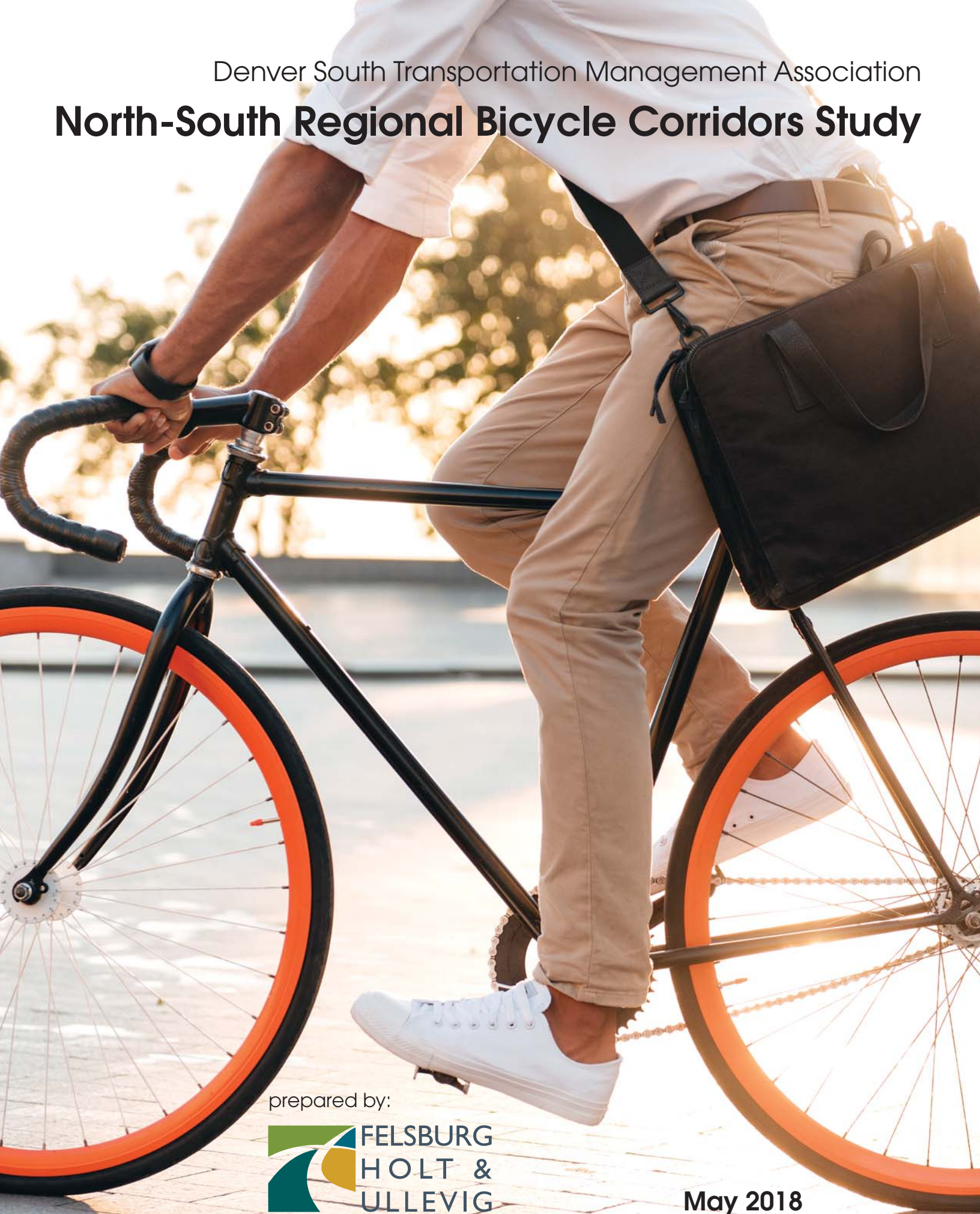
Denver South Transportation Management Association

North-South Regional Bicycle Corridors Study



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DSTMA NORTH-SOUTH REGIONAL BICYCLE CORRIDORS STUDY

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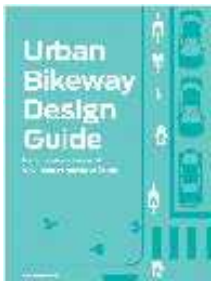
1. PROJECT OVERVIEW

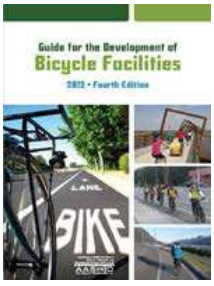
The Denver South Transportation Management Association (DSTMA) completed a *Phase I Regional Trail Connections Study* in 2016. The *Phase I* effort was a high-level bicycle corridor study that developed a framework for a regional bicycle network that connects Denver South employers, employees, and residents. Ultimately, the regional bicycle network will allow for bicycling as a viable modal choice for commute and utilitarian trips in addition to recreation.

The *Phase 1 Regional Trail Connections Study* resulted in the identification of 11 regional bicycle corridors, including four priority bicycle corridors and seven secondary corridors, as shown on **Figure 1-1.** This study, the *Phase II North-South Regional Bicycle Corridors Study,* is a follow up planning effort based on the findings of *Phase I* and focuses on the two-high priority north-south corridors on the east and west sides of I-25 from Lone Tree to Denver.

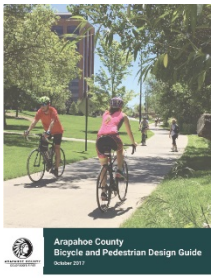
This study involved review and refinement of the previously identified alignments for each of the routes, an inventory of existing conditions, additional route level analysis, planning level cost estimation, and documentation to support future stakeholder collaboration and potential funding requests. For information on design standards and guidelines for the bicycle facility types identified in this plan, please reference the following resources:



National Association of City Transportation Officials
Urban Bikeway Design Guide, 2nd Edition (2014)

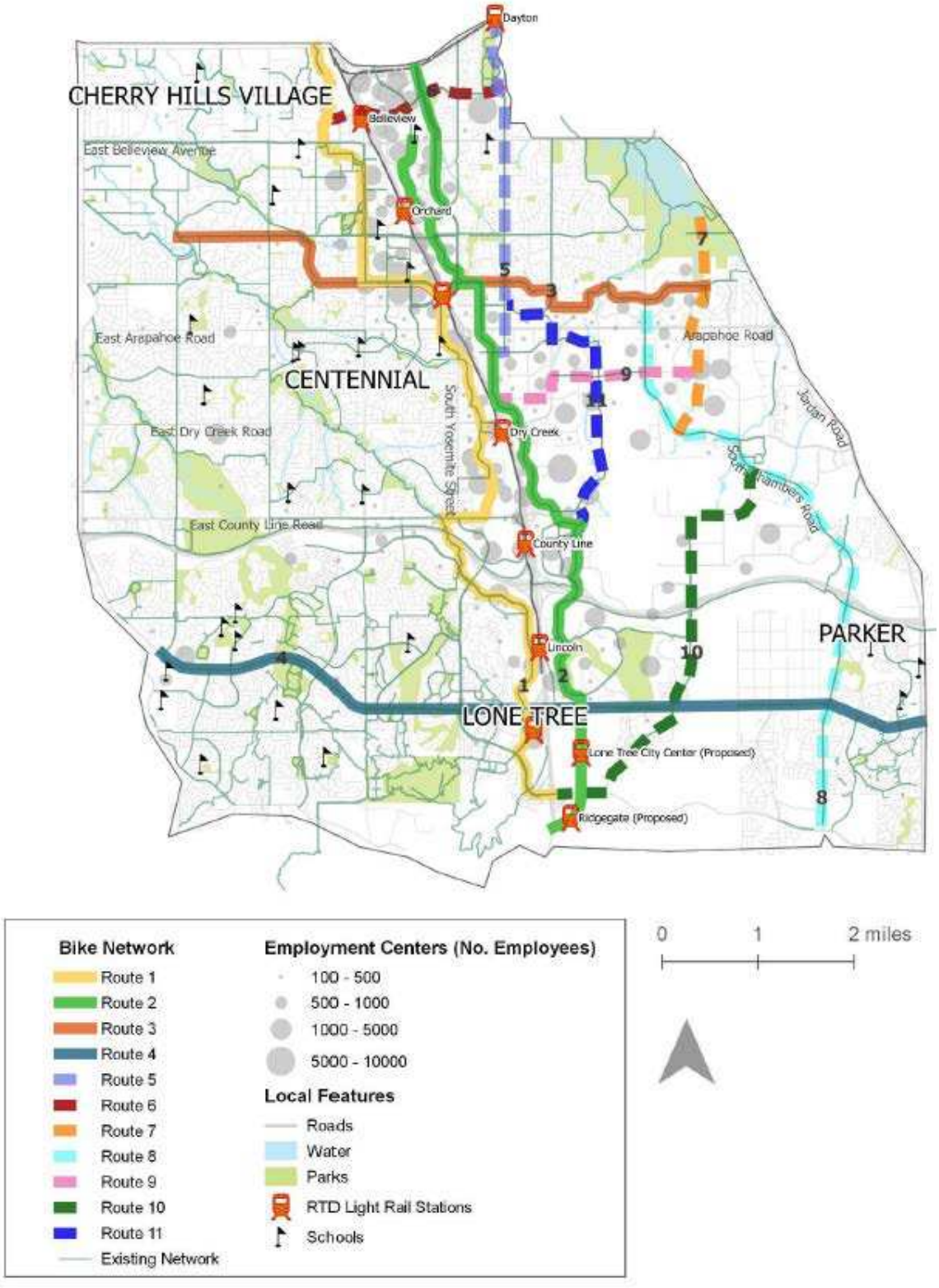


American Association of State Highway and Transportation Officials
Guide for the Development of Bicycle Facilities, 4th Edition (2012)



Arapahoe County, Colorado
Bicycle and Pedestrian Design Guide (2017)

Figure 1-1 Phase I Regional Trail Connections Study Priority Corridors



2. STAKEHOLDER ENGAGEMENT

It was important to engage stakeholders throughout the planning process to understand their needs and build support for the North-South Bicycle Corridors. At project onset, the project team held one-on-one meetings with all key stakeholders to provide an overview of the planning process, obtain consensus on the project vision and guiding principles, review and refine route alignments, and to discuss potential bicycle facility type recommendations.

Meetings were held with the following partner agencies:

- Arapahoe County
- City and County of Denver
- City of Centennial
- City of Greenwood Village
- City of Lone Tree
- Douglas County
- Inverness Metropolitan District
- John Madden Group
- Meridian Metropolitan District
- Park Meadows

2.1 Project Vision & Guiding Principles

A project vision and supporting guiding principles were developed to guide the project. The vision and guiding principles were reviewed at the one-on-on-partner meetings and supported unanimously.

North-South Regional Bicycle Corridors Vision

Low-stress regional north-south bicycle corridors that parallel I-25, encourage bicycle travel, and enhance the overall economic vitality and community prosperity of the Denver South region.

Guiding Principle #1

Provide seamless integration of the bicycle routes across jurisdictional boundaries to enhance social, economic, and environmental prosperity in the region.

Guiding Principle #2

Enhance the viability and safety of all rider types bicycling for commute purposes by providing low-stress bicycle facilities.

Guiding Principle #3

Connect major destinations such as employment centers, residential neighborhoods, transit stations, parks, schools, and shopping.

Guiding Principle #4

Maximize travel efficiency and minimize out of direction travel along the north-south corridors to attract local and regional trips.

Guiding Principle #5

Consider previously identified priority bicycle corridors and essential east-west connectivity for future network expansion.

2.2 DSTMA Technical Advisory Committee Meetings

The project team also participated in two Technical Advisory Committee (TAC) meetings at key project milestones. The first presentation to the TAC was given after the one-on-partner meetings and the initial review and analysis of the North-South Bicycle Corridors. The second meeting was held to review segment recommendations, cost estimates, and the draft plan. DSTMA staff and TAC members served as the reviewing body for the final plan.

3. EXISTING CONDITIONS, PLAN REVIEW, AND CORRIDOR REFINEMENT

Further review and data collection for each of the identified North-South Bicycle Corridors was a key building block in the refinement of the corridor alignments and informed the evaluation of comfort on the existing facilities.

3.1 Existing Conditions

To kick off the project, the team biked the North-South Bicycle Corridors to better understand the user experience and to document existing conditions through photo and video. The project team also documented existing conditions data available for the North-South Bicycle Corridors, including:

- Existing bicycle facilities
- Number of lanes
- Presence of on-street parking
- Street designation (truck or bus route)
- Posted speeds
- Traffic volumes (as available)

3.2 Plan Review

The team also reviewed related plans to understand any changes and/or discrepancies in identified facilities since the *Phase I Regional Trail Connections Study* was completed in 2016. Of particular interest were Centennials' *East-West Trails Connection Study* (2018) and the recently adopted A*rapahoe County Bicycle & Pedestrian Master Plan* (2017). Findings from the plan review were used to inform discussions with stakeholders, to guide the finalization of the corridor alignments, and to inform facility type recommendations.

3.3 Recommended North-South Bicycle Corridor Alignments

After conducting field work, reviewing plans, inventorying existing conditions, and meeting with stakeholders, the project team finalized the alignments for each of the North-South Bicycle Corridors. The final North-South Bicycle Corridor alignments are shown on **Figure 3-1.**

While the final corridors, for the most part, follow the alignments identified in the *Phase I Regional Trail Connections Study*, some changes were made to the proposed routing. Further analysis led the project team to conclude that several of the initially chosen segments were too busy and constrained to feasibly accommodate a comfortable bicycle facility. In these instances, the corridor alignments were shifted to parallel segments with lower traffic volumes and speeds. As an example, the previously identified corridor alignment east of I-25 utilized Clinton Street between Arapahoe Road and Dry Creek Road but the final corridor alignment was shifted east to Fulton Street. Of the two streets, Fulton has both lower

speeds and lower traffic volumes, and more capacity to accommodate a comfortable on-street bike facility. Other key changes to the corridor alignments include:

- Shifting from Quebec Street to Greenwood Plaza Boulevard in Greenwood Village
- Shifting from Chester Street to Yosemite Street in Centennial
- Shifting from Park Meadows Drive to a proposed new trail segment in Lone Tree

To provide context and perspective, **Figure 3-2** shows the North-South Bicycle Corridors with the existing and proposed on-street bicycle facilities and trails in the planning area. The existing and proposed facility data is from the 2017 Arapahoe County Bicycle & Pedestrian Plan and open-source GIS data from the City and County of Denver and Arapahoe County.

Figure 3-1 Final North-South Regional Bicycle Corridor Alignments

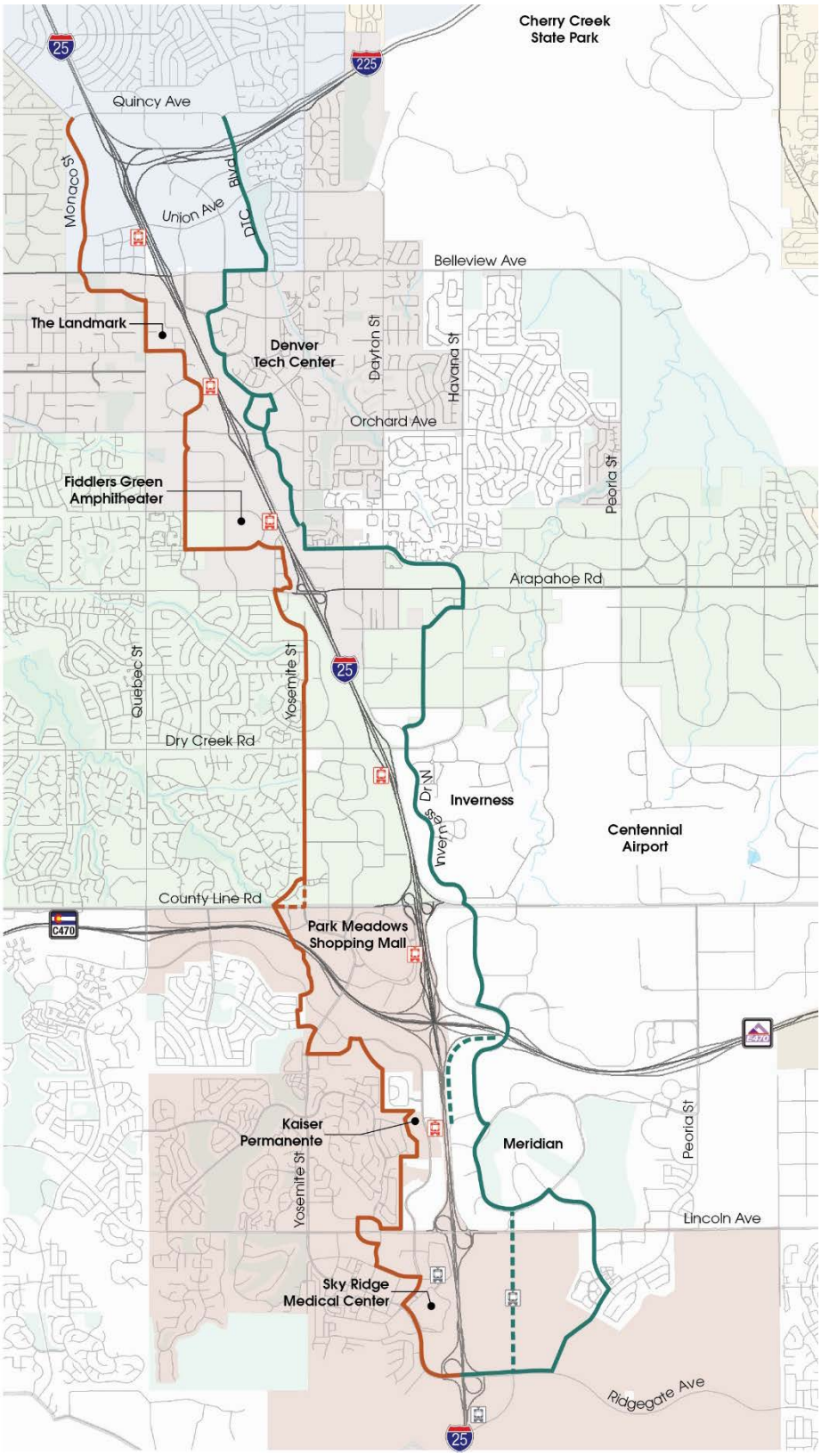
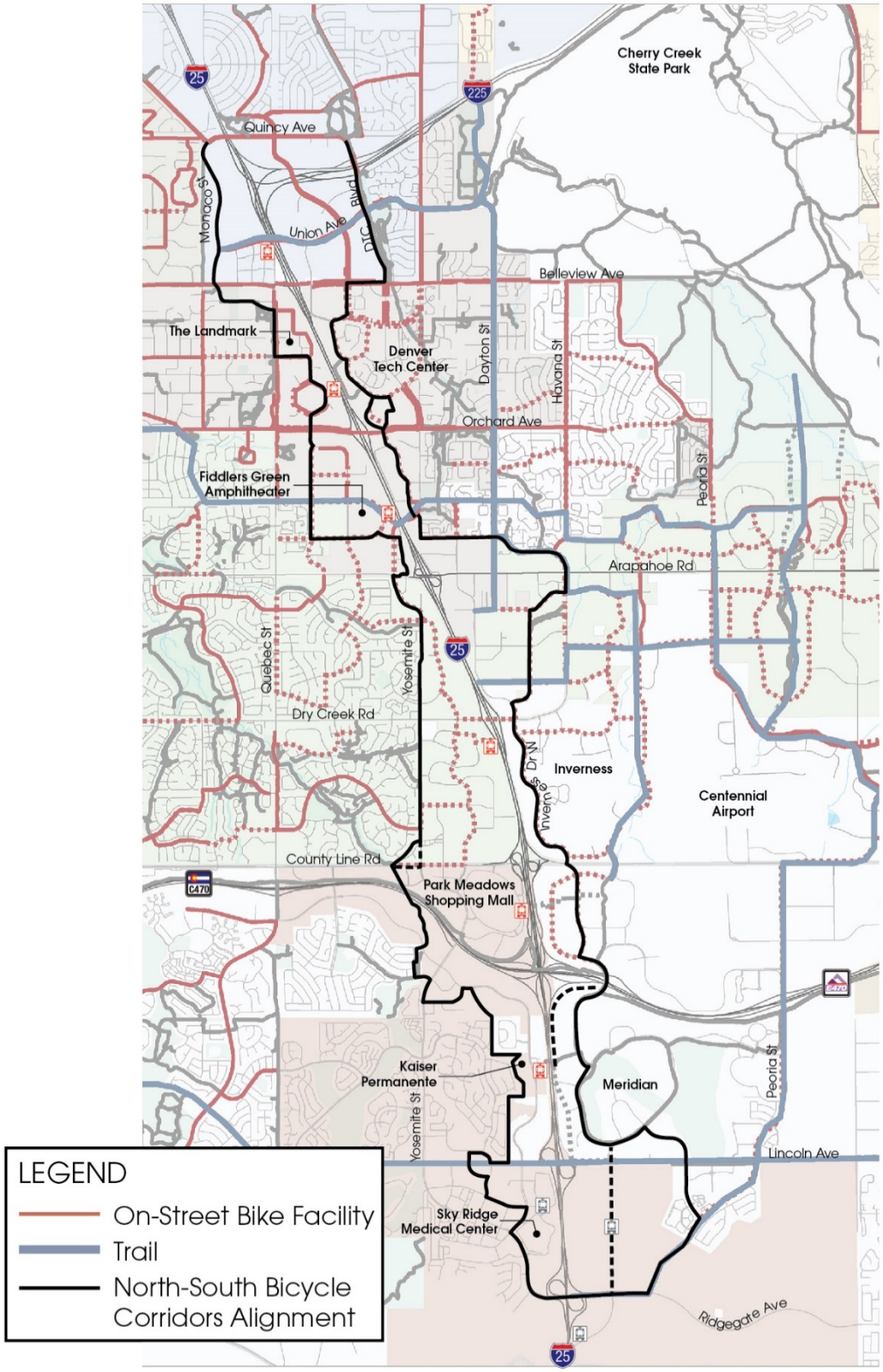


Figure 3-2 Final North-South Regional Bicycle Corridor Alignments with Existing and Proposed Bicycle Facilities and Trails



4. NORTH-SOUTH BICYCLE CORRIDORS ANALYSIS

Based on the desire to provide "low-stress" alternatives for cyclists, as defined in the North-South Bicycle Corridors project vision, a Level of Traffic Stress (LTS) analysis was conducted for each segment of Route 1 (West) and Route 2 (East). Conducting a level of traffic stress analysis helped the project team understand what types of facility improvements will be required to provide a safe and comfortable experience for a variety of user types.

4.1 Level of Traffic Stress Analysis

Providing low-stress alternatives to streets with high speeds and traffic volumes is a vital attribute of a bicycle network that attracts a range of ages and abilities, including those who are "Interested but Concerned", which equates to over half of the general population. Understanding the variety of rider types is important in network development. **Table 4-1** provides a summary of the research conducted by the Portland Bureau of Transportation, which defines the four types of cyclists and their differing needs.

Table 4-1 Types of Bicyclists

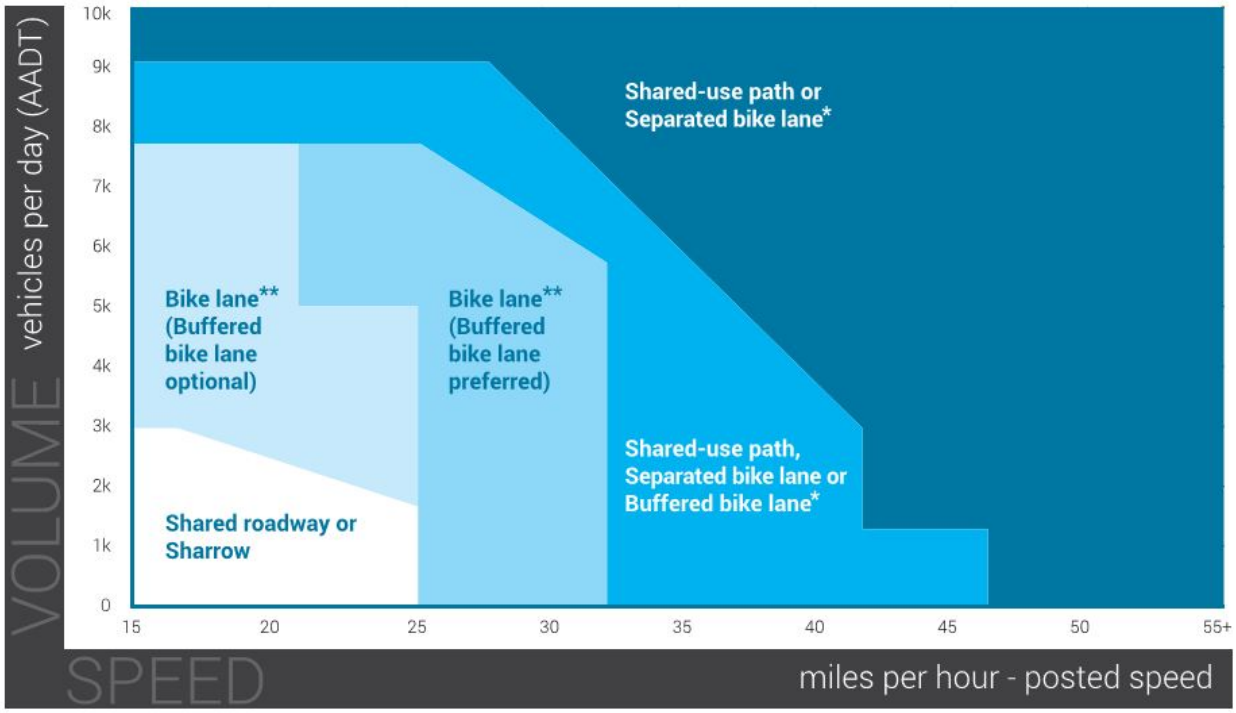
	**"Interested but Concerned" Bicyclists** are typically the largest group of a population. They are interested in biking but are concerned about their safety. They do not like using routes without bicycle facilities because they are nervous about mixing with motorized vehicles. They primarily ride their 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.	51–56% of the population
	**"Enthused and 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.	31–37% of the population
	**"Strong and 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.	4–7% of the population
	**"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.	5–9% of the population

Based on the types of cyclists and their varying needs, the Mineta Transportation Institute developed the bicycle Level of Traffic Stress (LTS) tool to assess the comfort level associated with cycling on specific on-street facilities. The LTS tool uses roadway characteristics, including traffic speeds and volumes, number of through lanes, and, if applicable, existing bike lane width, to calculate a facility grade on a scale of 1 to 4, with each grade corresponding to the level of comfort for cyclists.

- LTS 1 – Little traffic stress; suitable for most all cyclists, including children
- LTS 2 – Minimal interaction with traffic; suitable for most adult cyclists
- LTS 3 – Exclusive riding zone or shared lane with low speeds; welcome to many current cyclists
- LTS 4 – High traffic stress; only suitable for "strong and fearless" riders

LTS 1 and 2 facilities are comfortable for most all bicyclists, including the "Interested but Concerned" population. **Figure 4-1,** developed for the *Arapahoe County Bike and Pedestrian Design Guide*, identifies the types of bicycle facilities that "Interested but Concerned" riders would find comfortable at different roadway speeds and traffic volumes.

Figure 4-1 Design Guidelines to Attract Interested but Concerned Cyclists

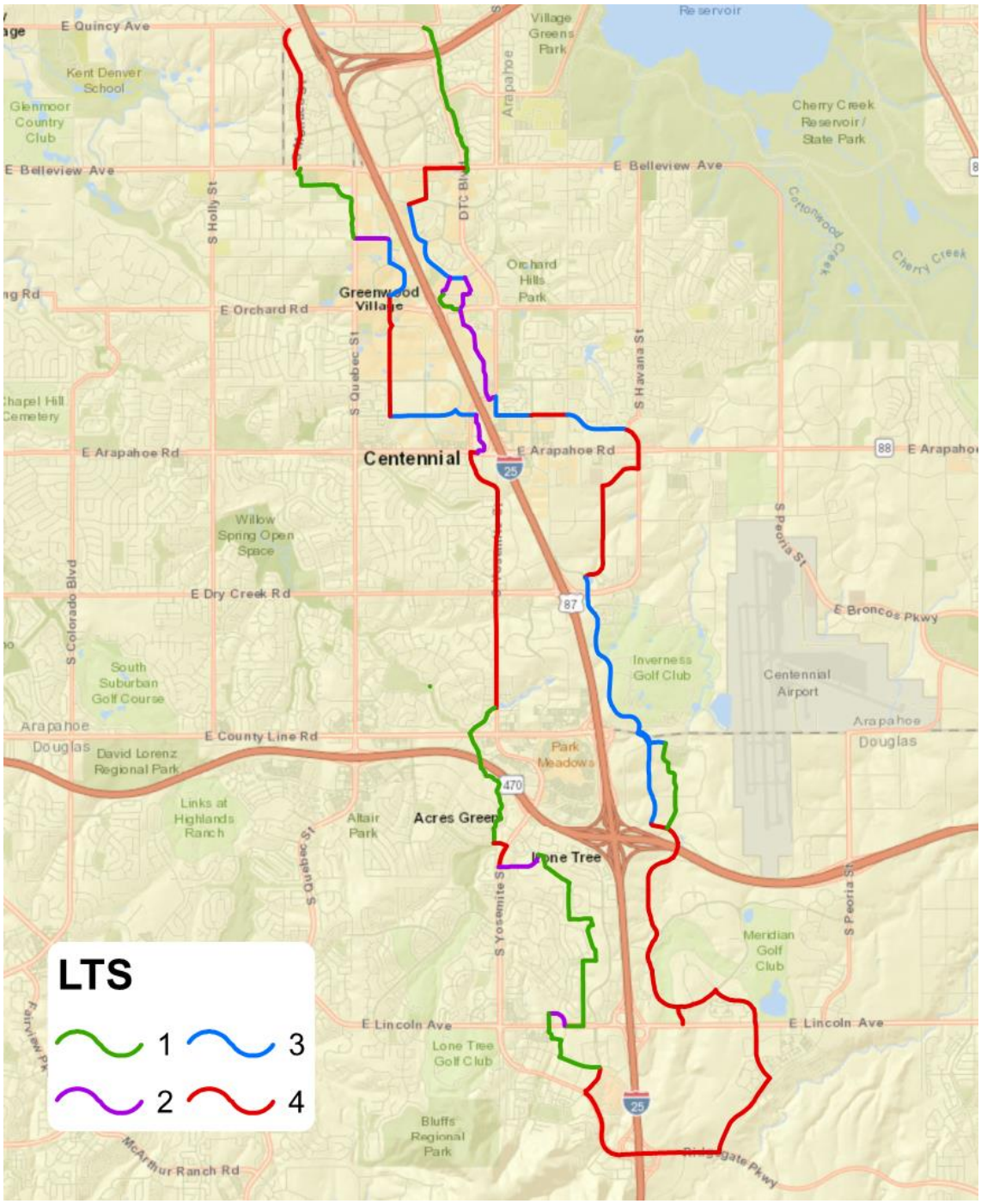


**To determine whether to provide a shared-use path, bike lane, or buffered bike lane, consider pedestrian and bicycle volumes or, in the absence of volume, consider land use.*
***Can use a shoulder bikeway as necessary.*

4.2 North-South Bicycle Corridors LTS Results

Using the LTS tool, the project team analyzed all segments of the North-South Bicycle Corridors. All segments were given a LTS score of 1-4 based on existing conditions. As shown on **Figure 4-2**, there are very few segments that achieve LTS 1 or LTS 2, the desired state of the facility to attract the "interested but concerned" population.

Figure 4-2 North-South Bicycle Corridor LTS Results



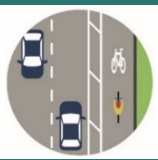
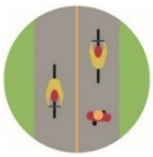
5. FACILITY TYPES & ASSOCIATED IMPROVEMENTS

The overarching focus during development of the North-South Bicycle Corridors was on the provision of low-stress facilities suitable for all types of cyclists. Effective bicycle corridors should provide everyone, regardless of their experience or confidence with cycling, a comfortable and attractive experience. The results of the LTS analysis described earlier highlighted existing conditions for bicycling on each corridor segment and helped inform what types of facilities are needed to make them all low-stress (LTS 1 or LTS 2).

5.1 Bicycle Facility Types

The North-South Bicycle Corridors envision the use of the six facility types described in **Table 5-1,** which are ordered from greatest separation from motor vehicle traffic to least separation.

Table 5-1 Bicycle Facility Types

Shared Roadway	
	Signed bike routes, possibly including shared lane markings, or 'sharrows'; only suitable along streets with low traffic speeds and volumes.
Bike Lanes	
	Exclusive spaces for bicyclists indicated by using striping, symbols, and signage; intended for one-way travel and typically provided in both directions on two-way streets.
Buffered Bike Lanes	
	Exclusive spaces for bicyclists with an additional flush, painted buffer zone between bicycle and motor vehicle traffic for additional separation.
Separated Bike Lanes	
	Exclusive spaces for bicyclists physically separated from motor vehicle traffic with bollards, landscaping, and/or vertical differences; may be street or sidewalk-level but are distinct from both; may be one-way or two-way.
Sidepaths	
	Shared-use paths physically separated from motor vehicle traffic and used by all non-motorized modes; typically constructed parallel to streets within existing right-of-way.
Trails	
	Shared-use paths following alignments independent from the street network and used by all non-motorized modes.

5.2 Facility Type Determination Factors

Three critical factors were included in the determination of the most appropriate bicycle facility for each segment of the North-South Bicycle Corridors:

- Achieving LTS 1 or LTS 2
- Feasibility
- Stakeholder Concurrence

Achieving LTS 1 or LTS 2. Both North-South Bicycle Corridors run largely along streets with high traffic speeds and/or volumes, such as Yosemite Street, Park Meadows Drive, and Meridian Boulevard. These major streets provide the most direct routing through the south I-25 region, an important consideration during segment identification, but are highly stressful for biking in their current state. Neither shared roadways or standard bike lanes would be low-stress in such environments, so most of the segment recommendations are for facilities that provide a greater degree of separation from motor vehicle traffic.

Feasibility. If proposed improvements cannot practically be implemented, they will not be useful towards improving conditions for cyclists. Feasibility was primarily assessed through an examination of existing street cross-sections and a qualitative assessment of potential limitations on the backside of the curb. Measuring current lane and pavement widths provided insight into the level of infrastructure improvements and/or modifications that would be required to add different bicycle facility types on each segment of the north-south corridors. Those that would reduce the number of motor vehicle lanes below a level sufficient to accommodate demand, require extensive land acquisition, or necessitate other infeasible changes, were ruled out in favor of alternate routes or facilities.

Where on-street facilities were deemed infeasible, sidepaths and sidewalk-level separated bike lanes were recommended. While both facility types provide a high degree of separation from motor-vehicle traffic, additional consideration is required where they intersect with driveways and commercial accesses.

Stakeholder Concurrence. The one-on-one stakeholder interviews allowed for conversations about what may be feasible physically, but also politically within a given jurisdiction. All input from the stakeholders was included in the development of recommendations.

5.3 Grade Separated Crossings

Underpasses and overpasses are the safest type of crossing for bicyclists as they eliminate conflicts with motor vehicles; they are appropriate to consider when crossing a street with a wide cross section and high speeds and traffic volumes, and/or when the crossing is near an activity center or trail expected to attract a lot of active users. Grade-separated crossings vary widely in terms of design and construction and can cost anywhere from $500,000 to $6,000,000. Given the high dependence on context, further studies of the individual major intersections along the North-South Bicycle Corridors will be necessary to determine where grade-separated crossings are most appropriate and feasible. Three grade separations are included in the North-South Bicycle Corridors based on input from stakeholders and grade separations identified in other planning documents. Cost estimates for the identified grade separations in the North-South Bicycle Corridors - I-225, Lincoln Avenue, and Ridge Gate Parkway - are not included in the segment costs as it is anticipated that they will be included as elements of future roadway construction and/or reconstruction projects.

5.4 Major Intersection Improvements

Crossings of major streets are often the most stressful part of a bicycle trip. Even when a robust network of low-stress facilities is provided, the need to occasionally cross multiple lanes of high-speed traffic while cycling can be enough to dissuade people from biking at all. As such, the project team gave additional consideration to major intersections along the North-South Bicycle Corridors and the types of improvements needed to make them safe and comfortable.

There are several major arterials running east-west through the South I-25 region that both corridor alignments cross. These major streets, including Arapahoe Road, Dry Creek Road, and Belleview Avenue, all carry four or more lanes of motor vehicle traffic at high speeds and present imposing obstacles to cyclists. For the North-South Bicycle Corridors to truly be low-stress, these major intersections require improvements.

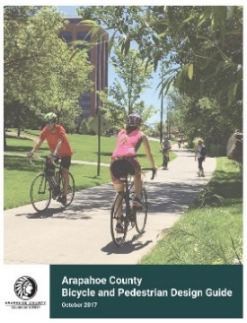
Treatment options that could make the crossings safer and more comfortable include:

- Colored pavement indicating where bikes should be expected
- Bicycle signal heads
- Bicycle detection (video or loops)
- Additional warning and regulatory signage

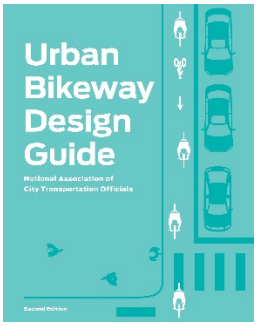
The intent of these bicycle-specific intersection enhancements is generally twofold; to increase visibility of cyclists passing through and to grant them an exclusive phase for crossing. Bicycle signals and detection allow for the provision of an advance bicycle signal phase, permitting cyclists to begin crossing before motor vehicles and reducing conflicts with turning motor vehicles. The cost estimates detailed later in this report include crossing improvement allowances for the segments that pass through a major intersection.

5.5 Conflict Zone Considerations

Conflict zone markings are particularly important on two-way bicycle facilities. Potential conflict zone markings include green colored pavement, added warning signs, and yield lines for motor vehicle traffic, all of which can help alert drivers to the presence of bikes where they might not otherwise think to look for them. Based on the roadway network and the high number of access points along the North-South Bicycle Corridors, the integration of conflict zone markings will be crucial to enhance safety and visibility of all bicyclists.



Arapahoe County Bicycle and Pedestrian Design Guide, 2017

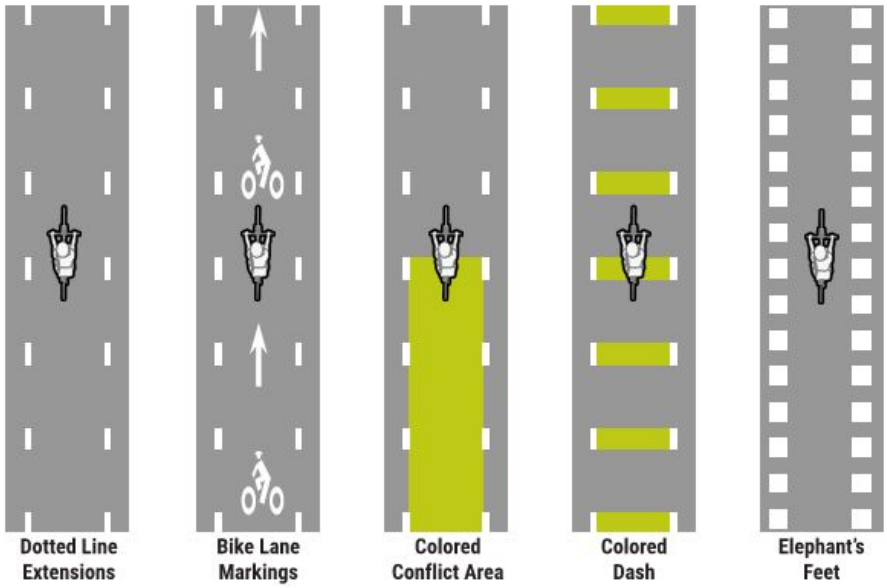


National Association of City Transportation Officials (NACTO), Urban Bikeway Design Guide, 2014

While this planning effort does not include specific recommendations for conflict zones throughout the North-South Bicycle Corridors, a summary of preferred treatments and considerations is included. All information is based on best practices identified in the *Arapahoe County Bicycle and Pedestrian Design Guide* and NACTO's *Urban Bikeway Design Guide*.

Special pavement markings are the most common treatment for improving visibility and heightening the awareness of all roadway users in potential conflict zones. Simple dotted lane lines may be sufficient in some locations, but more noticeable green pavement should be considered in high-traffic areas or crossings with complex layouts. **Figure 5-1**, from the *Arapahoe County Bicycle and Pedestrian Design Guide,* demonstrates the range of pavement marking options for designating conflict zones.

Figure 5-1 Conflict Zone Markings



5.6 Lane Narrowing

Narrowing motor vehicle lanes below the typical 12' is an increasingly common tactic for enhancing the safety and comfort of bicycling on a street. Conventional wisdom might suggest that wider travel lanes are safer, but a growing body of research is demonstrating that this is not the case. Research has found a positive correlation between lane width and vehicle speeds, perhaps due to the increased comfort of driving in a wider space; the increase in crash severity with increased vehicle speed, particularly for bicyclists and pedestrians, is well-documented. A reduction in roadway capacity is a common concern associated with lane narrowing, but several studies have found decreases in traffic throughput resulting from narrowing to be negligible. Given the increased comfort and safety for bicyclists when lanes are narrowed, doing so encourages more people to embrace active transportation and increase a street's overall 'person capacity', even if motor vehicle capacity dips slightly.

An important factor when considering lane narrowing is truck traffic, since large trucks may have a difficult time operating in narrow lanes; NACTO guidance suggests that streets with high truck traffic should maintain a minimum lane width of 11' while 10' is sufficient for all others. In addition to slowing down motor vehicles, lane narrowing also provides more space for dedicated on-street bike facilities.

5.7 Facility Transitions

Transitions between different bicycle facility types (e.g. bike lanes to a two-way separated bike lane) require special attention and design considerations, especially when they require cyclists to switch sides of the street. The conflict zone markings described in Section 5.5 should be used wherever such transitions occur to alert all users that the roadway cross-section is changing and cyclists may be

required to cross motor vehicle traffic. When the facility transitions occur at a signalized street intersection, cyclists should be given a dedicated phase to cross without conflicting with motor vehicle traffic. Additional signage, raised crossings, bicycle signals, and two-stage turn boxes may be considered as well. At transitions between on-street and off-street facilities, wide curb ramps are needed to provide a smooth transition.

6. PLANNING LEVEL COST ESTIMATES

Cost is an important consideration for any type of infrastructure project, bicycle facilities included. An understanding of how much various improvements typically cost can help inform eventual prioritization and funding strategies. For this study, planning-level cost estimates were compiled using per-mile unit costs for the various infrastructure modifications (e.g., restriping to add bike lanes or buffered bike lanes, roadside construction to add sidepaths) being recommended and then applied to the length of each segment. It is important to note that the cost estimates do not include potential right-of-way and/or easement acquisition costs for improvements.

Factored into these unit costs were the typical materials that would have to be added or removed and the construction effort required to do so. A typical unit cost for major intersection improvements, including enhancements such as added signage, colored pavement, and bicycle detection, was developed as well and applied to the appropriate segments. It should be noted that actual implementation costs depend highly on specific context, existing conditions, and a potential increase in materials and construction costs.

By including identified North-South Bicycle Corridor projects in planned improvements, the DSTMA and partner agencies may leverage funds and maximize progress. For example, Douglas County and the Meridian Metropolitan District are currently working together to include the designated bicycle facilities identified in this plan in the design alternatives for the Havana and Lincoln Ave improvements.

Cost information was acquired from several sources. The primary source was the Colorado Department of Transportation's annually compiled Cost Data Book, which provides detailed information on actual awarded contracts for hundreds of bid items used in all manner of infrastructure projects throughout the state. Additional cost estimate information for bike-specific items such as bicycle pavement markings and bicycle signal heads was obtained from research carried out by the National Association of City Transportation Officials (NACTO) and the Initiative for Bicycle & Pedestrian Innovation. The per-mile quantity and cost assumptions for each recommended facility type are included in **Appendix A.**

7. IMPROVEMENT RECOMMENDATIONS BY SEGMENT

A total of 52 segments comprise the North-South Bicycle Corridors. Route 1 (West) and Route 2 (East) have a total of 22 and 24 segments, respectively. **Figure 7-1** and **Figure 7-2** show the final corridor alignments with the recommended facility type by segment for Route 1 (West) and Route 2 (East). The segments were determined by logical breaks in the roadway network, bicycle facility type transitions, and jurisdictional boundaries as appropriate. One-page snapshots of each segment have been developed for easy reference by partner agencies. Associated GIS and graphics files are available from the Denver South TMA upon request.

Costs for major intersection improvements have been included in the total segment cost. The following information is included for each segment:

- Segment limits
- Existing conditions (posted speed, average daily traffic volumes, LTS, transit service, and the presence of on-street parking)
- Jurisdiction and key stakeholders
- Facility type recommendation
- Implementation requirements
- Cost estimate
- Existing cross-section
- Recommended cross section

It is important to note that many of the segments will require further study, including intersection operation analysis for segments where recommendations include modified cross-sections. There are also a number of segments that have various options; stakeholders will need to work together during the preliminary and final design phase to determine the most appropriate facility based on discussion with private partners and how to best coordinate with other roadway improvement projects. The per-mile quantity and cost assumptions for each recommended facility type, and the associated major intersection improvements, are included in **Appendix A**.

Figure 7-1. Route 1 (West) Segments

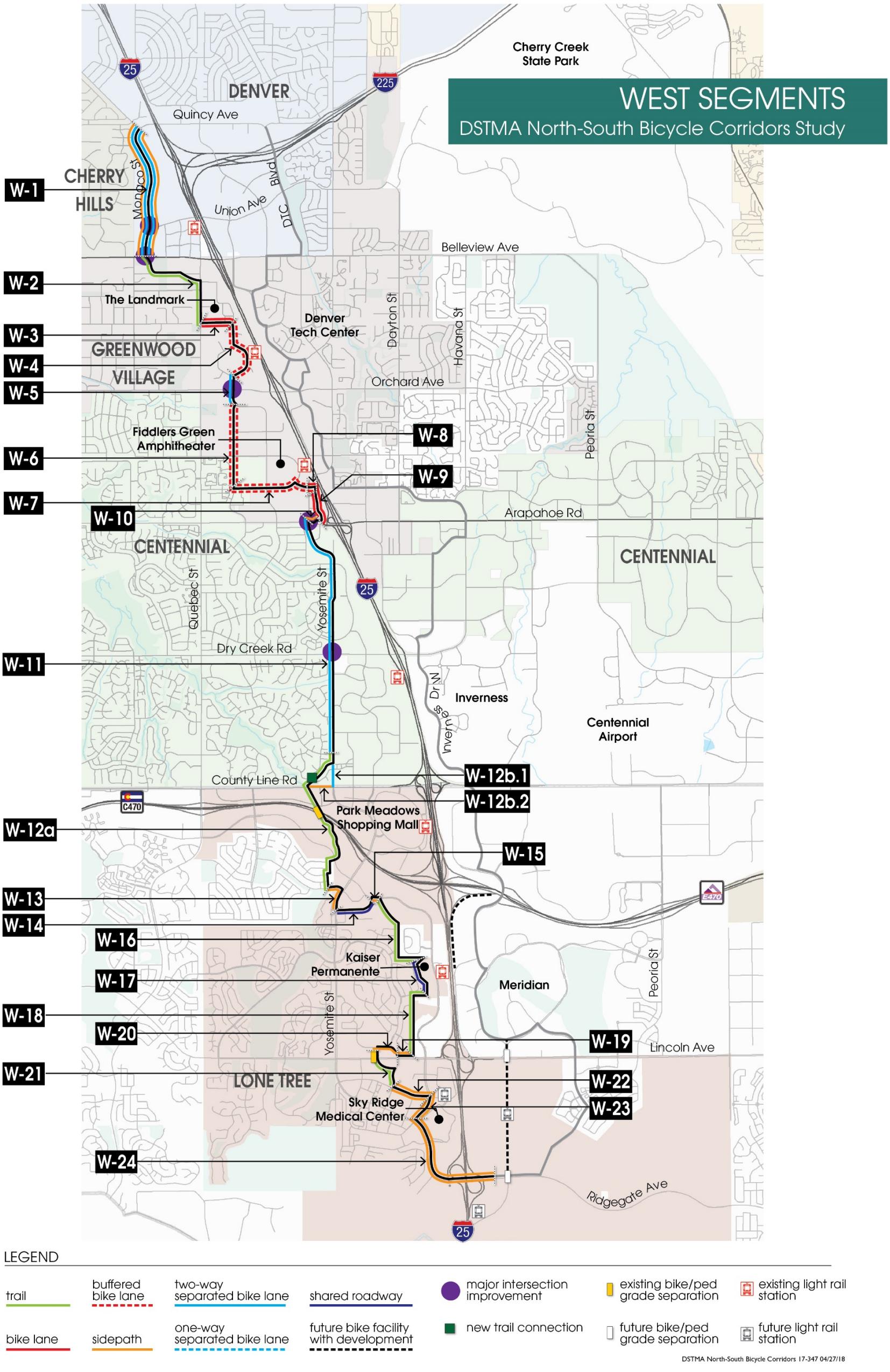
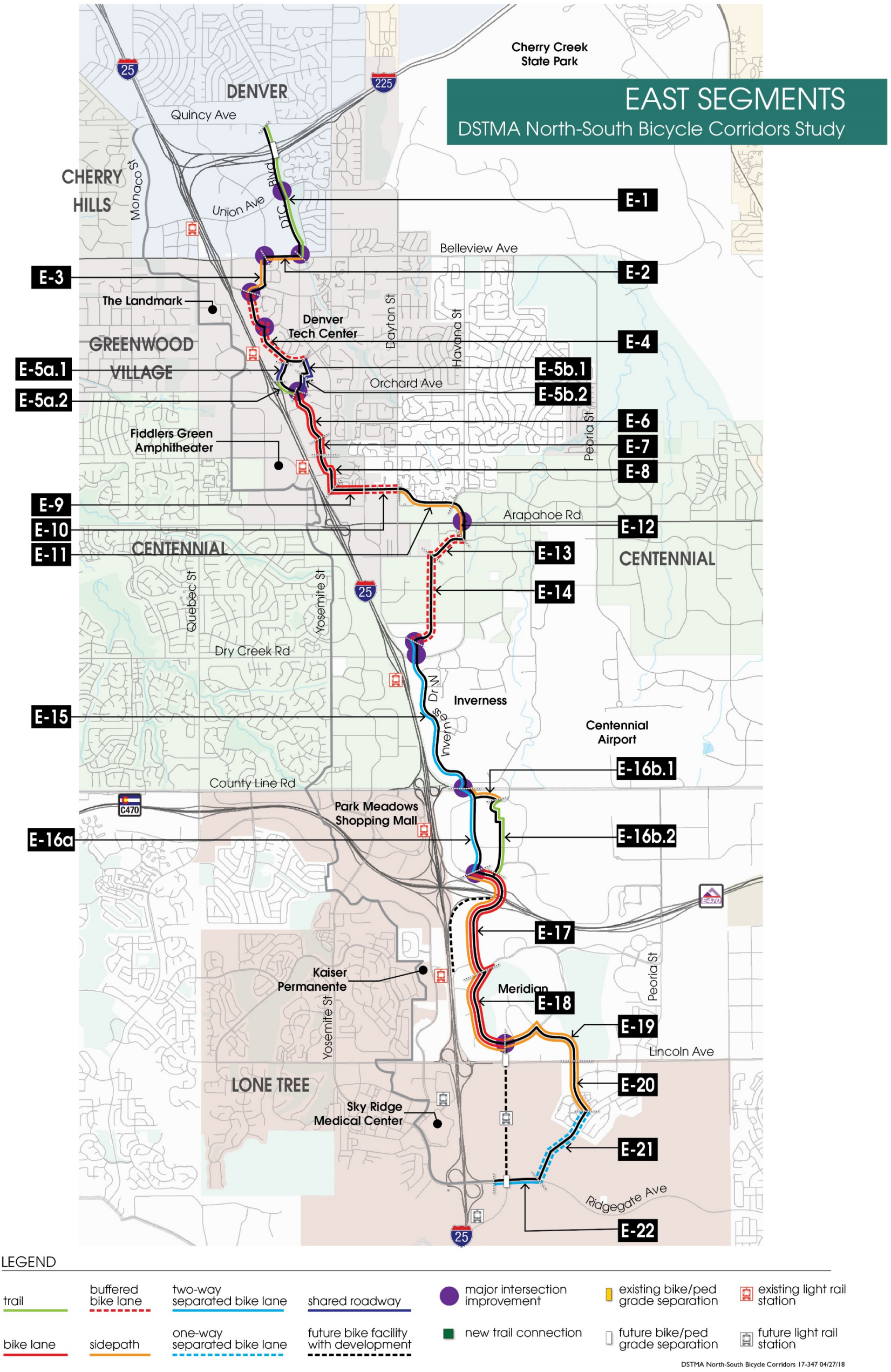


Figure 7-2. Route 2 (East) Segments



Segment W-1: S Monaco St

E Quincy Ave to E Belleview Ave

Jurisdiction: Denver

Alternatives:

A. Sidepath (One Side)

B. Sidepath (Both Sides)

C. Separated Bike Lanes

Implementation requirements:

A: Widen **1.02** miles of existing 8' sidewalk to 14' sidepath on one side of the street

B: Widen **1.02** miles of existing 8' sidewalk to 12' on both sides of the street

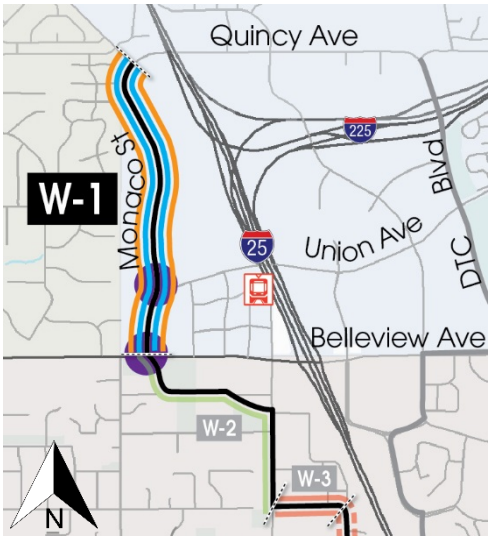
C: Restripe **1.02** miles of outside travel lanes on both sides of the street to 11' separated bike lanes with physical separation (e.g., protective bollards)

2 major intersection improvements

- S Monaco St and Union Ave
- S Monaco St and E Belleview Ave

Cost Estimate Range: $750,000 - $4M

Stakeholders: Denver, Goldsmith Metropolitan District, SPIMD, HOAs, CDOT



Existing Conditions	
Posted Speed	35
Annual Average Daily Traffic (AADT)	13,000
Level of Traffic Stress (LTS)	4
RTD Route	Yes
On-street Parking	No

Benefits of Sidepaths & Separated Bike Lanes

Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact Bike Lanes

Separated Bike Lanes

- Physical separation from the roadway
- Separate space for bicyclists and pedestrians

Segment W-1: S Monaco St (cont.)

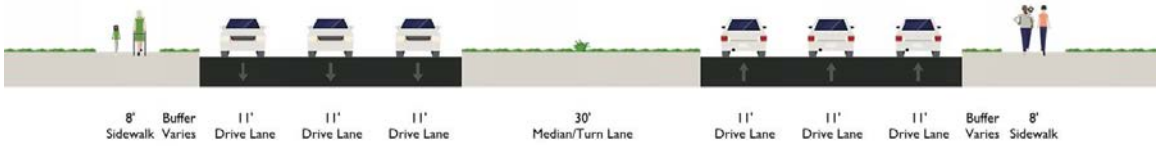
E Quincy Ave to E Belleview Ave

Jurisdiction: Denver

S Monaco St Considerations

Denver anticipates conducting a study of the S Monaco St segment in the near-term to identify the preferred bicycle facility type and the most appropriate cross-section. Additional items that need further analysis include: traffic and operational analysis of the roadway and intersections, facility transitions, conflict zone assessments, right-of-way requirements, transit service integration, etc. To inform this study, three potential alternatives have been identified for illustrative purposes and to inform planning level cost estimates for the full North-South Bicycle Corridors.

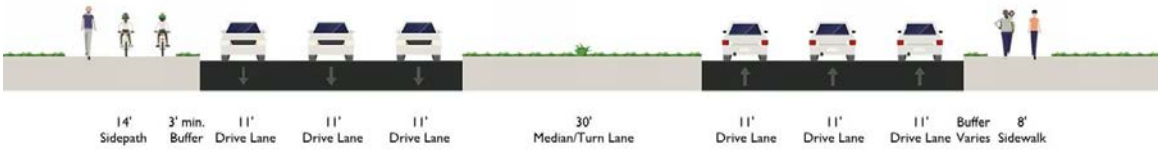
Segment W-1: Existing Cross Section



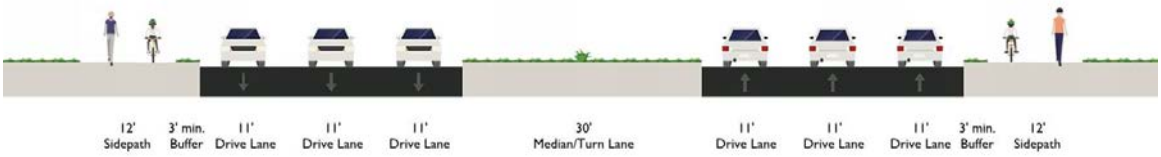
Segment W-1: Alternative Cross Sections

For illustrative purposes only. Final facility types and locations will be determined through additional study.

Alternative A: Sidepath on One Side of the Street



Alternative B: Sidepath on Both Sides of the Street



Alternative C: Street-level Separated Bike Lanes

Segment W-2: Quebec Trail

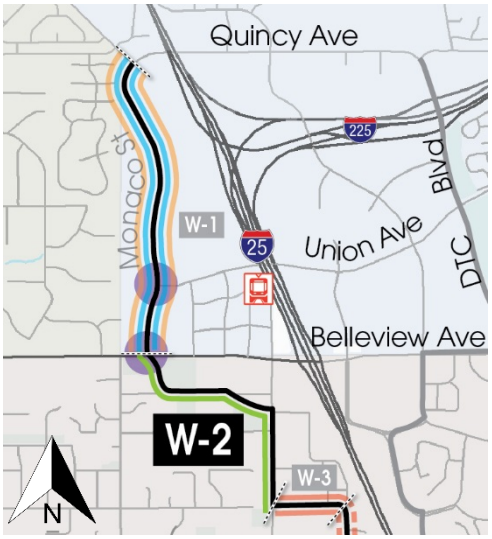
Belleview Ave to S Quebec St
Jurisdiction: Greenwood Village

Recommendation: Trail

Implementation requirements:
Widen **0.82** miles of existing 8' trail to 12'

Cost Estimate: $580,000

Stakeholders: Greenwood Village, SPIMD



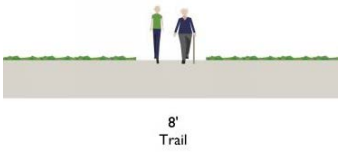
Existing Conditions

Posted Speed	n/a
Annual Average Daily Traffic (AADT)	n/a
Level of Traffic Stress (LTS)	n/a
RTD Route	n/a
On-street Parking	n/a

Benefits of Trails

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section

Segment W-3: E Berry Ave

S Quebec St to Greenwood Plaza Blvd

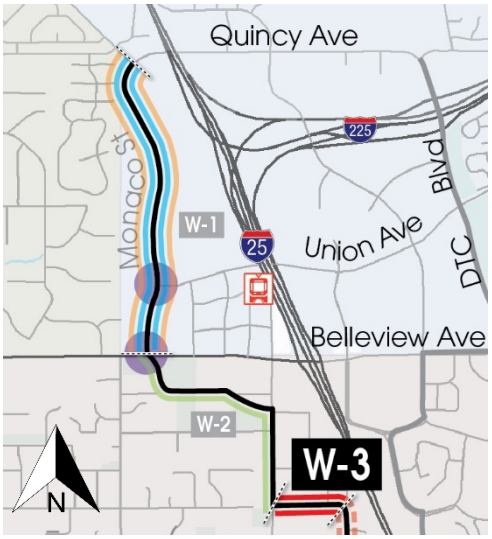
Jurisdiction: Greenwood Village

Recommendation: Bike Lanes

Implementation requirements:
None - utilize **0.24** miles of existing 4' bike lanes on both sides of the street

Cost Estimate: $0

Stakeholders: Greenwood Village, SPIMD, Marin Metropolitan District

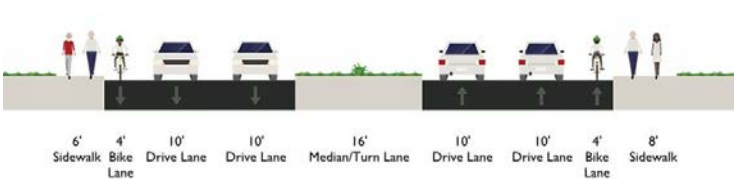


Existing Conditions	
Posted Speed	30
Annual Average Daily Traffic (AADT)	5,400
Level of Traffic Stress (LTS)	2
RTD Route	No
On-street Parking	No

Benefits of Bike Lanes

- Designated roadway space for bicyclists
- More predictable bicycle positioning and interaction with motor vehicles

Existing Cross Section



Recommended Cross Section

N/A

Segment W-4: Greenwood Plaza Blvd

E Berry Ave to Greenwood Plaza Blvd

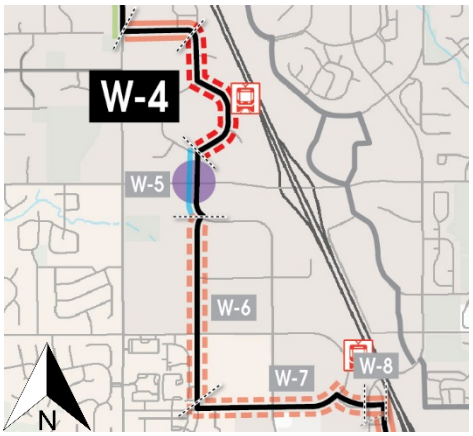
Jurisdiction: Greenwood Village

Recommendation: Buffered Bike Lanes

Implementation requirements:
Restripe **0.52** miles of outside travel lanes on both sides of the street to 10' buffered bike lanes

Cost Estimate: $60,000

Stakeholders: Greenwood Village, SPIMD



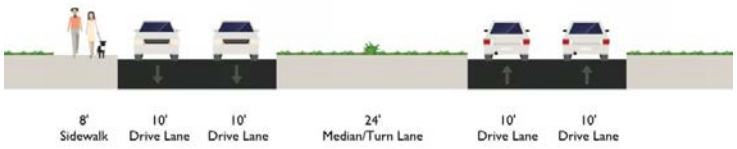
Existing Conditions

Posted Speed	30
Annual Average Daily Traffic (AADT)	5,400
Level of Traffic Stress (LTS)	3
RTD Route	No
On-street Parking	No

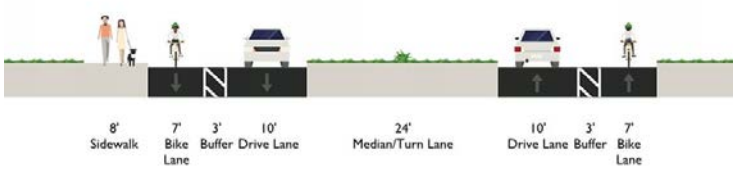
Benefits of Buffered Bike Lanes

- Greater distance between bicyclists and motor vehicles than standard bike lanes
- Space for bicyclists to pass other bicyclists

Existing Cross Section



Recommended Cross Section



Note: Traffic operational analysis will be required at time of preliminary/final design.

FELSBURG HOLT & ULLEVIG

Segment W-5: Greenwood Plaza Blvd

Greenwood Plaza Blvd to S Syracuse Way
Jurisdiction: Greenwood Village

Recommendation: Two-Way Separated Bike Lane

Implementation requirements:

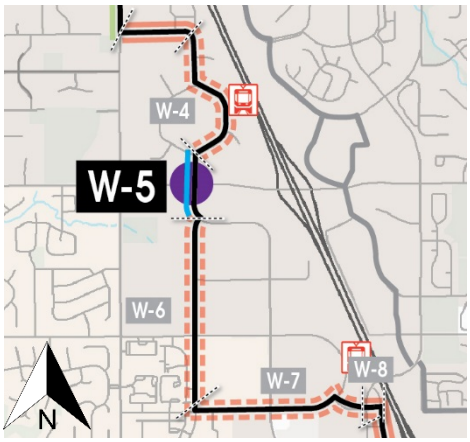
Construct **0.22** miles of 8' two-way separated bike lanes on west side of the street at sidewalk level

1 major intersection improvement

- E Orchard Rd & Greenwood Plaza Blvd

Cost Estimate: $620,000

Stakeholders: Greenwood Village, SPIMD



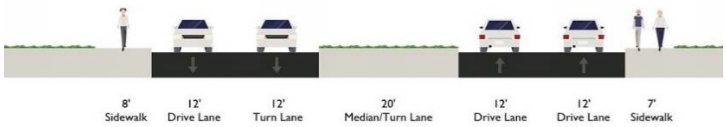
Existing Conditions

Posted Speed	30
Annual Average Daily Traffic (AADT)	13,000
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

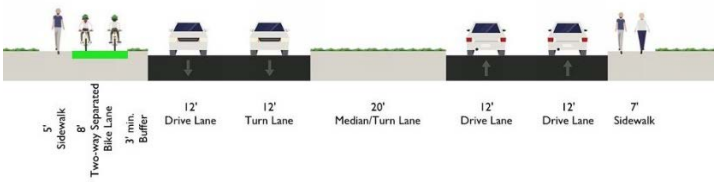
Benefits of Two-Way Separated Bike Lanes

- Physical separation from the roadway
- Separate space for bicyclists and pedestrians

Existing Cross Section



Recommended Cross Section



Note: Traffic operational analysis will be required at time of preliminary/final design.

FELSBURG HOLT & ULLEVIG

Segment W-6: S Syracuse Way

Greenwood Plaza Blvd to E Peakview Ave

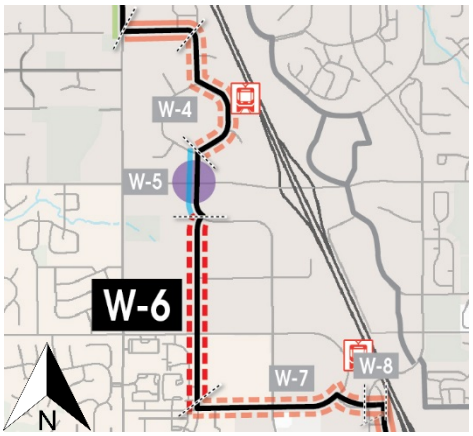
Jurisdiction: Greenwood Village/Centennial

Recommendation: Buffered Bike Lanes

Implementation requirements:
Restripe **0.64** miles to three-lane cross-section and add 7'buffered bike lanes on both sides of the street

Cost Estimate: $100,000

Stakeholders: Greenwood Village, Centennial, SPIMD, Greenwood South Metropolitan District



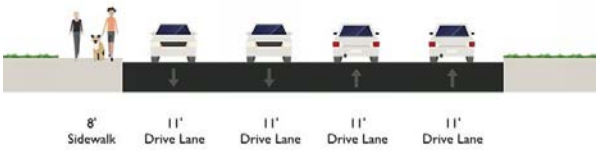
Existing Conditions

Posted Speed	30
Annual Average Daily Traffic (AADT)	3,600
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

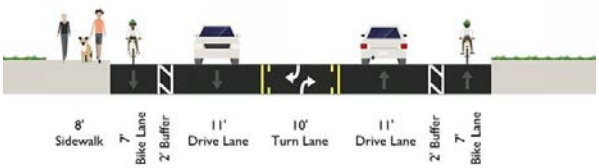
Benefits of Buffered Bike Lanes

- Greater distance between bicyclists and motor vehicles than standard bike lanes
- Space for bicyclists to pass other bicyclists

Existing Cross Section



Recommended Cross Section



Note: Traffic operational analysis will be required at time of preliminary/final design.

FELSBURG HOLT & ULLEVIG

Segment W-7: E Peakview Ave

S Syracuse Way to S Yosemite St

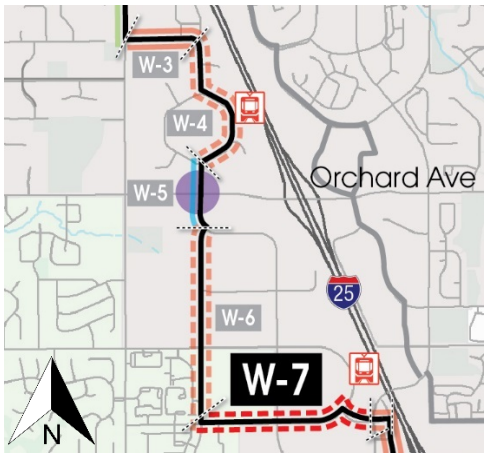
Jurisdiction: Greenwood Village/Centennial

Recommendation: Buffered Bike Lanes

Implementation requirements:
Restripe **0.63** miles of outside travel lanes on both sides of the street to 11' buffered bike lanes

Cost Estimate: $70,000

Stakeholders: Greenwood Village, Centennial, SPIMD, Greenwood South Metropolitan District



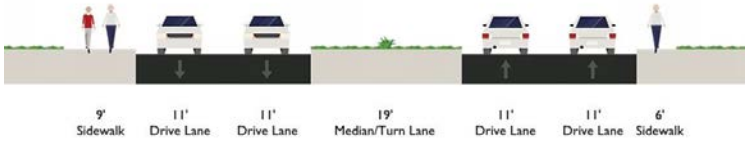
Existing Conditions

Posted Speed	30
Annual Average Daily Traffic (AADT)	5,100
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

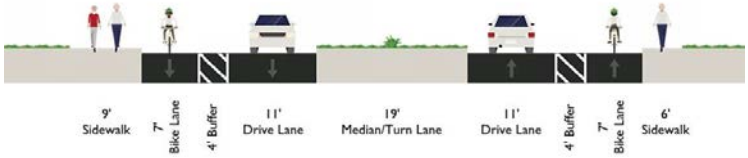
Benefits of Buffered Bike Lanes

- Greater distance between bicyclists and motor vehicles than standard bike lanes
- Space for bicyclists to pass other bicyclists

Existing Cross Section (west of S Fiddlers Green Cir)



Recommended Cross Section



Note: Traffic operational analysis will be required at time of preliminary/final design.

FELSBURG HOLT & ULLEVIG

Segment W-8: Yosemite St

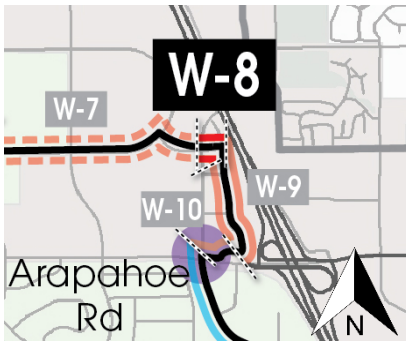
S Yosemite St to S Yosemite Cir
Jurisdiction: Greenwood Village

Recommendation: Bike Lanes

Implementation requirements:
Coordinate with Greenwood Village's upcoming Arapahoe Station connection project to ensure bicyclists are accommodated with a minimum of 5' bike lanes on both sides of the street between S Yosemite St and the future Yosemite Cir extension (**0.05** miles)

Cost Estimate: $0 (with future development)

Stakeholders: Greenwood Village, SPIMD



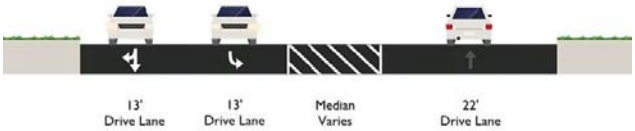
Existing Conditions

Posted Speed	25
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	2
RTD Route	No
On-street Parking	No

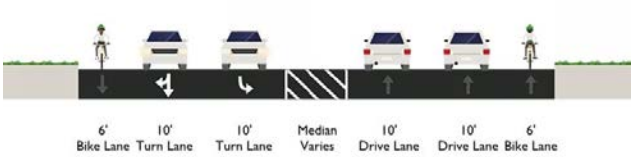
Benefits of Bike Lanes

- Designated roadway space for bicyclists
- More predictable bicycle positioning and interaction with motor vehicles

Existing Cross Section



Recommended Cross Section



Segment W-9: S Yosemite Cir/S Yosemite Ct

Yosemite St to E Arapahoe Rd

Jurisdiction: Greenwood Village

Recommendation: Bike Lanes

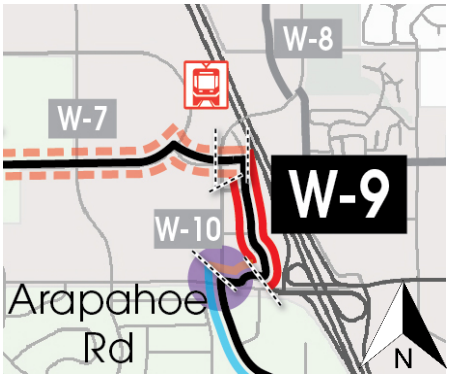
Implementation requirements:

Stripe **0.33** miles of 5' bike lanes on both sides of the street; eliminate parking on east side of Yosemite Cir

Requires a new road or trail connection between S Yosemite Cir and Yosemite St; construct with future development

Cost Estimate: $20,000

Stakeholders: Greenwood Village, SPIMD, Greenwood South Metropolitan District



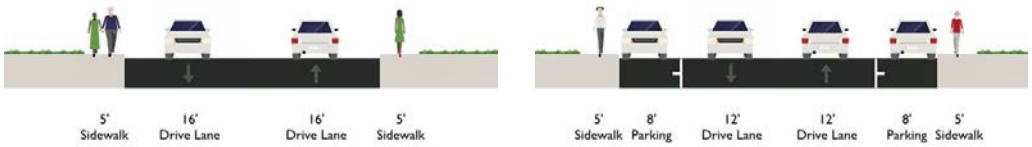
Existing Conditions

Posted Speed	25
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	2
RTD Route	No
On-street Parking	Yes

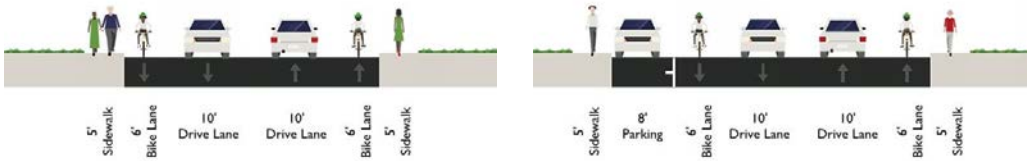
Benefits of Bike Lanes

- Designated roadway space for bicyclists
- More predictable bicycle positioning and interaction with motor vehicles

Existing Cross Section (S Yosemite Cir/S Yosemite Ct)



Recommended Cross Section (S Yosemite Cir/S Yosemite Ct)



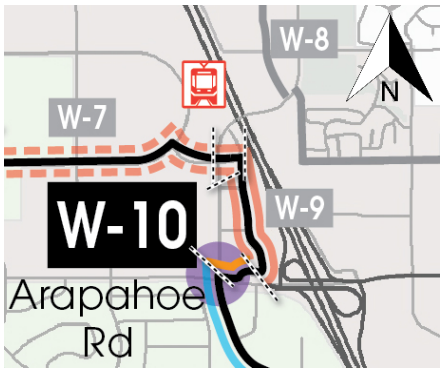
Segment W-10: E Arapahoe Rd

S Yosemite Ct to S Yosemite St

Jurisdiction: Centennial

Recommendation: Sidepath

Implementation requirements:
Widen **0.05** miles of existing sidewalk to 10' sidepath on the north side of the road



Cost Estimate: $100,000

Stakeholders: Centennial, Greenwood Village, SPIMD, Greenwood South Metropolitan District, CDOT

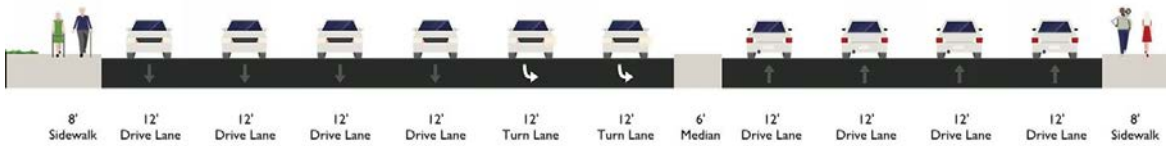
Existing Conditions

Posted Speed	35
Annual Average Daily Traffic (AADT)	56,000
Level of Traffic Stress (LTS)	4
RTD Route	Yes
On-street Parking	No

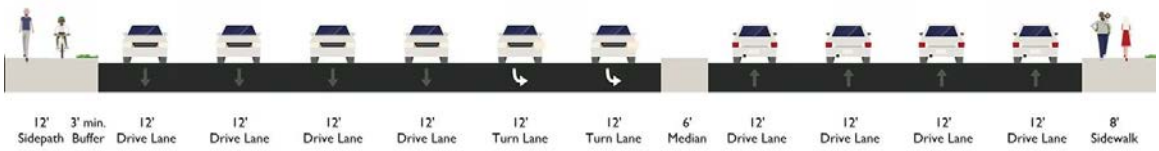
Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section



FELSBURG HOLT & ULLEVIG

Segment W-11: S Yosemite St

E Arapahoe Rd to Willow Creek Trail

Jurisdiction: Centennial

Recommendation: Two-Way Separated Bike Lane

Implementation requirements:

Construct **1.89** miles of a 10' two-way separated bike lane on west side of the street at sidewalk level

2 major intersection improvements

- S Yosemite St and E Arapahoe Rd
- S Yosemite St and E Dry Creek Rd

Cost Estimate: $5.6M

Stakeholders: Centennial, SPIMD, Southgate at Centennial Metropolitan District

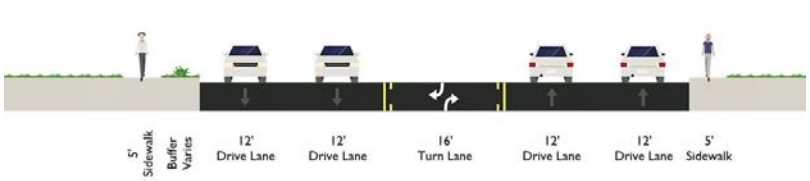
Existing Conditions

Posted Speed	35
Annual Average Daily Traffic (AADT)	22,000
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

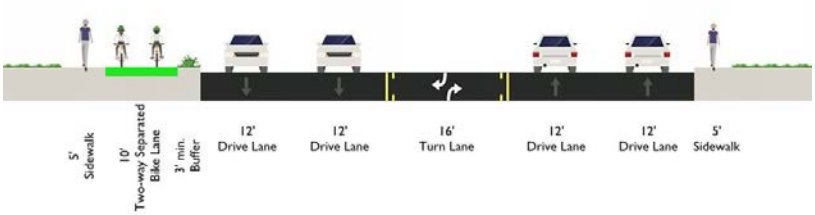
Benefits of Two-Way Separated Bike Lanes

- Physical separation from the roadway
- Separate space for bicyclists and pedestrians

Existing Cross Section



Recommended Cross Section



FELSBURG HOLT & ULLEVIG

Segment W-12a: Willow Creek Trail

S Yosemite St to Maximus Dr

Jurisdiction: Centennial/Lone Tree

Recommendation: Trail

Implementation requirements:

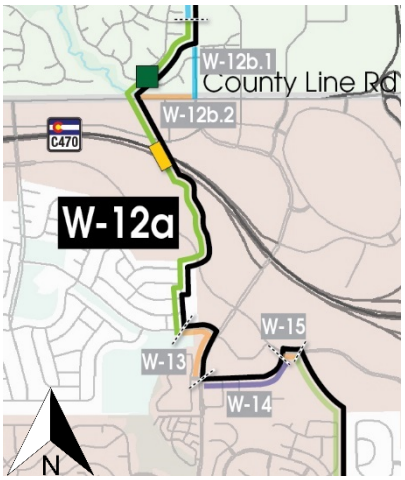
Conduct public outreach to determine viability of utilizing the Willow Creek Trail for this segment. Segments W-12b.1 and W12b.2 provide alternative alignments.

Widen **1.46** miles of existing 5-8' trail to 12'

Construct new bridge connecting trail from E Phillips Pl to existing E County Line Rd underpass

Cost Estimate: $1.4M

Stakeholders: Centennial, SPIMD, HOA



Existing Conditions

Posted Speed	n/a
Annual Average Daily Traffic (AADT)	n/a
Level of Traffic Stress (LTS)	n/a
RTD Route	n/a
On-street Parking	n/a

Benefits of Trails

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section

Recommended Cross Section

Segment W-12b.1: S Yosemite St

Willow Creek Trail to E County Line Rd

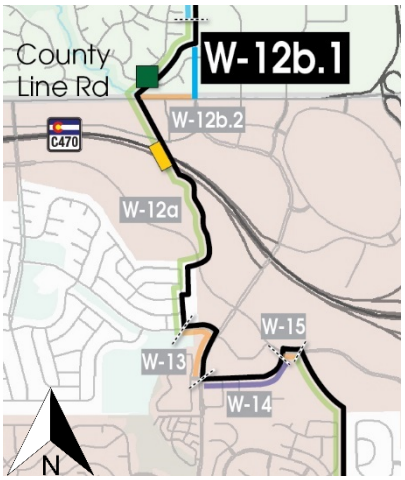
Jurisdiction: Centennial

Recommendation: Sidepath

Implementation requirements:
Construct **0.10** miles of a 10' two-way separated bike lane on west side of the street at sidewalk level

Cost Estimate: $550,000

Stakeholders: Centennial, Douglas County, SPIMD

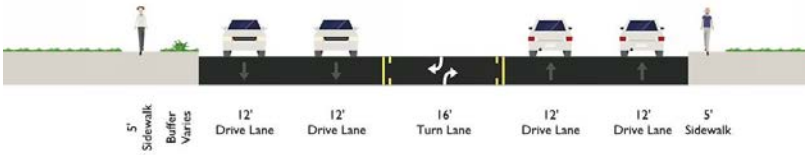


Existing Conditions	
Posted Speed	35
Annual Average Daily Traffic (AADT)	22,000
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

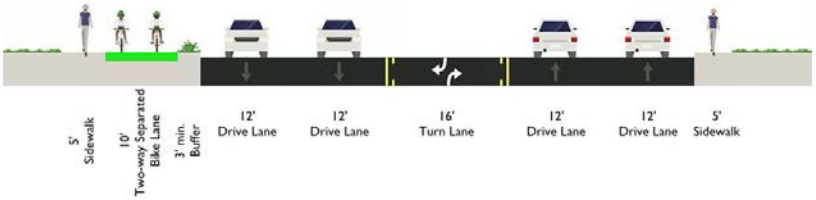
Benefits of Two-Way Separated Bike Lanes

- Physical separation from the roadway
- Separate space for bicyclists and pedestrians

Existing Cross Section



Recommended Cross Section



Segment W-12b.2: E County Line Rd

S Yosemite St to Willow Creek Trail Underpass

Jurisdiction: Centennial

Recommendation: Sidepath

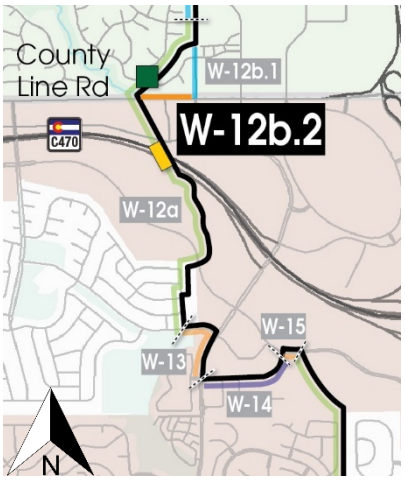
Implementation requirements:

Widen **0.10** miles of existing 8' sidewalk to 12' sidepath along north side of the street

Construct **0.15** miles of 12' trail to connect to Willow Creek Trail

Cost Estimate: $500,000

Stakeholders: Centennial, Douglas County, SPIMD



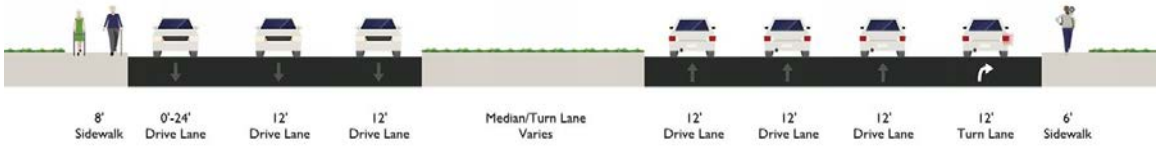
Existing Conditions

Posted Speed	45
Annual Average Daily Traffic (AADT)	12,000
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

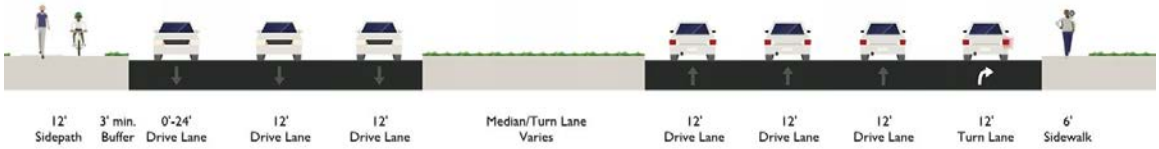
Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section



FELSBURG HOLT & ULLEVIG

Segment W-13: Maximus Dr/S Yosemite St

Willow Creek Trail to Kimmer Dr

Jurisdiction: Lone Tree

Recommendation: Sidepath

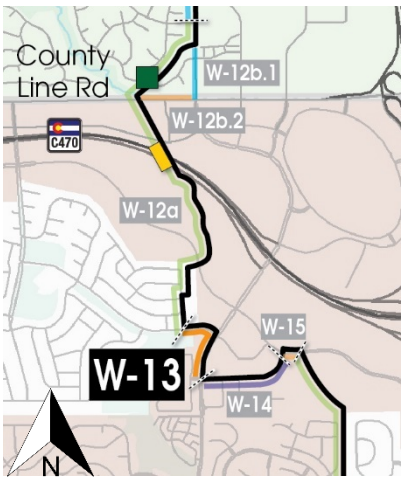
Implementation requirements:

Widen **0.10** miles of existing 5' sidewalk along Maximus Dr to 12' sidepath along south side of the street

Widen **0.16** miles of existing 5' sidewalk along S Yosemite St to 12' sidepath along west side of the street

Cost Estimate: $510,000

Stakeholders: Lone Tree, SPIMD

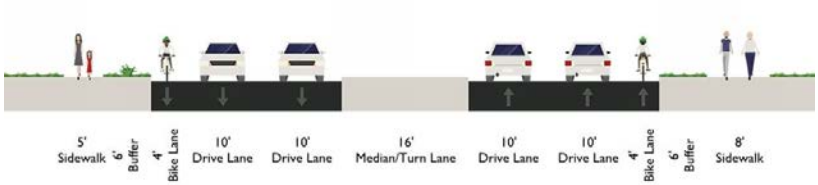


Existing Conditions (S Yosemite St)	
Posted Speed	35
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

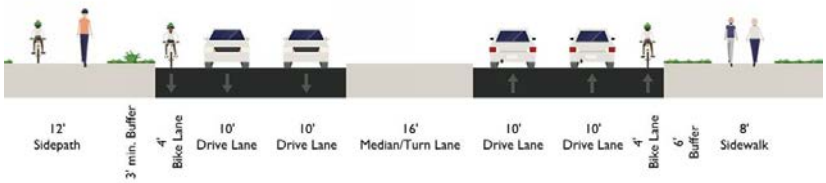
Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section (S Yosemite St)



Recommended Cross Section (S Yosemite St)



Segment W-14: Kimmer Dr

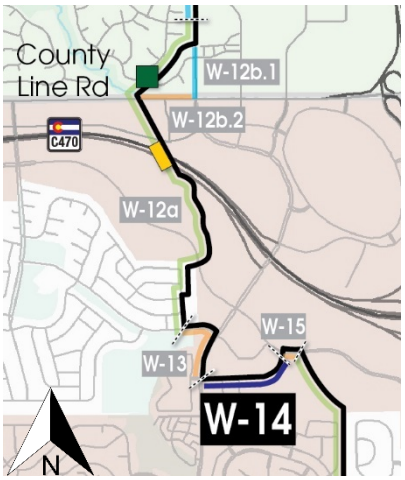
S Yosemite St to Park Meadows Dr
Jurisdiction: Lone Tree

Recommendation: Sidepath

Implementation requirements:
Widen **0.32** miles of existing 5' sidewalk to 10' sidepath on south side of the street

Cost Estimate: $630,000

Stakeholders: Lone Tree, SPIMD



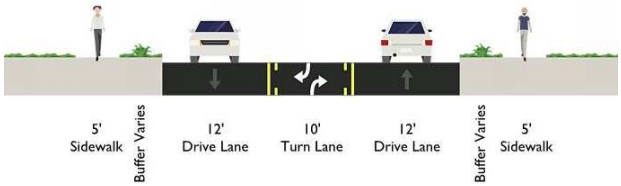
Existing Conditions

Posted Speed	35
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

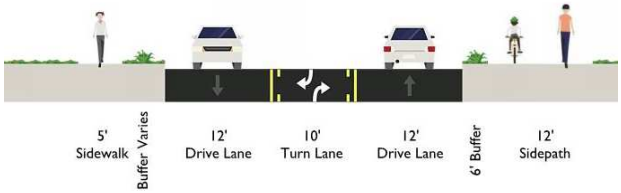
Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section



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Segment W-15: Park Meadows Dr

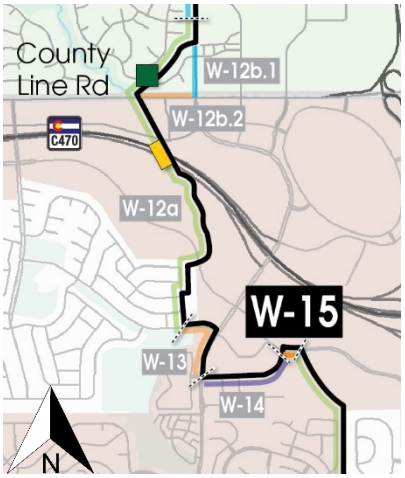
Kimmer Dr to Lone Tree Trail
Jurisdiction: Lone Tree

Recommendation: Sidepath

Implementation requirements:
Widen **0.04** miles of existing 5' sidewalk to 12' sidepath on south side of the street

Cost Estimate: $80,000

Stakeholders: Lone Tree, SPIMD



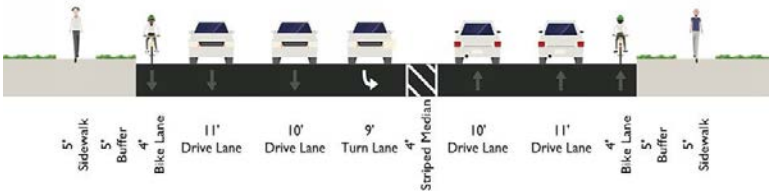
Existing Conditions

Posted Speed	40
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

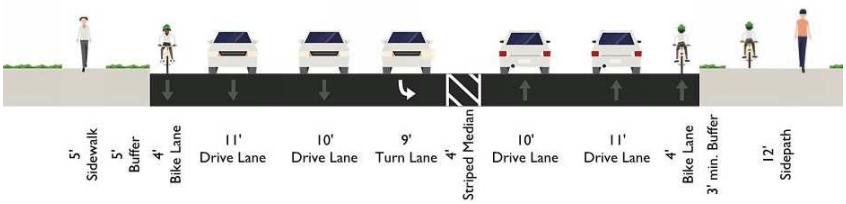
Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section



FELSBURG HOLT & ULLEVIG

Segment W-16: Lone Tree Trail

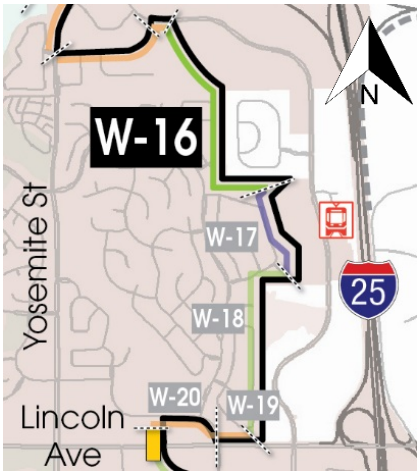
Park Meadows Dr to Kaiser Road Connector
Jurisdiction: Lone Tree

Recommendation: Trail

Implementation requirements:
Utilize **0.28** miles of trail currently being constructed by Lone Tree and construct an additional **0.46** miles of new 12' trail around The Retreat at Park Meadows apartments

Cost Estimate: $490,000

Stakeholders: Lone Tree, private property owners, SPIMD



Existing Conditions

Posted Speed	n/a
Annual Average Daily Traffic (AADT)	n/a
Level of Traffic Stress (LTS)	n/a
RTD Route	n/a
On-street Parking	n/a

Benefits of Trails

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section

N/A

Recommended Cross Section

Segment W-17: Kaiser Permanente Road Connector

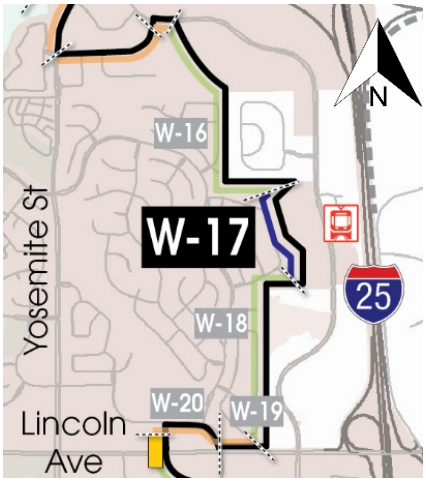
Lone Tree Trail to Heritage Hills Trail
Jurisdiction: Lone Tree

Recommendation: Shared Roadway

Implementation requirements:
Mark **0.28** miles of street as shared roadway

Cost Estimate: $10,000

Stakeholders: Lone Tree, SPIMD, Lincoln Station Metropolitan District, Kaiser Permanente



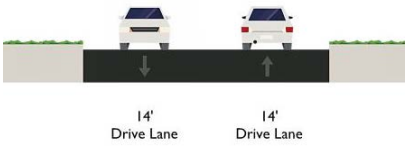
Existing Conditions

Posted Speed	25
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	1
RTD Route	No
On-street Parking	No

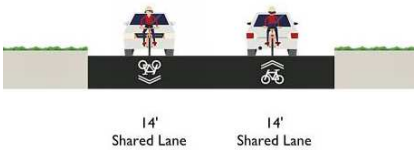
Benefits of Shared Roadways

- Markings alert motor vehicle drivers to presence of bicyclists
- Markings encourage proper positioning of bicyclists within the shared lane

Existing Cross Section



Recommended Cross Section



Segment W-18: Heritage Hills Trail

Kaiser Permanente Road Connector to E Lincoln Ave

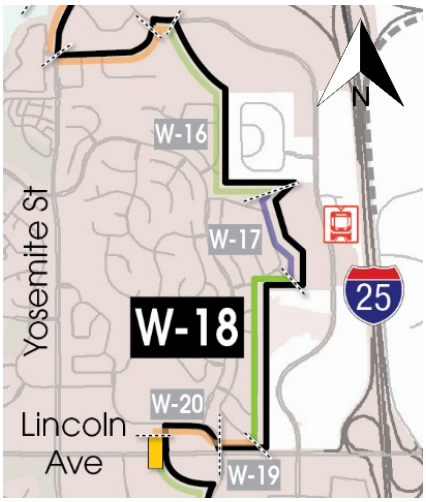
Jurisdiction: Lone Tree

Recommendation: Trail

Implementation requirements:
Construct **0.55** miles of 12' trail east of Heritage Hills neighborhood

Cost Estimate: $370,000

Stakeholders: Lone Tree, SPIMD, Heritage Hill Metropolitan District, Omnipark Metropolitan District, private property owners



Existing Conditions

Posted Speed	n/a
Annual Average Daily Traffic (AADT)	n/a
Level of Traffic Stress (LTS)	n/a
RTD Route	n/a
On-street Parking	n/a

Benefits of Trails

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section

N/A

Recommended Cross Section

Segment W-19: E Lincoln Ave

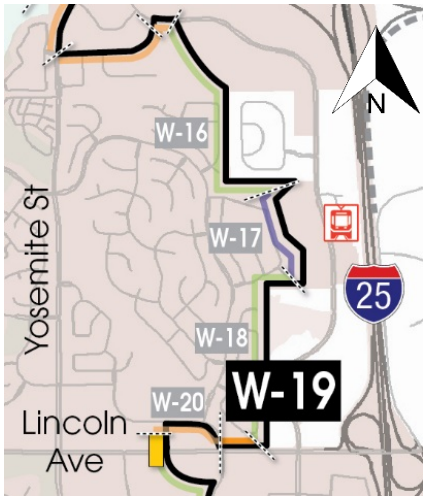
E Lincoln Ave to Heritage Hills Cir
Jurisdiction: Lone Tree

Recommendation: Sidepath

Implementation requirements:
Widen **0.24** miles of existing 6-8' sidewalk to 12' sidepath on north side of the street

Cost Estimate: $470,000

Stakeholders: Lone Tree, SPIMD, Omnipark Metropolitan District, Heritage Hills Metropolitan District, Park Meadows Metropolitan District



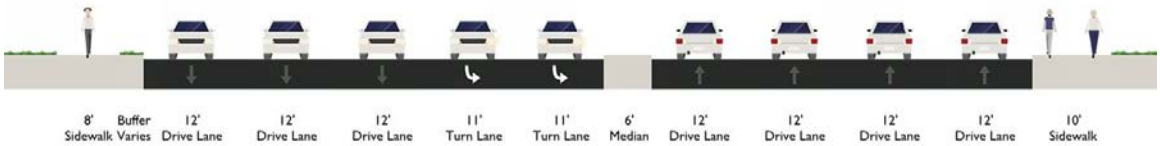
Existing Conditions

Posted Speed	40
Annual Average Daily Traffic (AADT)	24,000
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

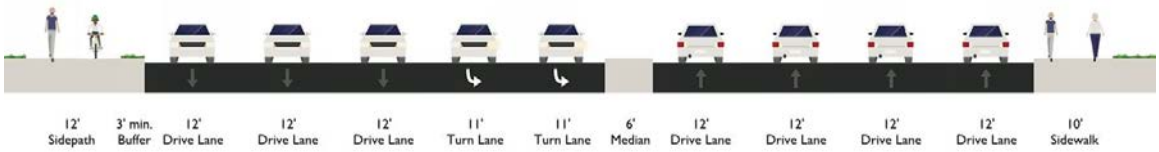
Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section



FELSBURG HOLT & ULLEVIG

Segment W-20: Heritage Hills Cir

E Lincoln Ave to Lincoln Ave Bike/Ped Bridge

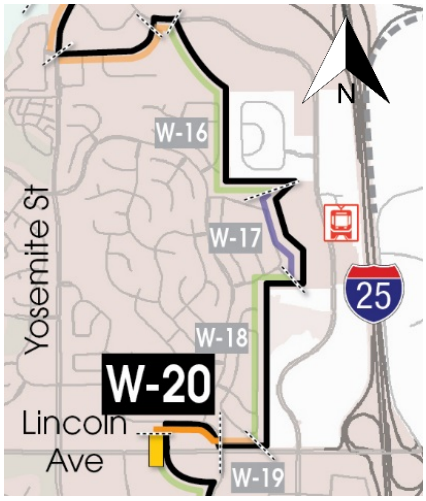
Jurisdiction: Lone Tree

Recommendation: Sidepath

Implementation requirements:
Widen **0.16** miles of existing 5' sidewalk to 12' sidepath on south side of the street

Cost Estimate: $320,000

Stakeholders: Lone Tree, SPIMD, Omnipark Metropolitan District, Heritage Hills Metropolitan District, Park Meadows Metropolitan District



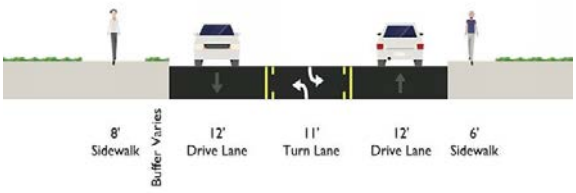
Existing Conditions

Posted Speed	25
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	2
RTD Route	No
On-street Parking	No

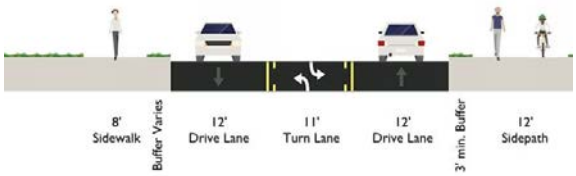
Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section



FELSBURG HOLT & ULLEVIG

Segment W-21: Lincoln Trail

E Lincoln Ave to Sky Ridge Ave
Jurisdiction: Lone Tree

Recommendation: Trail

Implementation requirements:
Construct **0.10** miles of 12' trail from E Lincoln Ave to Lone Tree Commons parking lot and widen **0.29** miles of existing 5-8' trail to 12' from Lone Tree Commons parking lot to Sky Ridge Ave

Cost Estimate: $410,000

Stakeholders: Lone Tree, SPIMD, Rampart Range Metropolitan District #7

Existing Conditions

Posted Speed	n/a
Annual Average Daily Traffic (AADT)	n/a
Level of Traffic Stress (LTS)	n/a
RTD Route	n/a
On-street Parking	n/a

Benefits of Trails

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section

Recommended Cross Section

Segment W-22: Sky Ridge Ave

Bellwether Ln to Park Meadows Blvd
Jurisdiction: Lone Tree

Recommendation: Sidepath

Implementation requirements:
Widen **0.29** miles of existing 8' sidewalk to 10' sidepath on north side of the street and construct **0.29** miles of new 10' sidepath on south side of the street

Cost Estimate: $990,000

Stakeholders: Lone Tree, SPIMD, Rampart Range Metropolitan District #2, Rampart Range Metropolitan District #7

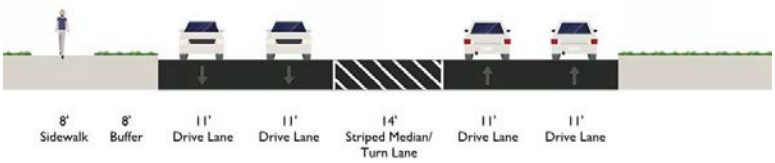
Existing Conditions

Posted Speed	35
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

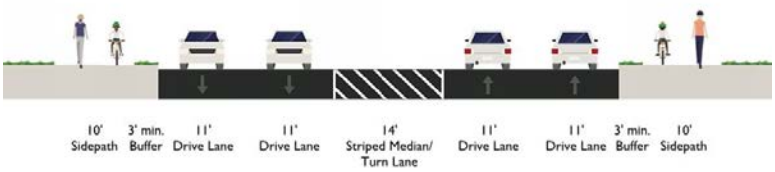
Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section



FELSBURG HOLT & ULLEVIG

Segment W-23: Park Meadows Blvd

Sky Ridge Ave to RidgeGate Pkwy

Jurisdiction: Lone Tree

Recommendation: Sidepath

Implementation requirements:
Widen **0.21** miles of existing 6' sidewalk to 10' sidepath on both sides of the street

Cost Estimate: $720,000

Stakeholders: Lone Tree, SPIMD, Rampart Range Metropolitan District #2, Rampart Range Metropolitan District #7

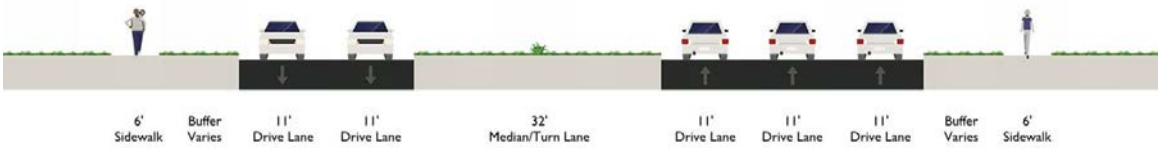
Existing Conditions

Posted Speed	40
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	4
RTD Route	Yes
On-street Parking	No

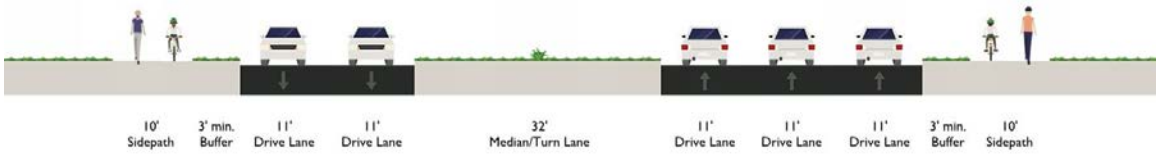
Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section



Segment W-24: RidgeGate Pkwy

Park Meadows Blvd to Havana St

Jurisdiction: Lone Tree

Recommendation: Sidepath

Implementation requirements:
Widen **1.01** miles of existing 8' sidewalk to 10' sidepath on both sides of the street

Cost Estimate: $3.4M

Stakeholders: Lone Tree, SPIMD, Rampart Range Metropolitan District #2, Rampart Range Metropolitan District #7, Rampart Range Metropolitan District #4

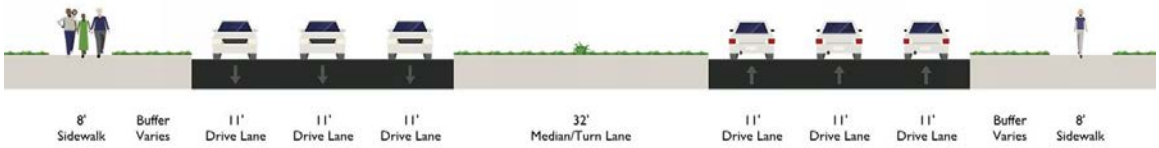
Existing Conditions

Posted Speed	40
Annual Average Daily Traffic (AADT)	20,000
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section (north of Cabela Dr)



Recommended Cross Section (north of Cabela Dr)

FELSBURG HOLT & ULLEVIG

Segment E-1: Goldsmith Gulch Trail

E Quincy Ave to E Belleview Ave

Jurisdiction: Denver

Recommendation: Trail

Implementation requirements:

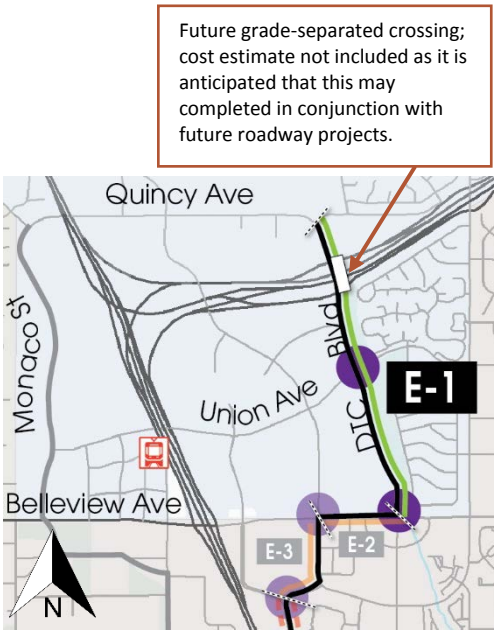
Widen **0.71** miles of existing 10' trail to 12' south of E Tufts Ave and construct **0.43** miles of new 12' trail north of E Tufts Ave. Widen **0.10** miles of existing 8' shoulder and 8' sidewalk to 12' sidepath under I-225 on the east side.

2 major intersection improvements

- DTC Blvd and Union Ave
- DTC Blvd and E Belleview Ave

Cost Estimate: $1.4M

Stakeholders: Denver, Greenwood Village, SPIMD, Goldsmith Metropolitan District



Existing Conditions

Posted Speed	n/a
Annual Average Daily Traffic (AADT)	n/a
Level of Traffic Stress (LTS)	n/a
RTD Route	n/a
On-street Parking	n/a

Benefits of Trails

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section (south of E Tufts Ave)

Recommended Cross Section

Segment E-2: Belleview Avenue

DTC Blvd to S Ulster St

Jurisdiction: Greenwood Village / Denver

Recommendation: Sidepath

Implementation requirements:

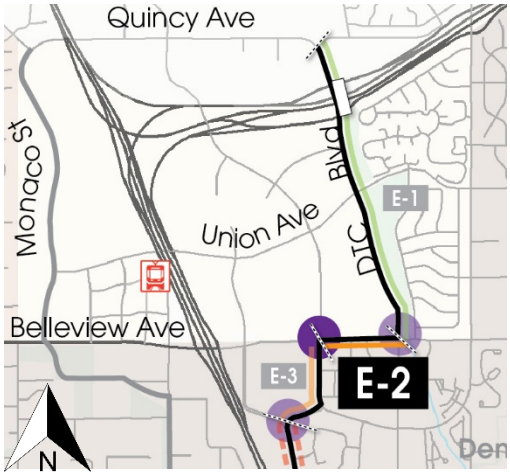
Widen **0.27** miles of existing 8' sidewalk to 12' sidepath on south side of the street

1 major intersection improvement

- E Belleview Ave and S Ulster St

Cost Estimate: $580,000

Stakeholders: Greenwood Village, Denver SPIMD, Goldsmith Metropolitan District, CDOT



Existing Conditions

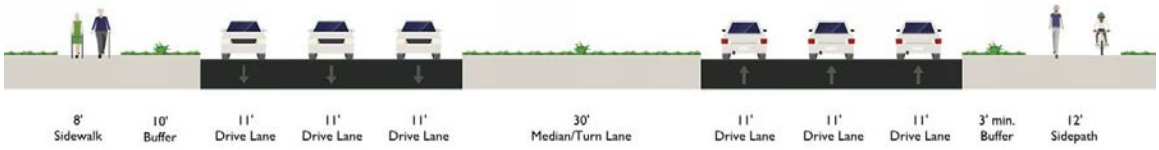
Posted Speed	35
Annual Average Daily Traffic (AADT)	32,000
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section

Recommended Cross Section



Segment E-3: S Ulster St/E Prentice Ave

E Belleview Ave to DTC Pkwy

Jurisdiction: Greenwood Village

Recommendation: Sidepath

Implementation requirements:

Widen **0.21** miles of 8' sidewalk to 12' sidepath on west side of S Ulster St

Widen **0.13** miles of 8' sidewalk to 12' sidepath on north side of E Prentice Ave

1 major intersection improvement

- E Prentice Ave and DTC Pkwy

Cost Estimate: $720,000

Stakeholders: Greenwood Village, SPIMD, Goldsmith Metropolitan District

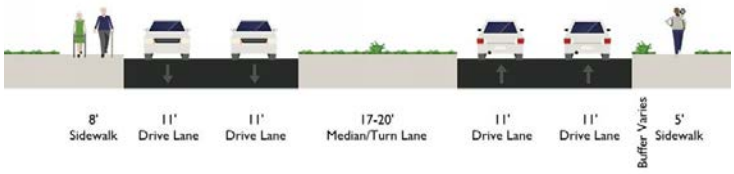
Existing Conditions

Posted Speed	30
Annual Average Daily Traffic (AADT)	13,000
Level of Traffic Stress (LTS)	4
RTD Route	Yes
On-street Parking	No

Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section

Segment E-4: DTC Pkwy

E Prentice Ave to Ulster Cir

Jurisdiction: Greenwood Village

Recommendation: Buffered Bike Lanes

Implementation requirements:

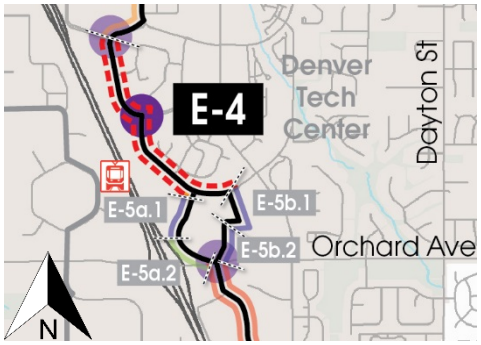
Restripe **0.74** miles of outside travel lanes to 11' buffered bike lanes on both sides of the street

1 major intersection improvement

- DTC Pkwy and S Valentia Way

Cost Estimate: $140,000

Stakeholders: Greenwood Village, SPIMD, Goldsmith Metropolitan District



Existing Conditions

Posted Speed	30
Annual Average Daily Traffic (AADT)	4,300
Level of Traffic Stress (LTS)	3
RTD Route	No
On-street Parking	No

Benefits of Buffered Bike Lanes

- Greater distance between bicyclists and motor vehicles than standard bike lanes
- Space for bicyclists to pass other bicyclists

Existing Cross Section

Recommended Cross Section

Note: Traffic operational analysis will be required at time of preliminary/final design.

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Segment E-5a.1: West Ulster Cir

DTC Pkwy to Great West Trail

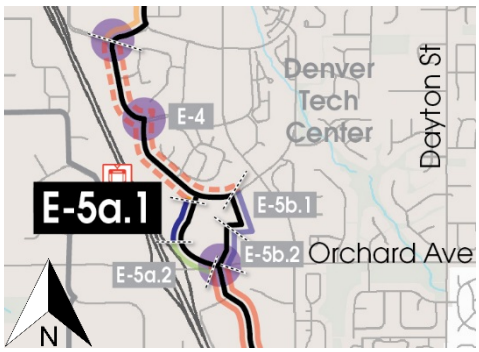
Jurisdiction: Greenwood Village

Recommendation: Shared Roadway

Implementation requirements:
Mark **0.14** miles of the street as shared roadway; roadway is privately owned and will require public-private coordination

Cost Estimate: $5,000

Stakeholders: Greenwood Village, SPIMD, private property owner, Goldsmith Metropolitan District



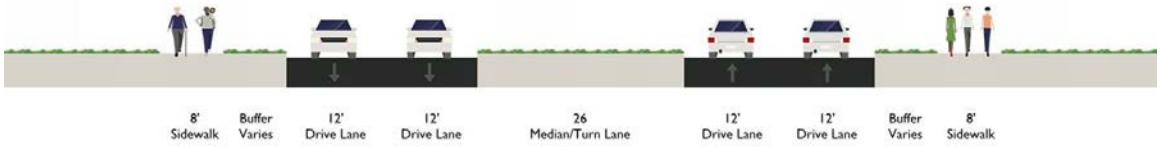
Existing Conditions

Posted Speed	25
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	2
RTD Route	No
On-street Parking	No

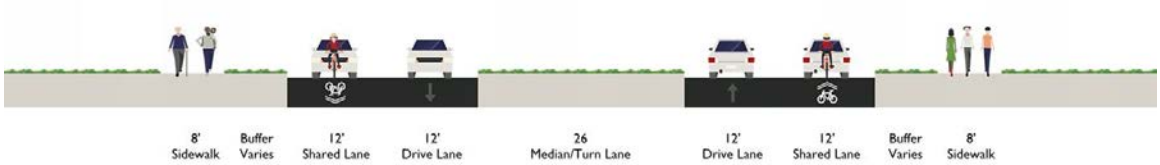
Benefits of Shared Roadways

- Markings alert motor vehicle drivers to presence of bicyclists
- Markings encourage proper positioning of bicyclists within the shared lane

Existing Cross Section



Recommended Cross Section



Segment E-5a.2: Great West Trail

West Ulster Cir to S Willow Dr

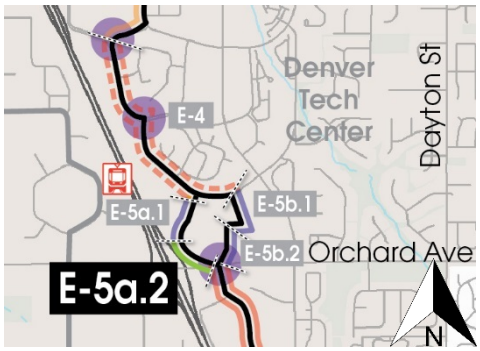
Jurisdiction: Greenwood Village

Recommendation: Trail

Implementation requirements:
Widen **0.06** miles of existing 10' trail to 12' and construct **0.15** miles of new 12' trail around west side of Great West Life to connect with Orchard Road/S Willow Dr

Cost Estimate: $140,000

Stakeholders: Greenwood Village, SPIMD, Great West Life, Goldsmith Metropolitan District



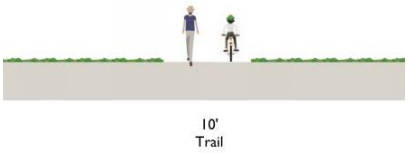
Existing Conditions

Posted Speed	n/a
Annual Average Daily Traffic (AADT)	n/a
Level of Traffic Stress (LTS)	n/a
RTD Route	n/a
On-street Parking	n/a

Benefits of Trails

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section

Segment E-5b.1: E Ulster Cir

DTC Pkwy to S Willow Dr

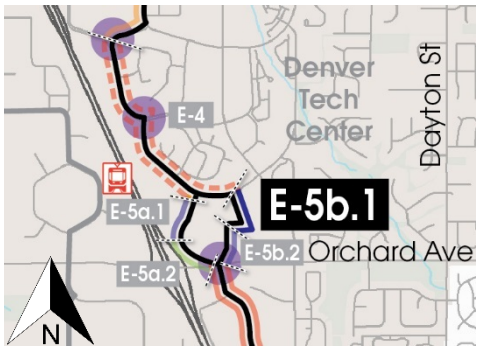
Jurisdiction: Greenwood Village

Recommendation: Shared Roadway

Implementation requirements:
Mark **0.13** miles of street as shared roadway; roadway is privately owned and will require public-private coordination

Cost Estimate: $5,000

Stakeholders: Greenwood Village, SPIMD, private property owners, Goldsmith Metropolitan District



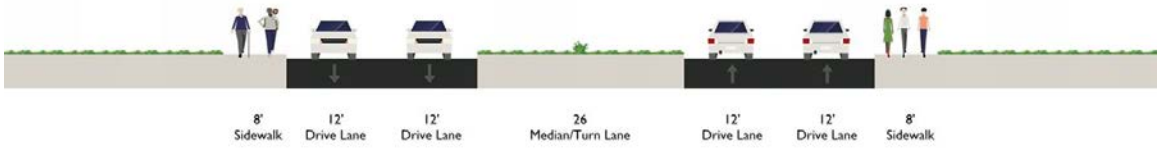
Existing Conditions

Posted Speed	25
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	2
RTD Route	No
On-street Parking	No

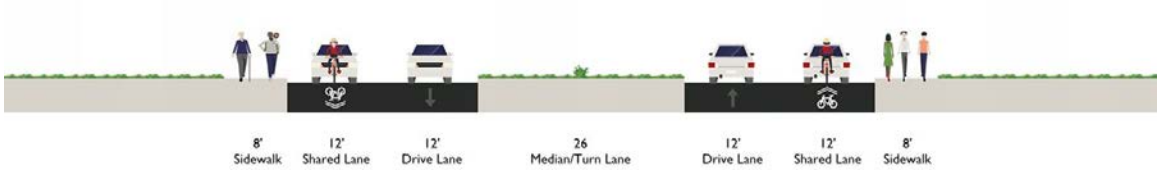
Benefits of Shared Roadways

- Markings alert motor vehicle drivers to presence of bicyclists
- Markings encourage proper positioning of bicyclists within the shared lane

Existing Cross Section



Recommended Cross Section



Segment E-5b.2: S Willow Dr

E Ulster Cir to E Orchard Rd

Jurisdiction: Greenwood Village

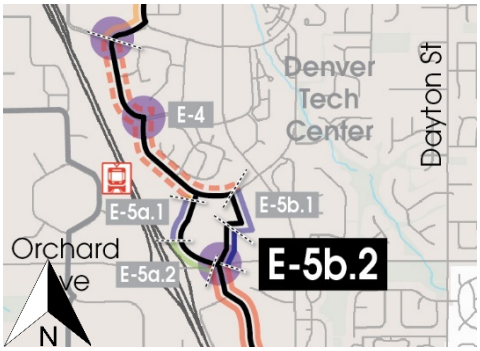
Recommendation: Shared Roadway

Implementation requirements:

Mark **0.18** miles of street as shared roadway; roadway is privately owned and will require public-private coordination

Cost Estimate: $5,000

Stakeholders: Greenwood Village, SPIMD, private property owners, Goldsmith Metropolitan District



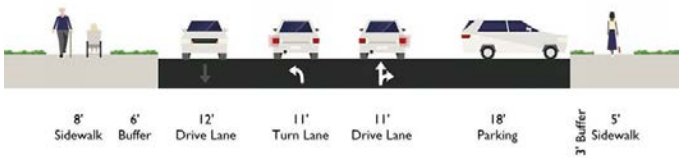
Existing Conditions

Posted Speed	25
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	2
RTD Route	No
On-street Parking	Yes

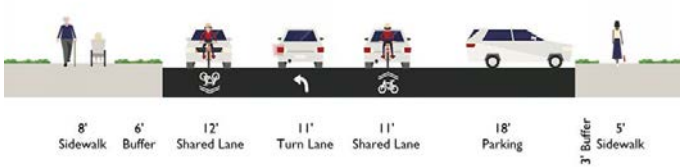
Benefits of Shared Roadways

- Markings alert motor vehicle drivers to presence of bicyclists
- Markings encourage proper positioning of bicyclists within the shared lane

Existing Cross Section



Recommended Cross Section



Segment E-6: S Willow Dr

E Orchard Dr to E Fair Ave

Jurisdiction: Greenwood Village

Recommendation: Bike Lanes

Implementation requirements:

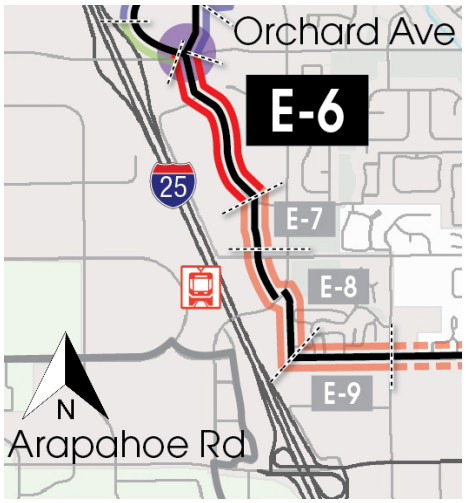
Stripe **0.10** miles of 6' bike lanes on both sides of the street north of S Wabash Way and widen **0.31** of existing 4' bike lanes to 5' south of S Wabash Way

1 major intersection improvement

- E Orchard Rd and S Willow Dr

Cost Estimate: $70,000

Stakeholders: Greenwood Village, SPIMD, Orchard Valley Metropolitan District



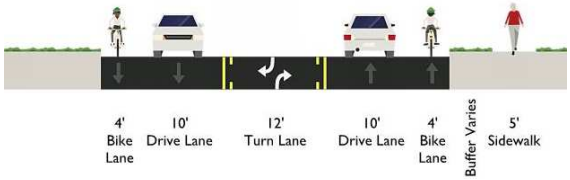
Existing Conditions

Posted Speed	25
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	2
RTD Route	No
On-street Parking	No

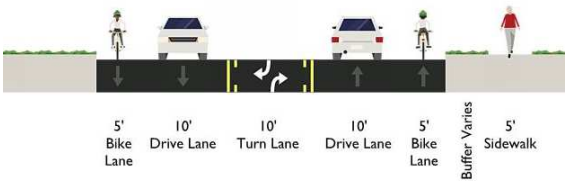
Benefits of Bike Lanes

- Designated roadway space for bicyclists
- More predictable bicycle positioning and interaction with motor vehicles

Existing Cross Section (south of S Wabash Way)



Recommended Cross Section (south of S Wabash Way)



Segment E-7: S Willow Dr

E Fair Ave to E Caley Ave

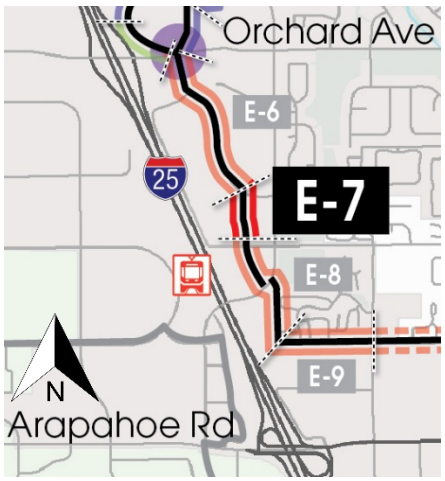
Jurisdiction: Greenwood Village

Recommendation: Bike Lanes

Implementation requirements:
None - utilize **0.13** miles of existing 5' bike lanes

Cost Estimate: $0

Stakeholders: Greenwood Village, SPIMD, Orchard Valley Metropolitan District



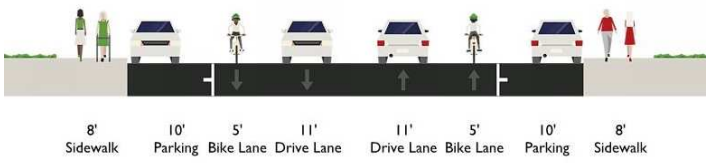
Existing Conditions

Posted Speed	25
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	2
RTD Route	No
On-street Parking	Yes

Benefits of Bike Lanes

- Designated roadway space for bicyclists
- More predictable bicycle positioning and interaction with motor vehicles

Existing Cross Section



Recommended Cross Section

N/A

Segment E-8: S Yosemite St

E Caley Ave to E Peakview Ave

Jurisdiction: Greenwood Village

Recommendation: Bike Lanes/Shared Roadway

Implementation requirements:

Stripe **0.14** miles of 5' bike lanes on both sides of the street south of E Caley Ave and north of underpass, mark **0.05** miles of the street as shared roadway through underpass to E Caley Way, and utilize existing 5' bike lanes south of E Caley Way

Cost Estimate: $10,000

Stakeholders: Greenwood Village, RTD

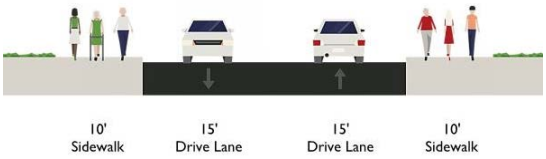
Existing Conditions

Posted Speed	35
Annual Average Daily Traffic (AADT)	4,000
Level of Traffic Stress (LTS)	3
RTD Route	Yes
On-street Parking	No

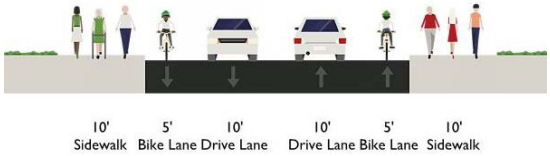
Benefits of Bike Lanes

- Designated roadway space for bicyclists
- More predictable bicycle positioning and interaction with motor vehicles

Existing Cross Section (north of underpass)



Recommended Cross Section (north of underpass)



Segment E-9: E Peakview Ave

S Yosemite St to S Boston St

Jurisdiction: Greenwood Village

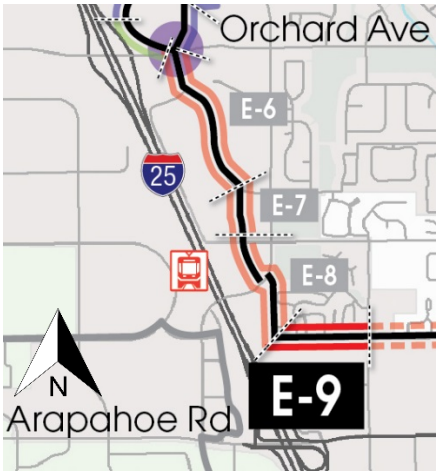
Recommendation: Buffered Bike Lanes

Implementation requirements:

Stripe **0.25** miles of 3' buffers between existing 6' bike lanes and drive lanes on both sides of the street

Cost Estimate: $30,000

Stakeholders: Greenwood Village



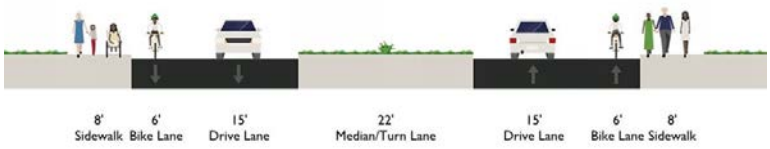
Existing Conditions

Posted Speed	35
Annual Average Daily Traffic (AADT)	4,000
Level of Traffic Stress (LTS)	3
RTD Route	No
On-street Parking	No

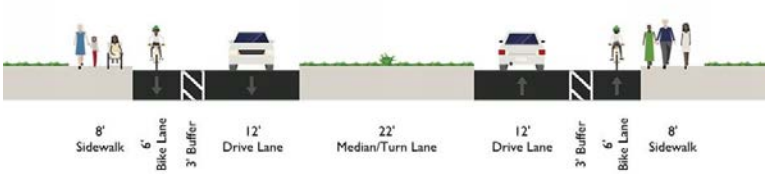
Benefits of Buffered Bike Lanes

- Greater distance between bicyclists and motor vehicles than standard bike lanes
- Space for bicyclists to pass other bicyclists

Existing Cross Section



Recommended Cross Section



Segment E-10: E Peakview Ave

S Boston St to S Dayton St

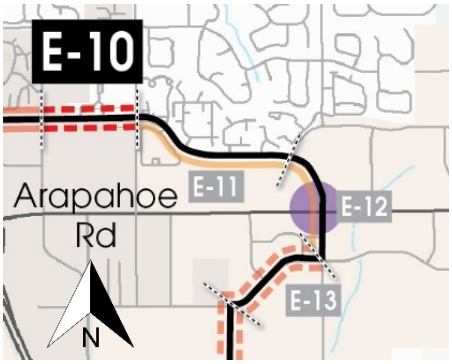
Jurisdiction: Greenwood Village

Recommendation: Buffered Bike Lanes

Implementation requirements:
Restripe **0.25** miles of outside travel lanes on both sides of the street to 10' buffered bike lanes

Cost Estimate: $30,000

Stakeholders: Greenwood Village



Existing Conditions

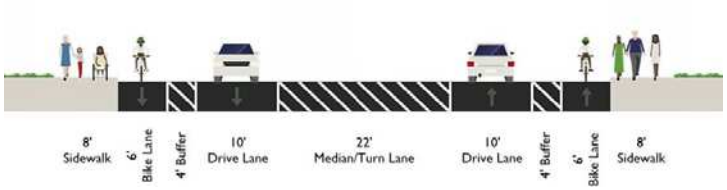
Posted Speed	35
Annual Average Daily Traffic (AADT)	4,000
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

Benefits of Buffered Bike Lanes

- Greater distance between bicyclists and motor vehicles than standard bike lanes
- Space for bicyclists to pass other bicyclists

Existing Cross Section

Recommended Cross Section



Note: Traffic operational analysis will be required at time of preliminary/final design.

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Segment E-11: E Peakview Avenue

S Dayton St to S Havana St

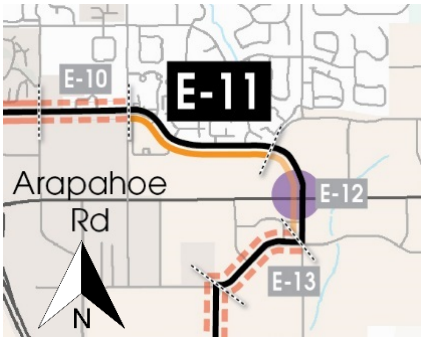
Jurisdiction: Centennial

Recommendation: Sidepath

Implementation requirements:
Widen **0.45** miles of existing 8' sidewalk to 12' sidepath on south side of the street

Cost Estimate: $890,000

Stakeholders: Centennial, SPIMD



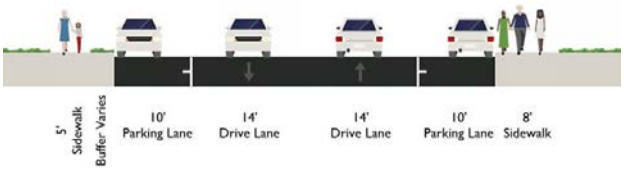
Existing Conditions

Posted Speed	30
Annual Average Daily Traffic (AADT)	12,000
Level of Traffic Stress (LTS)	3
RTD Route	No
On-street Parking	Yes

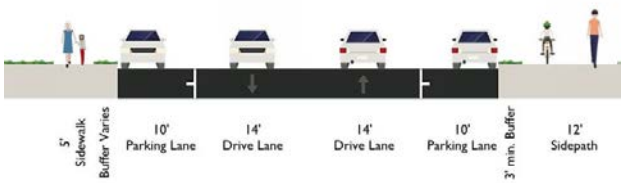
Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section



Segment E-12: S Havana St

E Peakview Ave to E Costilla Ave

Jurisdiction: Centennial

Recommendation: Sidepath

Implementation requirements:

Widen **0.31** miles of existing 6' sidewalk on south side of the street to 12' sidepath

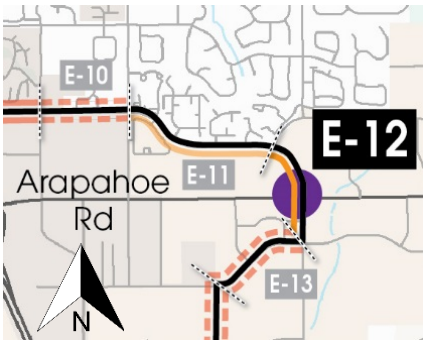
1 major intersection improvement

- E Arapahoe Rd and S Havana St

Note: partner agencies may consider secondary routes to minimize out of direction travel for commuters (e.g., west on Costilla, north on Clinton or Dayton).

Cost Estimate: $660,000

Stakeholders: Centennial, Greenwood Village, SPIMD, Interstate South Metropolitan District



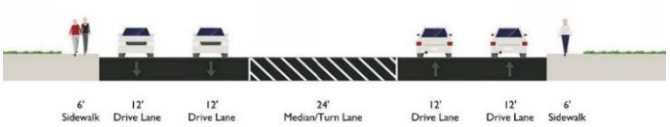
Existing Conditions

Posted Speed	35
Annual Average Daily Traffic (AADT)	23,000
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section

Segment E-13: E Costilla Ave

S Havana St to S Fulton St
Jurisdiction: Centennial

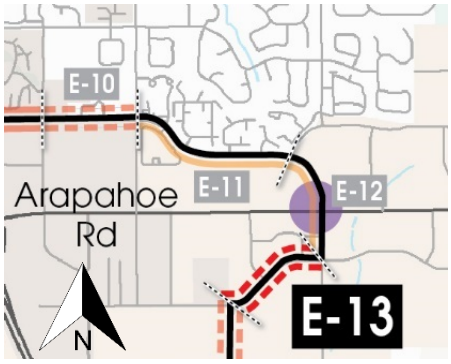
Recommendation: Buffered Bike Lanes

Implementation requirements:
Restripe **0.30** miles of outside travel lanes on both sides of the street to 12' buffered bike lanes

Note: partner agencies may consider secondary routes to minimize out of direction travel for commuters (e.g., west on Costilla, north on Clinton or Dayton).

Cost Estimate: $40,000

Stakeholders: Centennial, SPIMD, Interstate South Metropolitan District



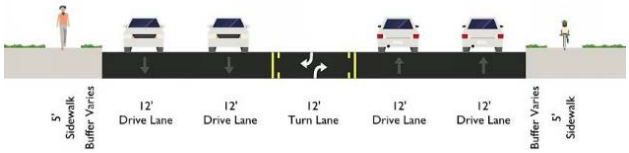
Existing Conditions

Posted Speed	35
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

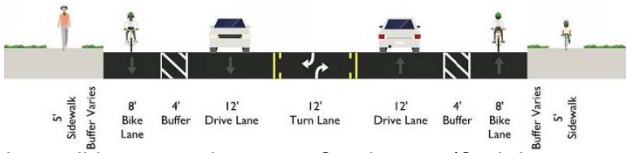
Benefits of Buffered Bike Lanes

- Greater distance between bicyclists and motor vehicles than standard bike lanes
- Space for bicyclists to pass other bicyclists

Existing Cross Section



Recommended Cross Section



Note: Traffic operational analysis will be required at time of preliminary/final design.

Segment E-14: S Fulton St

E Costilla Ave to S Clinton St

Jurisdiction: Centennial

Recommendation: Buffered Bike Lanes

Implementation requirements:

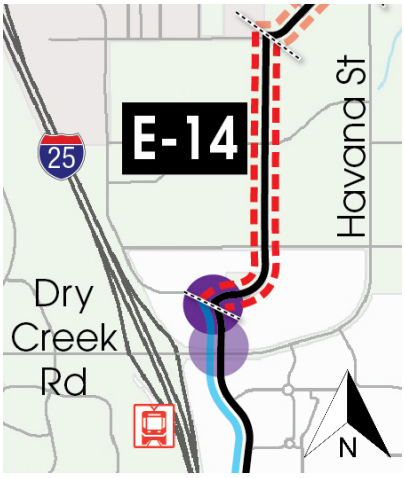
Restripe **0.72 miles** of outside travel lanes on both sides of the street to 12' buffered bike lanes

1 major intersection improvement

- S Fulton St and S Clinton St

Cost Estimate: $130,000

Stakeholders: Centennial, SPIMD, Interstate South Metropolitan District, Inverness Metropolitan Improvement District



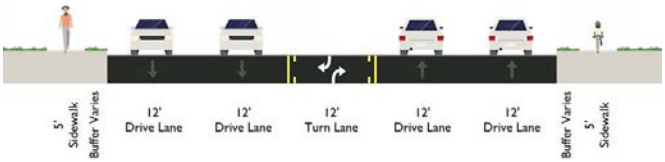
Existing Conditions

Posted Speed	35
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

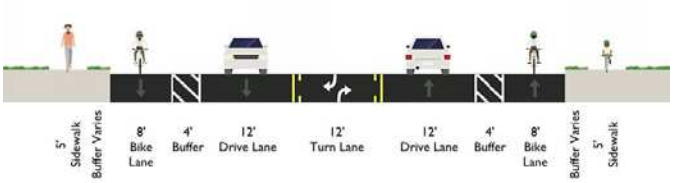
Benefits of Buffered Bike Lanes

- Greater distance between bicyclists and motor vehicles than standard bike lanes
- Space for bicyclists to pass other bicyclists

Existing Cross Section



Recommended Cross Section



Note: Traffic operational analysis will be required at time of preliminary/final design.

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Segment E-15: S Clinton St/Inverness Dr W

S Fulton St to Inverness Dr E

Jurisdiction: Arapahoe County

Recommendation: Two-Way Separated Bike Lane

Implementation requirements:

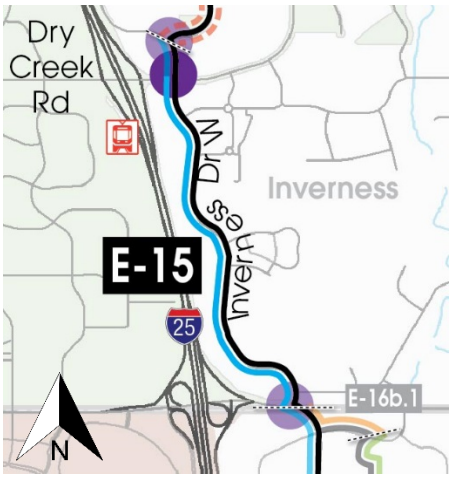
Construct **1.29** miles of 10' two-way separated bike lanes along west side of the street at sidewalk level

1 major intersection improvement

- S Clinton St and E Dry Creek Rd

Cost Estimate: $3.9M

Stakeholders: Arapahoe County, Douglas County, SPIMD, Inverness Metropolitan Improvement District



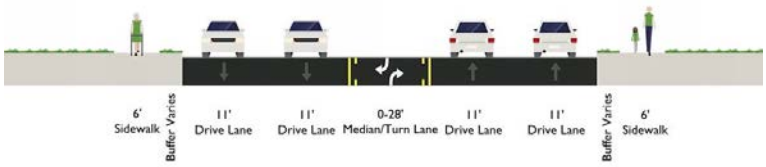
Existing Conditions

Posted Speed	25
Annual Average Daily Traffic (AADT)	14,000
Level of Traffic Stress (LTS)	3
RTD Route	No
On-street Parking	No

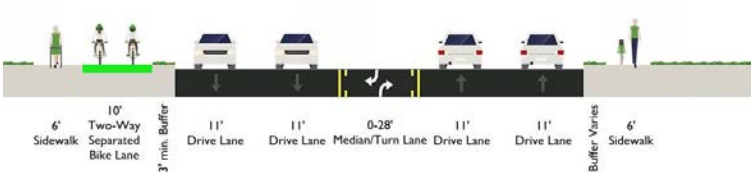
Benefits of Two-Way Separated Bike Lanes

- Physical separation from the roadway
- Separate space for bikes and pedestrians

Existing Cross Section



Recommended Cross Section



Segment E-16a: Inverness Dr W/Inverness Pkwy

Inverness Dr E to S Jamaica St

Jurisdiction: Arapahoe County/Douglas County

Recommendation: Two-Way Separated Bike Lane

Implementation requirements:

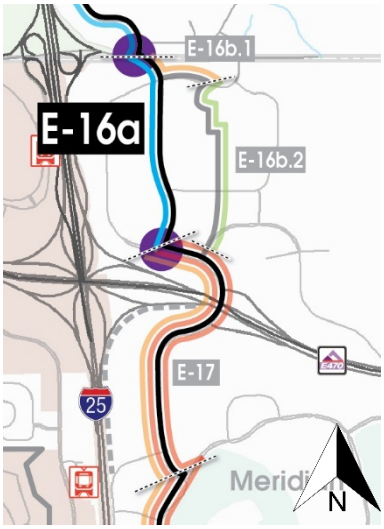
Construct **0.69** miles of 10' two-way separated bike lanes along west side of the street

2 major intersection improvements

- Inverness Dr W and Inverness Pkwy
- Inverness Pkwy and S Jamaica St

Cost Estimate: $2.2M

Stakeholders: Arapahoe County, Douglas County, SPIMD, Inverness Metropolitan Improvement District



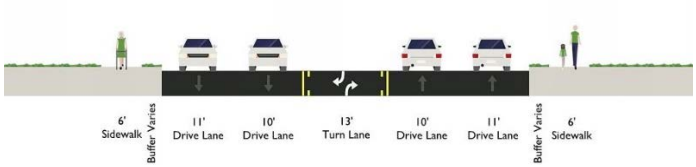
Existing Conditions

Posted Speed	30
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	3
RTD Route	No
On-street Parking	No

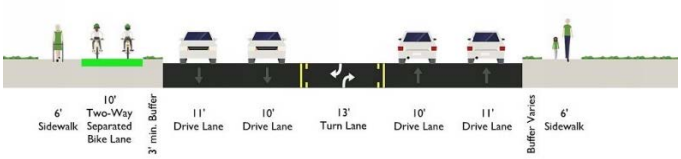
Benefits of Two-Way Separated Bike Lanes

- Physical separation from the roadway
- Separate space for bike and pedestrians

Existing Cross Section



Recommended Cross Section



Note: Traffic operational analysis will be required at time of preliminary/final design.

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Segment E-16b.1: Inverness Dr W/Inverness Pkwy/Inverness Way S

Inverness Dr E to Inverness Trail

Jurisdiction: Arapahoe County/Douglas County

Recommendation: Sidepath

Implementation requirements:

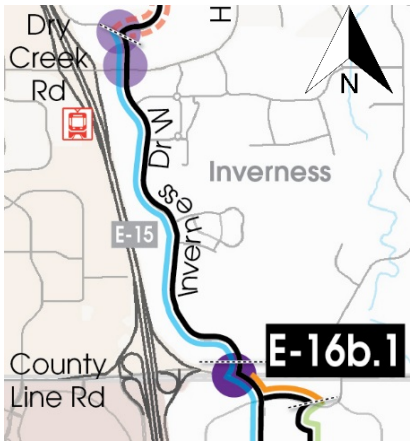
Widen **0.23** miles of existing 6' sidewalk to 12' sidepath on east/north side of the street

1 major intersection improvements

- Inverness Dr W and Inverness Pkwy

Cost Estimate: $500,000

Stakeholders: Arapahoe County, Douglas County, SPIMD, Inverness Metropolitan Improvement District

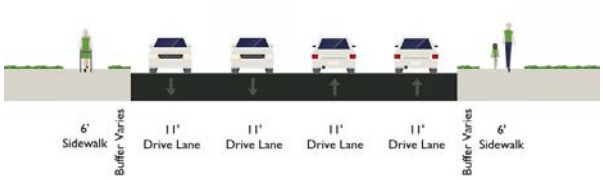


Existing Conditions	
Posted Speed	30
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	3
RTD Route	No
On-street Parking	No

Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section (Inverness Dr E)



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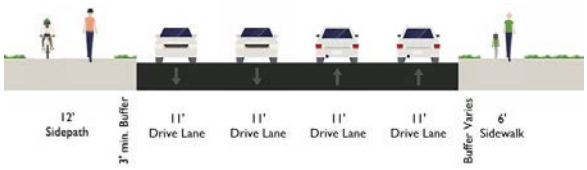

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Segment E-16b.2: Inverness Trail

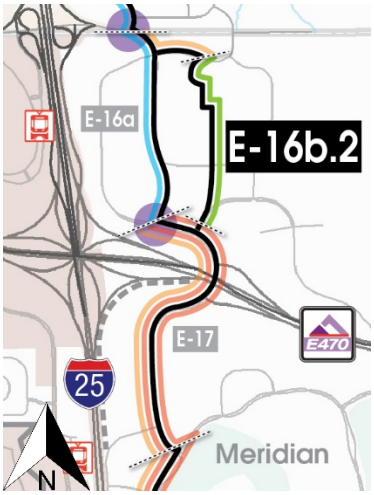
Inverness Way S to S Jamaica St
Jurisdiction: Douglas County

Recommendation: Trail

Implementation requirements:
Widen **0.25** miles of existing 6' trail to 12', utilize **0.27** miles of existing 12' trail, and construct **0.15** miles of 12' trail to connect to S Jamaica St

Cost Estimate: $390,000

Stakeholders: Douglas County, SPIMD, Inverness Metropolitan District



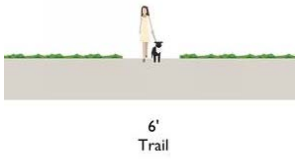
Existing Conditions

Posted Speed	n/a
Annual Average Daily Traffic (AADT)	n/a
Level of Traffic Stress (LTS)	n/a
RTD Route	n/a
On-street Parking	n/a

Benefits of Trails

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section

Segment E-17: S Jamaica St

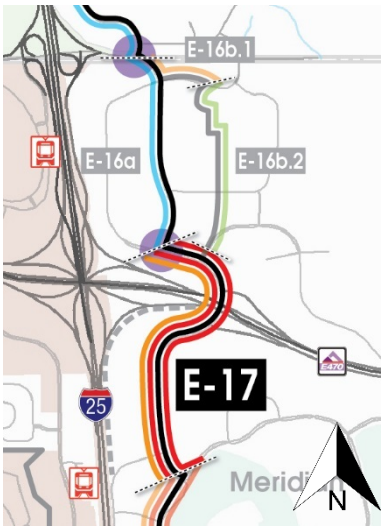
Inverness Pkwy to S Meridian Blvd
Jurisdiction: Douglas County

Recommendation: Sidepath & Bike Lanes

Implementation requirements:
Widen **1.06** miles of roadway and narrow drive lanes to 11' to provide 5' bike lanes on both sides of street, and widen 8' sidewalk to 12' sidepath on west side of the street

Cost Estimate: $3.4M

Stakeholders: Douglas County, SPIMD, North Meridian Metropolitan District, CDOT, E-470 Tolling Authority



Existing Conditions

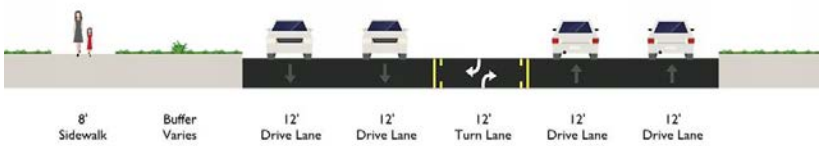
Posted Speed	35
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

Benefits of Sidepaths & Bike Lanes

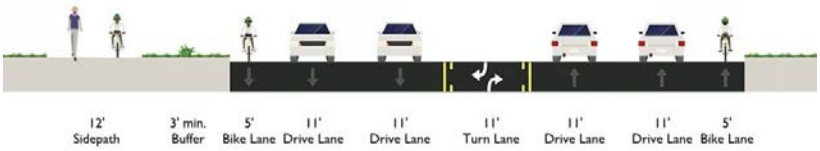
Sidepaths
- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact Bike Lanes

Bike Lanes
- Designated roadway space for bicyclists
- More predictable bicycle positioning and interaction with motor vehicles

Existing Cross Section



Recommended Cross Section



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Segment E-18: S Meridian Blvd

S Jamaica St to S Havana St
Jurisdiction: Douglas County

Recommendation: Sidepath & Bike Lanes

Implementation requirements:

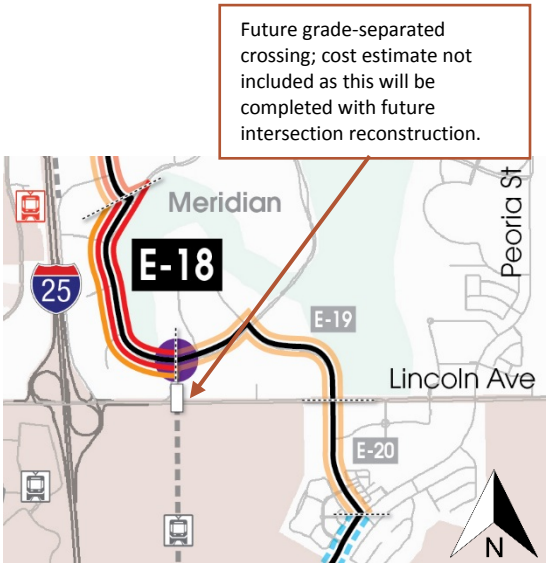
Widen **0.60** miles of roadway and narrow drive lanes to provide 5' bike lanes in each direction and widen existing 8' sidewalk to 12' sidepath on west side of the street

1 major intersection improvement

- S Meridian Blvd and S Havana S

Cost Estimate: $2.0M

Stakeholders: Douglas County, SPIMD, Meridian Metropolitan District



Existing Conditions

Posted Speed	35
Annual Average Daily Traffic (AADT)	9,000
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

Benefits of Sidepath & Bike Lanes

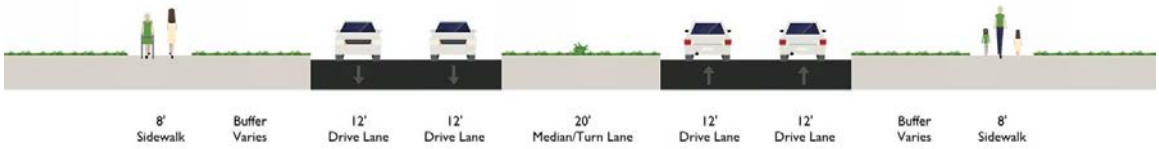
Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact Bike Lanes

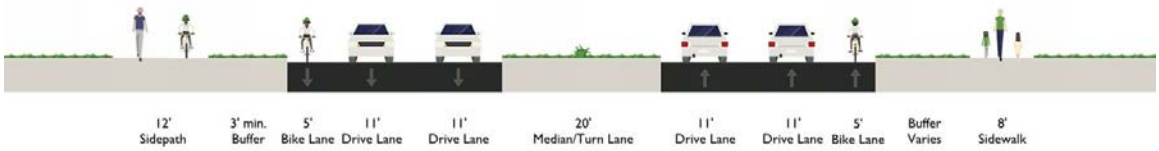
Bike Lanes

- Designated roadway space for bicyclists
- More predictable bicycle positioning and interaction with motor vehicles

Existing Cross Section



Recommended Cross Section



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Segment E-19: S Meridian Blvd/Oswego St

S Havana St to E Lincoln Ave

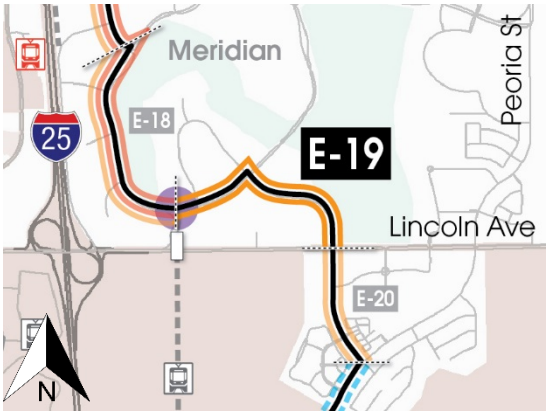
Jurisdiction: Douglas County

Recommendation: Sidepath

Implementation requirements:
None - utilize **0.72** miles of existing 8' sidepath on both sides of the street as an interim solution

Cost Estimate: $0

Stakeholders: Douglas County, SPIMD, Meridian Metropolitan District



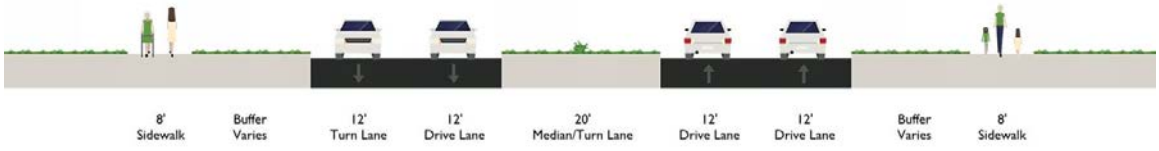
Existing Conditions

Posted Speed	35
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section

N/A

Segment E-19 is an interim solution prior to Havana St extending south through the Lone Tree Town Center to RidgeGate Pkwy.

Segment E-20: S Oswego St

E Lincoln Ave to S Peoria St

Jurisdiction: Douglas County

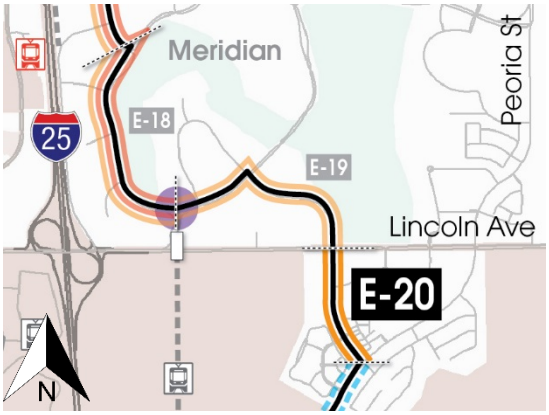
Recommendation: Sidepath

Implementation requirements:

None - utilize **0.42** miles of existing 8' sidepath on both sides of the street as an interim solution

Cost Estimate: $0

Stakeholders: Douglas County, SPIMD, South Meridian Metropolitan District, Rampart Range Metropolitan District #4



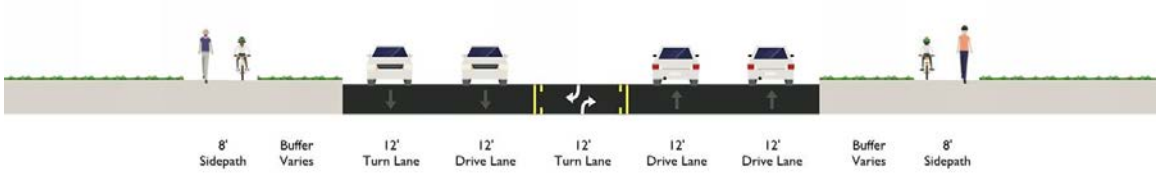
Existing Conditions

Posted Speed	35
Annual Average Daily Traffic (AADT)	Unavailable
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

Benefits of Sidepaths

- Physical separation from the roadway
- Adequate space for all non-motorized user types to safely interact

Existing Cross Section



Recommended Cross Section

N/A

Segment E-20 is an interim solution prior to Havana St extending south through the Lone Tree Town Center to RidgeGate Pkwy.

Segment E-21: S Peoria St

S Oswego St to RidgeGate Pkwy

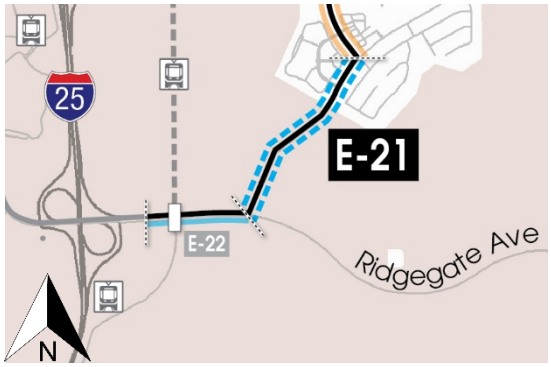
Jurisdiction: Douglas County/Lone Tree

Recommendation: One-Way Separated Bike Lanes

Implementation requirements:
Construct **0.65** miles of 8' one-way separated bike lanes on both sides of the street at sidewalk level with future roadway widening; *E-21 & E-22 are interim solutions prior to Havana St extending south through the Lone Tree Town Center to RidgeGate Pkwy*

Cost Estimate: $1.1M

Stakeholders: Douglas County, Lone Tree, SPIMD, South Meridian Metropolitan District, Rampart Range Metropolitan District #4

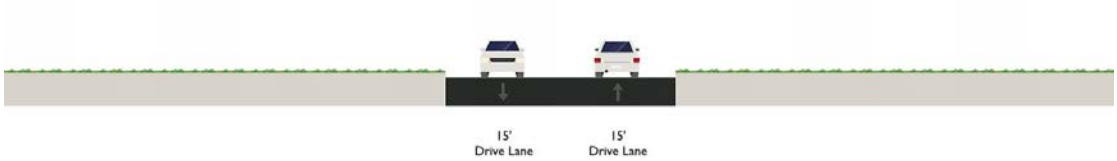


Existing Conditions	
Posted Speed	35
Annual Average Daily Traffic (AADT)	4,000
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

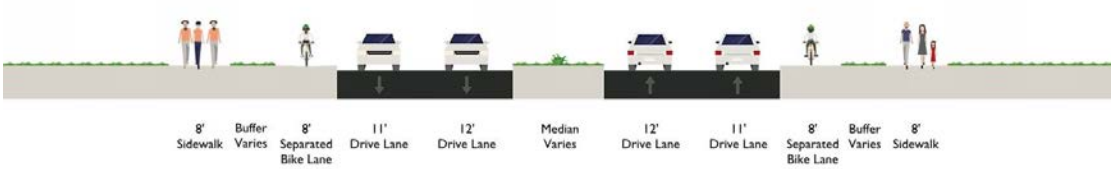
Benefits of One-Way Separated Bike Lanes

- Physical separation from the roadway
- Separate space for bikes and pedestrians

Existing Cross Section



Recommended Cross Section



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Segment E-22: RidgeGate Pkwy

S Peoria St to Havana St

Jurisdiction: Lone Tree

Recommendation: Two-Way Separated Bike Lane

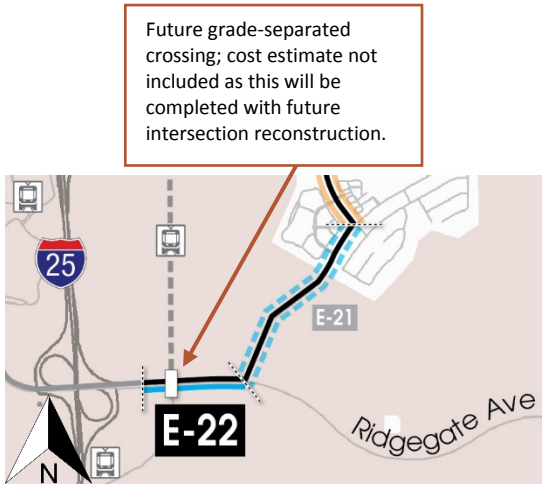
Implementation requirements:

Construct **0.25** miles of 12' two-way separated bike lane on south side of the street at sidewalk level with roadway widening

E-21 & E-22 are interim solutions prior to Havana St extending south through the Lone Tree Town Center to RidgeGate Pkwy

Cost Estimate: $300,000

Stakeholders: Lone Tree, SPIMD, Rampart Range Metropolitan District #4



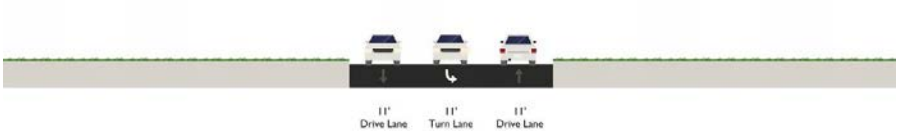
Existing Conditions

Posted Speed	40
Annual Average Daily Traffic (AADT)	20,000
Level of Traffic Stress (LTS)	4
RTD Route	No
On-street Parking	No

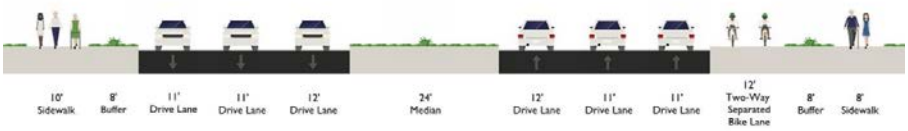
Benefits of Two-Way Separated Bike Lanes

- Physical separation from the roadway
- Separate space for bikes and pedestrians

Existing Cross Section



Recommended Cross Section



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7.1 Cost Estimate Summary by Route

Table 7-1 and **Table 7-2** provide planning level cost estimates for the North-South Regional Bicycle Corridors by route, jurisdiction, and facility type. This information will serve as a tool to inform partners and support project development.

Table 7-1 Cost Estimates by Agency

	Route 1 – West of I-25	Route 2 – East of I-25
Arapahoe County	$0	$3.9M
City of Centennial	$6M	$1.7M
City and County of Denver	$3.5M	$1.2M
Douglas County	$0	$7.5M
City of Greenwood Village	$1.5M	$1.7M
City of Lone Tree	$9.6M	$1.4M
Total Cost	**$20.5M**	**$17.4M**

Table 7-2 Cost Estimates by Facility Type

	Total Length (miles)	Route 1 – West of I-25	Total Length (miles)	Route 2 – East of I-25
Shared Roadway	0.3	$10,000	0.2	$5,000
Bike Lane	0.4	$20,000	0.6	$80,000
Bike Lane & Sidepath	0	$0	1.7	$5.3M
Buffered Bike Lane	1.8	$230,000	2.3	$360,000
Separated Bike Lane	2.1	$6.2M	2.9	$7.5M
Sidepath	3.6	$10.8M	1.5	$3.2M
Trail	3.7	$3.2M	1.4	$1M
Total Cost		**$20.5M**		**$17.4M**

8. BICYCLE CORRIDOR BRANDING & WAYFINDING

For the North-South Regional Bicycle Corridors to be successful upon implementation, the creation of a comprehensive branding and wayfinding package will be required. By creating a unified brand for the regional bicycle corridors, employees, residents and visitors will be able to successfully utilize the facilities for all trip types.

8.1 Bicycle Corridor Branding

The first step will be for the partners to work together to determine how the corridor will be branded and what message and the image the group would like to convey. Development of a corridor brand for the bike corridors will likely require the support of a graphic design/marketing/advertising agency. Assuming that the corridor brand will move forward as a long-term regional bicycle corridor brand, it is important to obtain buy-in from all stakeholders and ensure it is a collaborative process.

Branding

Branding provides a way to market the idea or image of a specific product or service that connects with consumers by identifying the name, logo, slogan, or design of the agency that owns the idea or image.

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**The Denver South TMA logo is an example of potential brand unification. The final development of a corridor brand will require stakeholder participation and buy-in.*

Initial ideas for consideration and discussion will include:

- How will the development of a branding package be funded?
- How will you ensure that the brand is representative of a unique set of values and needs throughout the corridor?
- Will the brand be representative of all agencies under the moniker of the DSTMA, its own new brand, or something else?
- Will there be supplementary information on each sign within a given jurisdiction?

Once the DSTMA and its partner agencies have prioritized projects and identified funding, the development of a branding and wayfinding signage package should be initiated.

8.2 Wayfinding Signage

Per NACTO, wayfinding is a system of comprehensive signing and/or pavement markings used to guide bicyclists to their destinations along preferred bicycle routes. Signs are typically placed at decision points along bicycle routes – typically at the intersection of two or more bikeways and at other key locations leading to and along bicycle routes.

Wayfinding

NACTO defines wayfinding as a system of comprehensive signing and/or pavement markings used to guide bicyclists to their destinations along preferred bicycle routes.

8.2.1 Benefits of Wayfinding Signage

When bicycle facilities are low stress, safe and easy to navigate, the likelihood of attracting more "interested but concerned" riders for all trip types goes up. The following provides a summary of some of the key benefits of wayfinding signage:

- Familiarizes users with the bicycle network
- Identifies the best routes to destinations
- Overcomes a "barrier to entry" for infrequent bicyclists
- Signage that includes mileage and travel time to destinations may help minimize the tendency to overestimate the amount of time it takes to travel by bicycle
- Visually indicates to motorists that they are driving along a bicycle route and should use caution
- Passively markets the bicycle network by providing unique and consistent imagery throughout the jurisdiction/region

8.2.2 Wayfinding Goals

Successful wayfinding allows users to reach their destinations efficiently and without confusion. Wayfinding goals that should be considered as the Denver South region develops a wayfinding signage program for the regional bicycle corridors include:

- Simple messages – all information on wayfinding signs should be clear and concise. It should convey the message in as few words and graphics as possible. Since these signs are typically viewed as users are moving along a bicycle facility, people need to read and absorb the information quickly.
- Predictability – providing predictable information allows for users to anticipate and absorb information quickly. Wayfinding signs that include the same design, message, and branding, allowing for users to focus on content.
- Provide connections – the ultimate goal of wayfinding signage is to provide connections for all users and to allow them to integrate into the community – whether for social, recreation, or commute purposes. Understanding the direction and distance of other cities, trails, and key activity centers improves the user experience and will encourage bicycling for future trips.

8.2.3 Wayfinding Signage Design Guidance

NACTO's Urban Bikeway Design Guide[1] provides guidance on the three general types of wayfinding signs used for bicycle routes. **Table 8-1** provides a summary of their purpose, typical information provided, and placement guidance. *The Manual on Uniform Traffic Control Devices* (MUTCD)[2] provides bicycle sign guidance (Section 9B.20) and should be referenced to inform the application and placement of wayfinding signs (Section 9B.01).

[1] https://nacto.org/publication/urban-bikeway-design-guide/bikeway-signing-marking/bike-route-wayfinding-signage-and-markings-system/

[2] https://mutcd.fhwa.dot.gov/pdfs/2009r1r2/pdf_index.htm

Table 8-1 Wayfinding Signage Guidance

	Purpose	Information	Placement
Confirmation Signs 	Indicate to bicyclists that they are on a designated bikeway. Make motorists aware of the bicycle route.	Can include destinations and distance/time. Do not include arrows.	Every ¼ to ½ mile on off-street facilities and every 2 to 3 blocks along bicycle facilities, unless another type of sign is used (e.g., within 150 ft of a turn or decision sign). Should be placed soon after turns to confirm destination(s). Pavement markings can also act as confirmation that a bicyclist is on a preferred route.
Turn Signs 	Indicate where a bikeway turns from one street onto another street. Can be used with pavement markings	Include destinations and arrows.	Near-side of intersections where bike routes turn (e.g., where the street ceases to be a bicycle route or does not go through). Pavement markings can also indicate the need to turn to the bicyclist.
Decision Signs 	Mark the junction of two or more bikeways. Inform bicyclists of the designated bike route to access key destinations.	Destinations and arrows, distances, and travel times are optional but recommended.	Near-side of intersections in advance of a junction with another bicycle route. Along a route to indicate a nearby destination.

Additionally, providing information about key destinations will be of critical importance for the North-South Regional Bicycle Corridors. The data and findings from the Phase I *Regional Trail Connections Study* provides great insight into key activity centers to be highlighted in a wayfinding program for the Denver South region. Key activity centers for consideration include:

- RTD light rail stations
- Schools
- Local or regional parks and trails
- Civic and community destinations
- Major retail and employment centers

8.2.4 North-South Bicycle Corridor Wayfinding Cost Estimates

Given the high-level nature of this study, a comprehensive wayfinding signage package (location, type and costs of signs) was not developed. A detailed wayfinding signage plan and cost estimate will be necessary as the partner agencies move the North-South Bicycle Corridors towards implementation.

To guide future planning and potential funding requests, planning level cost estimates were developed. Please note, major intersections will likely require additional signage and wayfinding – those costs have been built into the "major intersection improvement" costs included in Chapter 7.

Planning Level Wayfinding Cost Estimates

Basic assumptions were used to develop the cost estimates using industry standards for the North-South Corridors.

Signage assumptions include:

- 6 square feet of signage per sign
- 10-foot steel post
- $550 per sign
- 20% contingency

	Route 1 (West)	Route 2 (East)
Corridor Length	11.9 miles	10.6 miles
Signage spacing	Every ¼ mile (bi-directional)	Every ¼ mile (bi-directional)
Cost per sign (includes sign, sign post + 20% contingency)	$660 each	$660 each
Corridor Branding Fee	$20,000	$20,000
Design Fee	$40,000	$40,000
Cost Estimate	$125,000	$120,000

9. NEXT STEPS

9.1 Stakeholder Collaboration

The DSTMA led the development of this planning project and has brought partners together to create a vision for the implementation of the North-South Bicycle Corridors. To maintain the momentum, it will be important to continue conversations relative to segment prioritization, additional traffic/operational analysis, funding opportunities, branding/wayfinding and partner responsibility. Partner agencies may also want to initiate discussions with CDOT to coordinate on segments that interact with State Highways (e.g., I-225, Belleview Ave, etc.). These conversations are anticipated to continue through the DSTMA's TAC.

9.1.1 Corridor Segment Prioritization

To successfully secure funding for implementation of the North-South Bicycle Corridors, a strategic funding approach will need to be developed. A next step in this process will be to identify possible prioritization factors which will inform the decision of how to implement the facility improvements over time. Considerations for prioritization include:

- Proximity to major activity centers (employers, retail, schools, transit stations)
- Vehicle delay (vehicle congestion as an impetus for mode shift)
- Safety (history of bike-vehicle crashes)
- Short-trip analysis (identification of trips less than 3-miles by segment; identify potential for mode shift)

9.1.2 Future Facility Maintenance

Prior to build out of the North-South Regional Bicycle Corridors, stakeholders will need to discuss and come to agreement on how the bicycle corridors will be maintained and improved over time. This includes snow removal, street sweeping, pavement overlays, general maintenance, etc. It will be of critical importance that all agencies are committed to maintenance to ensure safe facilities across jurisdictional boundaries. This could be achieved through memorandums of understanding, intergovernmental agreements, etc. Off-street facility maintenance, specifically for sidepaths, will require coordination with property owners since they are typically responsible for routine maintenance and rehabilitation of sidewalk. Education and coordination among partners regarding responsibility and maintenance of all facilities will be important.

9.2 Funding Opportunities

The DSTMA and partner agencies will need to work together to determine how to best pursue grant monies for bicycle improvements from federal, local, and non-governmental funding sources. Implementing the North-South Bicycle Corridors will require a sustained pursuit of funding opportunities. A range of options should be considered for implementation, including:

- Leverage planned street maintenance projects and capital improvement projects by adding bicycle facility upgrades at a relatively low incremental cost
- Request Arapahoe County Open Spaces funding for shared-use path improvements (restricted to sidewalk with a minimum of 8 feet, 5 feet allowable for shorter distances when constrained by right-of-way and physical barriers – and connects to a school, park, local/regional trail)

- Partner with other agencies including CDOT and DRCOG to fund and implement bicycle and pedestrian projects that are mutually beneficial
- Partner with private developers, health organizations, nonprofit organizations, and school districts for funding and implementation of bicycle and pedestrian projects and programs
- Identify those projects that are eligible for and would compete most successfully for federal grants
- Pursue non-governmental grant opportunities

In the near term, project partners should continue working together to identify the most effective approach to pursue DRCOG TIP funding to move the North-South Bicycle Corridors forward.

APPENDIX A. COST ESTIMATES

Shared Lane Markings				
Includes: sharrow markings and bicycle warning signs				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Sign Panel (Class I)	SF	150	$20.00	$3,000
Steel Sign Post (2x2 Inch Tubing)	LF	300	$15.00	$4,500
Sharrow	EA	40	$275.00	$11,000
Mobilization	LS	1	$500.00	$500
Subtotal				**$19,000**
Lump Sum Items				
Maintenance of Traffic (10%)	LS	1.00	$1,900.00	$1,900
			Subtotal	**$20,900**
			20% Contingency	$4,180
			Total Estimated Per-Mile Cost	**$25,100**

Bike Lanes				
Includes: bicycle lane markings in both directions with bicycle lane signs; no removal of existing striping				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Thermoplastic Pavement Marking Lines (4")	SF	3,520	$7.50	$26,400
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000
Sign Panel (Class I)	SF	60	$20.00	$1,200
Steel Sign Post (2x2 Inch Tubing)	LF	300	$15.00	$4,500
Mobilization	LS	1	$500.00	$500
Subtotal				**$43,600**
Lump Sum Items				
Maintenance of Traffic (10%)	LS	1.00	$4,360.00	$4,360
			Subtotal	**$47,960**
			20% Contingency	$9,592
			Total Estimated Per-Mile Cost	**$57,600**

Bike Lanes				
Includes: bicycle lane markings in both directions with bicycle lane signs; removal of existing striping				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Thermoplastic Pavement Marking Lines (4")	SF	3,520	$7.50	$26,400
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000
Sign Panel (Class I)	SF	60	$20.00	$1,200
Steel Sign Post (2x2 Inch Tubing)	LF	300	$15.00	$4,500
Removal of Pavement Marking	SF	880	$0.65	$572
Mobilization	LS	1	$500.00	$500
Subtotal				**$44,172**
Lump Sum Items				
Maintenance of Traffic (10%)	LS	1.00	$4,417.00	$4,417
			Subtotal	**$48,589**
			20% Contingency	$9,718
			Total Estimated Per-Mile Cost	**$58,400**

Bike Lanes & Sidepath				
Includes: bicycle lane markings in both direction with bicycle lane signs; widening road 5' on one side with 60' pavement overlay of existing roadway; replacementof existing sidewalk with 12' sidepath on one side				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Removal of Pavement Marking	SF	4,400	$0.65	$2,860
Reset Light Standard	EA	10	$1,500.00	$15,000
Removal of Asphalt Mat	SY	35,200	$5.00	$176,000
Removal of Curb and Gutter	LF	5,280	$8.00	$42,240
Unclassified Excavation	CY	5,867	$25.00	$146,667
Aggregate Base Course (Class 6)	CY	2,933	$50.00	$146,667
HMA	TON	5,302	$80.00	$424,147
Curb and Gutter Type 2 (Section I-B)	LF	5,280	$20.00	$105,600
Removal of Sidewalk	SY	4,693	$80.00	$375,467
Concrete Sidewalk (6")	SY	7,040	$60.00	$422,400
Thermoplastic Pavement Marking Lines (4")	SF	9,680	$7.50	$72,600
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000
Sign Panel (Class I)	SF	60	$20.00	$1,200
Steel Sign Post (2x2 Inch Tubing)	LF	300	$15.00	$4,500
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$1,949,347**
Lump Sum Items				
Maintenance of Traffic (10%)	LS	1.00	$194,935.00	$194,935
Landscaping (5%)	LS	1.00	$97,467.00	$97,467
Drainage and E&S (10%)	LS	1.00	$194,935.00	$194,935
Utility Adjustments (10%)	LS	1.00	$194,935.00	$194,935
			Subtotal	**$2,631,619**
			20% Contingency	$526,324
			Total Estimated Per-Mile Cost	**$3,158,000**

Buffered Bike Lane (2' buffer)				
Includes: buffered bicycle lane markings in both directions with bicycle lane signs; restriping for conversion of four drive lanes to three				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Removal of Pavement Marking	SF	7,920	$0.65	$5,148
Thermoplastic Pavement Marking Lines (4")	SF	12,320	$7.50	$92,400
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000
Crosswalk	EA	4	$1,000.00	$4,000
Sign Panel (Class I)	SF	60	$20.00	$1,200
Steel Sign Post (2x2 Inch Tubing)	LF	300	$15.00	$4,500
Mobilization	LS	1	$1,000.00	$1,000
Subtotal				**$119,248**
Lump Sum Items				
Maintenance of Traffic (10%)	LS	1.00	$11,925.00	$11,925
			Subtotal	**$131,173**
			20% Contingency	$26,235
			Total Estimated Per-Mile Cost	**$157,500**

Buffered Bike Lane (4' buffer)				
Includes: buffered bicycle lane markings in both directions with bicycle lane signs, restriping for outside drive lane conversion				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Thermoplastic Pavement Marking Lines (4")	SF	8,800	$7.50	$66,000
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000
Crosswalk	EA	4	$1,000.00	$4,000
Sign Panel (Class I)	SF	60	$20.00	$1,200
Steel Sign Post (2x2 Inch Tubing)	LF	300	$15.00	$4,500
Removal of Pavement Marking	SF	880	$0.65	$572
Mobilization	LS	1	$1,000.00	$1,000
Subtotal				**$88,272**
Lump Sum Items				
Maintenance of Traffic (10%)	LS	1.00	$8,827.00	$8,827
			Subtotal	**$97,099**
			20% Contingency	$19,420
			Total Estimated Per-Mile Cost	**$116,600**

Buffered Bike Lane (3' buffer)				
Includes: buffered bicycle lane markings added to existing bicycle lanes in both directions with bicycle lane signs				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Thermoplastic Pavement Marking Lines (4")	SF	8,800	$7.50	$66,000
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000
Crosswalk	EA	4	$1,000.00	$4,000
Sign Panel (Class I)	SF	60	$20.00	$1,200
Steel Sign Post (2x2 Inch Tubing)	LF	300	$15.00	$4,500
Mobilization	LS	1	$500.00	$500
Subtotal				**$87,200**
Lump Sum Items				
Maintenance of Traffic (10%)	LS	1.00	$8,720.00	$8,720
			Subtotal	**$95,920**
			20% Contingency	$19,184
			Total Estimated Per-Mile Cost	**$115,200**

Two-way Separated Bike Lane (8', Sidewalk Level)				
Includes: replacement of existing concrete sidewalk with new 8 foot separated bike lane, 5 foot sidewalk, and 3 foot landscaped buffer alongside roadway; may require some retaining walls				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Removal of Sidewalk	SY	4,693	$20.00	$93,867
Unclassified Excavation	CY	7,822	$25.00	$195,556
Aggregate Base Course (Class 6)	CY	2542	$50.00	$127,111
Masonry Landscape Wall (Dry Stack)	SF	1,584	$50.00	$79,200
Concrete Sidewalk (6")	SY	7,627	$60.00	$457,600
Thermoplastic Pavement Marking Lines (4")	SF	440	$7.50	$3,300
Thermoplastic Pavement Coloring	SF	42,240	$12.00	$506,880
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000
Sign Panel (Class I)	SF	20	$20.00	$400
Steel Sign Post (2x2 Inch Tubing)	LF	40	$15.00	$600
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$1,478,513**
Lump Sum Items				
Landscaping (5%)	LS	1.00	$73,926.00	$73,926
Drainage and E&S (10%)	LS	1.00	$147,851.00	$147,851
Maintenance of Traffic (10%)	LS	1.00	$147,851.00	$147,851
Utility Adjustments (10%)	LS	1.00	$147,851.00	$147,851
			Subtotal	**$1,995,992**
			30% Contingency	$598,798
			Total Estimated Per-Mile Cost	**$2,594,800**

Two-way Separated Bike Lane (10', Sidewalk Level)				
Includes: replacement of existing concrete sidewalk with new 10 foot separated bike lane, 5 foot sidewalk, and 3 foot landscaped buffer alongside roadway; may require some retaining walls				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Removal of Sidewalk	SY	2,933	$20.00	$58,667
Unclassified Excavation	CY	7,822	$25.00	$195,556
Masonry Landscape Wall (Dry Stack)	SF	1,584	$50.00	$79,200
Aggregate Base Course (Class 6)	CY	2933	$50.00	$146,667
Concrete Sidewalk (6")	SY	8,800	$60.00	$528,000
Thermoplastic Pavement Marking Lines (4")	SF	440	$7.50	$3,300
Thermoplastic Pavement Coloring	SF	52,800	$12.00	$633,600
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000
Sign Panel (Class I)	SF	20	$20.00	$400
Steel Sign Post (2x2 Inch Tubing)	LF	40	$15.00	$600
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$1,659,989**
Lump Sum Items				
Landscaping (5%)	LS	1.00	$82,999.00	$82,999
Drainage and E&S (10%)	LS	1.00	$165,999.00	$165,999
Maintenance of Traffic (10%)	LS	1.00	$165,999.00	$165,999
Utility Adjustments (10%)	LS	1.00	$165,999.00	$165,999
			Subtotal	**$2,240,985**
			30% Contingency	$672,295
			Total Estimated Per-Mile Cost	**$2,913,300**

Two-way Separated Bike Lane (10', Sidewalk Level)				
Includes: relocation of existing concrete sidewalk with new 10 foot separated bike lane, 6 foot sidewalk, and 3 foot landscaped buffer alongside roadway; may require some retaining walls				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Removal of Sidewalk	SY	3,520	$20.00	$70,400
Unclassified Excavation	CY	7,822	$25.00	$195,556
Masonry Landscape Wall (Dry Stack)	SF	1,584	$50.00	$79,200
Aggregate Base Course (Class 6)	CY	3129	$50.00	$156,444
Concrete Sidewalk (6")	SY	9,387	$60.00	$563,200
Thermoplastic Pavement Marking Lines (4")	SF	440	$7.50	$3,300
Thermoplastic Pavement Coloring	SF	52,800	$12.00	$633,600
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000
Sign Panel (Class I)	SF	20	$20.00	$400
Steel Sign Post (2x2 Inch Tubing)	EA	40	$15.00	$600
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$1,716,700**
Lump Sum Items				
Landscaping (5%)	LS	1.00	$85,835.00	$85,835
Drainage and E&S (10%)	LS	1.00	$171,670.00	$171,670
Maintenance of Traffic (10%)	LS	1.00	$171,670.00	$171,670
Utility Adjustments (10%)	LS	1.00	$171,670.00	$171,670
			Subtotal	**$2,317,545**
			30% Contingency	$695,264
			Total Estimated Per-Mile Cost	**$3,012,900**

Two-way Separated Bike Lane (12', Sidewalk Level)				
Includes: construction of new 12 foot separated bike lane with road widening				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Unclassified Excavation	CY	4,693	$25.00	$117,333
Aggregate Base Course (Class 6)	CY	2347	$50.00	$117,333
Concrete Sidewalk (6")	SY	7,040	$60.00	$422,400
Thermoplastic Pavement Marking Lines (4")	SF	880	$7.50	$6,600
Thermoplastic Pavement Coloring	SF	960	$12.00	$11,520
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000
Sign Panel (Class I)	SF	30	$20.00	$600
Steel Sign Post (2x2 Inch Tubing)	EA	70	$15.00	$1,050
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$690,837**
Lump Sum Items				
Landscaping (5%)	LS	1.00	$34,542.00	$34,542
Drainage and E&S (10%)	LS	1.00	$69,084.00	$69,084
Maintenance of Traffic (10%)	LS	1.00	$69,084.00	$69,084
Utility Adjustments (10%)	LS	1.00	$69,084.00	$69,084
			Subtotal	**$932,631**
			30% Contingency	$279,789
			Total Estimated Per-Mile Cost	**$1,212,500**

One-way Protected Bike Lanes (8', Sidewalk Level)				
Includes: construction of new 8 foot separated bike lanes on both sides of the street with road widening				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Unclassified Excavation	CY	7,822	$25.00	$195,556
Aggregate Base Course (Class 6)	CY	3129	$50.00	$156,444
Concrete Sidewalk (6")	SY	9,387	$60.00	$563,200
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000
Thermoplastic Pavement Coloring	SF	1,280	$12.00	$15,360
Sign Panel (Class I)	SF	30	$20.00	$600
Steel Sign Post (2x2 Inch Tubing)	EA	70	$15.00	$1,050
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$946,210**
Lump Sum Items				
Landscaping (5%)	LS	1.00	$47,311.00	$47,311
Drainage and E&S (10%)	LS	1.00	$94,621.00	$94,621
Maintenance of Traffic (10%)	LS	1.00	$94,621.00	$94,621
Utility Adjustments (10%)	LS	1.00	$94,621.00	$94,621
			Subtotal	**$1,277,384**
			30% Contingency	$383,215
			Total Estimated Per-Mile Cost	**$1,660,600**

One-Way Separated Bike Lanes (7' & 4' Buffer, Street Level)				
Includes: buffered bicycle lane markings in both directions with bicycle lane signs, restriping for outside drive lane conversion, installation of bollards within buffer space				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Thermoplastic Pavement Marking Lines (4")	SF	8,800	$7.50	$66,000
Thermoplastic Pavement Marking Symbol	EA	40	$275.00	$11,000
Crosswalk	EA	4	$1,000.00	$4,000
Sign Panel (Class I)	SF	60	$20.00	$1,200
Steel Sign Post (2x2 Inch Tubing)	LF	300	$15.00	$4,500
Bollard	EA	528	$750.00	$396,000
Removal of Pavement Marking	SF	880	$0.65	$572
Mobilization	LS	1	$1,000.00	$1,000
Subtotal				**$484,272**
Lump Sum Items				
Maintenance of Traffic (10%)	LS	1.00	$48,427.00	$48,427
			Subtotal	**$532,699**
			20% Contingency	$106,540
			Total Estimated Per-Mile Cost	**$639,300**

Sidepath				
Includes: replace existing concrete sidewalk with new 10 foot sidepath along both sides of the street				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Removal of Sidewalk	SY	9,387	$80.00	$750,933
Unclassified Excavation	CY	7,822	$25.00	$195,556
Aggregate Base Course	CY	3,911	$50.00	$195,556
Masonry Landscape Wall (Dry Stack)	SF	1,584	$50.00	$79,200
Concrete Sidewalk (6")	SY	11,733	$60.00	$704,000
Thermoplastic Pavement Marking Lines (4")	SF	880	$7.50	$6,600
Sign Panel (Class I)	SF	30	$20.00	$600
Steel Sign Post (2x2 Inch Tubing)	LF	70	$15.00	$1,050
Topsoil	CY	782	$15.00	$11,733
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$1,948,228**
Lump Sum Items				
Landscaping (5%)	LS	1.00	$97,411.00	$97,411
Drainage and E&S (10%)	LS	1.00	$194,823.00	$194,823
Maintenance of Traffic (10%)	LS	1.00	$194,823.00	$194,823
Utility Adjustments (10%)	LS	1.00	$194,823.00	$194,823
			Subtotal	**$2,630,108**
			30% Contingency	$789,032
			Total Estimated Per-Mile Cost	**$3,419,200**

Sidepath				
Includes: replaceme existing concrete sidewalk with new 12 foot sidepath along one side of the street				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Removal of Sidewalk	SY	4,693	$80.00	$375,467
Unclassified Excavation	CY	4,693	$25.00	$117,333
Aggregate Base Course	CY	2,347	$50.00	$117,333
Masonry Landscape Wall (Dry Stack)	SF	1,584	$50.00	$79,200
Concrete Sidewalk (6")	SY	7,040	$60.00	$422,400
Thermoplastic Pavement Marking Lines (4")	SF	440	$7.50	$3,300
Sign Panel (Class I)	SF	20	$20.00	$400
Steel Sign Post (2x2 Inch Tubing)	EA	40	$15.00	$600
Topsoil	CY	391	$15.00	$5,867
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$1,124,900**
Lump Sum Items				
Landscaping (5%)	LS	1.00	$56,245.00	$56,245
Drainage and E&S (10%)	LS	1.00	$112,490.00	$112,490
Maintenance of Traffic (10%)	LS	1.00	$112,490.00	$112,490
Utility Adjustments (10%)	LS	1.00	$112,490.00	$112,490
			Subtotal	**$1,518,615**
			30% Contingency	$455,585
			Total Estimated Per-Mile Cost	**$1,974,200**

Trail				
Includes: construct new 12 foot concrete trail and signage				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Unclassified Excavation	CY	6,258	$25.00	$156,444
Concrete Sidewalk (6")	SY	3,520	$60.00	$211,200
Aggregate Base Course for Pavement	TON	2,382	$50.00	$119,098
Sign Panel (Class I)	SF	30	$20.00	$600
Steel Sign Post (2x2 Inch Tubing)	EA	300	$15.00	$4,500
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$494,842**
Lump Sum Items				
Maintenance of Traffic (2%)	LS	1.00	$9,897.00	$9,897
Drainage and E&S (10%)	LS	1.00	$49,484.00	$49,484
			Subtotal	**$554,223**
			20% Contingency	$110,845
			Total Estimated Per-Mile Cost	**$665,100**

Sidepath				
Includes: replaceme existing concrete sidewalk with new 12 foot sidepath along both sides of the street				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Removal of Sidewalk	SY	9,387	$80.00	$750,933
Unclassified Excavation	CY	9,387	$25.00	$234,667
Aggregate Base Course	CY	4,693	$50.00	$234,667
Masonry Landscape Wall (Dry Stack)	SF	1,584	$50.00	$79,200
Concrete Sidewalk (6")	SY	14,080	$60.00	$844,800
Thermoplastic Pavement Marking Lines (4")	SF	880	$7.50	$6,600
Sign Panel (Class I)	SF	30	$20.00	$600
Steel Sign Post (2x2 Inch Tubing)	LF	70	$15.00	$1,050
Topsoil	CY	782	$15.00	$11,733
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$2,167,250**
Lump Sum Items				
Landscaping (5%)	LS	1.00	$108,363.00	$108,363
Drainage and E&S (10%)	LS	1.00	$216,725.00	$216,725
Maintenance of Traffic (10%)	LS	1.00	$216,725.00	$216,725
Utility Adjustments (10%)	LS	1.00	$216,725.00	$216,725
			Subtotal	**$2,925,788**
			30% Contingency	$877,736
			Total Estimated Per-Mile Cost	**$3,803,600**

Sidepath				
Includes: replace existing concrete sidewalk with new 14 foot sidepath along one side of the street				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Removal of Sidewalk	SY	4,693	$80.00	$375,467
Unclassified Excavation	CY	5,476	$25.00	$136,889
Aggregate Base Course	CY	2,738	$50.00	$136,889
Masonry Landscape Wall (Dry Stack)	SF	1,584	$50.00	$79,200
Concrete Sidewalk (6")	SY	8,213	$60.00	$492,800
Thermoplastic Pavement Marking Lines (4")	SF	440	$7.50	$3,300
Sign Panel (Class I)	SF	20	$20.00	$400
Steel Sign Post (2x2 Inch Tubing)	EA	40	$15.00	$600
Topsoil	CY	391	$15.00	$5,867
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$1,234,411**
Lump Sum Items				
Landscaping (5%)	LS	1.00	$61,721.00	$61,721
Drainage and E&S (10%)	LS	1.00	$123,441.00	$123,441
Maintenance of Traffic (10%)	LS	1.00	$123,441.00	$123,441
Utility Adjustments (10%)	LS	1.00	$123,441.00	$123,441
			Subtotal	**$1,666,455**
			30% Contingency	$499,937
			Total Estimated Per-Mile Cost	**$2,166,400**

Sidepath				
Includes: replace existing paved shoulder & sidewalk with new 12 foot sidepath along one side of the street				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Removal of Sidewalk	SY	4,693	$80.00	$375,467
Removal of Asphalt Mat	SY	4,693	$5.00	$23,467
Removal of Curb & Gutter	LF	5,280	$8.00	$42,240
Unclassified Excavation	CY	6,258	$25.00	$156,444
Curb & Gutter Type 2 (Section I-B)	LF	5,280	$20.00	$105,600
Aggregate Base Course	CY	2,347	$50.00	$117,333
Masonry Landscape Wall (Dry Stack)	SF	1,584	$50.00	$79,200
Concrete Sidewalk (6")	SY	7,040	$60.00	$422,400
Thermoplastic Pavement Marking Lines (4")	SF	440	$7.50	$3,300
Sign Panel (Class I)	SF	20	$20.00	$400
Steel Sign Post (2x2 Inch Tubing)	EA	40	$15.00	$600
Topsoil	CY	391	$15.00	$5,867
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$1,335,318**
Lump Sum Items				
Landscaping (5%)	LS	1.00	$66,766.00	$66,766
Drainage and E&S (10%)	LS	1.00	$133,532.00	$133,532
Maintenance of Traffic (10%)	LS	1.00	$133,532.00	$133,532
Utility Adjustments (10%)	LS	1.00	$133,532.00	$133,532
			Subtotal	**$1,802,680**
			30% Contingency	$540,804
			Total Estimated Per-Mile Cost	**$2,343,500**

Trail				
Includes: construct new 12 foot concrete trail and signage				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Unclassified Excavation	CY	6,258	$25.00	$156,444
Concrete Sidewalk (6")	SY	3,520	$60.00	$211,200
Aggregate Base Course for Pavement	TON	2,382	$50.00	$119,098
Sign Panel (Class I)	SF	30	$20.00	$600
Steel Sign Post (2x2 Inch Tubing)	EA	300	$15.00	$4,500
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$494,842**
Lump Sum Items				
Maintenance of Traffic (2%)	LS	1.00	$9,897.00	$9,897
Drainage and E&S (10%)	LS	1.00	$49,484.00	$49,484
			Subtotal	**$554,223**
			20% Contingency	$110,845
			Total Estimated Per-Mile Cost	**$665,100**

Trail				
Includes: replace existing asphalt trail with new 12 foot concrete trail and signage				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Removal of Asphalt Mat	SY	4,693	$7.00	$32,853
Unclassified Excavation	CY	6,258	$25.00	$156,444
Concrete Sidewalk (6")	SY	3,520	$60.00	$211,200
Aggregate Base Course for Pavement	TON	2,382	$50.00	$119,098
Sign Panel (Class I)	SF	30	$20.00	$600
Steel Sign Post (2x2 Inch Tubing)	EA	300	$15.00	$4,500
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$527,696**
Lump Sum Items				
Maintenance of Traffic (2%)	LS	1.00	$10,554.00	$10,554
Drainage and E&S (10%)	LS	1.00	$52,770.00	$52,770
			Subtotal	**$591,020**
			20% Contingency	$118,204
			Total Estimated Per-Mile Cost	**$709,300**

Trail				
Includes: replace existing concrete trail with new 12 foot concrete trail and signage				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Removal of Sidewalk	SY	4,693	$80.00	$375,467
Unclassified Excavation	CY	6,258	$25.00	$156,444
Concrete Sidewalk (6")	SY	3,520	$60.00	$211,200
Aggregate Base Course for Pavement	TON	2,382	$50.00	$119,098
Sign Panel (Class I)	SF	30	$20.00	$600
Steel Sign Post (2x2 Inch Tubing)	EA	300	$15.00	$4,500
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$870,309**
Lump Sum Items				
Maintenance of Traffic (2%)	LS	1.00	$17,406.00	$17,406
Drainage and E&S (10%)	LS	1.00	$87,031.00	$87,031
			Subtotal	**$974,746**
			20% Contingency	$194,949
			Total Estimated Per-Mile Cost	**$1,169,700**

Major Intersection Improvements (On-street Facility)				
Includes: install high visibility crosswalks, colored pavement markings, additional warning signage, bicycle signals, and bicycle loop detectors				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Crosswalk	EA	2	$1,000.00	$2,000
Thermoplastic Pavement Marking Lines (6")	SF	60	$7.50	$450
Thermoplastic Pavement Coloring	SF	960	$12.00	$11,520
Sign Panel (Class I)	SF	12	$20.00	$240
Steel Sign Post (2x2 Inch Tubing)	LF	28	$15.00	$420
Bike Signal Head	EA	2	$1,000.00	$2,000
Bicycle Loop Detection	EA	2	$7,000.00	$14,000
Mobilization	LS	1	$500.00	$500
Subtotal				**$31,130**
Lump Sum Items				
Landscaping (5%)	LS	1.00	$1,557.00	$1,557
Drainage and E&S (10%)	LS	1.00	$3,113.00	$3,113
Maintenance of Traffic (10%)	LS	1.00	$3,113.00	$3,113
Utility Adjustments (5%)	LS	1.00	$1,557.00	$1,557
			Subtotal	**$40,470**
			20% Contingency	$8,094
			Total Estimated Per-Mile Cost	**$48,600**

Major Intersection Improvements (Sidewalk-level Facility)				
Includes: install high visibility crosswalks, colored pavement markings, wide curb ramps, additional warning signage, bicycle signals, and bicycle loop detectors				
Item	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**
Crosswalk	EA	2	$1,000.00	$2,000
Thermoplastic Pavement Marking Lines (6")	SF	60	$7.50	$450
Thermoplastic Pavement Coloring	SF	960	$12.00	$11,520
Sign Panel (Class I)	SF	12	$20.00	$240
Steel Sign Post (2x2 Inch Tubing)	LF	28	$15.00	$420
Bike Signal Head	EA	2	$1,000.00	$2,000
Concrete Curb Ramp	SF	71	$150.00	$10,667
Mobilization	LS	1	$1,000.00	$1,000
Clearing & Grubbing	LS	1	$2,000.00	$2,000
Subtotal				**$30,297**
Lump Sum Items				
Landscaping (5%)	LS	1.00	$1,515.00	$1,515
Drainage and E&S (10%)	LS	1.00	$3,030.00	$3,030
Maintenance of Traffic (10%)	LS	1.00	$3,030.00	$3,030
Utility Adjustments (5%)	LS	1.00	$1,515.00	$1,515
			Subtotal	**$39,387**
			20% Contingency	$7,877
			Total Estimated Per-Mile Cost	**$47,300**

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