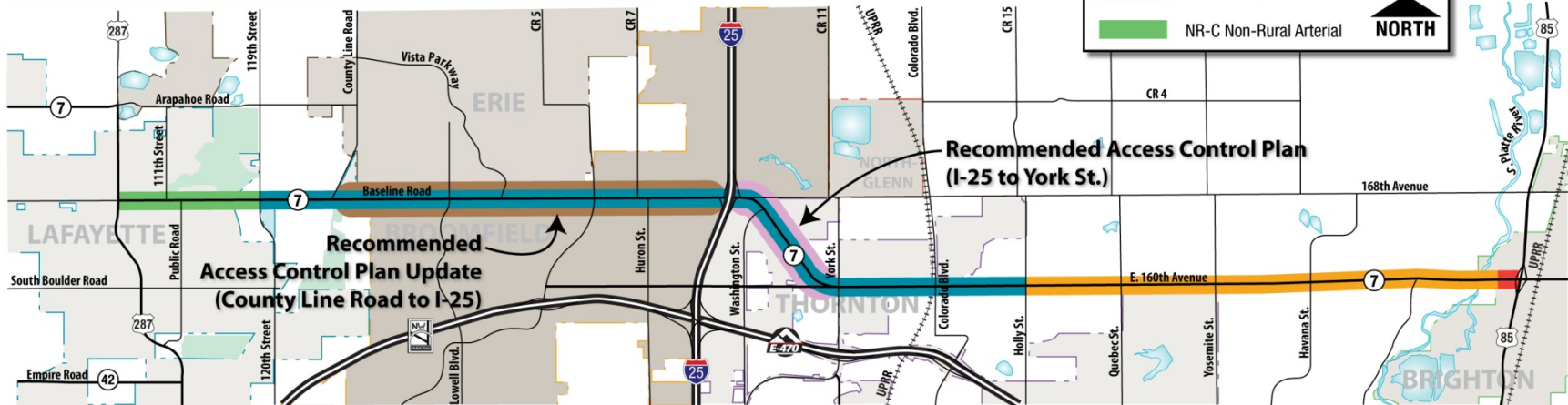
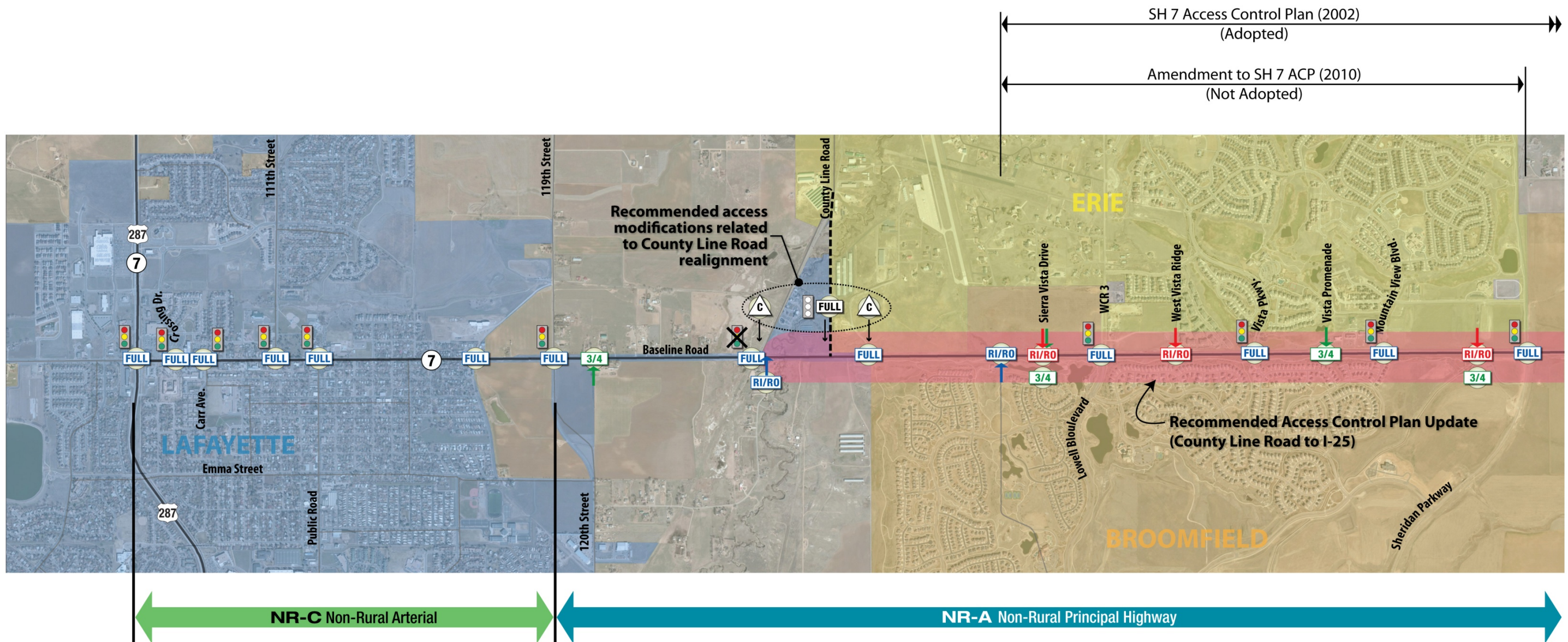


Figure 3.21 West Corridor Access

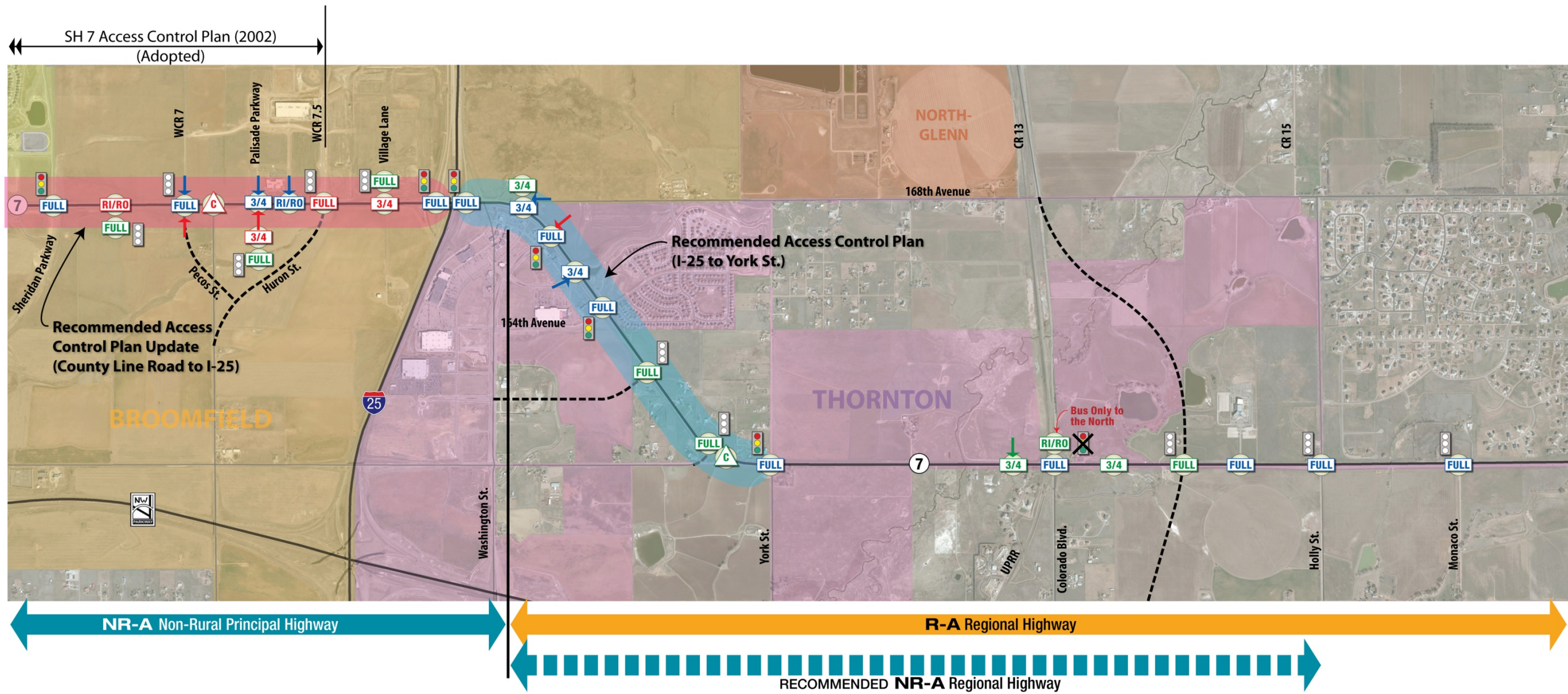


LEGEND		
ACCESS CONFIGURATION	SIGNALIZATION	ACCESS STATUS
Full Movement Access	Existing Traffic Signal	Existing Access: <i>(current access configuration at major intersections; not all existing accesses are shown)</i>
3/4 Movement Access	Future Traffic Signal	Approved Access: <i>(access configuration has CDOT approval through an IGA or access permit)</i>
Right-In/Right-Out Only Access	Remove Traffic Signal	Locally Proposed Access: <i>(local agency's desired access configuration; CDOT has not approved, nor is this configuration expressly recommended in the Preferred Alternative)</i>
Closure		



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Figure 3.22 Central Corridor Access

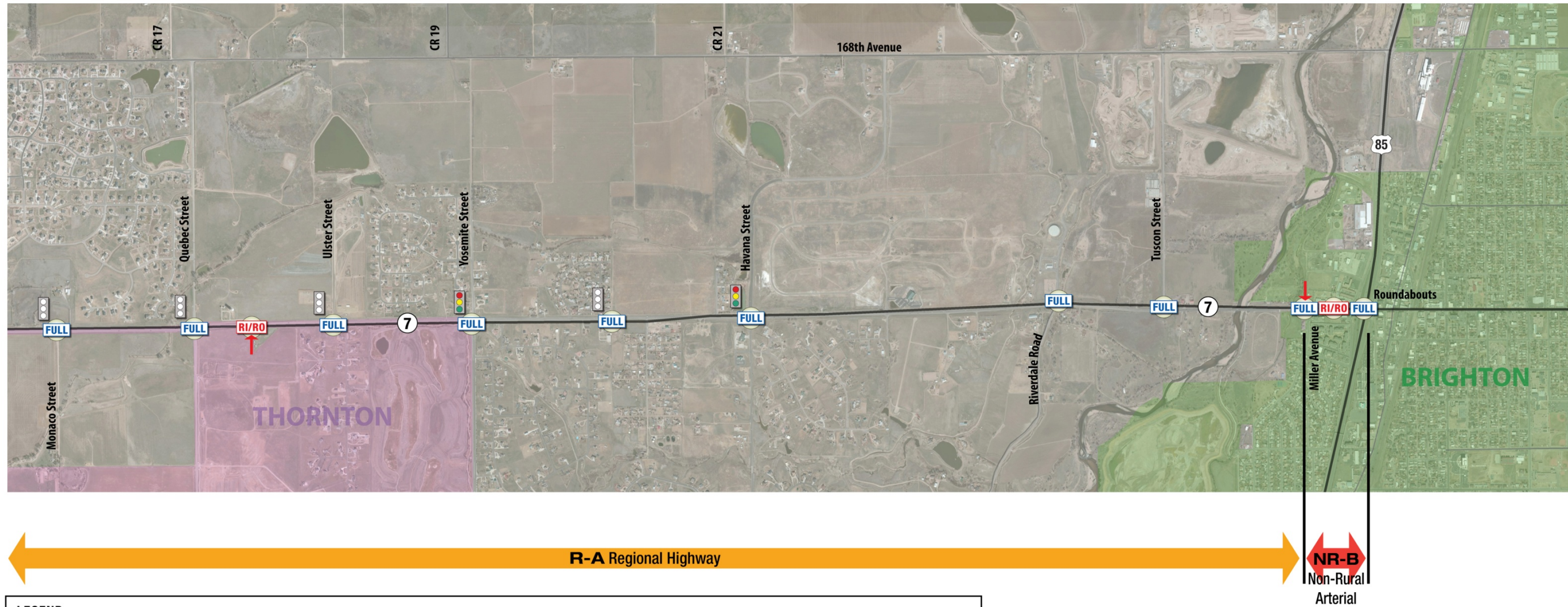


LEGEND		
ACCESS CONFIGURATION	SIGNALIZATION	ACCESS STATUS
Full Movement Access	Existing Traffic Signal	Existing Access: <i>(current access configuration at major intersections; not all existing accesses are shown)</i>
3/4 Movement Access	Future Traffic Signal	Approved Access: <i>(access configuration has CDOT approval through an IGA or access permit)</i>
Right-In/Right-Out Only Access	Remove Traffic Signal	Locally Proposed Access: <i>(local agency's desired access configuration; CDOT has not approved, nor is this configuration expressly recommended in the Preferred Alternative)</i>
Closure		



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Figure 3.23 East Corridor Access



LEGEND		
ACCESS CONFIGURATION	SIGNALIZATION	ACCESS STATUS
Full Movement Access	Existing Traffic Signal	Existing Access: <i>(current access configuration at major intersections; not all existing accesses are shown)</i>
3/4 Movement Access	Future Traffic Signal	Approved Access: <i>(access configuration has CDOT approval through an IGA or access permit)</i>
Right-In/Right-Out Only Access	Remove Traffic Signal	Locally Proposed Access: <i>(local agency's desired access configuration; CDOT has not approved, nor is this configuration expressly recommended in the Preferred Alternative)</i>
Closure		



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3.5 I-25/SH 7 Interchange

It is recommended that the DDI alternative be retained as a viable option in addition to the partial cloverleaf (**Figure 3.24**) when the I-25/SH 7 interchange is funded and ready to move ahead with final engineering design.

3.6 West End Concept Plan

Through this study, the Town of Erie, the City of Lafayette, Boulder County, and CDOT worked collaboratively to develop and agree upon a conceptual plan for improvements in the west end of the SH 7 project corridor (**Figure 3.25**). This conceptual plan keeps SH 7 on its current alignment and improves a series of intersections and local arterial roads to create a supporting network that provides alternate routes for traffic to disperse through this area. The plan includes a relocated SH 7/County Line Road intersection, a new County Line Road roadway in a due north-south direction and improvements, as necessary, to existing County Line Road, 119th Street, 120th Street, and Arapahoe Road. Priority would be given to intersection improvements at the junctures of these roadways. Transit, bicycle, and pedestrian accommodations also would receive priority. CDOT would support the local entities in seeking funding for the improvements along the local arterials.

3.7 Complementary Improvements

Improvements on roadway facilities that parallel SH 7 (Boulder Road and 168th Avenue) are recommended to complement the Recommended Alternative and to help provide alternative travel routes for east-west travel in the area.

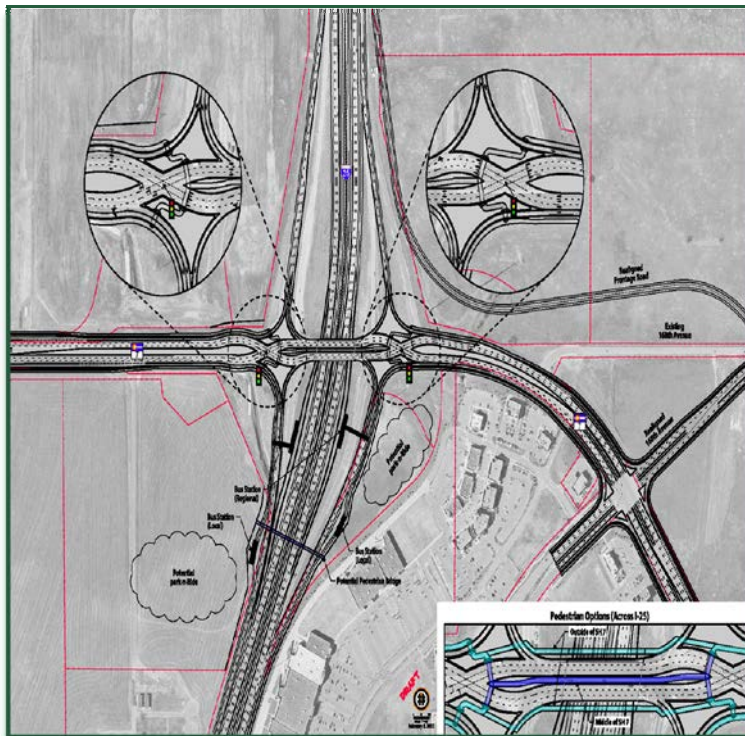
Boulder Road

Boulder Road is a parallel route to SH 7 from US 36 to its current eastern terminus at 120th Street. It reemerges as West 160th Avenue just to the west of Sheridan Parkway and continues eastward, eventually becoming SH 7 east of I-25. The City of Broomfield, the City of Lafayette, the City of Louisville, and Boulder County have agreed to an extension to connect the two segments through an intergovernmental agreement (IGA) effective February 18, 1999. The extension of Boulder Road would provide some relief to the travel demand on the SH 7.

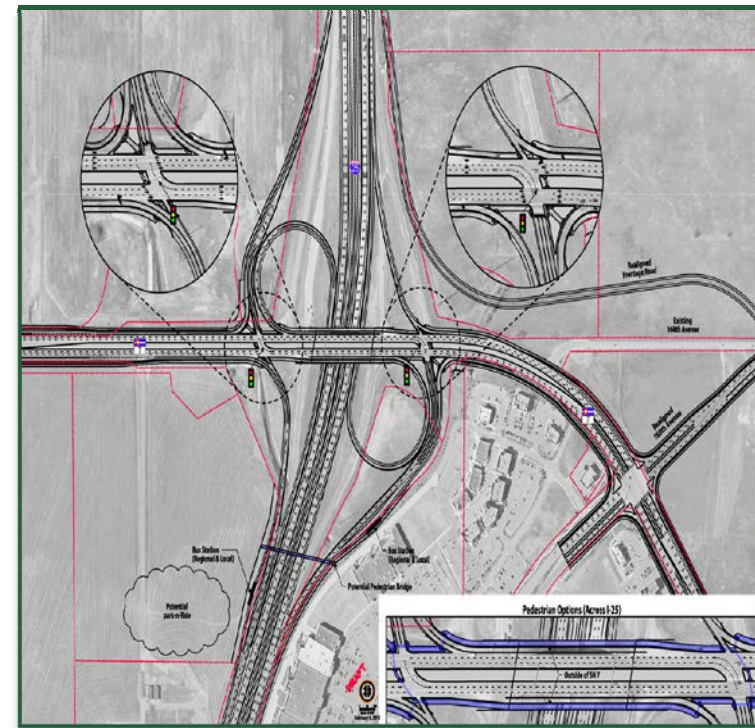
168th Avenue

168th Avenue (Weld County Road 2) travels along the Weld and Adams County Line, paralleling SH 7 from just east of I-25 to US 85 (and farther to the east). 168th Avenue is currently a two lane arterial road, but due to survey correction lines, many of the north-south roadways that intersect 168th Avenue are offset. Weld County, Adams County, the City of Brighton, and the City of Thornton jointly completed the *Weld/Adams County Line Crossroads Alignment Study* in October 2008, which identifies preferred north-south alignments to consolidate the offset intersections. Implementation of the recommendations along 168th Avenue could not only improve north-south travel between Weld and Adams Counties, but it could also improve mobility and safety along 168th Avenue and could help alleviate travel demand along SH 7.

Figure 3.24 I-25/SH 7 Interchange Options

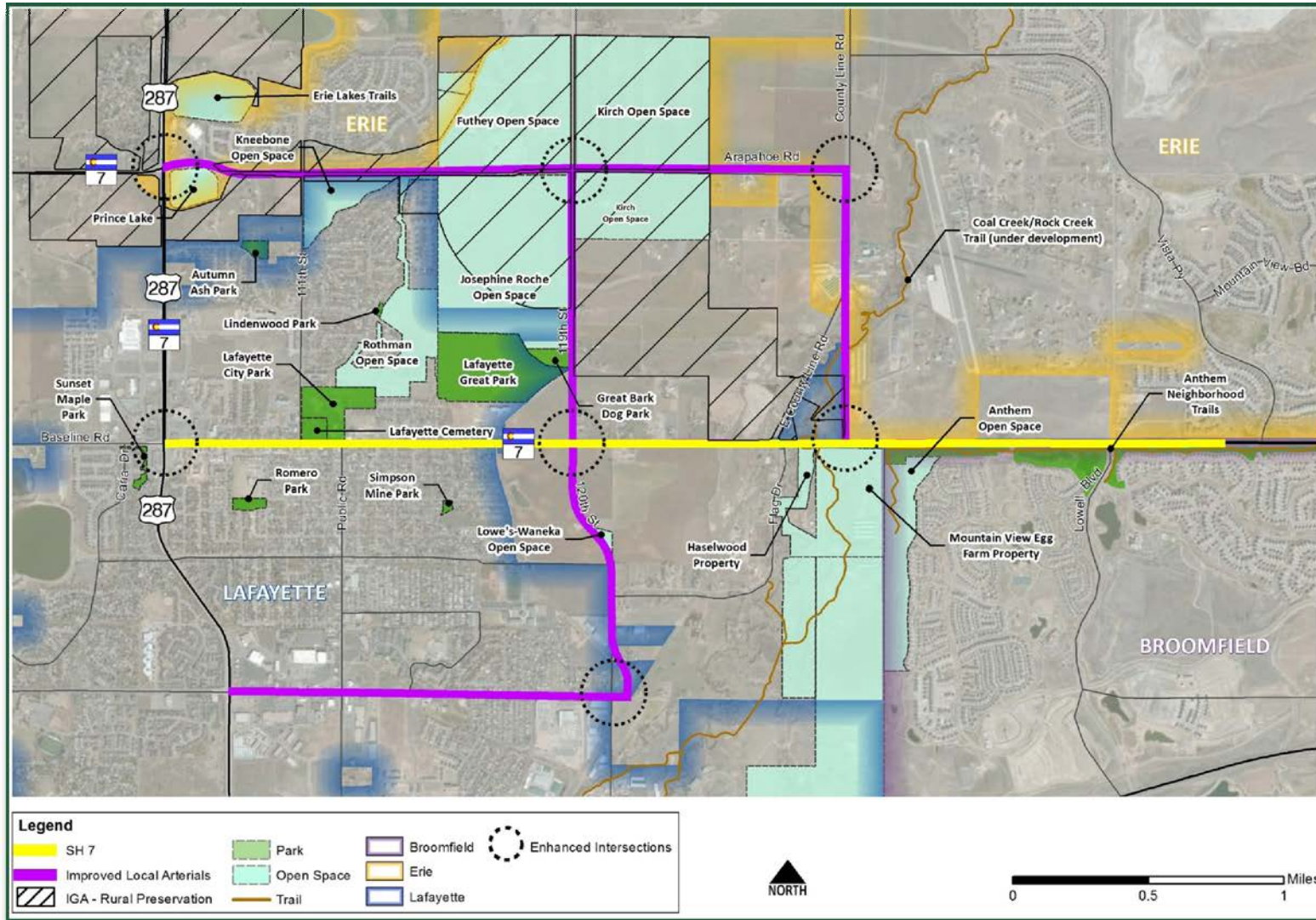


Diverging Diamond Interchange (DDI)



Partial Cloverleaf Interchange

Figure 3.25 Recommended West End Conceptual Plan



3.8 Long-Term Recommended Alternative Considerations

The following are additional long-term considerations for the Recommended Alternative.

Roadway

A land use sensitivity analysis was conducted based on planned buildout of the corridor. The buildout forecasts (beyond 2035) for the section of SH 7 from York Street to realigned Colorado Boulevard are expected to exceed the planning level capacity of a 4-lane roadway (estimated to be 32,000 vpd). A 6-lane roadway cross-section may be needed for this segment of the corridor after 2035; therefore, the Recommended Alternative includes ROW preservation for an ultimate 6-lane section from York Street to realigned Colorado Boulevard.

Transit

Although managed lanes (Bus-only lanes and Bus/HOV/HOT lanes) were eliminated for Segment 1 through the City of Lafayette and were not recommended as reasonable alternatives for the SH 7 PEL corridor within the 2035 planning horizon, the standard shoulder for the roadway cross-section was extended from 10 feet to 12 feet to allow for peak period shoulder lanes (sometimes referred to as hard shoulder running) for bus/HOV/HOT use at a later date.

Bicycle Accommodation

If the shoulders are converted to peak period hard shoulder running lanes at a later date, the use of the shoulder for bicycle accommodation would not be feasible. To accommodate bicycle lanes, the travel lanes and shoulder lane could be restriped from 12-ft lanes to 11-ft lanes. On the four-lane section of the corridor, this would result in 3 additional feet (two travel lanes in each direction and the shoulder lane), which, along with the 2-ft gutter pan, could be used for the bike lane within the proposed cross-section (bike lane should be 5 ft minimum from face of curb). On the 6-lane section of the corridor, the 11-ft travel lanes and shoulder, plus the gutter pan, would result in 6 feet for the bicycle lane.

Eastern Realignment

The City of Brighton envisions a possible realignment of SH 7 on the east end of the corridor as a longer term improvement. A consensus was not reached as to the location of this realignment; however, the City would like to recognize this option so that landowners and developers can be informed of potential future ROW requirements as they create development plans.

4.0 TRANSPORTATION ANALYSIS

Chapter 4.0 documents the transportation-related analytical methods and data used to evaluate the Level 1 through Level 4 alternatives described in **Chapter 2.0**.

4.1 *Land Use Forecasts*

Because of the strong relationship between land use and transportation, the transportation analysis began with a thorough assessment of existing and future land uses in the study area.

Development of former agricultural land to residential and employment uses has been occurring as the Denver metropolitan area continues to grow. County, city, and town governments along the SH 7 corridor have been proactively planning for this transition. Despite recent downturns in the economy, which have slowed development, long-term projections indicate that the communities along the SH 7 corridor will continue to grow and develop at a rapid rate.

For transportation planning purposes, DRCOG has divided the Denver metropolitan region into Transportation Analysis Zones (TAZ). DRCOG estimates socio-economic variables, including population, household, employment, and income, for each TAZ and then projects these variables through 2035 for local and regional planning purposes. DRCOG incorporates a wide variety of variables in their estimates and projections including, but not limited to, overall regional growth, each jurisdiction's potential share of future growth, and current and long range development plans. **Figure 4.1** shows the TAZ system within the study area.

The SH 7 corridor covers a broad regional area. The study examines land use conditions along SH 7 in Lafayette, Erie, Broomfield, Thornton, and Brighton and in parts of unincorporated Boulder, Adams, and Weld Counties. Each local government has its own comprehensive plan that incorporates a discussion of current and future land uses within each respective boundary.

The land use forecasts used to estimate the 2035 travel demand in the SH 7 study area are based on DRCOG's 2035 regional control totals and land use allocation by TAZ. To develop household and employment projections for each TAZ area, DRCOG requests local jurisdictions to provide their estimates of the buildout capacity in each TAZ based on each jurisdiction's future land use plans. Minor adjustments to the household and employment capacities were made in coordination with the City of Thornton and the City and County of Broomfield to address recent development planning efforts in the I-25/SH 7 interchange area and in the North Metro Station area. The land use capacities have been used to understand the potential travel demand along SH 7 when full development of the land within the study area is realized (after 2035).

Figure 4.1 Transportation Analysis Zones

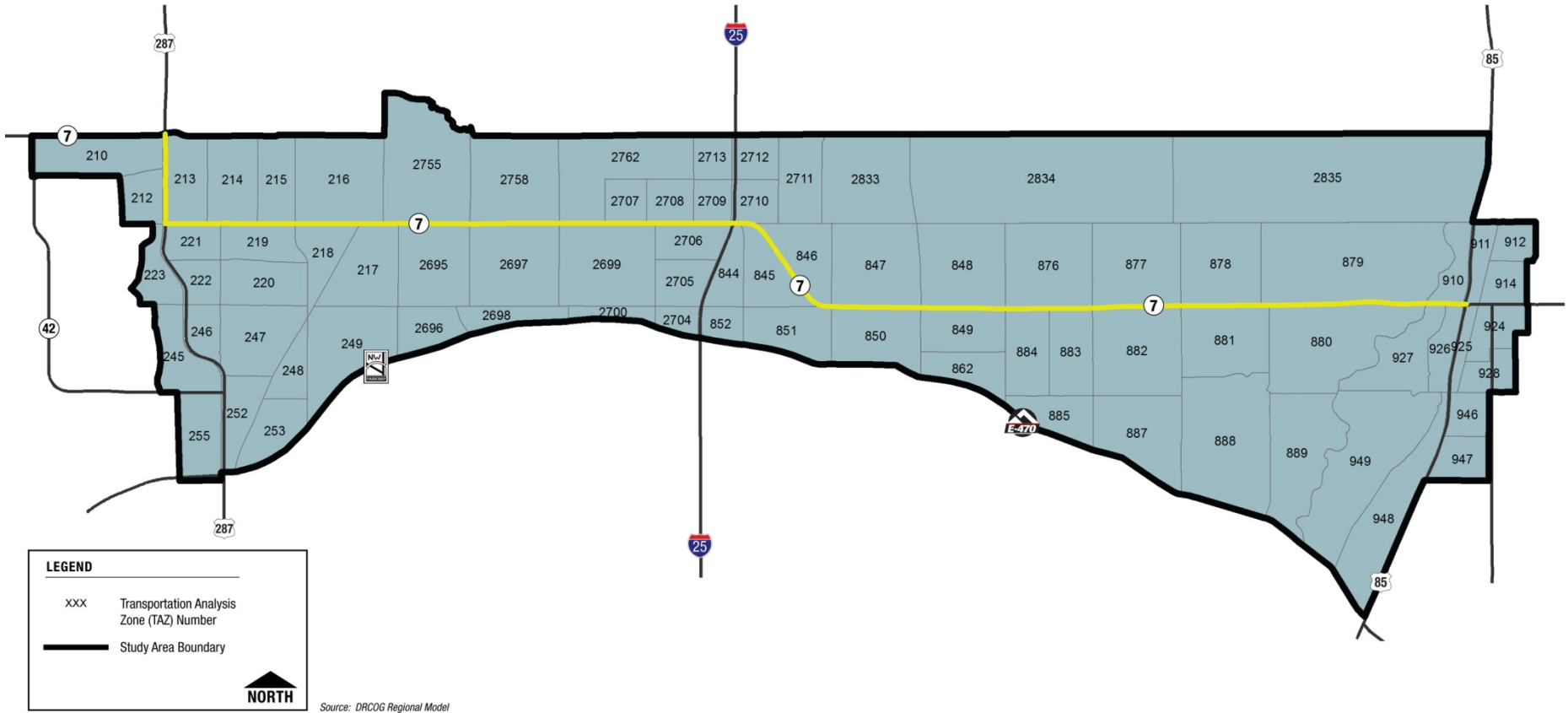


Table 4.1 shows the current (2010) household and employment data, the 2035 DRCOG forecasts, and the buildout capacities for the TAZs within the study area. By 2035, the number of households in the study area is expected to nearly triple, while the employment is forecast to increase four-fold. The study area's residential capacity is approximately 20 percent higher than the 2035 DRCOG forecasts. The employment capacity within the study area, however, represents a more than 75 percent increase over the 2035 DRCOG forecasts. That is, beyond the 2035 DRCOG land use forecasts, the SH 7 study area could see an additional 8,300 households and 43,000 new jobs to be fully built out, which would place an additional demand on the transportation system.

Most of the additional residential growth beyond the 2035 DRCOG forecasts is anticipated in the TAZs east of I-25 and north of East 168th Avenue. Concentrations of employment growth are most notable in the I-25/SH 7 interchange area and in close proximity to the North Metro Station (SH 7/Colorado Boulevard). The buildout land use forecasts account for the potential extension of passenger rail service to the north from the North Metro Station.

Table 4.1 Household and Employment Forecasts by TAZ within SH 7 Study Area

TAZ	Households			Employment		
	2010	2035	Capacity	2010	2035	Capacity
210	95	95	95	540	511	594
212	69	590	623	265	328	813
213	472	940	958	173	211	305
214	703	1244	1,279	64	108	256
215	38	38	38	30	24	39
216	26	26	26	94	85	106
217	26	26	26	13	14	16
218	22	22	22	19	19	22
219	625	835	847	306	376	662
220	1284	1284	1,284	1058	1060	1,275
221	692	696	696	362	368	458
222	320	320	320	713	735	1,120
223	770	770	770	232	242	420
245	476	708	720	186	211	319
246	10	67	72	932	913	1,027
247	435	565	574	712	789	1,280
248	2	3	3	654	645	699
249	6	40	43	299	455	1,203
252	3	3	3	1242	1237	1,385
253	0	0	0	21	19	23
255	470	517	520	94	288	808
844	2	3	3	0	6541	10,310
845	22	24	24	0	9956	15,497
846	478	645	653	7	201	443

Table 4.1 Land Use Forecasts by TAZ within SH 7 Study Area (Continued)

TAZ	Households			Employment		
	2010	2035	Capacity	2010	2035	Capacity
847	135	742	800	0	98	170
848	387	3270	4,497	1	1254	2,709
849	125	1042	1,439	0	580	1,000
850	121	827	872	1	6	11
851	77	570	608	0	782	1,800
852	6	47	51	0	557	1,000
862	119	1022	1,404	0	866	2,400
876	132	358	379	1	12	30
877	43	131	140	0	6	20
878	78	252	270	3	8	25
879	62	235	252	14	26	60
880	143	143	143	20	25	55
881	175	267	276	27	48	125
882	88	512	546	1	6	14
883	129	1082	1,172	0	68	200
884	88	732	793	0	0	0
885	127	1109	1,184	0	30	200
887	93	106	107	3	60	404
888	316	1180	1,265	3	17	29
889	27	27	27	0	9	30
910	80	80	80	66	96	333
911	140	217	224	632	663	820
912	214	214	214	55	57	105
914	570	609	612	727	726	867
924	719	785	789	901	888	1,075
925	113	168	172	461	453	509
926	527	698	709	446	464	527
927	444	448	449	10	11	81
928	495	539	542	267	262	353
946	29	193	0	265	377	833
947	30	188	201	0	22	120
948	154	983	1,061	799	858	910
949	455	658	677	98	149	392
2695	166	1453	1,563	0	60	200
2696	36	313	341	0	94	200

Table 4.1 Land Use Forecasts by TAZ within SH 7 Study Area (Continued)

TAZ	Households			Employment		
	2010	2035	Capacity	2010	2035	Capacity
2697	226	1971	2,051	3	168	313
2698	24	207	225	1	78	183
2699	251	2181	3,776	0	1761	4,164
2700	1	1	1	0	13	50
2704	0	0	0	0	236	441
2705	105	813	1,397	0	7087	14,880
2706	75	648	1,126	0	2412	3,910
2707	1	1	1	0	236	345
2708	165	1429	2,307	0	414	803
2709	25	198	317	0	3367	3,367
2710	22	193	181	0	2046	3,860
2711	120	1058	1,008	0	745	2,833
2712	181	1587	1,511	0	344	1,367
2713	0	0	0	0	850	1,790
2755	439	1044	1,110	68	251	573
2758	189	669	717	45	207	416
2762	189	405	426	21	161	338
2833	43	271	583	12	146	617
2834	100	657	1,424	7	308	1,456
2835	86	188	860	22	70	761
Study Area Total	15,931	44,182	52,479	12,996	55,874	99,154

4.2 2035 Traffic Forecasts and Operations

Methodology

The study team used the DRCOG regional travel demand model to develop the 2035 traffic forecasts, making minor modifications to the DRCOG model to better reflect the existing and planned roadway network in the study area. The 2010 model was used as the basis for post-processing the 2035 model results. Due to the complexity of real-world driver behavior and individual roadway characteristics, travel demand forecasting models cannot be expected to result in precise representations of traffic volumes on each roadway. A common technique used to improve the reliability of travel demand forecasts is referred to as post-processing adjustment. This technique uses comparisons of the base year (2010) model's predicted traffic volumes versus actual traffic counts. These comparisons provide estimations of the error associated with the model's representation of travel conditions. The model-produced forecasts can then be adjusted to account for the errors found in the model to provide more reliable forecasts. This post-processing adjustment process, as prescribed in the Transportation Research Board's publication NCHRP 255, has been applied to all SH 7 forecasts.

NCHRP 255 also provides a methodology for approximating future intersection turning movements using existing daily and peak hour traffic counts and modeled future daily traffic volumes. The methodology is an iterative process that uses the existing turning volumes and future growth rates for each leg of the intersection to determine the future turning volumes. While the methodology provides a basic framework for developing future turning volumes, additional balancing is often required, particularly when vastly different volumes or growth factors are experienced on particular legs of an intersection. These varying volumes or growth factors may require additional balancing to ensure that reasonable turning volumes are experienced for all movements at an intersection and along the corridor as a whole.

The study team analyzed the future traffic operations for each signalized and unsignalized intersection based on the methods described in the *Highway Capacity Manual* (HCM) and using Synchro 8 traffic analysis software. According to the HCM, the overall performance of an intersection is determined by the level of delay experienced by motorists at the intersection. Depending on the level of delay that is experienced, each intersection can be scored on a LOS scale and given a letter grade from A to F, with A being the best possible grade for the intersection. LOS A describes intersections with low control delay. LOS F is associated with high delays and is considered unacceptable to most drivers. This most often occurs with oversaturation, high congestion, poor progression of traffic signals, and/or long cycle lengths.

While the study team used Synchro 8 for most of the operational analyses, the study team used another software package, VISSIM, to analyze the DDI concept at I-25/SH 7. VISSIM, a micro-simulation traffic flow model, specializes in the analysis of complex transportation systems. It is especially useful for analyzing freeways and complex interchange designs due to its sophisticated driver behavior algorithms that accurately reflect lane changing and car following maneuvers.

No-Action Alternative

As described in more detail in **Section 2.4** of this report, the No-Action Alternative is defined as the condition of the corridor if CDOT does not select a build alternative. The No-Action Alternative is also used to compare alternatives for evaluation and environmental analysis purposes. The No-Action Alternative would leave SH 7 as it currently is and would not provide any major capacity improvements; however, the No-Action Alternative would include safety and maintenance activities that would be required to sustain an operational transportation system. The No-Action Alternative includes transportation projects currently planned in the project vicinity. These other transportation projects have committed or identified funds for construction and would be built regardless of any improvements that are identified as part of the SH 7 PEL study. These committed fiscally-constrained regional improvements are included in the travel demand forecasting for the No-Action Alternative.

Travel Demand Forecasts

Figure 4.2 shows the No-Action Alternative daily traffic forecasts along SH 7 within the study area. The study team used planning level roadway capacities to estimate when the travel demand along SH 7 would exceed the existing capacity. While the travel demands on eastern and western portions of the corridor currently exceed the existing planning-level capacities, nearly all of the corridor is expected to have travel demands that exceed the existing capacity by 2020. The only exceptions are the westbound section between Sheridan Parkway and Lowell Boulevard and the eastbound section between Riverdale Road and Havana Street. Both of these sections have two lanes (in the subject direction), providing adequate capacity for the 2035 travel demands.

Figure 4.2 2035 No-Action Daily Traffic Volume Forecasts and Capacity Threshold



NOTE: Based on existing planning level roadway capacities and straight-line growth between 2012 and 2035.

LEGEND

- XXXX 2035 No Action Daily Traffic Forecast
- Red line Currently Over Capacity
- Orange line Over Capacity in 2020
- Green line 2035 Travel Demand Less than Existing Capacity
- Red dotted line Planned Roadways (DRCOG Fiscally Constrained Plan)

NORTH

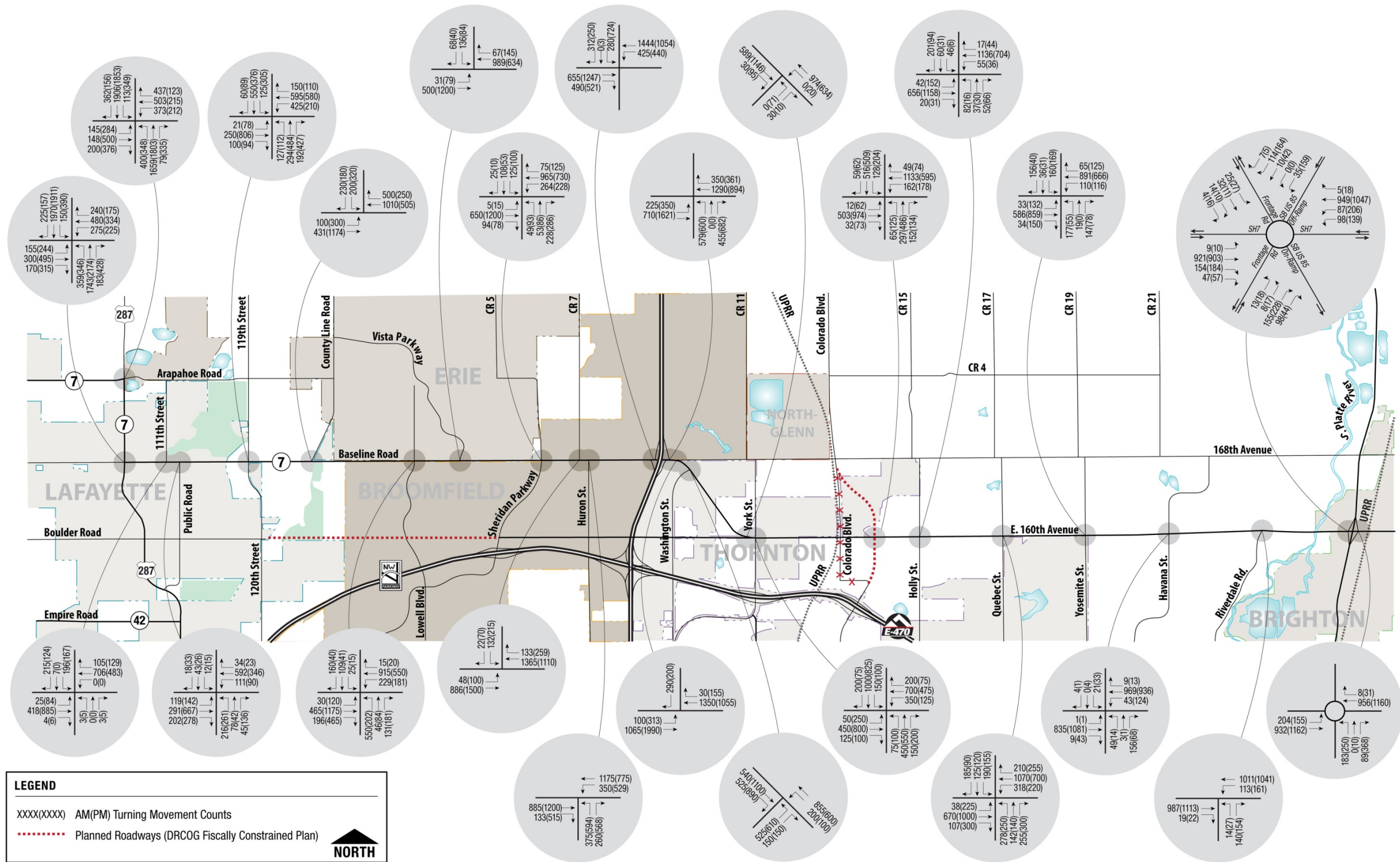
Traffic Operations

Using the NCHRP 255 methodology described previously, the study team translated the 2035 No-Action daily traffic forecasts to PM peak hour intersection turning movement forecasts, as shown in **Figure 4.3**. Due to the growth on and around the SH 7 corridor, traffic volumes through the corridor are projected to increase by 2035, especially in the central and eastern portions of the corridor where there are more development opportunities. The study team used these PM peak hour volumes to complete No-Action intersection operational analyses. If no operational improvements are made to the corridor, many intersections are projected to be over capacity in the PM peak hour. Most congestion is expected at locations where regional arterials that provide north-south connectivity through the area intersect with SH 7. The traffic volumes on these regional facilities are projected to increase, resulting in intersections that are over capacity. **Figure 4.4** shows the No-Action intersection operations. As a result of the additional intersection congestion, SH 7 operations will degrade, resulting in a reduction in speed and an increase in travel time along the corridor. The impacts of this are significant enough that congestion at specific intersections will regularly cause delayed traffic to back up beyond adjacent intersections.



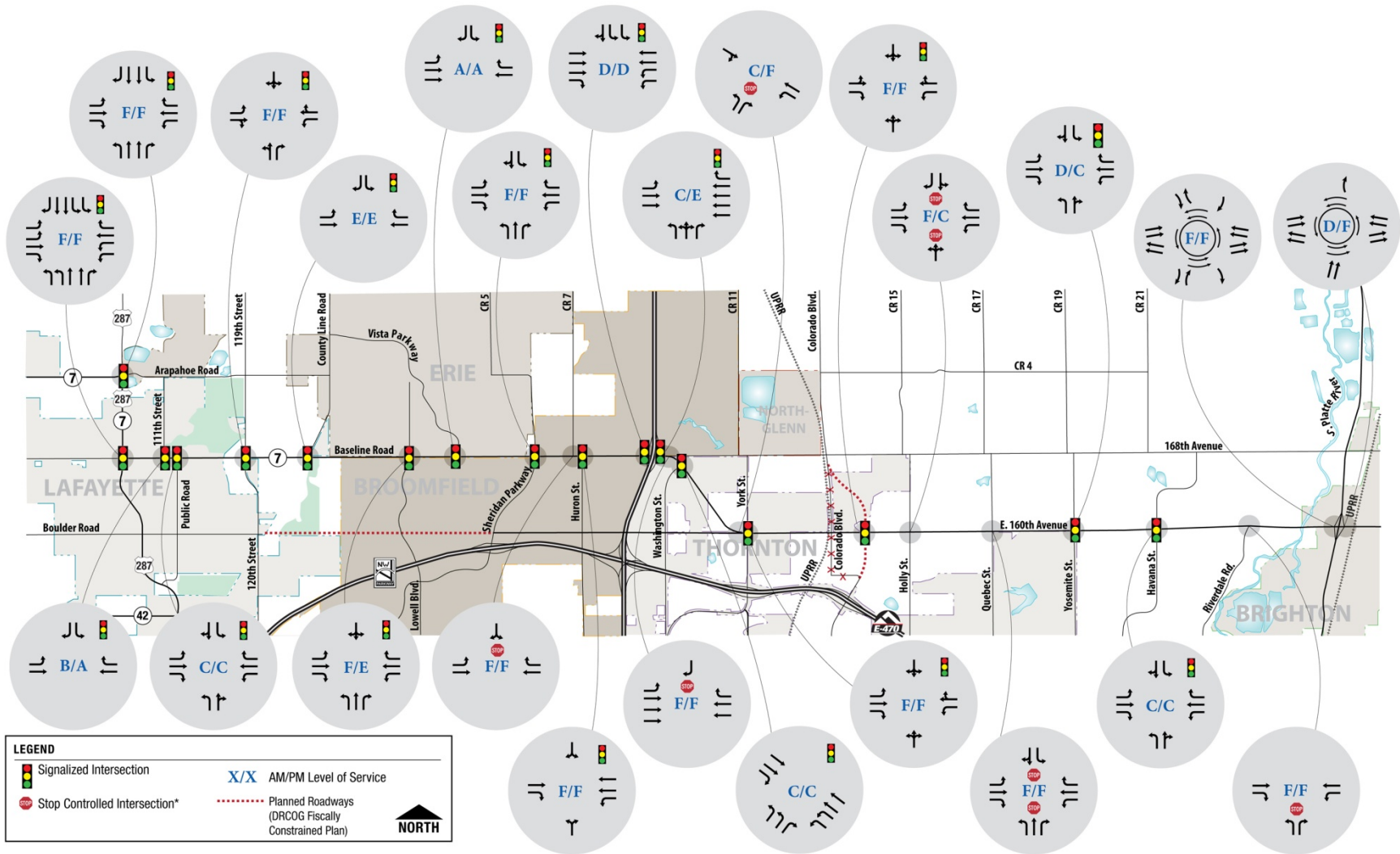
Looking west, SH 7/I-25 interchange.

Figure 4.3 2035 No-Action AM and PM Peak Hour Turning Movement Forecasts



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Figure 4.4 2035 No-Action AM and PM Peak Hour Intersection Operations



Alternatives Considered

Western Alignment

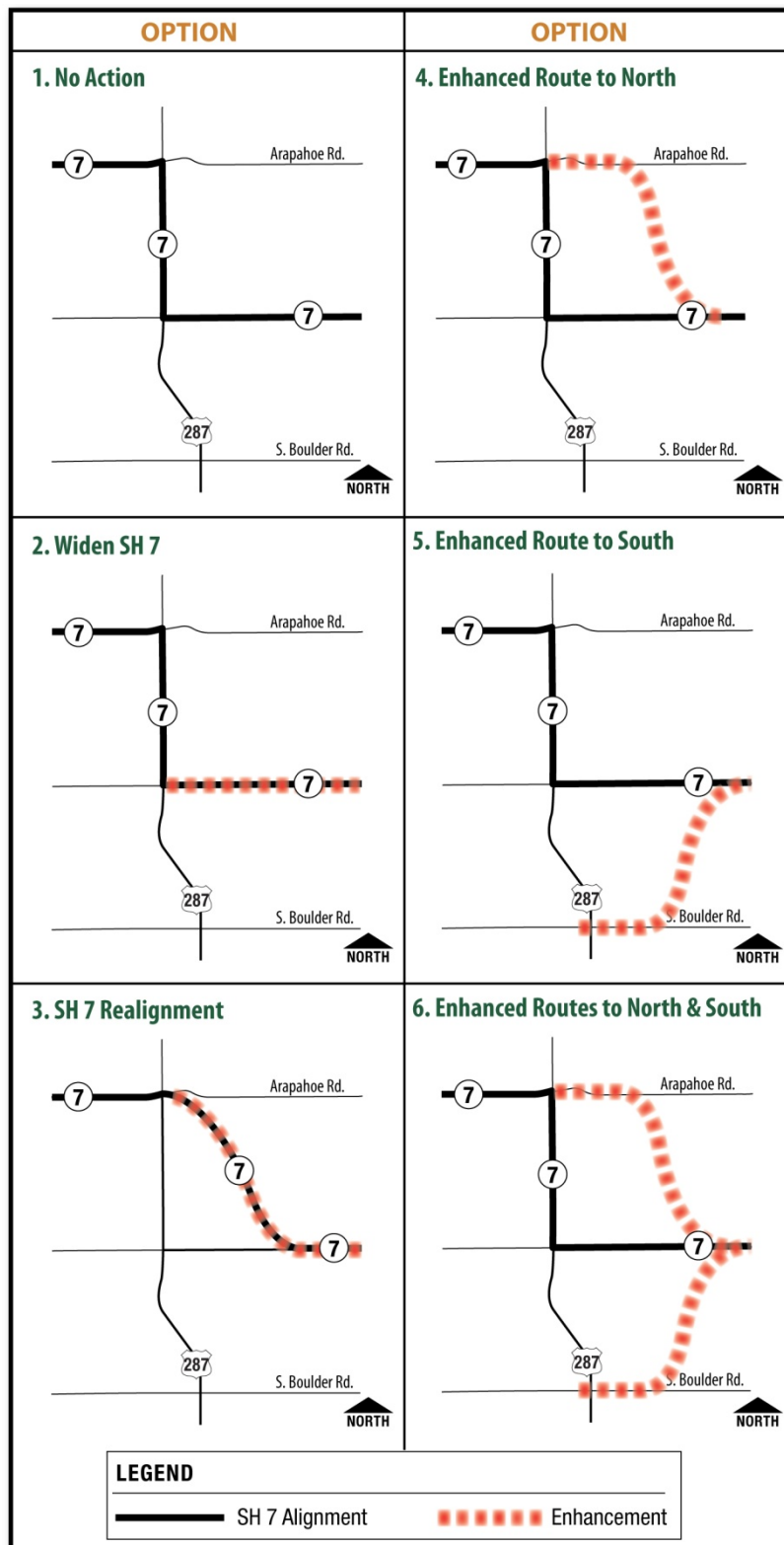
The Town of Erie and the City of Lafayette initially requested consideration of a potential realignment of SH 7 diverging north from its current alignment at some point west of the existing SH 7/Airport Drive intersection and connecting with US 287 at Arapahoe Road (SH 7). To ensure that the needs and concerns of the affected entities could be heard and considered in the western realignment evaluation, a small group was formed consisting of representatives and elected officials from the Town of Erie, City of Lafayette, Boulder County, CDOT, and the study team. **Section 2.5** discusses the specific goals of each agency. This section discusses the travel demand analysis that was conducted as part of the alternatives analysis for the western alignment.

The initial 2035 travel demand forecasts indicated that the traffic on SH 7 in the downtown Lafayette area has many destinations, with relatively equal portions destined for the central part of Lafayette, points north on US 287 and west on SH 7, or employment centers to the south via US 287. To address the observed travel patterns, the study team identified six basic concepts, as schematically depicted on **Figure 4.5**. The study team completed travel demand model runs for these six concepts (including No-Action), and the findings are summarized on **Figure 4.5**.

Through multiple meetings with the small group staff and elected officials, the study team worked through the general concepts. The discussions resulted in a recommendation to move forward with Option 6. This recommended plan would provide multiple opportunities for both cars and trucks to disperse through Lafayette on routes that would best fit their diverse travel needs. SH 7 and a network of enhanced intersections and improved local arterial roads would be used to serve these needs. Specifically, the recommended plan includes the following elements:

- ▶ The designation of SH 7 would be retained along its current route to serve those destined for the central area of Lafayette. In doing so, the existing width of the roadway, with a few exceptions, would not be modified. West of the Public Road intersection to US 287, the road cross-section would remain the same and all signalized intersections would be retained. East of Public Road, the two-lane section and the bike lanes would remain. The exceptions would be at the intersections of Iowa and Burlington with SH 7, where the long-range plan includes some potential widening to include a left turn lane at the intersection (to improve the safety of turning vehicles) and to retain the bike lanes.
- ▶ A network of local arterial roads would complement SH 7, including County Line Road, 119th Street, and Arapahoe Road on the north, and 120th Street and Boulder Road on the south. These routes would provide alternatives for those travelers (including trucks) who are not destined to central Lafayette. To be more effective as an alternative route, the plan recommends that County Line Road be realigned to a new intersection east of the existing intersection, thus separating it from the Flagg Drive intersection. The concept calls for enhanced intersections at SH 7/119th/120th and at SH 7/relocated County Line Road that would allow movements from SH 7 to flow better to the alternative routes.

Figure 4.5 Western Alignment Conceptual Options



- ▶ **Option 1 (No-Action):** SH 7 in the downtown area would continue to exceed capacity if nothing is done, with a volume to capacity (v/c) ratio of 1.15.
- ▶ **Option 2 (Widen SH 7):** A widened SH 7 in the downtown area would fill to capacity, nearly two times existing traffic.
- ▶ **Option 3 (SH 7 Realignment):** A realigned SH 7 would reduce volumes in the downtown area by approximately 20 percent compared to No-Action (within existing capacity).
- ▶ **Options 4 and 5 (Enhanced Route to North and South, respectively):** An enhanced route to the north would reduce traffic in the downtown area more than would an enhanced route to the south. (18 percent reduction in traffic versus 2 percent reduction).
- ▶ **Option 6 (Enhanced Routes to North & South):** A combination of enhanced routes to both the north and the south would reduce volumes in the downtown area by 25 percent, slightly better than a realigned SH 7 would.
- ▶ Any improvements of the east-west network east of US 287 would induce more travel on these routes. Total demand increases would range from 10 to 30 percent.
- ▶ Any of the improvements would result in only small increases west of US 287. Total demand increases would range from 1 to 4 percent.

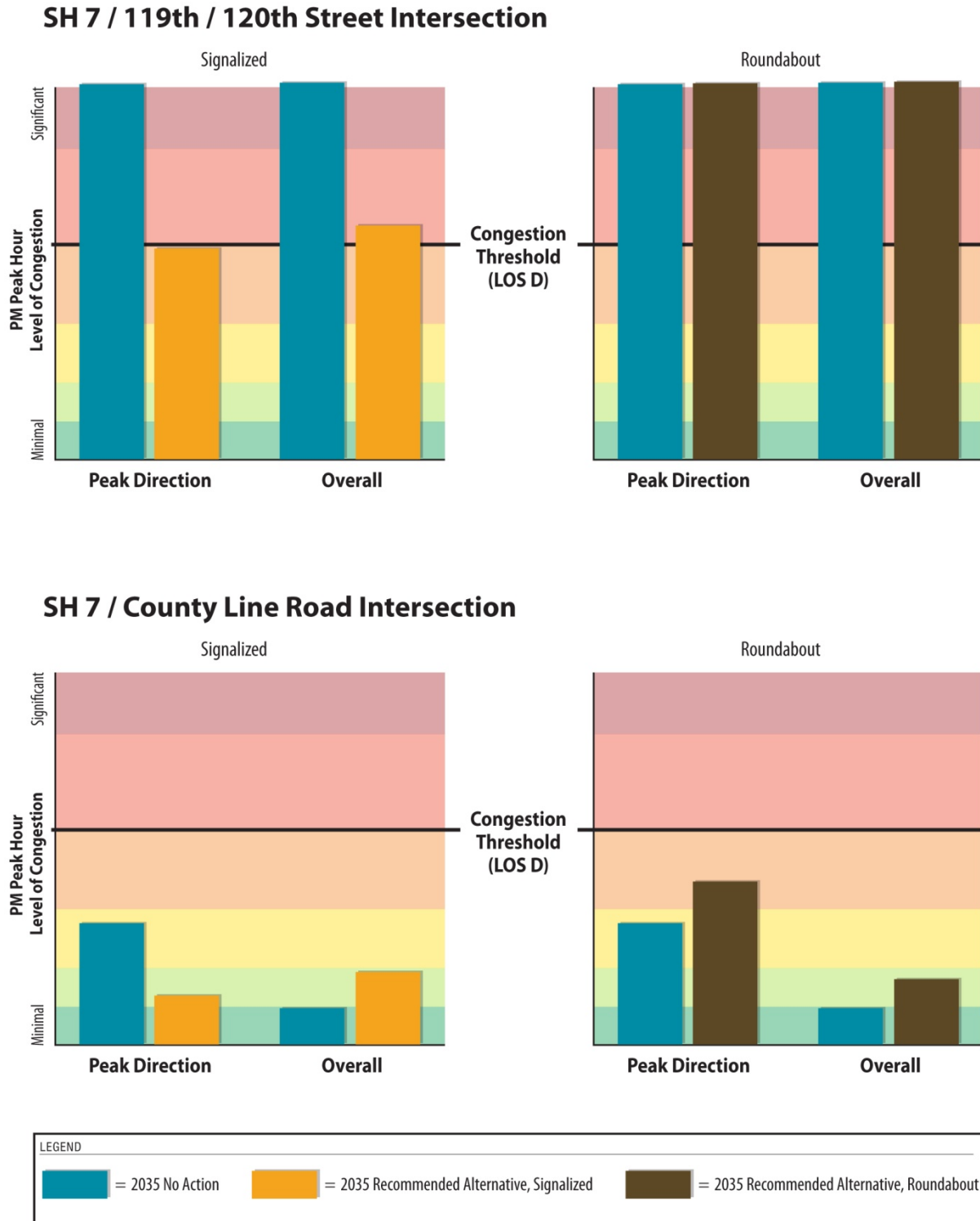
The intersections of SH 7 with 119th Street/120th Street and County Line Road serve as gateways to the City of Lafayette and the Town of Erie, respectively. The study team has illustrated alternative conceptual intersection types to enhance the community gateways.

The study team evaluated the intersections of SH 7/119th/120th Street and SH 7/relocated County Line Road as both signalized intersections and roundabouts to determine how they would work operationally in 2035. Synchro 8 and Sidra (both based on HCM 2010 methodology) were used for the operational analysis. Based on the initial operational analysis, it was determined that both a roundabout and signalization of the SH 7/relocated County Line Road could work. However, a roundabout would not function adequately at the SH 7/119th/120th Street intersection, but a signal would. The reason for this is that the volume of traffic circulating in the roundabout is high enough that it minimizes the number of acceptable gaps for traffic to safely enter the roundabout. During the AM peak hour, the westbound traffic volumes are the highest, making it difficult for southbound traffic (the second highest approach volume) to enter the roundabout. During the PM peak hour, the eastbound traffic volumes are the second highest approach volume, making it difficult for the northbound traffic (the highest approach volume) to enter the roundabout. A traffic signal controls when vehicles can enter the intersection. Due to the high approach volumes and subsequent low number of acceptable gaps, a traffic signal provides better operation at the SH7/119th/120th Street intersection.

Figure 4.6 summarizes the operational analysis of the roundabout and traffic signal options at these intersections. While the PEL study does not recommend specific intersection configurations, initial operational analyses have been completed. These configurations should be considered in the final design phase.

The 2035 traffic volumes also indicate the need for significant improvements at the intersection of US 287/SH 7/Arapahoe Road. The volumes suggest that US 287 may need to be widened with an additional through lane in each direction. In addition, at this intersection, Arapahoe Road should be widened to two through lanes in each direction.

Figure 4.6 2035 PM Peak Hour Intersection Operations (SH 7 /119th/120th Street and SH 7/Relocated County Line Road)



Eastern Alignment

As part of the SH 7 PEL study, the City of Brighton requested consideration of a potential realignment of SH 7 diverting north from its current alignment at some point west of the South Platte River and connecting with US 85 at the 168th Avenue (Baseline Road) intersection.

The stated goals of this realignment are:

- ▶ Reduce traffic volumes on Bridge Street through the downtown area, thereby making downtown more pedestrian friendly.
- ▶ Enhance regional connectivity by providing a convenient route via 168th Avenue for through traffic (particularly truck traffic) to travel between I-76 and points west on SH 7.
- ▶ Reduce congestion and improve safety at the roundabouts at the SH 7/US 85 interchange.

The study team completed additional travel demand modeling to better understand the potential travel pattern shifts associated with realigning SH 7. The study team used the 2035 DRCOG travel demand model for these model runs but made the following adjustments to the DRCOG base model:

- ▶ SH 7 west of US 85 – 4-lane principal arterial
- ▶ 168th Avenue from US 85 to I-76 – 4-lane principal arterial
- ▶ New interchange at I-76/Bridge Street

Bridge Street is classified as a principal arterial through downtown Brighton in the DRCOG model and as a minor arterial east of the downtown area; this coding was retained. With the adjustments described above in place, two model runs were completed: one with the current alignment of SH 7, and one with a realignment of SH 7 east of Riverdale Road such that SH 7 would intersect US 85 on the 168th Avenue alignment. The following travel patterns can be observed in comparing the two model runs, as shown on **Figure 4.7** (all forecasts are for 2035):

- ▶ The north-south portion of the realignment of SH 7 is projected to attract approximately 9,800 vehicles per day (vpd).
- ▶ The forecast on SH 7 between Riverdale Road and US 85 would be reduced by approximately 28 percent (8,200 vpd) with the realignment.
- ▶ The forecast on Bridge Street through downtown Brighton would be reduced by approximately 4 percent (1,200 vpd) with the realignment.
- ▶ The volume of traffic entering the roundabouts at US 85/SH 7 would be reduced by approximately 18 percent with the realignment.
- ▶ The volume of traffic entering the US 85/168th Avenue intersection would increase by approximately 6 percent with the realignment. The travel patterns at the intersection would change, with a considerable increase in the eastbound left turning movement from SH 7 onto US 85 and the corresponding southbound right turning movement. The north-south through movements on US 85 would be reduced by approximately 3,800 vpd.
- ▶ Approximately 40 percent of the traffic using the realignment is coming from or going to US 85 to the north of 168th Avenue. An additional 15 percent of the traffic on the realignment is coming from or going to County Road 27 to the north of 168th Avenue.
- ▶ The realignment has very minimal effect on the I-76 interchanges at Bridge Street and 168th Avenue. With the realignment, the total ramp volumes at the I-76/Bridge Street interchange would decrease by less than 1 percent, and the total ramp volumes at the I-76/168th Avenue interchange would increase by less than 1 percent.

Figure 4.7 2035 Daily Traffic Forecasts Eastern Realignment



I-25/SH 7 Interchange

The partial cloverleaf interchange is included in Phase 1 of the Preferred Alternative selected in the North I-25 Record ROD (FHWA and CDOT, 2011b). Operational analyses in the North I-25 EIS resulted in a finding that the existing diamond interchange would not provide sufficient capacity to meet future 2035 travel demand (FHWA and CDOT, 2011a). Through coordination with the local communities and other key stakeholders in the area during preparation of the EIS, the partial cloverleaf interchange was selected as the Preferred Alternative configuration for the I-25/SH 7 interchange.

Subsequently through the SH 7 PEL process, an alternative concept for interchange improvements was proposed for evaluation at the I-25/SH 7 interchange. The DDI concept is a recently emerging interchange type aimed at handling heavy turning movements at an interchange in a more cost-effective manner. **Section 2.5** presents a comparison of the partial cloverleaf and DDI interchanges in the Level 3C evaluation.

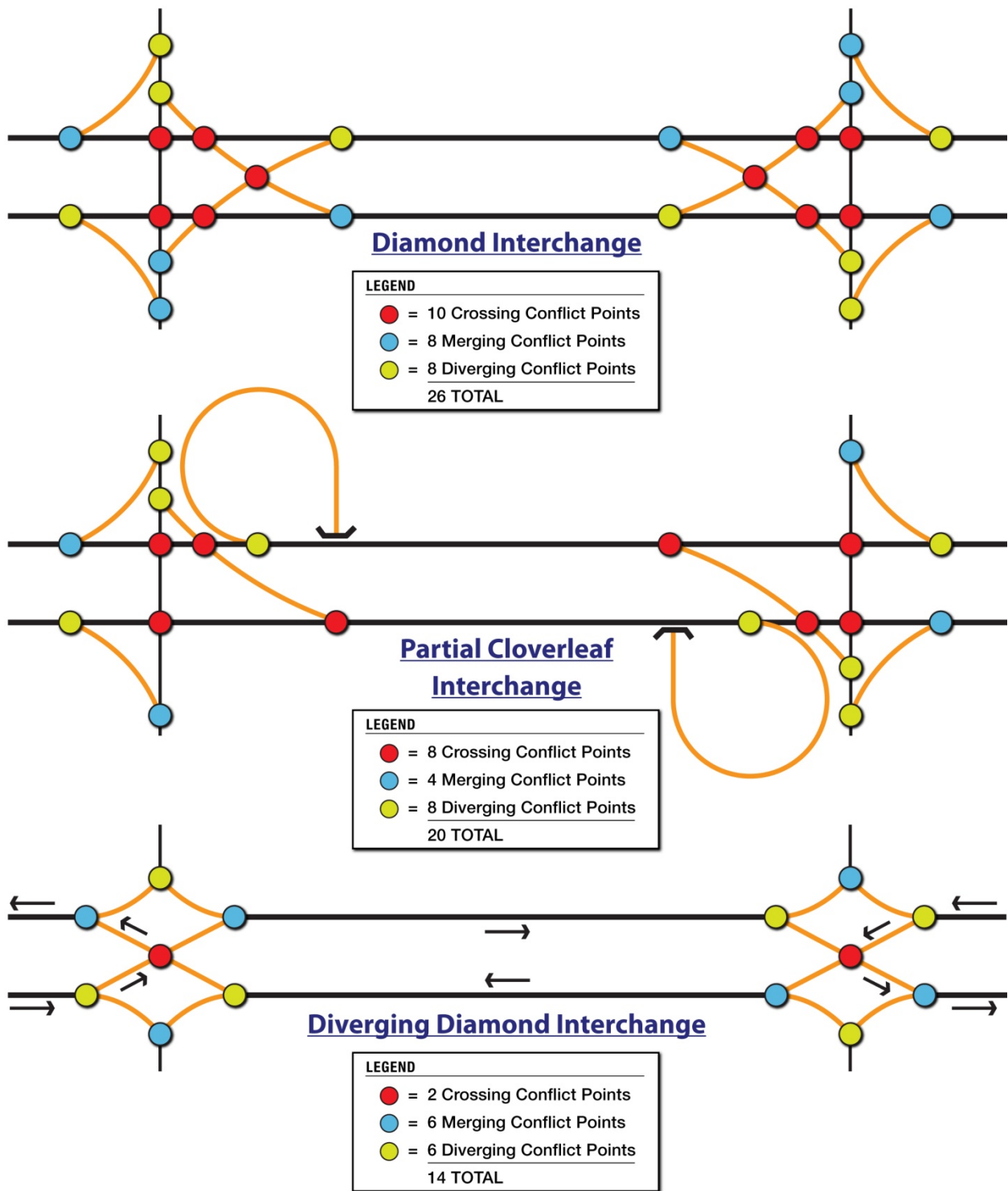
A DDI conveys traffic through an interchange by switching traffic to the opposite side of the roadway between the two ramp intersections. In general, this arrangement operates with fewer signal phases than a traditional diamond interchange and reduces operational conflict between left turns and through traffic. **Figure 4.8** shows the conflict points for diamond, partial cloverleaf, and DDI configurations.

As part of the SH 7 PEL study, the study team evaluated the traffic operations for both the partial cloverleaf interchange and DDI concepts. The interchange capacity analysis focused on the portion of the SH 7 corridor between Huron Street and Washington Street. The study team used two different traffic evaluation packages (Synchro 8 and VISSIM 5.4) in the analysis, capitalizing on the strengths of each software tool.

- ▶ The study team used Synchro 8 to evaluate the partial cloverleaf interchange concept. Synchro is based on HCM procedures and is recognized as the most widely used tool in the traffic engineering field for analyzing and optimizing traffic flows at signalized intersections. Synchro is a time effective tool that has been used for most of the traffic operational analyses for the SH 7 PEL study.
- ▶ The study team used VISSIM to analyze the DDI. VISSIM is a micro-simulation traffic flow model that specializes in analyzing complex transportation systems. VISSIM is especially useful in analyzing freeways and complex interchange designs due to its sophisticated driver behavior algorithms that accurately reflect lane changing and car following maneuvers. Development of a micro-simulation model using VISSIM is time intensive; this tool was used for the DDI because Synchro cannot sufficiently analyze this emerging interchange configuration.

It is important to recognize that analysis results are not directly comparable between the partial cloverleaf and the DDI because different analytical tools were used. The primary purpose of the operational analysis was to understand if the DDI might also be a viable interchange configuration.

Figure 4.8 Interchange Conflict Points



This evaluation used several measures, including intersection LOS, vehicular delay, and queue length. As shown in **Table 4.2**, operating conditions for the partial cloverleaf were graded in accordance with six levels of traffic service (Level A "Free Flow" to Level F "Fully Saturated") established by the HCM 2010, based on the average delay per vehicle. The average delays shown in **Table 4.3** for the DDI use a different methodology. While Synchro reports 50th percentile and 95th percentile queue lengths, VISSIM outputs include average queue length and maximum queue lengths. While these measures are slightly different, they provide a general understanding of the queuing that can be expected with each interchange concept.

The operational analyses reveal that both the partial cloverleaf and the DDI could reasonably accommodate the 2035 PM peak hour travel demands through the I-25/SH 7 interchange. **Table 2.6** includes a detailed comparison of the interchange characteristics.

Access Spacing

SH 7 between Sheridan Parkway and I-25 is approved to have full movement signalized traffic control at the intersections of SH 7 with Sheridan Parkway, Pecos Street, Huron Street, and I-25 (half-mile spacing of traffic signals). The intersections of Highlands, Palisade Parkway, and Village Lane, which fall between these signalized intersections, have been approved to provide additional access to adjacent land through restricted movements, such as right-in/right-out only or three-quarter movement access. With significant development proposed for the land adjacent to this section of SH 7, the City and County of Broomfield has expressed a desire for full movement access with future signalization at these intersections, which would result in quarter-mile signal spacing between Sheridan Parkway and I-25. An analysis evaluated the potential impacts of modifying these restricted movement intersections to be full movement signalized intersections.

The study team used Synchro in the operational analysis to evaluate the traffic operations impacts of the locally proposed quarter-mile signal spacing compared to the approved half-mile signal spacing. The analysis projects that including additional signalized intersections along this segment of SH 7 would have a negative impact on corridor traffic operations. **Table 4.4** summarizes the key findings of the analysis. As is evident from the operational analysis, additional signals would have a negative impact on LOS, free flow speed (FFS), and the green band. This would result in additional delay for drivers traveling along SH 7. It is recommended that the Access Control Plan along this section of SH 7 be updated to further evaluate access in light of current development plans.

Table 4.2 I-25/SH 7 Partial Cloverleaf Interchange 2035 PM Peak Hour Operations

Approach	Partial Cloverleaf Interchange ¹			
	LOS	Delay (sec/veh)	50th Percentile Queue (ft.)	95th Percentile Queue (ft.)
SH 7 & Huron Street				
Eastbound	C	29.5	371	378
Westbound	D	42.4	202	314
Northbound	E	72.1	201	310
Southbound	E	57.4	235	324
Overall	D	41.8	--	--
Village Lane (unsignalized)				
Eastbound Left-Turn	F	97.1	--	62
Westbound Right-Turn				
Southbound Right-Turn	D	27.0	--	5
SH 7 & I-25 Southbound Off-Ramp				
Eastbound	B	12.4	372	434
Westbound	A	10.0	128	222
Southbound	C	23.7	138	282
Overall	B	13.7	--	--
SH 7 & I-25 Northbound Off-Ramp				
Eastbound	A	6.4	180	189
Westbound	A	4.5	204	253
Northbound	B	15.0	73	159
Overall	A	7.4	--	--
SH 7 & 168th Avenue (unsignalized)				
Eastbound Left-Turn	F	>200	--	58
Westbound Right-Turn				
Southbound Right-Turn	F	82.9	--	18
SH 7 & Washington				
Eastbound	D	50.0	758	919
Westbound	B	16.7	222	364
Northbound	C	34.3	324	445
Southbound	D	37.8	247	362
Overall	D	38.5	--	--

¹ Operational analysis for the partial cloverleaf concept was completed using Synchro 8 software/HCM output.

Table 4.3 I-25/SH 7 Diverging Diamond Interchange 2035 PM Peak Hour Operations

Approach	Diverging Diamond Interchange ¹		
	Delay (sec/veh)	Avg. Queue (ft.)	Max. Queue (ft.)
SH 7 & Huron Street			
Eastbound	37.6	189	829
Westbound	30.2	102	275
Northbound	21.7	68	208
Southbound	27.0	87	276
Overall	31.0		
Village Lane (unsignalized)			
Eastbound Left-Turn	22.8	13	210
Westbound Right-Turn	2.0	0	0
Southbound Right-Turn	9.5	2	59
SH 7 & I-25 Southbound Off-Ramp			
Eastbound	31.3	184	609
Westbound	17.1	90	506
Southbound	25.3	74	433
Overall	24.9		
SH 7 & I-25 Northbound Off-Ramp			
Eastbound	19.0	148	697
Westbound	25.2	128	530
Northbound	37.6	230	833
Overall	24.8		
SH 7 & 168th Avenue (unsignalized)			
Eastbound Left-Turn	13.9	9	120
Westbound Right-Turn	0.6	0	0
Southbound Right-Turn	23.7	19	165
SH 7 & Washington			
Eastbound	17.3	116	583
Westbound	28.7	110	486
Northbound	39.3	119	335
Southbound	39.8	72	912
Overall	28.1		

¹ Operational analysis for the DDI concept was completed using VISSIM micro-simulation.

Table 4.4 Additional Signalized Intersections (Sheridan Parkway to I-25) Operational Analysis

		Travel Time (s)	Total Delay (s)	Green Band (s)	Arterial Speed (mph)	Speed as % of FFS	LOS
Half-Mile Signal Spacing (Approved)	EB	141.7	59.5	37	35.6	65%	C
	WB	151.2	70.4	20	31	56%	C
Quarter-Mile Signal Spacing (Locally Proposed)	EB	215.8	134.1	10	23.3	42%	D
	WB	210.5	128.7	10	22.2	40%	D

Complementary Improvements

Boulder Road

Minimal impact on adjusted daily traffic volumes was observed on SH 7 west of Public Road and east of Sheridan Parkway when removing the Boulder Road extension. However, adjusted daily volumes between Public Road and Sheridan Parkway increased, as shown in **Table 4.5**. Model results also showed an increase in daily traffic volume on Public Road and 120th Street/119th Street, while daily traffic volumes on Sheridan Parkway decreased. These model results suggest that connecting Boulder Road and West 160th Avenue would attract some travelers to bypass the parallel portion of SH 7 by using Sheridan Parkway.

Table 4.5 SH 7 2035 Daily Traffic Volume Forecasts with/without the Boulder Road Extension

From	To	2035 No-Action Forecast w/ Boulder Road Extension	2035 No-Action Forecast w/out Boulder Road Extension	% Difference w/out Boulder Road Extension
US 287	Public Road	18,200	17,900	-2%
Public Road	119th Street	13,000	13,700	5%
119th Street	Lowell Boulevard	26,600	31,000	17%
Lowell Boulevard	Sheridan Parkway	25,300	30,200	19%
Sheridan Parkway	I-25	54,400	54,800	1%

East 168th Avenue

East 168th Avenue (Weld County Road 2) travels along the Weld and Adams County Line, paralleling SH 7 from just east of I-25 to US 85 (and farther to the east). East 168th Avenue is currently a 2-lane arterial road, but due to survey correction lines, many of the north-south roadways that intersect East 168th Avenue are offset. The study team completed a model run to estimate the extent to which improvements along East 168th Avenue could alleviate travel demand along SH 7. Model results show that, between I-25 and US 85, improvements to East 168th Avenue could reduce the 2035 traffic forecasts on SH 7 by 1,000 to 2,000 vpd.

Recommended Alternative

Planning Thresholds and Operational Guidelines

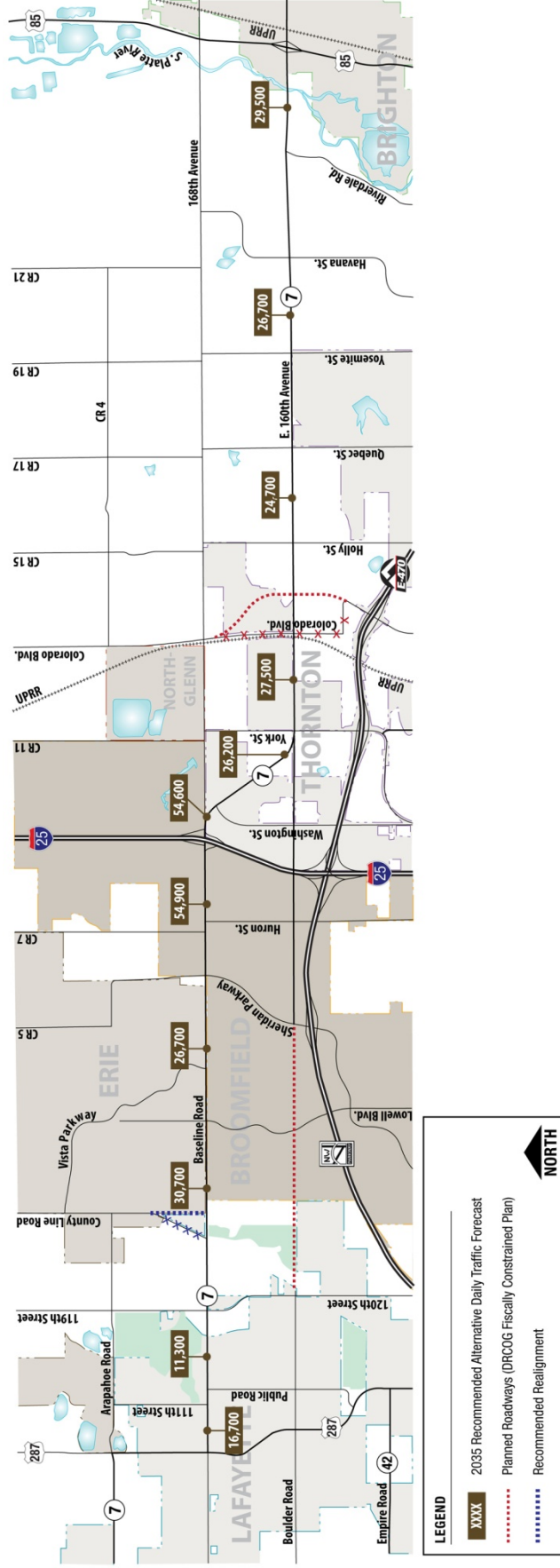
The study team used planning level roadway capacities to estimate when the travel demand along SH 7 would exceed the existing capacity. A planning level capacity of 8,000 vehicles per lane was used for most of SH 7; however, the segment through Lafayette (US 287 to 119th Street) has a lower capacity (approximately 6,000 vehicles per lane) because of the number of accesses and driveways and the slower speeds through this stretch of the corridor. These planning level capacities can be used to identify the future through travel lane needs to meet the forecasted 2035 demand. As described in the No-Action section (and as shown on **Figure 4.2**), the travel demands on eastern and western portions of the corridor currently exceed the existing planning-level capacities. Nearly the entire corridor is expected to have travel demands that exceed the existing capacity by 2020. The only exceptions are the westbound section between Sheridan Parkway and Lowell Boulevard and the eastbound section between Riverdale Road and Havana Street. Both of these sections have two lanes (in the subject direction), providing adequate capacity for the 2035 travel demands.

Traffic engineers use LOS as the measure to evaluate operations of roadway facilities. There are six LOS categories, which range from LOS A – free flow operations, to LOS F – breakdown of the roadway network. LOS D is the point where free-flow operations begin to decrease—this is generally considered acceptable operations because the roadways are still under capacity and traffic still moves relatively unimpeded. LOS D is considered to be the optimal balance between impacts of additional facilities to create new or larger transportation facility and operational effectiveness of the roadway network. For this reason, LOS D was identified as the threshold for acceptable operations for the SH 7 PEL study. Planning thresholds for auxiliary lanes (right and left turn lanes) at intersections were identified based on criteria in the State of Colorado State Highway Access Code (Access Code). The Access Code identifies when auxiliary lanes are required, as well as required lengths of the lanes. Additional turn lanes are required when turning volumes exceed 300 vehicles per hour (vph). The study team used this volume threshold to identify when an additional turn lane is necessary to accommodate traffic demand. These thresholds were applied along the SH 7 corridor to determine where the auxiliary lanes are required, the number of turn lanes required, and the length of each lane.

Travel Demand Forecasts

The study team used the planning level capacity thresholds described previously to identify the roadway cross-section elements for the Level 1 and Level 2a alternatives. As described in **Chapter 2.0**, major widening of the segment of SH 7 through Lafayette is not recommended because of the impacts on the community and environmental and cultural resources. The Recommended Alternative includes widening of SH 7 to four lanes from 119th Street to Sheridan Boulevard and from York Street to US 85. The section of SH 7 between Sheridan Boulevard and York Street is recommended for widening to six lanes to accommodate 2035 travel demands. The 2035 travel demand model was modified to reflect the widening included in the Recommended Alternative, and the resulting forecasts are shown on **Figure 4.9**. A comparison between the 2035 No-Action forecasts (**Figure 4.2**) and the 2035 Recommended Alternative forecasts (**Figure 4.9**) reveals that, with the widening, SH 7 is expected to experience some increase in traffic volumes resulting from latent demand by inducing people to travel along SH 7 who otherwise would not have done so. The Recommended Alternative forecasts are generally less than 5 percent higher than the No-Action forecasts (which account for the demand associated with the widening of SH 7 in the DRCOG Fiscally-Constrained Plan), except on the eastern stretch of the corridor (Colorado Boulevard to US 85), where daily forecasts are 15 to 25 percent higher with the widening.

Figure 4.9 2035 Recommended Alternative Daily Traffic Volume Forecasts



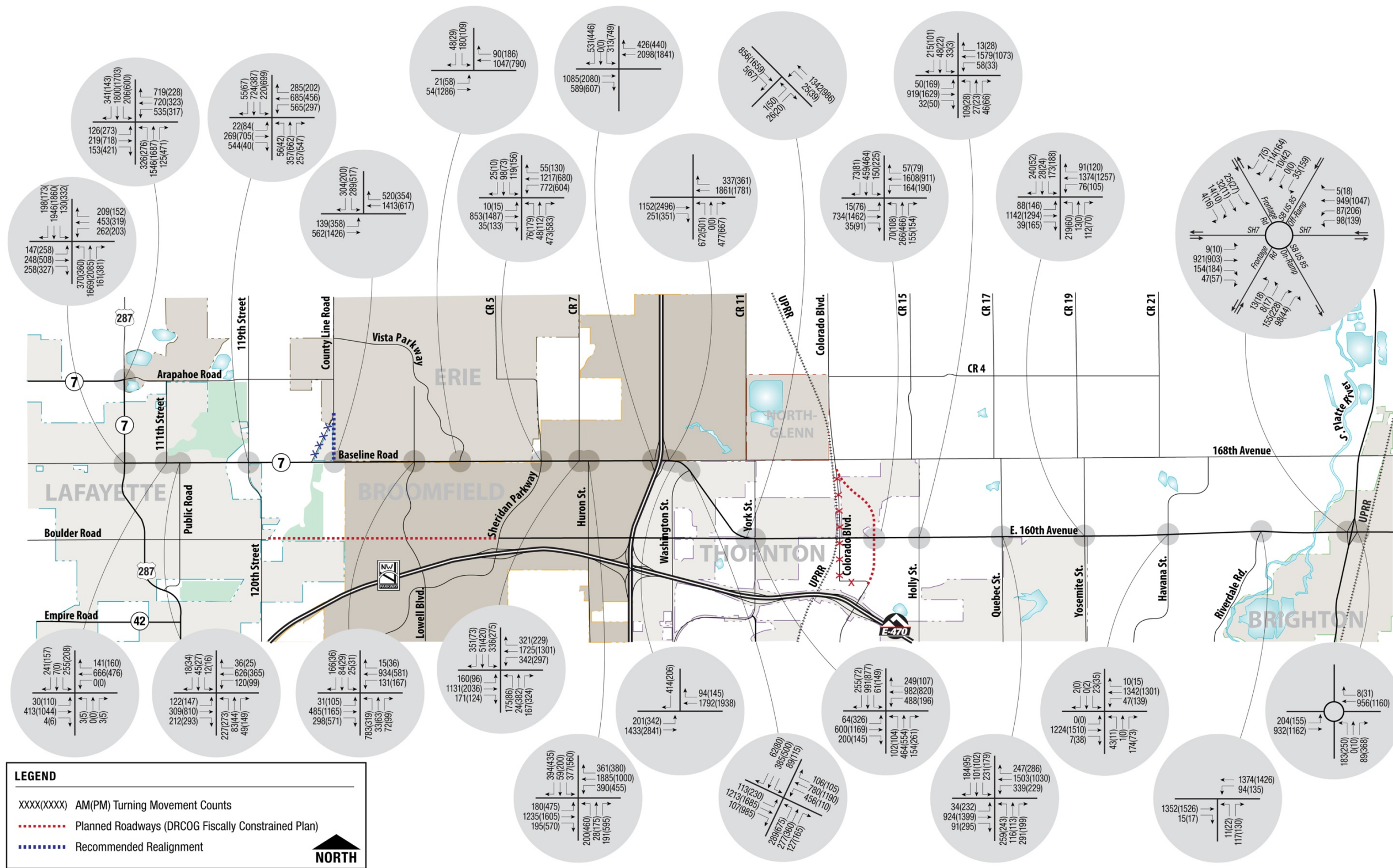
Traffic Operations

The study team conducted a planning level traffic operations analysis to evaluate intersection operations along the SH 7 corridor with the recommended improvements in place. To project turning movements for 2035, the study team applied the same K-factor (peak hour percent) and directional splits from the No-Action turning movements to the Recommended Alternative daily traffic forecasts. Next, the No-Action turning movements were used as the basis in the NCHRP 255 methodology to produce AM and PM turning movement projections (as shown on **Figure 4.10**). The operations analysis identified necessary intersection improvements to ensure acceptable traffic flow. The study team used Synchro 8 to evaluate intersection operations with the projected traffic flow using the HCM methodology. The modeling was used to identify projected operational deficiencies and mitigation strategies for the corridor to operate at an acceptable level. Mitigation strategies were modeled in Synchro, including the addition of auxiliary lanes, warranted traffic signals, and other geometric improvements. The study team incorporated these strategies into the Recommended Alternative. **Figure 4.11** presents the resulting intersection geometry and operations.



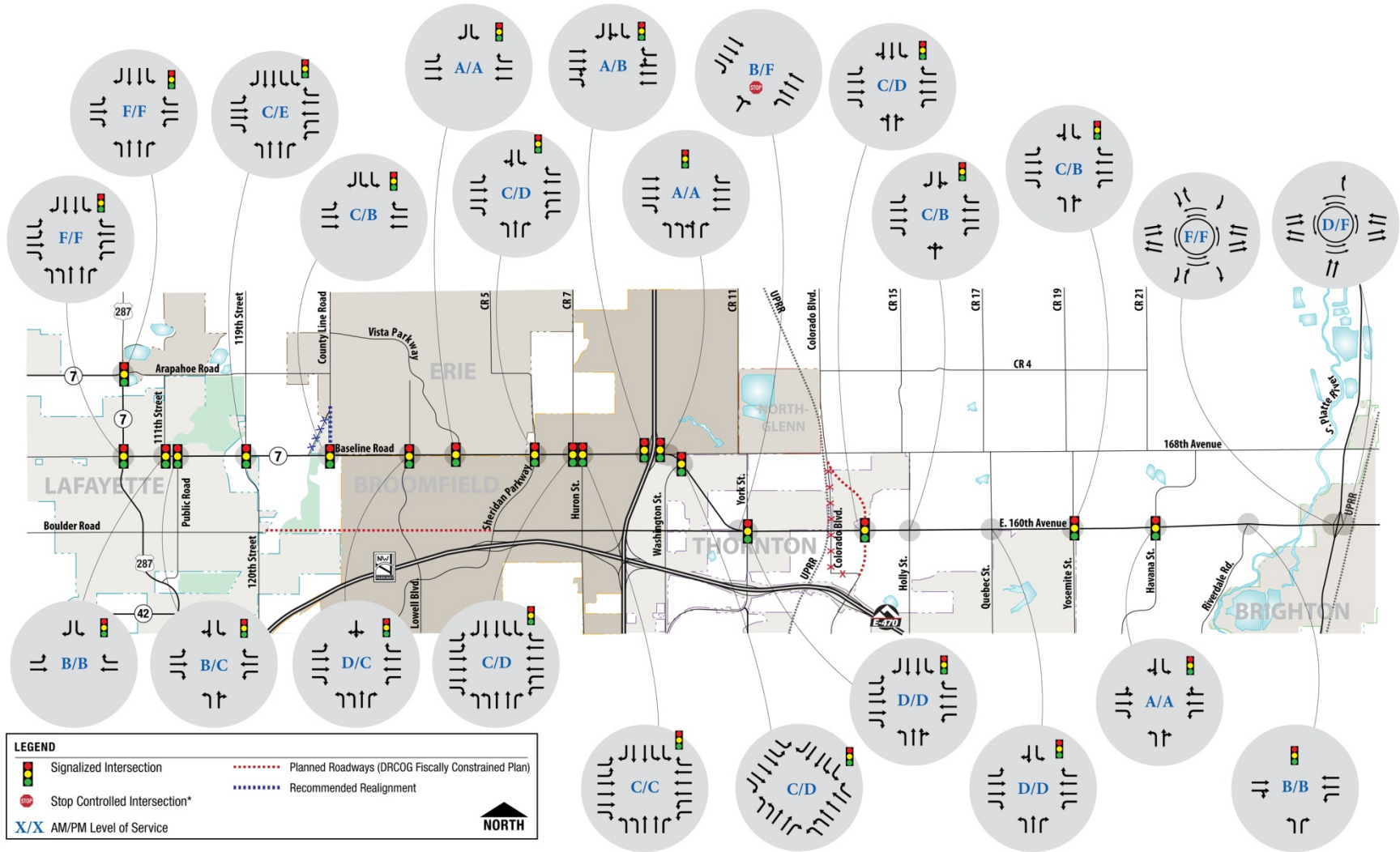
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Figure 4.10 2035 Recommended Alternative AM and PM Peak Hour Turning Movement Forecasts



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Figure 4.11 2035 Recommended Alternative AM and PM Peak Hour Intersection Operations



4.3 Transit

Alternatives Considered

With the exception of the shared stretch of roadway with US 287 and a short segment of SH 7 in Lafayette, no transit service currently operates along the SH 7 study corridor. RTD bus routes serve each terminus of the corridor, as both Lafayette and Brighton have park-n-Ride facilities close to their respective ends of the study corridor. Both a desire and a need for transit service along the SH 7 corridor in the future have been identified. Because transit service planning is under the jurisdiction of RTD, the transit elements of the alternatives considered for the PEL study focus on transit-related infrastructure. As described in more detail in **Chapter 2.0**, the transit elements considered for the SH 7 corridor included:

- ▶ Fixed guideway (light rail or streetcar) – *Eliminated in Level 1 evaluation because the alternative did not meet purpose and need.*
- ▶ Bus only lane
 - *Eliminated in Level 2A for segment 1 of the corridor through the City of Lafayette due to the magnitude of a combination of negative impacts on the community and cultural and environmental resources.*
 - *Not recommended in Level 2A evaluation for segments 2, 3, 4, and 5 of the corridor for anticipated 2035 transit demand, but retained for future consideration.*
- ▶ Bus/HOV lane/HOT lane
 - *Eliminated in Level 2A for segment 1 of the corridor through the City of Lafayette due to the magnitude of a combination of negative impacts on the community and cultural and environmental resources.*
 - *Not recommended in Level 3A evaluation for segments 2, 3, 4, and 5 of the corridor for anticipated 2035 transit demand, but retained for future consideration.*
- ▶ Transit priority (queue jumps, etc.) – *Included in Recommended Alternative*
- ▶ Transit amenities (bus stops, shelters, pull outs, etc.) – *Included in Recommended Alternative*

To evaluate the managed lane concept (bus/HOV lane/HOT/lane alternative), the 2035 travel demand model was used. HOV lanes (one in each direction) paired with the existing general purpose lanes along SH 7 would result in approximately 15 percent of the 2035 traffic using the HOV lanes. The remaining 85 percent of traffic (presumably single occupant vehicles [SOVs]) would be forced to use the existing general purpose lanes. The low utilization of the HOV lane and the corresponding congestion in the general purpose lanes resulted in the managed lanes not being recommended for 2035.

Recommended Alternative

The Recommended Alternative includes transit priority treatments and transit amenities throughout the corridor. The conceptual plans include transit queue jumps at most major intersections along the corridor that are currently signalized or are anticipated for future signalization.

To estimate potential time savings from queue jumps, the queue lengths for the 50th percentile at the intersections identified to include queue jumps on SH 7 were projected using the Recommended

Alternative Synchro model. These queue lengths were used to calculate headway loss using start-up times from the FHWA *Traffic Control Systems Handbook*. Based on the calculations, it is estimated that eastbound buses will save up to 10 minutes of travel time across the entire study corridor as a result of the queue jumps, and westbound vehicles up to 7 minutes of travel time.

Transit queue jumps are most effective at intersections where congestion exists, and the bus would benefit from bypassing the queued vehicles. The specific locations and configuration of transit queue jumps (and the use of transit signal priority treatments) will need to be evaluated in future design phases.

4.4 *Bicycle and Pedestrian*

Alternatives Considered

Sidewalks exist sporadically along the SH 7 corridor, and a wide shared use path exists on short segments of the corridor. The shoulders along SH 7 can accommodate bicycle travel; however, the shoulders are typically used to develop auxiliary lanes at intersections, resulting in a lack of bicycle accommodation in proximity to intersections.

SH 7 is designated as a regional and community bicycle corridor in DRCOG's 2035 fiscally-constrained *Metro Vision Regional Transportation Plan*. The alternatives developed for the SH 7 corridor are aimed at upgrading the bicycle and pedestrian accommodations along and across the SH 7 corridor to facilitate bicycling and walking, as well as to support future transit riders on the corridor.

As described in more detail in **Chapter 2.0**, the bicycle elements considered for the SH 7 corridor include:

- ▶ Shoulders
- ▶ Bike lanes
- ▶ Shared lanes ("Sharrows")
- ▶ Cycle tracks
- ▶ Shared use paths
- ▶ Intersection treatments (signing, striping)

The pedestrian elements considered for the corridor include:

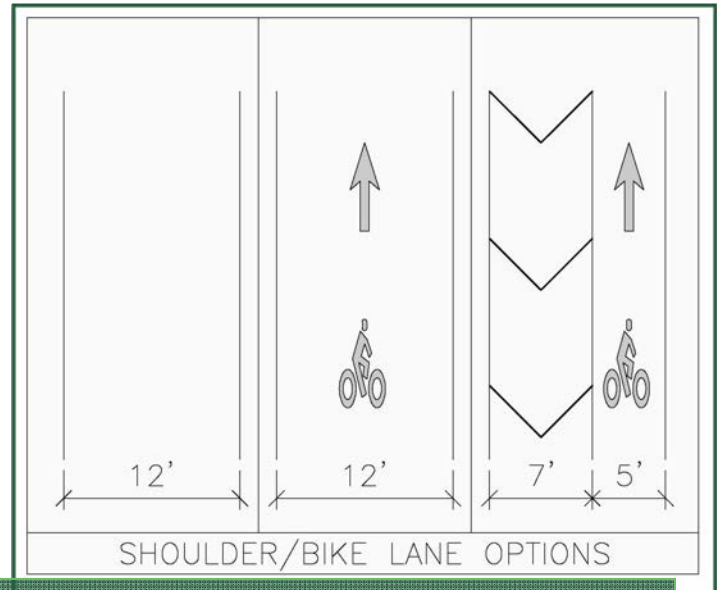
- ▶ Attached sidewalk
- ▶ Detached sidewalk
- ▶ Shared use paths
- ▶ At-grade crossing treatments
- ▶ Grade separated crossings

The only bicycle or pedestrian element listed above that is not recommended for SH 7 is a cycle track. A cycle track is similar to a bike lane but provides a physical separation (often a vertical separation such as a curb/median or bollards) between the travel lane and the bikeway. Cycle tracks were not recommended in the Level 2A evaluation because their capacity would exceed the need (anticipated 2035 bicycling demand).

Recommended Alternative

The Recommended Alternative includes all bicycle and pedestrian elements listed above, with the exception of cycle tracks. Because CDOT’s standard for sidewalks includes a minimum 5-ft buffer, attached sidewalks are only recommended along SH 7 in the constrained areas of Lafayette. Detached sidewalks are recommended where feasible through Lafayette.

Shared use paths are recommended along both sides of SH 7 on the remainder of the corridor. The shared use paths can accommodate pedestrians and recreational and less experienced bicyclists. For more experienced and commuter-type bicyclists, bike lanes are recommended within the wide (12 ft) shoulder. There are three options for striping the shoulder, as shown to the right. Through downtown Lafayette, the Recommended Alternative retains the existing bike lane and uses a shared lane (potentially with “sharrow” pavement markings) between US 287 and Public Road where there is not enough width to provide a separate bike lane.



A 12-foot shoulder is recommended along most of the corridor (except in the constrained portion of the corridor through Lafayette). The shoulder could include bike lane markings for bicyclists to use the full width, or the shoulder could be striped as a buffered bike lane with chevron markings to provide a visual separation between the travel lane and the bikeway.

Bicycle and pedestrian enhancements are recommended at all major at-grade intersections, including crosswalks, pedestrian activated signals, median refuges, signing and striping consistent with the CDOT Road Design Guide (Chapter 14 Bicycle and Pedestrian) and the MUTCD. The Recommended Alternative includes accommodation for grade separated crossings at five locations along the corridor:

- ▶ Coal Creek (existing)
- ▶ Near Huron Street
- ▶ West of Jackson Street
- ▶ West of Quebec Street
- ▶ South Platte River (existing)

4.5 Safety

The SH 7 PEL Recommended Alternative Several includes safety improvements. The following highlight key safety improvements identified in the PEL study:

- ▶ **Auxiliary lanes to CDOT standards:** State of Colorado State Highway Access Code (Access Code) standards define design standards for auxiliary lanes. These standards ensure that auxiliary lanes are located at the necessary locations, are of proper length for vehicles to accelerate and decelerate, and can accommodate queued vehicles while minimizing impacts on through traffic. Adequate auxiliary lanes minimize conflicts between vehicles slowing or stopped for turning and also ensure vehicles merging into moving travel lanes do so at a similar speed to the through traffic, further minimizing conflicts. When developing the SH 7 PEL Recommended Alternative, the study team used the Access Code to ensure that auxiliary lanes are properly planned for the corridor.
- ▶ **Median (raised in portions):** Medians provide separation between vehicles travelling in opposite directions. This buffer has been proven to provide a safety benefit to motorists by reducing crashes. Raised medians also reduce conflicts by restricting access from minor side streets, further reducing crashes. Median islands have been identified for most of the SH 7 PEL study area to provide this buffer and restrict access as appropriate to improve safety.
- ▶ **Continuous shoulders (12 feet):** Single vehicle run off the road crashes are one of the leading causes of fatal crashes in the United States. Paved shoulders have successfully reduced these types of crashes. Additionally, continuous paved shoulders provide space for vehicles that have broken down to move out of traffic, as well as a designated facility for bicyclists. The Recommended Alternative includes continuous shoulders for an enhanced recovery area, bicycle accommodation, and break-downs.
- ▶ **Intersection improvements for operations and safety:** Intersections are the locations with the highest occurrence of crashes. The reason is that the interaction of people and vehicles at intersections results in a significant number of potential conflict points. Congestion at intersections increases the potential for crashes. Improving geometry, adding appropriate auxiliary lanes, and improving operations typically result in crash reduction. Identified intersection improvements for the SH 7 PEL Recommended Alternative include the addition and/or improvement of auxiliary lanes. Other intersection improvements in the Recommended Alternative improve turning movements and pedestrian safety with channelizing islands. Through lanes are recommended where necessary for capacity, and bicycle lanes are designed to minimize conflicts with turning vehicles and transit vehicles.
- ▶ **Future signals at key intersections:** Traffic signals can improve intersection safety by reducing the severity of crashes when conditions are appropriate for their use. FHWA has identified scenarios when signalization can be beneficial and has established a series of warrants to consider before installing a traffic signal at an intersection. The study team evaluated intersections within the SH 7 PEL corridor to identify if signalization would likely be warranted in the future. Locations where signals are projected to be warranted are identified in the Recommended Alternative to reduce the likely severity of crashes at these locations.

- ▶ **Separate designated bicycle and pedestrian facilities (also a safety benefit for transit riders):** Shared use paths have been identified for much of the SH 7 PEL corridor. These paths will separate pedestrians and recreational bicyclists from vehicle traffic, improving safety for all levels of path users. These shared use paths will also improve safe access to future transit stops along SH 7.
- ▶ **Accommodation of grade separated bicycle and pedestrian crossings:** Separating bicycles and pedestrians from vehicle traffic improves safety by eliminating potential conflicts with vehicles. The SH 7 PEL did not recommend the addition of grade separated bicycle and pedestrian crossings in the segment of the corridor through the City of Lafayette. However, locations of potentially significant bicycle and pedestrian crossing activity have been identified (Coal Creek, Huron Street, West of Jackson Street, West of Quebec Street, and the South Platte River) and at these locations corridor improvements are recommended to accommodate these future grade separated crossings.

4.6 Post-2035 Land Use Sensitivity Analysis

As described in **Section 4.1**, the DRCOG 2035 land use forecasts that are the basis for the travel demand forecasts do not include full buildout of the land along the SH 7 corridor. The land use “capacities” have been used to understand the potential travel demand along SH 7 when full development of the land within the study area is realized.

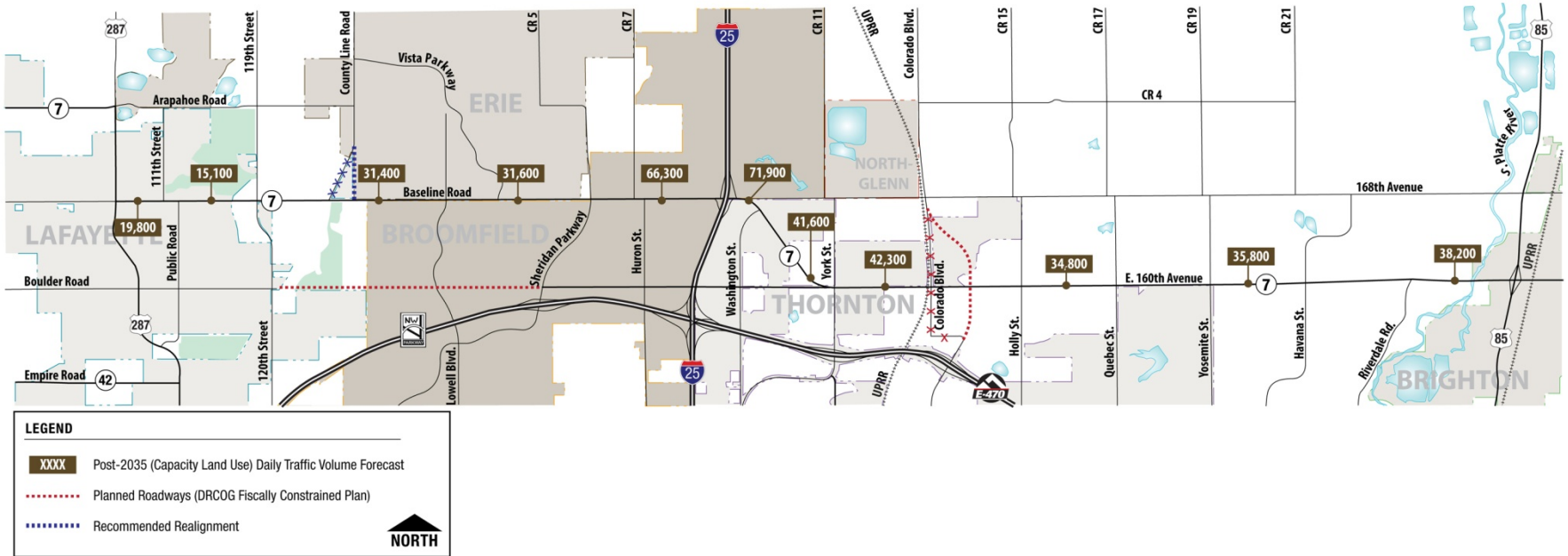
Travel Demand Forecasts

The land use capacities within the study area were applied to the regional travel demand model, using the SH 7 Recommended Alternative network. The purpose of this model run was to gain an understanding of the potential additional travel demand along the corridor associated with buildout of the study area. **Figure 4.12** shows the resulting daily traffic forecasts. As summarized in **Table 4.6**, the largest percent increase in travel demand from 2035 to buildout is in the vicinity of the North Metro Station, where travel demand is forecast to increase approximately 35 percent over 2035 forecasts. The travel demand on the central and eastern portions of the corridor could see travel demand increases in the range of 15 to 30 percent over the 2035 forecasts.

Table 4.6 2035 and Post-2035 Daily Traffic Volume Forecasts on SH 7

From	To	2035 Forecast (Recommended Alternative)	Post-2035 Forecast (Recommended Alternative)	% Increase
US 287	Public Road	18,500	19,800	7%
Public Road	119th Street	13,600	15,100	10%
119th Street	Lowell Boulevard	27,800	31,400	12%
Lowell Boulevard	Sheridan Parkway	25,900	31,600	18%
Sheridan Parkway	I-25	54,800	66,300	17%
I-25	Washington Street	54,300	71,900	25%
Washington Street	York Street	26,100	41,600	37%
York Street	Colorado Boulevard	27,400	42,300	35%
Colorado Boulevard	Quebec Street	24,700	34,800	29%
Quebec Street	Havana Street	26,700	35,800	25%
Havana Street	US 85	29,400	38,200	23%

Figure 4.12 Post-2035 (Capacity Land Use) Daily Traffic Volume Forecasts



Potential Post-2035 Considerations

Right-of-way Preservation

The post-2035 land use sensitivity analysis reveals that travel demand along the corridor could increase substantially when the land uses along the corridor are built out. To accommodate the potential post-2035 travel demand, the Recommended Alternative includes ROW preservation for an ultimate six-lane section from York Street to realigned Colorado Boulevard.

Transit Accommodation

As the land uses intensify along the SH 7 corridor and as regional transit service is implemented (including I-25 express bus service, the North Metro commuter rail line, and potential extension of passenger rail north of the North Metro Station), the demand for east-west transit service will likely increase. To accommodate the potential for enhanced transit service post-2035, the Recommended Alternative includes wide shoulders (12 feet) so as not to preclude the option of hard shoulder running bus operations in the future. This configuration could be paired with narrowed travel lanes to retain a bike lane and use of the shoulder for buses.

5.0 AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND MITIGATION STRATEGIES

Chapter 5.0 summarizes the results of the environmental analyses conducted for this PEL study. The analyzed resource areas were selected based on the characteristics of the project area and on input from the stakeholders.

A separate *SH 7 PEL Corridor Conditions Assessment Report (Appendix A)* includes documentation of current and future conditions of the SH 7 corridor with regard to environmental resources (CDOT, 2012a). The analyzed resources were considered “red flag” environmental resources with separate regulatory drivers, such as the Endangered Species Act (ESA) or Clean Water Act (CWA), or are typically resources of concern for the general public, such as traffic noise. The *SH 7 PEL Corridor Conditions Assessment Report* presents the results of the analysis for each resource, as well as methodology and existing conditions along the corridor.

The following resources were not evaluated as part of the SH 7 PEL: Farmlands, Socio-Economics and Community, Properties Acquired for Right-of-Way and Displacements, Archaeological Resources, Paleontology, Soils and Geology, and Water Resources. Additional environmental analysis will be required as part of future NEPA analysis and documentation.

The resources that were considered and the analyses performed are generally consistent with NEPA, its implementing regulations, and FHWA and CDOT guidelines.

The following resources were identified for analysis:

- ▶ Parks and Recreational Resources
- ▶ Air Quality
- ▶ Traffic Noise
- ▶ Historic Resources
- ▶ Floodways and 100-year Floodplains
- ▶ Wetlands and Waters of the US
- ▶ Wildlife/Threatened and Endangered Species
- ▶ Hazardous Materials

5.1 Environmental Analysis

Table 5.1 presents the analysis results for each resource topic. Each resource subsection summarizes the environmental resource and includes information on the following:

- ▶ **Affected Environment:** Summarizes the existing conditions of the environmental resource along the SH 7 corridor.
- ▶ **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 assessing this environmental resource for NEPA and recommending mitigation strategies that have been identified to address adverse impacts that would be expected with the Recommended Alternative.

Table 5.1 Summary of Affected Environment, Environmental Consequences, and Next Steps/Mitigation Strategies

Affected Environment	Environmental Consequences	Next Steps/Mitigation Strategies
Parks, Open Space and Trails		
<p>Some of the park properties present within the project area are publicly owned and are afforded protection under Section 4(f) of the US Department of Transportation (USDOT) Act of 1966, as defined in 23 Code of Federal Regulations (CFR) 774. A Section 4(f) resource is a property that functions or is designated as a significant publicly owned park, recreation area, wildlife or waterfowl refuge, or historic site. If the proposed action has an impact on one of these properties, a Section 4(f) evaluation may be required for that particular resource.</p> <p>In addition, these park properties may be afforded protection under Section 6(f) of the Land and Water Conservation Fund Act of 1965 if these properties are Section 6(f) assisted properties. Section 6(f) of the Act assures that once an area has been funded with Land and Water Conservation Fund assistance, it is continually maintained for public outdoor recreation use unless the Colorado Department of Natural Resources Parks and Wildlife (CPW) and the National Park Service (NPS) approves replacement property. Importantly, Section 6(f) applies to all transportation projects involving possible conversions of the property whether or not federal funding is being used for the project.</p> <p>While various parks, trails, and open space are located along the corridor, the largest concentration of parks and open space is located north of SH 7 in Boulder County between the City of Lafayette and the Town of Erie.</p>	<p>Based on the conceptual level of design, the Recommended Alternative will have an approximate impact on the following parks, open space, and trails:</p> <ul style="list-style-type: none"> ▶ Lafayette City Park – 0.3 acre ▶ Lafayette Cemetery – 0.4 acre ▶ Two Creeks Open Space – 0.3 acre ▶ Haselwood Open Space – 0.2 acre ▶ Mountain View Egg Farm – 0.2 acre ▶ Preble Creek Open Space and Trail – 0.8 acre ▶ German Ditch Open Space – 0.9 acre ▶ Signal Ditch Open Space – 0.3 acre ▶ Veteran’s Park – 0.6 acre ▶ Berry Property – 0.2 acre ▶ Coal Creek/Rock Creek Trail ▶ Anthem Neighborhood Trails ▶ Big Dry Creek Trail ▶ Colorado Front Range Trail Corridor (South Platte) ▶ American Discovery Trail 	<p>Separate evaluations of publicly-owned parks, trails, and open space lands will be conducted to determine if there are any properties that qualify for protection under Section 4(f) and/or are Section 6(f) assisted properties.</p> <p>Section 4(f) of the USDOT Act of 1966 mandates that the Secretary of Transportation shall not approve any transportation project requiring the use of publicly owned parks, recreation areas or wildlife and waterfowl refuge, or significant historic sites, regardless of ownerships, unless:</p> <ul style="list-style-type: none"> ▶ There is no prudent and feasible alternative to using that land, and ▶ The program or project includes all possible planning to minimize harm to the public park, recreation area, wildlife or waterfowl refuge, or significant historic site, resulting from that use. <p>Section 6(f) assisted properties require coordination with the affected local agency, as well as approval from the CPW and NPS to convert Section 6(f) assisted land for transportation improvements.</p>

Table 5.1 Summary of Affected Environment, Environmental Consequences, and Next Steps/Mitigation Strategies (Continued)

Affected Environment	Environmental Consequences	Next Steps/Mitigation Strategies
Air Quality		
<p><u>Regional Conformity</u> The 2035 Regional Transportation Plan (RTP) and the 2012–2017 TIP are the adopted fiscally-constrained air-quality-conforming plan and program for DRCOG. Federally funded projects need to be included in the current fiscally-constrained RTP and TIP before a decision document can be signed.</p> <p><u>Local Conformity</u> Local conformity is demonstrated by assessing whether future traffic conditions may cause an exceedence of a National Ambient Air Quality Standard (NAAQS) on a smaller basis. The proposed project must not lead to violations of an NAAQS.</p>	<p>The primary air quality issues of concern for this project are pollutants associated with the operation of vehicles on roadways. Issues include direct emissions of pollutants from vehicles, including road dust, and secondary pollutants formed from the direct emissions. Air quality issues related to road construction are also a potential short-term concern.</p> <p>Consequently, potential effects on air quality are primarily from congested traffic during peak periods and other traffic-related activities. Vehicles idling at intersections are a major source of local air pollution. Any action that alleviates congestion and vehicle idling will necessarily improve regional and local air quality.</p>	<p>Due to past and present air quality issues, infrastructure projects that might exacerbate existing air quality problems must meet certain requirements before they can proceed. In general, projects must be analyzed with respect to their potential impact on air quality at both the regional and local levels. An air quality impact assessment will need to be prepared. This assessment may include a hot spot analysis for carbon monoxide (CO) at intersections with a LOS of D, E, or F. Neighboring areas could be exposed to construction-related emissions, and particular attention will 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 strategies should be incorporated into construction contracts. These include following best management practices (BMPs) and relevant CDOT construction specifications, such as:</p> <ul style="list-style-type: none"> ▶ Keep engines and exhaust systems on equipment in good working order. Equipment is maintained on a regular basis, and equipment is subject to inspection by the project manager to ensure maintenance. ▶ Control fugitive dust systematically through diligent implementation of CDOT’s Standard Specifications for Road and Bridge Construction, particularly Sections 107.24, 209 and 250, and APCD’s Air Pollutant Emission Notification requirements. ▶ Allow no excessive idling of inactive equipment or vehicles. ▶ Use low-sulfur fuel for construction equipment and vehicles 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.

Table 5.1 Summary of Affected Environment, Environmental Consequences, and Next Steps/Mitigation Strategies (Continued)

Affected Environment	Environmental Consequences	Next Steps/Mitigation Strategies
Traffic Noise		
<p>The potential for noise or vibration impacts from vehicles to the receptors (that is, properties) near transportation facilities is a general concern. State and federal transportation agencies have established thresholds for determining noise impacts to guide these conclusions. When impacts are identified from an improvement, mitigation actions for the affected receptors must be considered for the project design. This is an important consideration for this project because many properties are along the project corridor and may be affected by noise. Many residential neighborhoods (Noise Abatement Criteria [NAC] Category B) can be found in the PEL study area between US 85 and US 287. Likewise, several Category C areas (parks, schools, churches, etc.) are also spread throughout the PEL study area.</p>	<p>TNM modeling of two representative scenarios for the corridor were evaluated for prospective future (2035) traffic noise conditions. First was the worst expected noise conditions for a four-lane SH 7 profile that included a narrow SH 7 profile (that is, 84-ft cross-section), high speeds, and, high traffic volumes. Second was the worst expected noise conditions for the six-lane SH 7 profile that included high speed and high traffic volumes. It was expected that these would represent reasonable “worst case” noise conditions for the corridor. Generalized distances to the NAC of 66 dB and 71 dB for these conditions for Land Use Categories B/C and E, respectively, were calculated from the TNM results for each scenario to indicate the maximum zone where noise impacts may occur. The findings are based on the preliminary traffic data available at the time of analysis.</p> <p>For the four-lane SH 7 segments, it was calculated that the maximum 2035 distances to 71 dB and 66 dB would be approximately 100 feet and 200 feet, respectively. For the six-lane SH 7 segments, it was calculated that the maximum 2035 distances to 71 dB and 66 dB would be approximately 125 feet and 250 feet, respectively. The distances are from the future edge of pavement for SH 7. Note that receptors beyond these distances from SH 7 are unlikely to be affected by traffic noise and that receptors within these distances may or may not be found not to be affected through a more detailed analysis (due to local noise conditions that are less than “worst case”).</p>	<p>The CDOT <i>Noise Analysis and Abatement Guidelines</i> (CDOT 2011) 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 Recommended Alternative would be a Type I project, and a traffic noise study will need to be prepared.</p> <p>Construction noise would be subject to relevant local regulations and ordinances, and any construction activities would be expected to comply with them.</p>

Table 5.1 Summary of Affected Environment, Environmental Consequences, and Next Steps/Mitigation Strategies (Continued)

Affected Environment	Environmental Consequences	Next Steps/Mitigation Strategies
Historic Resources		
<p>Historic resources are afforded consideration by Section 106 of the National Historic Preservation Act of 1966, as amended, as well as Section 4(f) of the Department of Transportation Act of 1966. Significant historic resources are those that are listed or may be eligible for inclusion on the National Register of Historic Places (NRHP). Historical resources are buildings, structures, districts (groups of buildings or structures), sites, and objects meeting the minimum age criterion of 45 years. Typically, 50 years is used as an age threshold; however, a 45-year threshold is often used in transportation projects to account for their protracted schedules including environmental clearance, design, and obtaining funding. For purposes of this study, only properties on the NRHP or officially eligible for the NRHP are listed as previously identified historic sites. The SH 7 corridor includes nine existing historic properties, including one eligible historic district in the City of Lafayette, two residences, two railroads, three ditches, and one farm. Potential historic sites were also evaluated. Potential historic sites are properties over 45 years of age that have not yet been surveyed, but based on a visual reconnaissance appear to possess architectural qualities that may make them eligible for the NRHP under Criterion C – Distinctive Architecture and/or Construction.</p>	<p>Based on the conceptual level of design, the Recommended Alternative will have an impact on the following previously identified historic properties or potential historic sites:</p> <ul style="list-style-type: none"> ▶ 1909 Farm (5AM.2199) – Officially NRHP Eligible ▶ UPRR – Dent Branch (5AM.472.1) – Officially NRHP Eligible ▶ BNSF Railroad (5BL.374) – Officially NRHP Eligible ▶ Lafayette Historic District (5BL.544) – Officially NRHP Eligible ▶ Conger Farm – Potentially Historic ▶ 1934 House and Farm – Potentially Historic ▶ Blue Star Memorial Highway Monument – Potentially Historic ▶ Lafayette Cemetery – Potentially Historic ▶ Former Lafayette High School (5BL.10401) – Potentially Historic ▶ Lafayette Feed & Grain (5BL.374.6) – Potentially Historic ▶ Waneka Farm (5BL.1994) – Potentially Historic Centennial Farm ▶ Three Unnamed Irrigation Ditches – Potentially Historic 	<p>The transportation improvements have the potential to affect currently unidentified and unevaluated cultural resources in unsurveyed areas; however, additional intensive-level inventory will be required to adequately assess these potential impacts. An intensive survey of cultural resources will be conducted, including preparation of a Cultural Resources Inventory Report, to facilitate official evaluations of NRHP-eligibility and assess specific project impacts as required for National Historic Preservation Act Section 106 review.</p> <p>If any archaeological materials (such as artifacts and faunal remains) or features are encountered or unearthed during construction, work would be immediately halted in the vicinity of the find, and the CDOT archaeologist and State Historic Preservation Officer (SHPO) would be promptly notified. The site of the find would be secured and work would remain halted until a qualified professional archaeologist could 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.</p> <p>If bones of potential human origin are encountered during construction, ground-disturbing work would be halted in the vicinity of the discovery, and the CDOT archaeologist would be promptly notified. The CDOT archaeologist would assess the find, and the county coroner would be summoned, if necessary, to determine the relative age and ethnicity of the individual(s) represented. Work should not resume in the vicinity of the find until CDOT grants clearance.</p>

Table 5.1 Summary of Affected Environment, Environmental Consequences, and Next Steps/Mitigation Strategies (Continued)

Affected Environment	Environmental Consequences	Next Steps/Mitigation Strategies
Floodways and 100-year Floodplains/Water Quality		
<p>Six drainageways have Federal Emergency Management Agency (FEMA) designated floodplains in the project area: Coal Creek, Big Dry Creek, South Fork Preble Creek, Preble Creek, Morris Creek, and South Platte River. Of these six drainageways, three are designated as Zone AE floodplains (Coal Creek, Big Dry Creek, and South Platte River), and three are designated as Zone A floodplains (South Fork Preble Creek, Preble Creek, and Morris Creek).</p> <p>Of these drainageways, Coal Creek, Big Dry Creek, and South Platte River 100-year floodplains overtop SH 7. It should be noted that Todd Creek Drainage Way 1 is shown on FEMA maps but does not have a FEMA designated floodplain. A 100-year floodplain has been documented in the Flood Hazard Area Delineation for Todd Creek. The upstream limit of the designated floodplain is located at the southeast corner of SH 7 and Yosemite Street but does not cross SH 7.</p>	<p><u>Floodplains</u></p> <p>Based on the conceptual level of design, the Recommended Alternative will have an approximate impact on the following floodplains:</p> <ul style="list-style-type: none"> ▶ Coal Creek – 4.2 acres ▶ Preble Creek – 3.7 acres ▶ Big Dry Creek – 8.9 acres ▶ South Fork Preble Creek – <0.1 acre ▶ Morris Creek – 5.6 acres ▶ South Platte River – 13.8 acres 	<p><u>Floodplains</u></p> <p>Coal Creek, Big Dry Creek, and the South Platte River floodplain would be the most sensitive to any changes in the floodplain and would require a Conditional Letter of Map Revision (CLOMR) and Letter of Map Revision (LOMR) from FEMA. South Fork Preble Creek, Preble Creek, and Morris Creek are sensitive to changes made in the floodplain. Floodplain modeling would be required to assess significant changes. Some relatively small changes may be incorporated in the floodplain without triggering the CLOMR/LOMR process. Floodplain modeling would be required to assess significant changes.</p> <p>Engineering design will take into account the floodplain and floodway issues. The location of bridges and bridge piers within the floodplain and floodway will be considered in the engineering design. Piers located within the floodway will require a specialized hydrologic assessment and approval by FEMA and Colorado Water Conservation Board. The placement of piers within the active channel of Coal Creek, Big Dry Creek, South Fork Preble Creek, Preble Creek, Morris Creek, and South Platte River will be avoided or placed in a position to reduce impacts on the stream channel, stream habitat, and biota.</p>

Table 5.1 Summary of Affected Environment, Environmental Consequences, and Next Steps/Mitigation Strategies (Continued)

Affected Environment	Environmental Consequences	Next Steps/Mitigation Strategies
Floodways and 100-year Floodplains/Water Quality (Continued)		
	<p><u>Water Quality</u></p> <p>Stormwater from the adjacent impervious areas (roadways, parking lots, etc.) currently discharges directly to Coal Creek, Big Dry Creek, South Fork Preble Creek, Preble Creek, Morris Creek, and South Platte River. Roadway runoff typically may contain the following pollutants:</p> <ul style="list-style-type: none"> ▶ Sediment: Solids such as sand, silt, and clays that are washed from paved surfaces or eroded from roadway slopes and become suspended in water. Sediment due to construction is a common water quality concern. ▶ Heavy metals: Metals such as zinc and copper from fuels, brake pads, and vehicle wear. In the past, lead was a common pollutant, but the use of unleaded gasoline has now substantially reduced this roadway contaminant. ▶ Magnesium chloride and salt: Deicers used on roads for winter maintenance. ▶ Oil and grease: Petroleum hydrocarbons deposited by vehicles on roadways and parking lots. 	<p><u>Water Quality</u></p> <p>CDOT has a Phase I Municipal Separate Storm Sewer System (MS4) permit from the Colorado Department of Public Health and Environment (CDPHE). The SH 7 corridor includes portions of Brighton, Thornton, Lafayette, Erie, Broomfield, Adams County, Weld County, and Boulder County. All of these jurisdictions have Phase II MS4 permits. Jurisdictions that have Phase I or Phase II MS4 permits are required to provide permanent water quality facilities for new development or redevelopment where there will be 1 acre or greater of new paved areas. Potential locations of permanent water quality ponds have been identified along the SH 7 corridor and are depicted in the <i>SH 7 PEL Conceptual Design Plan Set (Appendix D)</i>.</p> <p>During construction, stormwater impacts will be minimized by using the appropriate CDOT standard construction BMPs as appropriate. Potential BMPs would include silt fence, inlet protection, stabilized construction entrances, slope stabilization, concrete washouts, erosion logs, inlet filters, sediment basins (at permanent water quality pond locations), vehicle tracking pads, and other BMPs. Specific temporary and permanent stormwater management strategies will be identified during preliminary/final design as part of a drainage/hydraulics assessment and development of a storm water management plan (SWMP). Construction-related mitigation measures will be outlined in the SWMP and will include a detailed set of erosion control plans as part of the roadway design set.</p>

Table 5.1 Summary of Affected Environment, Environmental Consequences, and Next Steps/Mitigation Strategies (Continued)

Affected Environment	Environmental Consequences	Next Steps/Mitigation Strategies
Wetlands and Waters of the US		
<p>Wetland resources are protected under Section 404 of the CWA and Executive Order 11990 <i>Protection of Wetlands</i>. CDOT has incorporated FHWA environmental guidance into its <i>NEPA Manual</i> (CDOT, 2013), which emphasizes efforts to avoid and minimize wetland impacts. Most wetlands identified within the corridor are small palustrine emergent, palustrine scrub/shrub, and palustrine scrub/shrub-emergent mix wetlands, with most occurring along existing waterways and drainages and in roadside ditches. Previous studies considered most of these roadside and irrigation ditch wetlands as low-quality wetlands.</p> <p>However, wetlands associated with the South Platte River, Big Dry Creek, and Coal Creek provide a moderate quality wetland value.</p>	<p>Based on the conceptual level of design, the Recommended Alternative would have an impact on approximately 2.0 acres of wetlands and other waters of the US.</p>	<p>A Wetland Delineation Report will be required and submitted to the US Army Corp of Engineers (USACE) for concurrence. A Wetland Findings Report will be prepared based on the Preferred Alternative in the environmental document. FHWA and CDOT policy requires compensatory mitigation for permanent impacts on both jurisdictional and non-jurisdictional wetlands. Wetland mitigation is typically done on a one-to-one basis; however, a CWA Section 404 permit, which the USACE will issue, may require higher ratios if unique or high-quality wetlands are affected.</p>
Wildlife/Threatened and Endangered Species		
<p>Various federal laws have been established to protect wildlife, including the ESA; the Migratory Bird Treaty Act (MBTA); and the Bald and Golden Eagle Protection Act (BGPA). Threatened and endangered species habitat that is present in the project area includes habitat for the Colorado butterfly plant (<i>Gaura neomexicana coloradensis</i>), the Ute ladies'-tresses orchid (<i>Spiranthes divulialis</i>), the common shiner (<i>Notropis cornutus</i>) and the Preble's meadow jumping mouse (<i>Zapus hudsonius preblei</i>). The primary drainages that were identified from the field survey and that contained suitable habitat for these species include Coal Creek, Community Ditch, Big Dry Creek, and the South Platte River. A field survey noted major wildlife corridors that facilitate wildlife movement. These corridors include Coal Creek, Big Dry Creek, Brighton Ditch, and the South Platte River.</p>	<p>The SH 7 corridor crosses the Coal Creek, Community Ditch, Big Dry Creek, Brighton Ditch, and South Platte River. Threatened and endangered species habitat may be present along these drainages. Seven bald eagle/raptor nests are located within approximately 0.5 mile of the corridor.</p>	<p>A biological survey of threatened and endangered 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. Also, Senate Bill 40 (SB 40) wildlife certification will be required for the crossing of riparian corridors in the project. CPW will determine if Formal or Programmatic certification may be required depending on SB 40 guidelines.</p> <p>If proposed construction is planned to occur during the primary nesting season for migratory birds in eastern Colorado (typically April 1 – August 31, with some species nesting outside this period), a qualified biologist will resurvey the project area to verify if any active nests are present. If no active nests are present, trees can be removed. 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 egg laying begins or ceasing construction until all nestlings have fledged.</p>

Table 5.1 Summary of Affected Environment, Environmental Consequences, and Next Steps/Mitigation Strategies (Continued)

Affected Environment	Environmental Consequences	Next Steps/Mitigation Strategies
Hazardous Materials		
<p>For this hazardous materials assessment summary, sites within the project area were identified as having known (current and historic) soil or groundwater contamination and are distinguished in this report as sites with recognized environmental conditions. 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.</p> <p>A total of 39 sites with recognized and potential environmental conditions were identified within 500 feet of the SH 7 project area. Thirteen of these sites were leaking underground storage tank (LUST) sites adjacent to the project area.</p>	<p>Based on the conceptual level of design, the Recommended Alternative would have an impact on the following sites with potential and recognized environmental conditions:</p> <ul style="list-style-type: none"> ▶ Tri County Store (Parcel ID 157302002002) – LUST site ▶ Total Auto Coverage Corporation (Parcel ID 157103300006) – Machinery storage ▶ United Power (Parcel ID 157101000021) – Electrical substation ▶ Twin Peaks Ltd/Ace Auto Repair (Parcel ID 156906313002) – Automotive Repair/Maintenance facility ▶ Bolyard’s The Collision Center (Parcel ID 146535400011) – Automotive Repair/Maintenance facility ▶ CL Waneka & Company (Parcel ID 146535400012) ▶ Main Street Power Facility (Parcel ID 14653600031) – Solar power facility ▶ Mile High Shooting Range (Parcel ID 121964) – Voluntary cleanup site ▶ 7-Eleven (Parcel ID 122291) – Operating gasoline station (no reported leaks) <p>The SH 7 corridor from US 287 to Sheridan Parkway is located in the Boulder-Weld County coal field and may be underlain by an abandoned coal mine. Four abandoned mine audits and six abandoned mine air shafts are located in the vicinity of SH 7 in this area. Nine oil and gas wells are also located in the vicinity of SH 7 in this area.</p>	<p>Properties to be acquired will require a site-specific Phase I Environmental Site Assessment or Initial Site Assessment with an updated search of environmental databases as part of the ROW acquisition process.</p> <p>Contamination from hazardous materials is most likely to be encountered during ground-disturbing activities in areas near properties with potential or recognized environmental conditions (hazardous materials). During the design process, the information concerning these properties can be used to identify avoidance options, if possible, and to assist with the development of materials management and worker health and safety plans. An asbestos-containing materials survey is required for all structures to be demolished as part of this project and must be completed as part of the CDPHE demolition permit. Additionally, a lead-based paint survey and regulated materials clearance survey are recommended for all structures to be demolished as part of this project.</p>

Table 5.1 Summary of Affected Environment, Environmental Consequences, and Next Steps/Mitigation Strategies (Continued)

Affected Environment	Environmental Consequences	Next Steps/Mitigation Strategies
Other Resources		
<p>The following resources were not evaluated as part of the SH 7 PEL:</p> <ul style="list-style-type: none"> ▶ Farmlands ▶ Socio-Economics and Community ▶ Properties Acquired for Right-of-Way and Displacements ▶ Archaeological Resources ▶ Paleontology ▶ Soils and Geology ▶ Water Resources 	<p>Potential impacts were not analyzed for these resources as part of this SH 7 PEL.</p>	<p>Additional environmental analysis will be required as part of future NEPA analysis and documentation.</p>

The study team calculated impacts on environmental resources on a conservative basis and included the footprint for each grade separated crossing, including the South Platte River and Coal Creek bridges. The study team also calculated impacts on parks, open space and trails; property to be acquired for ROW; historic resources; sites with hazardous material concerns; oil and gas wells (hazardous materials); and abandoned coal mines and facilities (hazardous materials) based on the ROW preservation line on either side of the transportation improvements. Impacts on wetlands and other waters of the US, wildlife/threatened and endangered species, and floodplains were calculated based on direct physical impacts from the outer edge of the sidewalk/shared use path on the north and south sides of the transportation improvements. The impact analysis did not include existing trails, sidewalks, and shared use paths that are parallel to SH 7. The proposed transportation improvements are assumed to tie into these existing features.

It is important to note that when adverse impacts were predicted, efforts were first made to avoid or minimize the adverse impacts. **Chapter 2.0** and **Appendix C** document avoidance of adverse impacts. Recommended mitigation strategies were developed to address adverse impacts that could not be avoided.

5.2 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.

Corridor land use patterns include downtown, rural, suburban, commercial, and sites for future commercial development.

A cumulative impact analysis was conducted for most environmental resources for the North I-25 EIS, which fully encompassed the SH 7 study area (FHWA and CDOT, 2011a). The east-west boundaries of the North I-25 EIS study area extended from US 85 and the Union Pacific Railroad (UPRR) 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 areas of particular concern identified within the North I-25 EIS study area included land use (growth), water quality, wildlife, wetlands, air quality, and historic properties and districts (FHWA and CDOT, 2011a). Because the SH 7 study area (**Figure 1.2**) 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 SH 7 PEL study. The cumulative impacts analysis presented below supplements the North I-25 EIS cumulative impacts analysis.

Land Use

Past

In the early 20th century, the SH 7 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 (made possible by the Colorado-Big Thompson River Project in 1937) 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 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.

Population growth, development, and land use change have continued within the SH 7 PEL study area. Industrial development along the UPRR between Greeley and Denver has resulted in the expansion of residential and employment uses in the community of Brighton. Residential development has continued north of Denver in a suburban pattern. Communities have used programs to preserve open space, parks, and agricultural lands as a means to separate themselves from other cities and towns in the region. This has, in turn, spurred development in smaller surrounding communities. As shown in **Table 5.2**, Adams, Boulder, Broomfield, and Weld Counties have experienced the largest increase in population between 1950 and 2010. This growth has translated into the development of housing, employment centers, and community facilities.

Table 5.2 Census Population Totals by County 1950 to 2010

County	Population					Percent (%) Change 1950 to 2010
	1950	1970	1990	2000	2010	
Adams	40,234	185,789	265,038	363,857	441,603	998%
Boulder	48,296	131,889	225,339	291,288	294,567	510%
Broomfield	—	—	—	—	55,889	N/A ¹
Weld	67,504	89,297	131,821	180,936	252,825	275%

¹ Broomfield was not incorporated as a city until 1961 and became a county in 2001; therefore, the percent change was not calculated.

Current

In 2010, there were approximately 16,000 households and nearly 13,000 jobs in the SH 7 PEL study area, while in the larger 3-mile buffer area there were nearly 38,000 households and 25,000 jobs. Compared to the rest of the DRCOG region, the study area currently has a higher ratio of households to jobs, indicating that many residents in the study area must travel outside the study area for work.

Little development activity is taking place in the Boulder County portion of the SH 7 study area. Boulder County, the City of Lafayette and the Town of Erie have signed an IGA that identifies municipal influence areas and rural preservation areas. Under the IGA, these rural preservation areas, which include the area between Lafayette and Erie (generally 119th Street and County Line Road) and the southeast and

western quadrants of the US 287/Arapahoe Road intersection, are intended to remain undeveloped for the foreseeable future.

The SH 7 and I-25 corridors are Broomfield's primary emergent growth area. Anthem is a successful new residential neighborhood with more than 3,000 residents. North Park is a business and research park with the potential for more than 17 million square feet of commercial space. In January 2013, the University of Colorado Health Sciences Center announced the purchase of 66 acres within North Park with the intent to build a medical campus to serve burgeoning growth along the North 1-25 corridor. The Highlands, Palisade Park, and Northlands are three master-planned developments on the north side of SH 7 with the capacity for 4,800,000 square feet of commercial development and 2,325 residential units. Palisade Park is already home to the Children's Hospital and a branch of the National Archives and Records Administration.

A significant amount of residential and mixed use development has been approved for the SH 7 corridor in Thornton. North Creek Farms between SH 7 and York Street east of I-25, as well as Heritage at Todd Creek between Yosemite and Quebec Streets, E-470 and SH 7, and Talon View at the southeast corner of Quebec Street and SH 7 have initiated construction activity. All are single family residential developments. Although approved for many more units, Heritage at Todd Creek could potentially house up to 380 units, North Creek Farms up to 77 units, and Talon View up to 200 units during the near term.

Other projects that may see development activity starting within the next five years include the Larkridge Apartments (338 proposed multifamily units), Morrison (460 proposed single family units), Cundall Farms (375 proposed single family units), Westwood (156 approved single family units) and Talon Pointe (362 approved single family units). The Kaiser Medical Building, a 60,000-square-foot facility offering medical services to the northern Metro Denver community, is also forecast to be developed within the five-year timeframe.

Single family residential development has already been developed or is being planned for much of the Adams and Weld County areas within the SH 7 study area. In the Adams County area closer to Brighton, there are anticipated changes to gravel mining in the area with the addition of a new mine, and the transition of some existing mines to reservoirs. An approximately 15-acre outdoor storage facility is planned for the area between Weld County Road 19 and Weld County Road 21, just to the north of SH 7.

Reasonably Foreseeable

SH 7 is recognized as an important entryway to the City of Lafayette. Currently, SH 7 is the northern entrance to downtown Lafayette at Public Road. The City approved a vision document for Public Road, which calls for a "non-contrived, energy driven, pedestrian friendly, horizontal-walkable, mixed use environment." Various streetscape and landscape improvements are recommended for different road segments. Along SH 7, various designated land uses are seen on either side of Public Road. Designated future land uses east of Public Road include residential and mixed uses. West of Public Road, land use designations include residential on the north side of the highway in this area, while the area along the south side of the highway is within the City's Old Town Urban Renewal Area and suitable for future commercial redevelopment. As the highway turns north at the US 287/SH 7 intersection, there is a mix of commercial and mixed land uses. Unlike many other parts of the corridor, much of the land uses along the corridor in Lafayette have been in existence for some time.

There are primarily residential land uses at the Anthem community, which will continue to see long-term buildout. The area between Sheridan Parkway and past I-25 to the east (along SH 7) is

forecast for future long-term development of a significant amount of primarily commercial uses, some mixed use residential, employment and regional commercial uses. Existing development, such as the Northlands retail project at I-25 and SH 7 will continue to build out, eventually reaching 1.1 million square feet.

Erie's Comprehensive Plan reflects long-term buildout and development activities within the town. The areas bordering the SH 7 corridor in Erie are primarily slated for commercial development backed by low, medium, and higher density residential development. Although Erie is primarily a residential community, it is also planned for a significant amount of regional commercial development along its I-25 border north of Broomfield.

The northern Denver metro area has seen a significant amount of growth, which is forecast to pick up as the economy continues to improve. While residential development has been proposed and approved, Thornton is also planning for a mix of land uses in its northern area. Their development somewhat depends on significant infrastructure investments moving forward, including the construction of the North Metro commuter corridor, as well as interchange improvements along key E-470 intersections. Development of the communities at the North End Station and Parterre (at Quebec Street and E-470), in particular, may depend on the timing of these investments.

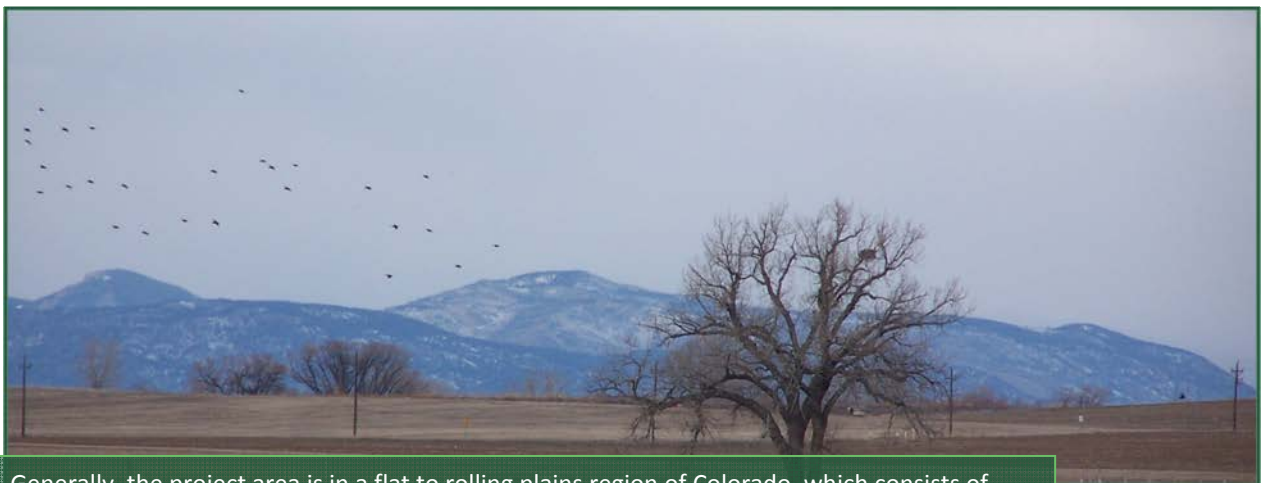
In the long term, a significant amount of commercial development is planned for the areas adjacent to I-25. Outside this area, the city is planning for mixed use development adjacent to its North End Station along Colorado and SH 7. With the exception of these areas, future development is anticipated to be primarily single family residential development.

Although most of the Adams County area within the SH 7 study area has been developed into single family residential, or has been platted for future residential development, commercial development is planned for the southwest corner of Havana and SH 7. Most of the Weld County area within the SH 7 study area is slated for future single family residential development.

By 2035, DRCOG projects an additional estimated 28,000 households (75 percent growth in households from 2010 to 2035) and 43,000 jobs (269 percent growth in jobs from 2010 to 2035) in the study area. In the larger 3-mile buffer area, an additional 54,000 households and nearly 70,000 jobs are projected. The area around the SH 7 corridor is forecast for significant growth with expected employment increases of particular note. The 2035 household forecasts are relatively close to the capacity estimates provided by the local jurisdictions; within the study area, the 2035 household forecasts represent 92 percent of the buildout capacities. Conversely, the employment numbers vary significantly. The 2035 employment forecasts represent just over half of the buildout capacity in both the study area and the 3-mile buffer area. This comparison indicates the potential for significant growth in employment in the area beyond 2035.

Environmental Consequences

Based on the near-term planned development, it is expected that the general pattern of urbanization will continue along the SH 7 corridor 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 SH 7 PEL study are implemented. Major impacts likely to result from development include increased impervious surfaces (for example, roads, driveways, rooftops, and 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 Alternative, anticipated development along SH 7 PEL would continue based on market forces and in accordance with city and county plans as described in the *SH 7 PEL Corridor Conditions Assessment Report (Appendix A)*. Conversion of agricultural and open lands into urban uses will continue regardless of whether the Recommended Alternative is implemented or not. 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.



Generally, the project area is in a flat to rolling plains region of Colorado, which consists of agricultural fields and individual farms, but is now experiencing an increase in both residential and commercial development throughout the corridor.

Water Quality

Before land cultivation for agriculture, the natural ecosystem was largely unaffected by human activity. Oil and gas development, 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.

With the No-Action Alternative, the amount of impervious surface would continue to increase as planned development occurs. Impacts on water quality within the SH 7 PEL study area would result from an increase in surface runoff and pollutants being carried into receiving waters.

Implementation of the Recommended Alternative would facilitate future development along SH 7, 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 by implementing maintenance programs and BMPs in both construction and design.

Based on information identified during the SH 7 PEL process for water quality, it not anticipated that the Recommended Alternative will contribute to cumulative impacts when combined with other past, present, and reasonably foreseeable projects.

Wildlife

Past actions affecting wildlife distribution and movement corridors in the SH 7 PEL study area include commercial and residential development, road construction, and gravel mining. These activities have directly displaced wildlife habitat, increased habitat fragmentation, and altered wildlife movements. Although gravel mining temporarily disrupts wildlife habitat, it may also create lakes, which benefit some species. In general, the amount and connectivity of wildlife habitat have declined in the regional study area since 1950.

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 SH 7 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 also will contribute to habitat fragmentation and further reduce open areas used as movement corridors by wildlife.

The Recommended Alternative would widen and extend culverts and bridges. While widening would facilitate wildlife movement, extending the length of a culvert or bridge would lengthen the distance wildlife would have to travel to cross SH 7. Planned transportation and development actions will contribute to further loss and degradation of wildlife habitat within the SH 7 PEL study area. 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 SH 7 PEL study area.

Based on information identified during the SH 7 PEL process for wildlife distribution and movement corridors, it not anticipated that the Recommended Alternative will substantially contribute to cumulative impacts when combined with other past, present, and reasonably foreseeable projects.

Wetlands

Wetlands in the SH 7 PEL study area are primarily associated with natural drainages, seep areas, 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 20th century. Rapid urbanization, mining, and agriculture have had a great impact on wetlands in the regional study area since 1940.

Planned development is likely to result in further direct and indirect impacts on wetland communities. A conservative estimate of this loss could be up to 300 acres by 2035, assuming the same rate of wetland loss as occurred between 1970 and 1990.

Under the No-Action Alternative, wetland degradation and loss are anticipated to continue as growth and development continue to occur in undeveloped areas. The Recommended Alternative would have a direct impact on a conservatively estimated 2.02 acres of wetlands and other waters of the US. Impacts on any jurisdictional wetlands would be mitigated on a one-for-one basis, resulting in no net loss of jurisdictional 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 SH 7 PEL process for wetlands, it not anticipated that the Recommended Alternative will contribute to cumulative impacts when combined with other past, present, and reasonably foreseeable projects.

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 metro area and the north Front Range as a non-attainment area for the 8-hour ozone (O_3). O_3 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 O_3 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. No CO or particulate matter hot spots emissions in violation of the NAAQS are predicted to result from the build alternatives under modeled 2035 traffic volumes.

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 (VMT) and traffic emissions for the region overall.

Based on information identified during the SH 7 PEL process for air quality, it not anticipated that the Recommended Alternative will contribute to cumulative impacts when combined with other past, present, and reasonably foreseeable projects.

Historic Resources

In the early 20th century, most of the SH 7 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 started replacing 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 established throughout the region served 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.

Under the No-Action Alternative, the conversion of the remaining historic farmsteads into urban development would continue in accordance with local development plans. Traffic and congestion within the SH 7 PEL study area would continue to increase and would result in an increase in noise, air emissions, and visual obstructions affecting historic properties and districts. Planned growth within the I-25 corridor would result in more traffic through some historically smaller communities.

Implementation of the Recommended Alternative would have an impact on the previously identified historic properties or potential historic sites:

- ▶ 1909 Farm (5AM.2199)
- ▶ UPRR – Dent Branch (5AM.472.1)
- ▶ BNSF Railroad (5BL.374)
- ▶ Lafayette Historic District (5BL.544)
- ▶ Conger Farm
- ▶ 1934 House and Farm
- ▶ Blue Star Memorial Highway Monument
- ▶ Lafayette Cemetery
- ▶ Former Lafayette High School (5BL.10401)
- ▶ Lafayette Feed & Grain (5BL.374.6)
- ▶ Waneka Farm (5BL.1994)
- ▶ Three unnamed irrigation ditches

Cumulative impacts on historic properties and districts have occurred and will continue to occur in the SH 7 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 communities. 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 projects 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 US Department of Transportation Act of 1966] and requires that adverse impacts be mitigated.

Based on information identified during the SH 7 PEL process for historic resources, it not anticipated that the Recommended Alternative will substantially contribute to cumulative impacts when combined with other past, present, and reasonably foreseeable projects.



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6.0 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

FHWA and CDOT have been committed to involving federal, state, and local agencies and the public throughout the SH 7 PEL process. Project success hinges on communication and cooperation among FHWA, CDOT, and the local communities. This includes coordination with and involvement of federal, state, and local government officials; regional transportation planning entities; community groups; civic and professional organizations; businesses; and residents.

"The public Involvement process shall be proactive and provide complete information, timely public notice, full public access to key decisions, and opportunities for early and continuing involvement."

23 CFR 450.212

This project has built on the agency coordination and public involvement previously conducted on other major transportation studies in the project area. Extensive agency coordination and public involvement has been conducted for the North I-25 (Denver to Wellington, Colorado) Project and the North Metro Corridor Project, as well as the North I-25 PEL study.

6.1 Agency Coordination

The study team prepared an Agency Coordination and Public Outreach Plan for the PEL study (CDR, 2012a) at the outset of the study. The purpose of the agency coordination and public involvement program was to set forth the public involvement process for the SH 7 PEL study and to describe how federal, state, and local governmental officials; regional transportation planning entities; citizen groups; community groups; civic and professional organizations; businesses; citizens; and low-income and minority populations would be involved in the process.

Project Management Team (PMT)

Agency involvement activities included regular progress committee meetings held with FHWA and CDOT participants approximately monthly during the PEL study. The participating agencies and their representatives on the PMT included:

- ▶ Monica Pavlik, FHWA
- ▶ Toni Whitfield, FHWA
- ▶ Yates Opperman, CDOT Environmental Programs Branch
- ▶ Cathy Cole, CDOT Planning
- ▶ David Kosmiski, CDOT Region 6 Engineering
- ▶ Leela Rajasekar, CDOT Region 6 Traffic
- ▶ Kirk Webb, CDOT Region 6 Environmental
- ▶ Dan Herrmann, CDOT Region 6 Planning
- ▶ Neil Lacey, CDOT Region 6 Engineering

Resource Agency Scoping

Resource agencies have specific technical expertise and regulatory oversight on various environmental issues and potential impacts associated with the project. The study team invited representatives from the US Army Corps of Engineers (USACE), US Fish and Wildlife Service (USFWS), US Environmental Protection Agency (USEPA), Colorado Parks and Wildlife (CPW), and State Historic Preservation Officer (SHPO) to a Natural Resources Agency Scoping Meeting on May 31, 2012 (**Appendix E**). If agency representatives were unable to attend, they were invited to participate in one-on-one meetings about the existing conditions within the project area and the PEL process. The study team received comments about the project from USFWS, CPW, and USACE (**Appendix E**).

NEPA requires that there be an early and open process for determining the scope of the issues to be addressed by a study. This process is commonly known as “NEPA scoping,” during which an agency will solicit input. This PEL study followed a similar scoping process to the NEPA scoping process.

Technical Working Group

CDOT worked closely with other agencies and the corridor’s local communities throughout the study process. Coordination largely occurred through the TWG, which was made up of staff from the corridor’s local governments, FHWA, DRCOG, and RTD. The TWG’s primary role was to provide input on a range of issues analyzed in the PEL study. The TWG met with the study team approximately every 6 to 8 weeks from December 2011 through the conclusion of the study to provide input about the analysis of technical data for CDOT’s decision-making purposes. TWG members kept their respective organizations, constitutions groups, or elected officials updated. Elected officials were invited to attend select TWG meetings as recommended by their TWG representatives.

Technical Working Group Composition

▶ Adams County	▶ FHWA
▶ Boulder County	▶ CDOT Environmental Programs Branch
▶ City of Boulder	▶ CDOT Planning
▶ City and County of Broomfield	▶ CDOT Office of Policy and Government Relations
▶ City of Brighton	▶ CDOT Region 4
▶ City of Lafayette	▶ CDOT Region 6 Engineering
▶ City of Thornton	▶ CDOT Region 6 Traffic
▶ Town of Erie	▶ CDOT Region 6 Environmental
▶ Weld County	▶ CDOT Region 6 Planning
▶ Northwest Parkway	▶ CDOT Region 6, I-25 PEL
▶ DRCOG	
▶ RTD	

SH 7 TWG Meetings

The study team met with the TWG throughout the study to discuss the following items to obtain community concurrence on how the study was proceeding.

Meeting Date	Meeting Topics Discussed
December 14, 2011	<ul style="list-style-type: none"> ▶ Project Overview ▶ Description of a PEL Study ▶ Corridor Context and Previous Studies ▶ Existing Conditions ▶ Critical Issues ▶ Agency Coordination and Public Involvement
March 7, 2012	<ul style="list-style-type: none"> ▶ Project Status ▶ Review of SH 7 Data Exhibits ▶ Draft Corridor Assessment Outline ▶ Agency Coordination and Public Involvement ▶ Next Steps
May 23, 2012	<ul style="list-style-type: none"> ▶ Project Status ▶ Visioning Workshop Summary ▶ Draft Corridor Conditions Assessment Report ▶ SH 7 Transportation Needs ▶ Public Meetings Overview ▶ Other Outreach ▶ Next Steps
August 22, 2012	<ul style="list-style-type: none"> ▶ Public Meetings and Other Public Outreach Update ▶ Draft Purpose and Need Statement ▶ Alternatives Development and Evaluation
October 17, 2012	<ul style="list-style-type: none"> ▶ Level 2A, 2B Screening ▶ Level 3A Packages Development ▶ SH 7 West End Realignment ▶ I-25/SH 7 Interchange
November 7, 2012	<ul style="list-style-type: none"> ▶ Project Status Update ▶ North I-25 PEL Update ▶ Level 3A Packages and Screening Results
December 12, 2012	<ul style="list-style-type: none"> ▶ Managed Lanes Evaluation ▶ Level 4 Alternatives Development - Corridor Access ▶ Corridor Maps Breakout Activity ▶ East/West End Alignments Update
January 16, 2013	<ul style="list-style-type: none"> ▶ Preliminary Access Recommendations ▶ I-25/SH 7 Interchange Comparison ▶ Combined Alternative Refinement ▶ West and East End Realignment Update ▶ PEL Action Plan
March 6, 2013	<ul style="list-style-type: none"> ▶ Project Status Update ▶ SH 7 Public Meetings ▶ PEL Action Plan ▶ Next Steps
April 16, 2013	<ul style="list-style-type: none"> ▶ Project Status Update ▶ PEL Action Plan ▶ PEL Final Report ▶ Next Steps

SH 7 TWG Small Group Meetings

Small group meetings were held with a sub-set of the TWG to focus on segment-specific alignment issues that primarily affected the communities at the west and east ends of the study area. Meetings to discuss the west end alignment of SH 7 were held with the staff and elected officials of the City of Lafayette, Town of Erie, and Boulder County; meetings to discuss the east end alignment of SH 7 were held with the staff of City of Brighton, Adams County, and Weld County. **Appendix E** contains summaries of these meetings. Meetings were held on the following dates to discuss the following topics.

Meeting Date	Meeting	Meeting Topics Discussed
June 13, 2012	SH 7 West End Realignment with Lafayette, Erie, and Boulder County Staff	<ul style="list-style-type: none"> ▶ SH 7 Realignment through Lafayette, Erie, and Boulder County ▶ Community Goals ▶ What Is Understood ▶ Next Steps
September 11, 2012	SH 7 West End Realignment Meeting – Staff	<ul style="list-style-type: none"> ▶ Review Community Goals and Draft Evaluation Criteria ▶ Travel Demand and System Concepts ▶ Preliminary Conceptual Alignment Alternatives ▶ Parks and Open Space
September 26, 2012	SH 7 West End Realignment Meeting – Elected Officials & Staff	<ul style="list-style-type: none"> ▶ Review Community Goals and Draft Evaluation Criteria ▶ Travel Demand and System Concepts ▶ Preliminary Conceptual Alignment Alternatives ▶ Parks and Open Space
November 16, 2012	SH 7 West End Alignment Meeting – Staff	<ul style="list-style-type: none"> ▶ Overview of West End Alignment ▶ Updates: Lafayette, Erie, Boulder County, CDOT ▶ Evaluation Matrix for Level 3C Screening – West End Alignment ▶ Intersection Improvements and Options ▶ Next Steps
November 20, 2012	SH 7 East End Alignment Meeting – City of Brighton Staff	<ul style="list-style-type: none"> ▶ SH 7 East End Alignment Options
December 11, 2012	SH 7 East End Alignment Meeting – City of Brighton, Adams County, Weld County Staff	<ul style="list-style-type: none"> ▶ East End Alignment Overview ▶ Comments ▶ Discussion ▶ Next Steps
January 9, 2012	SH 7 West End Alignment Meeting – Elected Officials & Staff	<ul style="list-style-type: none"> ▶ Introduction ▶ SH 7 PEL Update ▶ West End Alignment ▶ Intersection Improvements and Options ▶ Next Steps

6.2 Public Outreach Activities

The study team designed and conducted a various public outreach activities based on the decisions that needed to be made and the stakeholders who were to be engaged. **Appendix E** includes a table of all outreach meetings that occurred through the study and the related summaries documenting each meeting. The following describes outreach activities.

Key Stakeholder Interviews and Consultations

At the start of the project, the study team conducted individual interviews with key stakeholders in January and February 2012 to understand the interests, goals, and desired outcomes for the SH 7 PEL

study. Results informed both the Public Outreach Plan and the agenda for a Visioning Workshop. The following identifies the key stakeholders who were interviewed:

Agency	Representative/Interviewee(s)
Adams County	Jeanne Shreve, Transportation Coordinator
City of Boulder	Randall Rusch, Senior Transportation Planner Mike Sweeney, Transportation Planning and Operations
Boulder County	George Gerstle, Transportation Director Michelle Krezek, Commissioners' Deputy Julie McKay, Transportation Planning Manager
City and County of Broomfield	Wayne Anderson, City Council Debra Baskett, Transportation Manager Jim Becklenberg, Assistant City and County Manager Martha Derda, City Council David Jurcak, City Council Patrick Quinn, Mayor Tom Schomer, Traffic Engineer David Shinneman, Community Development Director Kevin Standbridge, Deputy City and County Manager Greg Stokes, City Council
CDOT Region 4	Myron Hora, Planning and Environmental Manager Karen Schneiders, Regional Transportation Planner Dan Marcucci, Resident Engineer
CDOT Region 6	Kirk Allen, Traffic and Safety Steve Hersey, Traffic and Safety David Kosmiski, SH 7 PEL Project Manager, Engineering Kevin Radel, Program Engineer Leela Rajasekar, Traffic and Safety Brad Sheehan, Traffic and Safety Kirk Webb, SH 7 PEL Project Manager, Environmental
DRCOG	Steve Cook, MPO Planning Manager Steve Rudy, Director of Transportation Planning Fred Sandal, Long Range Transportation Planning
Town of Erie	Gary Behlen, Public Works Director Fred Diehl, Assistant Town Administrator A.J. Krieger, Town Administrator
FHWA	Shaun Cutting, Program Delivery Team Leader Monica Pavlik, Senior Engineer, Program Delivery
City of Lafayette	Carolyn Cutler, Mayor Gary Klaphake, City Administrator Doug Short, Public Works Director
RTD	Bob Boot, RTD FasTracks North Metro Project Manager Lee Cryer, RTD FasTracks Planning Manager
City of Thornton	Gene Putman, Transportation Manager
Weld County	Elizabeth Relford, Transportation Planner

Visioning Workshop (April 2012) and Elected Officials Meeting (February 2013)

Elected officials representing the corridor communities were involved as recommended by their staff members who served on the TWG. The study team held a Visioning Workshop early in the study and held another Elected Officials Meeting later in the study. Elected officials from local municipalities and counties participated in the Visioning Workshop on April 10, 2012. The purposes of the Visioning Workshop were to:

- ▶ Confirm the goals and desired outcomes of the SH 7 PEL study;
- ▶ Develop a shared understanding of what is known about current and future corridor conditions;
- ▶ Understand how the communities currently define their vision for the SH 7 corridor; and
- ▶ Establish and define the expectations for how CDOT would work with the TWG, elected officials, and general public.

The study team met again with the corridor's elected officials on February 5, 2013, to confirm the corridor communities' support for the recommended improvements that had been identified in the SH 7 PEL study. The meeting also offered the study team an opportunity to provide the elected officials with a preview of what was going to be presented to the public at the open houses that were held in March 2013. **Appendix E** includes summaries of the Visioning Workshop and Elected Officials Meeting.

Small Group Meetings

Project staff met with local homeowner associations and business groups from March 2012 to the completion of the study in May 2013 to introduce the project and discuss concerns and issues related to the project. **Appendix E** lists the meetings conducted during the PEL study with homeowner associations, business groups, or other special interest groups.

Public Open Houses

Corridor-wide public open houses were held in June 2012 and in March 2013. Both rounds of public open houses were held at The Armory in Brighton and at the Public Library in Lafayette. There were 161 total registered attendees for the June 2012 open houses (46 in Brighton and 115 in Lafayette); there were 231 total attendees for the March 2013 meetings (76 in Brighton and 155 in Lafayette).



Attendees at the June 2012 open house review display boards, talk with study team members, and provide feedback.

The June 2012 open houses focused on reviewing the draft components of the SH 7 PEL study, including the Transportation Needs Statement and the Corridor Conditions Assessment Report and on receiving public input and feedback on the current conditions of the SH 7 study area and ideas for improvement.



Attendees at public open houses were encouraged to provide comments.

The public was invited to the March 2013 public open houses to review and provide input on the study's findings and preliminary recommendations for the SH 7 corridor. The public interacted directly with the study team, who were on hand to provide information, answer questions, and listen to additional suggestions.

The public provided feedback via comment forms at the meetings, online through the webpage, or over the phone by those who were unable to attend. A Spanish translator was available at the meetings. **Appendix E** summarizes the outreach conducted and input collected at the public open houses.

The following public outreach activities provided the public multiple ways of participating in the study:

- ▶ **E-Mail, Mailing List, and Contact Database:** The study team developed a contact database to include individuals who wanted to stay informed about the study. The database incorporated contact lists from previous studies and lists provided by local agencies. The database allowed the study team to communicate directly with the public, including sending notifications of the June 2012 and March 2013 public open houses. At the conclusion of the study, the mailing list contained approximately 670 contacts.
- ▶ **Project Web Page:** CDOT hosted a dedicated web page on its website to provide updated information about the study and to enable ongoing communication. The web page <http://www.coloradodot.info/projects/SH7pel> included study information, presentation materials, meeting summaries, and meeting announcements. The web page enabled the public to sign up for the study's mailing list and to submit comments. The webpage also contained contact information for the public to be able to speak directly with the CDOT Project Managers and the study team.
- ▶ **Media Outreach and Advisories:** CDOT's Office of Public Information distributed study-related media advisories to announce the study kickoff and public open houses.
- ▶ **Social Media Outreach:** CDOT's Office of Public Information used Facebook and Twitter to communicate announcements about the study and to publicize public open houses.
- ▶ **Points of Contact:** In an effort to maintain open communication channels between the study and all stakeholders, the project had several points of contact for the TWG members, elected officials, cooperating agencies, and the general public. Stakeholders were able to contact the following individuals with comments or questions throughout the study.
 - David Kosmiski CDOT Region 6, SH 7 PEL Project Manager
(303) 398-6767 or david.kosmiski@dot.state.co.us
 - Bob Felsburg Felsburg Holt and Ullevig, Consultant Team Project Manager
(303) 721-1440 or bob.felsburg@fhueng.com
 - Andrea Meneghel CDR Associates, Public Involvement Project Manager
(720) 407-4721 or ameneghel@mediate.org

6.3 *Public Comments*

Throughout the study, the public had ongoing, accessible, and distinct opportunities to participate and provide input to inform the study. Over the course of the study, the public submitted approximately 250 comments that were reviewed and taken into consideration. **Appendix E** includes the comments submitted by members of the general public during the course of the study.

7.0 ACTION PLAN

Experience has shown that an articulate and thoughtful implementation plan will help increase the probability of funding success in the current economic environment. Good information, collaboration, broad support, and readiness to proceed to construction are all keys to successful project prioritization. Additionally, to be effective, the process must be easy to use and to replicate, fair, and objective. The action plan for this corridor was formulated with these key considerations in mind.

The primary intent of this plan is to identify and prioritize projects so that the leadership of CDOT and the local entities have a basis for consideration and ultimate selection and funding of projects. To simplify the evaluation, the approach is more qualitative than quantitative, though there is rich information available through this PEL study to assist with the evaluation. It is designed to provide decision-makers with key information required to effectively understand potential projects, their benefits, and their readiness to encumber transportation funds.

The study team developed this plan with careful consideration of current CDOT programs but is flexible to adapt to future programs. These programs include key CDOT initiatives such as the Responsible Acceleration of Maintenance and Partnerships (RAMP) program and the current focus on operations and asset management systems. In addition, it was important that the plan be designed to mutually address current needs, yet prepare for future projects.

7.1 *Overview of the Process*

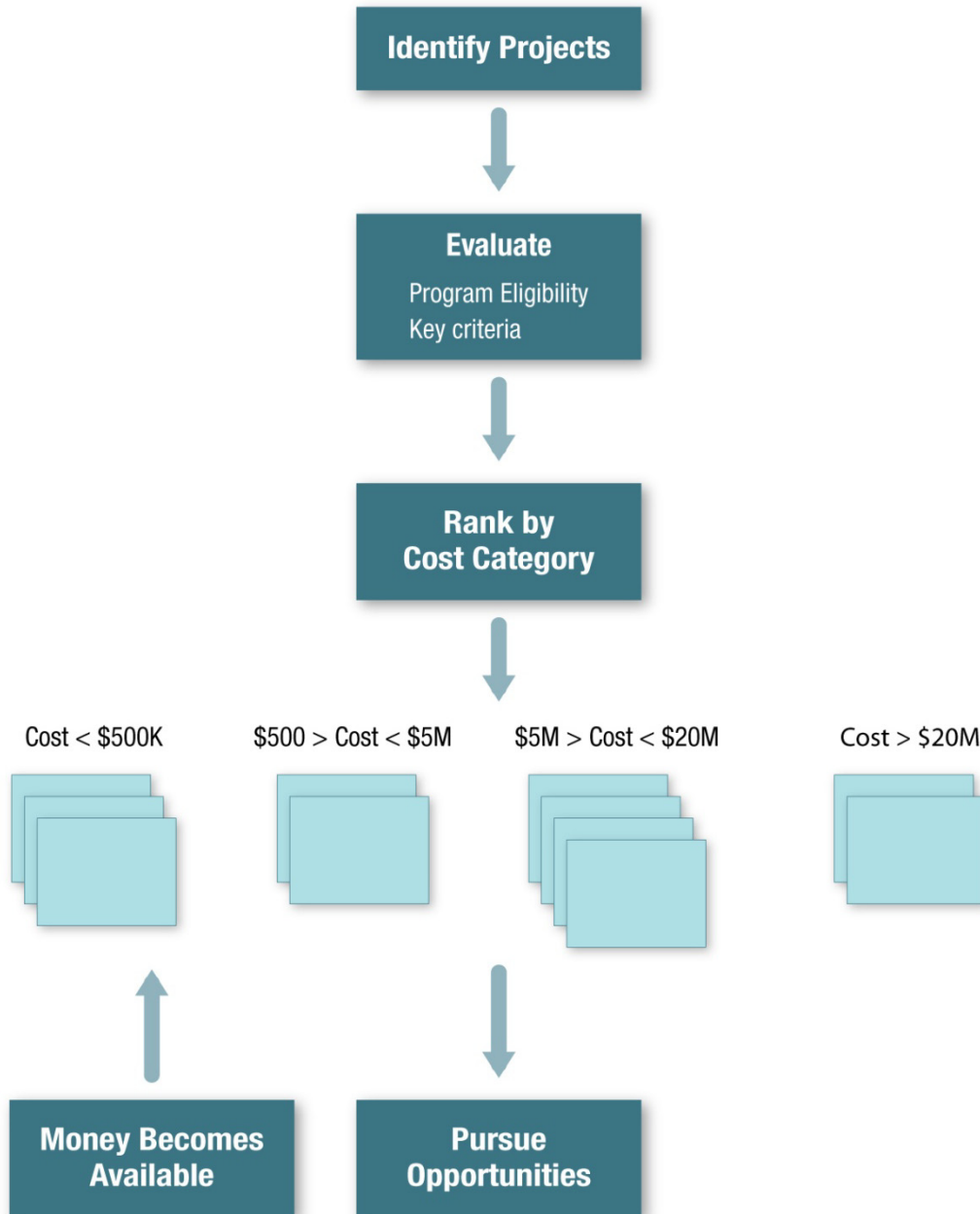
Figure 7.1 illustrates the process that was developed for use in prioritizing projects within the SH 7 corridor. This process established the initial action plan, and it can be used in the future as elements of the Recommended Alternative proceed closer to implementation.

The process begins with the appropriate identification of potential projects, which was completed with assistance from CDOT and the local agencies. Following the identification of the projects, each project is evaluated consistently using a series of defined criteria based on stakeholder goals and objectives. Then, to provide flexibility in the ability to respond to funding opportunities, projects can be placed into four categories of cost based on experience working with the CDOT and DRCOG funding programs:

- ▶ Under \$500,000
- ▶ Between \$500,000 and \$5 million
- ▶ Between \$5 million and \$20 million
- ▶ Over \$20 million

A key objective of this process is to pursue opportunities in advance of project requests, as well as to take advantage of unanticipated funding that might become available. This process will provide the necessary information to decision-makers throughout the planning process and the DRCOG TIP process. Having a thoughtful plan, with good information, along with broad support from the SH 7 corridor local agencies, should increase chances for funding. Furthermore, experience has shown that unplanned opportunities for funding, particularly for projects ready for construction, occur frequently. This process will help CDOT and the communities served by SH 7 to provide sound and reasonable data-based information to support corridor needs.

Figure 7.1 Project Prioritization Process



7.2 *Identification of Projects*

The study team identified projects for consideration in the action plan using input from the respective stakeholder agencies and the alternatives development and evaluation process outlined in **Chapter 2.0**. To be consistent with that process, the study team classified projects into categories (cross-section, intersection, interchange, alternative mode, and transit park-n-Ride) and by corridor segment. Collectively, the projects encompass all of the improvements identified in the Recommended Alternative.

The various types of improvements are generally defined as follows:

- ▶ **Cross-section:** Improvements include the addition of traffic lanes, shoulder widening to accommodate bicycles and potential transit vehicle hard shoulder running, curb and gutter, sidewalks, and median where applicable.
- ▶ **Intersection:** Improvements include the addition of through and/or turn lanes for vehicle traffic, transit queue jumps, provision for transit stops, pedestrian crossings, and bike lanes.
- ▶ **Interchange:** Improvements address the reconstruction of the I-25/SH 7 interchange to either a partial cloverleaf or a DDI configuration.
- ▶ **Alternative mode:** Improvements include bike lanes, shared use paths, and transit amenities.
- ▶ **Transit park-n-Ride:** Improvements include the implementation of part or all of the proposed park-n-Ride facility adjacent to the SH 7/I-25 interchange, which may include a pedestrian bridge across I-25 to enhance access to the park-n-Ride and transit services.

As the final elements of the Recommended Alternative became evident, a request for projects was made to CDOT and the local entities in the corridor. Specifically, they were asked to identify projects that would be their top priorities. **Table 7.1** briefly summarizes the comments received from the stakeholder agencies and how those comments were reflected in the potential list of projects. As can be seen in **Table 7.1**, each respondent replied a bit differently. Some commented on only their highest priorities, while others listed a wider range of projects. If multiple comments were made, they are listed in order of priority in the table. It should be noted that only projects on SH 7 or those that directly impact alternative mode travel along SH 7 are considered in the action plan. Complementary improvements, on facilities other than SH 7, are noted in the comments received; however, they are not included in the action plan projects as they are not directly related to SH 7.

Table 7.1 Projects Identified by Key Stakeholders

Agency	Comment	Projects
Boulder County	Bike, pedestrian, and transit improvements to lead general traffic improvements	Segment 2 alternative mode improvements
Boulder County	Intersection improvements at 119th/SH 7; intersection improvements should precede roadway widening	119th/120th/SH 7 intersection improvements
Broomfield	SH 7 interchange with I-25	I-25 interchange projects
Broomfield	Widening of SH 7 from Sheridan Boulevard to east Broomfield limits	Segment 3 cross-section and intersection improvements
Broomfield	Widening of SH 7 from end of Broomfield limits to Sheridan Boulevard	Segment 2 cross-section and intersection improvements
CDOT	I-25/SH 7 interchange environmental reevaluation and 30 percent design	I-25 interchange projects
CDOT	Further access planning	Recommended access control plans
CDOT	Widen shoulders at locations where they are non-existent because of auxiliary lanes	Segments 2-5 intersection improvements
Erie	SH 7/County Line Road intersection relocation and roundabout	County Line intersection improvements
Erie	Intersection improvements on Arapahoe	Not on SH 7
Lafayette	Intersection improvements at 119th/SH 7	119th/120th/SH 7 intersection improvements
Lafayette	Boulder Road/120th intersection	Not on SH 7
Thornton	Widening of SH 7 from 164th to Holly and ultimately to US 85	Segments 3-5 cross-section improvements
Thornton	Park-n-Ride lot at I-25/SH 7	Transit Park-n-Ride
Thornton	Diverging diamond interchange at I-25/SH 7	I-25 diverging diamond interchange
Thornton	Pedestrian bridge at I-25/SH 7	I-25 diverging diamond interchange
Thornton	Replacement of railroad bridge at Colorado	Segment 4 cross-section improvements
Thornton	New signalized intersections between 164th and York	Segment 3 intersection improvements
Thornton	Reclassification of SH 7 to NR-B with the boundaries of the City of Thornton	Not applicable as a construction project
Thornton	Widening of SH 7 west to Lafayette	Segments 2-3 cross-section improvements
Thornton	Addition of queue jump lanes at intersections	All intersection projects
Thornton	Detached sidewalks along the entire corridor	Segments 2-5 intersection improvements

Based on this information, as well as analyses conducted throughout the PEL study, **Table 7.2** shows the projects considered in the action plan. The project list is established by corridor segment and by the various types of improvements that have been identified for each segment. **Table 7.2** shows the planning level cost estimates, including construction, engineering, and ROW costs. **Appendix D** includes the cost estimate worksheets.

Table 7.2 Projects and Estimated Cost

Projects	Estimated Cost (Millions)
Segment 1: US 287 to 119th	
Cross-section improvements	\$3.6*
<i>Intersection Improvements at:</i>	
SH 7/US 287	\$0.9
Iowa/SH 7	\$0.4
Burlington/SH 7	\$0.1
119th/120th/SH 7	\$1.9
Segment 2: 119th to Sheridan	
Cross-section improvements	\$43.4*
<i>Intersection Improvements at:</i>	
Relocated County Line/SH 7	Roundabout \$1.6, Signalized \$1.5 Intersection improvements with relocated roadway \$5.3
Lowell/SH 7	\$1.9
Vista/SH 7	\$1.5
Mountain View/SH 7	\$1.5
Sheridan/SH 7	\$2.3
Alternative mode improvements	\$8.6
Segment 3: Sheridan to York	
Cross-section improvements	\$40.6*
<i>Intersection Improvements at:</i>	
Pecos/SH 7	\$2.0
Huron/SH 7	\$2.2
I-25 Parclo Interchange	\$25.2
I-25 Diverging Diamond Interchange	\$13.2
Washington/SH 7	\$2.1
York/SH 7	\$2.7
Transit - Park-n-Ride	\$2.1
Segment 4: York to Holly	
Cross-section improvements	\$26.2*
<i>Intersection Improvements at:</i>	
Colorado/SH 7	\$2.6
Holly/SH 7	\$1.5
Segment 5: Holly to US 85	
Cross-section improvements	\$64.1*
<i>Intersection Improvements at:</i>	
Quebec/SH 7	\$2.1
Yosemite/SH 7	\$2.3
Havana/SH 7	\$2.1
Riverdale/SH 7	\$1.7

(*) The cross-section improvement costs include the intersection costs in each segment.

7.3 *Evaluation of Projects*

The study team developed evaluation criteria to qualitatively rate the projects relevant to characteristics that cumulatively identify project benefits for the travelling public and communities. The study team identified seven specific evaluation criteria:

- ▶ Project readiness
- ▶ Avoidance of environmental impacts
- ▶ Ease of ROW acquisition
- ▶ Traffic operations
- ▶ Safety benefits
- ▶ Alternative mode benefits
- ▶ Community benefits

In evaluating projects for each criterion, the study team considered and used specific data to make qualitative assessments of the projects based on the general thresholds identified for each criterion. The following describe the criteria and the definitions used to rate a project.

Project readiness evaluates how quickly a project could go to construction. This considers if plans are ready, if ROW has been obtained, and if environmental clearances have been obtained. Evaluation thresholds are as follows:

- ▶ **Low:** Advertisement would likely require more than 18 months
- ▶ **Medium:** Can likely be advertised between 6 and 18 months
- ▶ **High:** Can likely be advertised in less than 6 months

Avoidance of environmental impacts evaluates how easily a project can move through the environmental approval process. Projects requiring less environmental evaluation are rated higher. Evaluation thresholds are as follows:

- ▶ **Low:** Would likely require an EIS/ROD
- ▶ **Medium:** Would likely require an Environmental Assessment (EA)/Finding of No Significant Impact (FONSI) or Reevaluation
- ▶ **High:** Can likely be accomplished with a Non-programmatic or Programmatic Categorical Exclusion (CatEx)

Ease of right-of-way acquisition evaluates if additional ROW would likely be required for the project, and, if so, what would be the likely magnitude of impacts on the affected properties. Evaluation thresholds are as follows:

- ▶ **Low:** Would likely require full takings and/or relocations
- ▶ **Medium:** Would likely require partial takings or easements, but no relocations
- ▶ **High:** Can likely be completed without ROW acquisition

Traffic operations evaluates the adequacy of existing and future traffic operations. Acceptable conditions are defined as LOS D or better. Evaluation thresholds are as follows:

- ▶ **Low:** There are acceptable traffic operations now and acceptable traffic operations are projected for 2035.
- ▶ **Medium:** There are acceptable traffic operations now, but unacceptable traffic operations are projected for 2035.
- ▶ **High:** There are unacceptable traffic operations now and unacceptable traffic operations are projected for 2035.

Safety benefits evaluate the need for safety improvements and the potential for improving conditions. The number of crashes and the level of service of safety (LOSS) are considered when evaluating the need for safety improvements. Evaluation thresholds are as follows:

- ▶ **Low:** Little anticipated benefit
- ▶ **Medium:** Moderate anticipated benefit
- ▶ **High:** Significant anticipated benefit

Alternative mode benefits evaluates if a project is likely to improve access to and use of alternative transportation modes. Improvements to bicycle, walking, and transit facilities are considered when evaluating alternative mode benefits. Evaluation thresholds are as follows:

- ▶ **Low:** No anticipated enhancement to pedestrian, bicycle, or transit facilities
- ▶ **Medium:** Anticipated enhancements to pedestrian, bicycle, or transit facilities, but not all three
- ▶ **High:** Anticipated enhancements to pedestrian, bicycle, and transit facilities

Community benefits evaluates if the communities along the SH 7 corridor generally support a project and if the project enhances or furthers the realization of the goals and plans of the communities, including those for economic development. The study team considered specific input provided during TWG meetings, public official meetings, and open houses, as well as specific stakeholder input and relevant comprehensive and transportation planning documents. Evaluation thresholds are as follows:

- ▶ **Low:** No stakeholder agencies identify the project as a priority and the project is not supported by relevant planning documents
- ▶ **Medium:** Stakeholder agencies identify the project as a priority or the project is supported by relevant planning documents, but not both
- ▶ **High:** Stakeholder agencies identify the project as a priority and the project is supported by relevant planning documents

The study team rated all of the projects low, medium, or high based on the identified criteria, as summarized in **Table 7.3**. These ratings are based on the information developed through this study. Once CDOT and/or the stakeholder agencies advance specific projects, these criteria could be updated accordingly.

Table 7.3 Composite Rating of Projects

Project Name	Project Readiness	Avoidance of Environmental Impacts	Ease of ROW Acquisition	Traffic Operations	Safety Benefits	Alternative Mode Benefits	Community Benefits
Segment 1: US 287 to 119th							
<i>Intersection Improvements at:</i>							
SH 7/US 287	High	High	High	High	High	Low	Low
Iowa/SH 7	High	High	High	Low	Low	Low	Low
Burlington/SH 7	High	High	High	Low	Low	Low	Low
119th/120th/SH 7	Medium	High	Medium	High	High	High	Medium
Segment 2: 119th to Sheridan							
Cross-section improvements	Medium	Medium	Medium	High	Medium	High	Medium
<i>Intersection Improvements at:</i>							
County Line/SH 7	Medium	High	High	Medium	High	High	Medium
Lowell/SH 7	Medium	High	Medium	Medium	Low	High	Low
Vista/SH 7	Medium	High	Medium	Low	Medium	High	Low
Mountain View/SH 7	Medium	High	Medium	Low	Low	High	Low
Sheridan/SH 7	Low	High	Low	Medium	Low	High	Medium
Alternative mode improvements	Medium	High	Medium	Low	Low	High	High
Segment 3: Sheridan to York							
Cross-section improvements	Low	Medium	Low	High	Medium	High	High
<i>Intersection Improvements at:</i>							
Pecos/SH 7	Low	High	Low	High	Medium	High	Medium
Huron/SH 7	Low	High	Low	Medium	Medium	High	Medium
I-25 Parclo Interchange	Low	Medium	Low	Low	High	High	Medium

Table 7.3 Composite Rating of Projects (Continued)

Project Name	Project Readiness	Avoidance of Environmental Impacts	Ease of ROW Acquisition	Traffic Operations	Safety Benefits	Alternative Mode Benefits	Community Benefits
I-25 Diverging Diamond Interchange	Low	Medium	High	Low	High	High	Medium
Washington/SH 7	Low	High	Low	Low	Medium	High	Medium
York/SH 7	Low	High	Low	Medium	Low	High	Medium
Transit - park-n-Ride	Medium	High	High	Low	Low	Medium	High
Segment 4: York to Holly							
Cross-section improvements	Medium	Medium	Medium	High	Low	High	Medium
<i>Intersection Improvements at:</i>							
Colorado/SH 7	Low	High	Low	Medium	Low	High	Medium
Holly/SH 7	Low	High	Medium	High	Medium	High	Medium
Segment 5: Holly to US 85							
Cross-section improvements	Medium	Medium	Medium	Medium	Medium	High	Low
<i>Intersection Improvements at:</i>							
Quebec/SH 7	Low	High	Medium	High	Medium	High	Low
Yosemite/SH 7	Low	High	Medium	Low	Low	High	Low
Havana/SH 7	Low	High	Medium	Low	Low	High	Low
Riverdale/SH 7	Low	High	Medium	Medium	High	High	Low

7.4 *Future Use of the Action Plan*

The true value of this process will become even more evident as progress is made along the corridor and there are projects in varying stages of development, including ones with proper environmental clearance, with adequate ROW, and with “shovel ready” plans and specifications at final engineering design for construction advertisement. Because none of the projects rated in **Table 7.3** have a design in place, they will all require design funding to proceed. Projects that are farther along in preparation become magnets to available funding, particularly where there is broad support.

Strategies

As CDOT and the other corridor stakeholders continue to pursue implementation of the Recommended Alternative, this planning effort has identified several strategies that should be considered:

▶ **Keep Projects Advancing**

It is important to continually have projects that are ready for funding because it positions the corridor well and because unanticipated funding opportunities often arise. Therefore, it is recommended to constantly keep a good balance of money dedicated to construction of projects, but at the same time allocate funding for design, ROW, and utility phases to prepare future shelf ready projects.

▶ **Focus on Intersections First**

Generally speaking, intersection projects should be considered before cross-section projects as intersections are the locations where congestion initially becomes apparent. Further, as experienced today in the corridor, degradation of intersection operations can contribute significantly to intersection and corridor safety issues.

▶ **Enhance Transit**

The stakeholders should closely monitor the progress of RTD in implementing its FasTracks North Metro Corridor plan and the multimodal planning being conducted by the CDOT Transit and Rail Division. It may be wise to prioritize projects on the SH 7 corridor that could expedite or complement the rail line and its related transit service.

▶ **Preserve Right-of-Way**

With the ultimate goal of preserving ROW so that the planned SH 7 improvements are not precluded by development activity, CDOT and the local entities should constantly look for opportunities to obtain dedications of ROW as developments are approved or land use changes occur.

▶ **Maximize the Use of Incremental Investments**

Projects should be selected, designed, and phased to make maximum use of previous investments in infrastructure and to minimize “throw away” improvements included in the project.

Use of the Strategies

The evaluation of projects as summarized in **Table 7.3** provides much of the information that decision-makers would typically use when making investment decisions in a corridor. However, to be most effective, those decisions should be consistent with a chosen strategy aimed at meeting the goals of the involved entities at any specific point in time. It is important to understand that the preferred strategy may vary from time to time, depending on funding availability, investment objectives, development activity, public sentiment or other factors. Once an investment strategy has been chosen,

the decision-makers can then use the prioritization process outlined in this action plan to determine those projects that best fit that strategy.

For example, if the decision is to advance an important project even if full funding is not yet available, the I-25/SH 7 interchange would be a potential choice. During the PEL process, this interchange was a topic of much discussion among the local entities and the general public because it is central to the corridor and because it would have an impact on nearly all of the corridor users. Enhancement of the interchange would benefit many travelers and has broad support throughout the corridor. However, it is a complex project, and there is considerable work to be done before any construction could begin. Hence, when one reviews the evaluation in **Table 7.3**, the project is rated as low to medium in several criteria, such as project readiness and environmental. By investing funds to conduct the necessary environmental reevaluation and to complete 30 percent design, the project would be advanced by taking the next step to environmental clearance and by completing sufficient work to determine final ROW needs and to estimate a reasonable opinion of probable cost. This would then change the ratings in **Table 7.3** and would position the project well for future funding opportunities, including potential partnership opportunities.

Similarly, if the chosen strategy is to focus on intersection improvements because they will reap the greatest immediate benefits for the investment made, the decision-makers could review **Table 7.3** and determine that the intersections of 119th Street/120th Street/ SH 7 and County Line Road/SH 7 would be good choices. They would achieve safety benefits, enhance traffic operations, have community support, and be reasonably ready for implementation. If an intersection project were implemented, it would also be a good opportunity to reflect the strategy of maximizing the use of incremental investments by making certain that the design of the intersection improvements would be consistent with the longer term need to widen the roadway on either side of the intersection and would accommodate alternative mode improvements.

Considerable interest about enhancing transit service in the corridor has been expressed during this planning process. If complementing transit service in the corridor were a part of the investment strategy defined by decision-makers, it would behoove CDOT and the corridor stakeholders to participate in the service planning efforts that RTD is undertaking in this area to help identify those transit amenities that should be prioritized in SH 7 projects. Further, a review of **Table 7.3** would suggest that funding the transit park-n-Ride facility in the vicinity of I-25 would be meaningful.

Finally, if the chosen strategy was to focus on ROW preservation, it would make sense to pursue the recommendation for further access planning in the corridor. During the planning process, there was extensive discussion about future access points along SH 7 being planned to support local development plans. Pursuing access control plans along the corridor would further these discussions and, in the process, would result in a much better understanding among governmental entities and private landowners and developers of the need for proper access planning and ROW preservation to ensure that the corridor will be able to serve future needs.

Keeping the Process Effective

To be effective, this action plan must remain dynamic, reflecting current conditions and goals and objectives. The process outlined in this chapter can be used for that purpose. Because this PEL study has evaluated the full corridor, these initial evaluations will need to be reviewed to ensure that the data used in the evaluation are current. Much of the data in the evaluation, including Traffic Operations, Safety Benefits, and Alternate Mode should remain relevant for at least 5 years. Some updating may be required, particularly with safety data and any significant shifts in travel behavior. The criteria in the areas of Project Readiness, Avoidance of Environmental Impacts, and Ease of ROW Acquisition will change as preliminary engineering activities proceed. And, lastly, Community Benefits should be reviewed to determine if any changes in the community have occurred that could change the evaluation.

General NEPA Requirements

This PEL study provides a framework for the long-term implementation of the Recommended Alternative as funding becomes available and to be used as a resource for future NEPA documentation. In light of this, this PEL study has identified issues that will require additional evaluation in any future NEPA documentation.

Funding for the Recommended Alternative has not been identified at this time. However, the identification of a Recommended Alternative for the entire project in this PEL study is consistent with the FHWA's objective of analyzing and selecting transportation solutions on a broad enough scale to provide meaningful analysis and to avoid segmentation. Phased implementation is typically detailed during NEPA and final design. However, the requirements of fiscal constraint must be satisfied for FHWA and CDOT to approve further NEPA documentation. Before FHWA and CDOT can sign a final NEPA decision document (ROD, FONSI, or programmatic or non-programmatic CatEx), the proposed project, as defined in the NEPA document, must meet the following specific fiscal-constraint criteria (FHWA, 2011):

- ▶ The proposed project or phases of the proposed project within the time horizon of the RTP must be included in the fiscally-constrained RTP, and other phase(s) of the project and associated costs beyond the RTP horizon must be referenced in the fiscally-unconstrained vision component of the RTP.
- ▶ The project or phase of the project must be in the fiscally-constrained TIP and STIP, which includes:
 - At least one subsequent project phase, or the description of the next project phase (For project phases that are beyond the STIP/TIP years, the project must be in the fiscally constrained STP/RTP and the estimated total project cost must be described within the financial element of the STP/RTP, STIP, and/or applicable TIP).
 - Federal-aid projects or project phases and State/locally funded, regionally significant projects that require a Federal action.
 - Full funding is reasonably available for the completion of all project phase(s) within the time period anticipated for completion of the project.

In cases where a project is implemented in more than one phase, care must be taken to ensure that the transportation system operates acceptably at the conclusion of each phase. This is referred to as "independent utility" – the ability of each phase to operate on its own. Additionally, it must be demonstrated that air quality conformity will not be jeopardized. Any mitigation measures needed in

response to project impacts must be implemented with the phase in which the impacts occur, rather than deferred to a later phase.

The establishment of phases for the Recommended Alternative should meet these criteria:

- ▶ **Independent Utility/Logical Termini:** Each phase should have independent utility and logical termini to the extent that the phase provides a functional transportation system even in the absence of other phases.
- ▶ **Elements of Purpose and Need:** Each phase should contribute to meeting the purpose and need for the entire project.
- ▶ **Environmental Impacts:** Individual phases should avoid the introduction of substantial additional environmental impacts that cannot be mitigated.



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8.0 REFERENCES

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**APPENDIX A SH 7 PEL CORRIDOR CONDITIONS
ASSESSMENT REPORT**

**APPENDIX B FHWA PLANNING/ENVIRONMENTAL LINKAGES
QUESTIONNAIRE**

APPENDIX C LEVEL 1, 2, 3, AND 4 EVALUATION

**APPENDIX D RECOMMENDED ALTERNATIVE, COST
ESTIMATES AND CONCEPTUAL DESIGN
PLAN SET (Separate Document)**

**APPENDIX E AGENCY COORDINATION AND PUBLIC
INVOLVEMENT**

All appendices are provided on the enclosed compact disc.



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