CO 7 Corridor Bikeway Treatment Guide

CDOT CO 7 Corridor (Brighton to Boulder)

April 2023

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Executive Summary

Colorado State Highway 7 (CO 7), between the City of Brighton (US 85) and the City of Boulder (28th Street), traverses eight local jurisdictions across a variety of land use contexts, ranging from urban to rural. The multimodal vision for the future includes bus rapid transit (BRT) and a bicycle facility along the entirety of the roadway.

The need to improve conditions for bicyclists was made clear in the Corridor Development Plan (CDP), which was completed by the Colorado Department of Transportation (CDOT) in 2021. This plan summarized previous planning study efforts and created a cohesive vision for the entire corridor. A bicycle level of traffic stress (LTS) analysis was completed to examine the level of comfort for bicyclists along this corridor. Most of the corridor was scored the lowest (or worst) comfort level for bicyclists, which indicates high stress for bicyclists along this corridor. This analysis identified a clear need to improve conditions for bicyclists.

The project team examined existing/projected conditions, previous planning study recommendations, and the Federal Highway Administration (FHWA) Bikeway Selection Guide to make recommendations.

Existing/Projected Conditions: There is not a continuous bicycle facility along the entire corridor. There are many sections of the corridor that have a shared use path, but this facility does not extend throughout the entire corridor. In many places, the only facility is a bike lane or shoulder, which for many people is not a comfortable facility. Future traffic volumes along the CO 7 corridor are projected to range between 14,000 and 45,000 average daily traffic (ADT) and posted speed limits are between 35 to 60 miles per hour (mph), including a large proportion of the corridor with a posted speed limit of at least 45 miles per hour.

Previous Planning Study Recommendations: Previous recommendations included: protected bike lanes, shared use paths, bikeable shoulders, and bike lanes for different extents throughout the corridor.

FHWA Bikeway Selection Guide: Based on future traffic conditions, the FHWA Bikeway Selection Guide identifies a separated bike lane or shared use path as the preferred bikeway type for urban, urban core, suburban, and rural town contexts.

After reviewing existing/projected conditions, previous planning study recommendations, and the Federal Highway Administration (FHWA) Bikeway Selection Guide, the ultimate recommendation along the CO 7 corridor is an off-street shared use path in both directions.

Design constraints, such as limited right-of-way or where the local agency recommends both an on-street and off-street facility, will be factors that impact what the recommended facility types along the corridor will be. A bikeable shoulder has also been identified as a near-term (before the ultimate facility is implemented) or supplemental recommendation in some areas. Installation and maintenance responsibilities related to the recommendations within this guide need to be discussed between relevant agencies as part of conceptual and final design. Agreements may need to be established between CDOT and local agencies.

Introduction

Colorado State Highway 7 (CO 7), between the City of Brighton (US 85) and the City of Boulder (28th Street), traverses eight local jurisdictions across a variety of land use contexts, ranging from urban to rural. The existing roadway varies as well, ranging from one to three lanes in each direction. The multimodal vision for the future includes bus rapid transit (BRT) and a bicycle facility along the entirety of the roadway. Between 2014 and 2019, agencies completed five different studies examining different segments of the corridor. In 2021, the Colorado Department of Transportation (CDOT) completed the Corridor Development Plan (CDP) summarized these planning study efforts and created a cohesive vision. The CDP also outlined next steps for implementation of $10 million in funding the CO 7 Coalition received for their CO 7 Preliminary and Environmental Engineering Project application as part of the 2020-2023 Denver Regional Council of Governments (DRCOG) Transportation Improvement Program (TIP).

The CDP completed a bicycle level of traffic stress (LTS) to examine the level of comfort for bicyclists along this corridor. A rating of one to four was applied with 1 being the best score (with the least amount of stress to bicyclists) to 4 being the worst score (with the highest amount of stress to bicyclists). The values were defined in the following way:

- LTS 1 (best score): Bike lane 6-feet-wide or wider adjacent to 1 travel lane in each direction and posted speed limit of 30 miles per hour (mph) or less
- LTS 2: Bike lane of less than 6-feet-wide adjacent to 2 travel lanes in each direction and posted speed limit of 30 mph
- LTS 3: Bike lane with more than 2 travel lanes in each direction and posted speed limit of 35 mph
- LTS 4 (worst score): Bike lane with more than 2 travel lanes in each direction and speeds above 40 mph

As shown in **Figure 1**, there are areas of LTS 1 (best score), but most of the corridor was scored the lowest score of LTS 4, showing there is high stress for bicyclists riding along this corridor. This analysis identified a clear need to improve conditions for bicyclists. The next step identified within the CDP was to create a corridor-wide framework for bicycle facility connectivity and design guidance for implementing bicycle improvements to include in the preliminary engineering activities for this project, which lead to this project, the Corridor Bicycle Treatment Guide (the Guide). This Guide builds off previous plans and recommendations that cover segments of the corridor to make recommendations and act as a resource for projects that will be implemented along the entire corridor.

Figure 1: Bicycle Level of Traffic Stress Analysis from CDP

Source: Figure 12 in CDP "Bicyclist Comfort Analysis"

Agency Coordination

Members of the CO 7 Technical Advisory Committee (TAC) were initially contacted to identify the contact for each agency that should be included within the working group for this project. For many agencies, the contact is also the TAC member, or it is the TAC member as well as another staff person. **Table 1** lists the working group members.

The first stakeholder meeting to discuss potential treatments was held on March 1, 2022. Additional breakout meetings were held March 4, 2022 (Adams County, City of Erie, and City of Brighton), March 10, 2022 (Boulder County, City of Boulder, City of Lafayette, and City of Erie), and March 14, 2022 (Thornton). The second stakeholder meeting to discuss intersection exhibits was held on August 31, 2022 and September 8, 2022. These meetings were an opportunity to provide direct feedback on the deliverables for this project, creating a more collaborative process.

Table 1: Working Group Members

Agency	Name	Position
CDOT	Mekonnen Mulugeta	Region 1 North Engineer/Co-PM
	Ryan Sorensen	Region 1 North Resident Engineer/Co-PM
	Jason Igo	Region 1 North Traffic and Safety Engineer
	Dan Marcucci	Resident Engineer - Boulder Residency
	Bryce Reeves	Region 4 Traffic and Local Agency Resident Engineer
	Mark Connelly	Region 4 Traffic Engineer
	Mitch Bekhit	Region 4 Project Manager Engineer
	Nate Will	CDOT Staff Support (Hg Consult)
Adams County	Chris Chovan	Senior Transportation and Mobility Planner
City of Boulder	DK Kemp	Senior Transportation Planner
Boulder County	Alexandra Phillips	Bike Planner/Employee Transportation Coordinator
City of Brighton	Noe Martinez	Engineer
	Christopher Montoya	Public Works Engineering Manager
City and County of Broomfield	Marc Ambrosi	Senior Transportation Planner
	Sarah Grant	Transportation Manager – Community Development
	Bryce Hammerton	Traffic Engineer
	Joliette Woodson	Civil Engineer
City of Erie	Todd Fessenden	Public Works Director
	Carlos Hernandez	Principal Transportation Planner
	David Pasic	Town Engineer
	Chad Schroeder	Development Engineering Supervisor
City of Lafayette	Michelle Melonakis	Transportation Engineer
City of Thornton	Darrell Alston	Traffic Engineer
	Kent Moorman	Regional Transportation Engineer
RTD	Nataly Handlos	Senior Service Planner and Scheduler
Smart Commute	Tammy Herreid	Director of Marketing & Communications
Commuting Solutions	Audrey DeBarros	Executive Director
Boulder Chamber	Amanda Mansfield	Senior Manager of Transportation

Using This Guide

This document serves as a starting point for project teams to address bicycle considerations as part of design projects along this corridor. Previous plans and recommendations are summarized at this point in time but there may be updates and changes to bicycle improvement guidance as projects move forward along this corridor. Therefore, it will be important for designers to revisit recommendations when they start a new project along the corridor. This document and the referenced documents utilize current design documents. As new design documents are created it may supersede some of these documents and planners and designers will need to evaluate the resources at that time.

Table 2 describes the steps that should be considered when starting a new project involving bicyclist facilities.

Table 2: How to Use this Guide Overview

Step (with hyperlinks to section)	Links
Information to Review Before Design	
Existing Conditions	N/A
Previous Planning Study Recommendations	Corridor Development Plan Final Report (2021) East Arapahoe Transportation Plan (2018) State Highway 7 Planning and Environmental Linkage Studies (US 287 to US 85, 2014; 75th Street to US 287, 2018) State Highway 7 BRT Station Area Design (2019) State Highway 7 Bus Rapid Transit Feasibility Study (2018)
Information to Utilize During Design	
Recommendations for the CO 7 Corridor	N/A
Preferred Bicycle Facility Based on Federal Highway Administration (FHWA) Guidance	Federal Highway Administration (FHWA) Bikeway Selection Guide
Agency Design Standards	Reference each local agency's website and/or transportation master plan.
Illustrative Examples	N/A
Information to Consider Outside of This Guide	
Evaluate additional conditions that are typical considerations during design projects, which may include: mix of bicyclists and pedestrians, types of bicyclists (including e-bikes), pedestrian signal/push button, bus stop location and access, sight distance analysis, available right-of-way (ROW), turning radius of design vehicle, signal phasing, existing safety conditions, traffic volumes, turning movement counts, ground cover, drainage	N/A

Step (with hyperlinks to section)	Links
Include appropriate elements within final design: Based on previous work and the evaluation for the specific location, apply bicycle treatments as appropriate (including necessary signage and signal modifications)	Reference local and national design references, including National Association of City Transportation Officials (NACTO) and the American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities
Installation and maintenance responsibilities related to the recommendations within this guide need to be discussed between relevant agencies as part of conceptual and final design. Agreements may need to be established between CDOT and local agencies.	

Information to Review Before Design

Existing Conditions

The existing conditions information was taken from previous planning studies and no additional data collection or verification was completed as part of this project. **Figure 2** and **Figure 3** show the existing conditions for bicycle facilities, as collected from the previous planning studies, and bike crash locations.

Facility Summary

There is not a continuous bicycle facility along the entire corridor. There are many sections of the corridor that have a shared use path, but this facility does not extend throughout the entire corridor. In many places, the only facility is a bike lane or shoulder, which for many people is not a comfortable facility.

The corridor intersects with north-south shared use paths and bike lanes, with most of the intersecting facilities south of CO 7. Intersecting facilities such as shared use paths and bike lanes appear more frequently in the Cities of Boulder and Lafayette. Moving east along the corridor past I-25 intersecting facilities become less frequent.

Throughout the corridor there are high visibility crosswalks at intersections that have sidewalks on all four legs. Some of the larger intersections have right turn islands which improves sight distance for turning vehicles to see bicyclists and pedestrians in the crosswalk but also lengths the crossing distance for bicyclists.

Bike Crash Locations

CDOT crash data involving bicyclists from 2014-2019 was reviewed as part of the CDP. While this data is helpful in understanding bike-vehicle crashes, it is important to note that crash information does not show the full story for bike safety. Solo bike crashes where the bicyclist does not crash with another vehicle and near misses are not included within the data.

When a project is located at one of these intersections where previous crashes have occurred, it is important to consider additional bicycle improvements for crash reduction. In addition, since this data is now three years old, project teams will need to update crash information when completing projects in specific areas.

Two intersections within the City of Boulder are important to note:

- The intersection of 30th Street and CO 7 in the City of Boulder experienced the highest number of crashes at one intersection, with 12 crashes.
- The intersection of 28th Street and CO 7 in the City of Boulder is the only location with one reported fatality.

Figure 2: Map of Existing Bicycle Facilities (West of E County Line Rd)

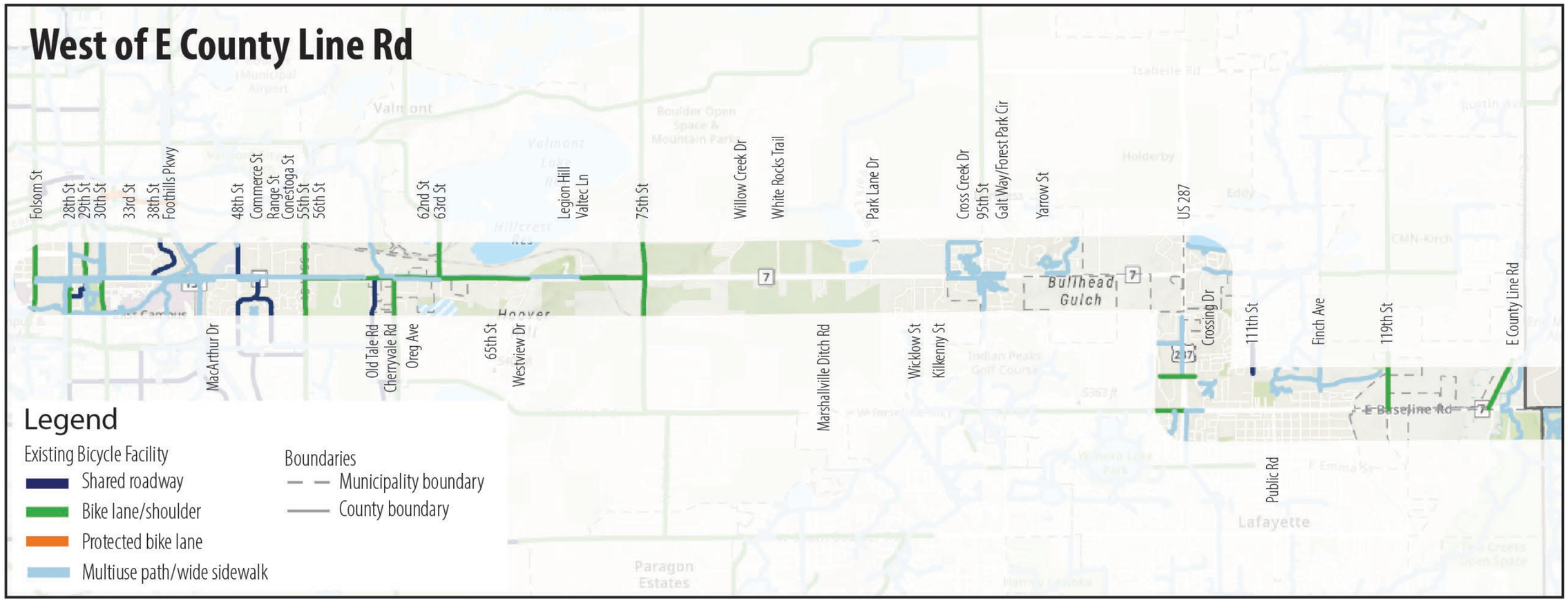
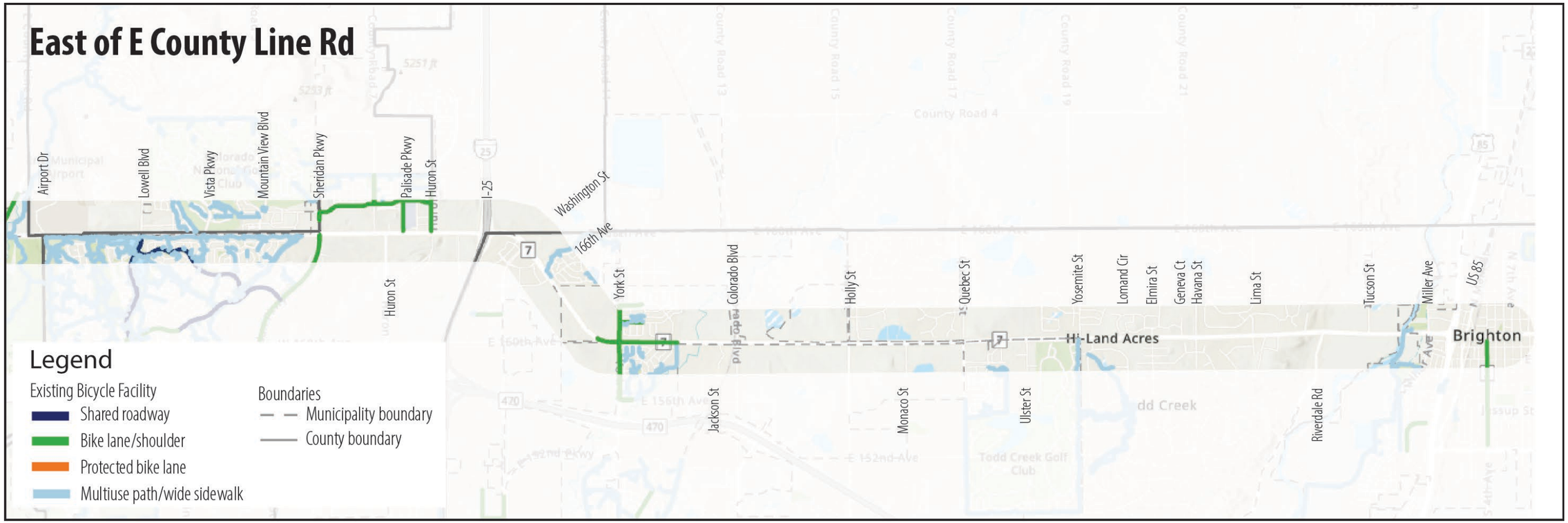


Figure 3: Map of Existing Bicycle Facilities (East of E County Line Rd)



Current Bicycle Usage

Bicycle counts were not available for the facilities along the corridor. A heatmap from Strava (an exercise/recreation smartphone app) was used to provide an overview of bicycle activity. There are a few things to note about the drawbacks of Strava: 1) it is typically used to record recreational and exercise activities so it does not capture all bicycle trips; and 2) the type of users tend to be habitual and more experienced cyclists, which means they are typically more comfortable bicycling with little to no bike infrastructure.

The heat map is produced from the aggregated activities logged through the application. Concentrations are shown in a heat map from low (light blue) to high (dark red) (**Figure 4**).

It is important to note that given the lack of current facilities along CO 7, looking at current usage does not provide the full picture of demand along this corridor. Due to better facilities along Baseline Road and South Boulder Road, bicyclists are much more likely to use those as east-west connections. However, the limited data that is available will provide information on where bicyclists are traveling now, even though there is a lack of facilities along the corridor.

Table 3 lists all the information previously described of the existing conditions.

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Figure 4: Map of Strava Concentration of Bicyclists (see Table 3 for Descriptions of Numbers)

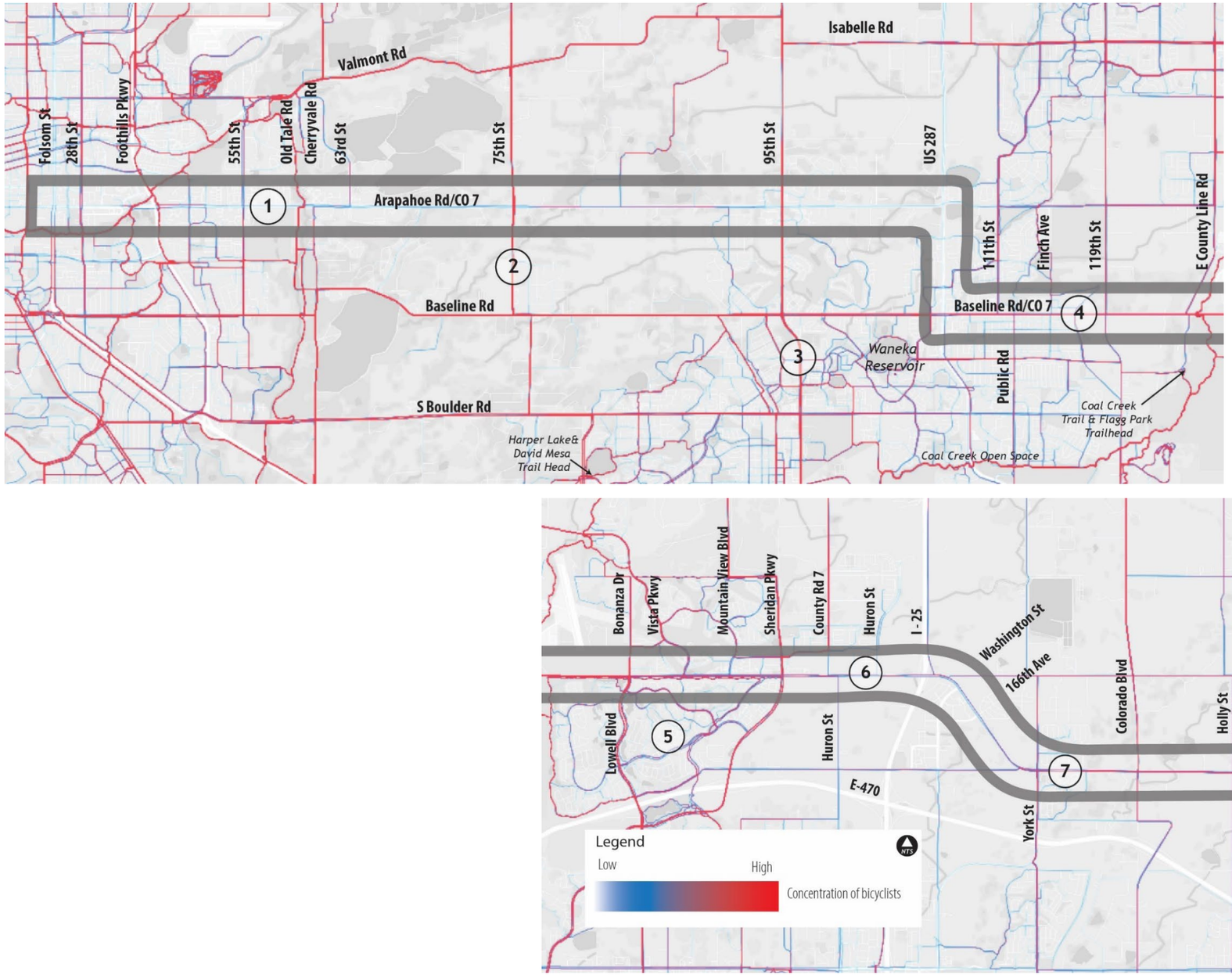

Table 3: Existing Conditions Information (Pulled from Previous Planning Project Data)

Segment	Limits	Existing Facility	Description of Existing Facility (widths approximate)	Crash Information (CDOT Crash data 2014-2019)	Bicyclist Concentration (Numbers refer to locations as noted on Figure 3)
A	28th Street to 63rd Street	Shared use path with gaps and bike lanes	Shared use path on both sides of CO 7 until approximately 55th Street, then shared use path on the north side of CO 7 8-11' wide with landscaped buffer. Gap of shared use path of approximately 600' near Old Tale Road. On-street bike lanes between 55th Street and 63rd Street.	28th Street: 4 crashes, 1 reported fatality, 3 reported injuries; 30th Street: 12 crashes, 0 reported fatalities, 9 reported injuries; Foothills Parkway: 3 crashes, 0 reported fatalities, 1 reported injuries; 55th Street: 12 crashes, 0 reported fatalities, 9 reported injuries	West of US 287, relatively low bike travel along CO 7 (likely related to high level of traffic stress), and instead most cyclists travel east to west on Baseline Road, S Boulder Road, and Valmont/Isabelle Road. (1) AND High concentrations of bike travel north to south on nearly all crossroads in the Cities of Boulder, Louisville, and Lafayette. (2)
B	63rd Street to Westview Drive	Bike lanes and shared use path	Bike lanes in both directions with shared use path 10' wide on the north side of CO 7.	None	West of US 287, relatively low bike travel along CO 7 (likely related to high level of traffic stress), and instead most cyclists travel east to west on Baseline Road, S Boulder Road, and Valmont/Isabelle Road. (1) AND High concentrations of bike travel north to south on nearly all crossroads in the Cities of Boulder, Louisville, and Lafayette. (2)
B	Westview Drive to 75th Street	Bike lanes/shoulders and shared use path	Bike lanes/shoulders in both directions with shared use path 8-10' wide on the north side of CO 7.	None	West of US 287, relatively low bike travel along CO 7 (likely related to high level of traffic stress), and instead most cyclists travel east to west on Baseline Road, S Boulder Road, and Valmont/Isabelle Road. (1) AND High concentrations of bike travel north to south on nearly all crossroads in the Cities of Boulder, Louisville, and Lafayette. (2) AND A high concentration of bicyclists traveling between Baseline Road and S Boulder Road, likely to trailheads including David Mesa and Coal Creek/Flagg Park. (3)
B	75th Street to US 287	Shared use path with gaps	East of 95th Street, shared use path in small sections along CO 7. Shared use paths appear to be in good condition with a landscaped buffer and 6-10' wide. They connect to a system of shared use paths that surround residential areas and travel north-south.	95th Street: 1 crash, 0 reported fatalities, 1 reported injury	West of US 287, relatively low bike travel along CO 7 (likely related to high level of traffic stress), and instead most cyclists travel east to west on Baseline Road, S Boulder Road, and Valmont/Isabelle Road. (1) AND High concentrations of bike travel north to south on nearly all crossroads in the Cities of Boulder, Louisville, and Lafayette. (2) AND A high concentration of bicyclists traveling between Baseline Road and S Boulder Road, likely to trailheads including David Mesa and Coal Creek/Flagg Park. (3)
B/C	US 287 between Arapahoe Road and Baseline Road	Shared use path with gaps	Shared use path 8' wide on both sides of US 287 between Diamond Circle/Lucerne Drive and Diamond Circle.	None	N/A
C	US 287 to S Public Road	Shared use path with gaps	Shared use path 8' wide on both sides of CO 7 between US 287 and Crossing Drive.	111th Street: 2 crashes, 0 reported fatalities, 2 reported injuries	East of US 287, bike travel along CO 7 increases for bicyclists traveling east to west. (4)
C	S Public Road to 119th Street	None	N/A	Public Road: 1 crash, 0 reported fatalities, 0 reported injuries	East of US 287, bike travel along CO 7 increases for bicyclists traveling east to west. (4)
D	119th Street to County Line Road	None	N/A	None	East of US 287, bike travel along CO 7 increases for bicyclists traveling east to west. (4)

Segment	Limits	Existing Facility	Description of Existing Facility (widths approximate)	Crash Information (CDOT Crash data 2014-2019)	Bicyclist Concentration (Numbers refer to locations as noted on Figure 3)
E	County Line Road to Sheridan Parkway	Shared use path with gaps	Between Airport Road and Sheridan Parkway, 10' wide shared use path on the south side of CO 7. Also a 10' wide shared use path for most of the north side of CO 7 as well.	Lowell Boulevard: 1 crash, 0 reported fatalities, 0 reported injuries	Higher concentrations in close proximity to residential communities like the one at CO 7 and Lowell Boulevard. Most of these areas have either open space/parks, a golf course, and/or a short trail system. Short segments of high concentration can be seen at these locations indicating that bicyclists are briefly using CO 7 to reach these areas. (5)
F	Sheridan Parkway to I-25 (West ramp)	None	N/A	None	East of County Road 7, the concentration of bicyclists traveling south is lower. (6)
G	I-25 (West ramp) to I-25 (East ramp)	None	N/A	None	N/A
H	I-25 (East ramp to York Street)	None	N/A	Washington Street: 1 crash, 0 reported fatalities, 0 reported injuries	East of I-25 there is a higher concentration of bicyclists traveling east to west on CO 7. (7)
I	York Street to Holly Street	Shared use path with gaps	Shared use path on both sides of CO 7 between York Street until the eastern end of the two developments.	None	East of I-25 there is a higher concentration of bicyclists traveling east to west on CO 7. (7)
J	Holly Street to Quebec Street	None	N/A	None	East of I-25 there is a higher concentration of bicyclists traveling east to west on CO 7. (7)
K	Quebec Street to Yosemite Street	None	N/A	None	East of I-25 there is a higher concentration of bicyclists traveling east to west on CO 7. (7)
L	Yosemite Street to Riverdale Road	None	N/A	None	East of I-25 there is a higher concentration of bicyclists traveling east to west on CO 7. (7)
M	Riverdale Road to US 85	None	N/A	None	A higher concentration of bicyclists traveling south of CO 7 can be seen along the S Platte River Trail and Riverdale Road. (8)

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Previous Planning Study Recommendations

The CO 7 Corridor has been studied in different segments from the City of Brighton to the City of Boulder and these studies have identified bike treatments that are sensitive to the context of the communities they serve. Previous planning study recommendations may no longer be adequate given new guidance and there is a need to create a recommendation for bicycle improvements for the entire corridor. This Guide will revisit previous planning study recommendations to make recommendations for the entire corridor. The following planning studies are important to reference when making improvements along the corridor:

- East Arapahoe Transportation Plan (2018)
- State Highway 7 Planning and Environmental Linkages (PEL) Study (2018) | 75th Street to US 287
- State Highway 7 Planning and Environmental Linkages Study (2014) | US 287 to US 85
- State Highway 7 Bus Rapid Transit Study (2018)

Table 4 summarizes the recommendations from previous planning studies and **Figure 5** shows the segments broken out for this corridor.

Table 4: Previous Planning Study Recommendations Summary

Segment	28th Street to 75th Street	75th Street to US 287	US 287 to 119th Street	119th Street to US 85
Previous planning study recommendations	Protected bike lanes + shared use path both sides	Bikes on shoulder + shared use path N side	Shared use bike facilities/bike lanes	Bikes on shoulders + shared use paths both sides

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Figure 5: Map of Corridor Segments

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The following identifies the facilities as identified in these plans, from west to east, and correlates to the segments in the CDP. Segments are portions of the recommended corridor alternative that can be implemented as separate projects. For this corridor, the various segments represent different areas along the corridor with different contexts, cross sections, and recommendations.

Segment A – 28th Street to 64th Street

The East Arapahoe Transportation Plan recommended a dedicated curb bus lane in each direction, serving the urban boundary area of Boulder (see **Figure 6**). Offset behind the curb by an 18-inch minimum amenity zone will be a one-way protected bike lane (7-foot-wide). On either side of the roadway, a 12-foot-wide sidewalk is proposed with an 8-foot planted buffer between the bike and pedestrian facilities.

Figure 6: Previous Plan Cross Section – Segment A 28th to 64th

Source: East Arapahoe Transportation Plan, page 21.

Segment B – 64th Street to US 287

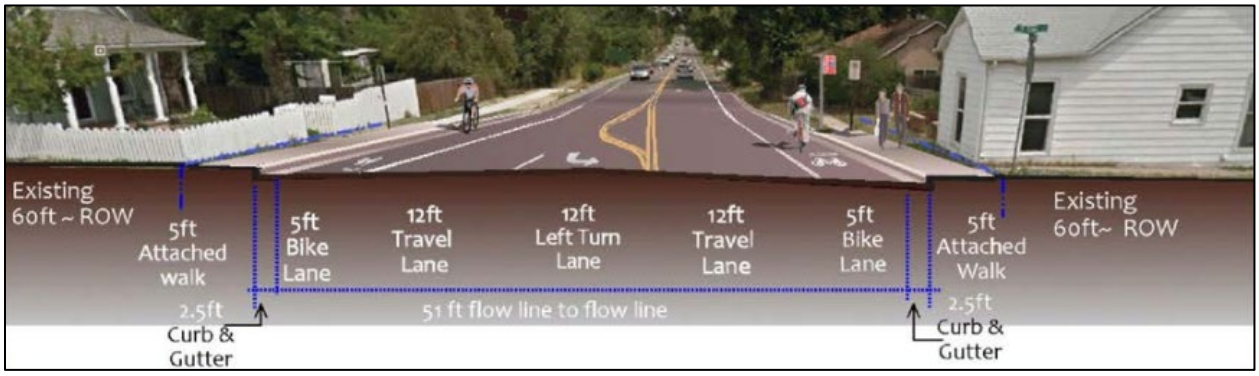
64th Street to Westview Drive will continue the same configuration as Segment A and this area will be the transition zone to the rural segments of East Boulder County. Westview Drive to 75th Street recommend a buffered bike lane in each direction between the curb and bus lane, with wide sidewalks on both sides.

Westview Drive to 75th Street will become a rural segment with recommended buffered bike lanes outside the bus lanes, with a shared use path on the north side. The 2014 PEL study recommends a shared use path on the north side of CO 7 with a minimum of 12-feet between 75th Street to US 287. This will allow connections to open space and trails to the north, while continuing the path already established west of 75th Street.

Segment C – US 287 to 119th Street

The CO 7 corridor jogs south along US 287 from Arapahoe Road to Baseline Road within the City of Lafayette. From US 287 to Burlington Avenue the area is constrained through the downtown area, therefore the recommendation from US 287 to S Public Road consist of shared lane marking to indicate that bicyclists and vehicles will be using the vehicular lane (sharrows) with 5-foot minimum sidewalk on both sides. From S Public Road to 119th Street, the recommendation is 5-foot bike lanes (see **Figure 7**).

Figure 7: Previous Plan Cross Section – Segment C US 287 to 119th Street



Source: Figure 3.3 SH 7 PEL Study (2014), page 62

Segments D to M – 119th Street to US 85

The corridor between the Cities of Lafayette and Brighton were planned to have a consistent treatment for bicycle and pedestrian users. The 12-foot outside shoulder in each direction is recommended to be a shared bus and bike facility with 10-foot shared use paths on both sides of the highway for the entire length, creating a fully multimodal corridor (see **Figure 8**).

Figure 8: Previous Plan Cross Section – Segments D to M 119th Street to US 85

Source: Figure 3.10 SH 7 PEL Study (2014), page 65

In addition to the recommended bicycle facilities along the corridor, there are five grade separated crossings identified in the PEL studies that will enhance regional trails and connectivity across the corridor: Coal Creek (existing), Near Huron Street, West of Jackson Street, West of Quebec Street, and South Platte River (existing).

Information to Utilize During Design

Recommendations for the CO 7 Corridor

Segment

Bike Facility Update Methodology to Create Consistent Facility

The details of the bicycle facility will likely be modified as specific locations move into final design. This may include adjustments based on type of facility (as long as an equivalent or additional facility is provided), width (based on available ROW), and whether the project is providing near-term or ultimate facility needs (a bikeable shoulder may be a near-term solution when the shared use path is the ultimate facility).

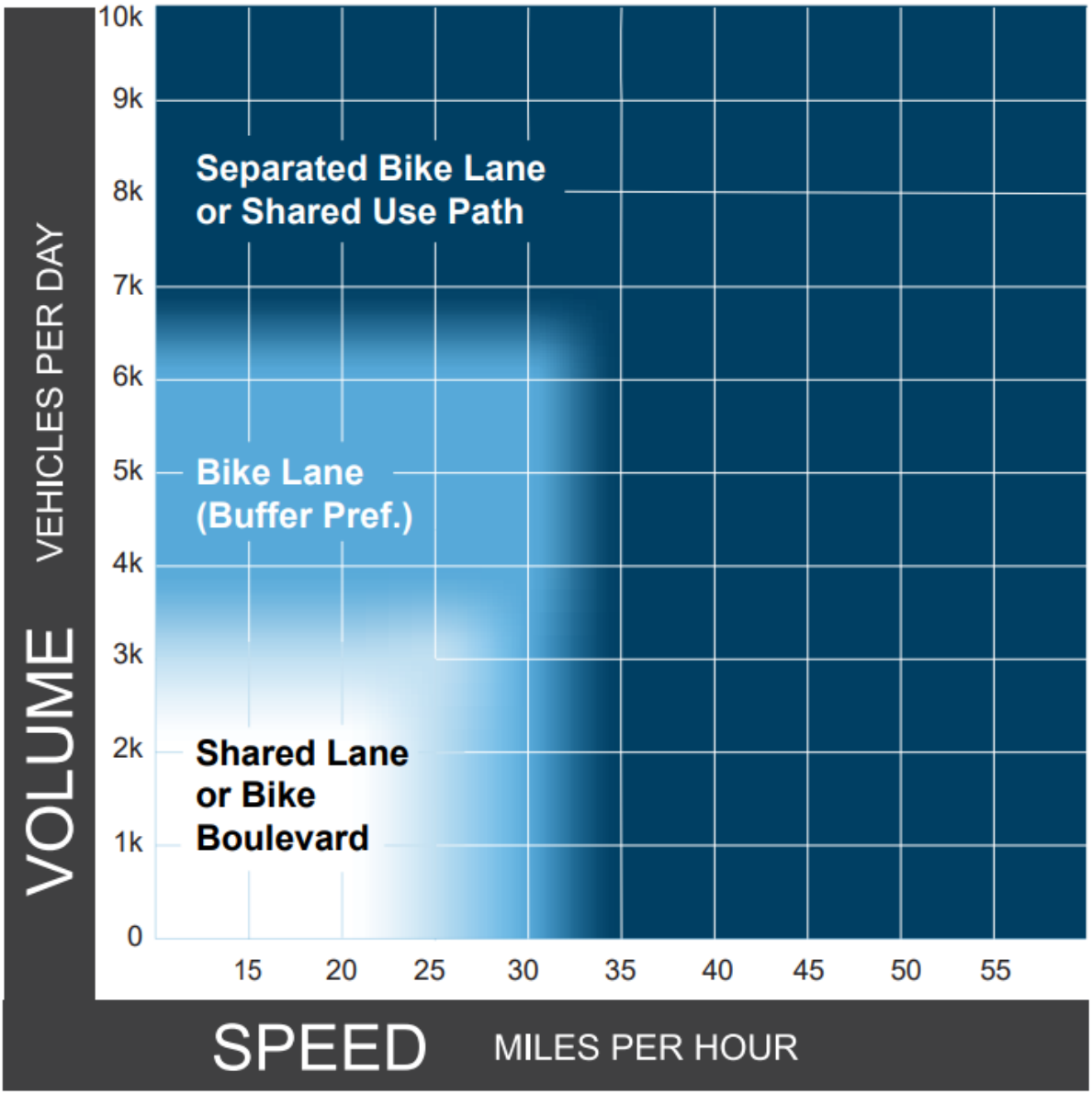
This Guide provides a starting point for design along this corridor and the elements considered here are not the only considerations when designing projects associated with the bike facility and do not prescribe the final design for any locations along the corridor. Other considerations may include: locations where the bus will use the shoulder, bus stop location, overall vision for bike network, road context, user types, defining the target design user, and design constraints (including ROW).

Preferred Segment Facilities Based on FWHA Bikeway Selection Guide

As part of making recommendations for the entire corridor, the previous planning study recommendations were reviewed. In addition, existing/projected traffic conditions and a bikeway selection guide were consulted. The FHWA has developed guidance for bike facility selection based on vehicle speeds and daily volumes (version referenced here was published in 2019). See **Figure 9** and **Figure 10** for these charts.

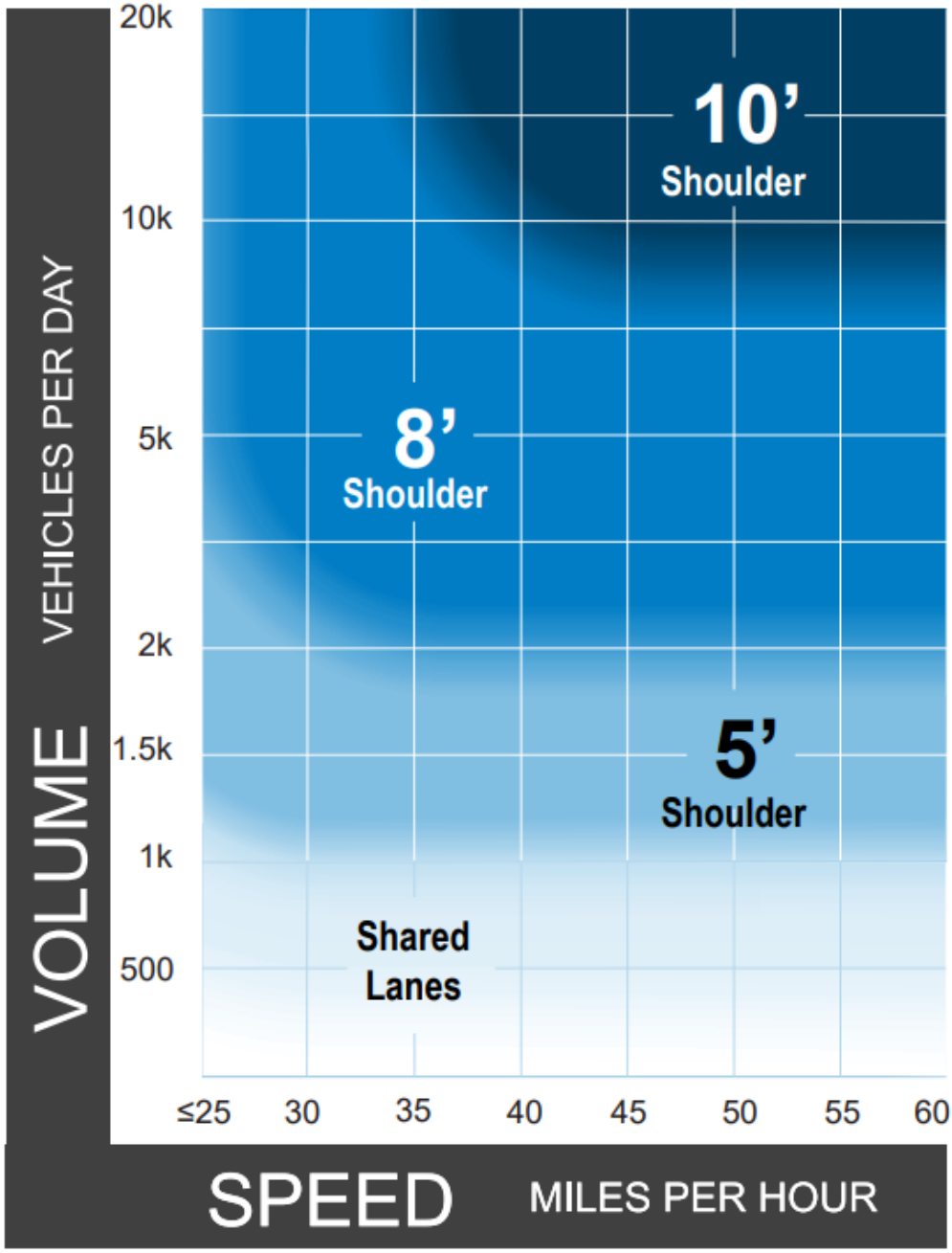
The CO 7 corridor has traffic volumes generally higher than 20,000 and posted speed limits between 35 to 60 miles per hour, including a large proportion of the corridor with a posted speed limit of at least 45 mph. Based on these conditions, the FHWA bikeway selection guide identifies a separated bike lane or shared use path as the preferred bikeway type for urban, urban core, suburban, and rural town contexts. For rural roadways up to 20,000 vehicles per day, a 10-foot shoulder is preferred based on the FHWA guidance.

Figure 9: FHWA Preferred Bikeway Type for Urban, Urban Core, Suburban, and Rural Town Contexts



Source: Figure 9 in FHWA Bikeway Selection Guide. 2019. Available at: https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf

Figure 10: FHWA Preferred Shoulder Widths for Rural Roadways



Source: Figure 10 in FHWA Bikeway Selection Guide. 2019. Available at: https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf

Recommendations for the CO 7 Corridor

For the urban, urban core, suburban and rural town contexts, the traffic volumes of current (11,000-40,000 vehicles per day) and future (14,000-45,000 vehicles per day) are well above the 7,000 vehicles per day threshold for a separated bike lane or shared use path. Posted speed limits range from 35-60 mph, which are also above the 35 mph threshold for a separated bike lane or shared use path.

While the rural contexts have current volumes under the 20,000 vehicles for day thresholds, future volumes generally rise above the 20,000 threshold. However, given the rural nature of this corridor, volumes just above the 20,000 threshold, limited ROW in some sections, and preferences of some bicyclists to ride on the road, bikeable shoulders should be considered as a near-term and/or supplemental facility in specific locations. **Table 5** lists out this information in addition to the recommendations by location.

Based on current and projected traffic conditions, previous planning study recommendations, and the preferred facility from the FWHA Bikeway Selection Guide, the most enhanced facility is recommended as the ultimate recommendation for this corridor: a shared use path in both directions. There are many locations where a bikeable shoulder should be considered as a near-term and/or supplemental facility as well.

Since the ultimate recommendation may not be possible to construct in coordination with current projects given design constraints such as limited ROW, near-term and/or supplemental recommendations have been made as well. These include: bikeable shoulder (in rural areas), one-way protected bike lane (in sections of Boulder) and bicycle boulevard (for a small stretch in Lafayette just south of CO 7 on Geneseo Street). **Figure 11** and **Figure 12** are maps showing the locations of the recommendations.

Table 6 Provides additional information associated with the different facility types. The name and description provide more context about the treatment. The general application is direct text taken from the FHWA Bikeway Selection Guide. The design details include the NACTO recommendations and the design recommendation for this corridor. Minimums and preferred widths are provided given that the corridor has many locations with limited ROW.

A note about bikeable shoulders: Bikeable shoulders are considered a near-term and/or supplemental recommendation and are not recommended to be the only available bike facility along the corridor. This is identified as a near-term recommendation in conditions where shared use paths are constructed at a different time. They are especially important to consider if near-term conditions only allow the shared use path on one side of CO 7. Bus usage of the shoulder will impact the comfort level for using the shoulders for biking and if high frequency transit use is anticipated for shoulders, bikeable shoulders is not anticipated to be an acceptable bicycle facility. The ultimate recommendation for the entire corridor is to have a shared use path in both directions. For the purposes of this Guide, when bikeable shoulder is noted, it is for the purposes of being utilized by bicyclists. Project teams will need to adhere to the shoulder requirements as determined for the roadway cross section.

Installation and maintenance responsibilities related to the recommendations within this guide need to be discussed between relevant agencies as part of conceptual and final design. Agreements may need to be established between CDOT and local agencies.

Table 5: Segment Recommendations

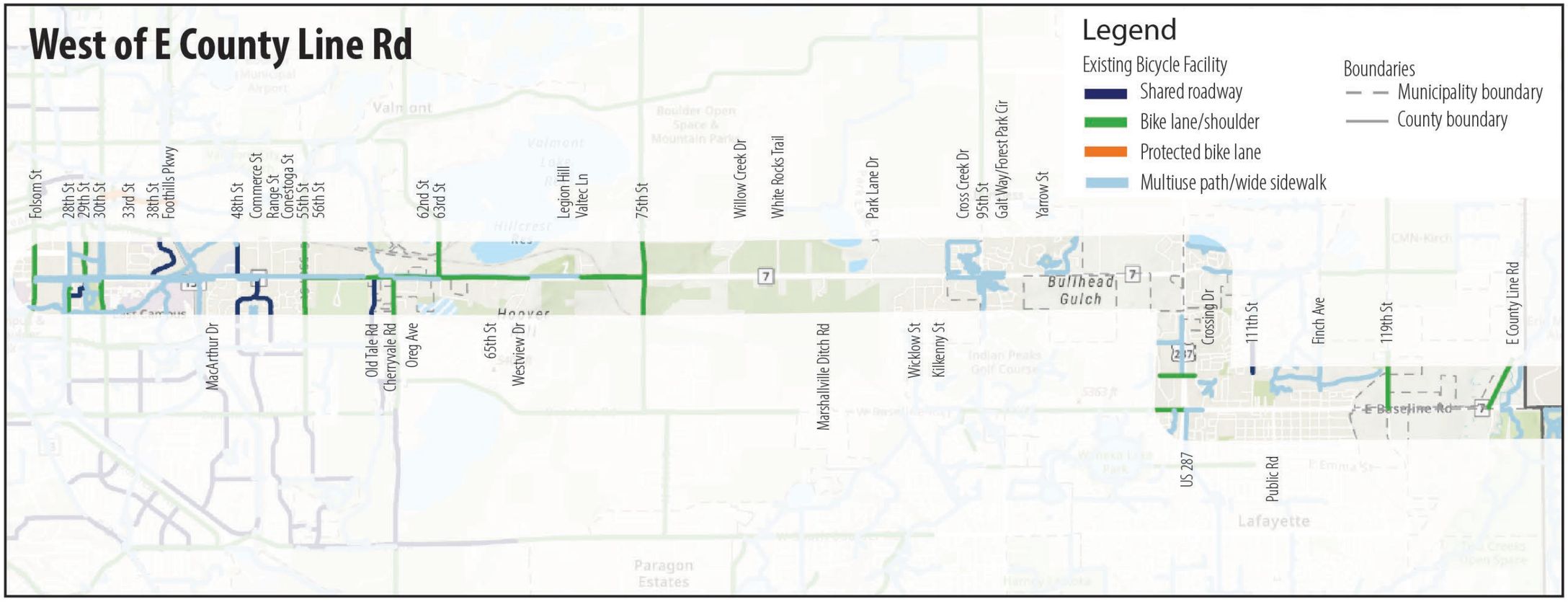
Segment	Limits	CDOT Access Control[1]	Daily volumes, 2021	Daily volumes, 2050	Posted Speed	Previous Plan Rec	FHWA Preferred Facility	Previous Plan Rec vs. FHWA Guidance	Recommended Facility[2]
A	28th Street to 63rd Street	NR-B	21-30k	26-40k	35, 45-50	One-way protected bike lanes and 12' shared use path on both sides	Separated bike lane or shared use path	Consistent	One-way protected bike lane and shared use path
B	63rd Street to Westview Drive	NR-B / R-A	20k	26k	45	One-way protected bike lanes and 12' shared use paths on both sides	Separated bike lane or shared use path	Consistent	One-way protected bike lanes and 12' shared use path
B	Westview Drive to 75th Street	NR-B / R-A	20k	26k	50	Buffered bike lanes and 10' shared use path on north side with 6' sidewalk on south side	Separated bike lane or shared use path	Consistent	Buffered bike lanes and 10' shared use path on north side with 6' sidewalk on south side
B	75th Street to US 287	R-A / NR-A	13-19k	17-25k	45-50	12' path on north side	Separated bike lane or shared use path	Consistent	Shared use path on north side AND consider bikeable shoulders (buffered if possible)
B/C	US 287 between Arapahoe Road and Baseline Road	NR-A	40k	35k	55-60	N/A	Separated bike lane or shared use path	N/A	Shared use path
C	US 287 to S Public Road	NR-C	18k	22k	30-35	Sharrows	Separated bike lane or shared use path	Inconsistent	Shared use path until Carr Avenue/Bicycle boulevard on Geneseo Street to Burlington Avenue
C	S Public Road to 119th Street	NR-C	11k	14k	30-45	5' bike lanes	Separated bike lane or shared use path	Inconsistent	Bicycle boulevard on Geneseo Street to Burlington Avenue/Shared use path to 119th Street
D	119th Street to County Line Road	NR-A	16k	21k	45-55	12' outside shoulder and 10' shared use paths on both sides	Separated bike lane or shared use path	Consistent	Shared use path AND consider bikeable shoulders (buffered if possible)
E	County Line Road to Sheridan Parkway	NR-A	19k	25k	55	12' outside shoulder and 10' shared use paths on both sides	Separated bike lane or shared use path	Consistent	Shared use path AND consider bikeable shoulders (buffered if possible)
F	Sheridan Parkway to I-25 (West ramp)	NR-A	29k	41k	55	12' outside shoulder and 10' shared use paths	Separated bike lane or shared use path	Consistent	Shared use path AND consider bikeable shoulders (buffered if possible)

[1] NR-B=Non-rural arterial; R-A: Regional highway; NR-A: Non-rural principal highway; NR-C: Non-rural arterial

[2] In both directions unless otherwise noted. When shoulder is noted, it is for the purposes of being utilized by bicyclists. Project teams will need to adhere to the shoulder requirements as determined for the roadway cross section.

Segment	Limits	CDOT Access Control[1]	Daily volumes, 2021	Daily volumes, 2050	Posted Speed	Previous Plan Rec	FHWA Preferred Facility	Previous Plan Rec vs. FHWA Guidance	Recommended Facility[2]
G	I-25 (West ramp) to I-25 (East ramp)	NR-A	No data available	No data available	40-50	12' outside shoulder and 10' shared use paths on both sides	Separated bike lane or shared use path	Consistent	Shared use path AND consider bikeable shoulders (buffered if possible)
H	I-25 (East ramp to York Street)	NR-A	29k	45k	40-60	12' outside shoulder and 10' shared use paths on both sides	Separated bike lane or shared use path	Consistent	Shared use path AND consider bikeable shoulders (buffered if possible)
I	York Street to Holly Street	NR-A / R-A	18k	27k	60	12' outside shoulder and 10' shared use paths on both sides	Separated bike lane or shared use path	Consistent	Shared use path AND consider bikeable shoulders (buffered if possible)
J	Holly Street to Quebec Street	R-A	No data available	No data available	60	12' outside shoulder and 10' shared use paths on both sides	Separated bike lane or shared use path	Consistent	Shared use path AND consider bikeable shoulders (buffered if possible)
K	Quebec Street to Yosemite Street	R-A	No data available	No data available	60	12' outside shoulder and 10' shared use paths on both sides	Separated bike lane or shared use path	Consistent	Shared use path AND consider bikeable shoulders (buffered if possible)
L	Yosemite Street to Riverdale Road	R-A	No data available	No data available	40-60	12' outside shoulder and 10' shared use paths on both sides	Separated bike lane or shared use path	Consistent	Shared use path AND consider bikeable shoulders (buffered if possible)
M	Riverdale Road to US 85	NR-B	17k	25k	30-40	12' outside shoulder and 10' shared use paths on both sides	Separated bike lane or shared use path	Consistent	Shared use path AND consider bikeable shoulders (buffered if possible)

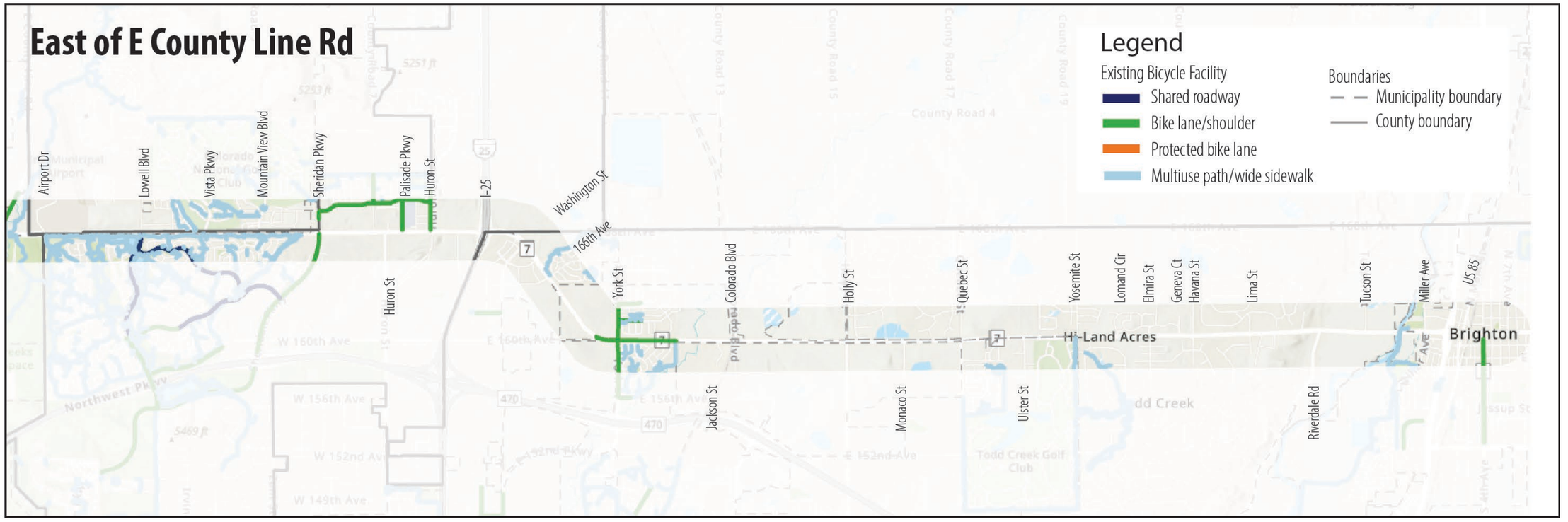
Figure 11: Map of Corridor Recommendations (West of E County Line Rd)



Recommendations

Segment	A	B			C	D	E
Recommendation	One-way protected bike lane and shared use path	One-way protected bike lane and shared use path	Shared use path on north side AND consider bikeable shoulders	Shared use path	Shared use path / bicycle boulevard east of Carr Avenue on Geneseo Street	Shared use paths AND consider bikeable shoulders	

Figure 12: Map of Corridor Recommendations (East of E County Line Rd)



Recommendations (continued)

E	F	G	H	I	J	K	L	M
Shared use path AND consider bikeable shoulders								

Table 6: Segment Summary Facility Recommendations

Facility	Recommended Location	Description	General application (text from FHWA Bikeway Selection Guide)	Design Guidance	Design Recommendation	Example
Shared use path (also referred to as multiuse path)	In one direction for the entire corridor and for both directions as design constraints allow	Off-street facility where bicyclists and pedestrians share the space with no separation between the two modes.	Roadways with moderate to high speeds and high volumes	Desired: 10' width with 2' graded area on both sides Minimum: 8' Standards taken from FHWA	Desired: 12'-14', depending on usage Minimum: 10' 8' allowed for short distances or in highly confined areas *Standards range from 8'-12'*	
Bikeable shoulder (buffered if possible)	Supplemental and near-term facility only in rural contexts. Extra consideration to areas where shared use path is only located in one direction.	A paved shoulder with an optional designated horizontal painted buffer space.	Shoulder width is an important consideration to accommodate these bicyclists based on traffic volumes and posted speeds in the rural context.	Min: 5' shoulder Optional: 1.5-4' buffer Standards taken from *Ruraldesignguide.com*.	Desired: 10' shoulder / 3' buffer if no off-street facility is provided Minimum: 5' shoulder *Rumble strips are not recommended Shoulder minimum taken from FHWA facility selection guide. Buffer information taken from Ruraldesignguide.com.*	
Bicycle Boulevard (also referred to as neighborhood bikeway)	Lafayette (Geneseo Street between Carr Avenue and Burlington Avenue)	No separate facility for bicyclists with striping and signing to communicate to both bicyclists and drivers to share the roadway.	Low-stress bikeways primarily located on low-volume, low-speed local streets.	Shared lane markings, wayfinding signs, traffic calming treatments (chicanes, speed humps, traffic diverters, curb extensions, traffic circles).	Design elements to be confirmed in the design phase of that project.	
One-way protected bike lane (also referred to as one-way separated bike lane or one-way cycle track)	Boulder	A physically separated bike lane that allows bicycle movement in one direction on one side of the street.	Roadways with moderate to high speeds and high volumes	Desired: 7' to curbface with 3' separation Minimum: 5' to curbface with 3' separation Standards taken from NACTO	Desired: 6"* bike lane with 2'-4' vertical separation Minimum: 5'* bike lane with 3' vertical separation * w/o curb and gutter *Standards range from 5'-7' for bike lane and 2'-4' for separation*	

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Intersections

Intersection typologies were developed in order to address the various conditions along the corridor in an organized manner. Based on the DRCOG street typology definitions, CO 7 is identified as a regional connector street throughout the entire extent of CO 7 included in this Guide. The following elements are identified as high compatibility with this type of roadway as it relates to bicycle infrastructure:

- Pedestrian elements: sidewalks, lighting
- Transit elements: transit lanes, transit stops, transit signal priority
- Intersection and crossing elements: curb ramps, signalization, median refuge islands

Although DRCOG identifies this corridor as the same classification throughout, there are a variety of intersections with different cross streets. We have created the following intersection typologies to make recommendations for different contexts.

Table 7: Intersection Typology Definitions

Number	Name	General Description of Cross Street
1	Large signalized	Double lefts, free rights, 3 lanes in each direction
2	Small signalized	One turn lane, 2 lanes in each direction
3	Small unsignalized	Creates intersection where minor road is either stop or yield sign controlled, allows all movements, may or may not have turn lanes
4	All movements or T-intersection or right-in/right-out access	Commercial or high-density access, allows all movements or is restricted to right-in/right-out access, may or may not have turn lanes

Note: These are generalized characteristics of intersections and actual intersections might have some different elements than listed in the description but still fall within a type listed.

Recommended Intersection Treatments

These recommendations are a starting point for designers and need to be evaluated to apply them at the appropriate locations when design is occurring for specific locations. The table below (**Table** 8) indicates when the various treatments should be considered given current guidance and application to this corridor.

Details about each intersection treatment can be found in **Table 9** and the intersection typologies are shown on a map on **Figure 13** and **Figure 14**.

Table 8: Intersection Treatments by Typology

Number	1	2	3	4	5
Name	**Large signalized**	**Small signalized**	**Small unsignalized**	**All movements access**	**Right-in /right-out access**
Striping					
Intersection crossing markings	With shoulders	With shoulders	With shoulders	With shoulders	With shoulders
Green conflict markings	At protected intersection and with protected bike lanes	At protected intersection and with protected bike lanes	At protected intersection and with protected bike lanes	At protected intersection and with protected bike lanes	At protected intersection and with protected bike lanes
Two-stage turn box	With intersecting bike facility	With intersecting bike facility	N/A	N/A	N/A
Design					
Protected intersection	x	x	N/A	N/A	N/A
Bend out	N/A	N/A	x	x	x
Raised crosswalk	With right turn island	With right turn island	On cross street	On cross street	On cross street
Signage					
No right on red blank-out sign	With two-stage turn box	N/A	N/A	N/A	N/A
Wayfinding	With intersecting bike facility	With intersecting bike facility	With intersecting bike facility	With intersecting bike facility	With intersecting bike facility

Number	1	2	3	4	5
Name	Large signalized	Small signalized	Small unsignalized	All movements access	Right-in /right-out access
	and proximity to bus stops	and proximity to bus stops	and proximity to bus stops	and proximity to bus stops	and proximity to bus stops
Leading pedestrian interval	With transit queue jump signal	With transit queue jump signal	N/A	N/A	N/A
Bicycle signal	With protected bike lanes	With protected bike lanes	N/A	N/A	N/A
Bicycle detection	With on-street facility	With on-street facility	N/A	N/A	N/A
Turning restrictions	With shared use path	With shared use path	N/A	N/A	N/A

Note: These are general treatments that could be applied to the corridor but before implementation of any treatment it should be fully evaluated to see if it should be installed at that location.

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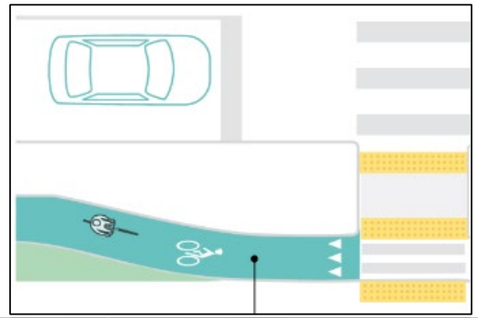
Table 9: Intersection Recommended Treatments

Name	Description	General Application	Photo Example
Intersection crossing markings extensions	Striping guidance continuing the bike lane through the intersection and may include green conflict zone markings.	High vehicle volumes or complex intersections with many movements.	
Green conflict markings	Green striping to indicate a mixing zone between bicyclists and vehicles.	At intersections with right turn only lanes where vehicles need to cross the bike lane and where there is a history of bike crashes. **Available through interim approval*[3]	
Two-stage turn box	Facilitates a left turn for bicyclists and breaks the turning movement into two separate straight movements.	Intersecting bike facilities where ROW allows. **Available through experimentation*[3]	

[3] *Bicycle Facilities and the Manual of Uniform Traffic Control Devices. Available at: https://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/mutcd/*

Name	Description	General Application	Photo Example
Protected intersection (includes protected intersections)	Separated crossings for bicyclists and pedestrians with vertical elements protecting the corners and reducing the radius where multimodal users wait to cross.	Locations with available ROW, high pedestrian and bicyclist usage and/or where there is a history of bike crashes. Photo example from Streetsblog SF.	
Bend out	The path is bent away from the travel lanes to increase visibility for where drivers see path users.	Realignment of a shared use path to provide additional space for vehicles to yield to path users. Photo example from NACTO.	
Raised crosswalk	Crosswalk is at sidewalk grade, with a small slope on each side for drivers to navigate.	Most commonly located at right turn islands to slow vehicles and provide better sight distance to drivers. Can also be located at cross streets with low vehicle volumes.	
No right on red blank-out sign	Bicycle detection activates a sign to prohibit red turning on red.	High volume of turning vehicles and/or complex intersections with many movements.	

Name	Description	General Application	Photo Example
Wayfinding	Intersection signage to direct pedestrians and bicyclists to stations, major destinations and/or crossing opportunities.	Confusing intersections where navigating to the bus stop or park and ride could be confusing. **Available through experimentation*[3]	
Leading pedestrian interval	Provides pedestrians (or path users) a head start to enter the crosswalk of an intersection 3-7 seconds before the green light for vehicles.	In combination with transit signal priority where there is a bus queue jump lane or where frequent bike ped crossings are present with crash history. Photo example from Long Beach, CA	
Bicycle signal	Bicycle signal that indicates to bicyclists when they should enter the intersection.	In combination with a protected bike lane.	
Bicycle detection	Bicycle detection activates a sign to communicate to drivers that a bicyclist is at the intersection.	At select locations with high volumes of turning vehicles and/or complex intersections with many movements or in combination with leading bike phase.	

Name	Description	General Application	Photo Example
Turning restrictions	Signalization modifications to separate left turn movements and trail users all the time or as activated. CDOT follows protected left turn warrants, so documentation will be required to implement. Can also be considered to restrict right turns with large volumes of shared use path users.	At signalized intersections with significant left or right turning movements and high path user volumes.	

Figure 13: Map of Intersection Typologies (West of E County Line Rd)

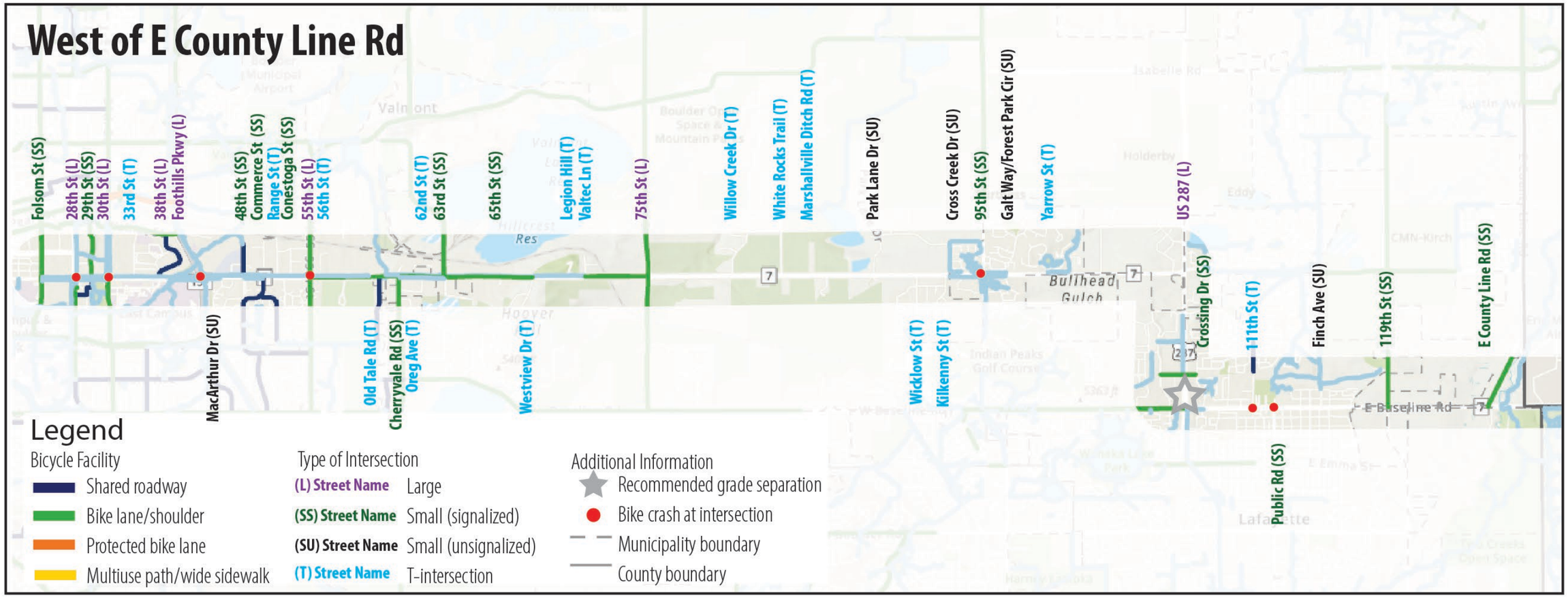
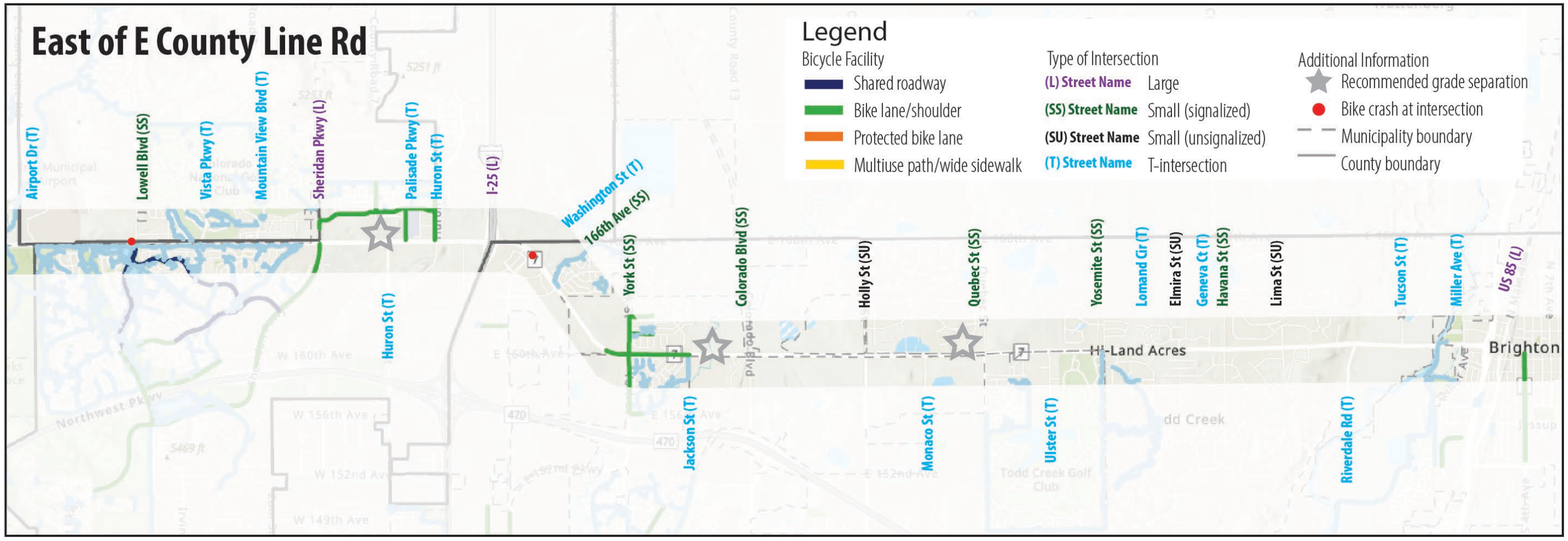


Figure 14: Map of Intersection Typologies (East of E County Line Rd)



Preferred Bicycle Facility Based on Federal Highway Administration (FHWA) Guidance

Given that this Guide was created at a point in time and projects along the corridor will continue, projects will need to confirm whether the recommended facilities are still appropriate given current guidance. When starting a project, it will be important for the project team to utilize the FHWA Bikeway Selection Guide to confirm that a shared use path is still the preferred facility for the entire corridor. Installation and maintenance responsibilities related to the recommendations within this guide need to be discussed between relevant agencies as part of conceptual and final design. Agreements may need to be established between CDOT and local agencies.

The project team will also need to update current and projected traffic counts to be utilized as part of the analysis.

Agency Design Standards

When implementing bicycle improvements, the project team needs to also reference the standards for agencies along the corridor (listed alphabetically): Adams County, City of Boulder, Boulder County, City of Brighton, City and County of Broomfield, CDOT, City of Erie, City of Layfette, and City of Thornton. The details documented here based on the point in time when the Guide was created, but the project team will need to confirm the standards are the latest by referencing the agency's standards.

Adams County

Standards listed below are from the Adams County Engineering Road Standards. Although Adams County will be updating their standards in the near future, the standards noted here are current. Relevant bicycle design standards are available for shared use paths and shoulders:

- Shared use paths require a width of 10-feet. This width was indicated only as sidewalk in the typical cross section.
- Bikeable shoulders shall be 6-feet for minor arterials in rural areas and 8-feet for minor collectors in rural areas. There are no standards for bicycle facilities on shoulder for major arterials.

The landscape strip between the bike facility and the roadway is undefined in the typical sections. It is stated that 15-feet of allotted buffer space is needed between the roadway centerline and the ROW on a major arterial.

City of Boulder

Standards listed below are from the City of Boulder Design and Construction Standards and at the request of City of Boulder staff, the East Arapahoe Multiuse Path and Transit Stops Project. Relevant bicycle design standards are available for bike lanes and shared use paths:

- Shared use paths shall follow AASHTO standards. The width is desired at 10-14-feet and can be a minimum of 8-feet in rare circumstances for short distances that have various obstructions.

Current Project: East Arapahoe Multiuse Path and Transit Stops

This project states that shared use paths shall use a minimum of 10-feet and maximum of 12-feet. If the path is designed for just bicyclists, then 12-feet is the required minimum. The shared use path inside radius shall be at least 15-feet. The landscape strip between the bike facility and the roadway shall be 2-8 feet.

Boulder County

Standards listed below are from the Boulder County Multimodal Transportation Standards. The Boulder County standards state that bicycle striping standards will follow MUTCD. Relevant bicycle design standards are available for shared use paths and shoulders:

- Shared use path standards along minor arterials require an 8-foot width. All shared use paths need a 2% cross-slope.
- Bikeable shoulders without curb and gutter shall have a width of 5-feet for minor arterials and 4-feet for collectors.

The landscape strip located between the bike facility and the roadway for minor collectors can vary from 0-8 feet-wide.

City of Brighton

Standards listed below are from the City of Brighton Public Works Standards and Specifications - Section 500 City Street Construction Details and the Brighton Transportation Master Plan (TMP). Relevant bicycle design standards are available for shared use path:

- Shared use path standards depend on trail classification. For a spinal trail, the requirements state that a concrete trail must be 8-10 feet-wide with an attached crusher fine frail of 4-feet. For a local trail, the minimum width must be at least 6-feet. The cross slope for both a spinal trail and a local trail must not exceed 2%.

City and County of Broomfield

Standards listed below are from the planned unit development (PUD) for this area. Relevant bicycle design standards are available for share use paths:

- A shared use path will be 12-feet on the south side of CO 7 and 10-12 feet on the north side of CO 7.

CDOT

Standards listed below are from Chapter 14 (Bicycles and Pedestrians Facilities) of the CDOT Roadway Design Guide. Relevant bicycle design standards are available for shared use paths and shoulders:

- Share use paths should be a minimum of 10-feet with a 3-foot clear zone preferred and 5-foot buffer between the roadway and path.
- Shoulders should be a minimum of 4-feet to accommodate bikes.

City of Erie

Standards listed below are from the Erie TMP. Relevant bicycle design standards are available for on-street standard and separated bike lanes and shared use paths:

- On-street bike lanes should have a minimum of 5-feet without curb and gutter. Separated bike lanes should be 5-feet without curb and gutter with a 2–4 foot vertical element.
- Shared use paths should a minimum of 8-feet with a preferred width of 10-feet.

City of Lafayette

Standards listed below are from the City of Lafayette 2012 Standards and Specifications. Two street types are given as example cross streets with bike lanes. There are no standards related to the facility types recommended as part of this project.

City of Thornton

Standards listed below are from City of Thornton 2012 Standards and Specifications for the Design and Construction of Public and Private Improvements and 2022 Thornton Transportation and Mobility Master Plan (TMMP). The city will have a future draft document for updated design standards but for current information staff directed the project team to reference the TMMP. Relevant bicycle design standards are available for bike lanes and shared use path:

- Shared use paths require a 10-foot width with a 2-foot clear zone. The landscape strip between the shared use path and the protected bike lane varies from 5.5-11.5 feet depending on the roadway classification.

Summary

Design standards are provided for separated bike lanes, shared use paths, and bikeable shoulders:

- Separated bike lanes have a vertical element that ranges from 2-4 feet associated with a bike lane that ranges 5-7 feet.
- Shared use paths require a width of 6-14 feet depending on circumstance and obstructions.
- Bikeable shoulders without curb and gutter vary based on roadway classification. It is noted that for minor arterials the width ranges from 5-6 feet. For collectors, the width ranges from 4-8 feet.

Table 10 lists summary information for all jurisdictions. **Table 6** describes the standards for the different facility types recommended for this corridor.

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Table 10: Bicycle Standards by Agency

Design Element	Adams County	Boulder	Boulder County	Brighton	Broomfield	CDOT	Erie	Lafayette	Thornton
CO 7 Roadway Classification	Principal arterial	Principal arterial	Minor arterial	Major arterial for most of the extent within City, minor arterial	Regional arterial (2-6 lanes)	Principal arterial	Principal arterial	State highway	Likely major arterial/minor arterial
Bike Facility for Roadway Classification of CO 7 within Jurisdiction	10' sidewalk	From plan: 7' separated bike lane	Bikeable shoulder: 5' Shared use path: 8' with 0-8' buffer	10' trail	Major arterial with 4-6 lanes: 14' shared use path Minor arterial with 2 lanes: 6' bike and 10' sidewalk (1' buffer to be added between bike and roadway if volumes exceed 6k ADT)	Paved shoulders	5' bike lane w/o curb and gutter (C&G)	As highlighted as arterial in map: 4' bike lane w/o C&G	12' side path or 6' bike lane with 4' protection/11' side path
One-way protected bike lane (also referred to as one-way separated bike lane or one-way cycle track)	--	3' vertical buffer + 6.5' bike lane (from curb face)	--	5'-7' for one-way, 12' for two-way	--	--	From E County Line plan set: 5' (w/o curb and gutter) with 2'/4' vertical element	--	--
Shared use path (also referred to as multiuse path)	10' (indicated only as sidewalk in typical cross section)	AASHTO: 10'-14'; 8' in rare circumstances or for short distances 12' / 10' (current project) /12' if bikes/bikes	8' - minor arterials 6' - collector, residential collector (2% cross-slope)	min 8', 2% cross-slope, 10' (street typicals)	min. 8' sidewalk, 14' multi-use striped 7' & 7' for bike/pedestrians	min. 10', 3' clear zone preferred, 5' buffer between roadway and sidepath. If not possible, need barrier. And if over 45 mph, need to be crashworthy.	min. 8', 2% cross-slope 10' for path (TMP)	--	10' width, 2' clear zone
Shoulder (w/o curb and gutter)	None for major arterial 6' for minor arterial rural, 8' for minor collector rural	--	5' for minor arterial, 4' for collector	--	--	4' - 12' - min. 4' to accommodate bikes	--	--	--

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Illustrative Examples

Illustrative examples showing the different segment and intersection recommendations provide additional information on how these improvements may be applied at locations along the corridor. As with the other recommendations included within this Guide, these are provided for illustrative purposes and need to be applied on a location-by-location basis as appropriate given engineering analysis.

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GENERAL NOTES

REFERENCES:

(1) CDOT ROADWAY DESIGN GUIDE (2005) CHAPTER 14, UNLESS OTHERWISE STATED IN NOTE

(2) AASHTO GUIDE FOR THE DEVELOPMENT OF BICYCLIST FACILITIES, FOURTH EDITION (2012)

(3) NACTO DON'T GIVE UP AT THE INTERSECTION (2019). AVAILABLE AT: HTTPS://NACTO.ORG/PUBLICATION/DONT-GIVE-UP-AT-THE-INTERSECTION/PROTECTED-INTERSECTIONS/VARIATIONS/

(4) NACTO TRANSIT STREET DESIGN GUIDE (2016). AVAILABLE AT: HTTPS://NACTO.ORG/PUBLICATION/TRANSIT-STREET-DESIGN-GUIDE/STATIONS-STOPS/STOP-CONFIGURATIONS/SIDE-BOARDING-ISLAND-STOP/

(5) FWHA SMALL TOWN AND RURAL MULTIMODAL NETWORKS GUIDE (2016). AVAILABLE AT: HTTPS://WWW.FHWA.DOT.GOV/ENVIRONMENT/BICYCLE_PEDESTRIAN/PUBLICATIONS/SMALL_TOWNS/

(6) CDOT PEDESTRIAN CROSSING GUIDELINES (2021). AVAILABLE AT: HTTPS://WWW.CODOT.GOV/SAFETY/TRAFFIC-SAFETY/ASSETS/DOCUMENTS/CDOT-PEDESTRIAN-CROSSING-GUIDELINES-2021.PDF

(7) FWHA BIKEWAY SELECTION GUIDE (2019). AVAILABLE AT: HTTPS://SAFETY.FHWA.DOT.GOV/PED_BIKE/TOOLS_SOLVE/DOCS/FHWASA18077.PDF

(8) NACTO URBAN BIKEWAY DESIGN GUIDE. AVAILABLE AT: HTTPS://NACTO.ORG/PUBLICATION/URBAN-BIKEWAY-DESIGN-GUIDE/

(9) RTD BUS INFRASTRUCTURE STANDARD DRAWINGS (2016). AVAILABLE AT: HTTPS://WWW.RTD-DENVER.COM/SITES/DEFAULT/FILES/FILES/2018-08/RTD-BUS-INFRASTRUCTURE-STANDARD-DRAWINGS-2016.PDF

(10) CDOT LEFT TURN TREATMENT GUIDELINES FOR SIGNALIZED INTERSECTIONS (2019).

(11) FHWA IMPROVING SAFETY FOR PEDESTRIANS AND BICYCLISTS ACCESSING TRANSIT(2022). AVAILABLE AT: HTTPS://SAFETY.FHWA.DOT.GOV/PED_BIKE/PED_TRANSIT/FHWASA21130_PEDBIKE_ACCESS_TO_TRANSIT.PDF

(12) CDOT CURB RAMP STANDARDS (2019). AVAILABLE AT: HTTPS://WWW.CODOT.GOV/BUSINESS/DESIGNSUPPORT/2019-AND-2012-M-STANDARDS/2019-M-STANDARDS-PLANS/2019-M-STANDARDS-PLAN-SHEETS/M-608-1-CURB-RAMPS/M-608-1-CURB-RAMPS

(13) NACTO URBAN STREET DESIGN (2019) AVAILABLE AT: HTTPS://NACTO.ORG/PUBLICATION/URBAN-STREET-DESIGN-GUIDE/

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GENERAL NOTES

THESE EXHIBITS ARE ILLUSTRATIVE EXAMPLES SHOWING HOW THE RECOMMENDED TREATMENTS CAN BE APPLIED TO LOCATIONS ALONG THE CO 7 CORRIDOR.

REFERENCE THE CO 7 BIKE TREATMENT GUIDE FOR ADDITIONAL INFORMATION AND HOW TO USE THESE ILLUSTRATIVE EXAMPLES AS A RESOURCE FOR FINAL DESIGN PROJECTS ALONG THIS CORRIDOR.

ASSUMPTIONS:

BASED ON THE FHWA SHARED USE PATH CALCULATOR, A 12' WIDE SHARED USE PATH WITHOUT A CENTERLINE IS LOS A WITH UP TO 50 TRAIL USERS PER HOUR IN EACH DIRECTION.

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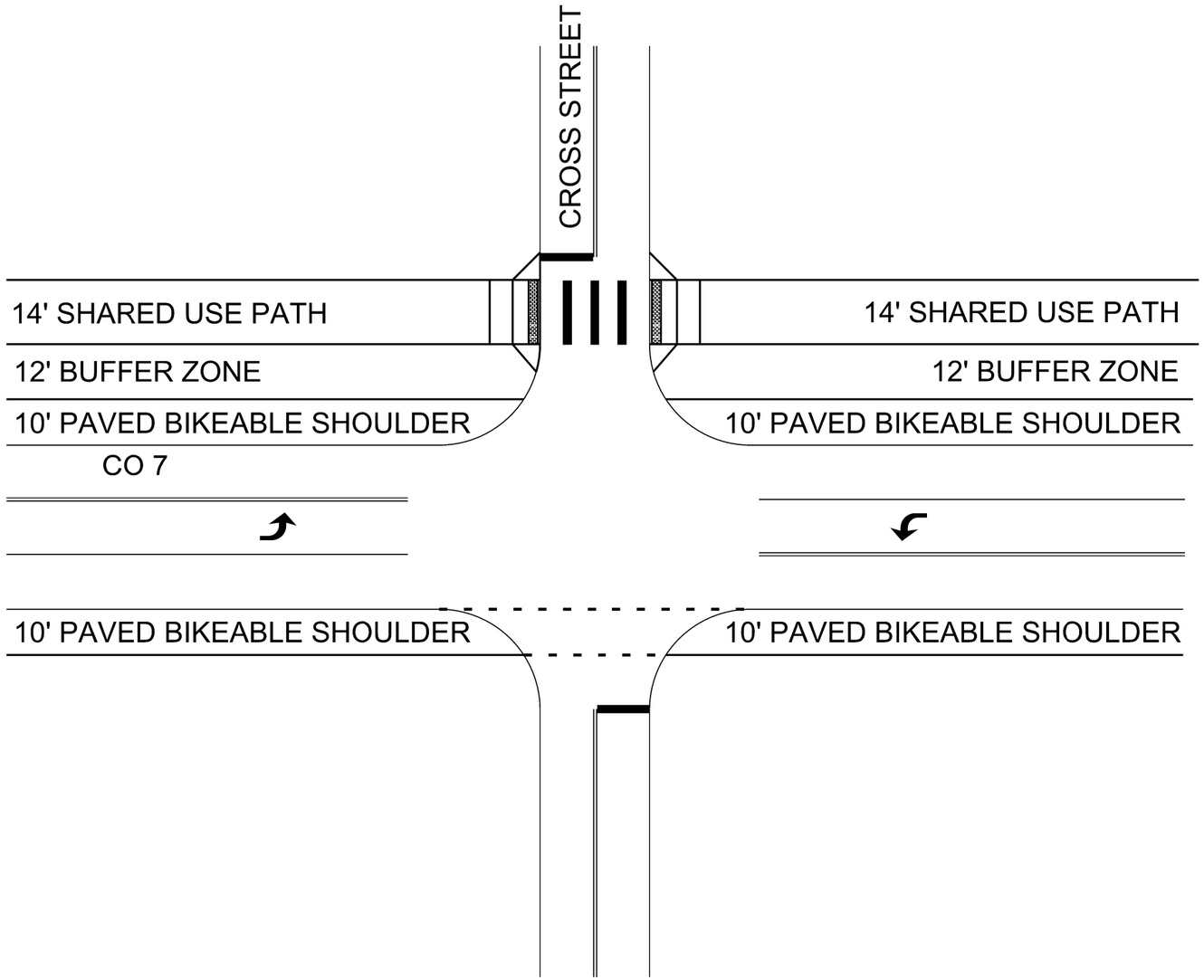
ILLUSTRATIVE EXAMPLE 1
SMALL UNSIGNALIZED INTERSECTION
UNCONSTRAINED



NOT FOR CONSTRUCTION AND FOR ILLUSTRATIVE PURPOSES ONLY

ILLUSTRATIVE EXAMPLE 1
SMALL UNSIGNALIZED INTERSECTION
UNCONSTRAINED - NOTES AND TECHNICAL INFORMATION

NOTES:

THESE ARE ILLUSTRATIVE EXAMPLES AND LOCATION SPECIFIC DETAILS WILL NEED TO BE CONSIDERED WHEN MAKING DECISIONS DURING FINAL DESIGN.

REFERENCE THE CO 7 BIKE TREATMENT GUIDE FOR ADDITIONAL INFORMATION.

SIGNAGE INFORMATION IS NOT INCLUDED WITHIN THESE EXHIBITS BUT SHALL BE INCLUDED AS PART OF FINAL DESIGN.

IF BUS STOPS ARE LOCATED AT INTERSECTIONS, ADJUST OR CREATE NEW WAITING AREA. (9)

CURB RAMPS WILL FOLLOW CDOT ADA STANDARDS. RAMP WIDTH OPENINGS SHOULD MATCH THE WIDTH OF THE ADJACENT SHARED USE PATH.

TECHNICAL INFORMATION:

WHEN A SHARED USE PATH IS LOCATED ON ONE SIDE OF THE ROADWAY, THE RECOMMENDED MINIMUM IS 14' WIDE TO ACCOMMODATE BOTH DIRECTIONS OF TRAVEL.

NOTE THAT THE ULTIMATE RECOMMENDED CROSS SECTION INCLUDES A 12' WIDE SHARED USE PATH ON BOTH THE NORTH AND SOUTH SIDE OF CO 7.

WHEN A LOCAL BUS STOP IS LOCATED AT AN INTERSECTION WITHOUT TRAFFIC CONTROL ON CO 7, CONSIDER A CROSSING. BASED ON CURRENT CDOT PEDESTRIAN CROSSING GUIDELINES, CROSSINGS SHOULD NOT BE INSTALLED ON ANY ROADWAYS THAT HAVE A POSTED SPEED LIMIT OF 45 MILES PER HOUR OR MORE. (6)

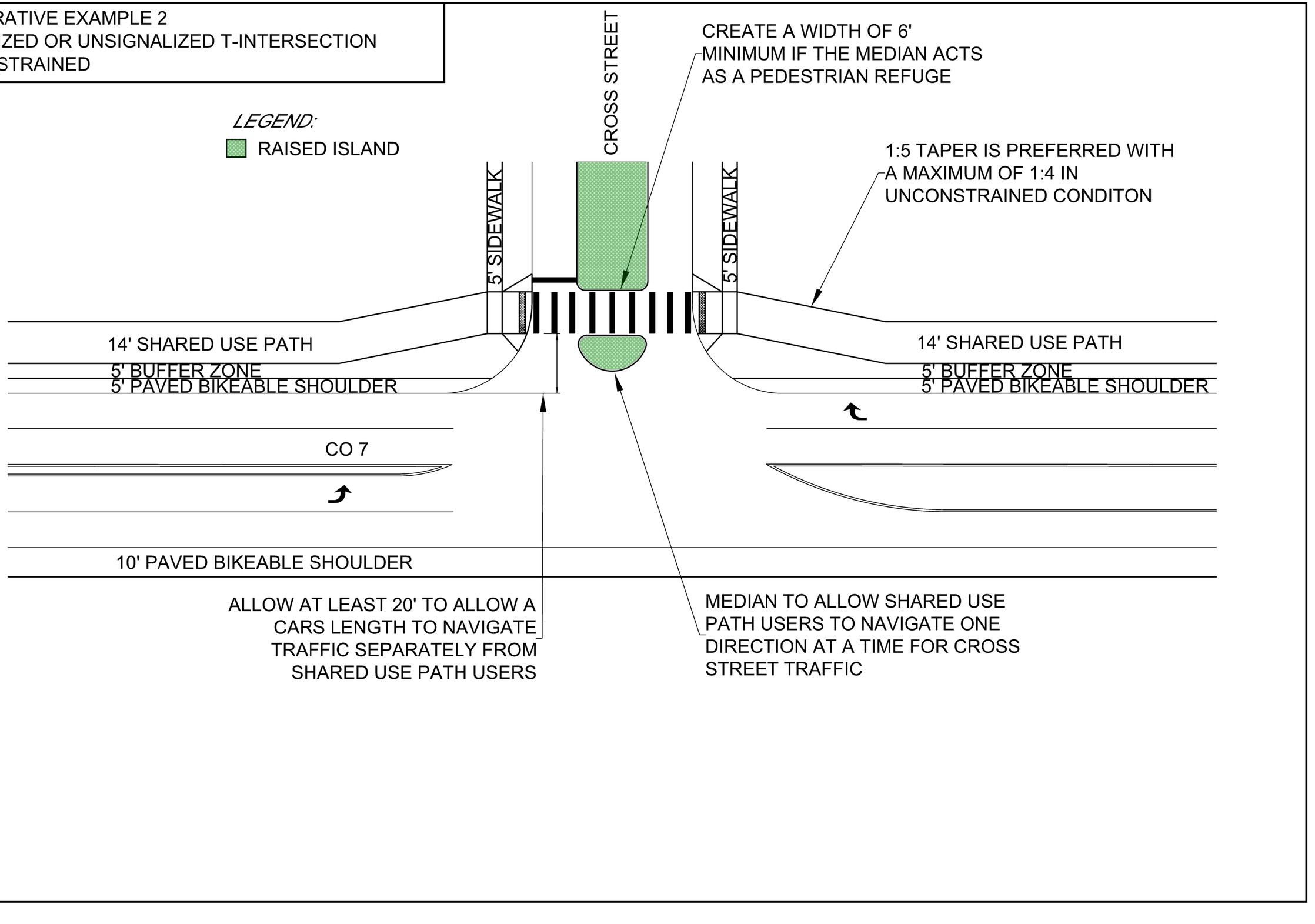
PREFERRED CONDITION IS A MINIMUM 2' BUFFER OF ANOTHER SURFACE TO INDICATE SEPARATION FROM THE SHARED USE PATH. ALTERNATE SURFACE EXAMPLES INCLUDE COLORED CONCRETE AND CRUSHED ROCK. WHEN DESIGN CONSTRAINTS DO NOT ALLOW THE 2' BUFFER, IN RURAL AND SUBURBAN CONTEXTS WITH HIGHER POSTED SPEEDS, IT IS APPROPRIATE TO REDUCE THE SHARED USE PATH WIDTH TO 10' TO ALLOW SPACE FOR THE BUFFER.

SKIP STRIPING FOR SHOULDER TO INDICATE TO BOTH BICYCLISTS AND DRIVERS TO EXPECT BICYCLISTS IN THIS SPACE. THIS IS MOST IMPORTANT IF THERE IS NO OFF-STREET FACILITY PROVIDED. (5)

WHEN A SHOULDER IS PROVIDED, IT SHOULD BE ASSUMED THAT SOME BICYCLISTS WILL UTILIZE THIS AS AN ON-STREET FACILITY. FOR THIS REASON, THE SHOULDERS SHOULD BE PAVED. THE FWHA BIKEWAY SELECTION GUIDE WAS CONSULTED IN THE RECOMMENDED WIDTH FOR SHOULDERS. THE MINIMUM WIDTH IS 5' AND THE MAXIMUM WIDTH IS 10'. (7)

NOT FOR CONSTRUCTION AND FOR ILLUSTRATIVE PURPOSES ONLY

ILLUSTRATIVE EXAMPLE 2
SIGNALIZED OR UNSIGNALIZED T-INTERSECTION
UNCONSTRAINED



NOT FOR CONSTRUCTION AND FOR ILLUSTRATIVE PURPOSES ONLY

ILLUSTRATIVE EXAMPLE 2
SIGNALIZED OR UNSIGNALIZED T-INTERSECTION
UNCONSTRAINED - NOTES AND TECHNICAL INFORMATION

NOTES:

THESE ARE ILLUSTRATIVE EXAMPLES AND LOCATION SPECIFIC DETAILS WILL NEED TO BE CONSIDERED WHEN MAKING DECISIONS DURING FINAL DESIGN.

REFERENCE THE CO 7 BIKE TREATMENT GUIDE FOR ADDITIONAL INFORMATION.

SIGNAGE INFORMATION IS NOT INCLUDED WITHIN THESE EXHIBITS BUT SHALL BE INCLUDED AS PART OF FINAL DESIGN.

IF BUS STOPS ARE LOCATED AT INTERSECTIONS, ADJUST OR CREATE NEW WAITING AREA. (9)

CURB RAMPS WILL FOLLOW CDOT ADA STANDARDS. RAMP WIDTH OPENINGS SHOULD MATCH THE WIDTH OF THE ADJACENT SHARED USE PATH.

TECHNICAL INFORMATION:

WHEN A SHOULDER IS PROVIDED, IT SHOULD BE ASSUMED THAT SOME BICYCLISTS WILL UTILIZE THIS AS AN ON-STREET FACILITY. FOR THIS REASON, THE SHOULDERS SHOULD BE PAVED. THE FWHA BIKEWAY SELECTION GUIDE WAS CONSULTED IN THE RECOMMENDED WIDTH FOR SHOULDERS. THE MINIMUM WIDTH IS 5' AND THE MAXIMUM WIDTH IS 10'. (7)

WHEN A SHARED USE PATH IS LOCATED ON ONE SIDE OF THE ROADWAY, THE RECOMMENDAED MINIMUM IS 14' WIDE TO ACCOMMODATE BOTH DIRECTIONS OF TRAVEL.

NOTE THAT THE ULTIMATE RECOMMENDED CROSS SECTION INCLUDES A 12' WIDE SHARED USE PATH ON BOTH THE NORTH AND SOUTH SIDE OF CO 7.

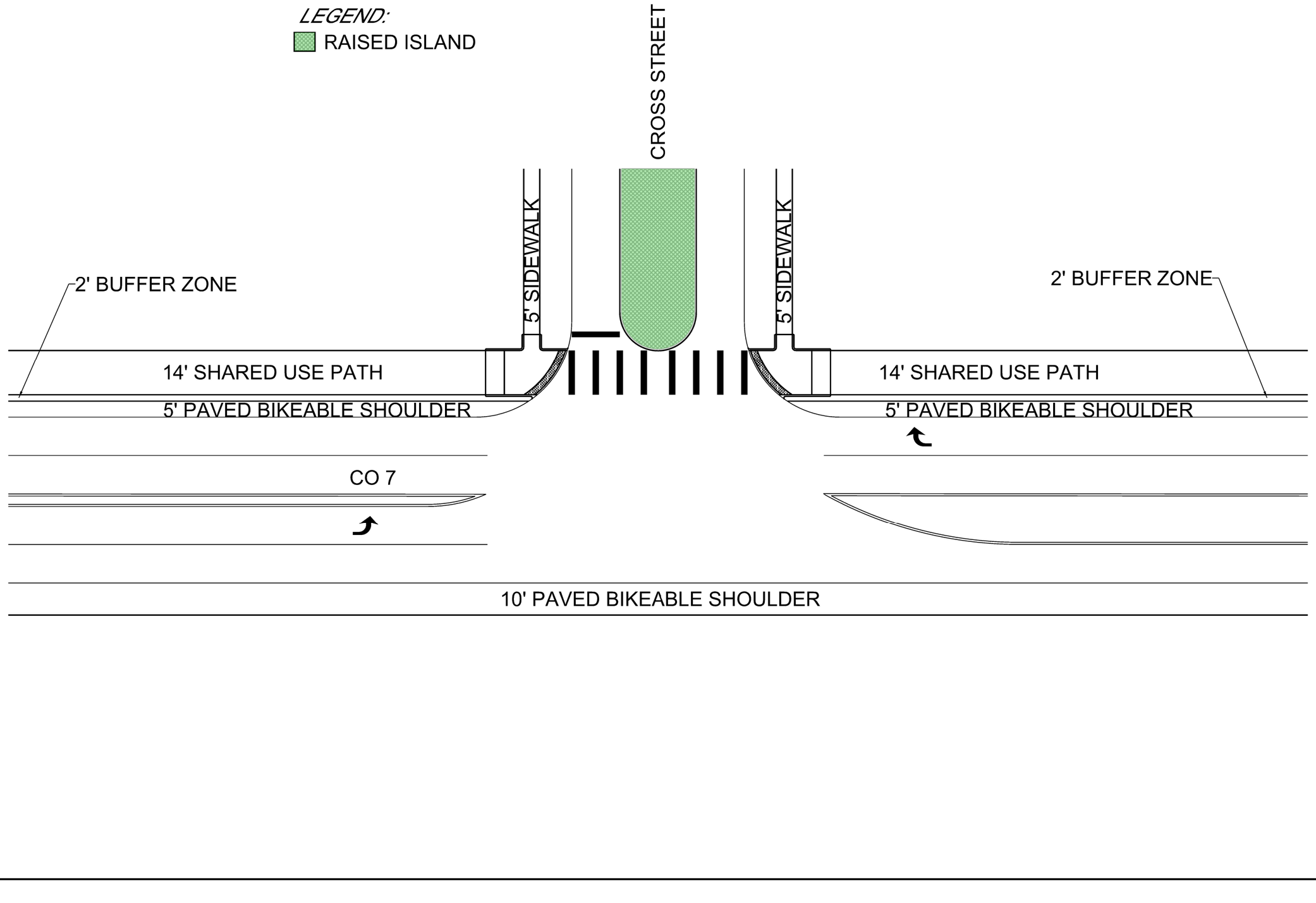
MINIMUM WIDTH FOR THE MEDIAN IS 6'. PREFERRED LENGTH IS 10' TO ALLOW SHARED PATH USERS TO NAVIGATE VEHICLES ENTERING AND EXITING THIS CROSS STREET. (8)

WHEN A LOCAL BUS STOP IS LOCATED AT AN INTERSECTION WITHOUT TRAFFIC CONTROL ON CO 7, CONSIDER A CROSSING. BASED ON CURRENT CDOT PEDESTRIAN CROSSING GUIDELINES, CROSSINGS SHOULD NOT BE INSTALLED ON ANY ROADWAYS THAT HAVE A POSTED SPEED LIMIT OF 45 MILES PER HOUR OR MORE. (6)

PREFERRED CONDITION IS A MINIMUM 2' BUFFER OF ANOTHER SURFACE TO INDICATE SEPARATION FROM THE SHARED USE PATH. ALTERNATE SURFACE EXAMPLES INCLUDE COLORED CONCRETE AND CRUSHED ROCK. WHEN DESIGN CONSTRAINTS DO NOT ALLOW THE 2' BUFFER, IN RURAL AND SUBURBAN CONTEXTS WITH HIGHER POSTED SPEEDS, IT IS APPROPRIATE TO REDUCE THE SHARED USE PATH WIDTH TO 10' TO ALLOW SPACE FOR THE BUFFER.

NOT FOR CONSTRUCTION AND FOR ILLUSTRATIVE PURPOSES ONLY

ILLUSTRATIVE EXAMPLE 3
SIGNALIZED OR UNSIGNALIZED T-INTERSECTION
CONSTRAINED



NOT FOR CONSTRUCTION AND FOR ILLUSTRATIVE PURPOSES ONLY

ILLUSTRATIVE EXAMPLE 3
SIGNALIZED OR UNSIGNALIZED T-INTERSECTION
CONSTRAINED - NOTES AND TECHNICAL INFORMATION

NOTES:

THESE ARE ILLUSTRATIVE EXAMPLES AND LOCATION SPECIFIC DETAILS WILL NEED TO BE CONSIDERED WHEN MAKING DECISIONS DURING FINAL DESIGN.

REFERENCE THE CO 7 BIKE TREATMENT GUIDE FOR ADDITIONAL INFORMATION.

SIGNAGE INFORMATION IS NOT INCLUDED WITHIN THESE EXHIBITS BUT SHALL BE INCLUDED AS PART OF FINAL DESIGN.

IF BUS STOPS ARE LOCATED AT INTERSECTIONS, ADJUST OR CREATE NEW WAITING AREA. (9)

CURB RAMPS WILL FOLLOW CDOT ADA STANDARDS. RAMP WIDTH OPENINGS SHOULD MATCH THE WIDTH OF THE ADJACENT SHARED USE PATH.

TECHNICAL INFORMATION:

PREFERRED CONDITION IS A MINIMUM 2' BUFFER OF ANOTHER SURFACE TO INDICATE SEPARATION FROM THE SHARED USE PATH. ALTERNATE SURFACE EXAMPLES INCLUDE COLORED CONCRETE AND CRUSHED ROCK. WHEN DESIGN CONSTRAINTS DO NOT ALLOW THE 2' BUFFER, IN RURAL AND SUBURBAN CONTEXTS WITH HIGHER POSTED SPEEDS, IT IS APPROPRIATE TO REDUCE THE SHARED USE PATH WIDTH TO 10' TO ALLOW SPACE FOR THE BUFFER.

WHEN A LOCAL BUS STOP IS LOCATED AT AN INTERSECTION WITHOUT TRAFFIC CONTROL ON CO 7, CONSIDER A CROSSING. BASED ON CURRENT CDOT PEDESTRIAN CROSSING GUIDELINES, CROSSINGS SHOULD NOT BE INSTALLED ON ANY ROADWAYS THAT HAVE A POSTED SPEED LIMIT OF 45 MILES PER HOUR OR MORE. (6)

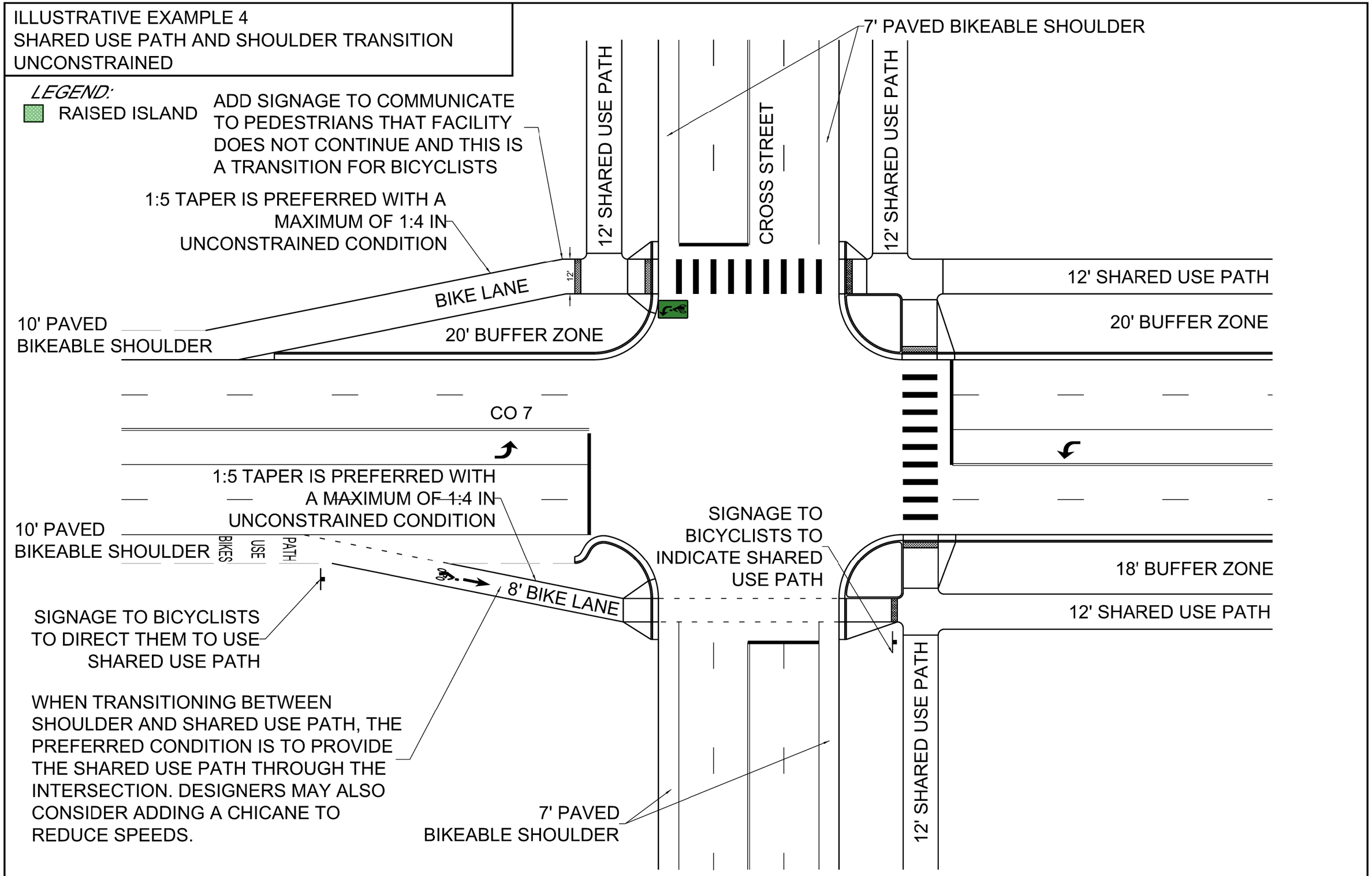
WHEN A SHARED USE PATH IS LOCATED ON ONE SIDE OF THE ROADWAY, THE RECOMMENDAED MINIMUM IS 14' WIDE TO ACCOMMODATE BOTH DIRECTIONS OF TRAVEL.

NOTE THAT THE ULTIMATE RECOMMENDED CROSS SECTION INCLUDES A 12' WIDE SHARED USE PATH ON BOTH THE NORTH AND SOUTH SIDE OF CO 7.

WHEN A SHOULDER IS PROVIDED, IT SHOULD BE ASSUMED THAT SOME BICYCLISTS WILL UTILIZE THIS AS AN ON-STREET FACILITY. FOR THIS REASON, THE SHOULDERS SHOULD BE PAVED. THE FWHA BIKEWAY SELECTION GUIDE WAS CONSULTED IN THE RECOMMENDED WIDTH FOR SHOULDERS. THE MINIMUM WIDTH IS 5' AND THE MAXIMUM WIDTH IS 10'. (7)

NOT FOR CONSTRUCTION AND FOR ILLUSTRATIVE PURPOSES ONLY

ILLUSTRATIVE EXAMPLE 4
SHARED USE PATH AND SHOULDER TRANSITION
UNCONSTRAINED



NOT FOR CONSTRUCTION AND FOR ILLUSTRATIVE PURPOSES ONLY

ILLUSTRATIVE EXAMPLE 4
SHARED USE PATH AND SHOULDER TRANSITION
UNCONSTRAINED - NOTES AND TECHNICAL INFORMATION

NOTES:

THESE ARE ILLUSTRATIVE EXAMPLES AND LOCATION SPECIFIC DETAILS WILL NEED TO BE CONSIDERED WHEN MAKING DECISIONS DURING FINAL DESIGN.

REFERENCE THE CO 7 BIKE TREATMENT GUIDE FOR ADDITIONAL INFORMATION.

SIGNAGE INFORMATION IS NOT INCLUDED WITHIN THESE EXHIBITS BUT SHALL BE INCLUDED AS PART OF FINAL DESIGN.

IF BUS STOPS ARE LOCATED AT INTERSECTIONS, ADJUST OR CREATE NEW WAITING AREA. (9)

CURB RAMPS WILL FOLLOW CDOT ADA STANDARDS. RAMP WIDTH OPENINGS SHOULD MATCH THE WIDTH OF THE ADJACENT SHARED USE PATH.

TECHNICAL INFORMATION:

WHEN A SHOULDER IS PROVIDED, IT SHOULD BE ASSUMED THAT SOME BICYCLISTS WILL UTILIZE THIS AS AN ON-STREET FACILITY. FOR THIS REASON, THE SHOULDERS SHOULD BE PAVED. THE FWHA BIKEWAY SELECTION GUIDE WAS CONSULTED IN THE RECOMMENDED WIDTH FOR SHOULDERS. THE MINIMUM WIDTH IS 5' AND THE MAXIMUM WIDTH IS 10'. (7)

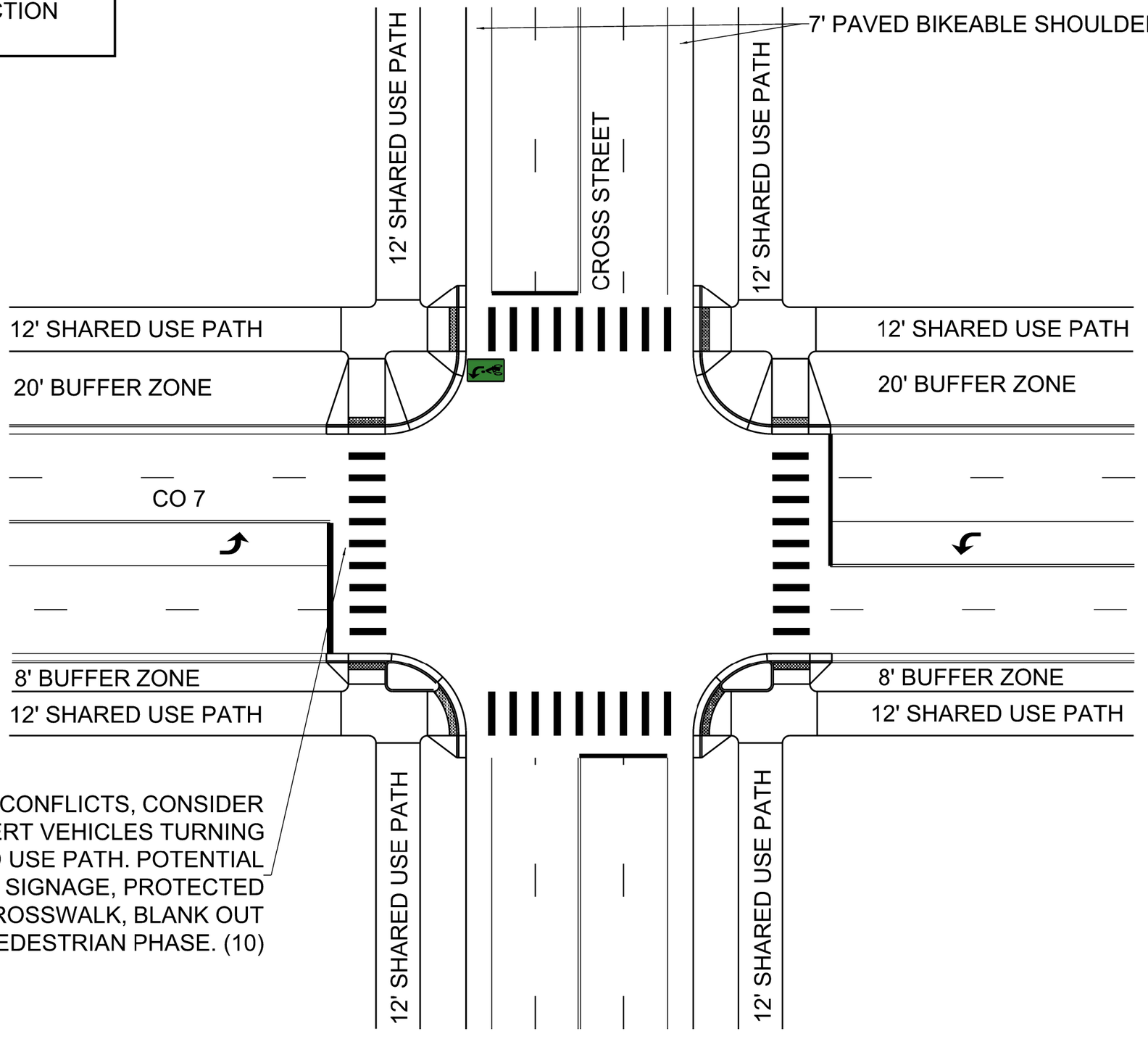
PREFERRED CONDITION IS A MINIMUM 2' BUFFER OF ANOTHER SURFACE TO INDICATE SEPARATION FROM THE SHARED USE PATH. ALTERNATE SURFACE EXAMPLES INCLUDE COLORED CONCRETE AND CRUSHED ROCK. WHEN DESIGN CONSTRAINTS DO NOT ALLOW THE 2' BUFFER, IN RURAL AND SUBURBAN CONTEXTS WITH HIGHER POSTED SPEEDS, IT IS APPROPRIATE TO REDUCE THE SHARED USE PATH WIDTH TO 10' TO ALLOW SPACE FOR THE BUFFER.

CONSIDER BIKE TURN BOX WHEN THERE ARE CONNECTING FACILITIES. NEED TO CONSIDER VEHICULAR RIGHT TURN VOLUMES, RESTRICTING RIGHT ON RED, AND NUMBER OF BICYCLISTS MAKING THIS CONNECTION.

NOT FOR CONSTRUCTION AND FOR ILLUSTRATIVE PURPOSES ONLY

ILLUSTRATIVE EXAMPLE 5
SMALL SIGNALIZED INTERSECTION
UNCONSTRAINED

LEGEND:
RAISED ISLAND



TO REDUCE POTENTIAL CONFLICTS, CONSIDER TREATMENTS TO ALERT VEHICLES TURNING LEFT OF SHARED USE PATH. POTENTIAL TREATMEATS INCLUDE SIGNAGE, PROTECTED LEFT TURN, RASIED CROSSWALK, BLANK OUT SIGNS, AND/OR SIGNAL PEDESTRIAN PHASE. (10)

NOT FOR CONSTRUCTION AND FOR ILLUSTRATIVE PURPOSES ONLY

ILLUSTRATIVE EXAMPLE 5
SMALL SIGNALIZED INTERSECTION
UNCONSTRAINED - NOTES AND TECHNICAL INFORMATION

NOTES:

THESE ARE ILLUSTRATIVE EXAMPLES AND LOCATION SPECIFIC DETAILS WILL NEED TO BE CONSIDERED WHEN MAKING DECISIONS DURING FINAL DESIGN.

REFERENCE THE CO 7 BIKE TREATMENT GUIDE FOR ADDITIONAL INFORMATION.

SIGNAGE INFORMATION IS NOT INCLUDED WITHIN THESE EXHIBITS BUT SHALL BE INCLUDED AS PART OF FINAL DESIGN.

IF BUS STOPS ARE LOCATED AT INTERSECTIONS, ADJUST OR CREATE NEW WAITING AREA. (9)

CURB RAMPS WILL FOLLOW CDOT ADA STANDARDS. RAMP WIDTH OPENINGS SHOULD MATCH THE WIDTH OF THE ADJACENT SHARED USE PATH.

TECHNICAL INFORMATION:

CONSIDER BIKE TURN BOX WHEN THERE ARE CONNECTING FACILITES. NEED TO CONSIDER VEHICULAR RIGHT TURN VOLUMES, RESTRICTING RIGHT ON RED, AND NUMBER OF BICYCLISTS MAKING THIS CONNECTION.

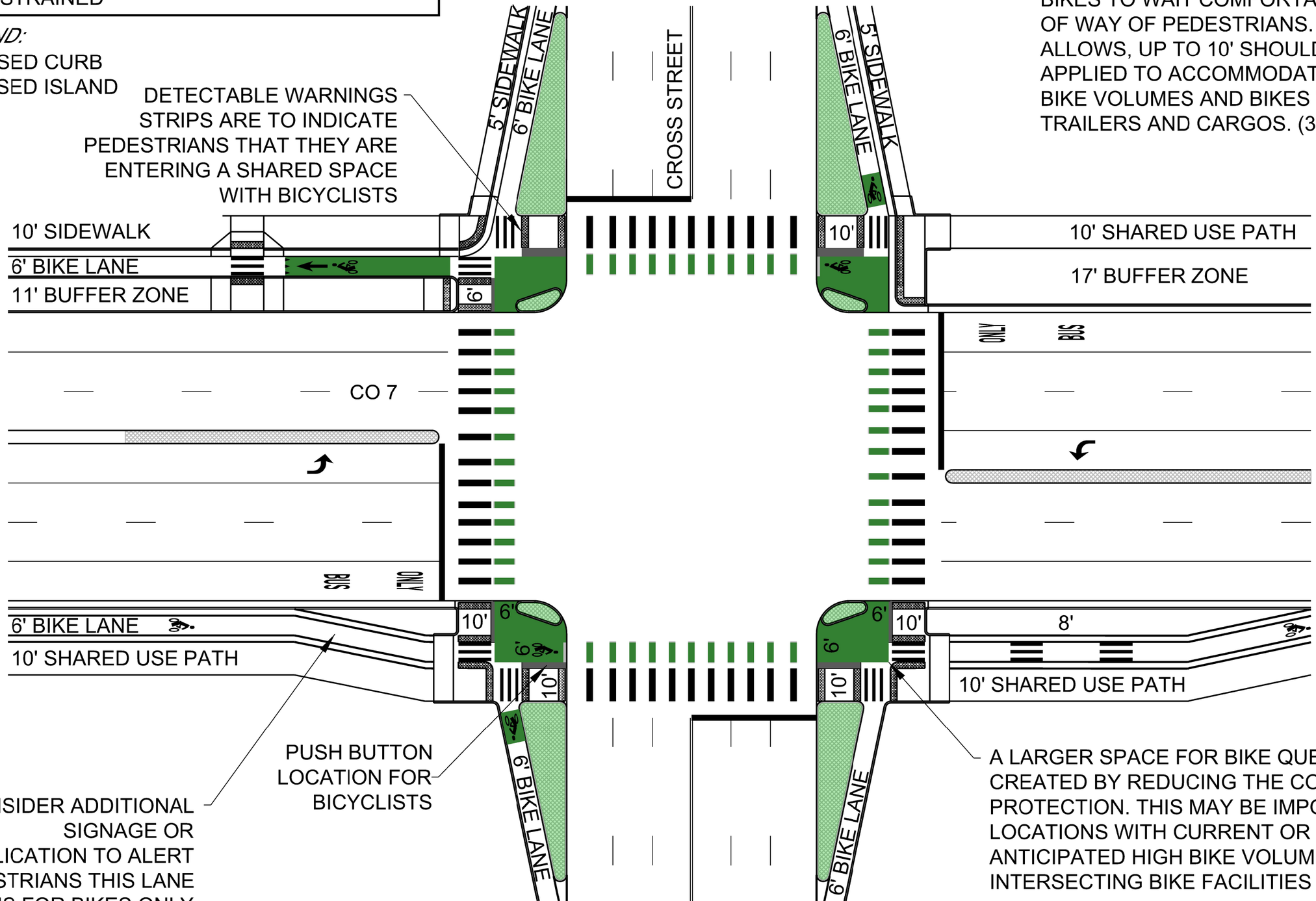
NOT FOR CONSTRUCTION AND FOR ILLUSTRATIVE PURPOSES ONLY

ILLUSTRATIVE EXAMPLE 6
LARGE INTERSECTION - FULLY PROTECTED
UNCONSTRAINED

LEGEND:
- RAISED CURB
- RAISED ISLAND

DETECTABLE WARNINGS STRIPS ARE TO INDICATE PEDESTRIANS THAT THEY ARE ENTERING A SHARED SPACE WITH BICYCLISTS

MINIMUM LENGTH OF 6.5' TO ALLOW BIKES TO WAIT COMFORTABLY OUT OF WAY OF PEDESTRIANS. IF SPACE ALLOWS, UP TO 10' SHOULD BE APPLIED TO ACCOMMODATE HIGH BIKE VOLUMES AND BIKES WITH TRAILERS AND CARGOS. (3)



CONSIDER ADDITIONAL SIGNAGE OR APPLICATION TO ALERT PEDESTRIANS THIS LANE IS FOR BIKES ONLY

PUSH BUTTON LOCATION FOR BICYCLISTS

A LARGER SPACE FOR BIKE QUEUING IS CREATED BY REDUCING THE CORNER PROTECTION. THIS MAY BE IMPORTANT IN LOCATIONS WITH CURRENT OR ANTICIPATED HIGH BIKE VOLUMES AND/OR INTERSECTING BIKE FACILITIES

NOT FOR CONSTRUCTION AND FOR ILLUSTRATIVE PURPOSES ONLY

ILLUSTRATIVE EXAMPLE 6
LARGE INTERSECTION - FULLY PROTECTED
UNCONSTRAINED - NOTES AND TECHNICAL INFORMATION

NOTES:

THESE ARE ILLUSTRATIVE EXAMPLES AND LOCATION SPECIFIC DETAILS WILL NEED TO BE CONSIDERED WHEN MAKING DECISIONS DURING FINAL DESIGN.

REFERENCE THE CO 7 BIKE TREATMENT GUIDE FOR ADDITIONAL INFORMATION.

SIGNAGE INFORMATION IS NOT INCLUDED WITHIN THESE EXHIBITS BUT SHALL BE INCLUDED AS PART OF FINAL DESIGN.

IF BUS STOPS ARE LOCATED AT INTERSECTIONS, ADJUST OR CREATE NEW WAITING AREA. (9)

CURB RAMPS WILL FOLLOW CDOT ADA STANDARDS. RAMP WIDTH OPENINGS SHOULD MATCH THE WIDTH OF THE ADJACENT SHARED USE PATH.

TECHNICAL INFORMATION:

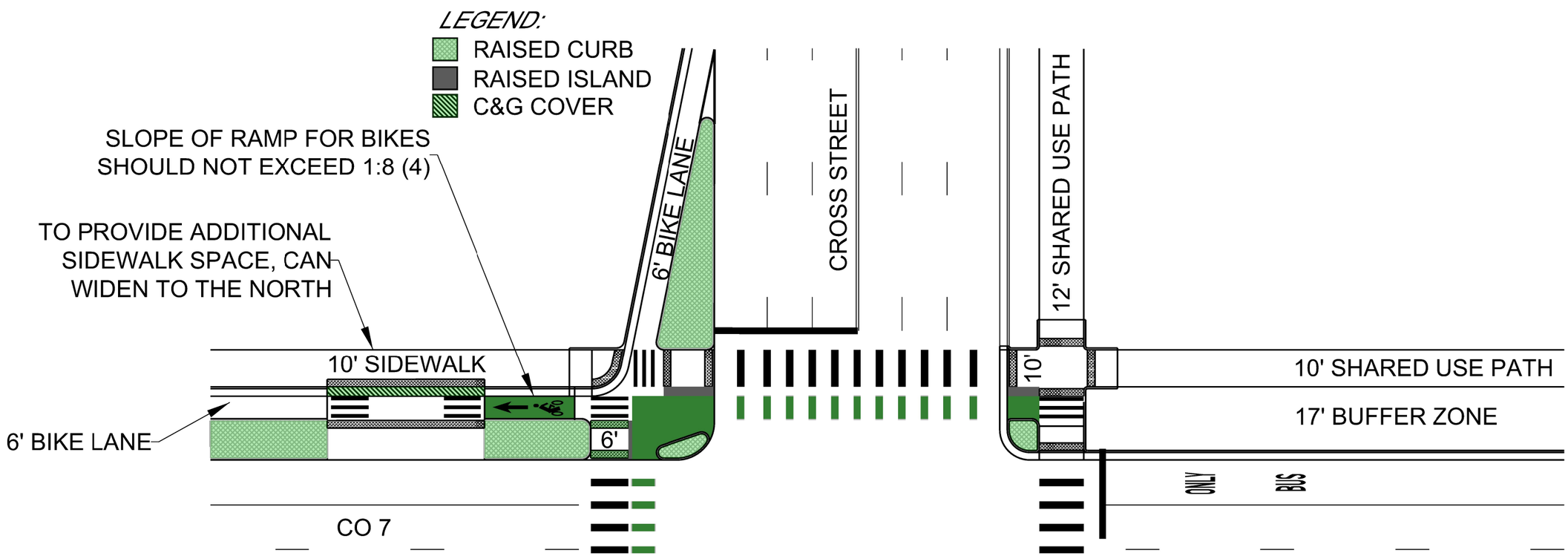
IF BUS QUEUE JUMP WITH TRANSIT SIGNAL IS PRESENT AT INTERSECTION, COORDINATE TO ALSO HAVE LEADING PEDESTRIAN INTERVAL

WHEN BICYCLISTS CROSS THE PATH OF PEDESTRIANS, YIELD MARKINGS AND YIELD TO PEDESTRIANS SIGNS (4)

CORNER PROTECTION NEEDS TO HAVE A VERTICAL ELEMENT AT LEAST ALONG THE PERIMETER OF THE CORNER. EXAMPLES INCLUDE: CONCRETE CURB, PRE-FABRICATED CURB, AND RUBBERIZED CURB.

NOT FOR CONSTRUCTION AND FOR ILLUSTRATIVE PURPOSES ONLY

ILLUSTRATIVE EXAMPLE 7
LARGE INTERSECTION -
PROTECTED ELEMENTS SHARED USE PATH ON EAST SIDE TRANSITION TO BIKE LANE AND SIDEWALK
(BOTH AT SIDEWALK GRADE)
UNCONSTRAINED



NOT FOR CONSTRUCTION AND FOR ILLUSTRATIVE PURPOSES ONLY

ILLUSTRATIVE EXAMPLE 7
LARGE INTERSECTION -
PROTECTED ELEMENTS SHARED USE PATH ON EAST SIDE TRANSITION TO BIKE LANE AND SIDEWALK (BOTH AT SIDEWALK GRADE)
UNCONSTRAINED - NOTES AND TECHNICAL INFORMATION

NOTES:

THESE ARE ILLUSTRATIVE EXAMPLES AND LOCATION SPECIFIC DETAILS WILL NEED TO BE CONSIDERED WHEN MAKING DECISIONS DURING FINAL DESIGN.

REFERENCE THE CO 7 BIKE TREATMENT GUIDE FOR ADDITIONAL INFORMATION.

SIGNAGE INFORMATION IS NOT INCLUDED WITHIN THESE EXHIBITS BUT SHALL BE INCLUDED AS PART OF FINAL DESIGN.

IF BUS STOPS ARE LOCATED AT INTERSECTIONS, ADJUST OR CREATE NEW WAITING AREA. (9)

CURB RAMPS WILL FOLLOW CDOT ADA STANDARDS. RAMP WIDTH OPENINGS SHOULD MATCH THE WIDTH OF THE ADJACENT SHARED USE PATH.

TECHNICAL INFORMATION:

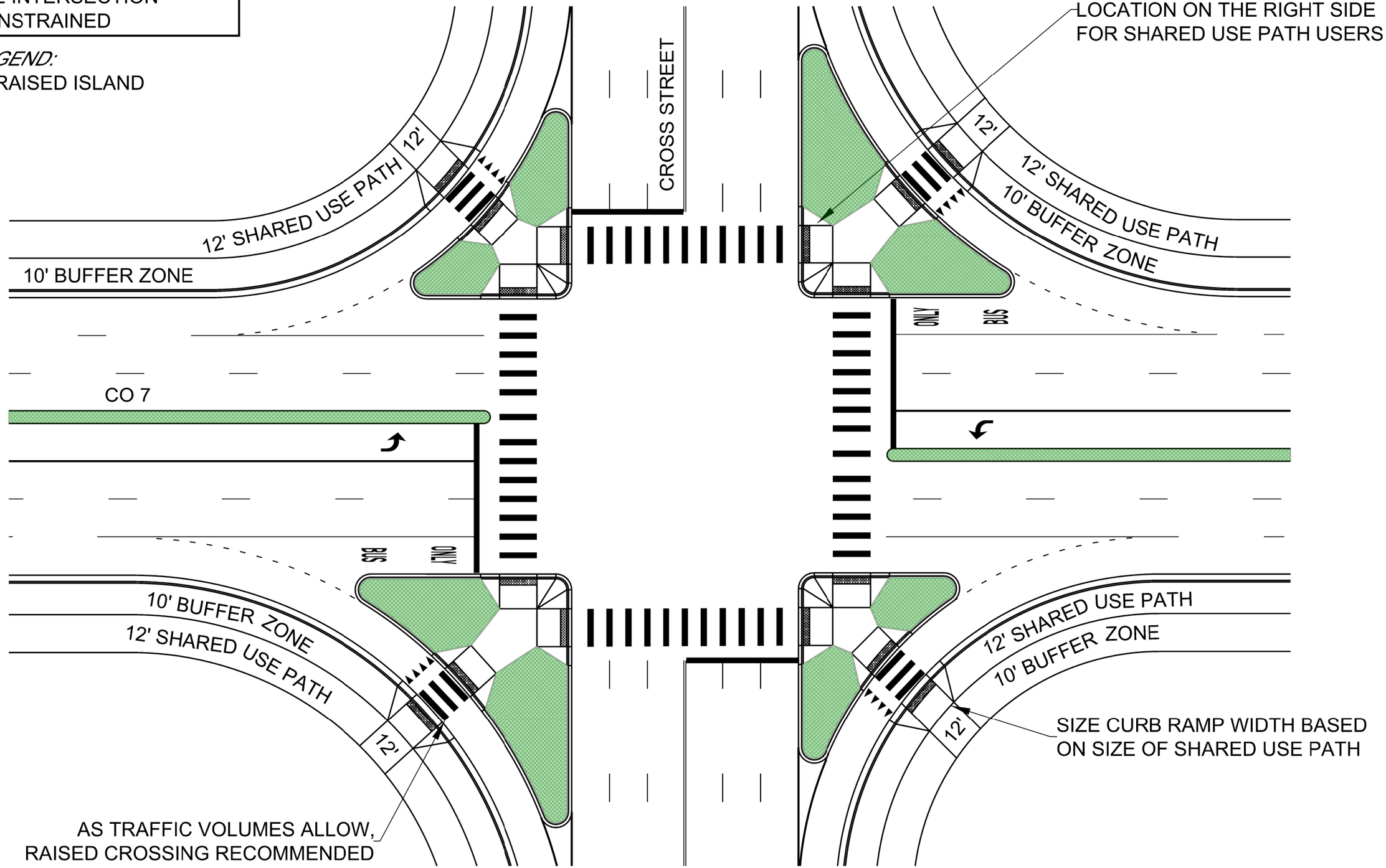
CORNER PROTECTION NEEDS TO HAVE A VERTICAL ELEMENT AT LEAST ALONG THE PERIMETER OF THE CORNER. EXAMPLES INCLUDE: CONCRETE CURB AND PRE-FABRICATED CURB.

A LARGER SPACE FOR BIKE QUEUING IS CREATED BY REDUCING THE CORNER PROTECTION. THIS MAY BE IMPORTANT IN LOCATIONS WITH CURRENT OR ANTICIPATED HIGH BIKE VOLUMES AND/OR INTERSECTING BIKE FACILITIES.

NOT FOR CONSTRUCTION AND FOR ILLUSTRATIVE PURPOSES ONLY

ILLUSTRATIVE EXAMPLE 8
LARGE INTERSECTION
UNCONSTRAINED

LEGEND:
RAISED ISLAND



NOT FOR CONSTRUCTION AND FOR ILLUSTRATIVE PURPOSES ONLY

ILLUSTRATIVE EXAMPLE 8
LARGE INTERSECTION
UNCONSTRAINED - NOTES AND TECHNICAL INFORMATION

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TECHNICAL INFORMATION:

IF BUS QUEUE JUMP WITH TRANSIT SIGNAL IS PRESENT AT INTERSECTION, COORDINATE TO ALSO HAVE LEADING PEDESTRIAN INTERVAL

REFERENCE CDOT CURB RAMP STANDARDS FOR INFORMATION ABOUT TURNING SPACE DETAILS (12)

RADII OF RIGHT TURN TO BE BASED OFF OF DESIGN SPEED AND VEHICLE (13)

IN LOCATIONS WITH BUS ONLY LANES, LANE TO BE LONG ENOUGH TO ACCOMODATE A STOPPED BUS WHILE MAINTAINING TRAFFIC FLOW THROUGH RIGHT TURN LANE

IN LOCATIONS WITH BUS ONLY LANES, CLEARLY INDICATE WITH STRIPING THAT THE LANE IS RESTRICTED TO BUSES