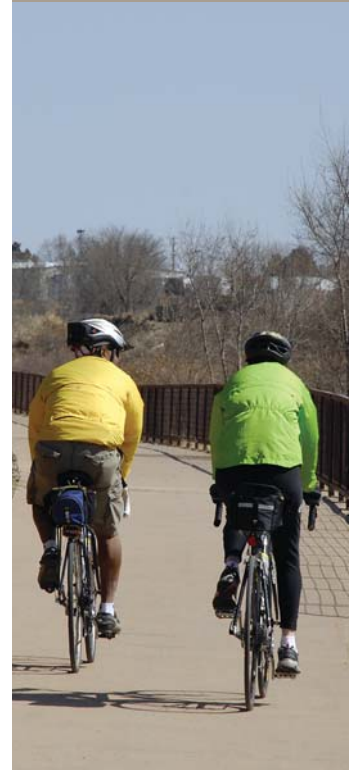
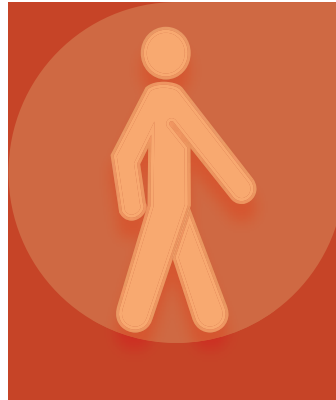


Erie Transportation Plan ●



Janaury 2018



FELSBURG
HOLT &
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ERIE TRANSPORTATION PLAN

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FHU Reference No. 16-062-01
January 2018

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LIST OF ACRONYMS

AASHTO	American Association of State Highway Transportation Officials
ACS	American Community Survey
ADT	Average Daily Traffic
AV	autonomous vehicle
BRT	Bus Rapid Transit
CDOT	Colorado Department of Transportation
CIP	Capital Improvement Plan
CNT	Center for Neighborhood Technology
CV	connected vehicle
DRCOG	Denver Regional Council of Governments
EIS	Environmental Impact Statement
EPA	US Environmental Protection Agency
FHWA	Federal Highway Administration
GOCO	Great Outdoors Colorado
I-25	Interstate 25
ICT	Information and Communications Technology
ITS	Intelligent Transportation System
LEHD	Longitudinal Employer-Household Dynamics
LOSS	Levels of Service of Safety
mph	miles per hour
MUTCD	Manual on Uniform Traffic Control Devices
NACTO	National Association of City Transportation Officials
PDO	property damage only
PROST	Parks, Recreation, Open Space, and Trails
RTA	Regional Transportation Authority
RTD	Regional Transportation District
SH #	State Highway Number
SPF	Safety Performance Function
UAS	Unmanned Aircraft System
US #	United States Highway Number
USCB	US Census Bureau
V/C	volume to capacity
V2I	vehicle-to-infrastructure
V2V	vehicle-to-vehicle
VMT	vehicle miles traveled
VZS	Vision Zero Suite
WCR	Weld County Road

Chapter 1. Introduction

Why Transportation Matters

The Town of Erie's early history, dating back to the late 1800s, is founded on many of the primary transportation modes of that era, including stagecoaches and rail lines. Over time, the transportation network has evolved, but the primary purpose of transportation remains the same—the movement of goods, people, and services.

Planning for the future requires that alternative modes fill a larger role in moving people for daily activities, like commuting, shopping, social activities, and recreation to minimize congestion and maintain Erie's high quality of life. Emerging technologies, such as shared-use mobility platforms, autonomous vehicles, and intelligent transportation systems must also be monitored and considered because they will undoubtedly redefine transportation as we know it today.

Purpose

Transportation is a critical component of Erie's community planning, and the Town recognizes the need to be proactive about transportation as the pace of growth and development increases. This Transportation Plan, therefore, provides guidance on how to strategically plan and accommodate this expected growth. This Plan updates the Town's previous Transportation Plan adopted in 2008.

The Plan addresses all transportation modes and is intended to accommodate projected growth through 2040. The Plan contains guidance to assist staff and policy makers in reviewing development proposals and implementing transportation improvements. The Plan includes a list of projects needed to

realize Erie's transportation goals. The intention of this Plan is that it is flexible enough to accommodate future revisions and adjustments as development conditions dictate.

Erie, Colorado



Erie is an attractive community for families and those seeking an active lifestyle—with its small-town feel, beautiful views, and extensive trails and open space—and residents are proud to call it home. While the automobile is the primary mode of transportation for the 25,000 residents who call Erie home today, there is a growing awareness of the importance of integrating biking, walking, and transit to create a comprehensive multimodal transportation network.

Planning Area

Previously defined in the 2008 Transportation Plan and the 2015 Erie Comprehensive Plan, the planning area for the Erie Transportation Plan includes land outside the Town boundaries but within the “sphere of influence,” covering a total land area of 48 square miles. Of the 48 square miles representing the planning area, approximately 19 square miles are within the incorporated Town boundaries. The planning area boundary extends from State Highway 52 (SH 52) south to State Highway 7 (SH 7), and between United States Highway 287 (US 287) on the west to Interstate 25 (I-25) to the east.

Figure 1 identifies the planning area boundary used to develop this Plan.

Approach

The development of this Transportation Plan involved several specific tasks, coordination, and public involvement. The transportation goals and policies established in Erie’s

Comprehensive Plan (2015) were used as a starting point to develop the policy framework. New or modified goals were created and upon adoption of this Plan, they will supersede the Comprehensive Plan’s transportation goals and policies. An inventory of the existing transportation system and areas of deficiencies were then documented so that immediate needs could be identified. Current and projected socioeconomic data were used to refine the regional travel demand model. The travel demand model was used to project future traffic and identify future needs. A list of short-term, mid-term, and long-term needs was developed, which will serve as the basis for the Town’s Capital Improvement Plan (CIP). This planning effort also resulted in recommended updates to the typical cross sections and the development of access control standards and roundabout guidelines. The sequence of the major work items completed during the transportation planning process is shown below.

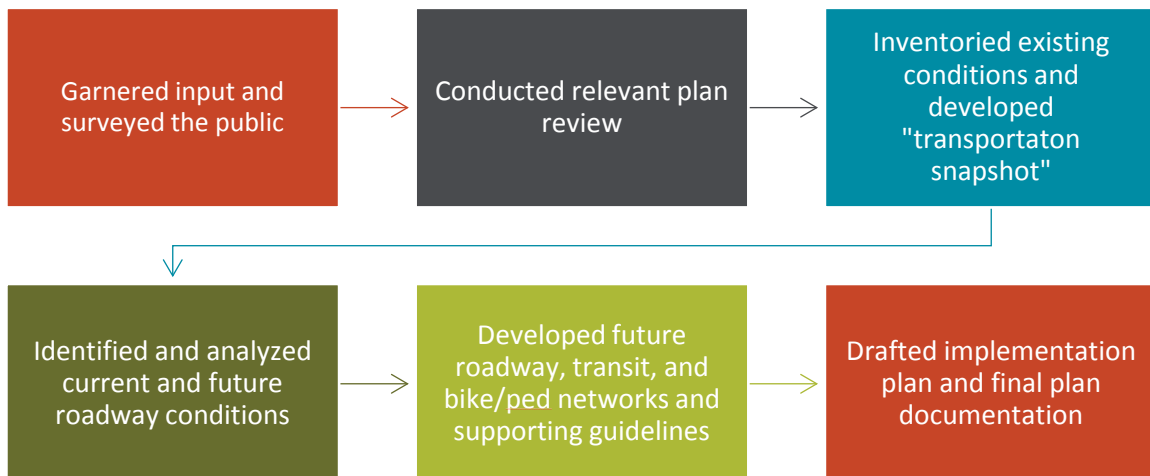
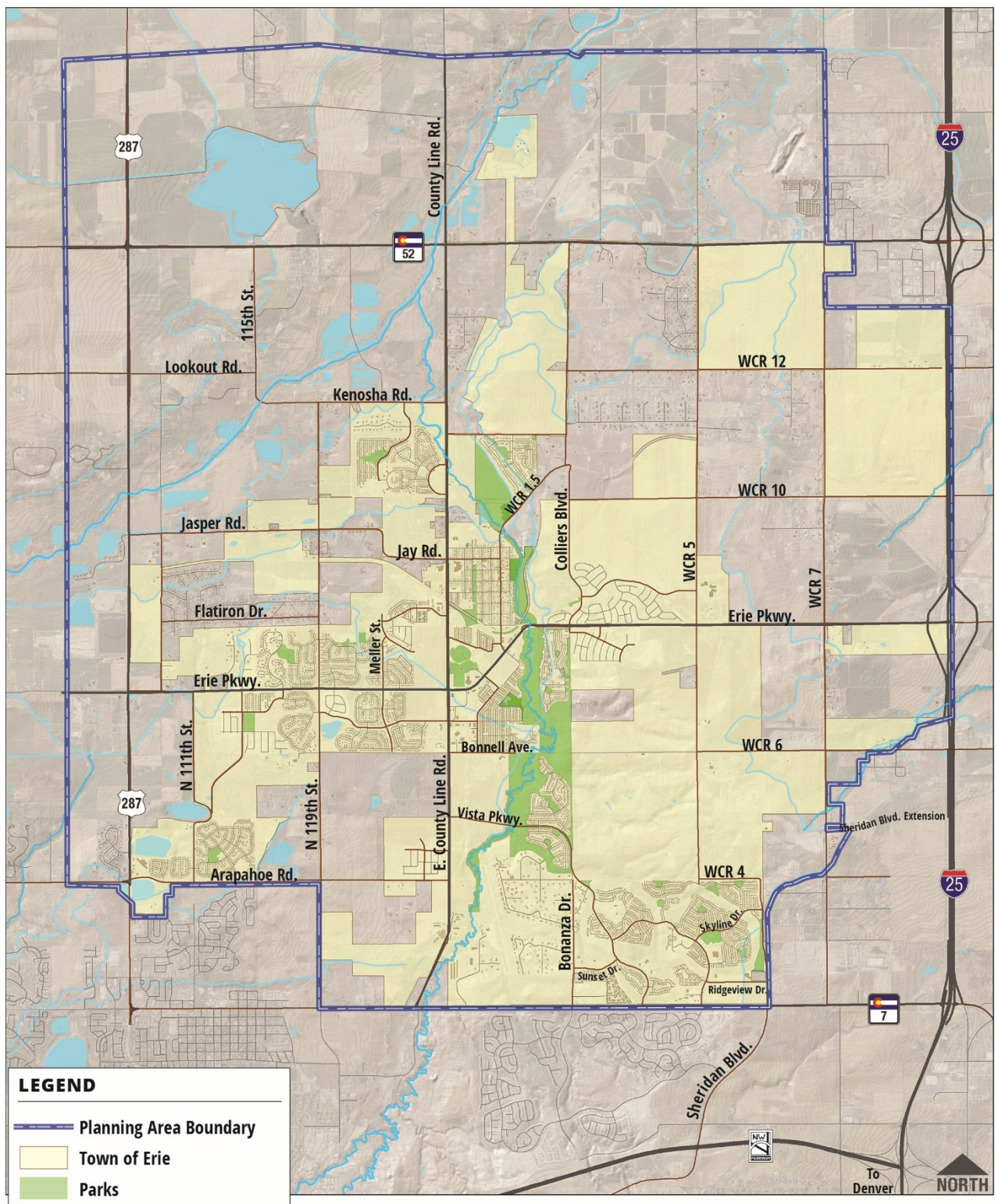


Figure 1. Planning Area Boundary



Chapter 2. Planning for the Future

Public Engagement

Public involvement is an essential part of the transportation planning process. The project team sought community input throughout the course of the project to ensure that key

stakeholders and the general public were engaged and well informed of the planning process, contributed to the development of project goals, and participated in identifying desired outcomes.

The team reviewed the 2015 Erie Citizen Survey to understand current perception of mobility in Erie. A summary of the key mobility findings from the survey are below.

Community Description of Transportation in Erie Today

Roadway Characteristics	Percent Positive
Travel by car	85%
Overall ease of travel	78%
Traffic flow	74%
Street lighting	63%
Street cleaning	62%
Traffic signal timing	60%
Snow removal	54%
Street repair	50%

Bike, Ped, Transit Characteristics	Percent Positive
Paths and walking trails	80%
Ease of walking	77%
Travel by bicycle	72%
Sidewalk maintenance	59%
Bus or transit services	34%
Travel by public transportation	28%

The Town of Erie hosted a joint public meeting at the Erie Community Center on October 18, 2016, to obtain input from the public about their preferences on the Erie Parkway alternatives and to provide comments on the larger transportation network for the Erie Transportation Plan. Approximately 40 members of the public attended the meeting.



In mid-October 2016, the project team crafted an online survey as an additional tool to collect public input about the packaged alternatives for Erie Parkway and for the Erie Transportation Plan. The survey was posted to the Erie Parkway project website and was promoted through the Town's social media outlets and a press release. The survey received over 115 responses.

What We Heard

The survey asked the public to describe transportation in Erie today and their vision for transportation in Erie in the future.

The word clouds provide snapshots of the community perception of transportation in Erie today and in the future.

Community Description of Transportation in Erie Today



Community Description of Transportation in Erie in the Future



Table 1 provides a snapshot of common themes heard at the public meeting and through the online survey.

Appendix A includes a public input summary and the full survey results.

Table 1. Public Input Common Themes

Bicycle/Pedestrian	Transit	Roadway
Add rail trail to Boulder and additional regional bicycle access	Need for transit access to Denver, Longmont, Boulder	Improve signal timing
Construct better bike lanes	Options for getting to DIA	At locations with high peak hour volumes, add turn arrows to existing signals
Add more underpasses	Improve local transit services	Improve access to Downtown
Focus on developing a multimodal transportation system	Extension of North Metro Rail Line	Plan for growth
Encourage the use of alternative modes		Mixed preference for roundabouts/signals

Vision and Goals

The Town of Erie completed an update to its Comprehensive Plan in 2015. As a part of that effort, the Town undertook an extensive effort to identify community values and desires to create a vision statement identifying the kind of place that residents, business owners, and community leaders want the Town to become in the future.

The vision included guiding principles that demonstrated the general ideas the Town would pursue within the planning area over the next 20 years, building on the vision established for the community as a whole. Among those guiding principles was a vision for a comprehensive, integrated transportation system that serves as the vision for the Transportation Plan.

ERIE TRANSPORTATION VISION

A safe, efficient, and innovative transportation system that reduces neighborhood isolation and promotes a sense of community by connecting all areas of town, accommodates various modes of public and private transit, and facilitates travel to regional centers.

Transportation Policies and Goals

The Comprehensive Plan identifies the Transportation Plan as the document best suited to address current and future mobility needs in the Town of Erie. The Comprehensive Plan also identifies goals and policies for creating an efficient transportation system with connected local and regional roads and future transit opportunities. These policies and goals have been reenvisioned and enhanced to form the foundation for the supporting objectives and strategies recommended in this Plan. The following goals and objectives will guide the development of Erie's transportation system.



System Preservation and Safety

Goal: A well-maintained and safe transportation system for motorized and non-motorized users.

***Objective 1:** Maintain/upgrade the condition of the transportation system.*

Strategies:

- ✓ Maximize system performance through regular maintenance of existing facilities
- ✓ Include system preservation and maintenance in the budgeting process

***Objective 2:** Improve system safety for autos, bicyclists, and pedestrians.*

Strategies:

- ✓ Prioritize improvements at intersections with a high number of crashes
- ✓ Construct underpasses/overpasses at key locations to minimize bicyclist/pedestrian and vehicle conflicts



System Operations

Goal: An efficient and reliable transportation system.

***Objective 1:** Minimize travel times, travel costs, and congestion.*

Strategies:

- ✓ Improve traffic signal coordination
- ✓ Maintain mobility on key roadways through effective access management
- ✓ Identify and preserve rights-of-way for future transportation needs
- ✓ Use access control standards to accommodate future growth and maintain mobility
- ✓ Identify appropriate locations for roundabouts based on Erie's roundabout guidelines
- ✓ Monitor regulations and future infrastructure needs to encourage and accommodate innovative transportation technologies



Mobility Options

Goal: An accessible, connected, and integrated multimodal transportation system.

Objective 1: Increase usage of alternative modes to reduce congestion and to provide options for residents and employees.

Strategies:

- ✓ Implement new on-street bicycle facilities identified in the bike plan
- ✓ Participate in regional studies to determine the viability of transit service improvements/expansions (e.g., SH 7 Bus Rapid Transit [BRT] Study)
- ✓ Work with Broomfield and the Regional Transportation District (RTD) to implement an interim transit route to serve Vista Ridge along SH 7 in advance of SH 7 BRT
- ✓ Identify and preserve key locations in Erie to serve as mobility hubs for transit and other shared use mobility services
- ✓ Target gaps in the non-motorized travel network for priority improvements
- ✓ Support land use patterns that provide connectivity to alternative modes



Economic and Community Vitality

Goal: A transportation system that supports a healthy, thriving economy and provides transportation access for employment, recreation, shopping, open spaces, and social activities.

Objective 1: Provide adequate transportation facilities to support economic and community vitality.

Strategies

- ✓ Coordinate transportation and land use planning efforts
- ✓ Identify and preserve rights-of-way for anticipated future transportation needs
- ✓ Preserve locations identified to serve as mobility hubs and micro-mobility hubs at key locations such as SH 7 and I-25
- ✓ Provide multimodal infrastructure to support mixed-use development and locations with high population and employment densities (e.g., Downtown and future Erie Parkway and I-25 development)
- ✓ Continue to enhance bicycle and pedestrian connections among housing, community destinations, and jobs



Natural Resources and the Environment

Goal: A transportation system that respects and provides access to the natural and built environment.

***Objective 1:** Minimize impacts on the environment.*

Strategies:

- ✓ Design neighborhood streets and access roads to follow natural contours and topographic features and respect the Town's historical and natural heritage
- ✓ Use environmentally responsible design and construction practices
- ✓ Encourage the use of electric bikes and the inclusion of electric vehicle charging facilities



Coordination and Funding

Goal: A transportation system that is well planned, funded, and implemented.

***Objective 1:** Work collaboratively with partners to plan for the future and maximize investment.*

Strategies:

- ✓ Participate in discussions with RTD, Colorado Department of Transportation (CDOT), Denver Regional Council of Governments (DRCOG), and surrounding jurisdictions to ensure the Town's plans and standards are compatible with ongoing transportation planning efforts to accommodate future development
- ✓ Prioritize projects based on funding availability from CDOT for state and federal roads, DRCOG's Transportation Improvement program, RTD, and the private sector
- ✓ Coordinate with Boulder and Weld counties and adjacent jurisdictions to ensure that on-street bicycle facilities connect with larger regional facilities
- ✓ Implement the preferred alternative identified in the Erie Parkway Corridor Study

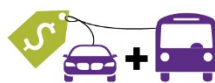
Chapter 3. Current Conditions

An inventory of the existing transportation system within the planning area was conducted to understand how the current system serves Erie residents. The information collected as part of the existing conditions inventory identifies areas that need improvement and assists in the development and evaluation of potential transportation improvements.

The inventory includes information about key transportation statistics and indicators, and documents the existing transportation system in the planning area, including roadway characteristics (functional classification, laneage, traffic control, posted speed limits, etc.), traffic operations, crash data, transit services, and bicycle and pedestrian facilities.

Transportation Snapshot

The US Census Bureau (USCB) and the Center for Neighborhood Technology (CNT) track several statistics to monitor key transportation indicators. The USCB American Community Survey (ACS) provides data at the state, regional, county, and local levels for items like commuter means of transportation to work, annual transportation costs, and average trip

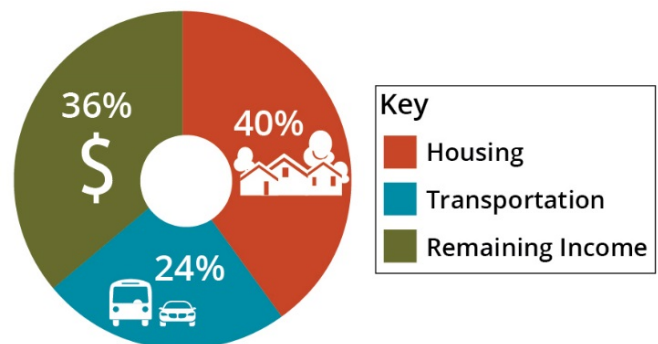
 **\$14,209**
Annual Transportation Costs

 **1.96**
Autos per Household

 **25,969**
Annual Average Household Vehicle Miles Traveled

 **26.8 Minutes**
Average Travel Time to Work

times. CNT provides information about the relative affordability of the combined costs of housing and transportation. Comparatively, Erie's transportation costs, household vehicle miles traveled (VMT), and travel time to work are higher than those of surrounding communities. As a comparison, the City and County of Broomfield's annual average household VMT is just over 20,000, and the City of Boulder's is approximately 18,000. It is important to remember that these characteristics are influenced by land use and the availability of transportation options.



Erie residents spend approximately 64 percent of their household income to cover the cost of their housing and transportation. The Center for Neighborhood Technology (CNT) research indicates that these costs should remain below 45 percent (in urban areas) of the household income to be affordable.

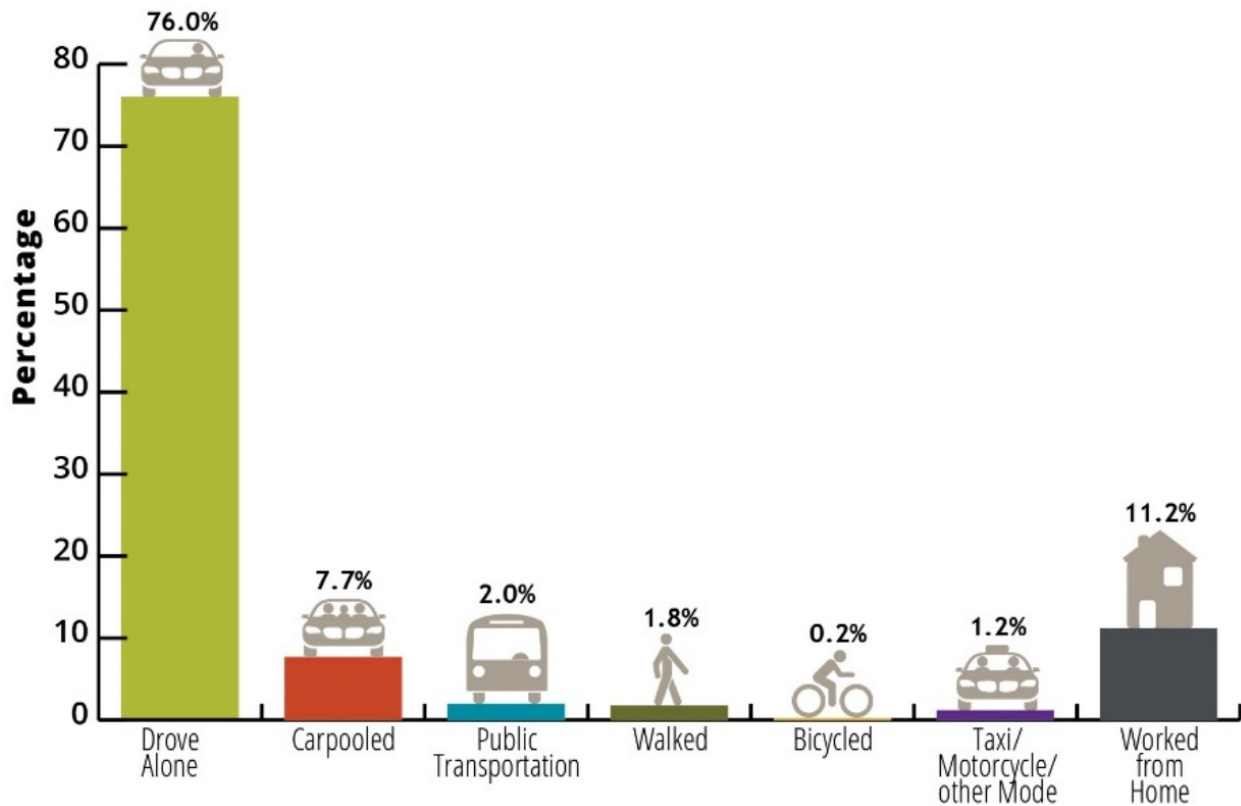
Mode Split

A five-year rolling average of ACS data from 2010–2014 data indicates that 76 percent of Erie employees commute to work in a single-occupant vehicle, with an additional 7.7 percent carpooling. Public transportation, walking, and

biking all have relatively low mode splits, but the percent of employees working from home is very high at 11.2 percent. By comparison, only 4.4 percent of employees nationally work from home and 6.5 percent in the State of Colorado.

Figure 2 provides a snapshot of how Erie residents commute to work.

Figure 2. Means of Transportation to Work



Source: US Census Bureau, 2010–2014 American Community Survey

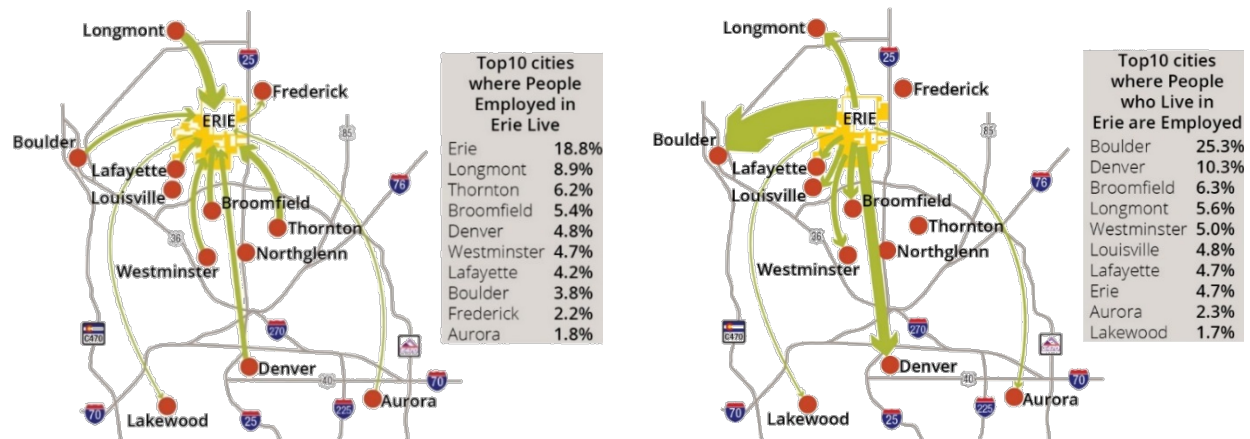
Travel Patterns

The ACS Longitudinal Employer-Household Dynamics (LEHD) OnTheMap tool—an online reporting and mapping tool that provides insight into commuting patterns—was used to explore existing household, employment, and demographic characteristics in Erie. The OnTheMap tool shows where people work and live and summarizes worker job flow patterns into and out of Erie.

In 2014, roughly 95 percent of the workforce living in Erie reported commuting out of the community; 25 percent of employees reported commuting to Boulder and 10 percent to Denver. Conversely, nearly 20 percent of jobs in Erie are held by Erie residents.

Figure 3 summarizes commuter workflows into and out of Erie.

Figure 3. Household and Employment Commuting Characteristics



Source: American Community Survey Longitudinal Employer-Household Dynamics (LEHD) OnTheMap tool, 2014

Roadway Network and Traffic

The roadway network is the primary component of Erie's transportation system. A comprehensive inventory of this network helps to identify issue areas and opportunities for safety and mobility improvements and to define the future roadway network.

Roadway Conditions

The roadway inventory focused on streets with a functional classification of collector and higher; local streets were not included in the inventory. **Figure 4** indicates roadway classification, number of through travel lanes, and surface types (paved vs. gravel) for roads within the planning area boundary.

Key Roadway Facilities

Several roadways provide key east-west and north-south connections for travel through and within the planning area. Major Erie roadways include:

- ▶ **Erie Parkway** is a Principal Arterial and is one of three continuous east-west arterial connections traversing the Town of Erie. Erie Parkway runs through the middle of town, roughly midway between SH 52 to the north and SH 7 to the south. Erie Parkway serves as the community's spine and as the gateway to the Town from US 287 on the west and I-25 on the east.
- ▶ **County Line Road** is a Principal Arterial from SH 7 to Erie Parkway and a Minor Arterial north of Erie Parkway to the planning area boundary. County Line serves as the primary north-south connection within the Town and extends into Weld County to the North and

terminates just east of Lafayette and west of Broomfield north of SH 7.

- ▶ **SH 7** is another east-west regional arterial roadway that is under CDOT jurisdiction. SH 7 connects to Boulder and US 36 to the west and I-25 and US 85 to the east.
- ▶ **SH 52** is the third continuous east-west regional arterial connection, classified as a Principal Arterial, and is also under CDOT jurisdiction. West of US 287, SH 52 connects to SH 119 and to the east, SH 52 connects to I-25, continuing east through Weld County and into Morgan County.
- ▶ **US 287** is a north-south US Highway that provides a parallel facility to I-25 with connections to Longmont, Berthoud, and Fort Collins to the north, and Broomfield, Westminster, and West Denver to the south.

Two other major facilities are also located nearby: I-25 runs along the eastern border of the planning area boundary and E-470/Northwest Parkway south of the planning area boundary.

Traffic Control Devices

Figure 5 shows locations of existing traffic signals and roundabouts. The planning area currently includes 20 signalized intersections. All traffic signals are located on the following five roadways: SH 52, US 287, SH 7, Erie Parkway, and Arapahoe Road.

Figure 6 shows the posted speed limits. Posted speed limits generally range from 25 to 50 miles per hour (mph) within the Town depending on adjacent land uses and roadway facility types. On the edge of town, speeds range from 55 to 65 mph on US 287 and SH 52.

Figure 4. Existing Roadway Characteristics

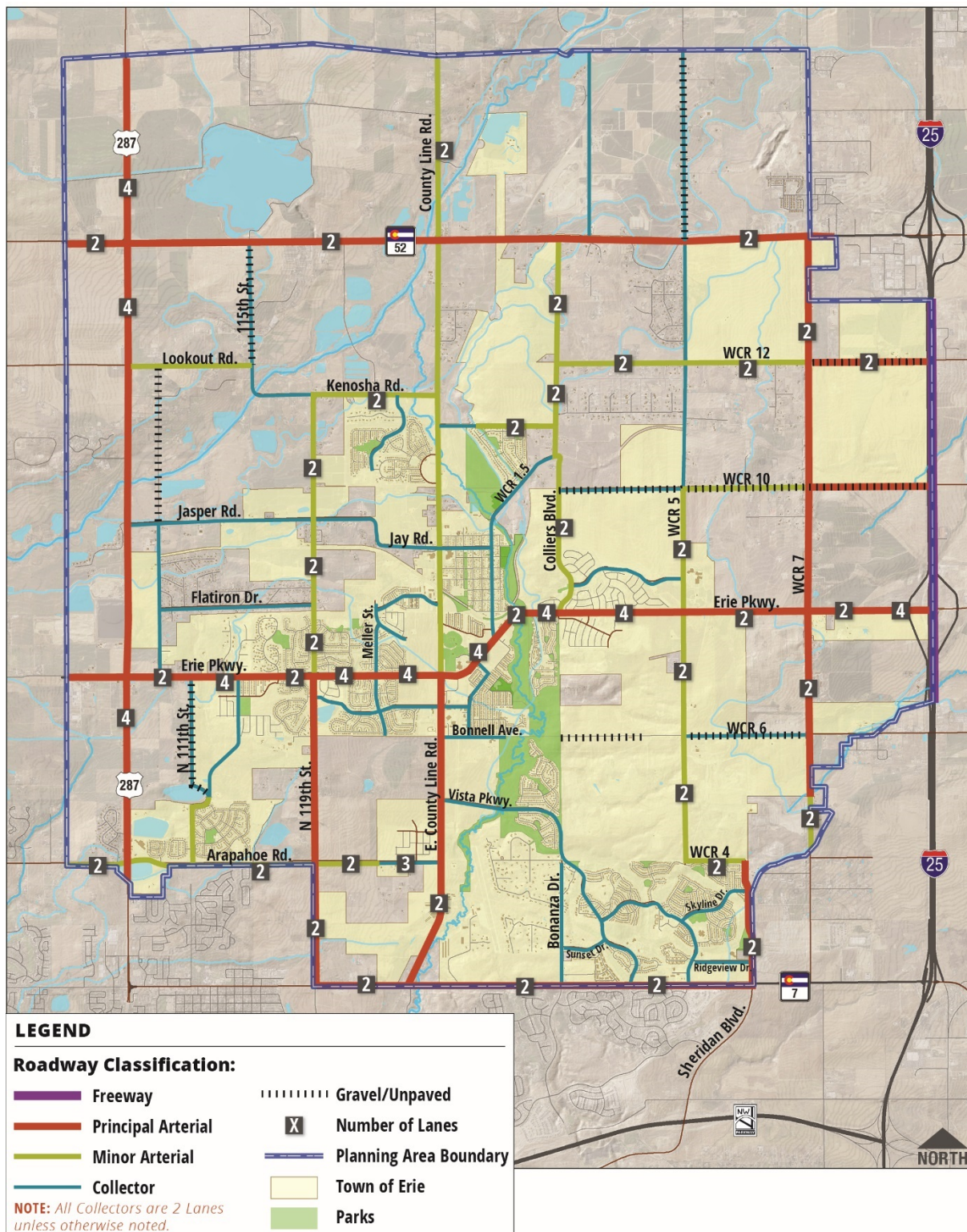


Figure 5. Existing Traffic Control

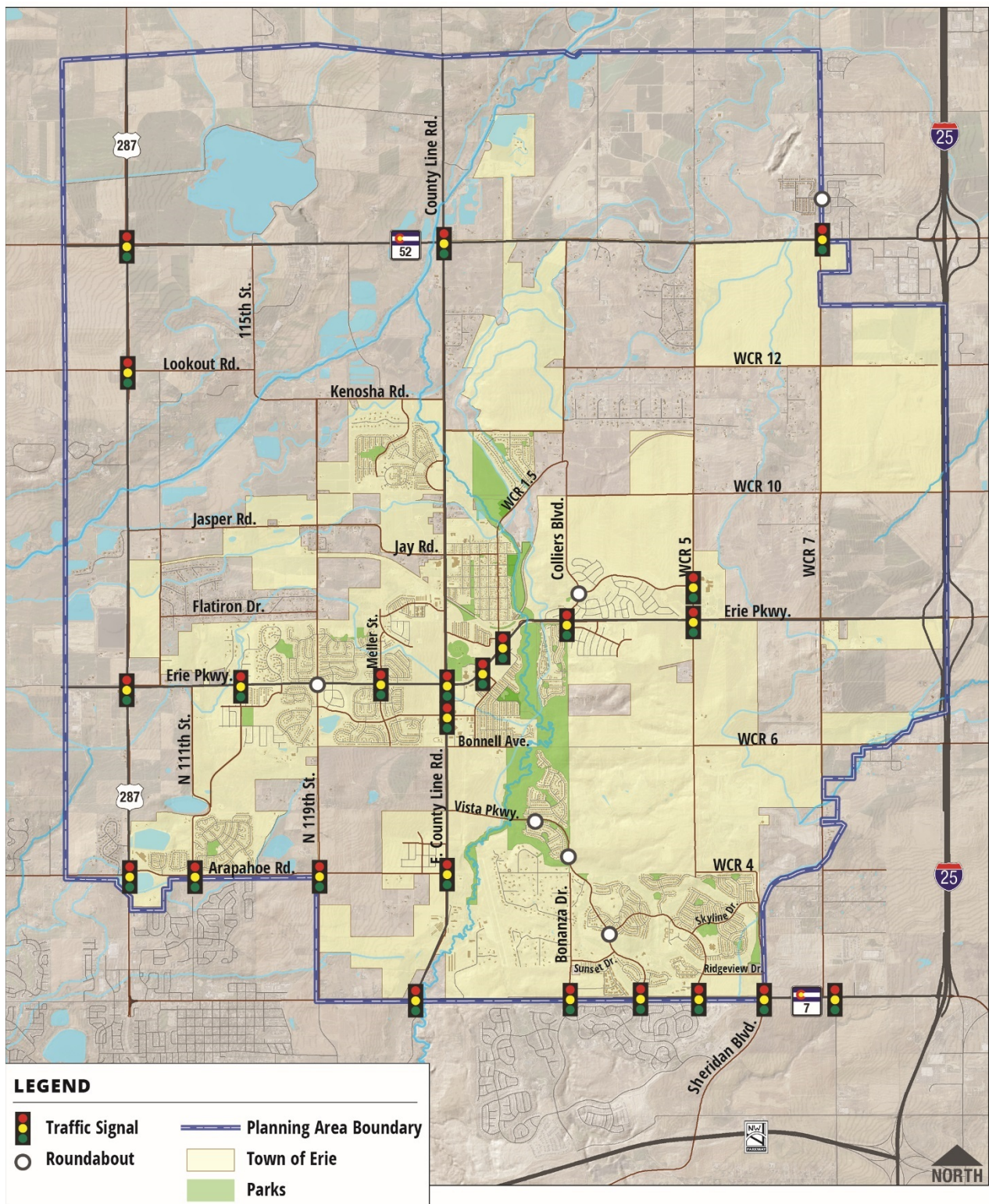
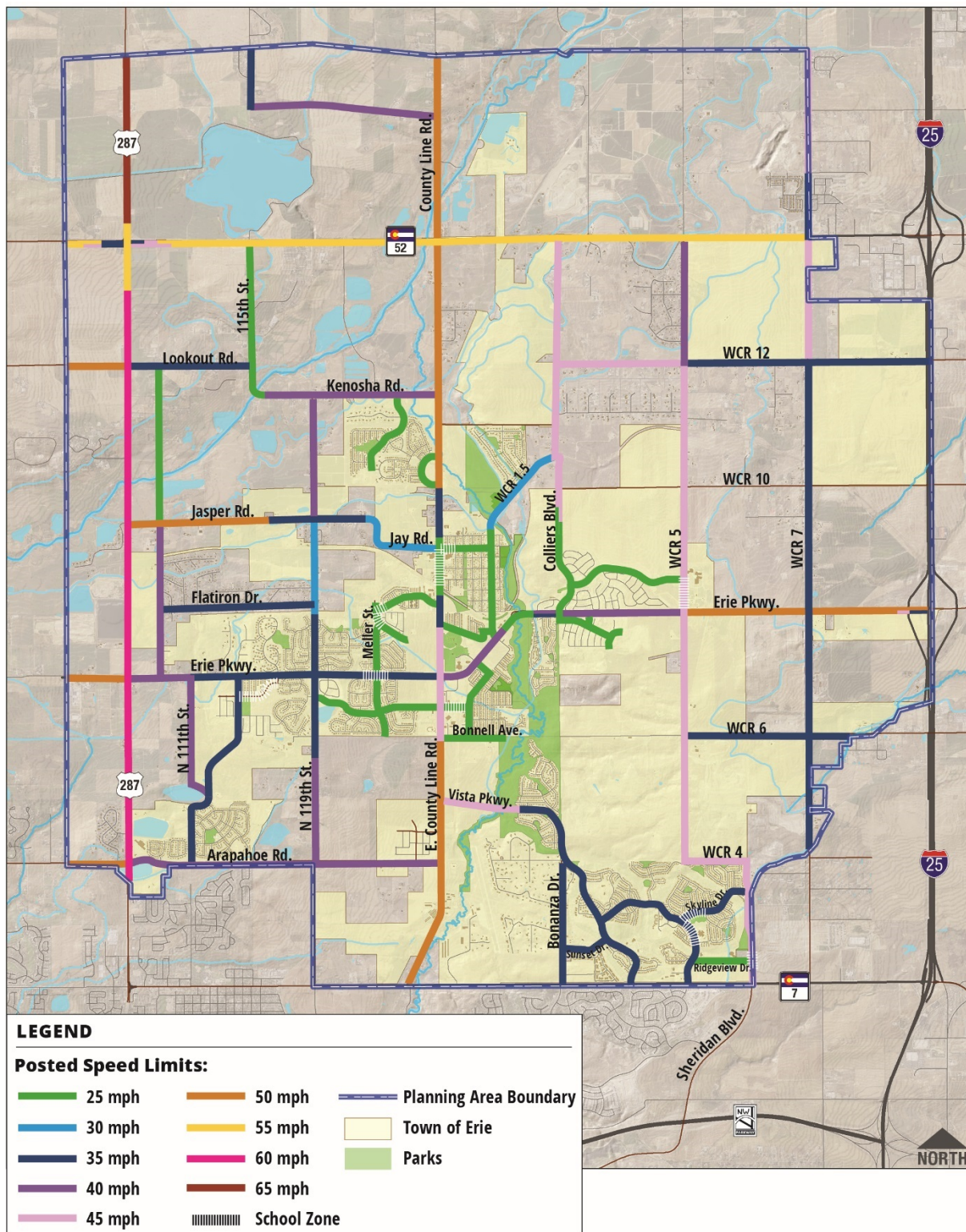


Figure 6. Posted Speed Limits



Traffic Volumes

The Town of Erie, CDOT, Weld County, and DRCOG provided daily traffic volumes on planning area roadways. These counts were recorded between 2013 and 2016 as a part of regular count programs or from recent traffic impact studies. This planning effort included 10 additional counts on September 27, 2016, along important roadway segments to supplement or update outdated count data. **Figure 7** shows each count and the year the count was recorded.

Volume to Capacity Analysis

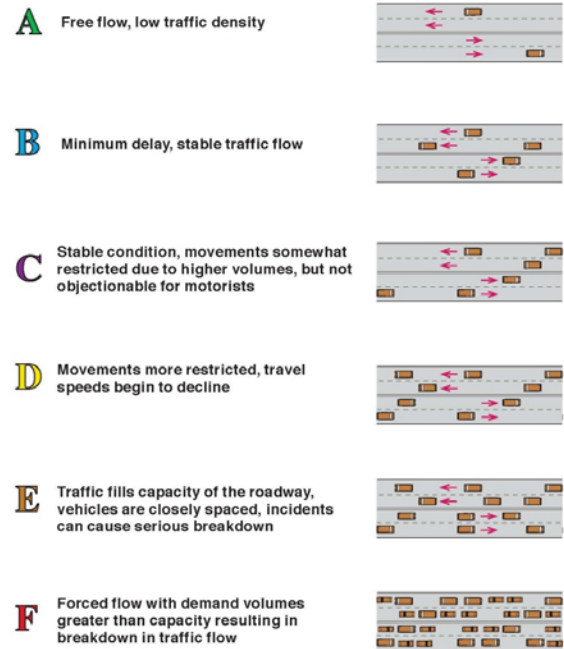
Comparing traffic volumes and planning level capacities assessed existing roadway capacity. The volume to capacity (V/C) ratio was calculated using daily traffic volumes and the planning level capacities for each roadway classification shown in **Table 2**. **Figure 8** summarizes the existing V/C ratios.

Table 2. Planning Level Capacities

Classification	Capacity/Lane (vehicles per day)
Principal Arterial	8,000
Minor Arterial	6,000
Collector	5,000

A lower V/C ratio means better traffic flow along the road segment. A V/C ratio between 0.9 and 1.0 indicates that a facility is approaching a congested state (Level of Service E), while a V/C ratio of 1.0 or greater represents congested conditions (Level of Service F). This analysis is helpful in identifying existing congestion problems. The roadways with poor V/C ratios in Erie are Arapahoe Road and on state and US highways, including SH 7, US 287, and SH 52. However, the V/C ratios do not account explicitly for peak hour conditions or individual intersection delay.

Level of Service - Roadway



Traffic Safety

Reported crash data were compiled for a three-year period (2012 through 2014) to aid in identifying high crash locations. The Town of Erie Police Department provided local reported crash data. Crash data for reported incidents on state highways were pulled from the DiExSys diagnostics tool (Vision Zero Suite – VZS) to summarize crash data and to identify higher than expected crash patterns on state facilities within the planning area.

For the three-year period from January 1, 2012, through December 31, 2014, there were 442 reported crashes at intersections within the planning area boundary. Of these 442 crashes, 311 were property damage only (PDO), 127 were injury accidents, and 4 were fatal crashes.

Table 3 summarizes the locations where most reported crashes occurred between 2012 and 2014 within the planning area. **Figure 9** shows all locations with greater than 10 reported crashes between 2012 and 2014.



Figure 7. Existing Daily Traffic Volumes

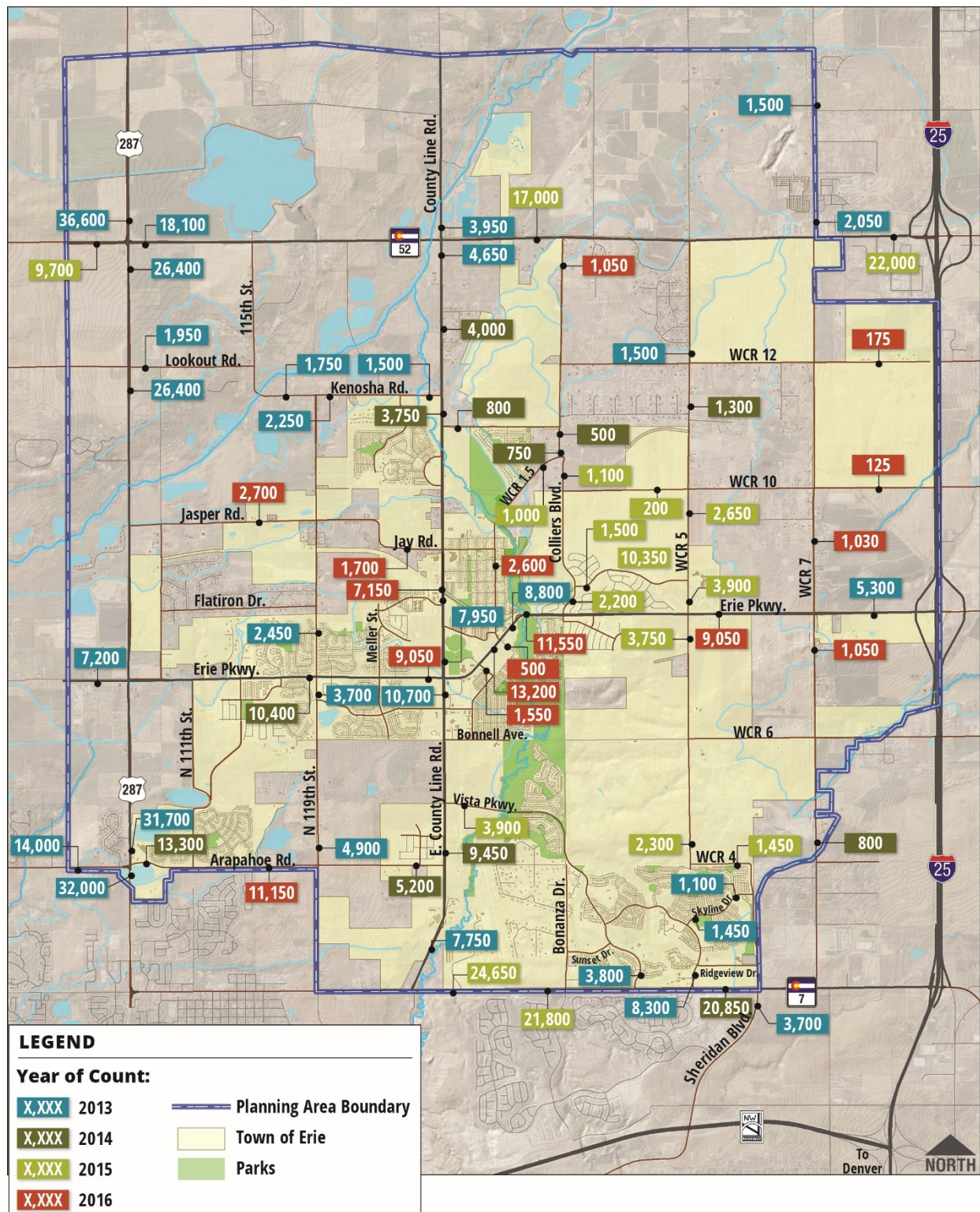


Figure 8. Existing Volume to Capacity Ratios

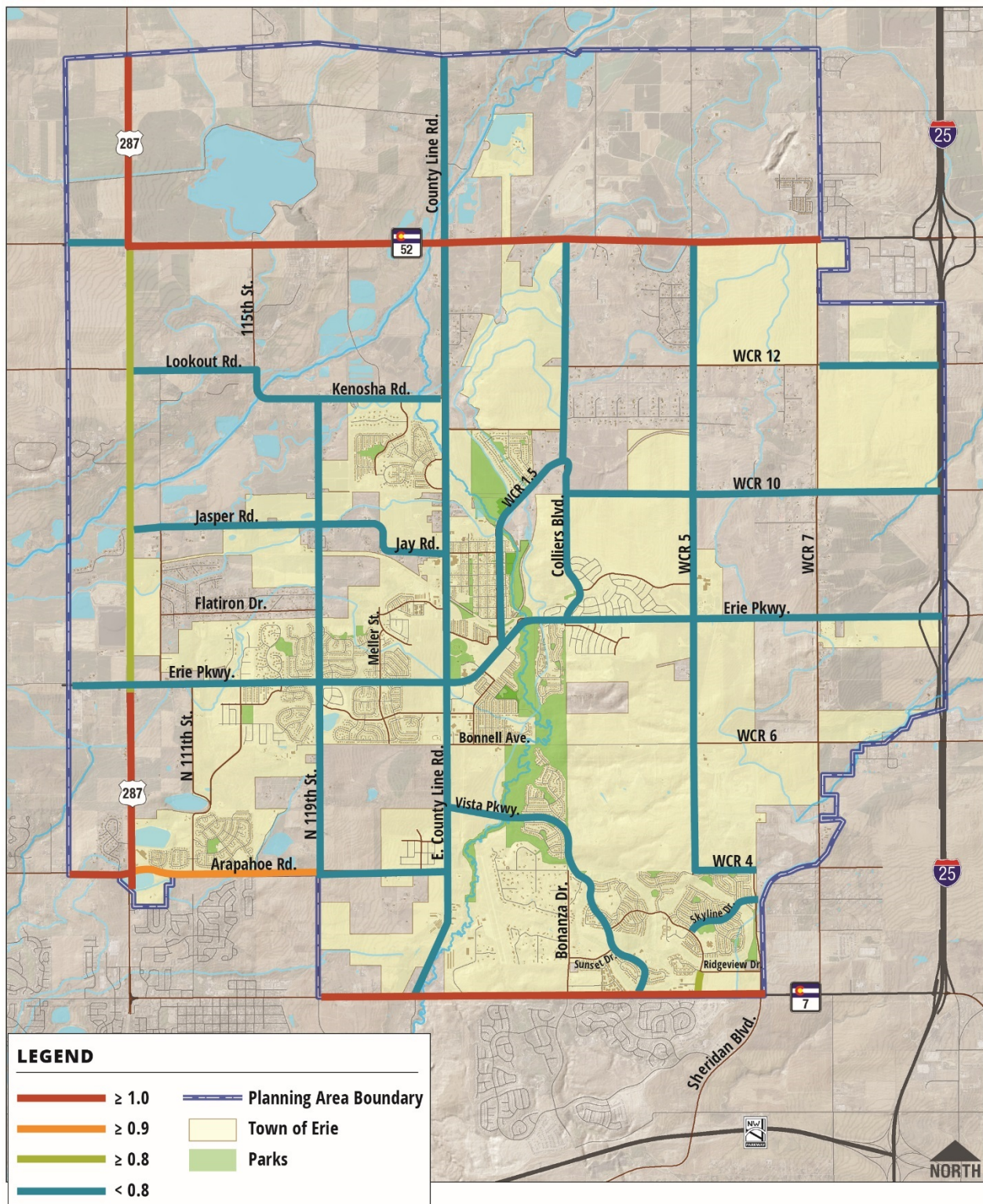


Figure 9. Crash Locations with Greater than 10 Crashes

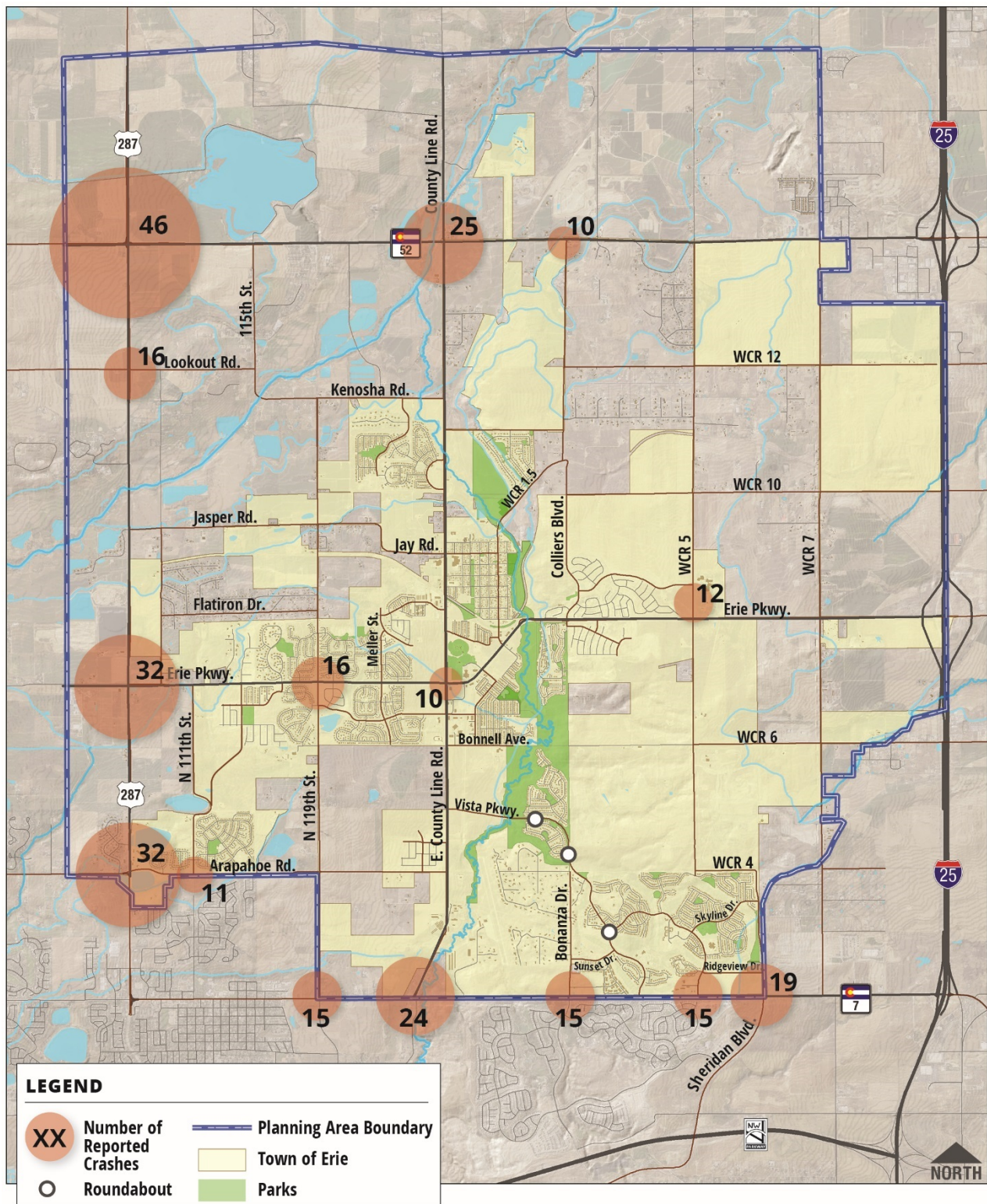


Table 3. Top 10 Locations for Intersection-Related Crashes (2012–2014)

Intersection	Total Crashes	PDO Crashes	Injury Crashes	Fatal Crashes
SH 52 & US 287	46	14	31	1
US 287 & SH 7/Arapahoe Road	32	21	11	0
US 287 & Erie Parkway	32	13	19	0
SH 52 & County Line Road	25	22	3	0
SH 7 & County Line Road	24	13	11	0
SH 7 & Sheridan Blvd	19	15	4	0
US 287 & Lookout Road	16	10	6	0
119 th Street & Erie Parkway	16	13	3	0
SH 7 & Mountainview Blvd	15	9	5	1
SH 7 & Bonanza Drive	15	13	2	0

Safety Performance Function (SPF) methodology can be used to assess the magnitude of safety problems on select highway sections and intersections. SPF reflects the complex relationship between exposure (measured in Average Daily Traffic [ADT]) and the crash count for a roadway section measured in crashes per mile per year or for an intersection measured in crashes per year. The SPF models estimate the expected crash frequency and severity for a range of ADT among similar facilities. This allows the magnitude of the safety problem to be assessed from a frequency standpoint. Development of the SPF informs the Levels of Service of Safety (LOSS).

Level of service uses quantitative measures to characterize the safety of a roadway segment in reference to its expected performance and severity. If the LOSS as predicted by the SPF represents a normal or an expected number of crashes at a specific level of ADT, then the degree of deviation from the normal can be stratified to represent specific levels of safety:

- ▶ LOSS I – Indicates a low potential for crash reduction
- ▶ LOSS II – Indicates a low to moderate potential for crash reduction

- ▶ LOSS III – Indicates a moderate to high potential for crash reduction
- ▶ LOSS IV – Indicates a high potential for crash reduction

LOSS can be calculated at an intersection for both total number of crashes and number of injury and fatal crashes. In the planning area, 11 intersections on state highways have LOSS III or LOSS IV, indicating that they have a moderate to high potential for crash reduction:

- ▶ SH 7 & Bonanza Drive – LOSS IV for Total Crashes and LOSS II for Injury & Fatal Crashes
- ▶ SH 7 & County Line Road – LOSS IV for Total Crashes and LOSS IV for Injury & Fatal Crashes
- ▶ SH 7 & Mountainview Blvd – LOSS IV for Total Crashes and LOSS IV for Injury & Fatal Crashes
- ▶ SH 7 & Sheridan Blvd – LOSS III/IV for Total Crashes and LOSS II for Injury & Fatal Crashes
- ▶ SH 52 & County Line Road – LOSS III for Total Crashes and LOSS III for Injury & Fatal Crashes

- ▶ SH 52 & County Road 3 – LOSS III for Total Crashes and LOSS II for Injury & Fatal Crashes
- ▶ SH 52 & Old SH 52 – LOSS II for Total Crashes and LOSS III for Injury & Fatal Crashes
- ▶ SH 52 & US 287 – LOSS IV for Total Crashes and LOSS IV for Injury & Fatal Crashes
- ▶ US 287 & Erie Parkway – LOSS IV for Total Crashes and LOSS IV for Injury & Fatal Crashes
- ▶ US 287 & Lookout Road – LOSS III for Total Crashes and LOSS III for Injury & Fatal Crashes
- ▶ US 287 & SH 7/Arapahoe Road – LOSS IV for Total Crashes and LOSS IV for Injury & Fatal Crashes

Bicycle and Pedestrian Facilities

Bicycle and pedestrian facilities play an important role in providing mobility options and an efficient and connected network. Both the 2015 Erie Comprehensive Plan and the 2011 [Parks, Recreation, Open Space, and Trails \(PROST\) Master Plan](#) indicate strong community support for local and regional trails. Trails play a critical role in providing connectivity for both bicyclists and pedestrians for recreational and transportation purposes in the community.

The Town of Erie's PROST plan provides a framework for improving and expanding the off-road recreational trail network and opportunities for connecting with on-street bike facilities. The backbone of Erie's trail system is the "spine trail network," which functions to provide connectivity to major activity centers, community parks, schools, Downtown,

employment and commercial centers, and regional trails, as shown on **Figure 10**.

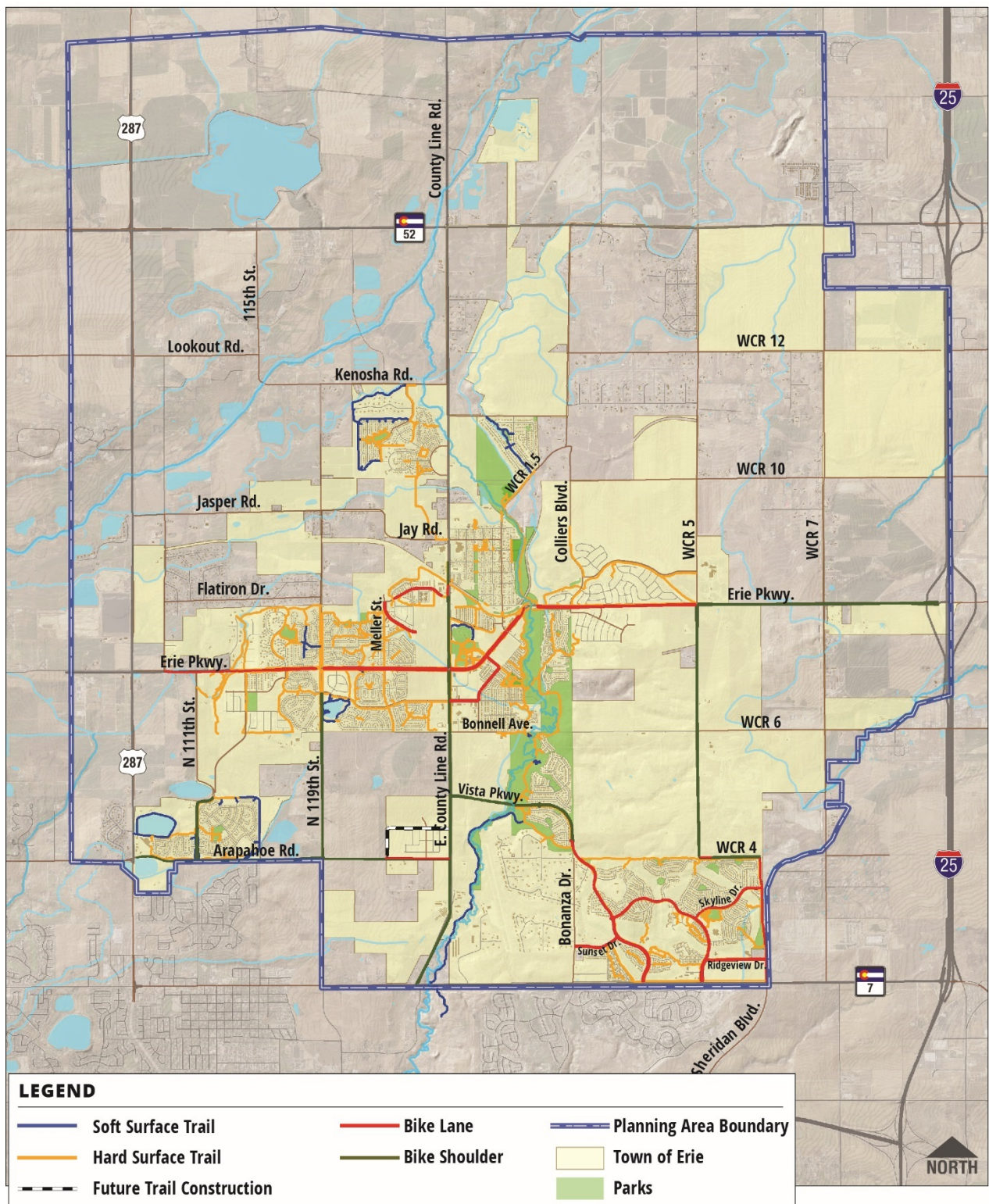
Coal Creek is the primary regional trail in Erie and provides north-south connectivity along Coal Creek and with several parks in Erie. An underpass at the Coal Creek Trail and Erie Parkway provides a safe crossing opportunity for the community. The Plan identifies future connections to the following regional trails:

- ▶ Coal Creek/Rock Creek Trail
- ▶ Union Pacific Rail Trail
- ▶ St. Vrain Legacy Trail
- ▶ Lafayette and Broomfield Trails

Bicycle facilities in Erie include a combination of multiuse paths, on-street bike lanes, bike shoulders, and soft surface trails. Bike lanes in Erie are currently 5-feet in width, including the gutter. Bike lanes exist on Erie Parkway, Mason Street, Telleen Avenue, Jasper Road (south of Telleen), Vista Parkway, Sunset Drive, Mountain View Boulevard, Skyline Drive, Ridgeview Drive, and Sheridan Parkway. Four-foot bike shoulders are present on several roadways, including Erie Parkway (east of Weld County Road [WCR] 5), WCR 5, Vista Parkway, E. County Line Road, and N. 119th Street.

Multiuse paths serve a critical role in the bicycle and pedestrian network in Erie today. These hard surface paths are often 8-feet-wide and accommodate both pedestrians and bicyclists. As Erie continues to grow, development standards are guiding new development to ensure that adequate bicycle and pedestrian infrastructure is included. These requirements will continue to successfully create more walkability and connectivity in residential and commercial areas, improving overall mobility for residents and employees.

Figure 10. Existing Bicycle and Pedestrian Facilities



Transit System

Transit is an important component of a multimodal network, which includes both traditional fixed-route public transit and human services transit in Erie, as shown on **Figure 11**. The following subsections summarize existing public transit and human services transportation options available to Erie residents.

RTD

RTD currently operates three fixed-routes within the Erie planning area boundary: the JUMP, L/LX and LSX routes.

JUMP

Two JUMP routes connect Erie and the Downtown Boulder Station. At the intersection of Arapahoe Road and US 287, these routes split providing service to Erie and Lafayette. The Erie Route has several stops (as shown on **Figure 11**) along Arapahoe Road, 119th Street, and Erie Parkway, with the route terminating at the Erie Community Center.

L, LX, and LSX

The L, LX, and LSX routes travel to and from Denver and Longmont. The US 287 & Niwot Road Park-n-Ride serves all three routes and is located within the planning area, north of the US 287 and SH 52 intersection on Niwot Road. This Park-n-Ride includes 40 parking spaces and 8 bike racks. Route 225 services the western portion of Erie and heads south to US 36 via Lafayette.

The L (Longmont/Denver) and LX (Longmont/Denver Express) both travel through the Erie planning area along US 287. South of Erie, the L and LX travel along US 287 and connect to the US 36 and Broomfield Station, where riders can connect to several other bus lines and the Flatiron Flyer. There are several stops for the L along US 287, as shown on **Figure 11**.

The LSX (Longmont/Denver Express) also provides express services between Longmont and Denver but travels along I-25 until SH 52 begins to head east to US 287. There are no stops for the LSX between Union Station and the US 287 & Niwot Road Park-n-Ride.

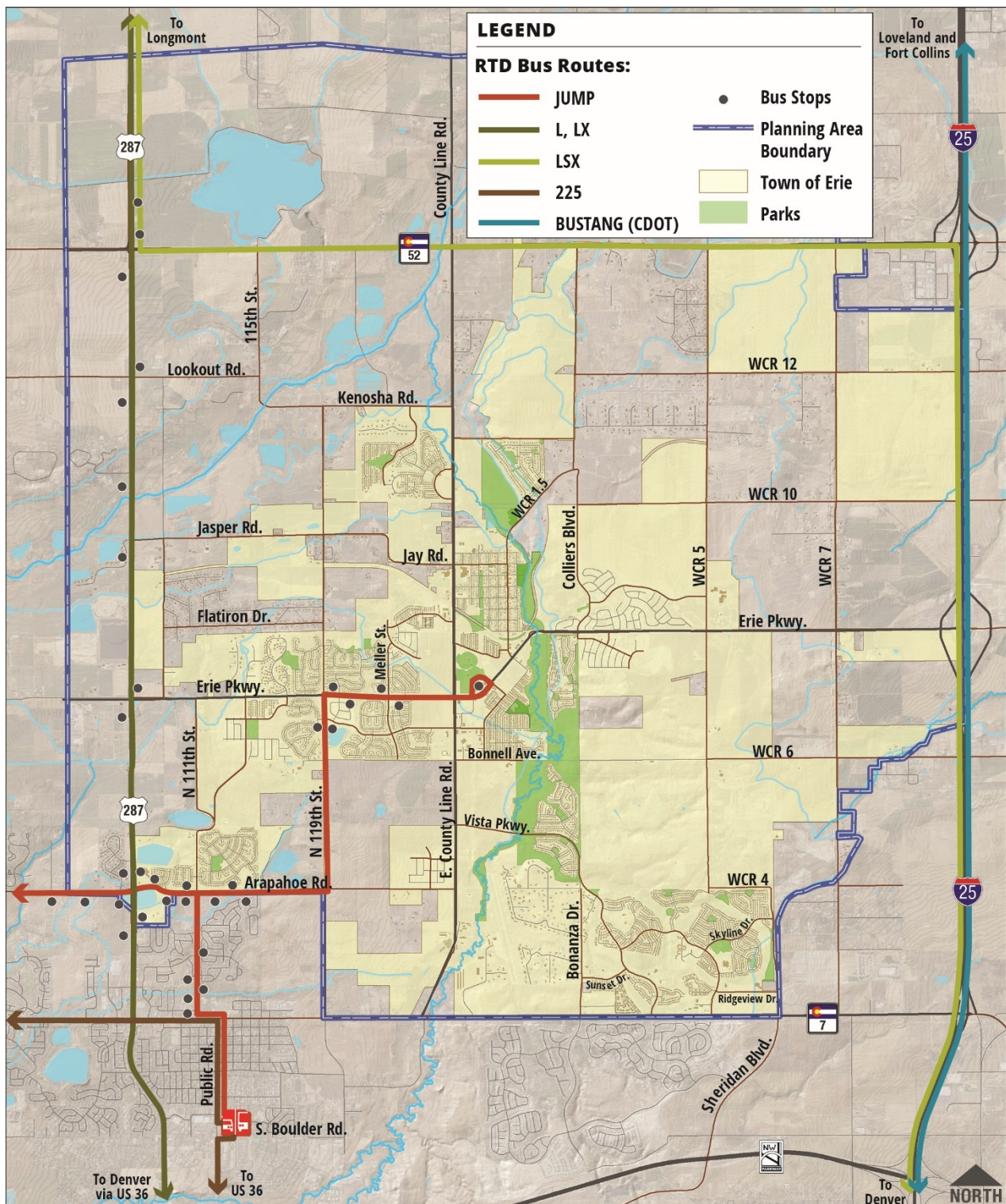
Bustang

Bustang, CDOT's Interregional Express Bus service, is designed to connect commuters and travelers to and from Denver, Colorado Springs, Fort Collins, and Glenwood Springs. The North Line travels between Denver and Fort Collins along I-25, on the eastern border of the planning area. However, there are currently no Bustang stops near the Town of Erie. The closest stop is located at the Loveland-Greeley Park-n-Ride.

Via Mobility Services

Via, a private nonprofit organization, offers on-demand, door-to-door paratransit service for older adults and people with disabilities in Erie. As a paratransit service, Via does not follow fixed routes or schedules; the shared ride service schedule changes daily based on where riders need to go. Erie residents who qualify for service can request local trips within Erie or to any community that Via serves.

Figure 11. Existing Transit Services



Freight and Railroad

While Erie's history is abundant with connections to the railroad, the Erie planning area boundary currently has no active railroad lines. However, an inactive rail line traverses the eastern portion of Erie. RTD acquired the rail bed formerly owned by Union Pacific for potential use for commuter rail. Existing railroad crossings are at-grade crossings and are currently marked with crossing signs and exempt highway rail grade crossing plaques, which inform drivers of vehicles carrying hazardous materials, vehicles carrying passengers for hire, and school buses carrying students for which a stop is not required.

Freight traffic is prevalent in Erie due to the landfill and other industries that require significant hauling. Several concerns exist relative to freight traffic, including safety, noise pollution, and overall quality of life.

Erie does not currently have identified truck routes; however, signs posted on major roadways, such as County Line Road, indicate that trucks may use the roadway only for local deliveries. Through movements should occur on the state highway system.

Chapter 4. Future Conditions

It is important to understand the impacts of projected local and regional growth on traffic volumes and travel patterns and characteristics to properly identify potential improvement projects for the Erie transportation system.

The DRCOG 2040 Compass Model was used to develop future year travel projections. The 2040 planning horizon provides a 20-year planning horizon and was modified to include the most up-to-date population and employment projections for the area.

The DRCOG model has subdivided its planning area into traffic analysis zones (TAZs), as shown on **Figure 12**.

Land Use Forecasts

The 2015 base year model includes estimates of the number of households and employees. Land use adjustments and forecasts were developed with input from Town staff from Public Works and Economic Development. The forecasts include 499 new households per year and 786 new jobs per year.

Table 4 summarizes the total estimated number of households and employment for the 48 TAZs within the Erie planning area boundary in 2015 and 2040.

Table 4. Land Use Growth Summary

Time Period	Households	Employment
2015	10,897	5,578
2040	23,373	25,237

Table 5 provides the 2040 land use estimates for the 48 TAZs within the planning area boundary.

Table 5. 2040 Land Use Forecasts by TAZ

TAZ	Total Households	Production/Distribution Employees	Retail Employees	Service Employees	Total Employees
43	751	0	9	64	73
44	107	21	0	0	21
45	106	12	6	0	18
63	34	6	0	0	6
64	9	19	0	0	19
65	107	6	0	1	7
66	122	3	0	79	82
67	1,096	74	216	120	410
68	206	9	0	21	30
69	286	14	0	29	43
87	25	104	0	9	113
88	5	0	0	0	0
89	685	0	0	20	20
90	4,886	5	76	163	244
91	328	2	0	2	4
92	701	0	0	30	30
93	134	0	169	44	213
94	73	0	0	22	22
150	39	3	0	1	4
151	46	6	0	11	17
153	4	7	0	1	8
154	85	51	20	79	150
213	482	20	393	754	1,167
214	718	10	9	461	480
215	51	0	0	7	7
216	120	19	1	23	43
2731	307	30	3	46	79
2732	45	0	2	7	9
2733	556	0	101	218	319
2741	262	19	64	146	229
2742	1,269	30	80	500	610
2743	365	21	5	107	133
2744	2,399	0	0	0	0
2745	352	0	0	40	40
2746	48	32	9	5	46
2747	293	2	53	238	293
2748	137	750	834	1558	3,142
2749	64	784	731	3333	4,848
2750	33	710	652	2500	3,862
2754	1,551	380	230	400	1,010
2755	280	180	48	400	628
2756	1,082	7	80	174	261
2757	115	0	2	22	24
2758	1,761	61	193	365	619
2759	330	12	101	218	331
2760	108	2221	603	2500	5,324
2761	30	8	4	1	13
2762	780	42	17	127	186
Total	23,373	5,680	4,711	14,846	25,237

Travel Demand Modeling

To develop traffic volume forecasts, two versions of the DRCOG model were used to estimate the amount of growth in traffic volumes expected on planning area roadways. The base 2015 model represents existing roadway network characteristics (roadway alignments, number of lanes and functional classifications) and land use conditions (households, employment and area types).

Traffic Forecasts

Future travel demand patterns are primarily a function of the population and employment opportunities in the area. The household and employment data outlined in the previous sections were used to modify the model. The model subsequently provided traffic forecasts for the 2040 roadway network.

The observed traffic counts were compared to the model's (2015) predicted traffic volumes. These comparisons provide an estimation of error associated with the model's representation of travel conditions. The 2040 model forecasts were then adjusted to account for the differences between observed data and model outputs to provide more reliable forecasts. This post-processing adjustment process, as prescribed in the Transportation Research Board's publication National Cooperative Highway Research Program 765,

was used to develop all 2040 daily traffic volume forecasts. **Figure 13** shows the forecasted 2040 daily traffic volumes for the Erie roadway network.

Volume to Capacity Analysis

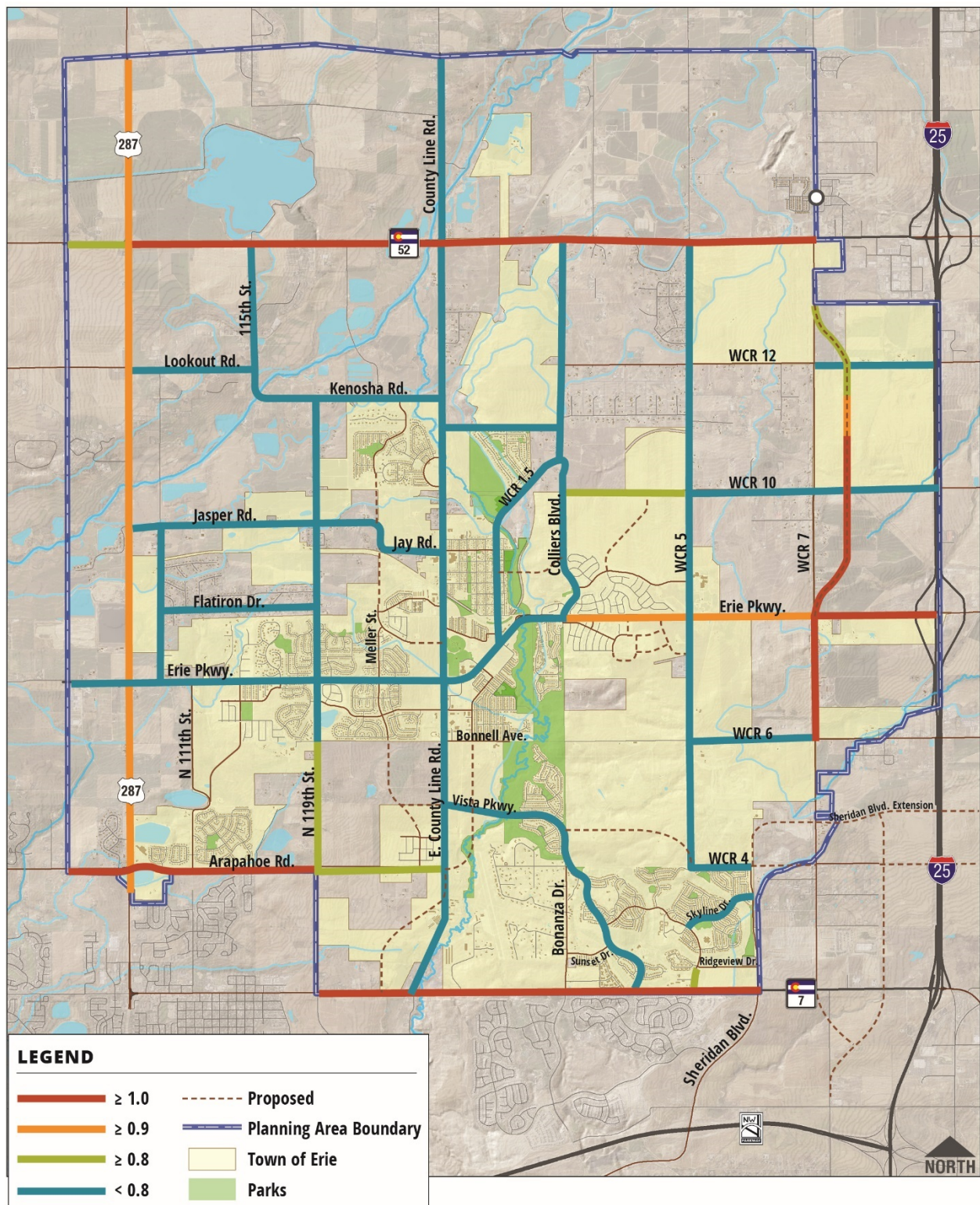
As with the existing traffic volumes, traffic volumes and planning level capacities were compared to assess roadway capacity needs for the 2040 and buildout planning horizons. The V/C ratio was calculated using daily traffic volumes and the planning level capacities for each roadway classification as shown in **Table 2**.

This analysis is helpful in identifying future congestion problems and assessing where potential widening projects are needed, informing where right-of-way preservation should occur. **Figure 14** summarizes the 2040 V/C analyses.

System Evaluation

The travel demand model was used to test the effectiveness of several roadway improvements on the Erie street network. Major roadway improvement alternatives were identified through a combination of technical analysis using the 2040 and buildout daily traffic volumes and V/C ratios, consistency with planned developments, discussions with the Board of Trustees, and community input.

Figure 14. 2040 Volume to Capacity Ratios



Chapter 5. Recommended Transportation Network

Recommended roadway, transit, and on-street bicycle networks have been developed for the Town of Erie. A specific pedestrian network was not identified because it is anticipated that sidewalks will come with new development and the Town responds to pedestrian infrastructure improvements on an as-needed basis.

Roadway Plan

As shown on **Figure 15**, Erie's Roadway Plan focuses on providing a well-planned system of streets to serve the Town's current and future multimodal travel needs. In addition to defining functional classifications, the Roadway Plan identifies the through lane requirements to meet the 2040 travel demands. The Roadway Plan, along with the standard cross sections, should be used to preserve right-of-way for future roadway needs and for planning roadway CIPs.

Three primary goals for the future roadway network have driven the development of the Roadway Plan:

- ▶ Maintain adequate capacity along existing corridors
- ▶ Ensure efficient road network connections for future development
- ▶ Fill existing network gaps with new road facilities

Major changes identified in the 2040 Roadway Plan, include:

- ▶ **Realignment of WCR 7 between Erie Parkway and WCR 12** – This realignment is based on the findings of the 2003 Weld County I-25 Parallel Arterial Study to preserve right-of-way to accommodate future growth and development.

- ▶ **Realignment of County Line Road between Arapahoe Road and SH 7** – The realignment will remove the offset intersection alignment with Flagg Drive; this recommendation is different from what was identified in the SH 7 PEL and will require coordination with CDOT.
- ▶ **Extension of Sheridan Parkway north to I-25** – This extension is identified in Broomfield's Transportation Plan and will require municipal coordination.
- ▶ **New Interchanges and Grade Separation at I-25** – These improvements have been identified to accommodate growth and development with new roadways; new interchanges are identified for WCR 10 (at buildout) and Sheridan Parkway. Grade separation is identified for WCR 12 and WCR 4. The North I-25 Environmental Impact Statement (EIS) identifies intersection reconstruction for SH 7/I-25, with a diverging diamond interchange as the ultimate configuration.

Roadway Classifications

Streets generally provide two important functions: mobility and land access. These functions conflict with each other—more land access generally leads to reduced vehicle carrying capacity and mobility, and vice versa. Each roadway type is specifically designed to operate with certain characteristics based on the adjoining land uses, level of continuity, and proximity and connections to other facilities.

A street's functional classification describes these characteristics, and the street design standards identify specific design parameters, right-of-way needs, and other measures for each classification. Erie's Roadway Plan includes the functional classifications described below.



Freeways have the highest level of mobility, providing unimpeded, high-speed regional and interstate connections. Freeways are limited access, divided highways that link major urban areas. I-25 is the only freeway in the Erie area, serving north-south interstate travel through Colorado's Front Range. I-25 is under the jurisdiction of Federal Highway Administration (FHWA) and CDOT.

State Highways can range in functional classification from Major Collectors to Principal Arterials but commonly provide longer distance travel between communities. For Erie's Transportation Plan, the State and US Highways in the area (SH 7, SH 52, and US 287) are categorized separately because they are under the jurisdiction of CDOT. Erie's design and access standards do not apply to these facilities.

Principal Arterials provide a high degree of mobility and serve corridor movements with longer trip lengths. While adjoining land uses can be served directly, access is limited to emphasize mobility. Erie's Principal Arterials include Erie Parkway, County Line Road, 119th Street, and WCR 7.

Minor Arterials provide trips of moderate length and offer connectivity to streets of higher functional classification. Minor Arterials provide intra-community continuity and a higher degree of land access than Principal Arterials without penetrating neighborhoods.

Collectors gather traffic from local streets and funnel it to the arterial network. Collectors provide a balance between access and mobility and retain continuity through neighborhoods. Travel speeds are moderate, and travel distances are short to medium. Collectors can be sub-stratified into *major* and *minor* categories with Major Collectors having lower connecting driveway density, longer lengths, and higher speeds.

Local Streets serve the highest level of access, provide direct driveway access to adjacent properties, and carry traffic to collectors. Local streets can be of limited continuity and may be designed to discourage through traffic. Development plans typically identify local streets.

The functional classification of a street reflects its role in the road network and forms the basis for access management, corridor preservation, and street design guidelines and standards. Existing streets may not meet all the desired characteristics described by their defined functional classification but can be upgraded as improvements to the street are made. The functional classification should be viewed as the desired condition and should not change over time. While the level of traffic is typically highest on higher level functional classifications like freeways and principal arterials, traffic volumes are a result of the street's function rather than a delineator between functional classifications.

Intersection Control

The Erie planning area boundary currently includes a limited number of signalized intersections, as identified on **Figure 5**. Most intersections are currently under STOP control with a handful of roundabouts.

The Manual on Uniform Traffic Control Devices (MUTCD) contains nine warrants for traffic signal installation based on various information and situations. As noted in the MUTCD, the satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

In evaluating the potential need for future traffic signals, Warrant 3 – Peak Hour was applied to provide an indication of the likelihood that an intersection may meet one or more signal warrants in the future. **Figure 16** identifies locations identified for traffic control devices in the future. These locations should be monitored to determine when signal warrants are met.

Roadway Cross-Sections

The Town's typical street cross sections are intended to provide safe, attractive, and comfortable access and travel for all modes within the public right-of-way. As a part of the Plan update, the Town's current street standards were reviewed. The review resulted in the recommendation of several minor modifications to the typical cross sections. The recommended typical cross sections are shown on **Figure 17** through **Figure 24** and the reasons for the proposed changes are described below.

Travel Lane Widths

Erie's current standards include 12-foot travel lanes for most streets (the local street cross section includes 11-foot travel lanes). Below is a summary of the considerations for narrowing travel lanes, based on documentation from FHWA¹.

If the primary purpose of a street is movement of people by all modes, 11-foot lanes may present the following advantages:

- ▶ Narrower lane widths can help manage or reduce speed and shorten crossing distances for pedestrians.
- ▶ A 1-foot reduction in lane width (from 12-feet to 11-feet) results in a corresponding 1.9 mph reduction in free flow speed on average, thereby, reducing the difference in speeds of vehicles, bikes, and pedestrians and increasing comfort for non-vehicular traffic.
- ▶ Narrower lanes have been known to have other benefits such as shorter signal cycles for the minor street and less accumulation of storm water.
- ▶ The Highway Capacity Manual includes a lane width adjustment factor to reduce

the saturation flow rate at signalized intersections for lane widths narrower than 12-feet. Subsequent research indicates "The measured saturation flow rates are similar for lane widths between 10-feet and 12-feet. For lane widths below 10-feet, there is a measurable decrease in saturation flow rate. Thus, so long as all other geometric and traffic signalization conditions remain constant, there is no measurable decrease in urban street capacity when through lane widths are narrowed from 12-feet to 10-feet." (Zegeer 2007)

If the primary purpose of a roadway is mobility, 11-foot lanes may present the following challenges:

- ▶ On high-speed (especially rural) roadways, there is an increased risk for cross-centerline head-on or cross-centerline sideswipe crashes because drivers may have more difficulty staying within the travel lane. Recent research seems to be indicating that there is not a strong correlation between crash rates and lane width.²
- ▶ Depending on the roadway purpose, reduced travel speeds may be perceived as a problem.

With respect to truck routes, the National Association of City Transportation Officials (NACTO) states that travel lane widths of 10-feet generally provide adequate safety in urban settings while discouraging speeding. Cities may choose to use 11-foot lanes on designated truck and bus routes (one 11-foot lane per direction) or adjacent to lanes in the opposing direction; 11-foot lanes are acceptable for use on truck routes.

¹http://safety.fhwa.dot.gov/geometric/pubs/mitigationstrategies/chapter3/3_lanewidth.cfm

²http://safety.fhwa.dot.gov/geometric/pubs/mitigationstrategies/chapter3/3_lanewidth.cfm



Per the American Association of State Highway Transportation Officials (AASHTO) *Green Book*, for rural and urban arterials, lane widths may vary from 10-feet to 12-feet. It goes on to say that 12-foot lanes should be used where practical on higher speed, free flowing principal arterials. However, lane widths of 10-feet may be used in more constrained areas where truck and bus volumes are relatively low and speeds are less than 35 mph.

Based on this research, Felsburg Holt & Ullevig proposes the following modifications to lane widths for Erie's street typical cross sections:

- ▶ Use 11-foot travel lanes for all streets that include a curb and gutter (Principal Arterial, Minor Arterial, Collector, and Local Streets). Narrowing the travel lanes on these streets in the more urbanized portions of Erie will make additional pavement width available for striped bike lanes. This modification is expected to result in reduced travel speeds and a higher level of comfort for bicyclists, while maintaining the flow-line to flow-line width of the current cross sections.
- ▶ Retain 12-foot travel lanes for the Initial Phase of Principal Arterial and Minor Arterial cross sections, as well as the Rural Arterial cross sections. These cross sections are typically applied in the less urbanized portions of Erie, where speeds are likely higher. In the case of the Rural Arterial, there is no median separation between travel directions.

Bike Lanes

With the proposed reduction in travel lane widths described above, additional space will be available for wider and more comfortable bike lanes. Erie's current street cross sections include a wide outside lane to accommodate bikes on arterials, and 3- to 4-foot bike lanes on two lane collectors except for the cross section with on-street parking. It is recommended that

a bike lane be striped on roadways to clearly delineate the use of the space by bicyclists and to discourage high vehicular travel



speeds in the outside lane. In most cases, bike lanes will be 5-feet wide (plus the gutter pan). On the 6-Lane Principal Arterial cross section, 6-foot bike lanes (plus the gutter pan) are recommended. The Collector with Raised Median cross section would include 4-foot bike lanes (plus the gutter pan). The wider bike lanes align more with AASHTO and NACTO recommendations and will provide bicyclists using Erie's streets a greater level of comfort.

Sidepaths/Bikeways

Erie's current standard for sidepaths/bikeways on Principal Arterials is 8-feet. To reduce conflict between modes and to accommodate increased activity in the future, it is recommended that the sidepaths/bikeway be expanded to a width of 10-feet.

Minor and Principal Arterial Ultimate Configurations

The current standards include Initial, Intermediate, and Ultimate Phases for Principal Arterials. Because some Principal Arterials may remain as four-lane roads at the ultimate configuration, it is recommended that the Intermediate Phase and Ultimate Phase titles are modified to "4-Lane Principal Arterial" and "6-Lane Principal Arterial," respectively.

The Minor Arterial standards include only Initial and Ultimate configurations. Some Minor Arterials may remain as two-lane roads at the ultimate configuration, but curb and gutter may be appropriate. For this reason, an additional "2-Lane Minor Arterial" cross section with curb and gutter should be considered. The Ultimate Roadway section should be renamed to "4-Lane Minor Arterial."

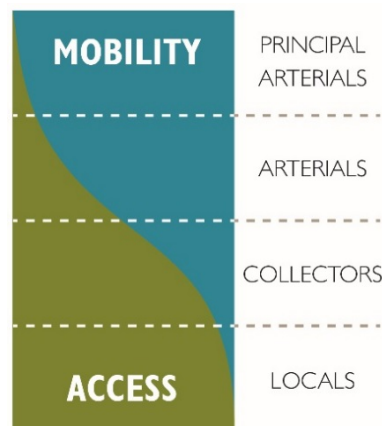
Access Control Policies

To preserve the functional integrity, safety, and capacity of roadways in Erie, it is necessary to establish general access control policy guidelines. Each classification of roadway represents a compromise between the level of mobility (use by through traffic) and access.

Access management minimizes interruptions to traffic flow on major roadways while providing appropriate levels of access for adjacent existing and future development. A proliferation of driveways and residential street intersections decreases the speed and capacity of major roadways, while increasing hazards to motorists and conflicts for bicyclists and pedestrians.

Access Control Policies were developed during the planning process and are found in **Appendix D**. These policy guidelines encourage, to the

maximum extent possible, the provision of direct access to the roadways with lower functional classifications and, to a limited degree, the minor arterial network. For arterials, the priority function is mobility, which means that access to these roads should be limited.



Roundabout Guidelines



Roundabout at Erie Parkway and 119th

With the continued growth and development in the Erie planning area, it is necessary for the Town to have guidelines for the implementation of roundabouts. FHWA and many state departments of transportation have developed roundabout policies to help guide planners and engineers in making appropriate decisions when considering a roundabout intersection.

Roundabout Guidelines have been developed for the Town of Erie and identify the conditions in which a roundabout could be considered, as well as the conditions where a roundabout is likely to be inappropriate. These guidelines should be used as an initial assessment of the applicability of a roundabout; this assessment should be followed by a traffic and safety analysis and conceptual design study to assess the feasibility of a roundabout.

While Erie has a policy for proportioning costs to adjacent development for signaling intersections, signals are now shared equally by four quadrants. A similar process would need to be determined for a roundabout. Appendix D contains the complete Roundabout Guidelines.

Key Considerations for Roundabouts

Safety

Traffic Operations

Bicycle and Pedestrian

Design and Right-of-Way Costs

Figure 15. Roadway Plan

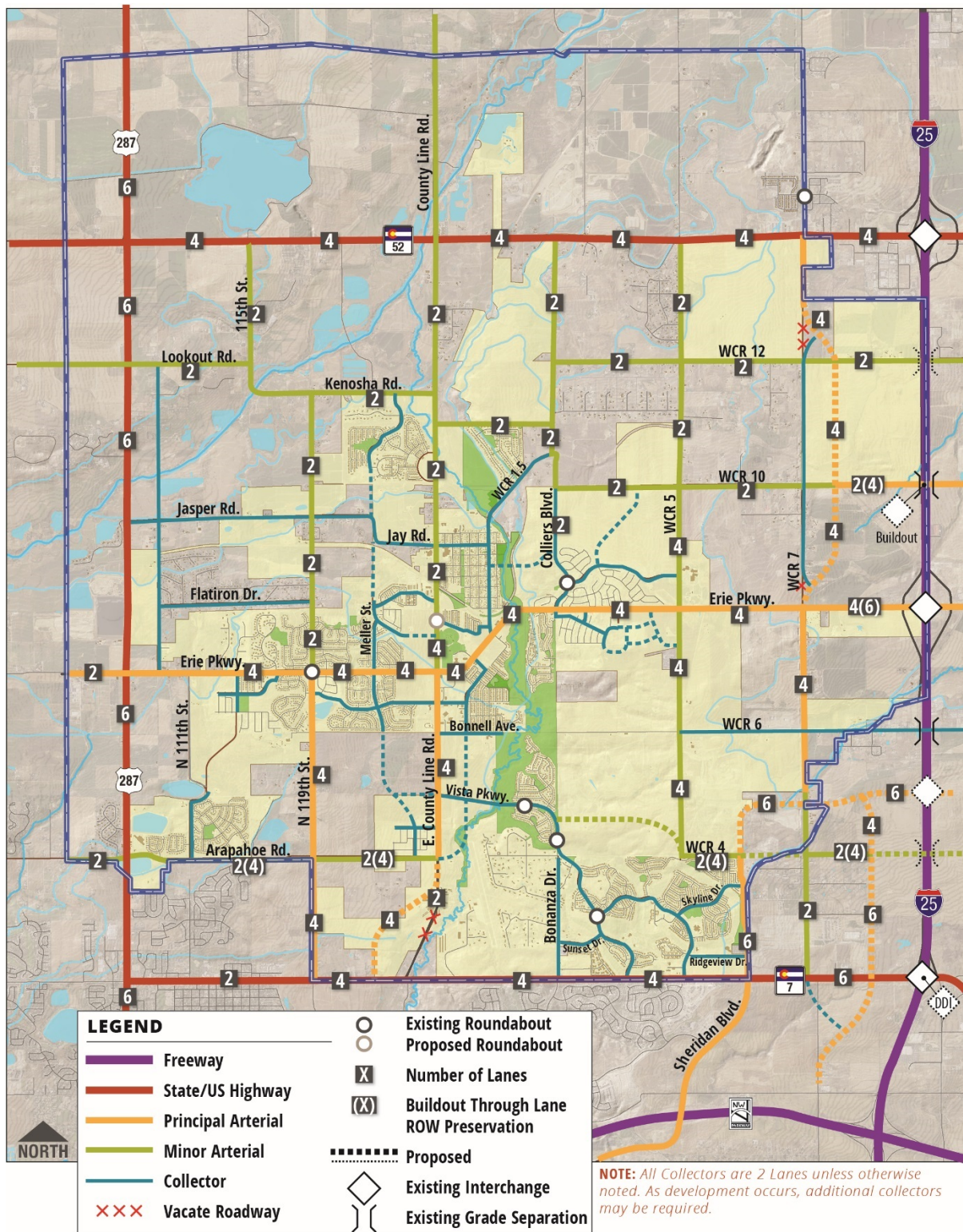


Figure 16. Future Traffic Control

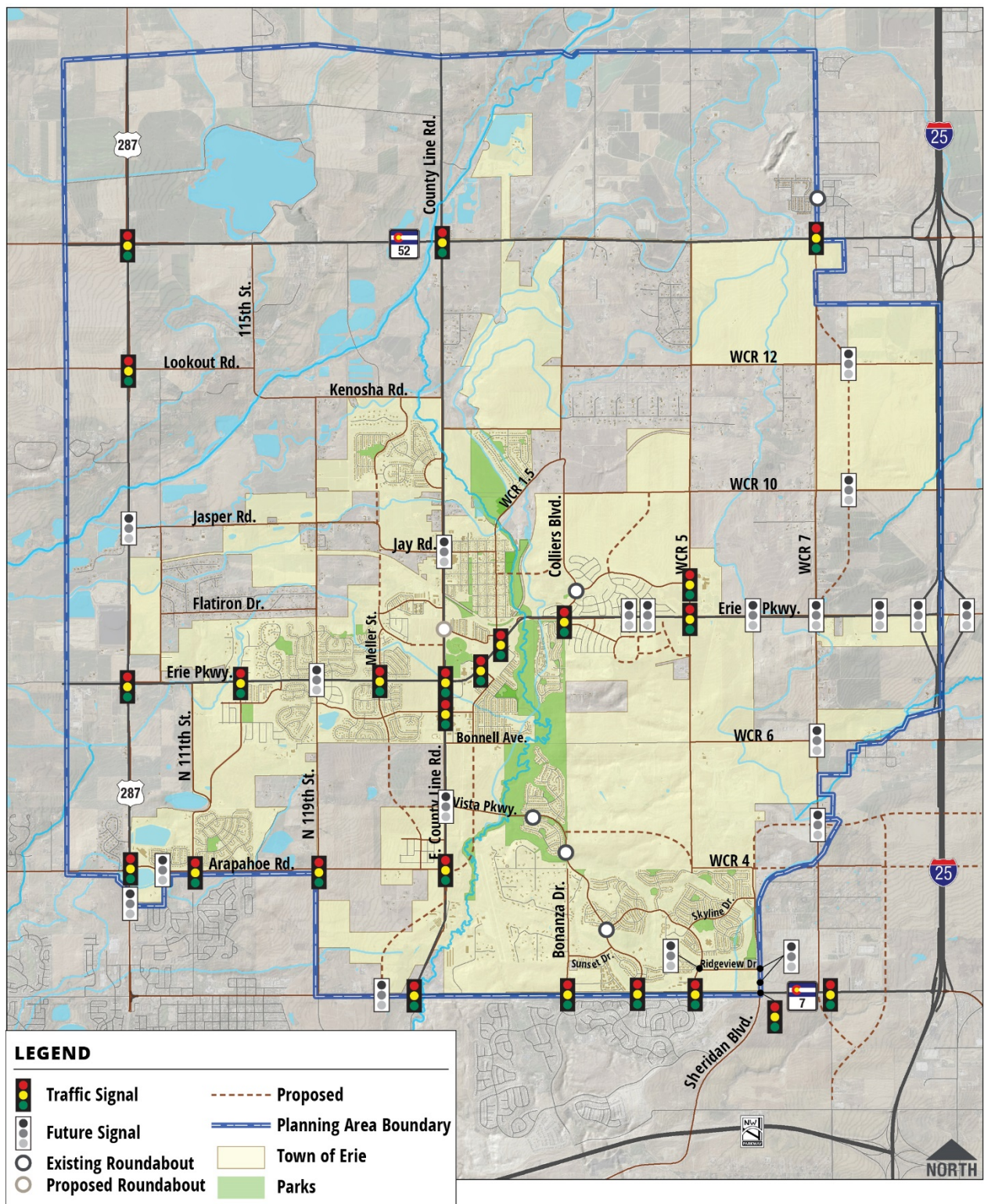
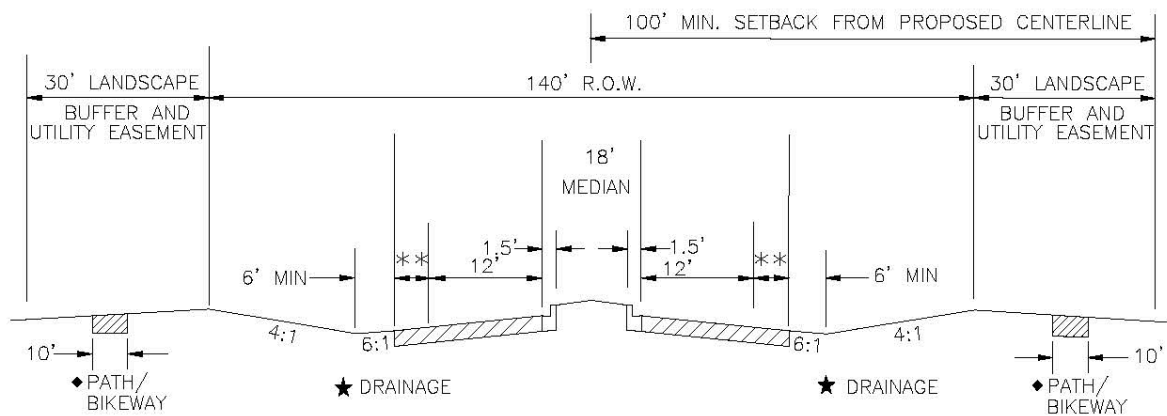


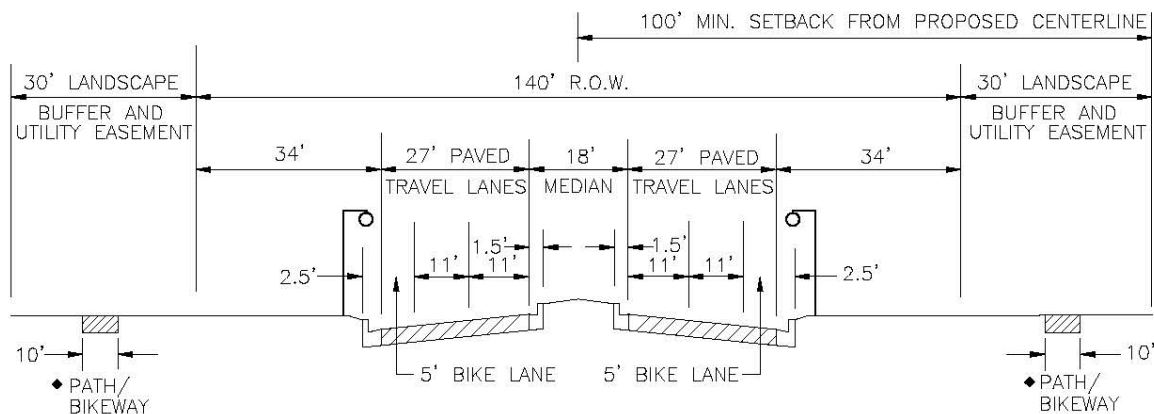
Figure 17. 4-Lane Principal Arterial



INITIAL PHASE

** 6' SHOULDER TO ACCOMMODATE BICYCLES

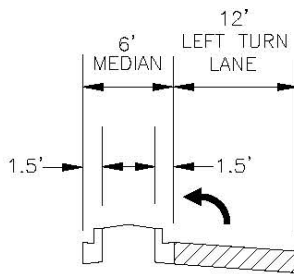
★ DRAINAGE DITCH TO BE ENGINEERED AT CROSS STREETS AND DRIVEWAYS



4-LANE PRINCIPAL ARTERIAL

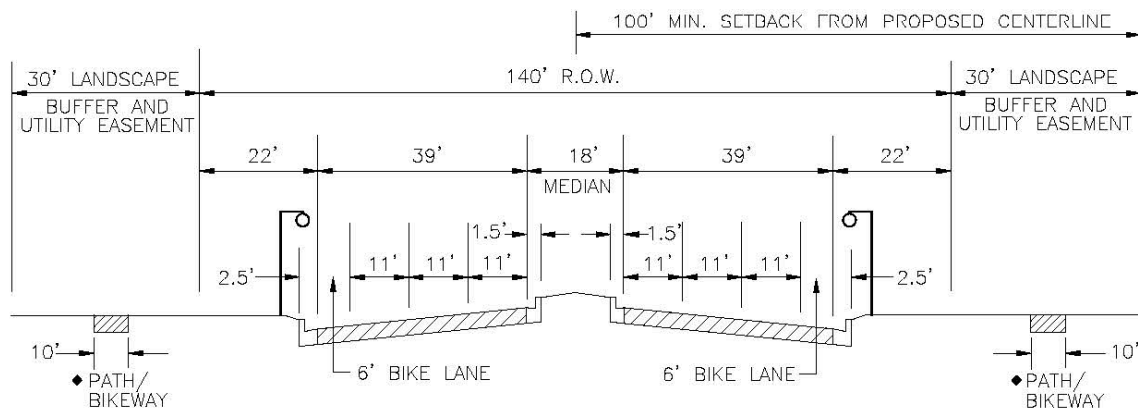
- ◆ PATH MAY BE LOCATED IN LANDSCAPE BUFFER OR WITHIN ROW.
PATH SHOULD MEANDER—SEE PARKS AND RECREATION STANDARDS

Figure 18. 6-Lane Principal Arterial



SEE LANDSCAPE PLANS
FOR MEDIAN TREATMENT

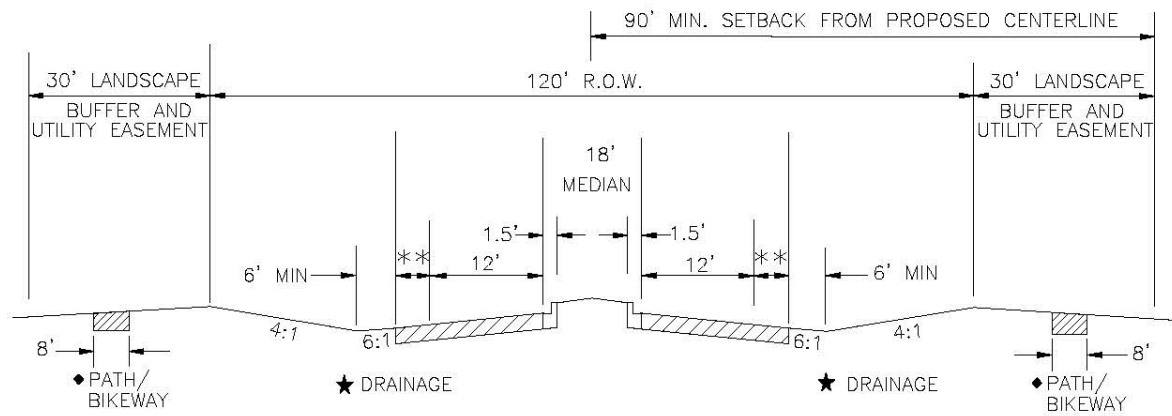
TYPICAL MEDIAN
W/LEFT TURN LANE



6-LANE PRINCIPAL ARTERIAL

- ♦ PATH MAY BE LOCATED IN LANDSCAPE BUFFER OR WITHIN ROW.
PATH SHOULD MEANDER—SEE PARKS AND RECREATION STANDARDS

Figure 19. 2-Lane Minor Arterial

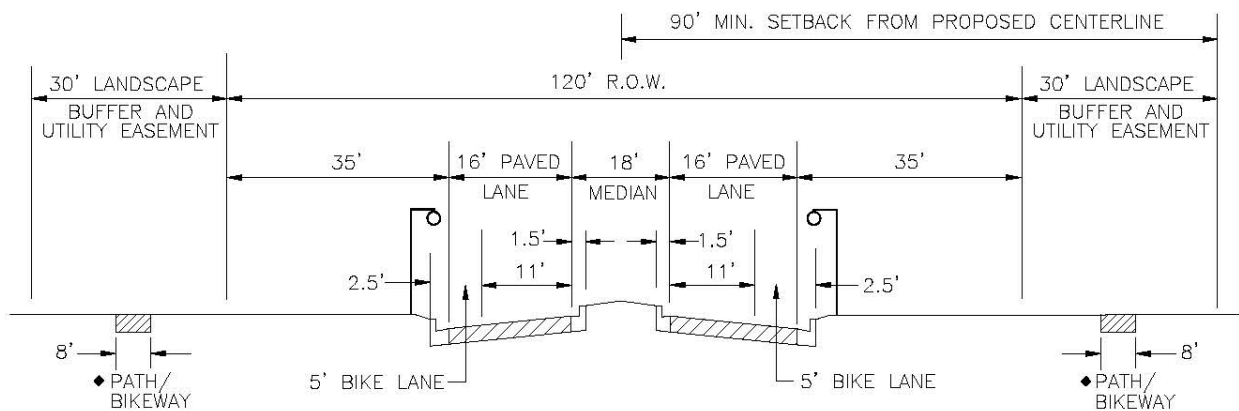


INITIAL PHASE

- ◆ PATH MAY BE LOCATED IN LANDSCAPE BUFFER OR WITHIN ROW.
PATH SHOULD MEANDER—SEE PARKS AND RECREATION STANDARDS

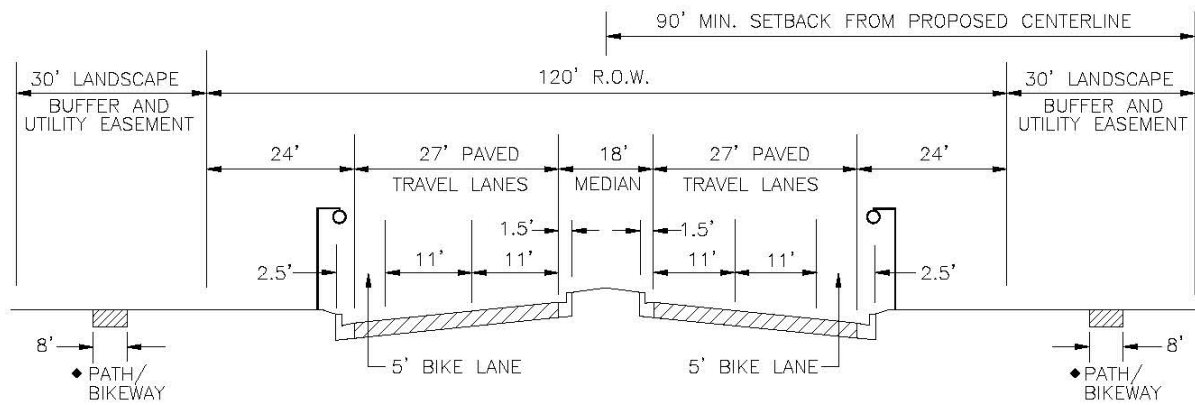
** 6' SHOULDER TO ACCOMMODATE BICYCLES

★ DRAINAGE DITCH TO BE ENGINEERED AT CROSS STREETS AND DRIVEWAYS

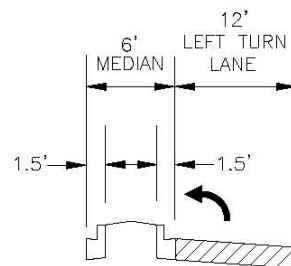


2-LANE MINOR ARTERIAL

Figure 20. 4-Lane Minor Arterial

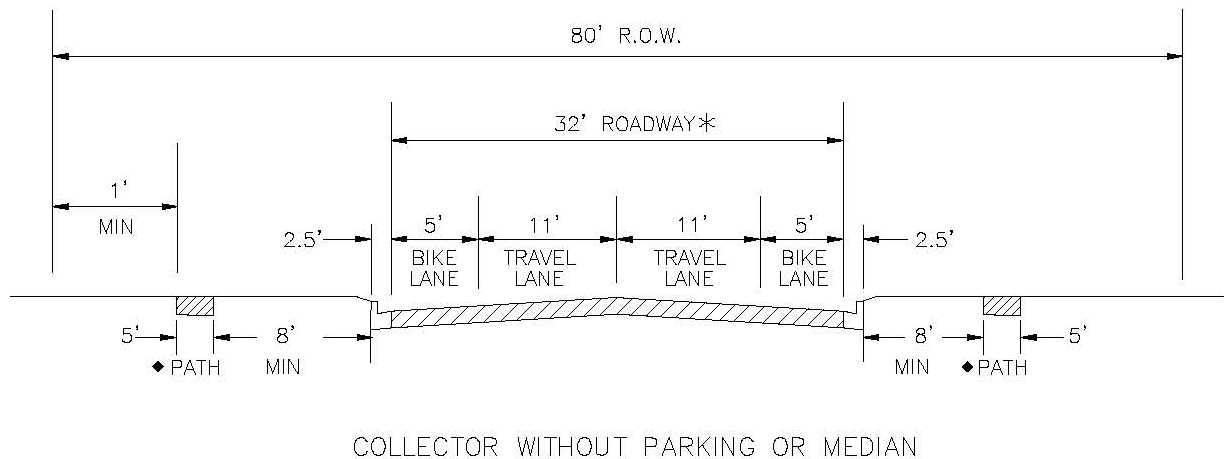


4-LANE MINOR ARTERIAL



TYPICAL MEDIAN W/LEFT TURN LANE

Figure 21. Collector Without Parking or Median



NOTE:
PRIVATE UTILITIES TO BE PLACED OUTSIDE OF THE PUBLIC RIGHT-OF-WAY
*TURN LANES WILL BE REQUIRED AS DETERMINED BY A TRAFFIC STUDY
◆ PATH SHOULD MEANDER—SEE PARKS AND RECREATION STANDARDS

Figure 22. Residential Collector With On-Street Parking

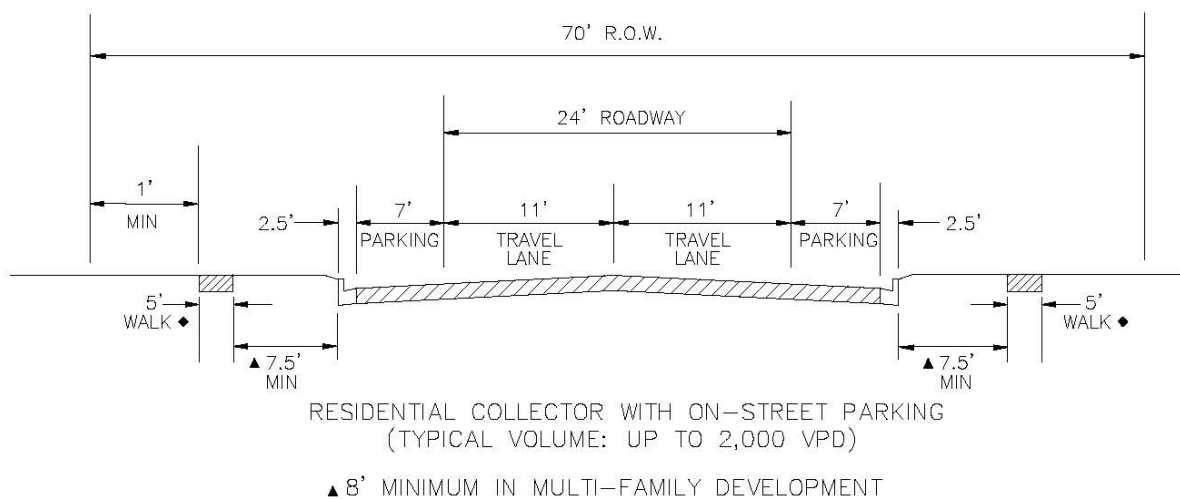
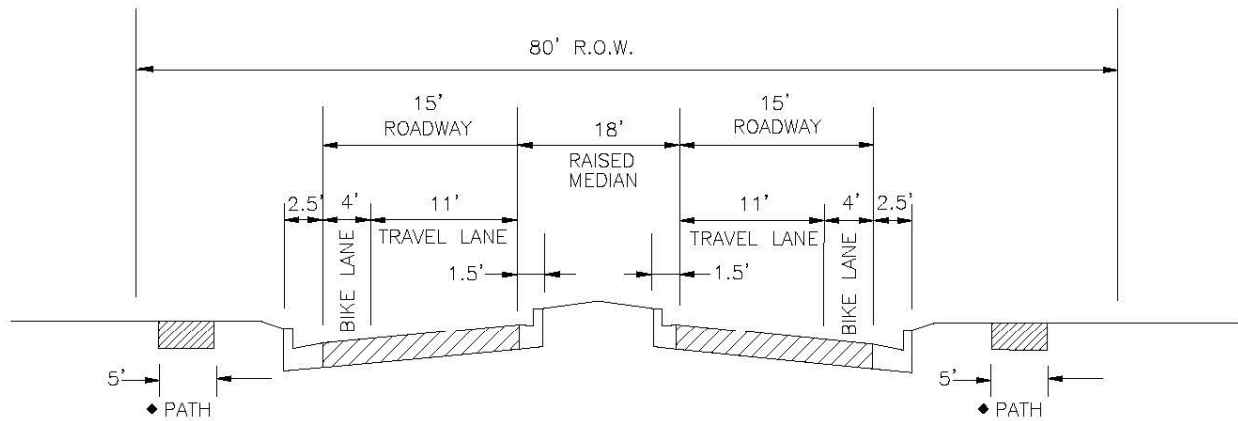


Figure 23. Collector With Raised Median



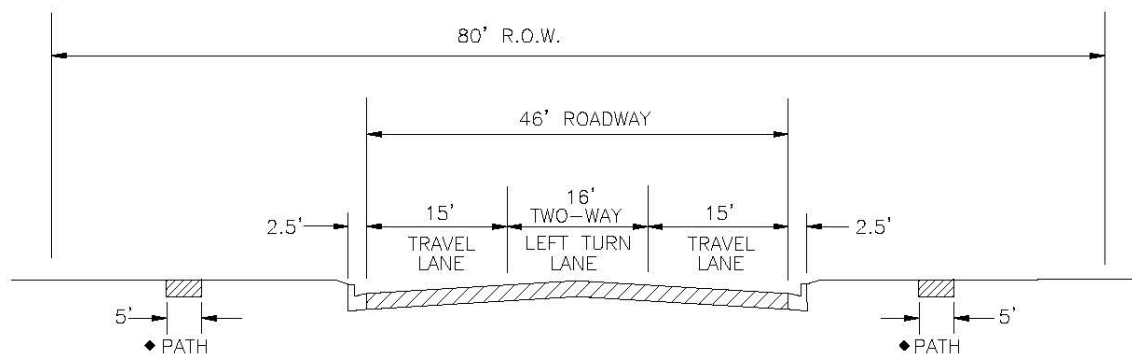
COLLECTOR WITH RAISED MEDIAN

NOTE:

PRIVATE UTILITIES TO BE PLACED OUTSIDE OF THE PUBLIC RIGHT-OF-WAY

- ◆ PATH SHOULD MEANDER—SEE PARKS AND RECREATION STANDARDS

Figure 24. Collector With Flush Median



COLLECTOR WITH FLUSH MEDIAN
(PRIMARILY INTENDED FOR INDUSTRIAL AREAS)

NOTE:

PRIVATE UTILITIES TO BE PLACED OUTSIDE OF THE PUBLIC RIGHT-OF-WAY

- ◆ PATH SHOULD MEANDER—SEE PARKS AND RECREATION STANDARDS

Active Transportation

Accommodating active modes, bicycle, and pedestrian travel is essential to maintaining Erie's quality of life and preparing for future growth. The Town has the opportunity to expand the network of facilities for alternative modes, which will help the Town meet the goals and objectives identified in the Comprehensive Plan and the Transportation Plan.

Pedestrian Plan

The Town's sidewalk and trail systems provide pedestrian travel throughout the Town. Although often overlooked, the pedestrian mode of travel is significant because virtually every trip involves walking at some point.

Pedestrian improvements should focus on two priorities – (1) providing connections between developments and travel modes and (2) establishing pedestrian-friendly areas throughout the Town to improve quality of life with more mobility choices and access to new activity areas to live, work, shop, and play.

The Town of Erie should continue to ensure that adequate pedestrian facilities are built with new development and to address any needed pedestrian infrastructure improvements identified by the community. The Town should continue to monitor pedestrian needs and use funding identified in the CIP to make improvements.

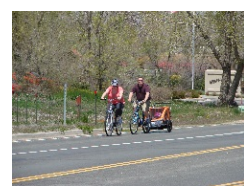
Bicycle Plan

Erie prides itself on its parks, trails, and open space, of which bicycle access is a critical component. Expanding the bicycle network—for recreation and utilitarian purposes—will increase access to amenities and activity centers in the community.

Bicycle accommodation can vary based on users' abilities and their level of comfort in using various types of facilities. Ideally, the transportation system should accommodate all types of bicyclists. The Transportation Research Board Journal No. 2587 places cyclists in four categories as described below.

"Strong & Fearless"

Bicyclists are bicycle enthusiasts who will ride their bicycle for any trip type, with bicycling being their primary commuting mode. Bicycling is part of their identity, and they will ride on nearly any roadway in any conditions.



"Enthusied & Confident"

Bicyclists are encouraged to bicycle by the availability of bicycle facilities. They will occasionally ride in traffic when bicycle facilities are not

present but prefer to ride within their own facility. These riders may not always choose to bicycle but are comfortable doing so in many cases. Investing in additional bicycling infrastructure to improve safety and connectivity will lead to these riders making more bike trips.

"Interested but Concerned"

Bicyclists are typically the largest group of a population. They are interested in biking but are concerned about their safety. They do not like using routes without bicycle facilities because they are nervous about mixing with motorized vehicles. They primarily ride their bicycle for short trips and for recreational reasons. The addition of bicycle facilities that remove them from interacting with motorized vehicles would increase their likelihood of riding.



"No Way, No How" are people who have no interest in bicycling due to immense safety concerns, weather, topography, are unable, and/or simply lack interest.

The Town of Erie’s updated cross sections include wider on-street bike lanes in its typical cross sections for all Principal and Minor Arterials, and many of the Collectors. While the arterial on-street bike lanes provide direct connections in and around the community, they predominantly serve the “strong and fearless” and “enthused and confident” riders; the “interested but concerned” population (which typically accounts for over 50 percent of any rider type) may not be comfortable riding alongside higher traffic volumes and higher speeds associated with arterial streets. To better serve the “interested but concerned” rider group—and accommodate bicyclists of all abilities throughout Erie—the *Bike Network Plan* identifies low-stress bicycle facilities to

Types of Bicycle Riders

4–7% of riders are “Strong and Fearless”

5–9% of riders are “Enthused and Confident”

51–56% of riders are “Interested but Concerned”

31–37% of riders are “No Way, No How”

Source: Transportation Research Board Journal No. 2587

complement the on-street bicycle facilities. Low-stress facilities include multiuse trails and paths and on-street facilities on streets with lower speeds and volumes.

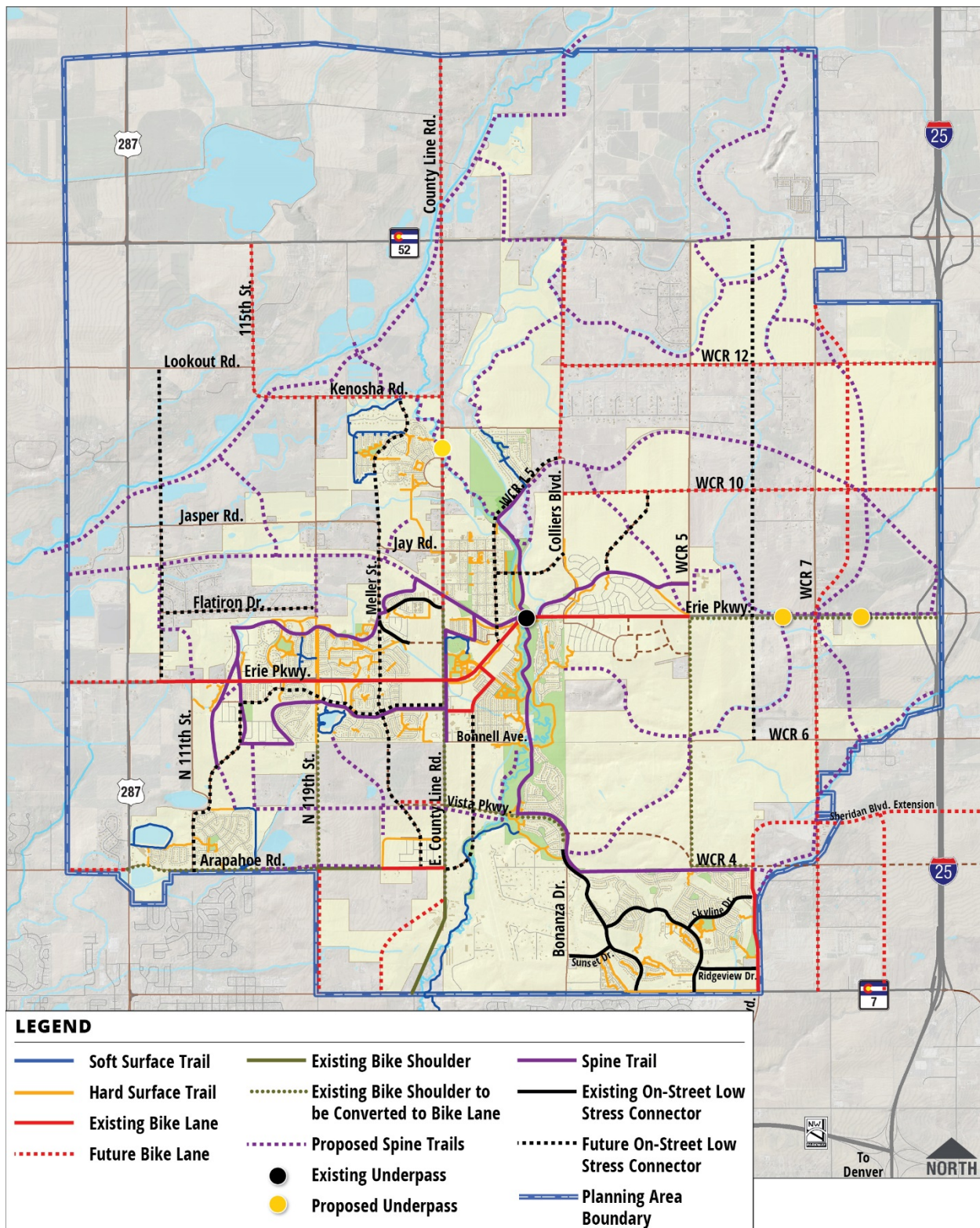
Bike Network Plan

Figure 25 identifies the recommended on-street bicycle network for the Town of Erie. The future network includes:

- ▶ The addition of bicycle lanes when new roads and development come in and with roadway widening projects
- ▶ The conversion of existing bike shoulders to bicycle lanes that meet the standards identified in the recommended typical cross sections
- ▶ On-street low-stress connectors, which can be identified through signage/wayfinding or on-street markings like bike lanes or sharrows
- ▶ Proposed underpass locations on Erie Parkway and County Line Road
- ▶ Existing and proposed spine trails to identify the connectivity between on-street and trail facilities

The implementation plan in **Chapter 7** includes specific projects associated with the Bike Network Plan.

Figure 25. Proposed On-Street Bicycle Facilities



Mobility Hubs

Mobility hubs are locations that provide intermodal connectivity among modes. This Plan identifies “major” and “micro” mobility hubs for the Town of Erie.

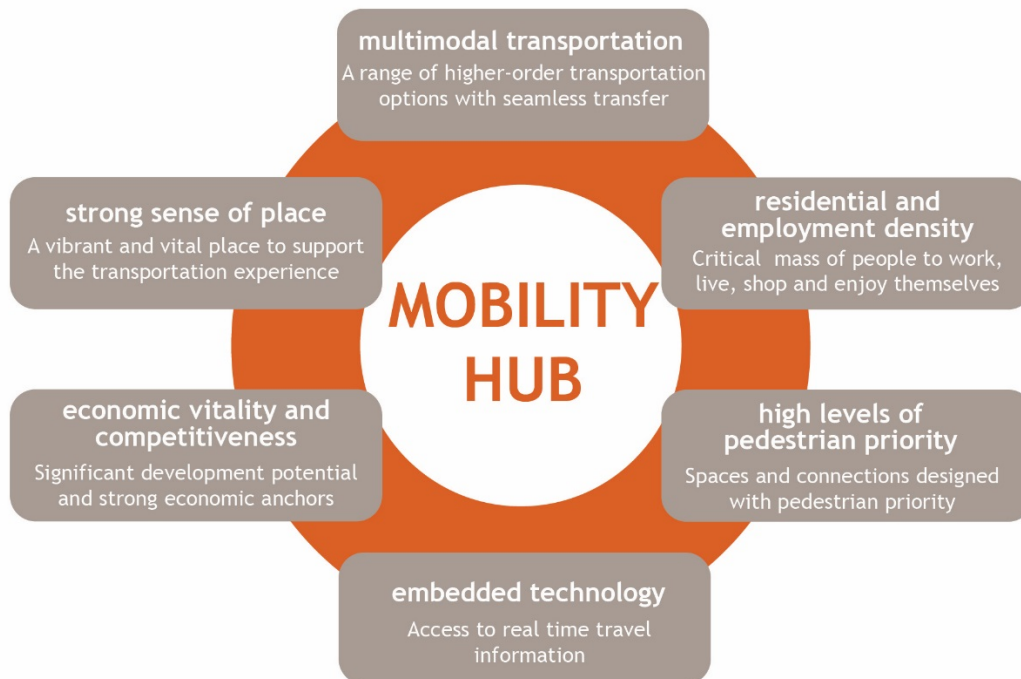
By identifying locations for mobility hubs and micro-mobility hubs in the Transportation Plan, the Town of Erie is proactively positioning itself to ensure that mobility options are well connected. Mobility hubs facilitate easy and efficient movement among modes and are most prevalent where several modes intersect, including things like transit, shared-use mobility, carsharing, and bikesharing. Successful mobility

hubs have adequate bicycle and pedestrian connectivity and often have wayfinding/signage.

What is a Mobility Hub?

Mobility Hubs: These locations include a major transit station area and act as an anchor to the local and regional transportation system.

Micro-Mobility Hubs: These locations are often, but not always, local destinations/ activity centers that may or may not have transit service and are an important connection point within the local transportation system.



Source: Metrolinx (Toronto), Mobility Hub Guidelines, 2011

Mobility hubs have been identified at the following locations:

- ▶ Erie Parkway/I-25
- ▶ SH 7/I-25
- ▶ SH 7/Sheridan Parkway
- ▶ Arapahoe Road/US 287

Micro-mobility hubs have been identified for:

- ▶ Erie Parkway/WCR 7
- ▶ Erie Parkway/WCR 5
- ▶ Erie Parkway/Powers Street



Figure 26 shows the mobility hubs and micro-mobility hubs identified on the Proposed Transit Services map.

Transit Plan

The future transit network identifies services and infrastructure improvements to enhance mobility in Erie. The transit network includes improved local service, the addition of BRT, and the extension of the North Metro Rail Line.

Fixed-Route Bus Service

The plan identifies several local and regional transit projects to improve mobility for those who rely on public transit and commuters who are traveling to work.

Local Transit Recommendations

Because Erie does not operate transit service, the following service recommendations will require coordination with RTD and adjacent cities and counties.

Recommendations

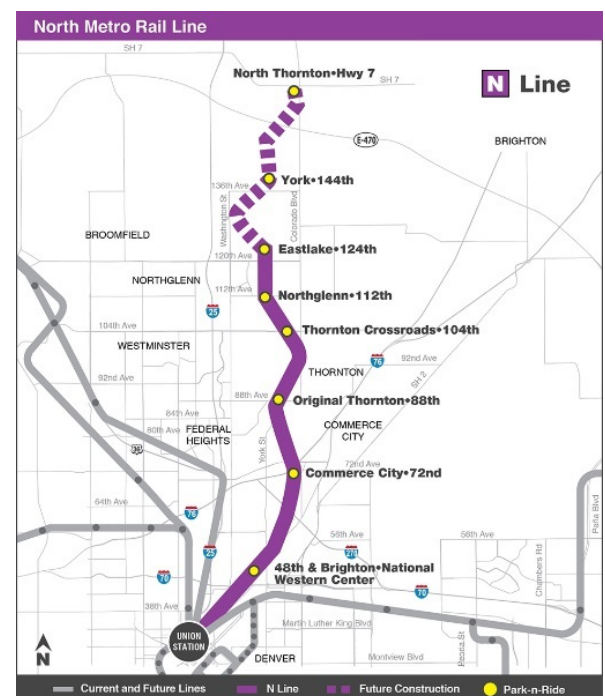
- ▶ Extend JUMP service east to I-25
- ▶ Add bus service from SH 7/I-25 to the Lafayette Park-N-Ride as an interim solution before the implementation of BRT on SH 7
- ▶ Participate in development review processes to ensure accommodation of transit vehicles, amenities, and infrastructure to support new development (e.g., bus stops, bicycle and pedestrian access and connectivity, etc.)

Regional Transit

Like the local transit recommendations, the implementation of new and enhanced regional service will require coordination with RTD, CDOT, and adjacent cities and counties.

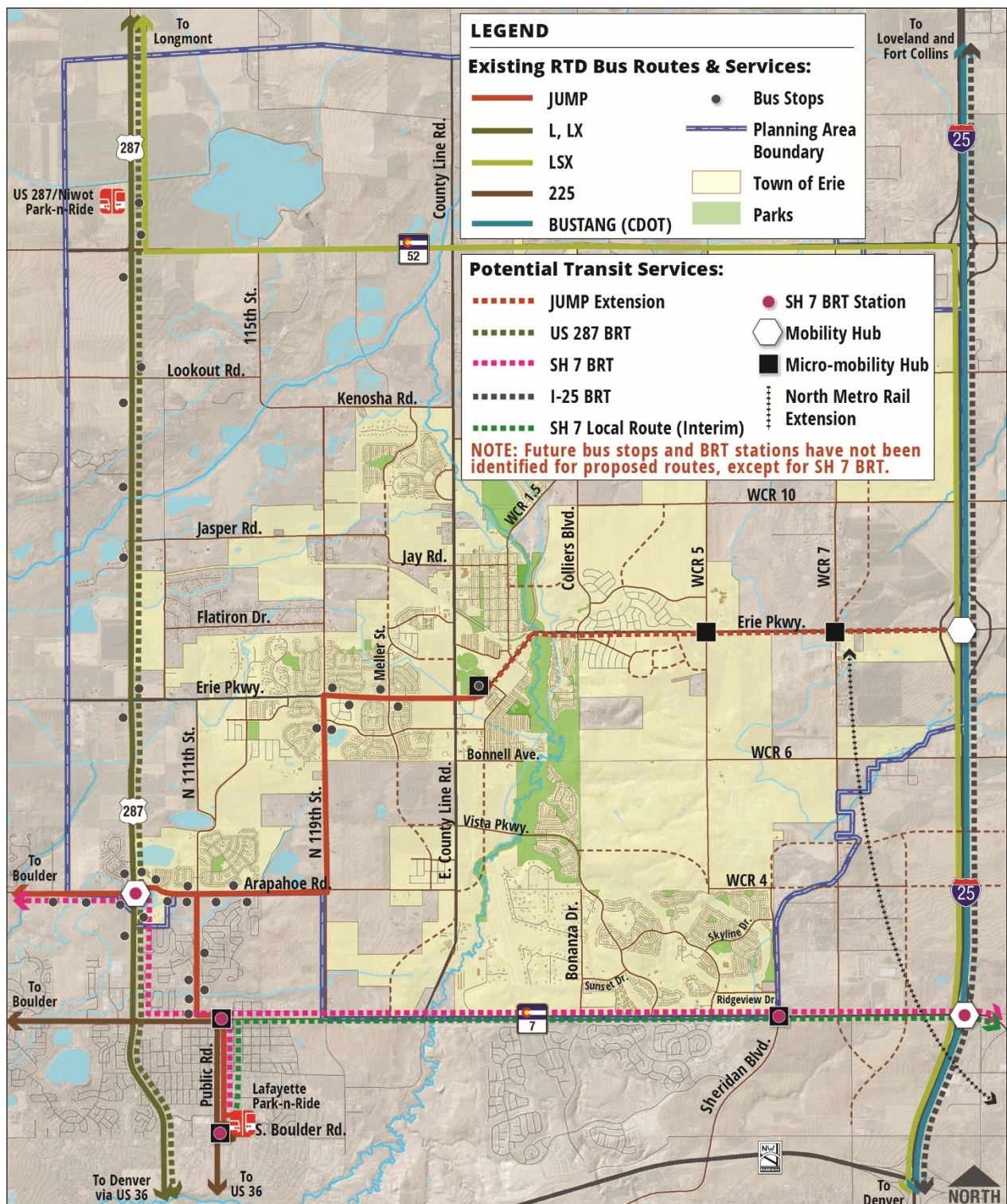
Recommendations

- ▶ Add BRT on SH 7 from I-25 to Boulder, with stations located at Sheridan Blvd/SH 7, Public Road/SH 7, and Arapahoe/US 287 in accordance with the SH 7 BRT Study
- ▶ Add BRT on US 287 connecting Erie with Longmont and US 36
- ▶ Add Express Bus service on I-25 connecting north to Fort Collins and south to Denver Union Station and Transit Station at I-25 and WCR 8
- ▶ Extend North Metro Rail line north of SH 7 west of I-25 into Erie (alignment unknown at this time)



- ▶ Coordinate with CDOT's Division of Transit and Rail on future high-speed rail service along I-25 (the 2014 Interregional Connectivity Study identifies rail from Pueblo to Fort Collins)

Figure 26. Proposed Transit Services



NOTE: Via Mobility Services provides transportation services for Erie Residents.

Connected and Autonomous Vehicles

Connected vehicles (CVs) and autonomous vehicles (AVs) present an uncertain future for communities. These technologies include vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I) communications, and/or AV communications. It is unknown whether key indicators such as VMT, congestion, fuel consumption, and safety will be changed for the positive or negative with the onset of these technologies. Erie should assume that CVs and AVs will be a part of the transportation network and continue to follow local, regional, and national policy trends as they relate to CV and AV use and policies.

Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) represent methods and techniques designed to inform the traveling public and influence behavior change among travelers. ITS can improve mobility by informing motorists about current travel conditions, optimize use of existing infrastructure by advising travelers about available capacity throughout the system, and increase safety by warning about upcoming conditions or through educational campaigns.

This Plan is designed to support further implementation of ITS as opportunities arise and to encourage the Town to adopt new trends and technology as they come forward.

Many potential opportunities for ITS should be considered, including:

- ▶ **Dynamic Signal Coordination** –Dynamic signal coordination can help reduce congestion through a more efficient and interconnected traffic signalization network. This may help Erie reduce congestion at key intersections and along critical corridors by providing additional vehicle capacity on the same roadways without the need for roadway widening. Erie Parkway would be a

candidate corridor for dynamic signal coordination.

- ▶ **Dynamic Signage** –Dynamic signage can help reduce congestion by alerting drivers to existing delays or crashes and provide information about the use of alternative routes. This may help Erie reduce delay experienced by increased peak hour congestion or incidents. Other uses for dynamic signage include the option to alter lane usage during peak periods or to disseminate public information about road closures during events or emergency messages.

Advanced Intelligence/Robotics and Machine Learning

These technologies may change the face of the workforce and could have economic impacts. Erie may consider monitoring zoning requirements to determine if they should be changed over time to evaluate the possibility that lower parking ratios may be beneficial.

Unmanned Aircraft Systems

Unmanned Aircraft Systems (UAS), sometimes referred to as drones, have the potential to change the way goods are delivered, but the industry struggles to balance the potential benefits with safety and privacy concerns. Transportation system impacts could include increased ease and speed of access to goods, possible congestion reductions, and uncertainty related to safety implications (US Department of Education, 2015 OST-R Transportation Technology Scan: A Look Ahead, 2015).

Safety and Infrastructure

As mentioned previously, many impacts of emerging technologies are unknown. This section describes some of the possible impacts these technology innovations may have on safety and infrastructure.

Safety Benefits

Safety of all road users, including bicyclists and pedestrians, may benefit from emerging technologies. This includes using hardware and sensors on vehicles that are intended to help reduce collisions by providing warnings for a range of circumstances, such as blind spot notification or automatic breaking.

Parking/Curb Space Usage

CVs, AVs, and ride sharing services could change the way street frontage is used. Erie should continue to monitor parking and curbside drop-off needs as travel patterns change. It may be necessary to transition on-street parking to curbside drop-off locations as pick-up and drop-off behavior changes.

Electric and Other Alternative Fuel Vehicles

Alternative fuel (especially electric) vehicles are becoming more common due to US Environmental Protection Agency (EPA) provisions designed to reduce US dependence on petroleum by accelerating the introduction of alternative fuel vehicles. Erie should continue to monitor EPA regulations as they consider expansion of Vehicle Charging Stations. The Town may consider using public-private partnerships to establish a network of Vehicle Charging Stations.

Chapter 7. Implementation Plan

The roadway and alternative mode recommendations outlined in this Plan identify strategies and projects that will move the Town toward achieving the goals stated in **Chapter 2**. The intent of this chapter is to provide guidance on the phasing and funding strategies for the Town to implement the Transportation Plan recommendations.

Roadway Plan

The roadway projects have been divided into three-time periods based on input from Town Staff, Board of Trustee members, and the public, and have considered anticipated

development patterns and projected travel demand.

Regional Projects

Several transportation improvement projects from either this planning effort or through previous and ongoing regional planning efforts will require considerable regional coordination.

While these projects, shown in **Table 6**, are important to both the Town's transportation system and the regional transportation system, implementation of these projects will not be the primary responsibility of the Town. The Town will likely partner with the appropriate agencies to support the implementation of these regional projects.

Table 6. Regional Projects

Location	Description	Primary Responsibility
SH 7	Widen from 2 to 4 Lanes – Boulder County Line to Sheridan Pkwy	CDOT, Boulder County
I-25 & WCR 4	New Grade Separation	CDOT
I-25 & WCR 6	New Grade Separation	CDOT
I-25 & WCR 10	New Interchange (at buildout)	CDOT
I-25 & WCR 12	New Grade Separation	CDOT
SH 7	Widen from 2 to 6 Lanes – Sheridan Pkwy to I-25	Broomfield
Sheridan Pkwy	Widen from 2 to 4 Lanes – NW Pkwy to SH 7	Broomfield
Sheridan Pkwy & WCR 7	Signalize Intersection	Broomfield, Erie
US 287	Widen from 4 to 6 Lanes (Within planning area boundary)	CDOT
US 287 & Jasper Road	Signalize Intersection	CDOT, Erie
US 287 & Erie Parkway	Intersection Improvements	CDOT, Boulder County, Erie
SH 52	Widen from 2 to 4 Lanes (within planning area boundary)	CDOT
SH 52 & WCR 7	Signalize Intersection	CDOT, Weld County

Local Projects

Roadway improvement projects identified in the 2040 Roadway Plan fall under five general categories:

- ▶ Paving of currently unpaved roadways
- ▶ Reconstruction of an existing roadway to meet the standard cross section
- ▶ Road widening to accommodate increasing traffic volumes and to meet the standard cross section
- ▶ New road connections or realignments of existing road segments
- ▶ Intersection improvements – signalization or reconstruction of the existing intersection configuration

The typical cross section recommendations identified in **Chapter 5** are multimodal and include the provision of bike lanes and sidewalks on all streets. Therefore, should the Town adopt the updated typical cross sections, the roadway improvement projects described herein will include the design and construction of the associated bicycle and pedestrian facilities.

The roadway projects have been divided into three-time periods based on input from the public, Town staff, and Council members; on anticipated development patterns; and on projected travel demand:

- ▶ Short-term (2017–2021)
- ▶ Mid-term (2022–2030)
- ▶ Long-term (2030–2040)

A limited number of roadways have right-of-way preservation needs beyond 2040. As shown on **Figure 15** in the Roadway Plan, the following locations require right-of-way preservation beyond 2040:

- ▶ Arapahoe from US 287 to E. County Line Road (4-lanes at buildout)

- ▶ WCR 4 from Bonanza Drive to I-25 (4 lanes at buildout)
- ▶ Erie Parkway from WCR 7 to I-25 (6 lanes at buildout)
- ▶ Realigned WCR 7 from Erie Parkway to north of WCR 12 (4 lanes at buildout)

Table 7 lists the projects in terms of general time frames but does not prioritize within each time frame. Where two or more projects may be related (and could be constructed as a package), the appropriate Project ID #s are cross-referenced in the table.

Although funding sources for these projects will vary, **Table 7** also presents planning-level cost estimates for each project. Contributions to these projects may come from the Town, developers, adjacent jurisdictions, state or federal funding, or other funding sources. Much of the needed right-of-way will be obtained from adjacent future development. Funding from Erie may be from the general fund and/or cash in-lieu-of impact fees collected from developers.

Appendix C provides quantities and calculations used to develop the per-mile opinions of probable cost. Cost estimates presented in this plan are in 2017 dollars, are high-level planning estimates, and exclude the costs of right-of-way acquisitions.

Twenty intersections have been identified as likely candidates for signalization in the future. The Town should monitor traffic volumes to determine if/when the intersection warrants signalization. The cost identified for signalization of an intersection is \$300,000.

Table 7. Roadway Projects

Project ID	Roadway	Segment	Description	Length (Miles)	Per-mile Cost	Cost Estimate	Primary Responsibility	Project ID Cross Reference
Short-Term Projects								
1	Colliers Hill Development	Colliers Parkway to WCR 10	New 2-lane extension (collector)	0.8	\$4,684,000	\$3,747,000	Developers	—
2	County Line Road	Telleen Ave north to Cheesman St	Roadway improvements (left turn lane, curb, gutter, sidewalk)	PER CIP	—	\$1,430,000	Erie	9
3	County Line Road	Erie Parkway north to Telleen Ave	Widen from 2 to 4 lanes (minor arterial)	PER CIP	—	\$3,750,000	Erie	EP 7, 19
4	County Line Road	Austin to Erie Pkwy	Widen from 2 to 4 lanes (principal arterial)	PER CIP	—	\$2,093,000	Erie, Developers	EP 7
5	County Line Road	Bonnell Ave to Austin Ave	Widen from 2 to 4 lanes (principal arterial)	PER CIP	—	\$3,500,000	Erie	—
6	Erie Highlands Development	Highlands Dr to Erie Parkway and WCR 5	New 2-lane extensions (collector)	1.3	\$4,684,000	\$6,089,000	Developers	—
EP1*	Erie Parkway	West of US 287 to 109 th St	Reconstruction of Erie Pkwy per Boulder County plans	0.5	—	\$4,900,000	CDOT, Boulder County, Erie	8
EP7*	Erie Parkway	Erie Pkwy & County Line Rd	Intersection enhancements	—	—	\$760,000	Erie	4
EP8*	Erie Parkway	Erie Pkwy & Powers St	Intersection enhancements	—	—	\$68,000	Erie	—
EP9*	Erie Parkway	Erie Pkwy & Briggs St	Intersection enhancements	—	—	\$56,000	Erie	—
EP10*	Erie Parkway	Erie Pkwy Bridge over Coal Creek	Reconstruction of Erie Pkwy, bridge replacement, and trail improvements	PER CIP	—	\$15,110,000	Erie	—

Project ID	Roadway	Segment	Description	Length (Miles)	Per-mile Cost	Cost Estimate	Primary Responsibility	Project ID Cross Reference
EP16*	Erie Parkway	Signalize I-25 ramp intersections	Signalization	—	—	\$650,000	CDOT, Erie, Dacono	—
7	Erie Parkway	Erie Pkwy and WCR 7	Intersection Improvements	PER CIP	—	1,015,000	Erie	EP 13, EP 14, 41
8	Erie Parkway	Erie Pkwy and US 287	Intersection Improvements	PER CIP	—	\$300,000 (<i>Erie contribution only</i>)	Erie, Boulder County, CDOT	EP 1
9	Main Street	County Line Rd	Relocation of intersection at South Main St and County Line Rd	PER CIP	—	\$300,000	Erie	2
10	Moffat Extension	Kattell to Colliers Blvd	New two-lane extension (collector)	PER CIP	—	\$6,000,000	Erie, Developers	—
11	Nine Mile Development	Southeast Corner of Arapahoe and SH 287	Internal roadway development	PER CIP	—	\$2,400,000	Erie, Developers	12, 13
12	Nine Mile Development	US 287 South of Arapahoe (Nine Mile Development)	New signalized full movement interchange	PER CIP	—	\$350,000	Erie, Developers, CDOT	11
13	Nine Mile Development	Arapahoe Rd between US 287 and 111 th (Nine Mile Development)	New signalized full movement intersection	PER CIP	—	\$350,000	Erie, Developers, CDOT	11
14	Sheridan Pkwy	Sheridan Pkwy and Ridgeview Dr	New signalized full movement intersection	PER CIP	—	\$475,000	Erie, Broomfield	—
15	Sheridan Pkwy	Sheridan Pkwy and King Soopers access north of SH 7	New signalized $\frac{3}{4}$ movement intersection	PER CIP	—	\$300,000	Erie, Broomfield	—

Project ID	Roadway	Segment	Description	Length (Miles)	Per-mile Cost	Cost Estimate	Primary Responsibility	Project ID Cross Reference
Mid-Term Projects								
16	115th St	SH 52 to Lookout Rd	Pave 2-lane minor arterial	1	\$9,644,000	\$9,644,000	Boulder County	—
17	119th St	Erie Pkwy to SH 7	Widen from 2 to 4 lanes (principal arterial)	2.5	\$11,804,000	\$29,510,000	Erie, Boulder County	—
18	County Line Road	Erie Pkwy to Bonnell Ave to Arapahoe Rd	Widen from 2 to 4 lanes (principal arterial)	1.5	\$11,804,000	\$17,706,000	Erie, Boulder County, Developers	20
19	County Line Road and Maxwell Ave	—	New single-lane roundabout	—	—	\$1,000,000	Erie, Developers	21
20	County Line Road and Vista Parkway	—	New signalized full movement intersection	—	—	\$300,000	Erie, Developers	18, 27
EP2A*	Erie Parkway	109th St. to Baxter Farm Ln	Reconstruction of Erie Parkway (with only one EB thru lane)	0.5	—	\$11,100,000	Erie	—
EP4*	Erie Parkway	Meadowview Pkwy to Brennan St	Reconstruction of Erie Parkway	0.4	—	\$5,500,000	Erie	—
EP17*	I-25 Interchange	Gateway Intersection improvements	Intersection enhancements, landscaping	—	—	1,300,000	Erie, Dacono	—
21	Jasper Road	Stewart Way to County Line Rd	New 2-lane extension (collector)	0.25	\$4,864,000	\$1,216,000	Erie, Boulder County, Developers	19
22	Jasper Road Extension	Telleen Ave to Jay Rd	New 2-lane extension (collector)	0.5	\$4,864,000	\$2,432,000	Erie, Boulder County, Developers	—
23	Lombardi Street	Allen Ave to Jasper Rd	New 2-lane extension (collector)	0.4	\$4,864,000	\$1,945,600	Erie, Boulder County, Developers	—
24	Mason Street	Bonnell Ave to County Line Rd & Arapahoe Rd intersection	New 2-lane extension (collector)	1.2	\$4,864,000	\$5,837,000	Erie, Developers	—

Project ID	Roadway	Segment	Description	Length (Miles)	Per-mile Cost	Cost Estimate	Primary Responsibility	Project ID Cross Reference
25	Meller Street	Westin Dr to Compass Pkwy	New 2-lane extension (collector)	0.8	\$4,864,000	\$3,891,000	Erie, Boulder County, Developers	—
26	Mountain View Blvd and Ridgeview Dr	—	New signalized full movement intersection	—	—	\$300,000	Erie, Developers	—
27	Vista Parkway	County Line Rd to Meller St	New 2-lane extension (collector)	0.5	\$4,864,000	\$2,432,000	Developers	18
28	WCR 10	Colliers Blvd to I-25	Pave 2-lane minor arterial	3	\$9,644,000	\$28,932,000	Erie, Developers	31
29	WCR 12	WCR 7 to 1-25	Pave 2-lane minor arterial	1	\$9,644,000	\$9,644,000	Erie, Developers	32
30	WCR 7	SH 52 to Erie Pkwy	Realignment/widen from 2 to 4 lanes (principal arterial)	2.5	\$11,804,000	\$29,510,000	Erie, Developers	31, 32
31	WCR 7 and WCR 10	—	New signalized full movement intersection	—	—	\$300,000	Erie, Developers	28
32	WCR 7 and WCR 12	—	New signalized full movement intersection	—	—	\$300,000	Erie, Developers	29
33	WCR 7 and WCR 6	—	New signalized full movement intersection	—	—	\$300,000	Erie, Developers	40, 41
Long-Term Projects								
34	109th Street	Lookout Road to Jasper	Pave 2-lane collector	1.25	\$4,864,000	\$6,080,000	Boulder County, Erie	—
35	County Line Road	Arapahoe Rd to SH 7	Realignment/widen from 2 to 4-lanes (principal arterial)	1.4	\$11,804,000	\$16,525,600	Boulder County, Erie	—
42	County Line Road and SH 7	—	New signalized ¾ movement intersection	—	—	\$300,000	Boulder County, Erie	35

Project ID	Roadway	Segment	Description	Length (Miles)	Per-mile Cost	Cost Estimate	Primary Responsibility	Project ID Cross Reference
36	County Line Road and Jay Road	—	New signalized full movement intersection	—	—	\$300,000	Erie	22
EP2B*	Erie Parkway	US 287 to 111th St	Addition of 2 nd EB thru lane, sidewalk and landscape area	0.4	—	\$4,409,000	Erie	—
EP12*	Erie Parkway	WCR 5 to (new) WCR 5 1/2	Reconstruction of Erie Parkway	0.6	—	\$9,205,000	Developers, Erie	—
EP13*	Erie Parkway	(new) WCR 5 ½ to WCR 7	Reconstruction of Erie Parkway	0.5	—	\$12,584,000	Developers	—
EP14*	Erie Parkway	WCR 7 to (new) WCR 7 1/2	Reconstruction of Erie Parkway	0.5	—	\$14,115,000	Developers	—
EP15*	Erie Parkway	New CR 7 1/2 to I-25 SB ramps	Reconstruction of Erie Parkway	0.5	—	\$11,511,000	Developers	—
37	WCR 4	Vista Pkwy to WCR 5	Pave 2-lane extension (minor arterial)	1	\$9,644,000	\$9,644,000	Erie, Developers	—
38	WCR 4	Sheridan Blvd to WCR 7	New 2-lane extension (minor arterial)	0.5	\$9,644,000	\$4,822,000	Erie, Broomfield	—
39	WCR 5	WCR 10 to WCR 4	Widen from 2 to 4 lanes (minor arterial)	3	\$10,973,000	\$32,919,000	Erie, Developers	—
40	WCR 6	WCR 5 to WCR 7	Pave 2-lane collector	1	\$4,864,000	\$4,864,000	Erie, Developers	—
41	WCR 7	Erie Parkway to Sheridan Blvd	Widen from 2 to 4 lanes (minor arterial)	1.6	\$10,973,000	\$17,557,000	Erie, Broomfield	—

*Project ID correlates to the project IDs identified in the 2017 Erie Parkway Corridor Study; signals are included in reconstruction cost estimates for all Erie Parkway projects.

Figure 28. Mid-Term Roadway Projects

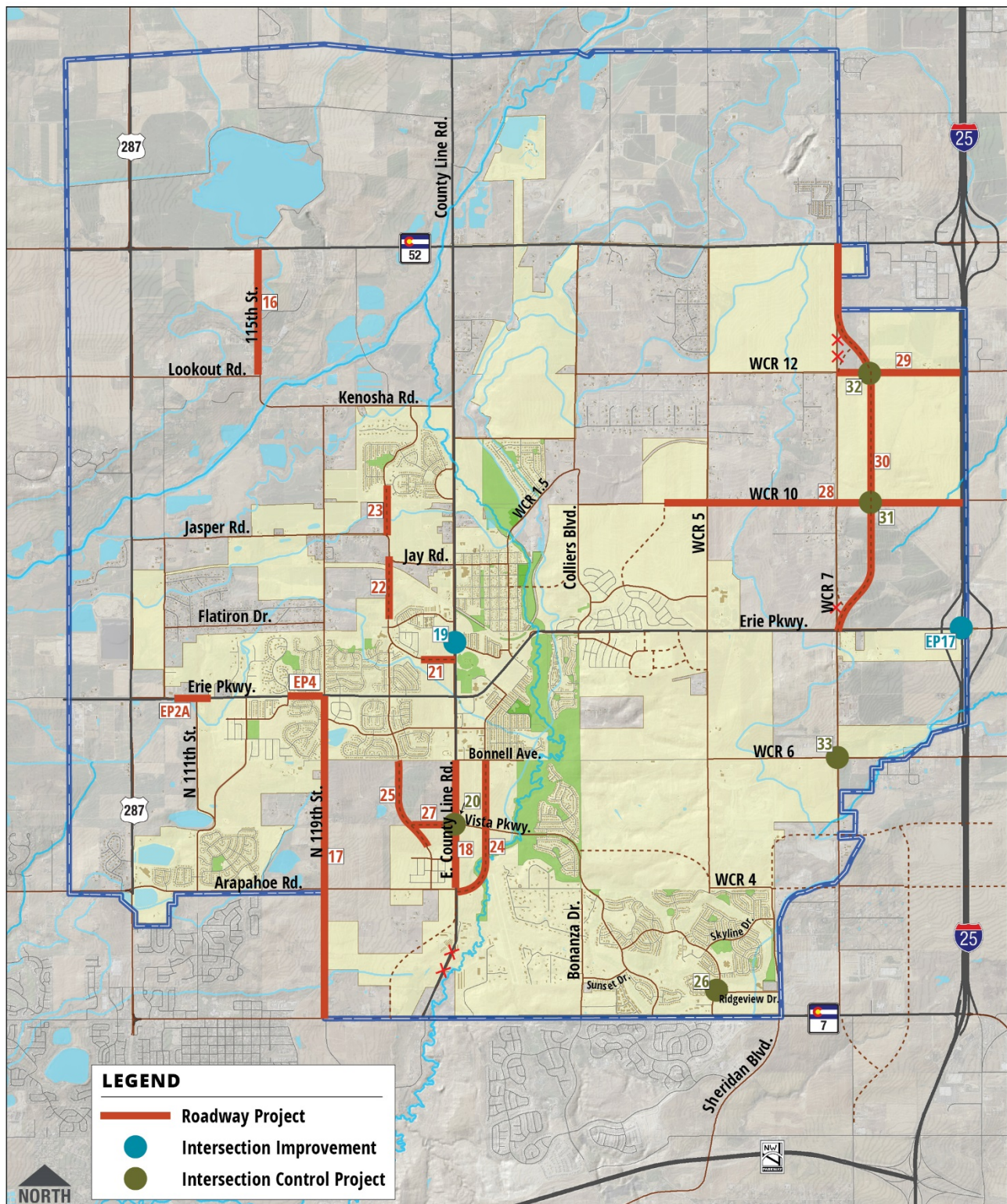
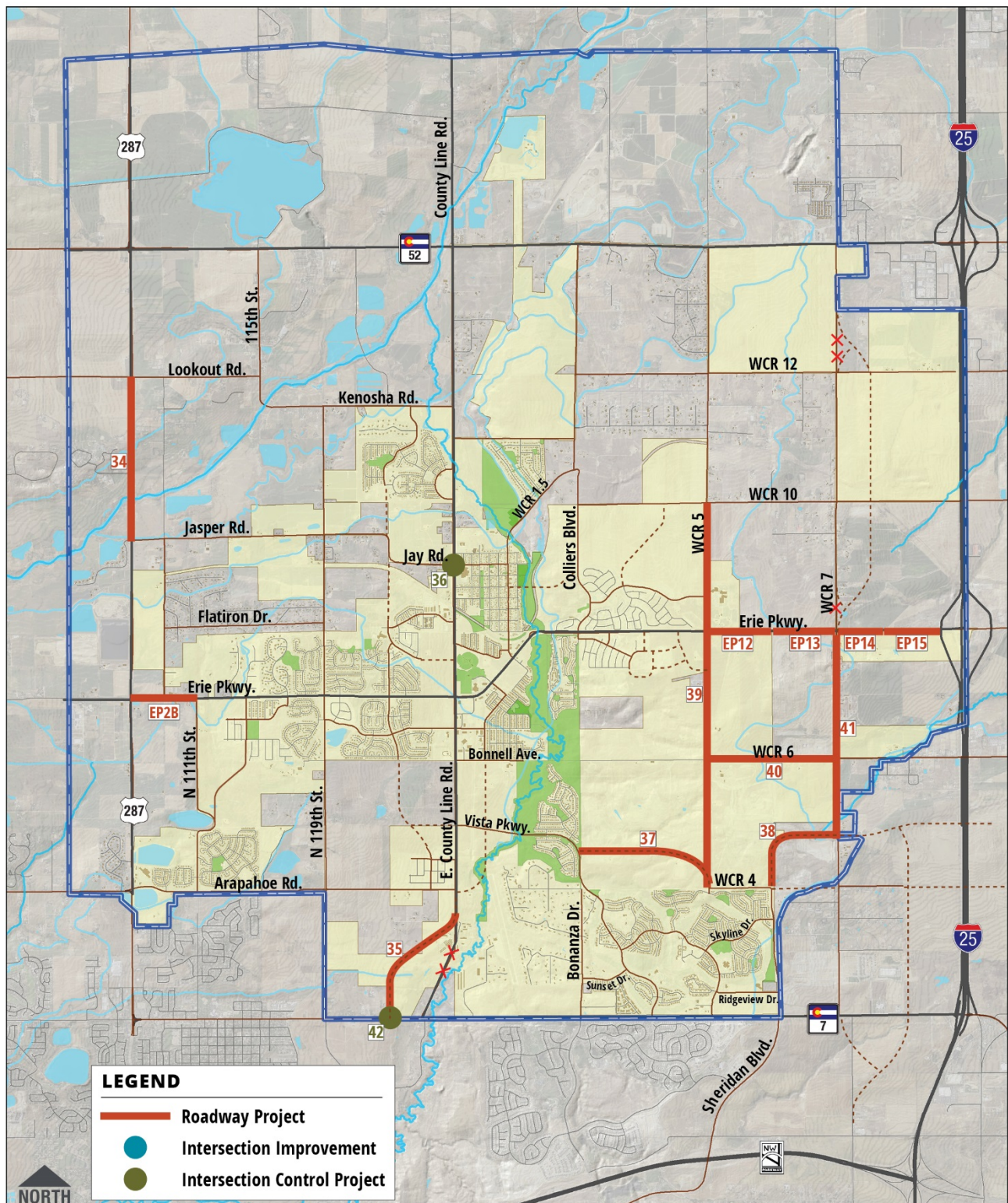


Figure 29. Long-Term Roadway Projects



Bicycle Plan

Creating a bicycle-friendly community will improve quality of life, promote active lifestyles, and provide connectivity to jobs and activity centers.

Many of the bicycle plan projects will be built in conjunction with roadway projects per the typical cross sections. Many projects have been identified that will require additional investment, such as new underpasses and markings for low-stress connectors, but many may be completed as a restriping project with ongoing pavement maintenance projects. Projects that convert existing bike shoulders to striped bike lanes are also recommended.

Bicycle projects from the Erie Parkway Corridor Study have been cross-referenced in the project list for ease of reference. Additionally, it is important to remember that the creation of a comprehensive network will require coordination with the implementation of the PROST Plan and ensuring connectivity between on-street bicycle facilities and the trail network.

Table 9 identifies the key projects required to build a comprehensive network to create a low-stress network. The projects were developed based on the proposed on-street bicycle network shown on **Figure 25**.

Because most of the bicycle projects will be constructed with roadway projects, specific cost estimates have not been developed on a per project basis. For planning purposes, **Table 8** identifies planning level cost estimates to help guide implementation of the bicycle projects. Bicycle projects are shown on **Figure 30**.

Table 8. Planning Level Cost Estimates

Facility Type	Unit Cost	Notes
Pavement Marking Symbols	\$14,000 per mile	Thermal plastic pavement marking symbols; one symbol every 250 feet on both sides (40 symbols per mile)
Bike Lanes	\$95,000 per mile	Restriping only; includes lane lines, sign panels and posts, and pavement markings
Grade Separation (overpass or underpass)	\$3-6 million	Based on location-specific needs

Table 9. Bicycle Projects

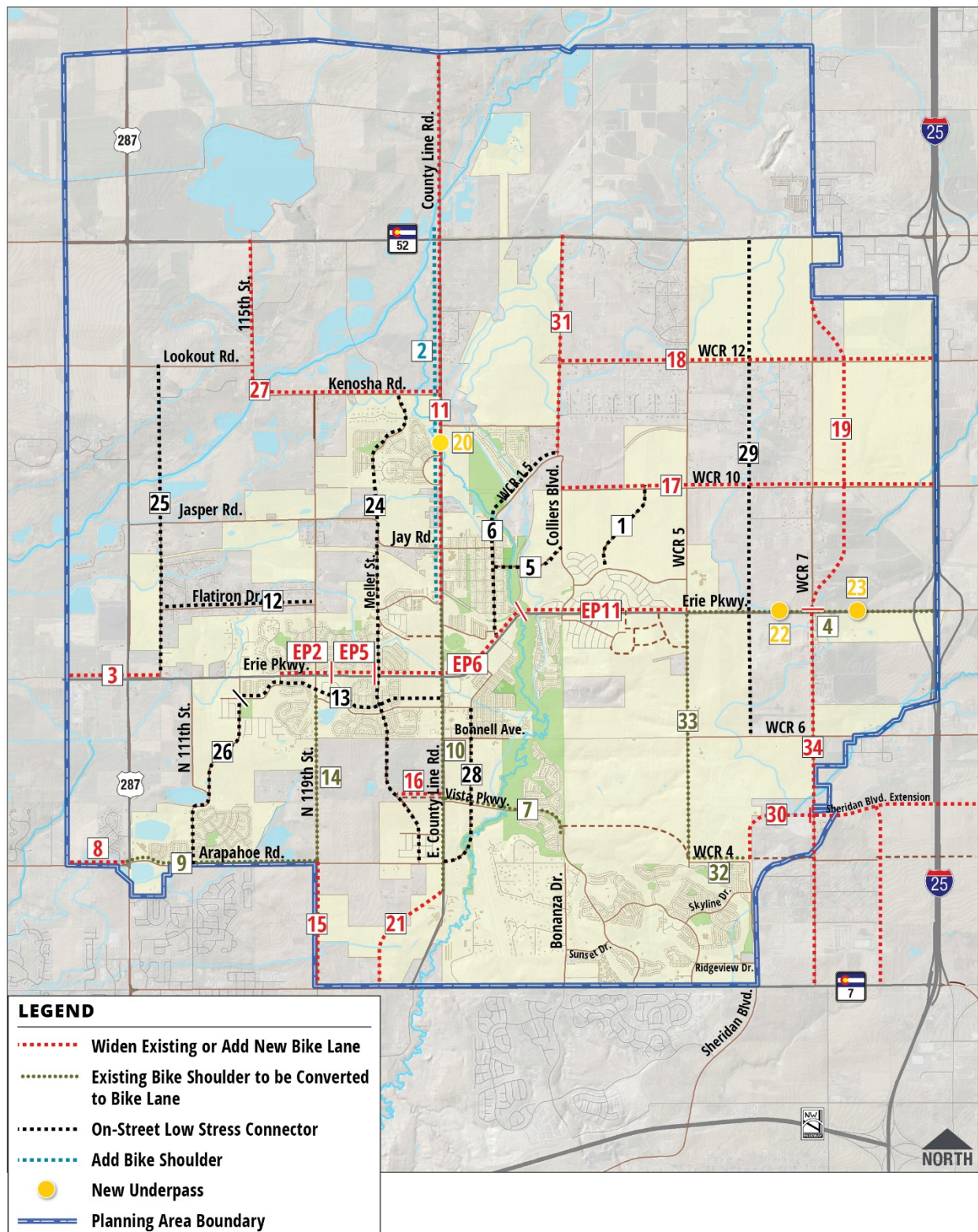
Project ID	Facility	Segment	Type of Facility	Length (Miles)	Roadway Project ID
Short-Term Bicycle Projects					
1	Colliers Hill Development	Colliers Pkwy to WCR 10	On-Street Low Stress Connector	0.8	1
2	County Line Rd	SH 52 to Cheesman	Add 4-foot shoulders	PER CIP	—
EP3*	Erie Pkwy	Baxter Farm Ln to Meadowview Pkwy	Restriping of Erie Parkway to narrow travel lanes and add bike lanes	0.4	—
EP6*	Erie Pkwy	Meller St to Coal Creek Bridge	Restriping of Erie Parkway to narrow travel lanes and widen bike lanes	1.3	—
3	Erie Pkwy	Botany Ln to 109th St	Add bike lane	0.6	EP1, EP2A, EP2B, 8
4	Erie Pkwy	WCR 5 to I-25	Bike shoulder to bike lane conversion	2	EP12, EP13, EP14, EP15
5	Moffat St	Kattell St to Colliers Blvd/ WCR 3	On-Street Low Stress Connector	0.5	10
6	S Briggs St/WCR 1 1/2	Erie Pkwy to Colliers Blvd/ WCR 3	On-Street Low Stress Connector	1.7	—
7	Vista Parkway	County Line Rd to Parkdale Cir	Bike shoulder to bike lane conversion	1.2	—
Mid-Term Bicycle Projects					
8	Arapahoe Rd	Planning Boundary to N 107th St/US 287	Add bike lane	0.5	—
9	Arapahoe Rd	N 107th St/US 287 to N 119th St	Bike shoulder to bike lane conversion	1.6	13
10	County Line Rd	S Main St to Telleen Ave	Bike shoulder to bike lane conversion	2.5	3, 4, 5, 18
11	County Line Rd	Telleen Ave to Planning Boundary/County Rd 16 1/2	Add bike lane	4.4	2, 9

Project ID	Facility	Segment	Type of Facility	Length (Miles)	Roadway Project ID
EP5*	Erie Pkwy	Brennan St to Meller St	Restriping of Erie Pkwy to narrow travel lanes and widen bike lanes	0.4	—
EP11*	Erie Pkwy	Coal Creek Bridge to WCR 5	Restriping of Erie Pkwy to narrow travel lanes and widen bike lanes	1	—
12	Flatiron Dr	N 109 th St to N 119 th St	On-Street Low Stress Connector	1.2	—
13	Meadow Sweet Ln, Austin Ave	Flatiron Meadows Blvd to County Line Rd	On-Street Low Stress Connector	1.8	—
14	N 119th St	Arapahoe Rd to Austin Ave	Bike shoulder to bike lane conversion	1.5	17
15	N 119th St	E Baseline Rd/SH 7 to Arapahoe Rd	Add bike lane	1	17
16	Vista Pkwy	County Line Rd to Meller St	Add bike lane	0.4	27
17	WCR 10	Colliers Blvd to I-25	Add bike lane	3	28
18	WCR 12	WCR 3 to I-25	Add bike lane	3	29
19	WCR 7	Realignment from Erie Pkwy to SH 52	Add bike lane	2.5	30
Long-Term Bicycle Projects					
20	Coal Creek; County Line Rd	CW Bixler Blvd and WCR 10 1/2	New underpass	—	—
21	County Line Rd	S Main St to E Baseline Rd/ SH 7	Add bike lane	1	—
22	Erie Pkwy	Between WCR 7 and I-25	New underpass	-	35
23	Erie Pkwy	WCR 5 and WCR 7	New underpass	-	EP13
24	Meller St	Arapahoe Rd to Kenosha Rd	On-Street Low Stress Connector	4	EP14
25	N 109th St	Erie Pkwy to Lookout Rd	On-Street Low Stress Connector	2.5	22, 23, 25

Project ID	Facility	Segment	Type of Facility	Length (Miles)	Roadway Project ID
26	Flatiron Meadows Blvd	Arapahoe Rd to Meadow Sweet Ln	On-Street Low Stress Connector	1.5	—
27	N 115th St/Kenosha Rd	SH 52 to County Line Rd	Add bike lane	2.7	—
28	New Mason St Connection	Arapahoe Rd to Austin Ave	On-Street Low Stress Connector	1.3	16
29	New WCR 5 1/2	WCR 6 to SH 52	On-Street Low Stress Connector	4	24
30	Sheridan Blvd Extension	WCR 4 to WCR 7	Add bike lane	0.5	39
31	WCR 3	WCR 1 ½ to SH 52	Add bike lane	1.8	—
32	WCR 4	WCR 5 to Sheridan Blvd Extension	Bike shoulder to bike lane conversion	0.5	—
33	WCR 5	WCR 4 to Erie Pkwy	Bike shoulder to bike lane conversion	2	39
34	WCR 7	Erie Pkwy to Sheridan Blvd Extension	Add bike lane	1.7	41

**Project ID correlates to the project IDs identified in the 2017 Erie Parkway Corridor Study*

Figure 30. Bicycle Projects



Pedestrian Plan

The Town of Erie allocates funding each year to design and construct missing sidewalk connections. No specific projects have been defined, but the Town will address needs based on input from the public, desire to close gaps, and locations seeing increased pedestrian demand. Given that the typical cross sections include pedestrian infrastructure, new sidewalks will come with new development.

Moving Transit Forward

As the Town of Erie is not directly responsible for planning, implementing, or operating transit, it will be Important to continue working with partner agencies. This will allow the Town to work toward achieving its multimodal transportation goals. Key steps to move transit forward in Erie include:

- ▶ Participate in regional studies to determine viability of transit service improvements/expansions (e.g., SH 7 BRT Study)
- ▶ Work with Broomfield and RTD to implement an interim transit route to serve Vista Ridge along SH 7 in advance of SH 7 BRT
- ▶ Advocate for the extension of North Metro Rail into Erie with regional partners, especially RTD, and secure needed right-of-way
- ▶ Identify and preserve key locations in Erie to serve as mobility hubs for transit and other shared use mobility services
- ▶ Plan for transit supportive amenities with roadway improvements (e.g., bus shelters, benches, concrete pads)
- ▶ Support land use patterns that provide connectivity to transit

Funding

Like most other municipalities along Colorado's Front Range, Erie faces a challenge of how to fund transportation improvements. Not only are future needs significant in monetary terms, but the Town must consider resident concerns that new development pay for the transportation infrastructure demands it imposes on the community. New development in the Town will generate new vehicle trips and associated new demands on the Town's road system. The impacts of different developments vary from a small number of trips for a single new home to many trips for a major residential subdivision or commercial development. Developers currently must submit traffic impact studies to estimate the number of trips expected to be generated, the expected distribution of those trips onto the surrounding road network, and to identify major road improvements needed to accommodate the traffic. The Town should continue to follow this practice to ensure that appropriate infrastructure is constructed for future development.

The following summarize financing options that the Town of Erie can consider, individually or in combination, to fund these improvements to the major road system to address existing deficiencies or needs created by new development.

Erie Capital Improvement Program –

Much of the funding for improvements to existing roads currently uses transportation impact funds. These funds are limited by the size of the anticipated Town revenues through the annual budgeting process.

Transportation Impact Fees – Impact fees are development exactions, which many local governments use as common devices to impose charges on new development to generate revenues for funding off-site road expansion necessitated by new development. These fees allow developer contributions to be pooled so that road improvements can be implemented community-wide. It is important to regularly update impact fees to keep pace with rising construction costs.

Street Maintenance Fees – A street maintenance fee is a way to recoup a portion of ongoing street maintenance costs by way of a fee paid through residents' utility bills.

Federal/State Funding – CDOT, in coordination with DRCOG, is primarily responsible for state highways. The decision to improve these facilities will be based on state and regional funding considerations. Erie should monitor this process closely and may need to be prepared to provide local matching funds to leverage money on regionally significant corridors. Partnerships between communities and CDOT can be an effective way to pool resources to implement regionally important projects. Funding sources that might be applicable to some of Erie's projects include Transportation Alternatives Program, Congestion Mitigation and Air Quality Improvement Program, and Surface Transportation Improvement Program.

Regional Transportation Authority (RTA) – The Town may join with neighboring communities to develop a transportation funding and implementation district, similar to the Pikes Peak RTA in the Colorado Springs area.

Bond Programs/Borrowing – Erie can use long-term financing programs to allow capital improvements to proceed sooner than would be possible with a "pay-as-you-go" approach. This approach is most common for capital improvements in entities with an expanding tax base. Again, voter approval would be required.

Special Service Districts – Special districts are another option to link specific transportation improvements to funding generated from the development associated with the demand for, or benefitting from, the improvements. Under Colorado law, there are several forms of special service districts. One form, a tax increment district, can be applicable for commercial development. The incremental tax revenues generated by the development are dedicated to either fund public costs to serve the area or to rebate developer-incurred costs expended on public improvements for the project.

Energy and Mineral Impact Assistance Fund – The Colorado Department of Local Affairs Energy and Mineral Impact Assistance Fund provides funds generated from the state's severance tax to assist local governments that are socially and/or economically impacted by the development, processing, or energy conversion of minerals and mineral fuels. The grant can fund various projects, including road improvements, construction/ improvements to recreation centers, and local government planning.

Great Outdoors Colorado (GOCO) – This state funding program uses a portion of lottery proceeds for projects that protect and enhance Colorado's trails and open space.

Appendix A. Summary of Relevant Plans

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Summary of Relevant Plans

Local and regional agencies have completed several plans and studies in the Erie area in recent years. Each plan or study, as listed and summarized below, has been used to varying degrees in the development of the *Erie Transportation Plan*.

Local Plans

Erie Parkway Corridor Study (2017)

The Erie Parkway Corridor Study kicked off in May 2016 to revisit the original vision of the corridor and to define creative multimodal streetscape solutions that will further define this critical corridor spine. The project includes an inventory of multimodal facilities along Erie Parkway, development of character districts, an economic assessment, and creation of a purpose and need. A range of alternatives will be developed and evaluated and a recommended alternative for the corridor will be selected. The resulting document will include conceptual design, cost estimates, and an implementation plan for the recommended alternative for the corridor.

Broomfield Transportation Plan (2017)

The City and County of Broomfield's Transportation Plan was updated in 2016 and identifies several future plans that would require coordination with Erie. Critical components include:

- ▶ Key Corridors
 - Sheridan Boulevard – identifies the extension of Sheridan Boulevard north of SH 7 and east to I-25
 - SH 7 – CDOT is currently completing a Planning and Environmental Linkages (PEL) study to provide a vision for the corridor, which could include Bus Rapid Transit (BRT)
- ▶ Mobility hubs at SH 7 and I-25 and micro-mobility hubs at SH 7/Huron Street and SH 7/Lowell Boulevard
- ▶ Extension of North Metro Rail Line to SH 7 and North Park
- ▶ Additional on-street bicycle facilities and trails that are in, and adjacent to, Erie north of SH 7

Erie Comprehensive Plan (2015)

The Erie Comprehensive Plan emphasizes that the transportation system is to be a multimodal network of roads, bicycle lanes and paths, transit services, and pedestrian facilities that provides a high level of mobility to residents and visitors. In addition to providing multimodal travel options, the plan highlights the importance of intermodalism and the provision of a seamless transportation system that facilitates easy transitions between modes.

The Plan outlined the following goals to guide the development of the transportation system:

- ▶ Ensure that new development patterns are designed to achieve safety, connectivity, and mobility for all transportation modes
- ▶ Promote opportunities for regional transit to connect the Town to regional employment centers

Erie Parks, Recreation, Open Space and Trails Master Plan (2010)

The Town of Erie Board of Trustees adopted the Parks, Recreation, Open Space and Trails (PROST) Plan in March 2010. The Plan provides an integrated vision to guide the development of the Town's parks, recreation, open space and trails facilities, programs and services. The Plan is a companion document to the Town's Comprehensive Plan. The Open Space and Trails vision is: "Conserve and protect open space lands and significant natural resources in and around Erie, and to provide for an extensive network of trails open to all types of non-motorized travel that link neighborhoods to other areas in the community and region." Key goals in the Plan relevant to the Transportation Plan include:

- ▶ Access and connectivity
- ▶ Access to regional trails and neighboring communities
- ▶ Minimization of impact to sensitive natural areas
- ▶ Adequate maintenance and replacement funding
- ▶ Signage and maps
- ▶ Community awareness
- ▶ Adequate funding

Regional Plans

Denver Regional Council of Governments – 2040 Fiscally Constrained Plan

DRCOG's current long-range regional plan, the *2040 Fiscally Constrained Regional Transportation Plan*, defines the vision for the region and identifies transportation projects and services to serve the multimodal transportation system for the next 25 years. The plan identifies portions of Erie Parkway, US 287, and SH 7 as corridors that are expected to experience congestion by 2040. As such, the plan includes widening projects for both Erie Parkway and SH 7.

Northwest Area Mobility Study (Regional Transportation District – August 2014)

The *Northwest Area Mobility Study* (NAMS) identified a prioritized list of mobility improvements—rail and bus rapid transit—for the northwest area of the Regional Transportation District's (RTD) service area.

The study explored several alignments for construction of the Northwest Rail line, as well as the feasibility of extending the FasTracks' North Metro Line to Longmont as an alternative to providing commuter rail service to Longmont via the Northwest Rail.

The Alternative B alignment has a segment that would travel through the Town of Erie and would use the Boulder Branch, formerly owned by the Union Pacific Railroad and now owned by RTD. Alternative B would follow SH 119 out of Longmont, travel to the south and southwest through Boulder County Open space to US 287, parallel US 287 to the Boulder Branch right-of-way and proceed through Erie along the Boulder Branch toward I-25. A second optional alignment was proposed with an 8.5-mile spur into

Boulder. The Alternative B alignments were eliminated during the preliminary environmental assessment due to the number of potential wetland and open space impacts.

The NAMS also identified six candidate arterial BRT corridors. Among these six, US 287 and Arapahoe/SH 7 were included as potential BRT corridors.

- ▶ The US 287 line would connect Longmont to Lafayette and Broomfield along US 287 with limited stop service and could operate as a “bus-on-shoulder.”
- ▶ The Arapahoe/SH 7 line would connect Boulder to Lafayette using Arapahoe Road from the Boulder Transit Center to US 287 and then SH 7 to I-25. This line would be consistent with recommendations from the SH 7 PEL.

SH 7 PEL (2014)

The SH 7 Planning and Environmental Linkages (PEL) study, completed in 2014, identified a Recommended Alternative for transportation improvements to improve safety, reduce existing and future traffic congestions, provide efficient access for existing/future development, and improve multimodal mobility and connectivity along the SH 7 corridor.

The SH 7 PEL Recommended Alternative includes queue jump lanes at major signalized intersections. In addition to transit amenities and treatments, the PEL acknowledged the need to provide strong connections between SH 7 and the future regional transit service along the North Metro commuter rail line and future commuter bus service along I-25.

The Recommended Alternative also included bicycle and pedestrian facilities along the full length of the SH 7 corridor. All signalized intersections are to include at-grade crossing treatments to enhance safety and convenience for bicyclists and pedestrians.

SH 7 Bus Rapid Transit Study (Underway)

The SH 7 BRT Study is currently underway and will be an inclusive process with stakeholder involvement from three counties, six communities, and two CDOT regions. Recent CDOT and RTD studies have identified necessary traffic/travel improvements along the SH 7 corridor between the City of Boulder and the City of Brighton. They have also shown that current projected traffic volumes and expansion plans by communities along the corridor suggest that SH 7 may be a strong candidate for the implementation of BRT service.

The project kicked off in 2016 and will:

- ▶ Consider CDOT's analysis and recommendations for SH 7
- ▶ Investigate the feasibility of BRT on SH 7 and develop a cohesive operations plan for the corridor
- ▶ Conduct a connectivity analysis to other elements of RTD's transit system, including FasTracks lines and regional transit routes

Boulder County Transportation Master Plan (December 2012)

The Boulder County Transportation Master Plan identified SH 7, SH 52, and US 287 as candidates for implementation of various strategies or improvements: bus rapid transit/high frequency bus service, local transit connections, transportation demand management strategies, and intersection



enhancements to improve safety, reduce congestion, and increase convenience for all modes. The study also emphasized the importance of regional trail connections between Boulder and Erie.

North I-25 EIS (2011)

The North I-25 Environmental Impact Statement (EIS) study, led by CDOT, identified a number of options for the segment of the I-25 corridor between Denver and the North Front Range. The preferred alternative would serve the Town of Erie with commuter rail and express bus service, and a carpool lot with 185 parking spaces at I-25 and WCR 8.

The preferred alternative identified an alignment for a potential commuter-rail line connecting Fort Collins, Longmont, and Thornton to Downtown Denver. Express bus service would also connect northern Colorado to Downtown Denver and DIA using the proposed I-25 express lanes. A feeder bus on WCR 8 would connect Erie and Broomfield to the express bus and commuter rail services.

Weld County Transportation Plan (2011)

The Weld County Transportation Plan focused on looking at growth in the county and subsequent impacts and also emphasized the update to the roadway classification plan. The plan focused mainly on the roadway network and provided a set of short-, mid-, and long-range improvements. Most of identified projects are outside Erie, aside from the Highway 52 Access Control Plan. Overarching themes identified in the plan's goals were safety, efficiency, coordination, supportive land use planning, and funding.

Weld County I-25 Parallel Arterial Corridor Study (2003)

This study identified preservation of 140' of right-of-way on either side of I-25 for approximately 24 miles. The study aligns WCR 7 and WCR 7.5 on the west side of I-25 and WCR 9.5 and WCR 11 on the east side. The Board of County Commissioners adopted this study in October 2003.

Appendix B. Public Input Summary

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Public Input Summary

October 18, 2016 Public Meeting

The Town of Erie hosted a joint public meeting at the Erie Community Center on October 18, 2016, to obtain input from the public about their preferences on the Erie Parkway alternatives and to provide comments on the larger transportation network for the Erie Transportation Master Plan. Approximately 40 members of the public attended the event.

Transportation Master Plan materials provided for review by the public included:

- ▶ Project overview
- ▶ Transportation snapshot
- ▶ Existing bicycle and pedestrian facilities
- ▶ Existing transit services
- ▶ Roadway classifications and laneage
- ▶ 2015 volume to capacity ratios
- ▶ Interactive exercise about transportation in Erie today and the vision for the future
- ▶ Planning area roll plot for the public to provide comments

Online Survey

In mid-October 2016, the project team crafted an online survey as an additional tool to collect public input about the packaged alternatives for Erie Parkway and for the Erie Transportation Master Plan. The survey was posted to the Erie Parkway project website and was promoted through the Town's social media outlets and the public meeting announcement press release. The survey has been open for approximately 8 weeks, and a total of 114 community members have participated. The survey questions asked regarding the larger transportation network in the online survey included:

- ▶ What 3 words would you use to describe transportation in Erie today?
- ▶ What 3 words best describe your vision for transportation in Erie in the future?
- ▶ What suggestions do you have on how to improve transportation in Erie?

Summary of Input

[illegible]

Key Themes from Public Meeting

What suggestions do you have on how to improve transportation in Erie?

- ▶ Transit access to Denver, Longmont, Boulder
- ▶ Better bike lanes
- ▶ Limit density and additional building
- ▶ Improve signal timing / maximize flow
- ▶ Additional trails and walking paths
- ▶ Regional bicycle access
- ▶ Encourage use of alternative modes (carpool, transit, etc.)
- ▶ More roundabouts, less signals
- ▶ Plan for growth
- ▶ Add turn arrows to existing signals
- ▶ Improve local transit access
- ▶ Improve flow near Downtown
- ▶ Additional underpasses
- ▶ Develop a multimodal transportation system
- ▶ Transit to the DIA

Appendix C. Cost Estimates

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Erie Transportation Plan

Opinion of Probable Cost

4-Lane Principal Arterial

FHU Ref # 116062-01



Date Prepared: May 12, 2017

Prepared By: E. Stover

length of roadway = 1.00 miles

Project Construction Items	Unit	Quantity	Unit Cost (\$)	Total Cost	
Clearing and Grubbing	LS	1	\$10,000	\$10,000	
Removal of Asphalt	SY	14,080	\$8	\$112,640	
Curb and Gutter (Type 2-IB)	LF	10,560	\$20	\$211,200	
Curb and Gutter (Type 2-IIB)	LF	10,560	\$25	\$264,000	
Hot Mix Asphalt (HMA)	TON	13,686	\$70	\$958,003	
Aggregate Base Course (ABC)	CY	10,885	\$30	\$326,542	
Concrete Sidewalk	SY	11,733	\$50	\$586,667	
Median Landscaped Area	SF	79,200	\$5	\$396,000	
Native Landscaped Area	SF	543,840	\$3	\$1,631,520	
Total accounted construction items				\$4,496,571	(A)
		<u>% Range</u>	<u>% Used</u>		
Project Construction Bid Items (from above)	Project Dependent			\$4,496,571	(A)
Removals	3-5% of (A)	3.00%		\$134,900	(B)
Drainage	5-10% of (A)	6.00%		\$269,800	(C)
Erosion Control	(3-8%) of (A)	4.00%		\$179,870	(D)
Signing and Striping	1-5% of (A)	3.00%		\$134,900	(E)
Lighting	1-5% of (A)	3.00%		\$134,900	(F)
Utilities	8-10% of (A)	8.00%		\$359,730	(G)
Environmental	8-10% of (A)	8.00%		\$359,730	(H)
Construction Traffic Control	5 to 25% of (A)	15.00%		\$674,490	(I)
Mobilization	(4 to 10%) of (A+B+C+D+E+F+G+H+I) Default = 6%	6.00%		\$404,700	(J)
Contingencies	(15% - 30%) of (A+B+C+D+E+F+G+H+I+J)	30.00%		\$2,144,880	(K)
Total of Construction Bid Items	(A+B+C+D+E+F+G+H+I+J+K)			\$9,294,480	(L)
Total Construction Engineering	15% of (L)	15.00%		\$1,394,180	(M)
Total Final Engineering	12% of (L)	12.00%		\$1,115,340	(N)
Total Project Cost	(L+M+N)			\$11,804,000	

1. Unit Costs based on per mile cost estimates from comparable local communities and average CDOT project bids available on CDOT's website.
2. In providing opinions of probable construction cost, the Client understands that Felsburg Holt & Ullevig has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of probable construction costs provided herein are to be made on the basis of our qualifications and experience. FHU makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.



Erie Transportation Plan ●

Opinion of Probable Cost

2-Lane Minor Arterial

FHU Ref # 116062-01



Date Prepared: May 12, 2017

Prepared By: E. Stover

length of roadway = **1.00** miles

Project Construction Items	Unit	Quantity	Unit Cost (\$)	Total Cost	
Clearing and Grubbing	LS	1	\$10,000	\$10,000	
Removal of Asphalt	SY	14,080	\$8	\$112,640	
Curb and Gutter (Type 2-IB)	LF	10,560	\$20	\$211,200	
Curb and Gutter (Type 2-IIB)	LF	10,560	\$25	\$264,000	
Hot Mix Asphalt (HMA)	TON	8,110	\$70	\$567,706	
Aggregate Base Course (ABC)	CY	7,022	\$30	\$210,672	
Concrete Sidewalk	SY	11,733	\$50	\$586,667	
Median Landscaped Area	SF	79,200	\$5	\$396,000	
Native Landscaped Area	SF	438,240	\$3	\$1,314,720	
Total accounted construction items				\$3,673,604	(A)
% Range		% Used			
Project Construction Bid Items (from above)	Project Dependent			\$3,673,604	(A)
Removals	3-5% of (A)		3.00%	\$110,210	(B)
Drainage	5-10% of (A)		6.00%	\$220,420	(C)
Erosion Control	(3-8%) of (A)		4.00%	\$146,950	(D)
Signing and Striping	1-5% of (A)		3.00%	\$110,210	(E)
Lighting	1-5% of (A)		3.00%	\$110,210	(F)
Utilities	8-10% of (A)		8.00%	\$293,890	(G)
Environmental	8-10% of (A)		8.00%	\$293,890	(H)
Construction Traffic Control	5 to 25% of (A)		15.00%	\$551,050	(I)
Mobilization	(4 to 10%) of (A+B+C+D+E+F+G+H+I) Default = 6%		6.00%	\$330,630	(J)
Contingencies	(15% - 30%) of (A+B+C+D+E+F+G+H+I+J)		30.00%	\$1,752,320	(K)
Total of Construction Bid Items	(A+B+C+D+E+F+G+H+I+J+K)			\$7,593,390	(L)
Total Construction Engineering	15% of (L)		15.00%	\$1,139,010	(M)
Total Final Engineering	12% of (L)		12.00%	\$911,210	(N)
Total Project Cost	(L+M+N)			\$9,644,000	

- Unit Costs based on per mile cost estimates from comparable local communities and average CDOT project bids available on CDOT's website.
- In providing opinions of probable construction cost, the Client understands that Felsburg Holt & Ullevig has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of probable construction costs provided herein are to be made on the basis of our qualifications and experience. FHU makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.



Erie Transportation Plan ●

Opinion of Probable Cost

4-Lane Minor Arterial

FHU Ref # 116062-01



Date Prepared: May 12, 2017

Prepared By: E. Stover

length of roadway =				1.00	miles
Project Construction Items	Unit	Quantity	Unit Cost (\$)	Total Cost	
Clearing and Grubbing	LS	1	\$10,000	\$10,000	
Removal of Asphalt	SY	14,080	\$8	\$112,640	
Curb and Gutter (Type 2-IB)	LF	10,560	\$20	\$211,200	
Curb and Gutter (Type 2-IIB)	LF	10,560	\$25	\$264,000	
Hot Mix Asphalt (HMA)	TON	13,686	\$70	\$958,003	
Aggregate Base Course (ABC)	CY	10,885	\$30	\$326,542	
Concrete Sidewalk	SY	11,733	\$50	\$586,667	
Median Landscaped Area	SF	79,200	\$5	\$396,000	
Native Landscaped Area	SF	438,240	\$3	\$1,314,720	
Total accounted construction items				\$4,179,771	(A)
% Range		% Used			
Project Construction Bid Items (from above)	Project Dependent			\$4,179,771	(A)
Removals	3-5% of (A)		3.00%	\$125,400	(B)
Drainage	5-10% of (A)		6.00%	\$250,790	(C)
Erosion Control	(3-8%) of (A)		4.00%	\$167,200	(D)
Signing and Striping	1-5% of (A)		3.00%	\$125,400	(E)
Lighting	1-5% of (A)		3.00%	\$125,400	(F)
Utilities	8-10% of (A)		8.00%	\$334,390	(G)
Environmental	8-10% of (A)		8.00%	\$334,390	(H)
Construction Traffic Control	5 to 25% of (A)		15.00%	\$626,970	(I)
Mobilization	(4 to 10%) of (A+B+C+D+E+F+G+H+I) Default = 6%		6.00%	\$376,190	(J)
Contingencies	(15% - 30%) of (A+B+C+D+E+F+G+H+I+J)		30.00%	\$1,993,780	(K)
Total of Construction Bid Items	(A+B+C+D+E+F+G+H+I+J+K)			\$8,639,690	(L)
Total Construction Engineering	15% of (L)		15.00%	\$1,295,960	(M)
Total Final Engineering	12% of (L)		12.00%	\$1,036,770	(N)
Total Project Cost	(L+M+N)			\$10,973,000	

- Unit Costs based on per mile cost estimates from comparable local communities and average CDOT project bids available on CDOT's website.
- In providing opinions of probable construction cost, the Client understands that Felsburg Holt & Ullevig has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of probable construction costs provided herein are to be made on the basis of our qualifications and experience. FHU makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.



Erie Transportation Plan

Opinion of Probable Cost

Collector without Parking or Median

FHU Ref # 116062-01



Date Prepared: May 12, 2017

Prepared By: E. Stover

length of roadway =			1.00	miles
Project Construction Items	Unit	Quantity	Unit Cost (\$)	Total Cost
Clearing and Grubbing	LS	1	\$10,000	\$10,000
Curb and Gutter (Type 2-IIB)	LF	10,560	\$25	\$264,000
Hot Mix Asphalt (HMA)	TON	8,110	\$70	\$567,706
Aggregate Base Course (ABC)	CY	6,496	\$30	\$194,872
Concrete Sidewalk	SY	5,867	\$50	\$293,333
Native Landscaped Area	SF	174,240	\$3	\$522,720
Total accounted construction items				\$1,852,631
% Range		% Used		
Project Construction Bid Items (from above)	Project Dependent		\$1,852,631	(A)
Removals	3-5% of (A)	3.00%	\$55,580	(B)
Drainage	5-10% of (A)	6.00%	\$111,160	(C)
Erosion Control	(3-8%) of (A)	4.00%	\$74,110	(D)
Signing and Striping	1-5% of (A)	3.00%	\$55,580	(E)
Lighting	1-5% of (A)	3.00%	\$55,580	(F)
Utilities	8-10% of (A)	8.00%	\$148,220	(G)
Environmental	8-10% of (A)	8.00%	\$148,220	(H)
Construction Traffic Control	5 to 25% of (A)	15.00%	\$277,900	(I)
Mobilization	(4 to 10%) of (A+B+C+D+E+F+G+H+I) Default = 6%	6.00%	\$166,740	(J)
Contingencies	(15% - 30%) of (A+B+C+D+E+F+G+H+I+J)	30.00%	\$883,720	(K)
Total of Construction Bid Items	(A+B+C+D+E+F+G+H+I+J+K)		\$3,829,450	(L)
Total Construction Engineering	15% of (L)	15.00%	\$574,420	(M)
Total Final Engineering	12% of (L)	12.00%	\$459,540	(N)
Total Project Cost	(L+M+N)		\$4,864,000	

1. Unit Costs based on per mile cost estimates from comparable local communities and average CDOT project bids available on CDOT's website.

2. In providing opinions of probable construction cost, the Client understands that Felsburg Holt & Ullevig has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinions of probable construction costs provided herein are to be made on the basis of our qualifications and experience. FHU makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

Appendix D. Access Control Policies and Roundabout Guidelines

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Town of Erie Access Control Policies and Roundabout Guidelines

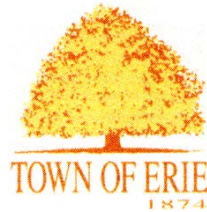


FELSBURG
HOLT &
ULLEVIG

January 2018

TOWN OF ERIE ACCESS CONTROL POLICIES AND ROUNDBOUT GUIDELINES

Prepared for:



645 Holbrook Street
Erie, CO 80516

Prepared by:



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Project Manager: Cady Dawson

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1. Access Control Policies

To preserve the functional integrity, safety, and capacity of roadways in Erie, it is necessary to establish general access control policy guidelines as part of the Transportation Plan. As previously mentioned, each classification of roadway represents a compromise between the level of mobility (use by through traffic) and access. Access management minimizes interruptions to traffic flow on major roadways, while providing appropriate levels of access for adjacent existing and future development. A proliferation of driveways and residential street intersections decreases the speed and capacity of major roadways, while increasing hazards to motorists and conflicts for bicyclists and pedestrians. The purpose of these policy guidelines is to encourage, to the maximum extent possible, the provision of direct access to roadways with lower functional classifications and limit access to the arterial network.

In general, speeds within the community are low (40 mph or less), and this is reflected in modifications to Erie's street standards recommended with the Transportation Plan. During the development review process, Erie should implement these basic access control guidelines through a formal review and approval process based on preparation of a traffic impact study for each development by a qualified traffic engineer. This formal process should give Erie staff the ability to control access along the Town's arterials through a permitting process. Developers would be required to coordinate their access with that of nearby properties so that capacity and safety are maximized, while still accommodating growth.

The purpose of access control is to limit the number of driveways and conflict points, separate conflict points, and separate turning traffic from through traffic. No more than two access points on adjacent streets should be allowed per property, and access should be to collector streets wherever possible. Techniques to limit the number of conflict points include decreasing the number of left turns, using right-in/right-out (RIRO), restricting movements at median openings (for example, a ¾ intersection restricts through and left-turn movements from the minor street); and implementing spacing standards, corner clearance requirements, signal spacing guidelines, and requirements related to the separation of access points.

Table 1 summarizes the recommended intersection spacing guidelines for Erie.

Town of Erie Access Control Policies & Roundabout Guidelines

Table 1. Intersection and Access Spacing Guidelines

Functional Classification	Access Type	Access Spacing	Traffic Control
Principal Arterials	At-Grade Intersections with Raised Medians	½ Mile Preferred	Traffic Signal
	Additional access may be considered subject to justification provided in the traffic study. An analysis demonstrating that arterial progression can be maintained will be required for any proposed signal location of less than ½ mile spacing. Private access shall be limited to one access per parcel and shall generally be restricted to right-turns only. Left-turns in (3/4 movement) may be allowed if operational or safety benefits can be demonstrated. Minimum spacing of unsignalized access shall be 660 feet.		
Minor Arterials	At-Grade Intersections with Raised Medians	½ Mile Preferred ¼ Mile Minimum	Traffic Signal – Typical Stop Signs in special circumstances
	Additional access may be considered subject to justification provided in the traffic study. An analysis demonstrating that arterial progression can be maintained will be required for any proposed full-movement location that could warrant signalization in the future. Private access shall be limited to one access per parcel and shall generally be restricted to right-turns only. Left-turns in (3/4 movement) may be allowed if operational or safety benefits can be demonstrated. Minimum spacing of unsignalized access shall be 650 feet.		
Collectors	At-Grade Intersections	400 Feet Typical	Stop Signs – Typical Signals in special circumstances
	Additional access will be considered subject to recommendations of the traffic study. Access shall be full-movement, unless safety or operational conditions are identified.		
Locals	At-Grade Intersections	150 Feet	Stop Signs
	The function of local roads is to provide access to adjacent properties. Private access will not be restricted.		



Auxiliary Lanes

Turning and through traffic can be separated by using left- and right-turn lanes. Turning lanes should include adequate provision for acceleration or deceleration to minimize friction to through traffic from turning vehicles traveling at slower speeds. The latest edition of Erie's *Standards and Specifications* provides guidance for turning lanes, including the necessary volume warrants and associated geometrics.

Auxiliary lanes provide for the safe acceleration or deceleration of turning traffic on and off roadways. Left- and right-turn auxiliary lane standards have been developed following a comprehensive review of standards used by other jurisdictions throughout the State of Colorado. Right-turn acceleration lane criteria have been developed in a manner consistent with CDOT's State Highway Access Code requirements. **Table 2** summarizes the recommended auxiliary lane criteria. **Table 2** includes proposed modifications to the guidelines found in the Town's *Street Construction Standards and Specifications* (as shown in the attached redlined version of pages 500-11 and 500-12). The updates are to better suit Erie's specific roadway network and circulation patterns.

Table 2. Auxiliary Lane Criteria

Auxiliary Lane			
	Left-Turn Deceleration	Right-Turn Deceleration	Right-Turn Acceleration ¹
Principal Arterial	25 vph/storage (min. 150 ft) + taper	25 vph/storage (min. 150 ft) + taper	50 vph/550 ft accel (including taper)
Minor Arterial	25 vph/storage (min. 100 ft) + taper	50 vph/storage (min. 100 ft) + taper	-
Collector	50 vph/storage (min. 50 ft) + taper	50 vph/storage (min. 50 ft) + taper	-
Taper Ratio			
	Left-Turn Deceleration	Right-Turn Deceleration	Right-Turn Acceleration
Principal Arterial	12:1	12:1	13.5:1
Minor Arterial	12:1	12:1	-
Collector	10:1	10:1	-

Note:

¹ Right-turn acceleration is required on Principal Arterials with a posted speed >40 mph and the roadway has only one lane for through traffic in the direction of the right turn and the minimum volume threshold of 50 vph is met.



Town of Erie Access Control Policies & Roundabout Guidelines

Auxiliary lanes may also be required or could be eliminated under the following scenarios:

- ▶ A right-turn acceleration lane may be required
 - for any access where there is a high traffic volume on the arterial or using the access and there is a lack of acceptable gaps in traffic, and/or
 - where necessary for public safety and traffic operations.
- ▶ A left-turn acceleration lane may be required when unique location factors are present (such as arterial speed and traffic density, access volume, the volume of commercial trucks, the influence of nearby access, existing highway auxiliary lanes close to the access, nearby traffic control devices, available stopping sight distance) and where other topographic and street design factors exist that determine the need.
- ▶ The left-turn deceleration lane may be dropped if the opposing traffic is predicted to be below 100 vph during the design hour.
- ▶ The right-turn deceleration lane may be dropped if the volume in the travel lane is below 150 vph during the design hour.
- ▶ The right-turn acceleration lane may be dropped if the adjacent travel lane is predicted to be below 120 vph during the design hour.

Access Guideline References

Access control policies and guidelines from several municipalities, counties, and state departments of transportation were referenced in preparing the recommended access control policies for the Town of Erie. **Table 3**, **Table 4**, and **Table 5** summarize the signalization/major intersection spacing, left-turn lane requirements, and right-turn lane requirements, respectively.

Table 3. Comparison of Signalization/Major Intersection Spacing Standards

Agency	Principal/Major Arterial	Minor Arterial	Collector
CDOT SHAC	NR-A	NR-B	NR-C
	1/2 mile – 35% efficiency	1/2 mile – 30% efficiency	signal progression
Arapahoe County, CO	1/2 mile / +/- 200'	1/4 mile / +/- 100'	no mention
Bismark, ND	1320 ft	1320 ft	660 ft
Colorado Springs, CO	1/2 mile	no mention	no mention
Douglas County, CO	1/2 mile / +/- 200'	1/4 mile / +/- 100'	330 ft (no mention of signal)
Grand Junction, CO	1/2 mile	1/4 mile	1/4 mile
Greeley, CO	2640 ft	2640 ft	1320 ft
Jefferson County, CO	5280 ft	-	1320 ft
Lakeshore, Ontario		400 meters (1320')	-



Town of Erie Access Control Policies & Roundabout Guidelines

Agency	Principal/Major Arterial	Minor Arterial	Collector
Lakewood, CO	signalized: 1/2 mile unsignalized: 600 ft	signalized: 1/2 mile unsignalized: 300 ft	signalized: 1/2 mile – less based on progression unsignalized: 100 ft
Larimer County, Ft Collins	signalized: 2640 ft unsignalized: 1320 ft	signalized: 2640 ft unsignalized: 1320 ft	N/A
Larimer County, Loveland	signalized: 2640 ft unsignalized: 1320 ft	signalized: 2640 ft unsignalized: 1320 ft	N/A
Longmont, CO	signalized: 1/2 mile unsignalized: 660 ft	signalized: 1/2 mile unsignalized: 660 ft	signalized: 1/2 mile – less based on progression unsignalized: 100 ft
MoDOT	1/2 mi to 1 mile	1/4 mi to 1/2 mile	N/A
Parker, CO	signalized: 1/2 mile unsignalized: 1/4 mile	signalized: 1/2 mile unsignalized: 1/4 mile	signalized: 1/4 mile unsignalized: 1050'
Westminster, CO	1/2 mile / +/- 100'	N/A	N/A
York Regional, Ontario	400 meters (1320 ft) minimum: 215 meters (700 ft)	300 meters (1000 ft) minimum: 215 meters (700 ft)	300 meters (1000 ft) minimum: 215 meters (700 ft))

Table 4. Comparison of Left-Turn Lane Requirements

Agency	Principal/Major Arterial	Minor Arterial	Collector
CDOT SHAC	NR-A	NR-B	NR-C
	10 vph/decel + storage	> 40 mph - 10 vph/decel <= 40 mph - 25 vph/st + taper	> 40 mph - 10 vph / decal <= 40 mph - 25 vph/st + taper
Arapahoe County, CO	NR-B/taper + storage	NR-B/taper + storage	NR-C/taper + storage
Bismark, ND	-	-	-
Colorado Springs, CO	=> 10 vph/decel (taper)	=> 25 vph/decel (taper)	decel (taper)
Douglas County, CO	design speed: 60 mph posted speed: 40 mph min	design speed: 60 mph posted speed: 40 mph min	design speed: 55 mph posted speed: 40 mph min
Grand Junction, CO	vol: 10 to 160 depending on through volume & speed	vol: 10 to 160 depending on through volume and speed	vol: 10 to 160 depending on through volume and speed
Greeley, CO	design speed: 60 mph posted speed: 50 mph decel determined by TIS	design speed: 55 mph posted speed: 45 mph decel determined by TIS	design speed: 45 mph posted speed: 40 mph decel determined by TIS
Jefferson County, CO	decel + storage	decel + storage	decel + storage
Lakeshore, Ontario	-	based on storage length	-
Lakewood, CO	SHAC criteria	SHAC criteria	SHAC criteria



Town of Erie Access Control Policies & Roundabout Guidelines

Agency	Principal/Major Arterial	Minor Arterial	Collector
Larimer County, Ft Collins	=> 20% of approach volume or >100 vph	=> 20% of approach volume or >100 vph	=> 20% of approach volume or >100 vph
Larimer County, Loveland	=> 20% of approach volume or >100 vph decel (taper) + storage	=> 20% of approach volume or >100 vph decel (taper) + storage	=> 20% of approach volume or >100 vph decel (taper) + storage
Longmont, CO	Yes decel(taper) + storage	Yes decel(taper) + storage	meets conditions taper + storage
MoDOT	-	-	-
Parker, CO	NR-A	NR-B	NR-C
Westminster, CO	SHAC criteria	NA	SHAC criteria
York Regional, Ontario	-	-	-

Table 5. Requirements for Right-Turn Lane Requirements

Agency	Principal/Major Arterial	Minor Arterial	Collector
CDOT SHAC	NR-A	NR-B	NR-C
	25 vph/decel + storage	> 40 mph - 25 vph/decal ≤ 40 mph - 50 vph/st + taper	> 40 mph - 25 vph/decel ≤ 40 mph - 50 vph/st + taper
Arapahoe County, CO	NR-B / taper + storage	NR-B / taper + storage	NR-C / taper + storage
Bismark, ND	-	-	-
Colorado Springs, CO	=> 25 vph/decel (taper)	=> 50 vph/decel (taper)	decel (taper)
Douglas County, CO	design speed: 60 mph posted speed: 40 mph min	design speed: 55 mph posted Speed: 40 mph min	-
Grand Junction, CO	vol: 20 to 200 depending on through volume and speed	vol: 20 to 200 depending on through volume and speed	vol: 20 to 200 depending on through volume and speed
Greeley, CO	design speed: 60 mph posted speed: 50 mph decel determined by TIS	design speed: 55 mph posted Speed: 45 mph decel determined by TIS	design speed: 45 mph posted Speed: 40 mph decel determined by TIS
Jefferson County, CO	decel	decel	decel
Lakeshore, Ontario	-	-	-
Lakewood, CO	20 vph/>40 mph	25 vph/≤ 40 mph	25 vph/≤ 40 mph
Larimer County / Ft Collins	40-50 vph depending on vol and speed decel (taper)	40-50 vph depending on vol and speed decel (taper)	40-120 vph depending on vol and speed decel (taper)
Larimer County / Loveland	40-50 vph depending on vol & speed decel (taper)	40-50 vph depending On vol and speed decel (taper)	40-120 vph depending on vol & speed decel (taper)



Town of Erie Access Control Policies & Roundabout Guidelines

Agency	Principal/Major Arterial	Minor Arterial	Collector
Longmont, CO	10-50 vph depending on vol	10-50 vph depending on vol	10-50 vph depending on vol
MoDOT	-	-	-
Parker, CO	NR-A	NR-B	NR-C
Westminster, CO	SHAC criteria	NA	SHAC criteria
York Regional, Ontario	-	-	-

2. Town of Erie Roundabout Guidelines

Roundabout Guidelines

The Federal Highway Administration (FHWA) and many state departments of transportation have developed roundabout policies to help guide planners and engineers in making appropriate decisions when considering a roundabout intersection.

Tradeoffs and Considerations

Safety

Safety benefits are the primary attractiveness of roundabouts compared to signalized intersections. Roundabouts provide an overall reduction in vehicle speed, eliminate dangerous situations (such as running a red-light), and remove some of the most serious conflicts including angle, left-turn, and head-on crashes. Generally, the most common type of crash at roundabouts is sideswipe-same direction. Single-lane roundabouts generally offer greater safety benefits than multilane roundabouts due to fewer points of conflict. The decision to install a roundabout as a safety improvement should be based on a demonstrated safety problem of the type susceptible to correction by a roundabout.

Traffic Operations

Roundabouts work best with balanced flows; a heavy left turn movement, for example, may result in blocking entrance to the roundabout for other approaches. Roundabouts delay and deflect all traffic entering the intersection and could introduce new delay or speed inconsistencies to flow along a major corridor. Roundabouts eliminate the opportunity to control (synchronize) the flow of traffic along a major corridor. A traffic operations analysis should be used to compare existing and future traffic operations with a roundabout compared to a traditional intersection treatment (signalized or unsignalized).

Roundabouts have the benefit of slowing traffic (traffic calming). Installation of a roundabout may necessitate additional design modifications to slow drivers in advance of the intersection. These can include geometric design features such as extended splitter islands and introducing horizontal curvature on high-speed approaches to slow drivers.

Bicycle and Pedestrian

Pedestrians are accommodated along the outside perimeter of roundabouts. Typical roundabout designs include a splitter island which allows pedestrians to cross one direction of traffic at a time in a shorter distance, which simplifies the crossing and improves safety. Roundabouts have been documented to reduce serious injury and fatal crashes involving pedestrians due to low operating speeds; but there remains a considerable perceived safety concern for pedestrians and issues with drivers failing to yield to pedestrians at roundabouts.



Bicyclists are typically accommodated at roundabouts by either taking the full circulating lane or by accessing the sidewalk typically by a ramp prior to the roundabout and navigating the roundabout as a pedestrian. Although roundabouts do not provide documented safety benefits to bicyclists, the slow operational speeds of roundabouts are consistent with bicycle speeds, reducing the speed differential between modes.

Design and Right-of-Way (ROW)

Roundabouts can be effective where there are more than four approaches, where the intersection is oddly shaped, or there are other poor geometric conditions. Roundabouts can be designed to consider immediate and future traffic demands. The design should consider phasing of the roundabout so that it can be built initially as a single-lane roundabout with later expansion to a multilane roundabout when the traffic volumes increase. The landscaping in the center island for a roundabout can be designed to create an entry statement. The ROW required for a roundabout (particularly a multi-lane roundabout) is typically larger than would be required for a signalized intersection.

Costs

Roundabouts involve significant initial costs due to large amounts of landscaping in the central and splitter islands, extensive signing and lighting, and the provision of curbs on all outside pavement edges. Operation and maintenance costs of roundabouts are typically less than signalized intersections. Traffic signals consume electricity and require periodic service (e.g., bulb replacement, detector replacement, and periodic signal re-timing). Operating costs for a roundabout are generally limited to the cost of illumination (similar to signalized alternatives but typically more than is required for other unsignalized intersections). Maintenance includes regular re-striping and re-paving as necessary, as well as snow removal and storage in cold climates (these costs are also incurred by conventional intersections). Landscaping may require regular maintenance as well, including such things as pruning, mowing, and irrigation system maintenance. The cost of maintaining traffic during construction tends to be relatively high for retrofitting or expanding roundabouts. This expense is due mainly to the measures required to maintain existing traffic flow through the intersection while rebuilding it in stages.

Erie has a policy for proportioning costs to adjacent development for signalizing intersections; signals are now shared equally by four quadrants. A similar process would need to be determined for a roundabout.

The roundabout guidelines in **Table 6** depict the conditions in which a roundabout could be considered as well as the conditions where a roundabout is likely to be inappropriate. These guidelines should be used as an initial assessment of the applicability of a roundabout; this assessment should be followed by a traffic and safety analysis and conceptual design study to assess the feasibility of a roundabout.

Table 6. Roundabout Guidelines

Condition	Appropriate for Roundabout Consideration	Inappropriate for Roundabout Consideration
Intersections with historic safety problems	✓	
Intersections with relatively balanced traffic volumes	✓	
Intersections with a high percentage of turning movements	✓	
Intersections where a community enhancement is desired	✓	
Intersections where widening an approach may be difficult or cost-prohibitive	✓	
Locations where the speed environment changes	✓	
Locations with a transition between land use environments	✓	
Roads with a historic problem of excessive speeds	✓	
Intersections with more than four approach legs	✓	
Intersections in close proximity to a signalized intersection where queues may spill back into the roundabout		✓
Intersections located within a coordinated arterial signal system		✓
Intersections with a heavy flow of through traffic on the major street opposed by relatively light traffic on the minor street		✓
Locations with steep grades or unfavorable topography that may limit visibility		✓
Intersections with heavy bicycle and/or pedestrian volumes		✓

Resources

There are two key roundabout documents used in the transportation industry for the evaluation, design, construction, and maintenance of roundabouts.

Roundabouts: An Informational Guide, Second Edition, NCHRP Report 672, Federal Highway Administration, 2010.

A publication of National Cooperative of Highway Research Professionals with funding support from FHWA. This report updates FHWA's *Roundabouts: An Informational Guide* based on experience gained in the United States since that guide was published in 2000. The report addresses the planning, design, construction, maintenance, and operation of roundabouts. It also includes information that is useful in explaining to the public the trade-offs associated with roundabouts.

Roundabouts: An Informational Guide, Federal Highway Administration, 2000.

This publication is the original roundabout guide developed by FHWA in 2000. The Guide is based on established international and U.S. practices and was supplemented by research. The guide is comprehensive in recognition of the diverse needs of transportation professionals and the public for introductory material through design detail, as well as the wide range of potential applications of roundabout intersections.

References

Roundabouts: An Informational Guide, Second Edition, NCHRP Report 672, Federal Highway Administration, 2010.

Roundabout Evaluation and Design: A Site Selection Procedure, Illinois Center for Transportation, July 2009.

TOWN STREET CONSTRUCTION

521.03.07 Intersection Plateau

The profile of the major highway generally takes precedence over the minor cross street. This results in a hump for the cross street profile which is particularly undesirable for signalized intersections where the cross street traffic may enter the intersections without stopping. In some instances the designer may determine that the cross street should receive the same profile considerations as the major highway due to similar traffic demands. To provide this "equal treatment", with respect to profile, a technique commonly known as intersection plateauing is applied. Plateauing refers to the transitioning of the roadway profiles and cross slopes at the approaches of an intersection.

521.03.08 Cross Slope

The rate of change in pavement cross slope, when warping side streets at intersections, shall not exceed one (1) percent every twenty five (25) feet horizontally on local streets/roads, one (1) percent every thirty seven and one half (37.5) feet horizontally on collector streets/roads, or one (1) percent every fifty six and one half (56.5) feet horizontally on arterial streets/roads to ensure public travel safe transition.

521.03.09 Auxiliary Lanes

Auxiliary lanes provide for the safe acceleration or deceleration of turning traffic on and off roadways and help reduce the accident potential of turning vehicles. All auxiliary lane requirements are based on ~~the Colorado Department of Transportation's (CDOT) State Highway Access Code and~~ the Town's Street Design Criteria found in Table 500-3 at the end of Section 500.

Right-turn Deceleration Lane

	Minimum Right-Turns to Require Deceleration Lane (vph)	Deceleration Lane and STORAGE Taper Length (ft)	Taper Rate
Principal Arterial (CDOT NR-A)	25	Storage (min 100') 435 + taper	13.5:1 12:1
Minor Arterial (CDOT NR-B)	25 30	Storage (min 100') 370 + taper	12:1
Collector (CDOT NR-C)	50	Storage 310 (min 30) + taper	10:1

TOWN STREET CONSTRUCTION

Left-turn Deceleration Lane

	Minimum Left-Turns to Require Deceleration Lane (vph)	STORAGE AND Deceleration Lane Including Taper Length (ft)	Taper Rate
Principal Arterial (CDOT NR-A)	10 25	435 + Storage + Taper (min 150')	13.5:1 12:1
Minor Arterial (CDOT NR-B)	10 25	Storage + Taper (min 100')	12:1
Collector (CDOT NR-C)	25 30	Storage + Taper (min 50')	10:1

Storage Lengths

Turning Vehicles Per Hour	< 30	30-59	60-99	100-199	200-299	>300
Storage Length (ft)	25	40	50	100	200	300

Right-turn Acceleration Lane

	Minimum Right-Turns to Require Acceleration Lane (vph) ¹	Acceleration Lane Including Taper Length (ft)	Taper Rate
Principal Arterial (CDOT NR-A)	50	550	13.5:1
Minor Arterial (CDOT NR-B)	N/A	--	--
Collector (CDOT NR-C)	N/A	--	--

¹ Right turn acceleration is required on Principal Arterials with a posted speed > 40 mph and the roadway has only one lane for through traffic in the direction of the right turn and the minimum threshold of 50 vph is met.

Where half streets are allowed, sufficient additional right of way will be dedicated and additional width will be constructed to allow sufficient paved width to accommodate two directions of traffic and emergency parking by offsetting the geometric cross section.

523.00 Structural Sections

523.01 Structural Sections for Streets

Structural sections for streets shall be composite sections of base and asphalt.

Structural sections for streets shall be designed by a qualified soils engineer based on the Equivalent (18 Kip) Daily Load Applications (EDLA) for a twenty (20) year service life and the subgrade support analysis. The soils analysis shall be performed in accordance with AASHTO standard methods of surveying and sampling Soils. The field investigation shall consist of boring subgrade soils to a depth of at least four feet below proposed subgrade elevation (nine (9) feet below proposed subgrade on arterial roadways), at spacing of not more than two hundred fifty (250) feet, or a

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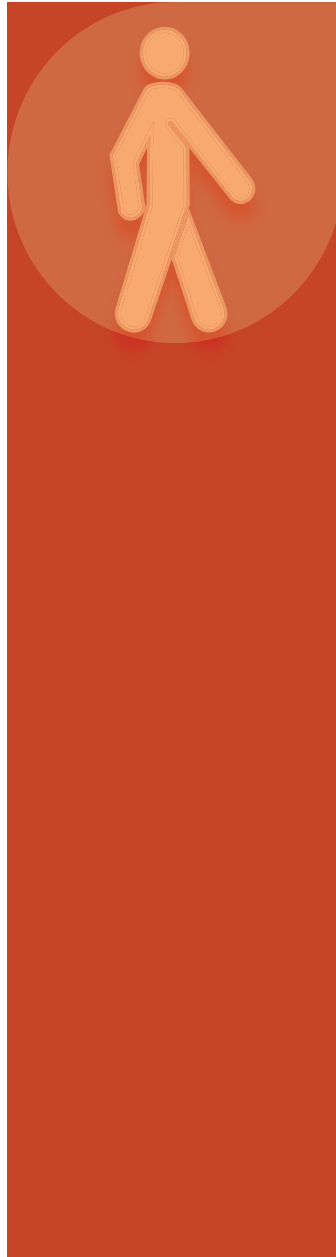
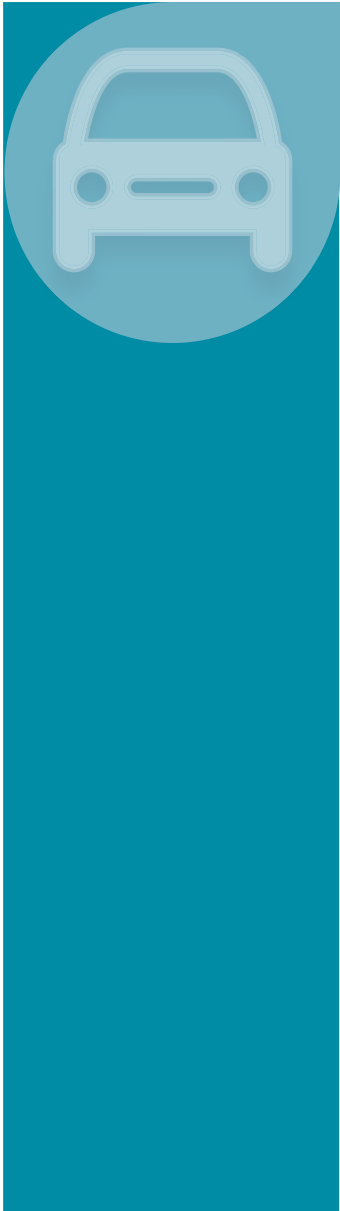
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