WASATCH FRONT REGIONAL COUNCIL

Clearfield City
we've got it made

The City of Clinton
Established 1896

Sunset City
Utah

Syracuse
Est City 1935

West Point
Utah

North Davis County Active Transportation Implementation Plan

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1. Introduction

The communities of Clearfield, Clinton, Sunset, Syracuse, and West Point have come together in a regional effort to make bicycling, walking, and other forms of active transportation safer and easier for their region's residents. Collectively, the communities of North Davis County are in an exciting position from which to enhance active transportation:

- Public enthusiasm is high for better and safer opportunities for residents to travel and recreate using active modes;
- Significant destinations such as Antelope Island attract cyclists from within and beyond North Davis County;
- Existing high-quality regional active transportation facilities, like the Denver-Rio Grande-Western Trail (D&RGW), provide an excellent starting point for a backbone network for long-distance active travel;
- The developing western portions of Clinton, Syracuse, and West Point present opportunities for active transportation connections to be built alongside residential and other development; and
- Regional transportation facilities, such as FrontRunner and the West Davis Corridor, create opportunities for complementary active travel facilities.

This plan provides a framework for the five North Davis communities to develop a coordinated and integrated network of bicycle and pedestrian connections that make biking, walking, and other forms of active transportation easy, convenient, comfortable, family-friendly, and safe.

The rest of this plan document is organized into six chapters:

Chapter 1: Introduction provides an overview of the North Davis Active Transportation Implementation Plan and its key recommendations.

Chapter 2: Existing Conditions establishes a baseline for understanding facilities and planned improvements for active transportation in North Davis County today.

Chapter 3: Plan Goals and Outreach describes efforts in this planning process to engage residents and other members of the five participating communities in understanding active transportation needs, as well as the goals and objectives that guide the plan.

Chapter 4: Recommended Facilities presents a set of recommended active transportation investments to connect within and between the North Davis communities. This list of recommendations includes proposed routes, facility types, and prioritization for the study area as a whole as well as individual communities.

Chapter 5: Conceptual Designs lays out concept-level designs for the highest-priority facilities identified in Chapter 4, emphasizing segments of these routes where more constrained conditions exist. In addition, this chapter also provides a set of design standards appropriate for North Davis County communities to use in designing and implementing new facilities.

Chapter 6: Implementation gives the North Davis communities a set of actionable items for implementing the Plan's recommendations. This section includes cost estimates for each facility, potential funding sources available in Utah and their suitability for implementing recommended facilities, and best practices for wayfinding and facility maintenance.

In addition, two appendices provide additional information to assist communities in implementing the Plan's recommendations.

Appendix A: Design Guidelines provides general design guidance regarding best practices for various active transportation facilities, wayfinding systems, and maintenance.

Appendix B: Projects by Community shows phased mapping of proposed projects for each individual community, as well as implementation cost estimates for individual cities to undertake each project.

2. Existing Conditions

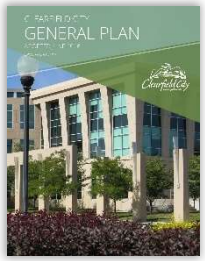
Overview

The communities of Clearfield, Clinton, Sunset, Syracuse, and West Point, have already made significant investments in developing active transportation facilities that provide high-quality trail connections for recreation and long-distance active travel, as well as the beginnings of a backbone network of bike facilities. In addition, these five communities have also included various goals and action items related to active transportation in various general plans, small area plans, and other plans and studies.

In order to understand existing facilities, plans, and usage of active transportation facilities in North Davis County, the project team reviewed relevant existing plans, met with stakeholders, and collected data on existing and planned active transportation facilities throughout the study area.

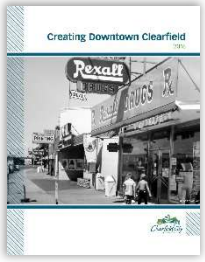
Existing Plans

From the beginning of the creation of the North Davis County Active Transportation Implementation Plan, the project team reviewed and evaluated existing plans to establish a baseline of understanding on which to build this plan.



Clearfield City General Plan (2017)

The Clearfield City General Plan, updated in 2017, serves as a living document to help guide change and growth in the City. Its intent is to enable a straightforward, fair, efficient, and consistent planning process. The plan also outlines active transportation recommendations and forward-looking elements for the City, providing further guidance on downtown Clearfield with the Downtown Design Guidelines. These guidelines include bike lanes on all street alignments with appropriate traffic calming actions and driveway consolidation to increase safety and comfort for all users. The guidelines also include wider-than-standard sidewalks on all downtown streets with consistent lighting, seating, street trees, and other pedestrian-oriented street furniture as appropriate. Furthermore, walking and biking paths should connect open spaces, plazas, and city parks.



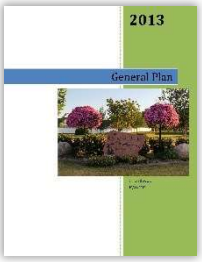
Creating Downtown Clearfield (2016)

The Creating Downtown Clearfield plan provides a framework for a strong downtown to connect districts and destinations via a "string of pearls"[1] approach to its transportation network.

The plan summarizes active transportation recommendations and forward-looking elements for downtown, including pedestrian crossings, traffic calming and safety,

[1] Creating Downtown Clearfield, 2016, pg. 4.

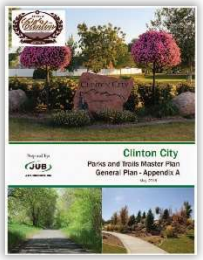
bicycle infrastructure, walking experience, and public transportation. Enhancements to pedestrian crossings include adding a rectangular rapid flashing beacon (RRFB) and crosswalk across Main Street and retiming of traffic lights to give pedestrians more time to cross the street. Clearfield also plans to heighten the downtown walking experience by investing in landscaping treatments along SR-126, developing a unique but consistent lighting identity throughout downtown, and widening sidewalks beyond the standard widths on streets where the right-of-way is 100 feet. In addition, the plan recommends increasing bus stop accessibility by those taking active transportation. Traffic calming and safety enhancements include limiting and consolidating vehicle driveways along SR-126 while encouraging side and rear accesses. Bicycle infrastructure improvements include adding dedicated bike lanes along SR-126 from the Clearfield FrontRunner station to 650 North, using paint- or planter-based right turn pockets. The plan notes that in order to implement many of these recommendations successfully, Clearfield must work collaboratively with UDOT in the design of cross-sections for SR-126 that improve/increase safety for all modes of transportation.



Clinton City General Plan (2013)

The Clinton City General Plan was prepared by the Clinton City Community Development Department and the General Plan Advisory Committee in 2013 to manage change and growth in the city. The plan's transportation goals include supporting and improving residential access to local destinations via connected public streets, trail systems, and bike networks, as well as working with UTA to increase and enhance public transit service in the city.

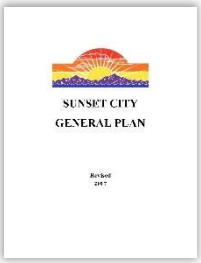
The active transportation elements include recreation components beginning with heavily landscaped residential and commercial streetscapes that add to the unique character of Clinton and provide convenient access to parks, trails, walking and bike paths. The plan recognizes the potential for improving and enhancing the active transportation network along 1800 North from the Falcon Hill development located southeastward in Clearfield. This plan provides the foundation for active transportation facilities that include a cohesive network of trails, and the potential for connecting these trails to existing or future active transportation elements in nearby cities, thereby developing a broad regional active transportation network providing simple connections and easy access for residents.



Clinton City Parks and Trails Plan (2018)

The Clinton City Parks and Trails Plan provides an assessment of the City's parks and trails resources, accessibility to residents, and future needs. It sets out goals and defines a desired level of service for the City's parks, recreation, trails, and open space needs. Based on this assessment, the Plan recommends locations for new

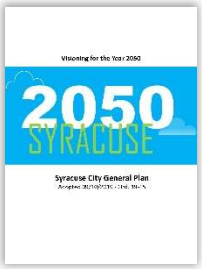
parks and trails as well as other capital investments in recreational amenities. Two proposed community trails proposed in this Plan are an extension of the Canal Trail at approximately 2050 North west towards Roy and West Point, and an extension of the Powerline Park trail along 2000 West to the south towards West Point.



Sunset City General Plan (2017)

The Sunset City General Plan was prepared by the Sunset City Planning Commission in 2017 to guide present and future decision-making as well as managing growth in a manner consistent with the City's vision. The plan is organized into sections that give background information on the City and its residents, with specific elements that include land use, transportation, economic development, parks and recreation, and community facilities/services.

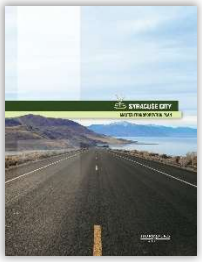
The City's overarching transportation goals are to create and maintain a walkable environment as well as maintain a comprehensive master transportation plan. For active transportation, the plan states that Sunset City is relatively walkable and makes recommendations for enhancing and improving the current network. These recommendations include the development of new or continuance of existing plans (Bicycles and Pedestrian Trails Plan, a Commuter Rail Corridor Beautification Program, a transit plan, Safe Routes to School), adding walkability requirements to all business and development applications, increase separated pedestrian facilities that connect commercial and open space destinations, and increase the walkability of Main Street through design standards and sidewalk improvements.



2050 Syracuse - Syracuse City General Plan (2019)

Compiled by the Planning Commission and City staff in 2019, the 2050 Syracuse - Syracuse City General Plan gives residents, stakeholders, and city officials direction and guidance on achieving the City's overall vision between now and 2050 - to maintain their way of life while also embracing growth in a strategic way.

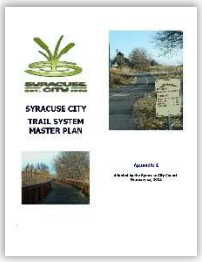
The plan summarizes current active transportation infrastructure in the City and lists action items for transportation overall. The non-automobile transportation action items include working with UTA and UDOT to extend transit service to the West Davis Corridor interchanges, acquire right-of-way (ROW) and secure easements for the Shoreline Trail, encourage pedestrian safety infrastructure and trail connectivity in each commercial development plan, and look for opportunities to add active transportation infrastructure between downtown Syracuse and the Antelope Island State Park (AISP) Causeway.



Syracuse City Master Transportation Plan (2015)

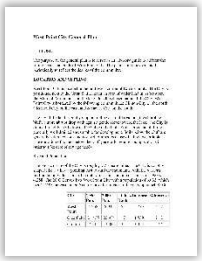
In 2015, Syracuse City developed a master transportation plan to help manage the significant growth and change the area is experiencing as well as helping the City in planning and maintaining the overall transportation network from the present day through 2040.

The plan includes a chapter on alternative modes of transportation, including transit and active transportation. The plan's cross-sections show standard four-foot-wide sidewalks separated from the roadway by park strips of widths between three- to eleven-feet. A map of the current and existing bicycle paths from the Wasatch Front Regional Council Wasatch Front Regional Council Regional Transportation Plan (RTP) is also included.



Syracuse Trails Master Plan (2012)

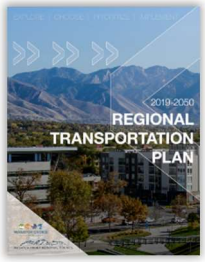
The Syracuse Trails Master Plan was adopted in 2012 to improve and enhance the current trail network in the City. The plan's vision is to improve quality of life through placemaking, outdoor recreation, open space, and community character to encourage healthy lifestyles and spur economic development. This plan serves as a long-term guide to managing current and future trail projects from planning through implementation to connect residents to key destinations both in the City as well as the greater region. The goals of the plan are to expand and enhance the current trail system, maintain the trail network continuity, and to identify resources that enhance current trails and support future expansions to the trail network in accordance with residents' needs.



West Point General Plan (2017)

The West Point City General Plan serves as a framework to address the City's growth and subsequent future needs and goals. Developed by the City in 2017, this plan includes a list of actionable items through a series of goals and policies.

The plan makes active transportation recommendations throughout West Point. A major recommendation is taking advantage of the City's natural drainages and canals to build a trail system that connects neighborhoods and residents to popular destinations and activity centers. In addition, creating walking paths simultaneously with neighborhood development that either includes bicycle routes or are next to bicycle routes. Furthermore, the plan recommends designating some (total number unspecified) non-arterial streets as bicycle routes where the road width is suitable for bike lane striping.



Wasatch Front Regional Council Regional Transportation Plan (RTP)

The RTP is the regional transportation planning vision created by WFRC with direct input from the cities. Updated every four years, this plan is intended to set forth a strategy of regional transportation investments for vehicle, transit, and active transportation modes according to the collective vision of increasing the quality of life in the region. The plan details investment recommendations in order to achieve the plan in a phased approach (Phase 1:2019 – 2030, Phase 2: 2031 – 2040, Phase 3: 2041 – 2050).

The RTP calls for 28 new active transportation facilities—roughly 50 new miles—within these five communities, with 33 miles of facilities recommended in Phase 1, nine miles recommended in Phase 2, and eight miles recommended in Phase 3. In addition to the active transportation facilities, the RTP also indicates "Regionally Significant Land-Uses." These areas include commercial centers, neighborhood centers, and city centers.

Stakeholder Meetings

Meetings took place with major stakeholders including Utah Transit Authority (UTA), the Military Installation Development Authority (MIDA), Davis School District, Freeport Center Associates, and the Utah Department of Transportation (UDOT) to gather information, review upcoming planned active transportation projects, and locate places where active transportation challenges exist and how to address them. Feedback summaries for these agencies are provided below.

Utah Transit Authority (UTA)

UTA's priorities include ensuring Congestion Mitigation and Air Quality (CMAQ) grant funding from the state is in place for new trail connections from the Clearfield FrontRunner station to Antelope Drive and 700 South. A pedestrian bridge connection between the Clearfield FrontRunner station and the Freeport Center was previously planned, but due to new industrial development in the Freeport Center that obstructs the previously contemplated alignment, this option has been deprioritized. Their priorities looking forward include maximizing connections to the D&RGW Rail Trail for north-south connectivity and connecting to new development activity along State Street. Due to the width and volume of traffic carried on State Street, safe crossing facilities (including conventional signalized intersections as well as HAWK, high intensity activated crosswalk, signals) are a priority for connectivity.

Military Installation Development Authority (MIDA)

Due to the large and growing employment center on MIDA land between Hill Air Force Base (AFB) and I-15 and associated challenges serving primarily auto commuters, MIDA is increasingly looking to transportation alternatives, including active transportation and transit service to provide additional options for its workforce. MIDA has a strong interest in preserving the right-of-way for shared-use trails, and potential future transit

service, extending north and south from the MIDA property adjacent to Hill AFB on the existing rail corridors. MIDA also wants to see enhanced bike connections on M Street (east side of 650 North).

Davis School District

Davis School District's priorities included addressing connectivity gaps and deficiencies around elementary and junior high schools within the study area. School-level Safe Routing Plans were requested from the District reflecting known safety issues for students walking, biking, or taking other modes to reach their schools. The issue of key sidewalk connections to/through new developments is either not required and/or missed during development review, resulting in approved projects with gaps that create safety issues and, at times, necessitate bussing.

Freeport Center Associates

Freeport Center Associates operates the majority of the large manufacturing and distribution center located in Clearfield, which is a major regional employment center. The Freeport Center property management team has expressed interest in enhancing connections to FrontRunner, whether by means of a pedestrian bridge over the adjacent rail corridor, trail connections via adjacent arterial roadways, and/or private shuttle service between the Freeport Center and FrontRunner station.

Utah Department of Transportation (UDOT)

The project team coordinated with UDOT staff, including the Region 1 Planner and the Active Transportation Manager, in order to understand contemplated projects as well as potential concerns and challenges in expanding active transportation in North Davis County. Priorities include

- Expansion of automated counters on major active transportation corridors to provide usage data
- Providing safer facilities where feasible on well-used existing routes such as antelope drive
- Identifying suitable parallel routes for active transportation in cases where UDOT facilities are inappropriate or do not have an adequate right-of-way for dedicated bike and/or pedestrian facilities

Existing Infrastructure

Clearfield, Clinton, Syracuse, Sunset, and West Point all have existing active transportation infrastructure. An overview of typical bicycle and pedestrian facility types is included below with definitions and local examples.

Figure 1: Buffered Bike Lane with protective bollards in Seattle.

Figure 2: Bike lane in the study area.

Figure 3: Shared lane markings ("sharrows") in Salt Lake City.

Bicycle and Pedestrian Infrastructure Facility Types

This section provides an overview of the existing bicycling and pedestrian facility types in the study area.

Buffered Bike Lanes

Like bike lanes, buffered bike lanes use signage and striping to delineate the right-of-way assigned to bicyclists and motorists. The difference between a standard and a buffered bike lane is that the latter is separated from adjacent vehicles by a one- to three-foot-wide striped zone between the adjacent travel lane, parking lane, or both.

There are currently no buffered bike lanes in the project area. However, the Downtown Clearfield Form-based Code proposes buffered bike lanes along SR-126 from 300 North southwards, and buffered bike lanes are proposed by the WFRC RTP in two locations:

- 2000 West from the Weber County Line to 300 North in Clinton/West Point (may be implemented as shared use path)
- 2000 West from Antelope Drive to 2700 South in Syracuse

Bike Lanes

This type of bikeway uses signage and striping to delineate the right-of-way assigned to bicyclists and distinguish it from vehicular travel and parking lanes. Bike lanes encourage predictable movements by both bicyclists and motorists. Standard bike lanes exist in North Davis County on portions of Antelope Drive and 2000 West among other locations.

Shared Roadways

Shared roadways are designated bicycle routes where bicyclists and cars operate within the same travel lane, either side by side or in single file depending on roadway configuration. These facilities may be marked with wayfinding signage and/or shared lane markings ('sharrows'). This facility is used to connect other, more protected types of bikeways (usually bike lanes) or designate preferred routes through corridors with low traffic speeds and volumes and/or insufficient right-

Figure 4: Sidewalk

Figure 5: People walking on the Denver and Rio Grande Western Rail Trail

Figure 6: Trail sign for the Denver and Rio Grande Western Rail Trail.

of-way for more delineated bicycle facilities. An example of a shared roadway in the area includes 3200 West from the Great Salt Lake Shoreline Trail to the Great Salt Lake Shorelands Preserve.

Sidewalk

Sidewalks are paved footpaths, commonly found adjacent to streets or roads. Sidewalks are commonly found adjacent to roads separated by a buffer of some sort (park strips). In the traditional block-grid sections of North Davis County, sidewalk connectivity is generally good. However, some neighborhood pockets lack adequate sidewalk infrastructure, are missing all sidewalks, or have significant gaps in the sidewalk network. In addition, some commercial and industrial areas have also been developed without complete sidewalk networks.

Shared Use Paths and Trails

Shared use paths and trails are established walking and bicycling paths, typically paved and at least 10' wide, that provide connections along current or former rail and utility corridors, as well as in rights-of-way parallel to but separated from major roadways. These paths and trails typically provide cyclists and pedestrians with the highest level of separation from vehicle traffic. Some major trails in the area include:

- **Denver and Rio Grande Western (D&RGW) Rail Trail**, a 24-mile paved trail running through Davis and Weber Counties.
- **Old Emigration Trail**, a 7-mile paved greenway trail running from 1000 West 3700 South in Syracuse to 1300 North 4100 West in West Point
- **2050 North Trail** and **Clinton City Park Trail**, a 1.5-mile paved trail running east-west through central Clinton
- **Clearfield Canal Trail**, a 3-mile paved trail running alongside the Clearfield Canal.

Park Paths

Park paths refer to paths within parks or open space areas. These facilities may or may not be designed to accommodate bicyclists.

Crossings

Bicycle and pedestrian crossings are an important tool for connecting sidewalks, paths, and trails that must cross wide or high-volume roadways. These crossings are demarcated by markings, paving materials, signs, and other traffic control devices to guide pedestrians

Figure 7: HAWK Crossing in Clearfield

Figure 8: RRFB Crossing with in Salt Lake City, Utah

and cyclists to safe crossing locations and alert motorists that active transportation users may be present.

Painted Crosswalks: These crossings are marked with a painted pattern on the street to clearly indicate where pedestrians may cross.

For long crossing distances on wide roads, adding a pedestrian refuge island improves safety by providing pedestrians a place to stop and wait for the next crosswalk cycle, and reduces the amount of time a pedestrian is exposed in the roadway.

High-Intensity Activated Crosswalk (HAWK) beacon: Sometimes referred to as Pedestrian Hybrid Beacons (PHB), HAWKs have both a traffic control signal as well as a flashing beacon to stop motorists and provide an array of cues that pedestrians or cyclists are crossing in the roadway.

Rectangular Rapid-Flashing Beacons (RRFB): Yellow warning signs with pedestrian-activated devices that flash to alert motorists when pedestrians are crossing the road.

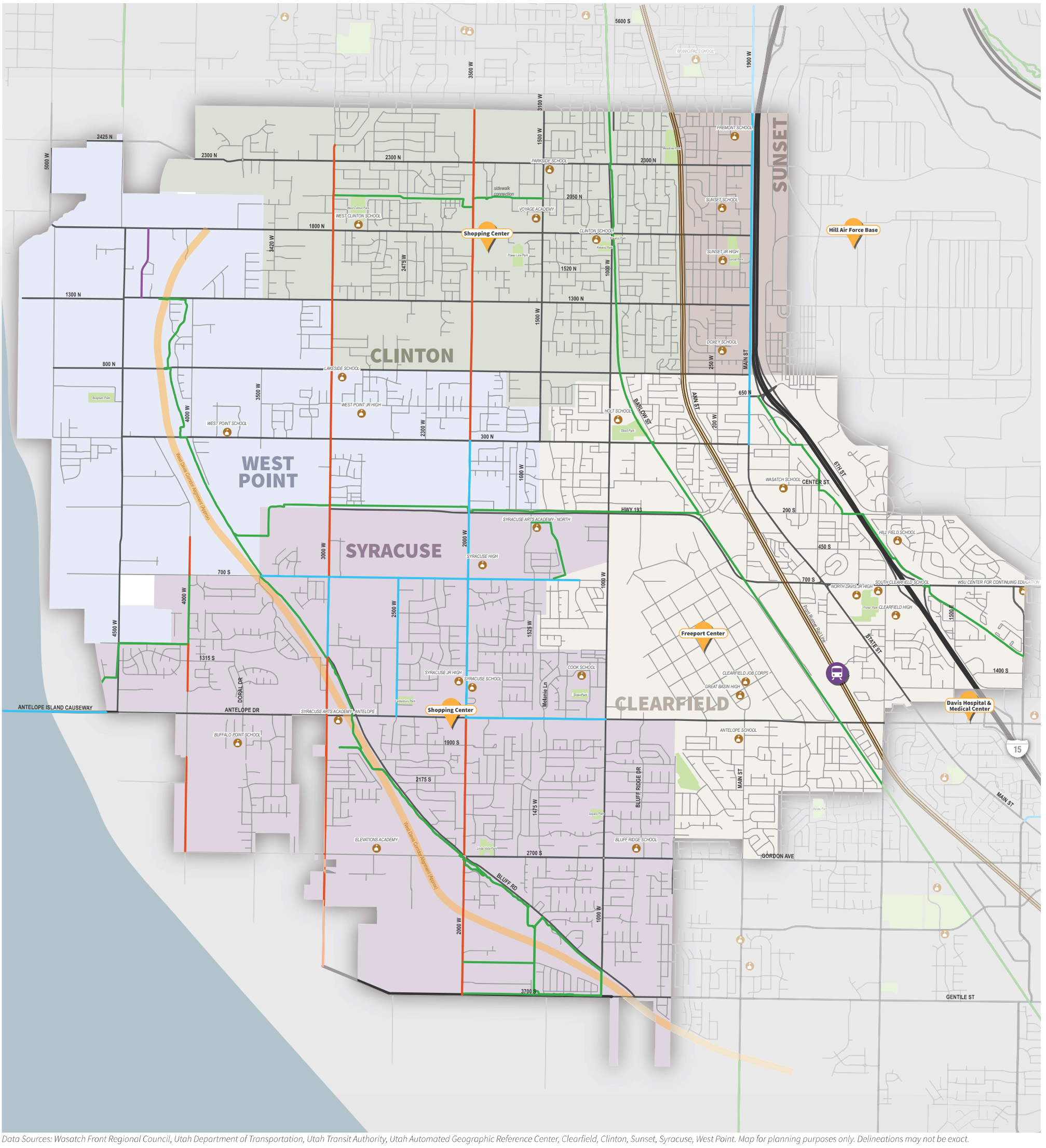
A map of existing active transportation facilities in the study area is provided on the following page.

North Davis

Existing Active Transportation Infrastructure

LEGEND

- Shared roadway
- Bike lane
- Buffered bike lane
- Multi-use trail
- FrontRunner railroad
- Park
- School
- FrontRunner station



Data Sources: Wasatch Front Regional Council, Utah Department of Transportation, Utah Transit Authority, Utah Automated Geographic Reference Center, Clearfield, Clinton, Sunset, Syracuse, West Point. Map for planning purposes only. Delineations may not be exact.

Transit Infrastructure and Active Transportation Connections to Transit

Transit trips always begin and end on foot or bicycle. When active transportation connectivity to transit is poor, ridership and ease of use of the system are also negatively affected. The study area is served by seven UTA bus fixed routes, flex service, or shuttle service, and one commuter rail (FrontRunner) line. It should be noted that during the preparation of this Plan, the COVID-19 pandemic resulted in temporary reductions in frequency and/or suspensions of service on many UTA routes as well as substantial reductions in UTA ridership.

Table 1. Existing Transit Service in the Study Area (Fall 2019)

LINE #	LINE NAME	FREQUENCY	COUNTIES SERVED	AVG DAILY BOARDINGS (AUG 2019)
BUS				
456	Ogden / Unisys / Rocky Mtn. Express	Two trips	Weber, Davis, Salt Lake	28
470	Ogden - Salt Lake Intercity	30 minutes	Weber, Davis, Salt Lake	2972
472	Ogden - Salt Lake Express	30 peak	Weber, Davis, Salt Lake	351
626	West Roy	60 peak	Weber, Davis	262
627	Clearfield Station / DATC	60 peak	Davis	372
628	Midtown Trolley		Davis	524
640	Layton Hills Mall / WSU Ogden Camp	30 minutes	Weber, Davis	812
RAIL				
750	FrontRunner	30 minutes	Utah, Weber, Davis, Salt Lake	18,883

Source: UTA, Fehr & Peers

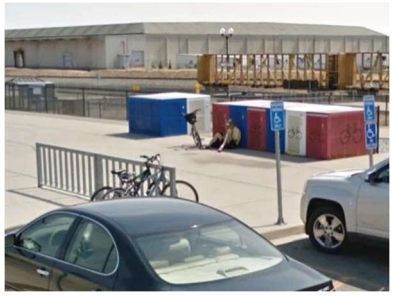


Figure 10: Bike lockers and bike parking at the Clearfield FrontRunner station.

Station Accessibility & Accommodation

The Clearfield FrontRunner station is the only commuter rail station in the study area. The station has covered and secured bicycle parking (bicycle lockers) and uncovered bike racks available. The station also has adequate pedestrian crossing features, including crosswalks, curb cuts, and station platform lighting.

Both the bus vehicles and the FrontRunner commuter rail vehicles accommodate bicycles. All UTA buses have front end-mounted bike racks that carry two to three bikes each. Transit users are prohibited from bringing bikes onboard buses if the bike rack is full.

Figure 11: UTA bus with ADA designs. Source: UTA.

ADA Standards for Accessible Design

All UTA buses meet ADA requirements and accommodate patrons in wheelchairs and with other disabilities. All fixed route vehicles are low floor vehicles and have ramps that can be deployed at a passenger's request or can "kneel" if that is preferred by the passenger. Once on the bus, there are wheelchair tie-downs and additional lap/shoulder belts available upon request. UTA also offers paratransit services to persons who have cognitive or physical disabilities that prevent them from utilizing fixed-route bus service. All the UTA FrontRunner trains have deployable ramps to accommodate a mobility device entering and exiting. There is also ADA accessible seating on every vehicle. All FrontRunner stations are equipped with ADA accommodations, including detectable warning surfaces on platform edges and crosswalks, and audible and tactile notification messages.

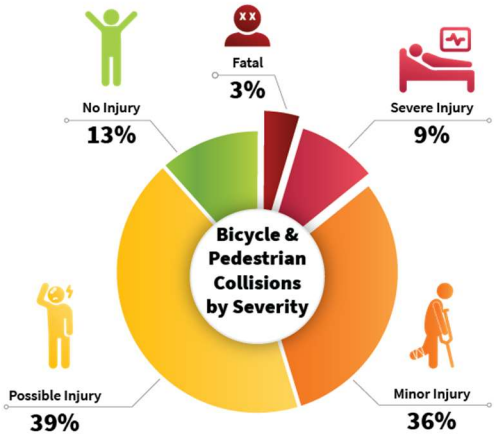


Figure 12: Bicycle and pedestrian collisions by severity.

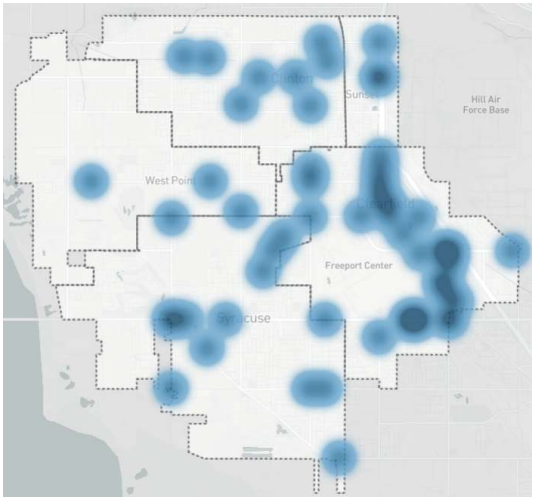


Figure 13: Bike collision heat map. Source: UDOT Numetrics

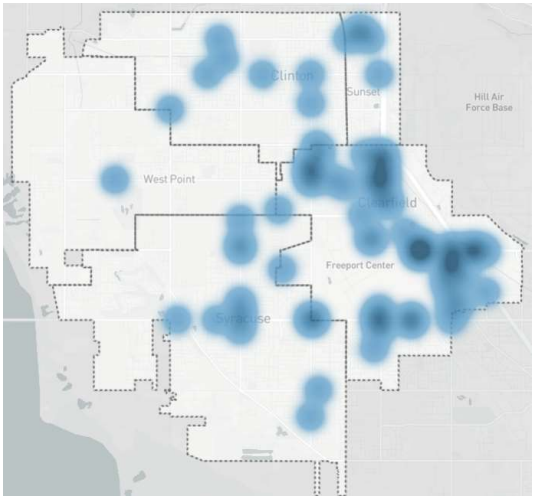


Figure 14: Pedestrian collision heat map. Source: UDOT Numetrics.

Active Transportation Collisions

Collision data is an important statistic in tracking and analyzing bicycle and pedestrian safety. UDOT Numetrics collision data was retrieved between January 2016 and May 2019.

Between 2016 and 2019, there were 150 reported bicycle or pedestrian-related collisions in North Davis. Of those collisions, four were fatal, 14 were severe, 54 resulted in minor injuries, 59 resulted in possible injuries, and 19 resulted in no injuries. Ninety of the collisions involved pedestrians and the other 60 involved bicyclists.

Bicycle Collision Profile

Most bicycle collisions occurred on Main Street. There are particularly high concentrations of collisions at the intersection of 1000 East and SR-193, Main Street (SR-126) and SR-193, and 1700 South and Main Street. None of those roadways have any type of bicycle infrastructure. Other collision hotspots include Main Street between 300 North and 650 North, and all along Antelope Drive, both segments of roadway that have a striped bicycle lane.

Pedestrian Collision Profile

The pedestrian collisions tend to occur in similar locations to the bicycle collisions. Again, 1000 East and SR-193, Main Street (SR-126), and SR-193 possess high amounts of pedestrian collisions, particularly along Main Street. State Street (SR-126) near the Clearfield FrontRunner station also has a high concentration of collisions. This is likely due to the large number of FrontRunner passengers making their way from the train.

Bicycle Facilities Research & Considerations

There is a large body of research comparing bicycle facility types and bicycling demand (both existing and induced demand). A key framework within this area of research links bicyclists (and potential bicyclists) with levels of facility stress they are likely to tolerate. The bicyclists with the most skill and riding confidence tend to tolerate the highest amount of facility stress, whereas the bicyclists with the lowest skill and experience likely have a much lower facility stress tolerance. This is important because consistently validated research also suggests that most people (51 – 56% of a statistically significant survey) consider themselves "Interested but Concerned" when it comes to bicycling—that is, interested in bicycling more often and to more places, but only in situations where they perceive they are safe.

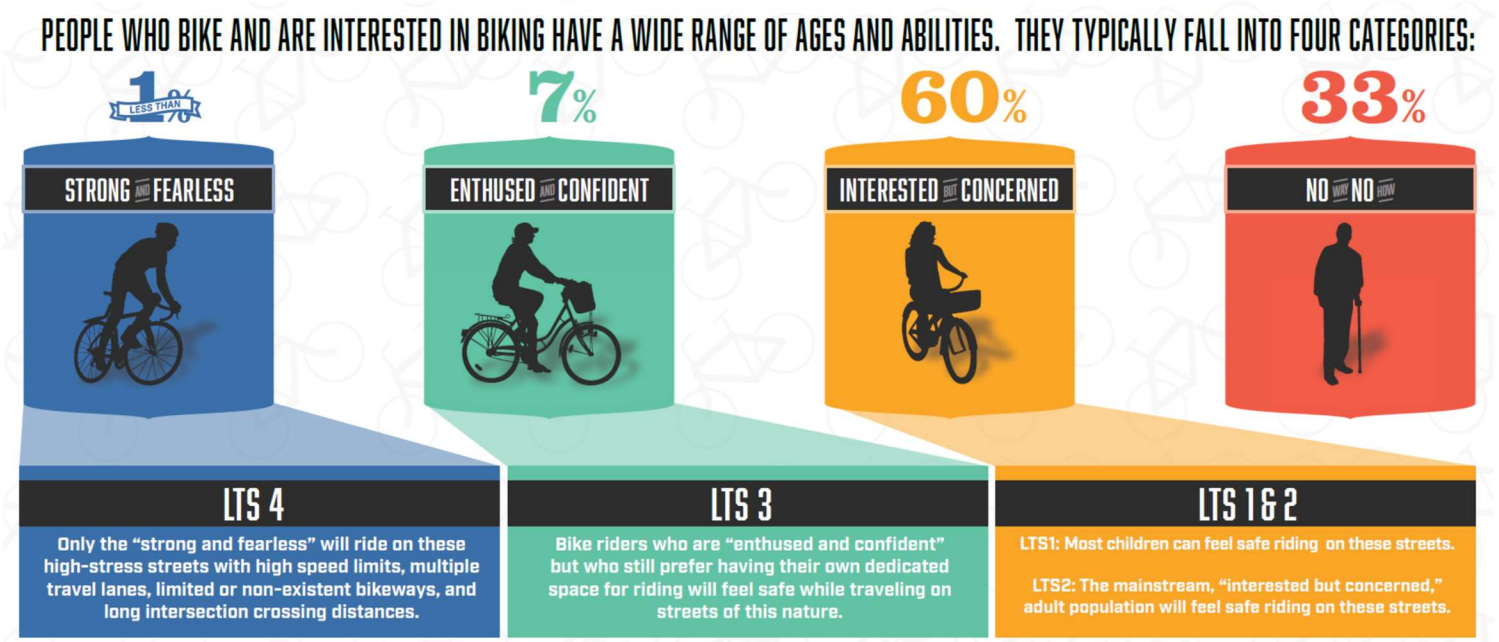


Figure 15: Graphical representation of the skill and stress tolerance spectrum. (Source: Fehr & Peers)

The breakdown of all the skill levels includes:

- **Strong and fearless bicyclists** will typically ride anywhere regardless of road or weather conditions, ride faster than other user types, prefer direct routes, and will usually choose to ride on the road, even if shared with vehicles, over separate bikeways like shared-use trails. This type of cyclist represents less than 1% of people.
- **Experienced and confident bicyclists** are fairly comfortable riding in dedicated bikeways but usually choose low traffic streets or shared-use trails when available.
- **Interested but concerned bicyclists** comprise most of the population and are typically those who only ride on low traffic streets or shared-use trails in fair weather. This demographic would like to bike more but can easily be deterred by a lack of safe, comfortable, and separated routes to potential destinations.
- **"No way, no how"** reflects the population who will not ride a bicycle under any circumstances.

This background information matters for the North Davis Active Transportation Plan because it is important to understand that different facility types accommodate different skill levels and stress tolerances of bicyclists. For example, it would be reasonable to infer that someone who identifies as "Interested but Concerned" would not tolerate or use a four-foot-wide stiped bike lane on a heavily used five-lane arterial roadway. That facility would be considered too stressful. However, that same rider would likely tolerate a physically separated bike lane or multi-use pathway adjacent to that same five-lane arterial.

Level of Traffic Stress (LTS)

"Stress" as a concept in these terms is the relationship between the bicycling facility and an assortment of metrics associated with the adjacent vehicle facility. Level of Traffic Stress (LTS) is a method of assessing the roadway network according to the perceived danger and discomfort that cyclists face in using a given road, path, or trail, including:

- Traffic volumes
- Traffic speeds
- Noise
- Presence of on-street parking
- Exhaust fumes

Research suggests that a large portion of Americans have a low tolerance for bicycling on a roadway with heavy or fast traffic and could be classified as traffic intolerant. Since many Americans have an aversion to stressors when riding a bicycle, the LTS system was developed to classify the roadway network according to how much stress they induce, with the goal of informing decision-makers where there are low and high-stress roadways.

LTS is categorized into four levels of traffic stress. Level of traffic stress 1 (**LTS 1**) is meant to be a level that most children can tolerate; **LTS 2**, the level that will be tolerated by the mainstream adult population; **LTS 3**, the level tolerated by American cyclists who are "enthused and confident" but still prefer having their own dedicated space for riding; and **LTS 4**, a level tolerated only by those characterized as "strong and fearless."[2]

The LTS classification on a specific segment of the roadway is derived by comparing the bikeway facility with the roadway characteristics. For example, a roadway can still have a low LTS rating, even if it does not have a bike lane if it has low vehicle speeds, number of lanes, and volumes. Similarly, a roadway can have a high LTS classification if it has a striped bike lane, but also has high vehicle volumes, number of lanes, and speed limits. Put simply, LTS evaluates whether the bikeway facility (or lack thereof) is appropriate for the roadway conditions.

An LTS network was created for the North Davis Active Transportation Plan. *Figure 1* displays the outcome of the LTS evaluation. Some key take-aways of the evaluation include:

[2] *Low-Stress Bicycling and Network Connectivity.* 2012. Mineta Transportation Institute. https://transweb.sjsu.edu/research/low-stress-bicycling-and-network-connectivity

- The major arterials in the area, including Antelope Drive, 4500 West, 1800 North, 2000 West, and 700 South, are classified as LTS level 4 and are considered the most stressful conditions for cycling. This includes the segment of Antelope Drive that has a bike lane because a bike lane is an inadequate facility for the roadway.
- Most of the neighborhood streets off the main roadway grid are classified as LTS level 1, or the least stressful. This is due to them being low volume and low-speed roadways. In these circumstances, a bike lane may be unnecessary.
- Many of the roadways classified as LTS level 2 are parking lot connections or areas with a substantial number of driveways. While these areas may still be low volume and low speed, they introduce potential conflicts of cyclists and vehicles because of the parking and driveways.
- Of the 30 schools in the study area, 10 of them are located on roadways with an LTS of 3 or higher.
- Both of the two major shopping centers in the study area are located on the roadways with an LTS level 4.

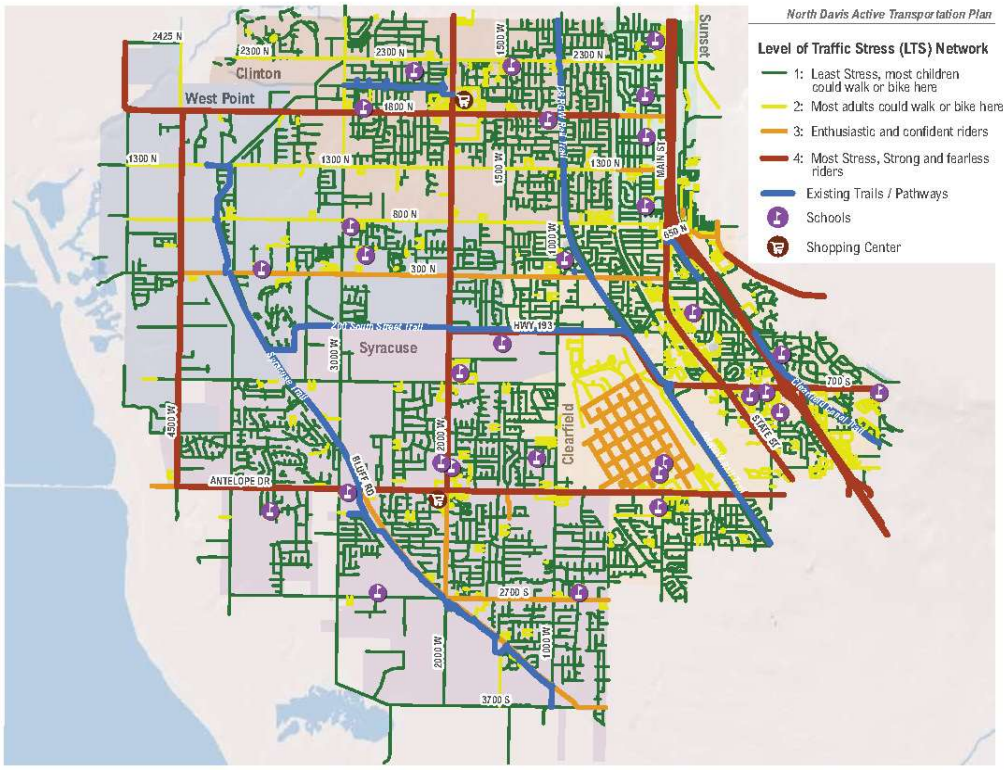


Figure 16: LTS Network for West Point, Clinton, Syracuse, Clearfield, & Sunset

3. Outreach and Plan Goals

Public Outreach

Outreach and engagement of interested members of the public is a crucial source of information on where existing issues and deficiencies exist across the five North Davis communities, as well as providing information on the destinations and amenities that would be most valuable to connect with bikeways and pedestrian connections. In order to gather this critical information, the project team conducted a two-pronged outreach strategy that included both in-person "pop-up" events and online outreach through a web-based interactive mapping platform.

In-person outreach was conducted through project booths at Fire Prevention Week public open houses at fire stations in Clearfield and Clinton during September and October of 2019. Both events were well-attended, with the project team and city staff receiving input from an estimated 200-300 community members who live and/or work in all five of the participating North Davis municipalities, as well as Layton, Weber County, and other nearby communities.

Figure 17: Outreach Booth at Clearfield Open House

Priorities heard at these events included enhancing crossings and filling sidewalk gaps to and from schools and parks; enhancing bicycle access to jobs and transit (e.g., FrontRunner station); creating better connections to the D&RGW Rail Trail so users can safely access the facility without driving; and enhancing trail crossings with signage and lighting to provide greater visibility for users. In general, comments and discussions related to the western part of North Davis County were more focused on active transportation facilities for outdoor recreation, while those addressing the eastern part of the study area had a greater focus on access to businesses, jobs, and transit.

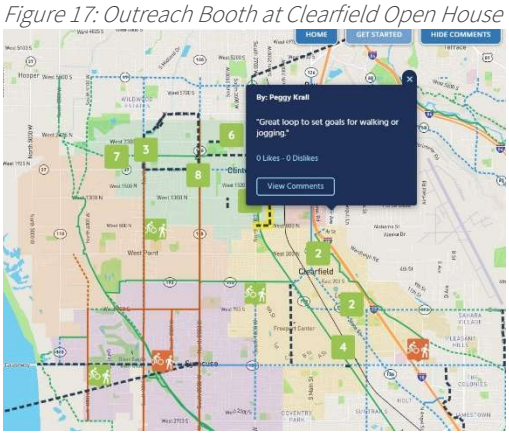


Figure 18: Web-Based Mapping and Outreach Platform

In addition to the in-person outreach conducted in Fall 2019, an online outreach platform was developed, which allows interested community members who may not have been able to attend in-person events to weigh in on existing and proposed active transportation facilities. The platform was live for the first phase of outreach from February to mid-March of 2020. Approximately 60 comments and suggestions were received from the public through this web-based platform. Themes in these comments included issues crossing State Street in Clearfield's downtown area; a need for better facilities on Antelope Drive; locations on access routes to the D&RGW Rail Trail where existing sidewalks and facilities are narrow or have gaps that make access uncomfortable or unsafe; and potential extensions of existing facilities in the western parts of Clinton, Syracuse, and West Point.

Following the development of a set of recommended new facilities, the same outreach tool will be used to solicit public input on these proposals.

Plan Goals and Objectives

At the outset of the North Davis Active Transportation Implementation Plan, a steering committee was formed with representatives of all five North Davis County communities, as well as Davis County, UDOT, and the Wasatch Front Regional Council (WFRC). Based on guidance from the public outreach efforts described above, as well as goals enshrined in prior studies and guidance from local elected officials, the steering committee identified a set of five goals that this plan must address in order for it to be successful.

These goals lay out the aspirations of the participating cities to provide their residents with a high-quality system of active transportation infrastructure. These goals will not be achieved by the adoption of this plan alone but will be pursued over time with consistent effort to implement the projects, policies, and other recommendations of the plan, as well as ongoing attention to opportunities and challenges as they arise in the region.

Goal #1: Increase the availability, quality, and use of active transportation connections within and between their communities;

- Invest in building active transportation facilities prioritized by the NDATP
- Plan and prioritize active transportation facilities across all communities and neighborhoods
- Through investments in automated counters in new and improved active transportation facilities, measure usage statistics and continue to pursue programs, projects, and strategies to increase year-over-year usage

Goal #2: Create safe and comfortable active transportation facilities and enhance access to existing high-quality trails

- Close gaps between existing regional trails and nearby bike facilities
- Create connections between regional trails and nearby nodes of activity (including employment centers, retail nodes, and civic amenities) with connecting facilities as well as clear wayfinding
- Create at least two high-comfort east-west facilities that connect the Syracuse Trail and D&RGW Rail Trail within the study area

Goal #3: Build family-friendly facilities suitable for all ages, abilities, and user groups (including pedestrians as well as bikes, scooters, strollers, and other modes/devices)

- Design major AT infrastructure investments with ‘interested but concerned’ riders (who may be riding with children) as the design user
- Conduct phased implementation of new connections and facilities where appropriate, starting with immediately feasible facilities and advancing to more fully separated and protected infrastructure as funding and other factors allow
- Consider mobility devices including strollers, scooters, and children in bike trailers in design parameters for high-quality facilities

Goal #4: Build a network that connects neighborhoods to community amenities and expands opportunities for outdoor recreation

- Prioritize facilities and crossings that are safe and comfortable for children and families using a variety of active modes around schools, parks, and neighborhoods
- Create safer bicycle connections to the Antelope Island Causeway and other trailheads

Goal #5: Improve commuting routes and access to transit stops and stations in areas near regional transit services and employment centers

- Prioritize facilities that enhance bike and pedestrian access to the Freeport Center and Hill AFB/Falcon Hill
- Improve connections between regional trails and Clearfield Station, as well as improving active transportation access to UTA Route 470 stops

4. Recommended Facilities

This Recommended Facilities chapter presents a set of recommended investments in active transportation infrastructure to improve connectivity within the five constituent communities, and among the five communities in northern Davis County. This list of recommendations includes proposed routes, facility types, and project prioritization for implementation, presented for the study area in its entirety and the individual communities.

Plan Goals

As stated in Chapter 3, this Plan was developed in pursuit of five goals:

- Goal #1: Increase the availability, quality, and use of active transportation connections within and between their communities;
- Goal #2: Create safe and comfortable active transportation facilities and enhance access to existing high-quality trails;
- Goal #3: Build family-friendly facilities suitable for all ages, abilities, and user groups (including pedestrians as well as bikes, scooters, strollers, and other modes/devices);
- Goal #4: Build a network that connects neighborhoods to community amenities and expands opportunities for outdoor recreation; and
- Goal #5: Improve commuting routes and access to transit stops and stations in areas near regional transit services and employment centers.

The development of a connected, low-stress active transportation network involved several steps, incorporating qualitative and quantitative processes, described below.

Review of Existing Plans

This Plan used existing plans as a foundation for developing a recommended active transportation network. Building on the recommendations of WFRC's 2019-2050 Regional Transportation Plan, City General Plan transportation elements, and Transportation Master Plans, long-standing priorities for local and regional mobility were identified as key opportunities for improvement.

Beyond transportation and general plans, land use plans and related community plans were consulted to establish an understanding of proposed changes in development patterns in the Plan area. Changes in land use, and their fundamental impacts on evolving mobility needs, were essential to the development of a recommended, prioritized network.

Outreach and Engagement

The project team deployed an interactive online engagement tool to gather feedback on active transportation needs in the Plan area. On a webmap, users were able to identify routes by which they often travel via non-motorized modes, and others by which they would like to be able to travel (as lines). Users were also able to identify key intersections at which improvements in active transportation were needed (as points). These lines

and points, in concert with existing plans for the area, and with additional input from City staff as well as representatives of the Freeport Center, were developed into a proposed network of active transportation infrastructure.

The proposed network was posted to the interactive, online engagement tool, allowing residents to comment on proposed facilities as well as show support for any proposed facility or associated comment by adding a "like." The webmap results were checked against City staff's understanding of community requests, and to avoid double-counting for planned active transportation infrastructure projects in North Davis County.

Project Prioritization

With a more complete understanding of community needs, and a well-developed set of Plan goals, proposed facilities were scored on a series of criteria based on the plan goals described above:

- Is the proposed facility separated or protected?
- Is the proposed facility a high-quality east-to-west route?
- Does the proposed facility provide connections to the Freeport Center, the Clearfield Frontrunner Station, or existing retail areas?
- Does the proposed facility provide connections to the Antelope Island Causeway?

Each proposed facility meeting any of the criteria above was scored to develop a prioritized set of recommended active transportation investments. This final list of prioritized infrastructure investments was reviewed by City staff before developing the final proposed network.

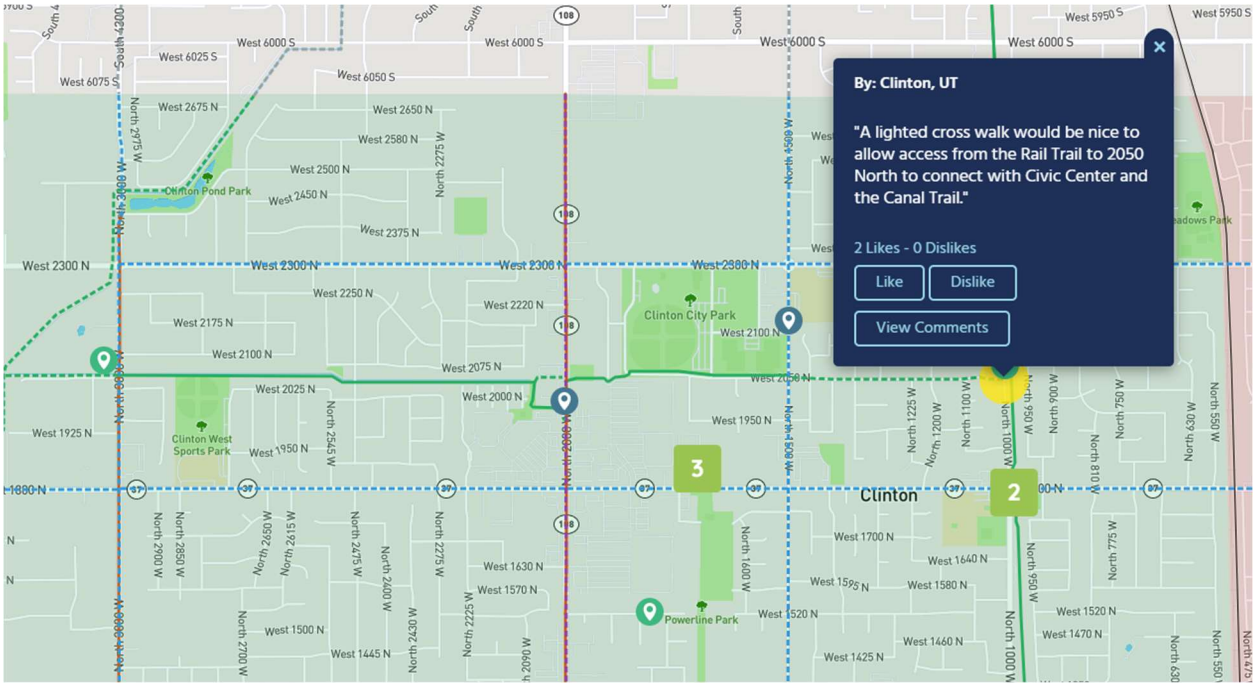


Figure 19: Sample Input from Online Engagement Map

Proposed Network

The proposed active transportation network developed for this Plan is shown in the following map series. Proposed active transportation facilities are shown by facility type for the final proposed network in Figure 20 and by project tier in Figures 21-23. Tiers 1, 2, and 3 correspond to near, mid, and long-term projects for implementation by the North Davis communities in collaboration with UDOT and other partners, as applicable. Tier 0 corresponds to active transportation improvements that are a confirmed component of funded UDOT roadway projects. Table 2 below lists each linear project by facility type, length, tier, and which city or cities the proposed project extent includes. Table 3 lists each crossing improvement project by city and phase. **Appendix B: Projects by Community** contains additional mapping at the level of individual communities, as well as cost estimates allocated by each of the five North Davis communities.

Table 2. Proposed Line Projects

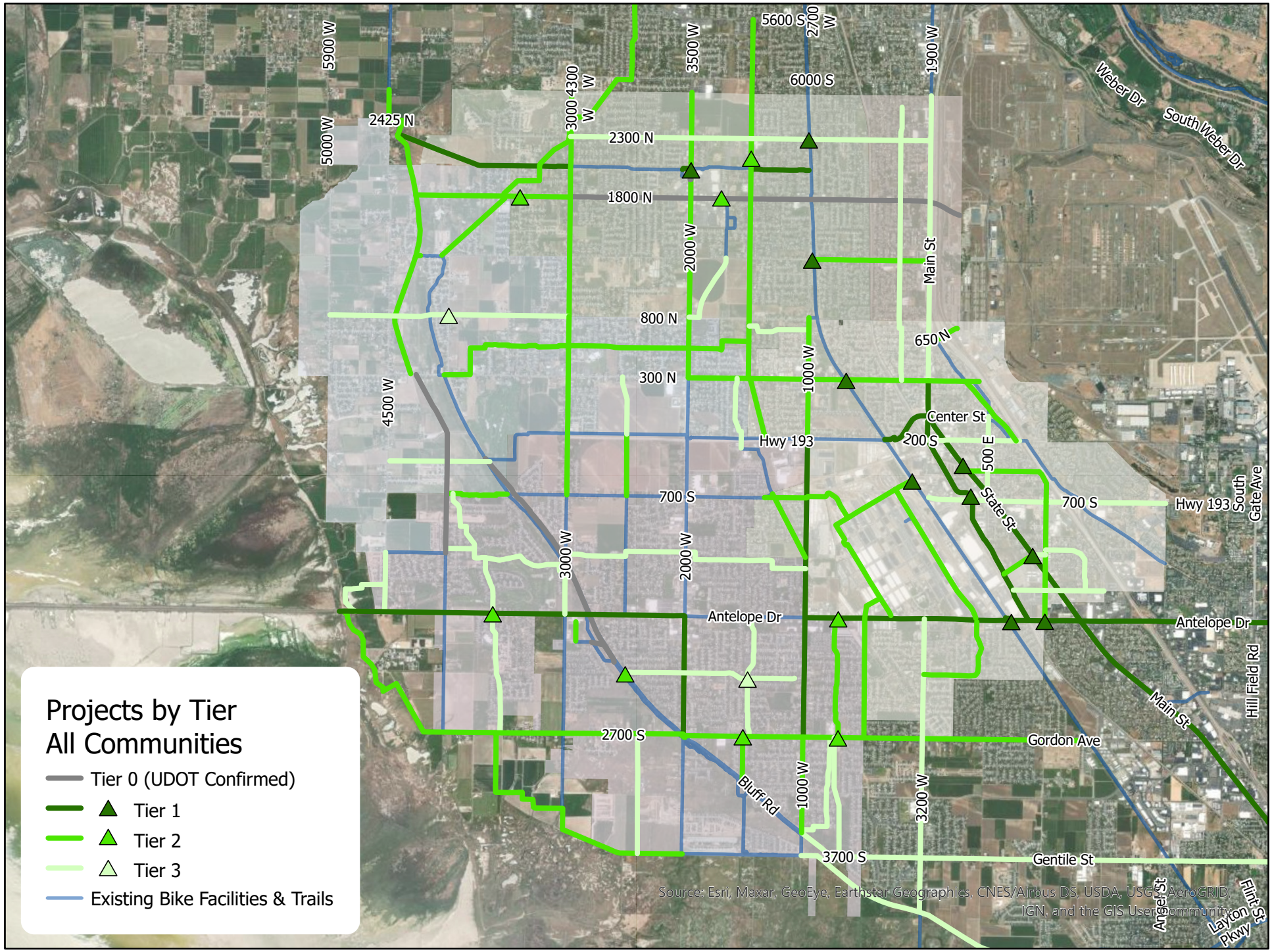
	PROJECT	FACILITY TYPE	LENGTH (MILES)	CITIES	TIER
1	Emigrant Trail Access	Shared Use Path	0.2	Syracuse	0
2	Emigrant Trail	Shared Use Path	2.0	Syracuse, West Point	0
3	4000 West Shared Use Path	Shared Use Path	1.6	Syracuse, West Point	0
4	1800 North Bike Lane	Bike Lane	4.6	Clinton, Sunset, West Point	0 and 2
5	Clinton Community Trail West Extension	Shared Use Path	1.5	Clinton	1
6	Center Street Bike Lane	Bike Lane	0.4	Clearfield	1
7	Antelope Drive Shared Use Path	Shared Use Path	7.9	Clearfield, Syracuse	1
8	2000 West Buffered Bike Lane	Buffered Bike Lane	1.0	Syracuse	1
9	State Street / Main Street Protected Bike Lane	Protected Bike Lane	5.5	Clearfield	1
10	Clearfield FrontRunner Trail	Shared Use Path	0.4	Clearfield	1
11	Depot Street Bike Lane	Bike Lane	1.5	Clearfield	1
12	Clinton Community Trail	Shared Use Path	0.6	Clinton	1
13	1000 West Bike Lane	Bike Lane	3.3	Clearfield, Syracuse	1 and 2
14	200 South Bike Lane	Bike Lane	0.9	Clearfield	1 and 3
15	1300 North Bike Lane	Bike Lane	1.0	Clinton, Sunset	2
16	650 North Bike Lane	Bike Lane	0.3	Clearfield	2
17	Bluff Road Roundabout	Shared Use Path	0.1	Syracuse	2
18	Emigrant Trail Extension	Shared Use Path	2.6	West Point	2

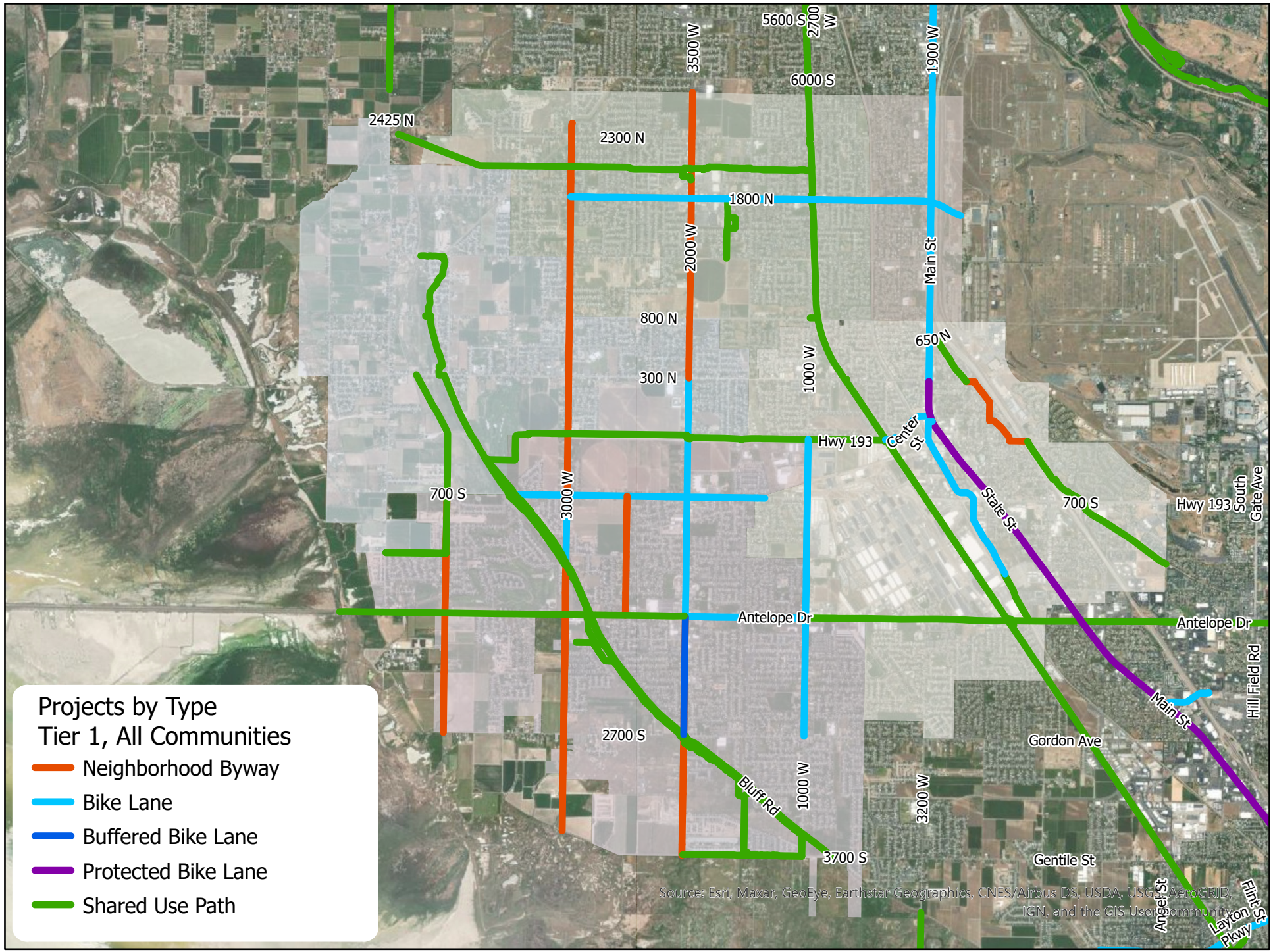
	PROJECT	FACILITY TYPE	LENGTH (MILES)	CITIES	TIER
19	3000 West Byway	Neighborhood Byway	1.9	Clinton	2
20	2000 West Shared Use Path	Shared Use Path	2.4	Clinton, West Point	2
21	1000 East Bike Lane	Bike Lane	1.0	Clearfield	2
22	Emigrant Trail to Syracuse Arts Academy Connection	Shared Use Path	0.2	Syracuse	2
23	Canal Shared Use Path	Shared Use Path	0.4	Syracuse	2
24	Freeport Center Byway	Neighborhood Byway	3.7	Clearfield	2
25	300 North Bike Lane	Bike Lane	2.4	Clearfield, West Point	2
26	450 South Bike Lane	Bike Lane	0.6	Clearfield	2
27	1000 West Bike Lane to DRGW	Bike Lane	1.0	Clearfield	2
28	2700 South Bike Lane	Bike Lane	5.0	Syracuse	2
29	1500 West Byway	Neighborhood Byway	2.4	Clearfield, Clinton	2
30	Power Line Corridor Shared Use Path	Shared Use Path	1.1	Clearfield	2
31	Layton Canal Shared Use Path	Shared Use Path	2.2	Clinton, West Point	2
32	Clearfield Station Bike Lane	Bike Lane	0.3	Clearfield	2
33	700 East Bike Lane	Bike Lane	0.3	Clearfield	2
34	500 West Bike Lane	Bike Lane	1.2	Clearfield	2
35	2200 South 400 East Neighborhood Byway	Neighborhood Byway	0.9	Clearfield	2
36	300 N / 550 N / 600 N Byway	Neighborhood Byway	2.9	Clinton, West Point	2
37	Clearfield Canal Trail Realignment	Shared Use Path	0.7	Clearfield	2
38	2500 West Bike Lane Extension to Antelope Island Drive	Bike Lane	0.5	Syracuse, West Point	2
39	Great Salt Lake Shoreline Trail	Shared Use Path	5.5	Syracuse, West Point	2 and 3
40	Bluff Ridge Shared Use Path	Neighborhood Byway	2.0	Clearfield, Syracuse	2 and 3
41	3000 West Bike Lane	Bike Lane	1.9	Clinton, Syracuse, West Point	2 and 3
42	700 South Bike Lane	Bike Lane	2.0	Clearfield	3
43	3700 South / Gentile Street	Bike Lane	4.7	Syracuse	3
44	West Davis Corridor Trail	Shared Use Path	2.3	Syracuse	3
45	4500 West Bike Lane	Bike Lane	0.5	Syracuse	3
46	Main Street Buffered Bike Lane	Buffered Bike Lane	2.4	Clearfield, Sunset	3
47	Gentile Street Trail Connection to 2400 W	Shared Use Path	1.0	Syracuse	3

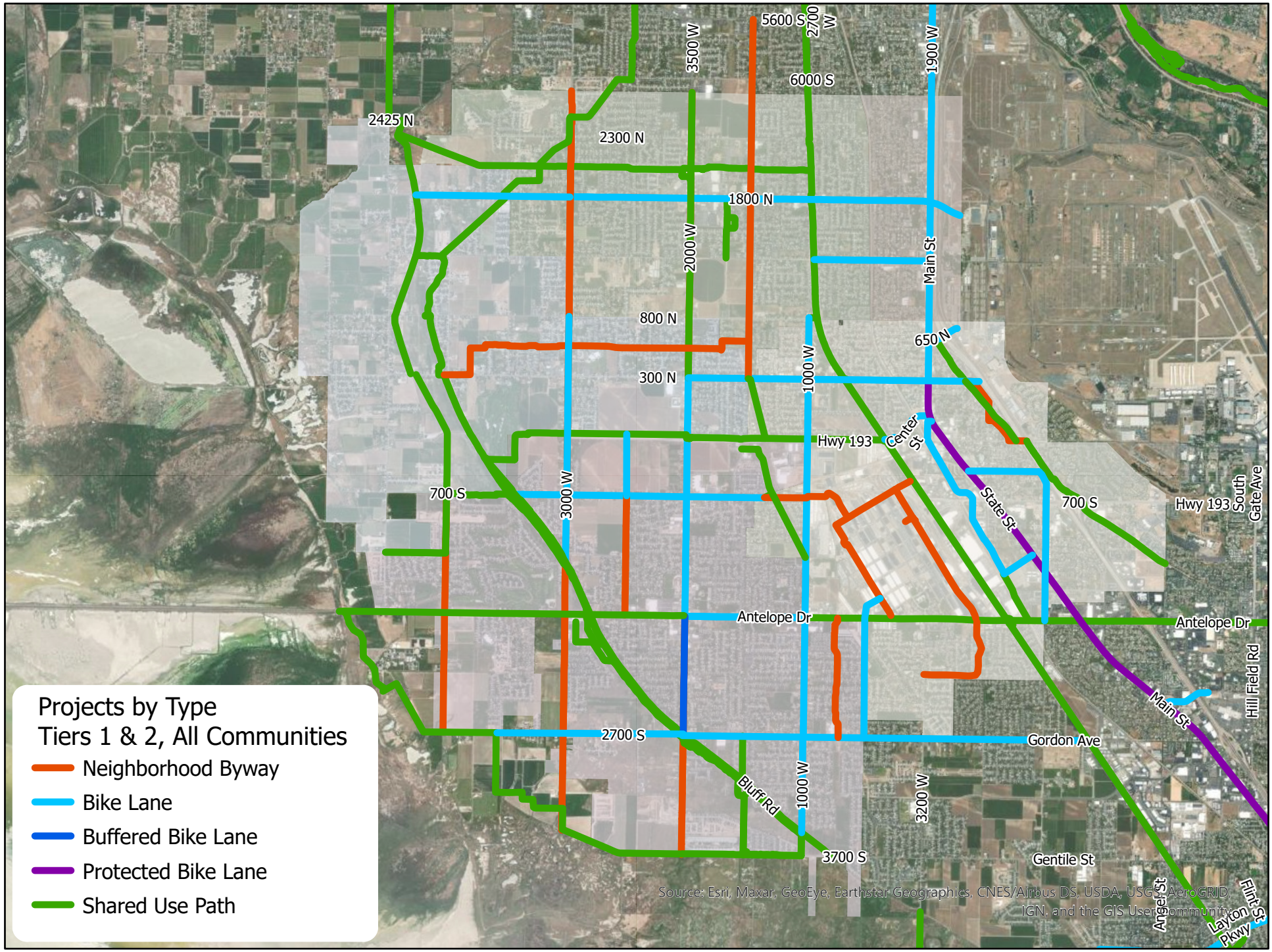
	PROJECT	FACILITY TYPE	LENGTH (MILES)	CITIES	TIER
48	Doral Drive Neighborhood Byway	Neighborhood Byway	2.2	Syracuse	3
49	1175 South Bike Lane	Bike Lane	2.2	Syracuse	3
50	1475 West Bike Lane	Neighborhood Byway	1.0	Syracuse	3
51	2175 South Bike Lane	Neighborhood Byway	1.4	Syracuse	3
52	School Connector Byway	Neighborhood Byway	2.3	Clearfield, Sunset	3
53	Utility Corridor Shared Use Path Connections	Shared Use Path	1.4	Syracuse	3
54	1550 West Neighborhood Byway	Neighborhood Byway	0.6	Syracuse, West Point	3
55	1150-1000 South Neighborhood Byway	Neighborhood Byway	0.7	Clearfield	3
56	SR-193 Extension Bike Lane	Bike Lane	0.8	West Point	3
57	800 North Bike Lane or Byway	Bike Lane	2.0	West Point	3
58	Main Street Bike Lane or Byway	Bike Lane	2.5	Clearfield	3
59	1450 South Bike Lane	Bike Lane	0.8	Clearfield	3
60	500 East Neighborhood Byway	Neighborhood Byway	0.6	Clearfield	3
61	St. Andrews Drive Neighborhood Byway	Neighborhood Byway	0.8	Syracuse	3
62	Augusta Drive Neighborhood Byway	Neighborhood Byway	0.2	Syracuse	3
63	2300 North Bike Lane	Neighborhood Byway	3.0	Clinton, Sunset	3
64	725 North Neighborhood Byway	Neighborhood Byway	0.5	Clearfield, Clinton	3
65	2500 West Bike Lane Extension to 300 North	Bike Lane	0.5	West Point	3
66	Powerline Trail Extension	Shared Use Path	0.6	Clinton	3
	Grand Total		**112.7**		

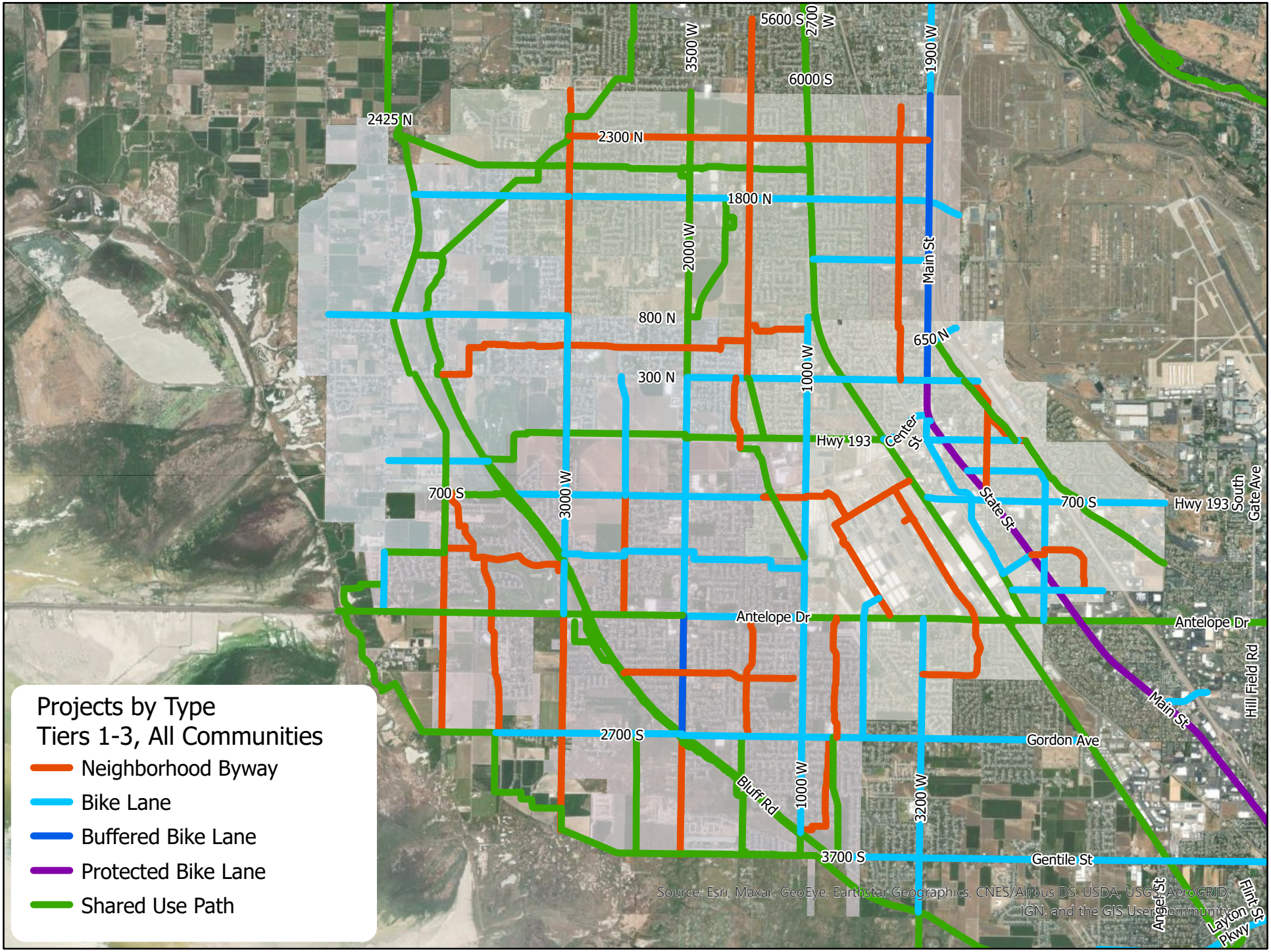
Table 3. Proposed Crossing Improvement Projects

ID	PROJECT	CITY	TIER
1	Antelope Drive Crossing and Access Improvements at DRGW Trail	Clearfield	1
2	Antelope Drive and 1000 East Crossing	Clearfield	1
3	DRGW Trail and SR193 Crossing at H Street	Clearfield	1
4	Clinton City Community Trail Crossing at 2000 West	Clinton	1
5	DRGW Trail Crossing at 2300 North	Clinton	1
6	DRGW Trail Crossing at 300 North	Clearfield	1
7	State Street Crossing at 1150 South	Clearfield	1
8	DRGW Trail Crossing at 1300 North	Clinton	1
9	Depot Street / 700 South Sidepath Access Improvement	Clearfield	1
10	State Street Crossing at 400 South (Mabey Pond)	Clearfield	1
11	Bluff Ridge Crossing at 2700 South	Syracuse	2
12	Bluff Ridge Crossing to Freeport at Antelope Drive	Syracuse	2
13	1700 West Crossing at 1800 North	Clinton	2
14	Doral Drive Crossing at Antelope Drive	Syracuse	2
15	Bluff Road Crossing at 2175 South and Emigrant Trail Connection	Syracuse	2
16	1500 West Crossing at 2100 North	Clinton	2
17	1800 North at 3420 West Crossing	Clinton	2
18	1500 West Canal Trail Crossing at 2700 South	Syracuse	2
19	2175 South and 1475 West Crossing	Syracuse	3
20	800 North Crossing at 4000 West	West Point	3


Projects by Tier
All Communities
Tier 0 (UDOT Confirmed)
Tier 1
Tier 2
Tier 3
Existing Bike Facilities & Trails
5900 W
5000 W
4500 W
4300 W
3500 W
3000 W
2700 W
2000 W
1900 W
1000 W
3200 W
2425 N
2300 N
1800 N
800 N
650 N
300 N
5600 S
6000 S
Weber Dr
South Weber Dr
Main St
Center St
Hwy 193
200 S
500 E
State St
700 S
Hwy 193
South Gate Ave
Antelope Dr
Antelope Dr
Hill Field Rd
Main St
2700 S
Gordon Ave
Bluff Rd
3700 S
Gentile St
Angel St
Layton Pkwy
Flint St
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Projects by Type
Tier 1, All Communities
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
2425 N
2300 N
1800 N
800 N
300 N
700 S
2700 S
3700 S
5600 S
6000 S
3500 W
2700 W
1900 W
2000 W
1000 W
3000 W
3200 W
Main St
650 N
Hwy 193
Center St
State St
Antelope Dr
Gordon Ave
Gentile St
Bluff Rd
Hwy 193
South Gate Ave
Hill Field Rd
Angel St
Layton Pkwy
Flint St
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Projects by Type
Tiers 1 & 2, All Communities
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
2425 N
2300 N
1800 N
800 N
300 N
700 S
2700 S
3700 S
5600 S
6000 S
3500 W
2700 W
1900 W
2000 W
1000 W
3000 W
3200 W
Main St
650 N
Hwy 193
Center St
State St
Hwy 193 South
Gate Ave
Antelope Dr
Hill Field Rd
Gordon Ave
Bluff Rd
Gentile St
Angel St
Layton Pkwy
Flint St
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

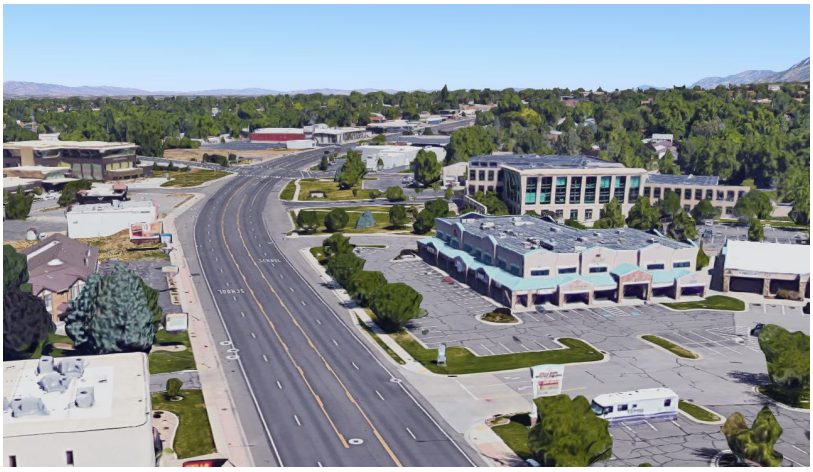

Projects by Type
Tiers 1-3, All Communities
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
2425 N
2300 N
1800 N
800 N
300 N
700 S
2700 S
3700 S
5600 S
6000 S
3500 W
2700 W
1900 W
2000 W
1000 W
3000 W
3200 W
Main St
650 N
Hwy 193
Center St
State St
Hwy 193
South Gate Ave
Antelope Dr
Antelope Dr
Hill Field Rd
Main St
Gordon Ave
Bluff Rd
Gentile St
Angel St
Layton Pkwy
Fillmore St
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

5. Conceptual Designs

This Chapter lays out concept-level designs for a subset of high-priority facilities identified in Chapter 4, emphasizing segments of these routes where more constrained conditions exist and design challenges are greatest. Each concept design is accompanied by a project profile, which provides a summary of the proposed project, its estimated cost and potential benefits, and key considerations for implementation.

State Street

From 800 N to 1525 S



Project Summary

Clearfield City's 'Creating Downtown Clearfield' plan contains a set of goals to transform State Street (SR-126) into a corridor that supports a vibrant downtown corridor, including recommendations to incorporate separated bike lanes and enhance safety for all road users. To support these goals, this Plan recommends the addition of separated bike lanes on State Street and Main Street from 800 N to 1525 S. Due to ongoing negotiations with UDOT and their concurrent SR-126 Corridor Study, other routes or facilities may be considered for portions of this proposed alignment.

Estimated Cost (Total): $2.48 million

***Cost less 700 S & 1150 S intersection improvements*: $2.36 million**

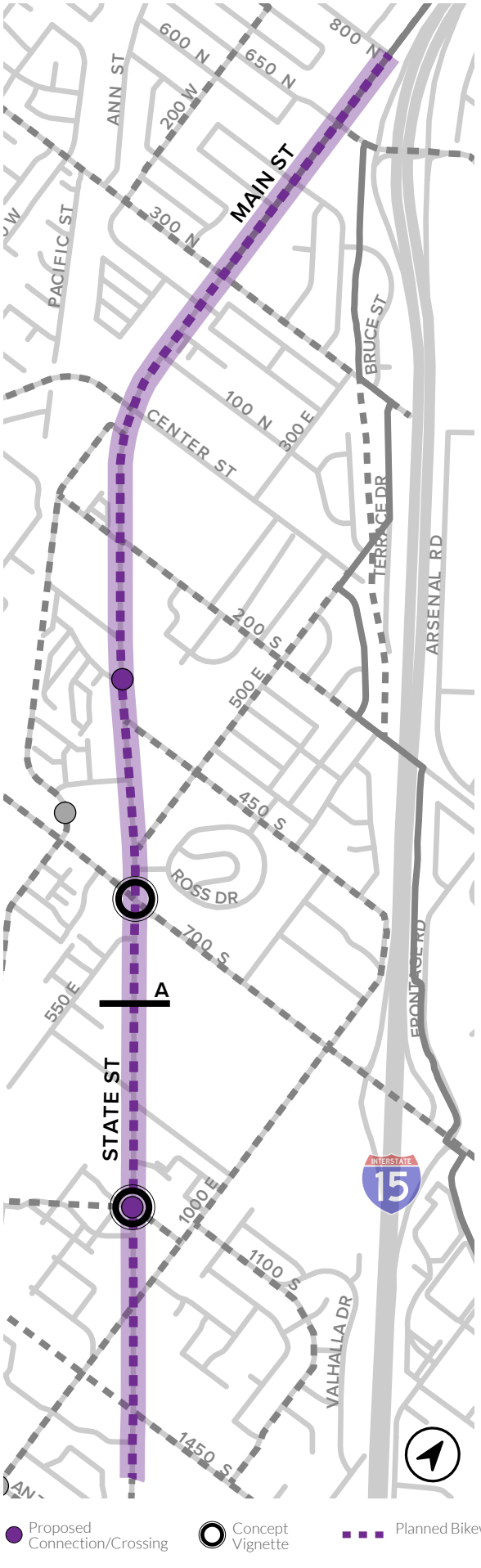
Benefits

ENHANCED NORTH/SOUTH CONNECTION FOR ALL MODES SR-126 already serves as a significant north/south connection for vehicles in Clearfield. Buffered bike lanes will provide increased comfort for bicyclists and pedestrians traveling along the corridor while providing safer access to and from transit and other destinations along the downtown corridor, whereas parallel routes such as the Denver and Rio Grande Western Rail Trail and the Clearfield Canal Trail require substantial out-of-direction travel to connect to Clearfield's Downtown.

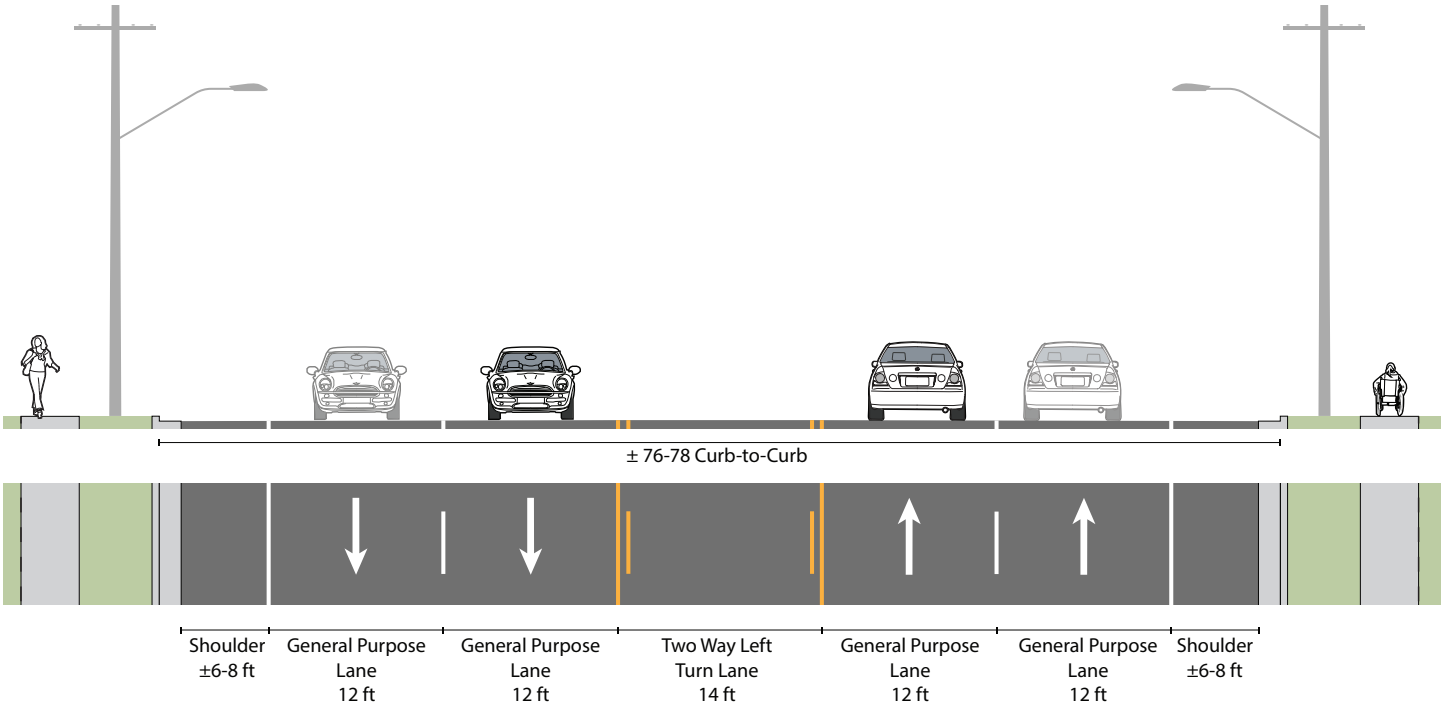
IMPROVED SAFETY FOR EVERYONE State Street is an uncomfortable and unsafe corridor for the average person traveling by bike, given the current high vehicle volumes (AADTs of 17,000 to 26,000 across the corridor) and speed limits of 40 MPH or higher. Buffered bike lanes provide greater distance between vehicles and bicyclists, enhancing safety and comfort for a broader range of users.

Key Considerations

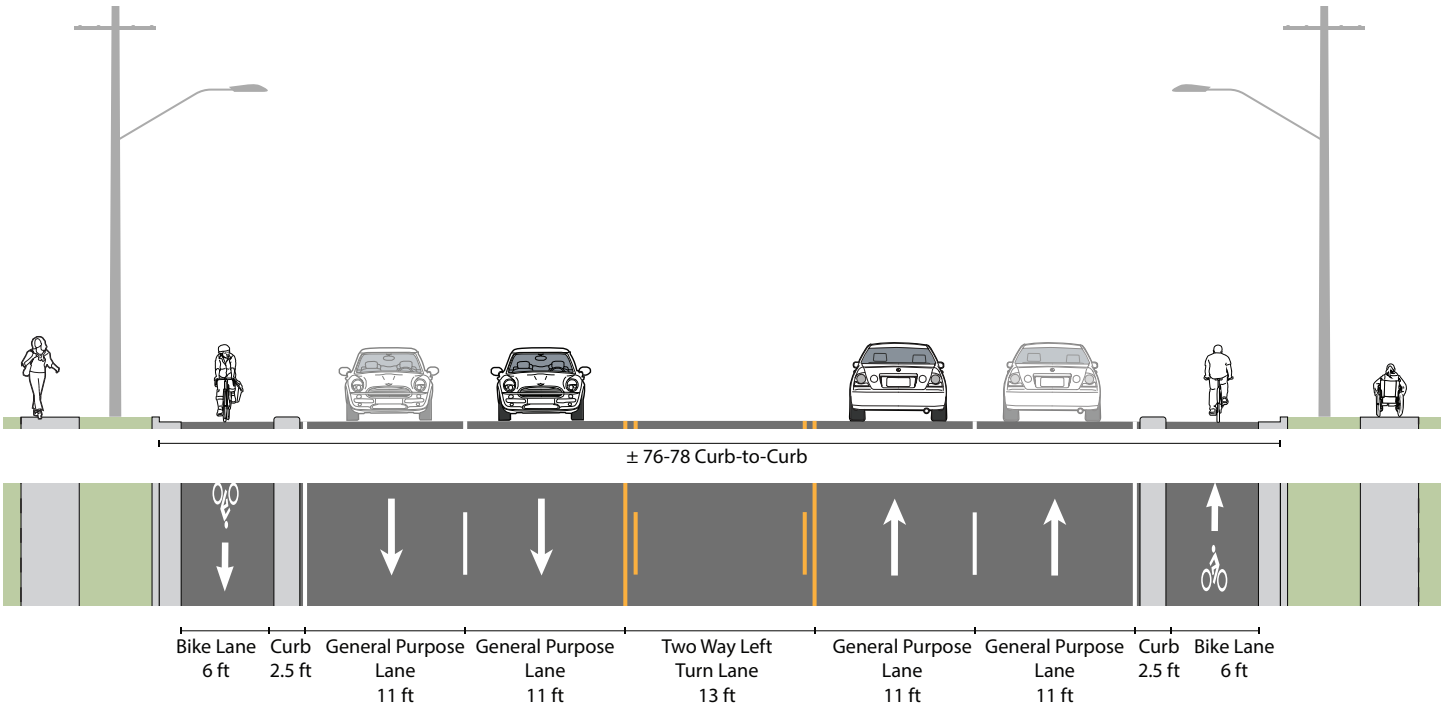
- Any on-street parking currently allowed on State Street would be removed
- Bus pull-outs should strive to minimize bus/bicyclist/transit user conflicts



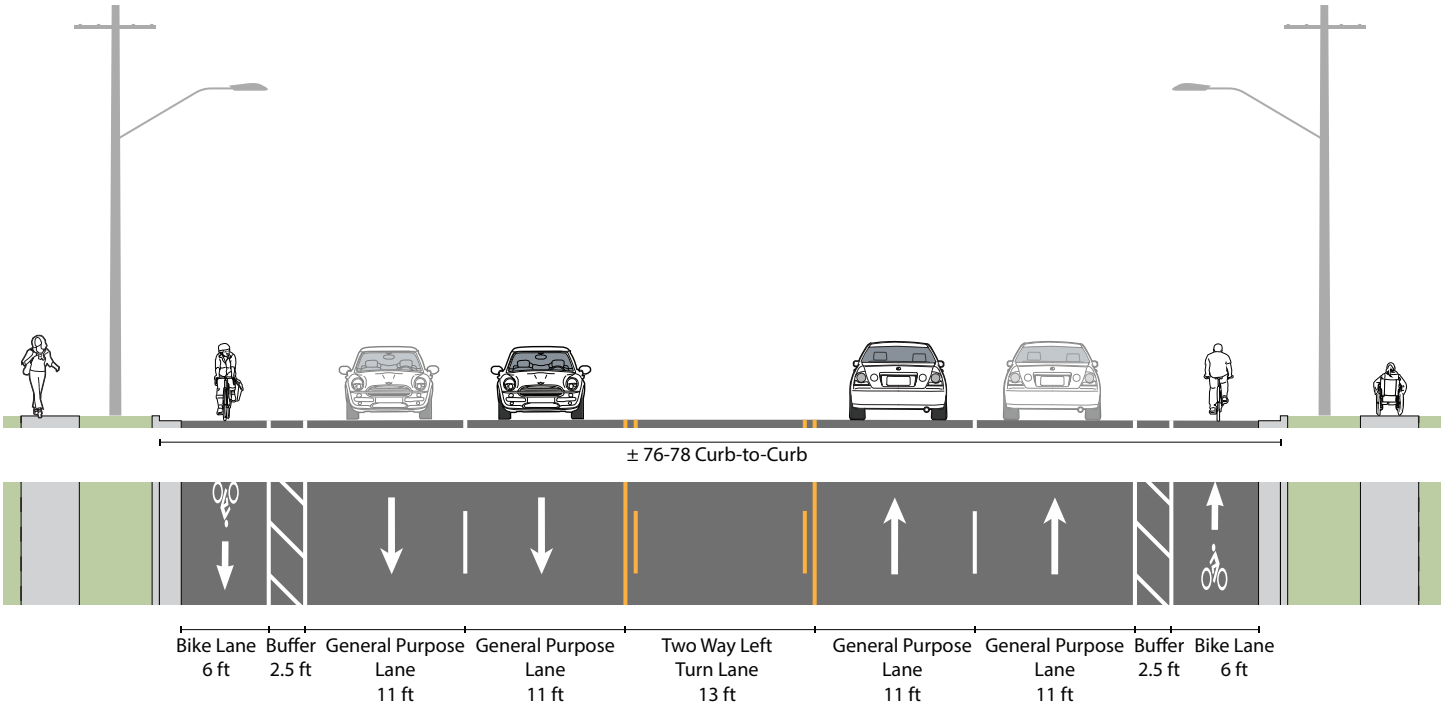
Existing Conditions



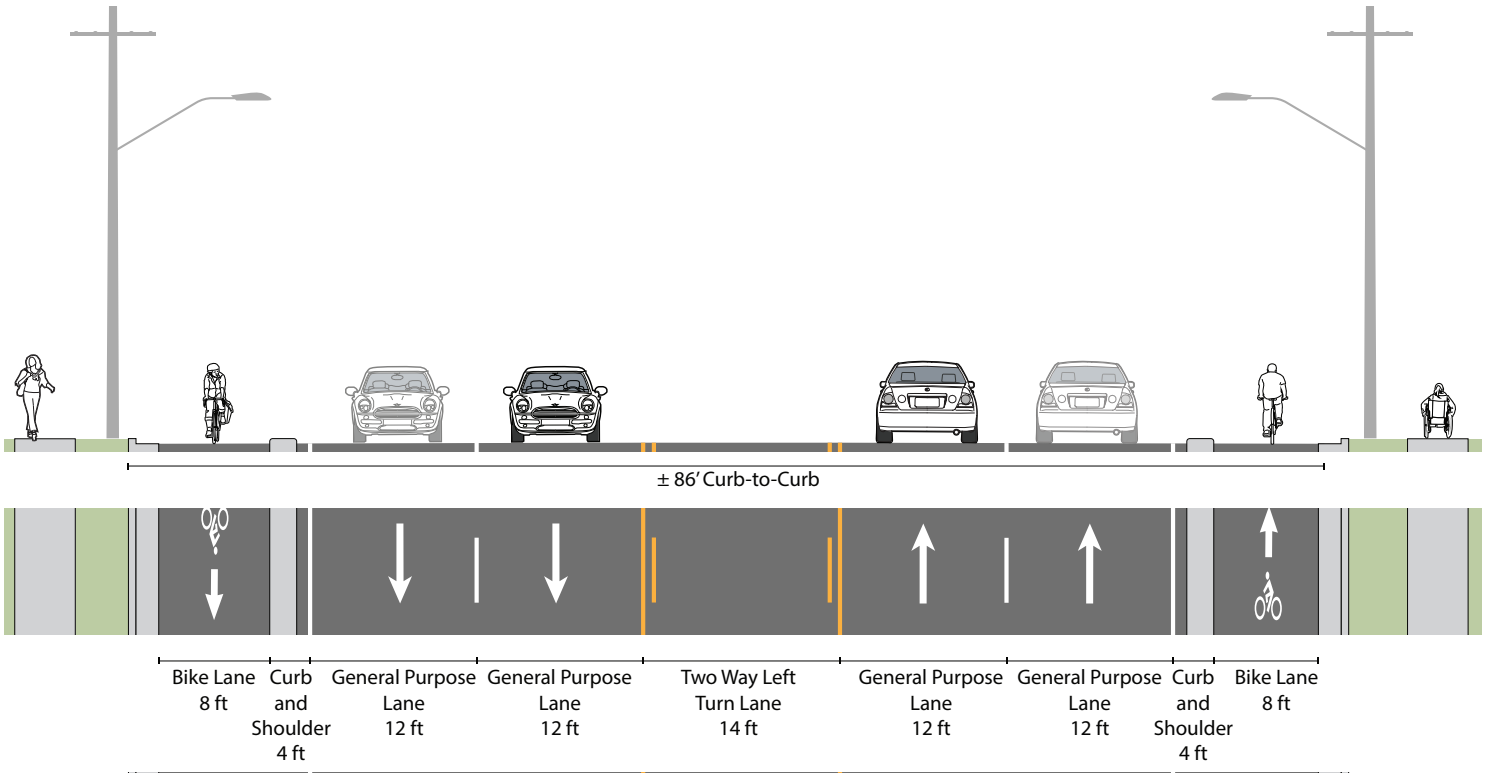
Proposed Separated Bike Lanes



Interim treatment: Buffered Bike Lanes



Alternate Treatment: UDOT Preferred 86' Right of Way

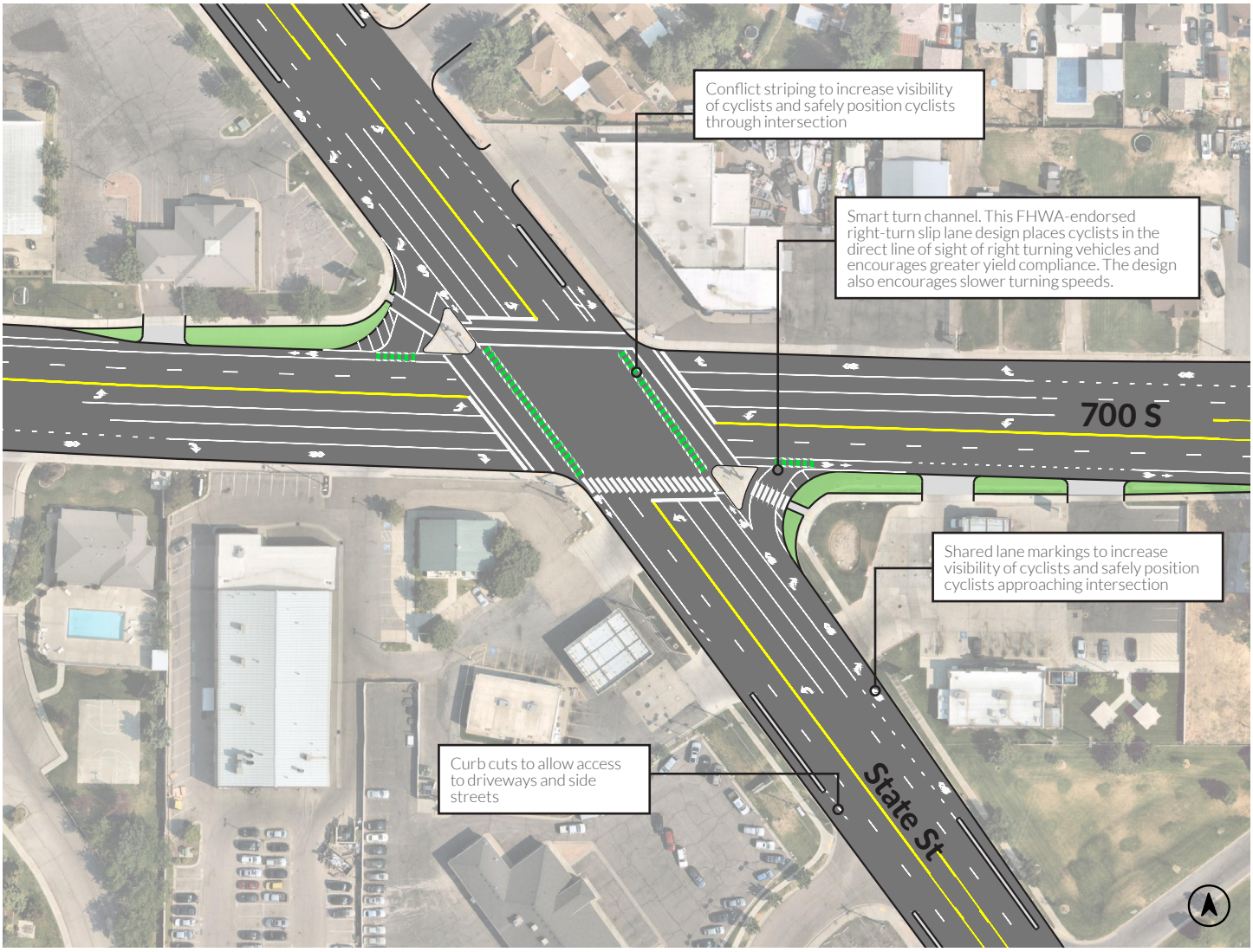


State Street at 700 S

Statistically, most vehicle-bike conflicts occur at intersections, which is why special attention should be given to intersections such as 700 S along the State Street / Main Street corridor. Given the arterial nature of State Street, most intersections, if ignored, will prove to be uncomfortable and unsafe for people on bikes, even with the implementation of physically separated or buffered lanes. The illustration below provides conceptual design for the intersection of State Street and 700 S in Clearfield.

Key considerations:

- Address conflicts with right turning vehicles and cyclists approaching the intersection. Proper placement of shared lane markings can communicate to drivers the presence of cyclists and successfully position cyclists for a safe approach to and through the intersection.
- Reduce speeds of right-turning vehicles by reducing turning radii while still accommodating turning movements by larger vehicles.

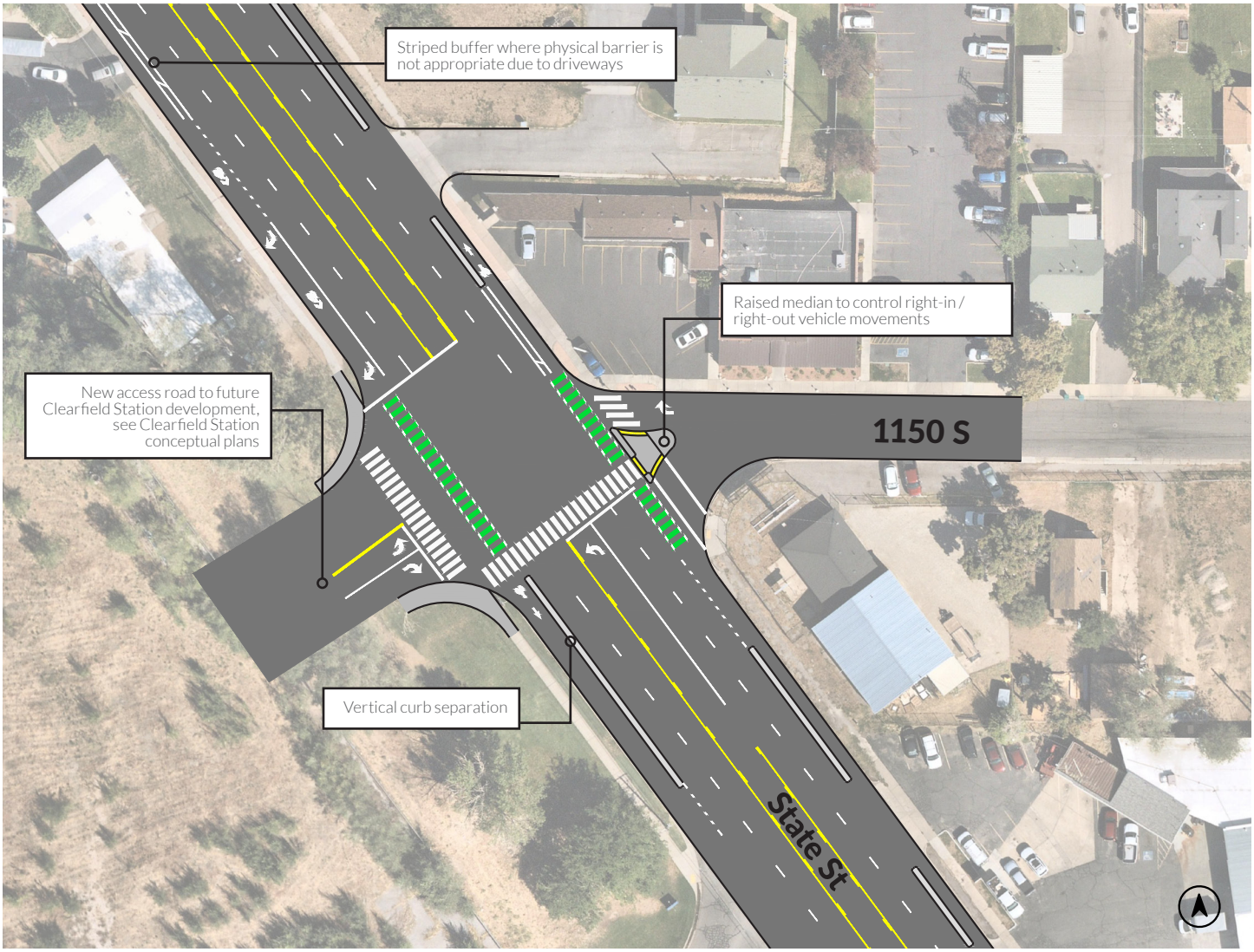


State Street at 1150 S

Plans for transit-oriented development surrounding the Clearfield FrontRunner Station include the realignment of the existing access drive to meet 1150 S at State Street, where a signalized intersection would be implemented. To discourage neighborhood cut-through traffic via 1150 S, conceptual plans for the intersection include a traffic diversion treatment on the east leg of the intersection to prohibit southbound left turn and eastbound straight through movements onto 1150 S. The drawing below illustrates intersection design that safely accommodates north/south cyclists through the intersection.

Key considerations:

- Appropriate signage and geometric design to discourage westbound movements straight through the intersection
- Consider east-west bicycle travel through the intersection as plans for Clearfield Station access develop further



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Antelope Dr

From 4500 W to 2000 W

Project Summary

Antelope Drive serves as a major east/west connector through Syracuse and Clearfield. With connections to I-15 to the east and Antelope Island State Park to the west and commercial nodes and residential access dotted in between, motorists, bicyclists, and pedestrians alike rely on this corridor for a variety of trips. This project provides both on- and off-street facilities for people on bikes to accommodate users of varying ages and abilities. Proposed improvements include a multi-directional sidepath that switches sides of the road at Doral Drive and on-street bike lanes east of Doral Drive. Imminent UDOT plans to widen Antelope Dr. as part of the West Davis Corridor present an opportunity to implement this project in conjunction with planned construction.

Estimated Cost (sidepath, bike lanes, and 2000 W only): $2.85 million

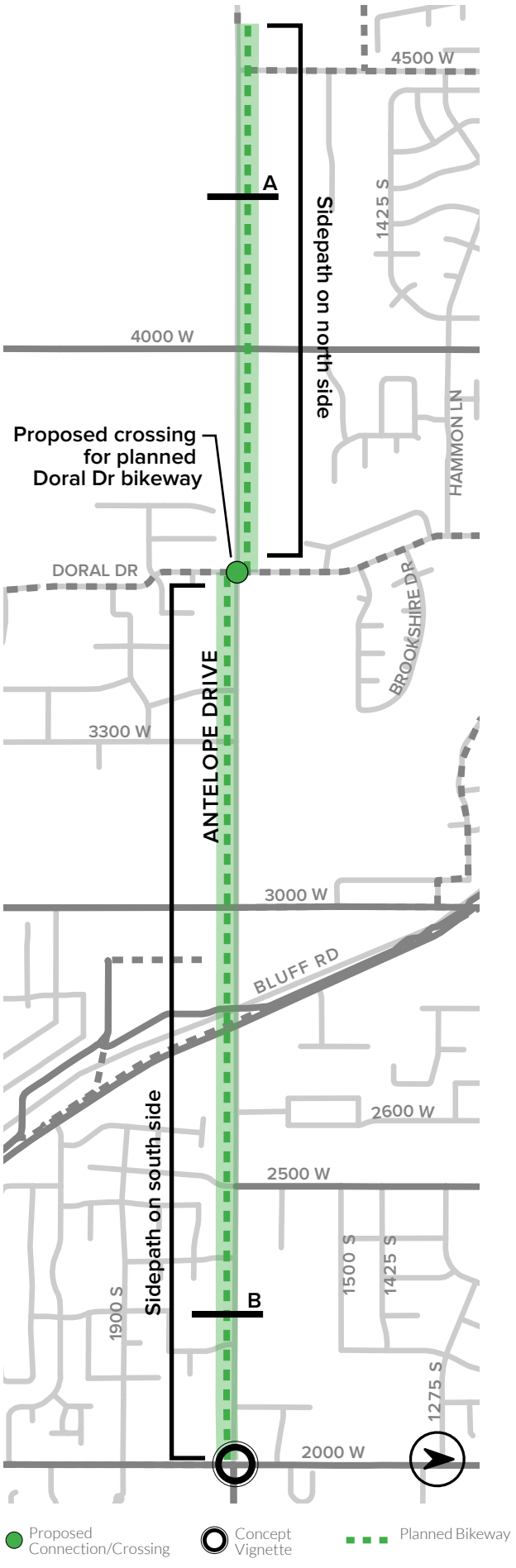
Benefits

MULTI-MODAL EAST/WEST CONNECTIVITY Many of Clearfield's and Syracuse's commercial nodes fall along Antelope Drive. Combine this with the regional nature of this corridor in connecting people across the valley, enhanced bicycle/pedestrian facilities greatly expand multi-modal connectivity.

SERVES A WIDER RANGE OF CYCLISTS Antelope Drive is currently a well-traveled route by sport cyclists who are comfortable sharing the road with traffic. By providing an enhanced on-street experience as well as an off-street option, this project improves the comfort of existing cyclists while making bicycle travel a viable option for people who prefer more protection from motor vehicles.

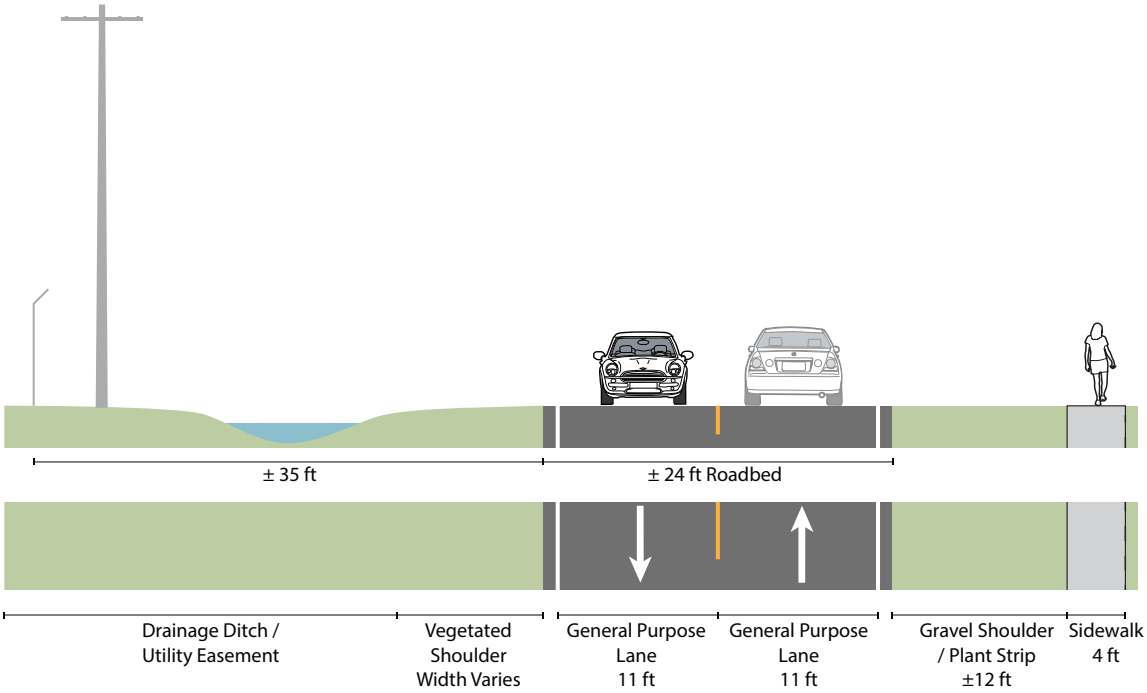
Key Considerations

- Coordination with future developments and adjacent property owners will be critical as the sidepath may infringe on adjacent properties in some locations; alternatively, realignment of street center line or relocation of curb and gutter can be explored

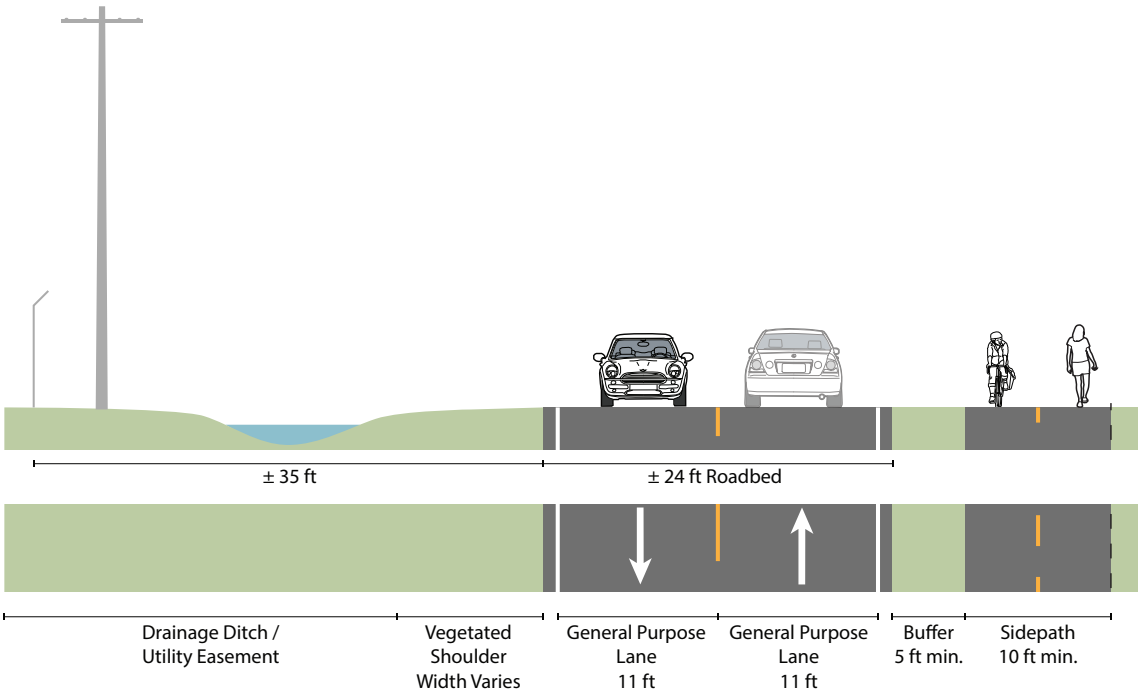


Typical Cross Section **A**

Existing Conditions

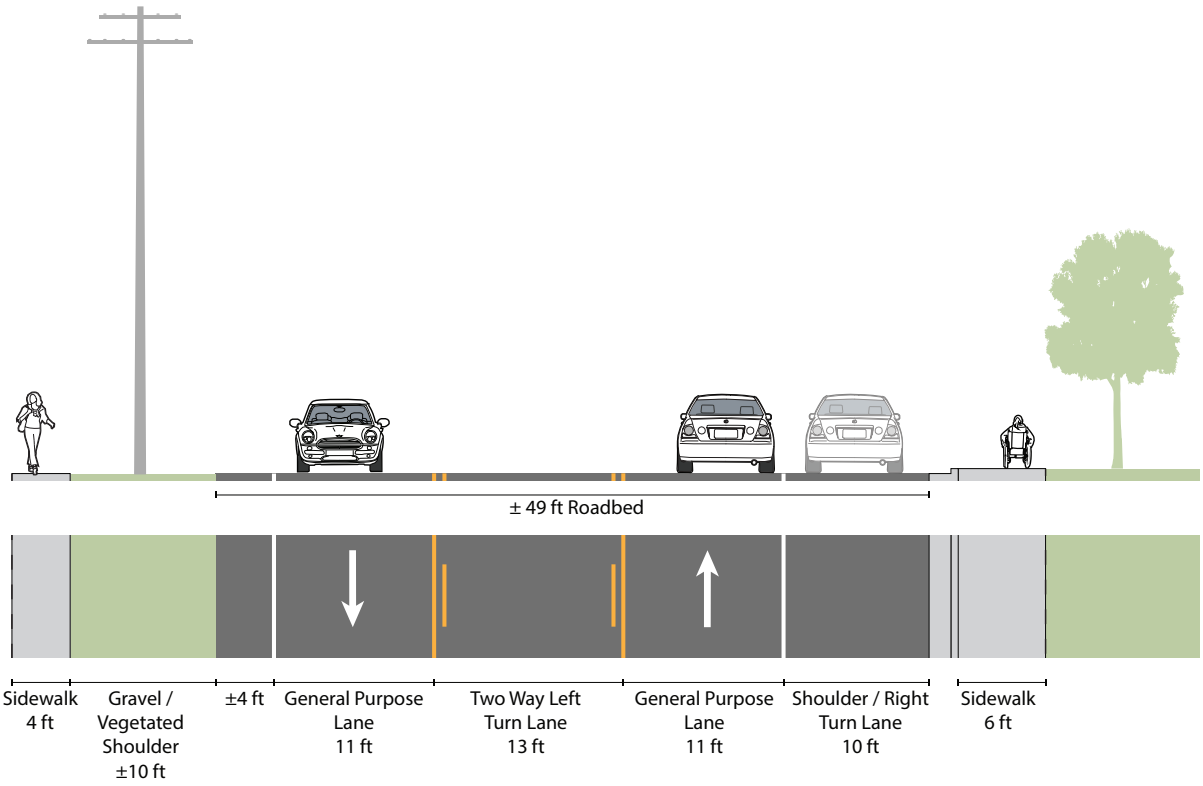


Proposed Sidepath

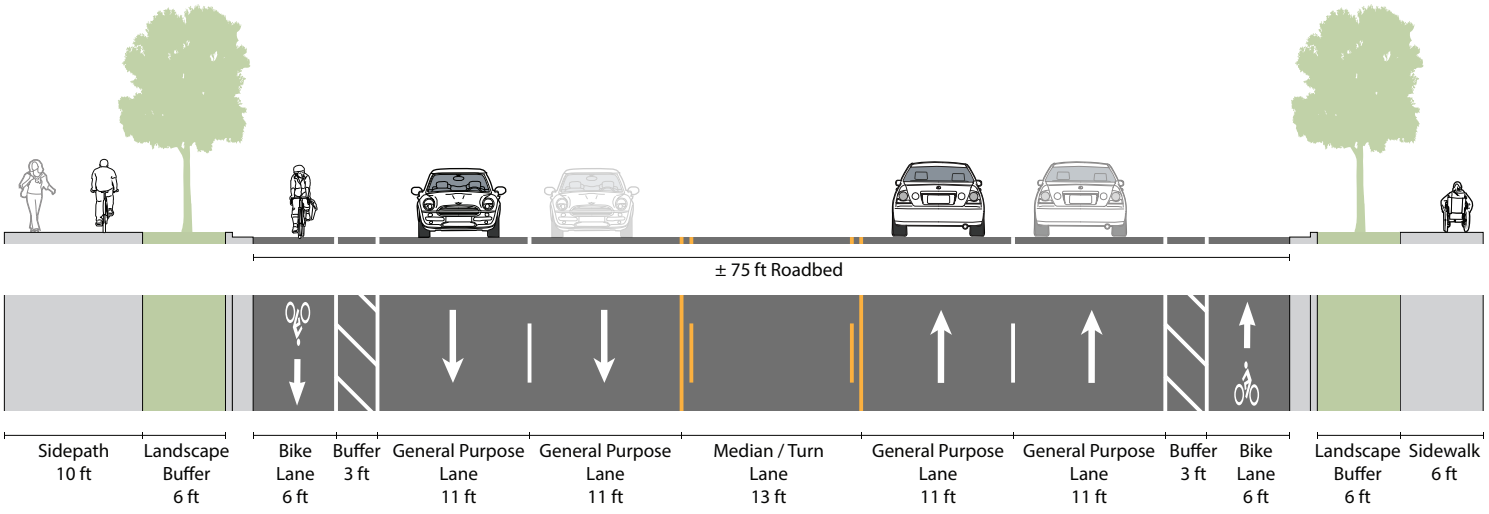


Typical Cross Section **B**

Existing Conditions



Proposed Sidepath and Bike Lanes

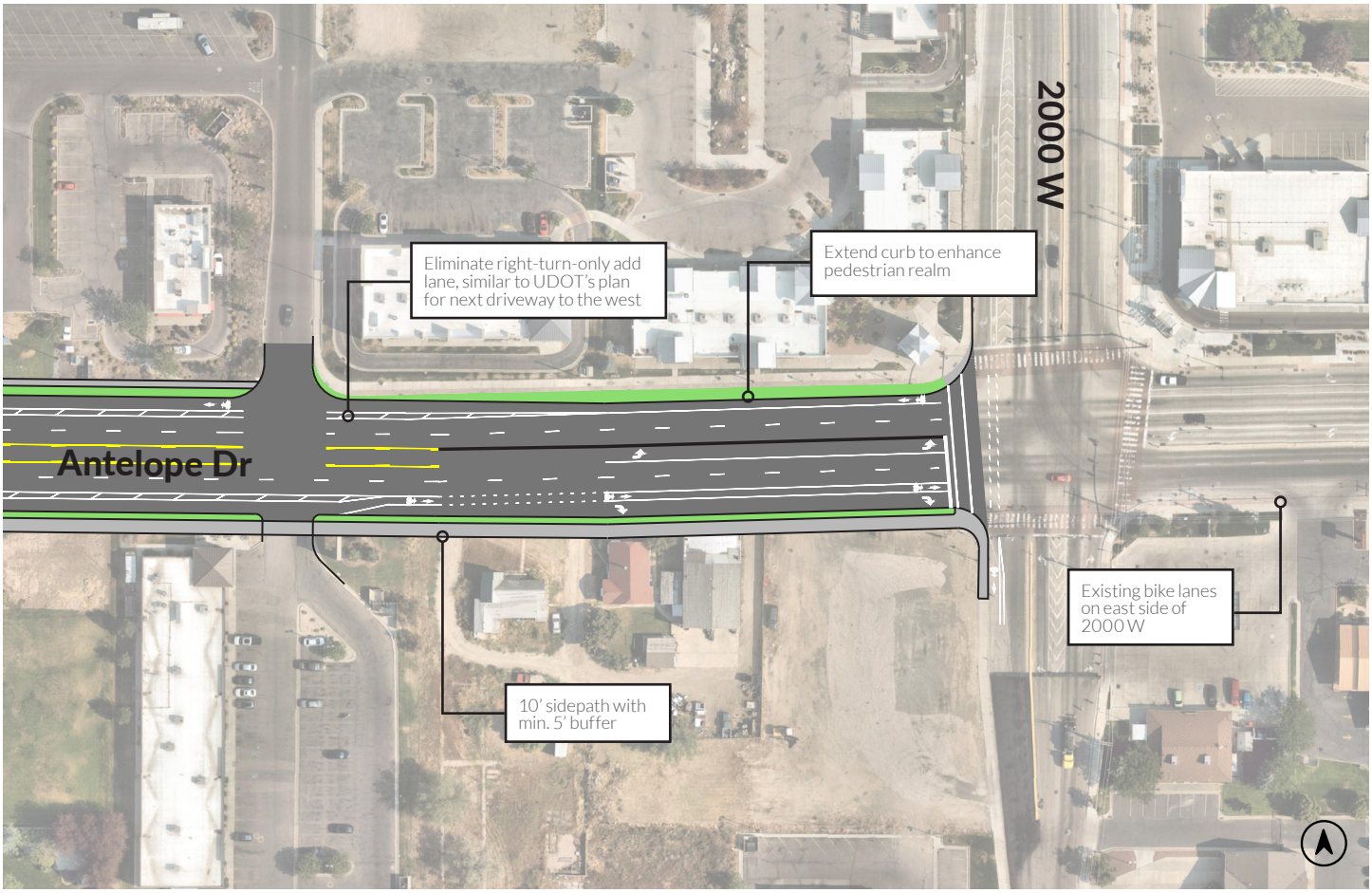


Antelope Drive at 2000 W

Plans for the West Davis Corridor include enhancements to Antelope Dr from about 3300 W to 2000 W. While the current plans call for conventional bike lanes, this plan proposes they be upgraded to buffered bike lanes and include a higher-comfort sidepath along the south side of the street. This may require right-of-way negotiations, but otherwise the proposed concept works within the same constraints of UDOT's preliminary design.

Key considerations:

- Provide on-street bike lanes for recreational cyclists that often use the corridor and an off-street sidepath for more casual cyclists accessing businesses
- Closely consider on-street parking and/or shoulder needs along Antelope Dr. to allocate more room for bicyclists and pedestrians where possible



Antelope Dr

From 1000 W to 1000 E

Project Summary

Antelope Drive serves as a major east/west connector through Syracuse and Clearfield. With connections to I-15 to the east and Antelope Island State Park to the west and commercial nodes and residential access dotted in between, this arterial corridor plays a big role for motorists, bicyclists, and pedestrians alike in their daily commutes, everyday errands, and recreational trips. This project fills a gap in the existing bike network by providing both on- and off-street facilities for people on bikes to accommodate users of varying ages and abilities. The proposed facility includes a sidepath along the south side of Antelope Drive and buffered bike lanes in both directions.

Estimated Cost: $2.45 million

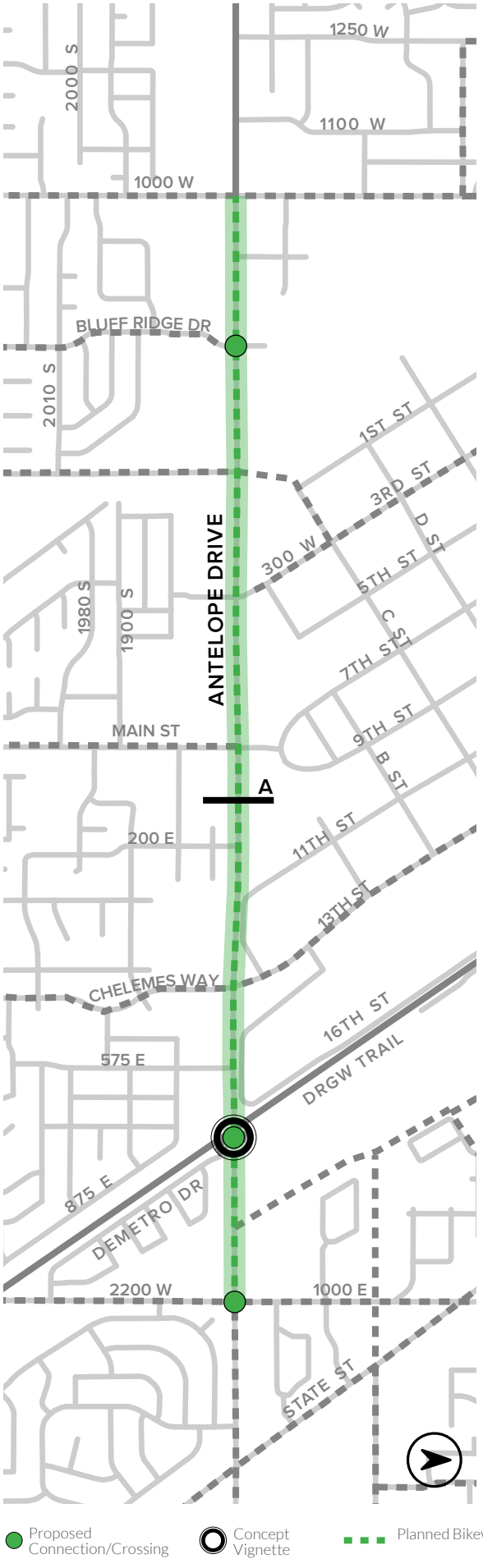
Benefits

MULTI-MODAL EAST/WEST CONNECTIVITY Many of Clearfield's and Syracuse's commercial nodes fall along Antelope Drive. Combine this with the regional nature of this corridor in connecting people across the valley, enhanced bicycle/pedestrian facilities greatly expand multi-modal connectivity.

SERVES A WIDER RANGE OF CYCLISTS Antelope Drive is currently a well-traveled route by sport cyclists who are comfortable sharing the road with traffic. By providing an enhanced on-street experience as well as an off-street option, this project improves the comfort of existing cyclists while making bicycle travel a viable option for people who prefer more protection from motor vehicles.

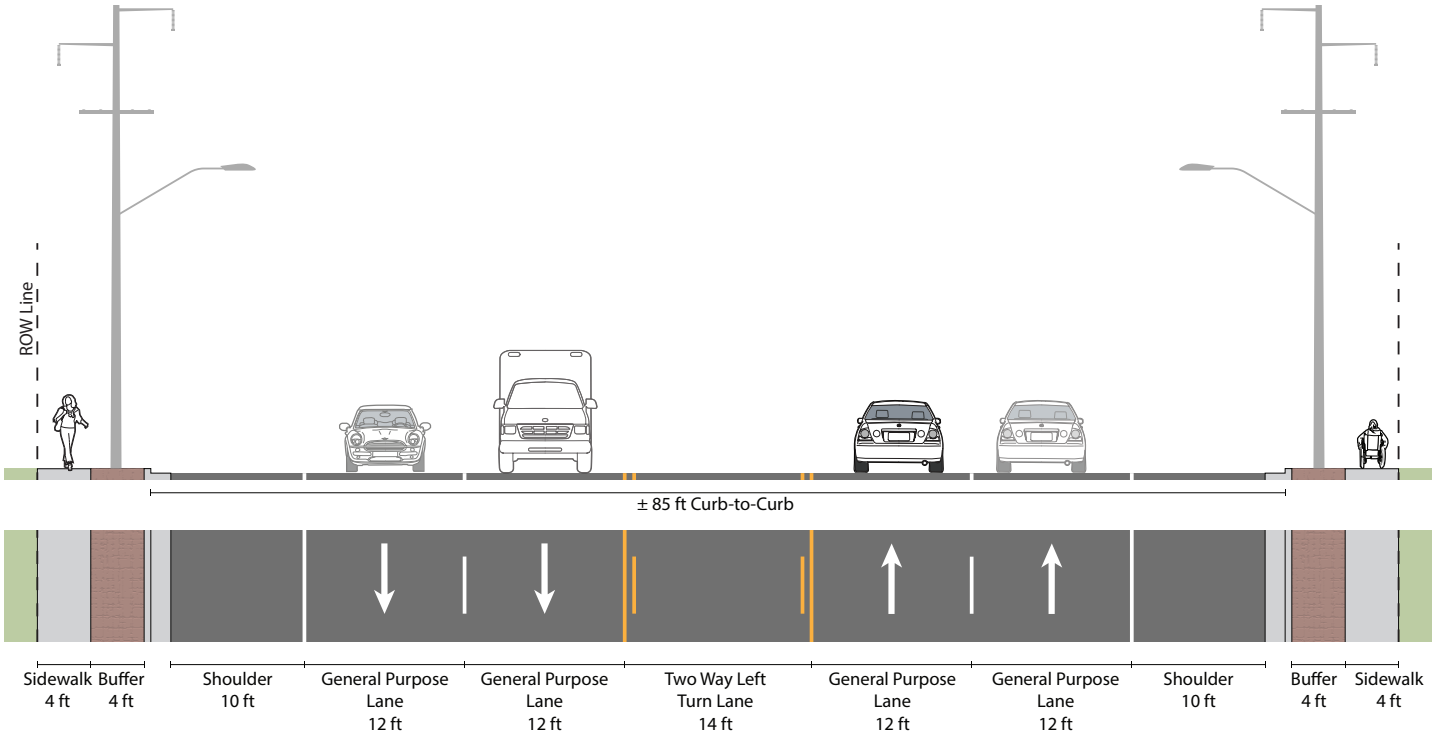
Key Considerations

- Coordination with future developments and adjacent property owners will be critical as the side path requires slightly more ROW; alternatively, relocation of curb and gutter can be explored
- Utility poles vary in location and may present constraints or induce higher costs due to relocation

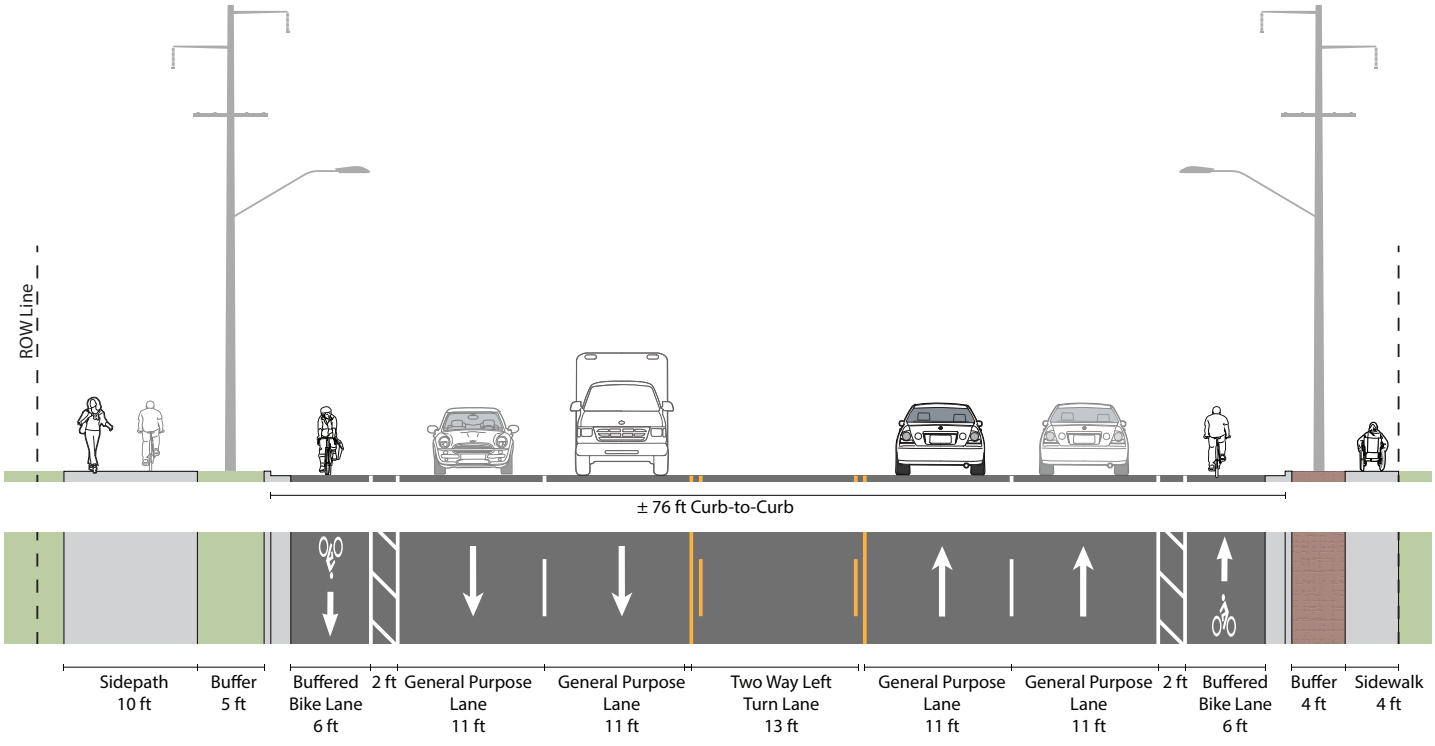


Typical Cross Section **A**

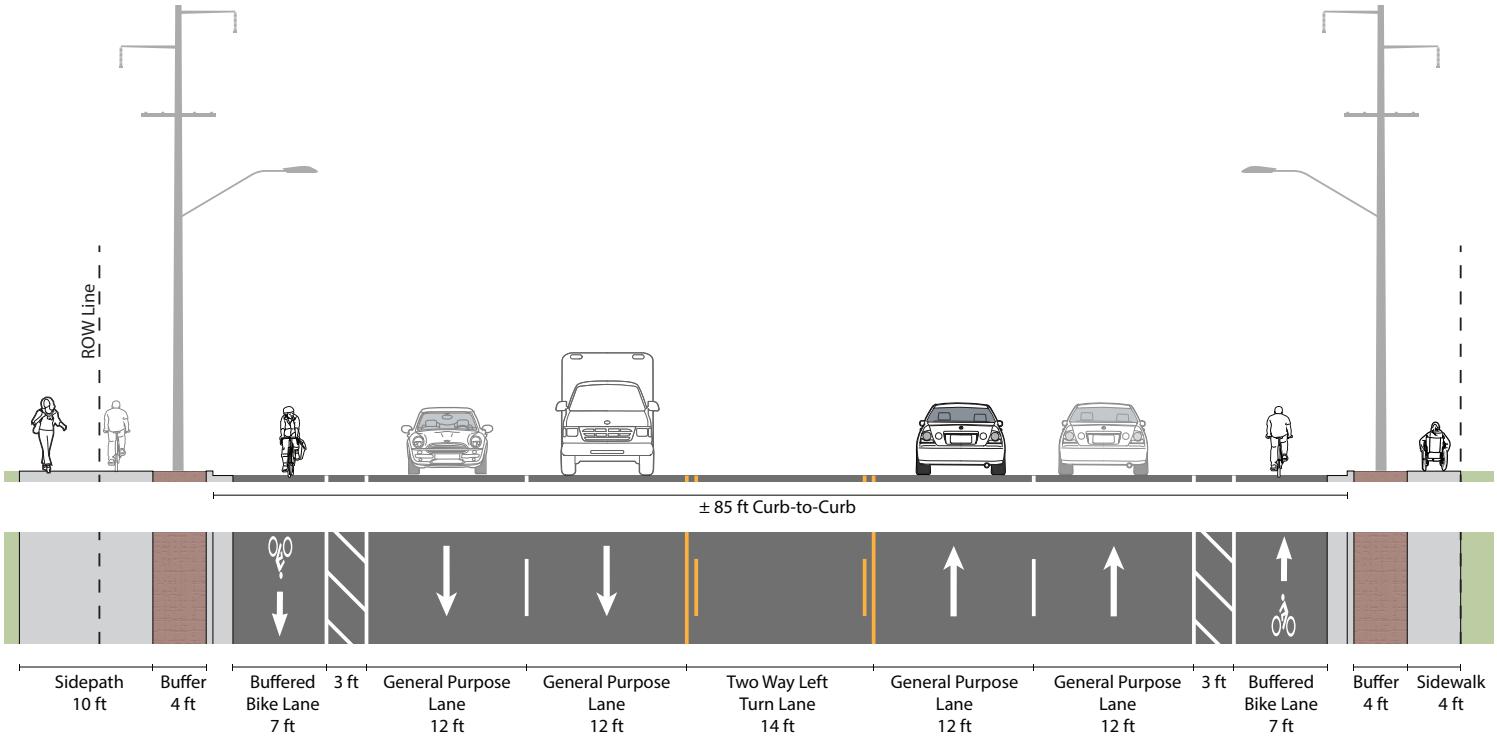
Existing Conditions



Proposed Sidepath and Buffered Bike Lanes | Concept 1: Move curb & gutter



Proposed Sidepath and Buffered Bike Lanes | Concept 2: ROW Acquisition

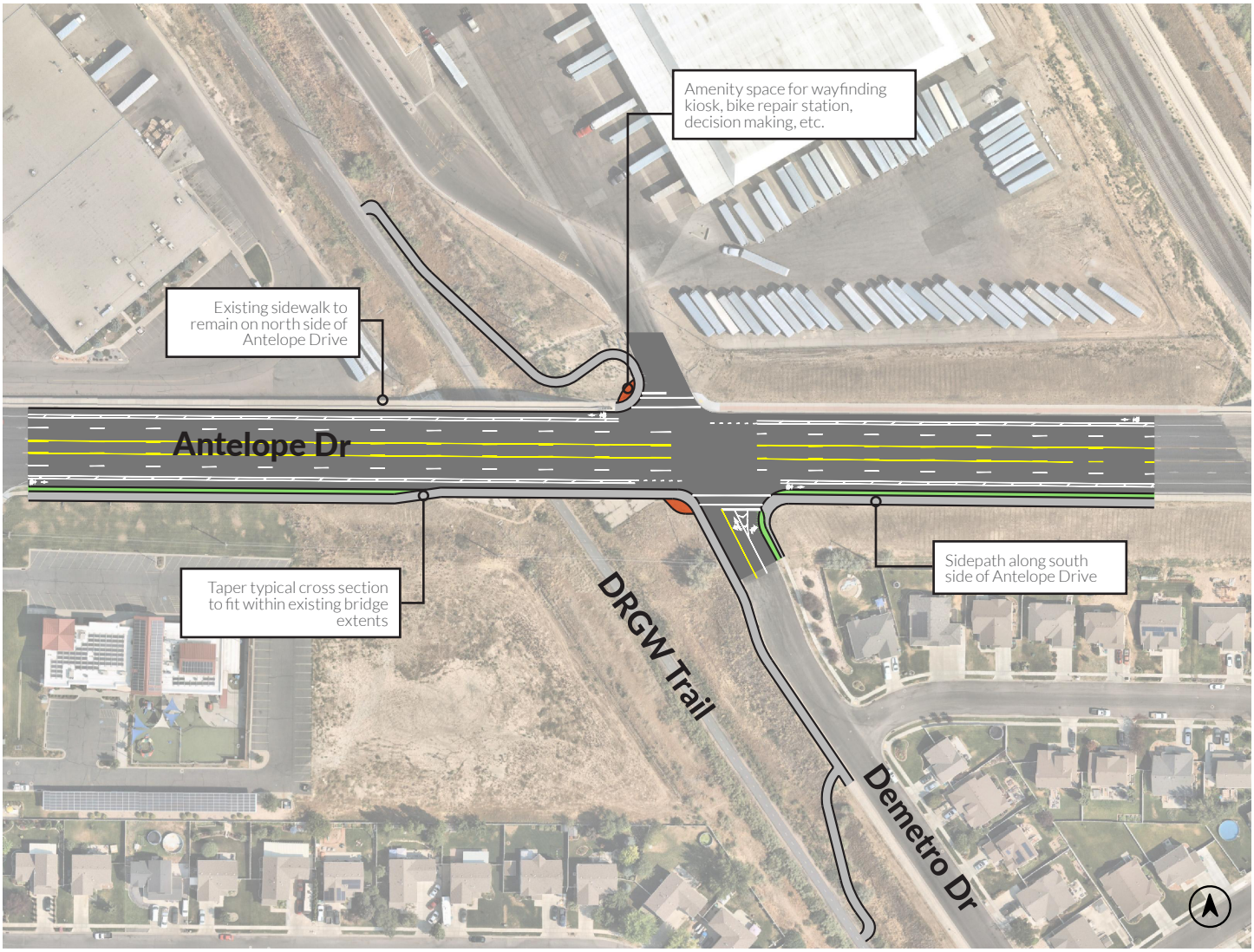


Antelope Drive at DRGW Trail

This concept vignette explores conceptual design at the intersection of Antelope Drive with the DRGW Trail. Making a connection at this junction between the two intersecting bikeways increases the density and reach of the active transportation network and expands the network of high-comfort, off-street facilities.

Key considerations:

- Significant grade change between Antelope Drive and the DRGW Trail will require further study and survey to determine feasibility and accurate cost estimates.
- The typical cross section for Antelope Drive will need to be adapted to work within the constraints of the existing bridge over the DRGW Trail. This may include reducing or eliminating the planted buffer between the sidepath and roadway and/or reducing buffer widths of buffered bike lanes.
- Wayfinding along the DRGW Trail and at the corners of Demetro Drive will be critical to help cyclists safely navigate the interchange between Antelope Drive and the DRGW Trail



250 W

From 2575 N to 800 N

Project Summary

With the exception of busy, high-speed Main Street (HWY 126), Sunset's only significant north-south corridor is 250 W. With a fairly narrow existing cross section, on-street parking, relatively low volumes, and the presence of several important destinations, 250 W is a prime candidate for a neighborhood byway. A neighborhood byway is a shared street bikeway that utilizes pavement markings, signage, and traffic calming elements (e.g. curb bulbouts, speed humps, etc.). The goal of a neighborhood byway is to create a quiet street that mitigates high speeds and cut-through traffic and communicates that the street is meant for people on bikes.

Estimated Cost: $125,251

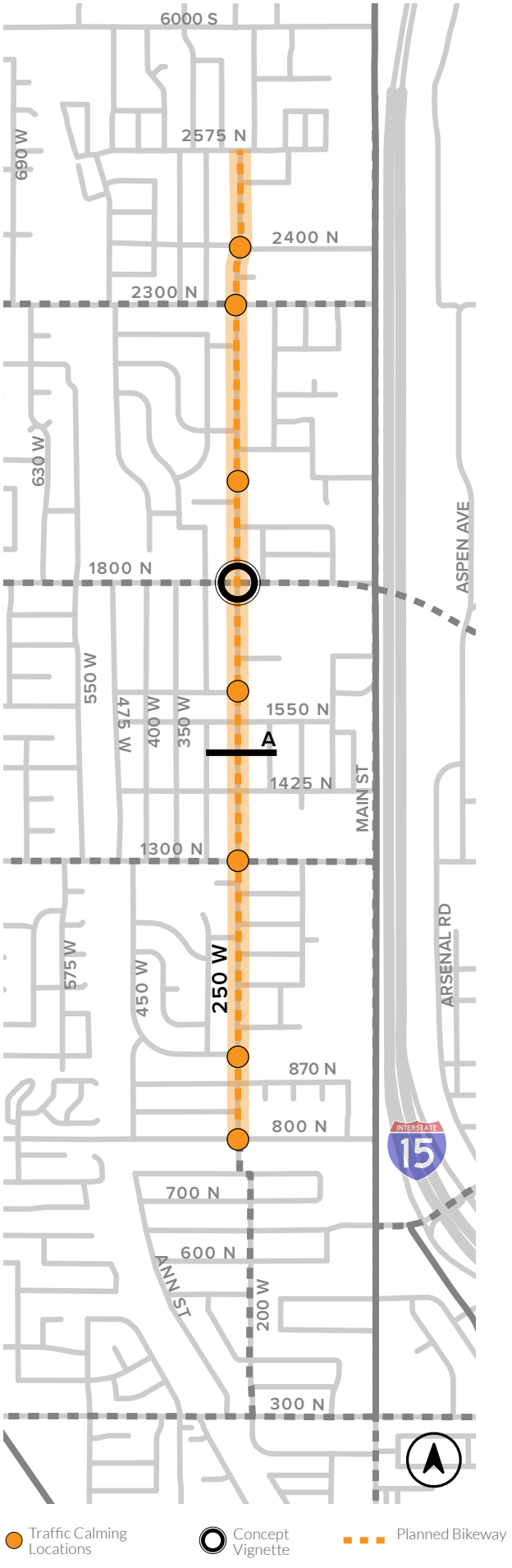
Benefits

ENHANCED NORTH/SOUTH CONNECTION FOR ALL MODES These proposed enhancements along 250 N make traveling in Sunset by bike or on foot more feasible and comfortable. Many of Sunset's important destinations such as schools, churches, parks, and grocery stores are on 250 W or within a block of the corridor. A neighborhood byway can turn 250 W into a central, multi-modal spine where people of varying ages and abilities feel comfortable and safe walking and biking.

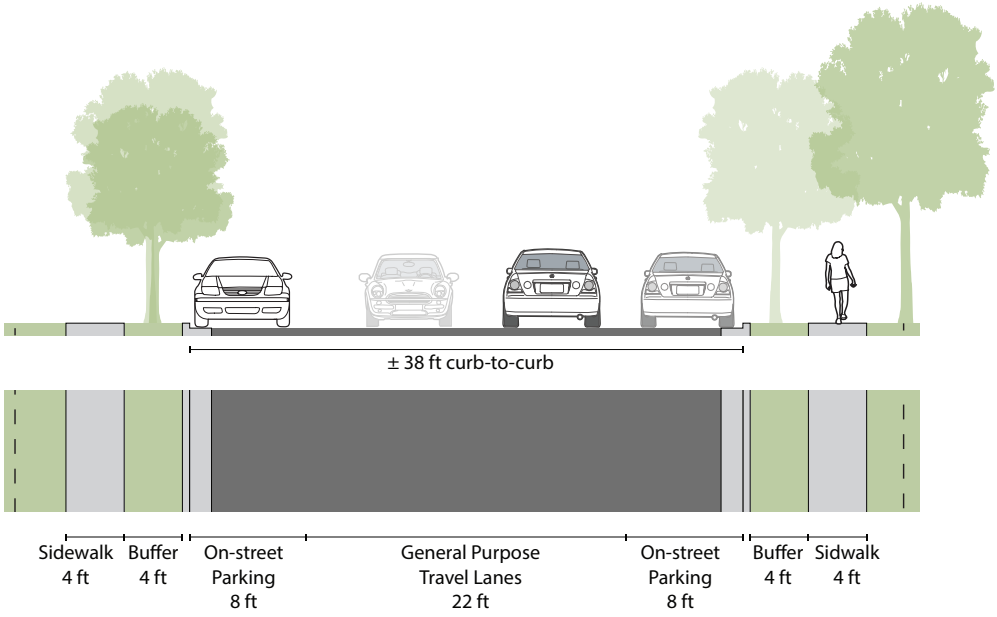
SAFE ROUTES TO SCHOOL Four schools can be found along the 250 W corridor in Sunset: three elementary schools and one junior high, with all students under driving age. This project presents significant benefits for families with children attending these schools, including increased physical activity, safety, and less drop-off/pick-up traffic.

Key Considerations

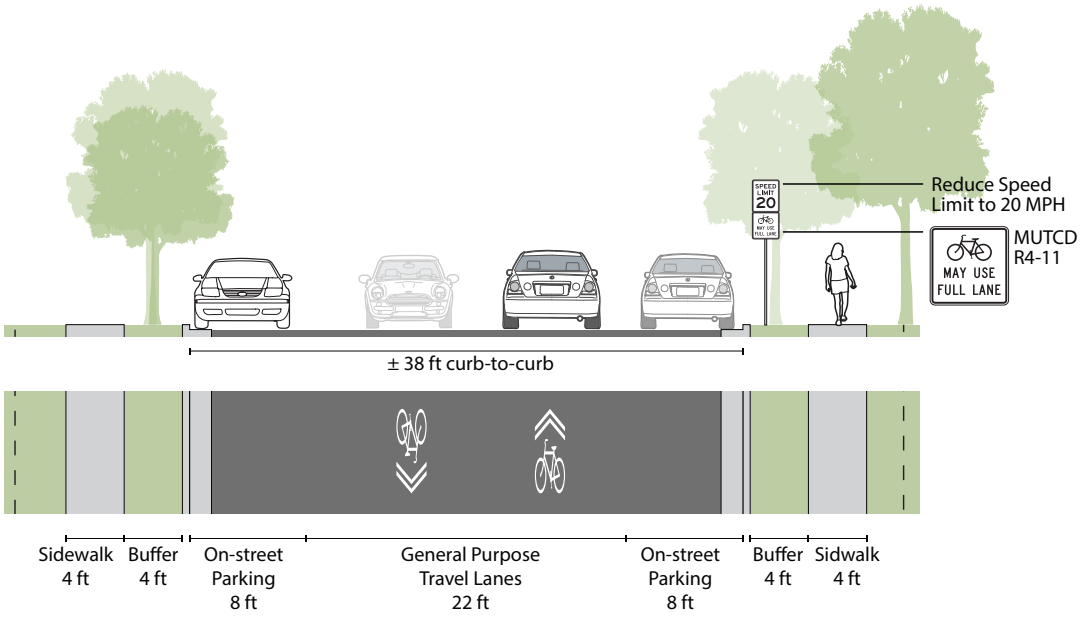
- This project would require minimal to no impacts on current access, parking, and infrastructure along the corridor



Existing Conditions



Proposed Neighborhood Byway

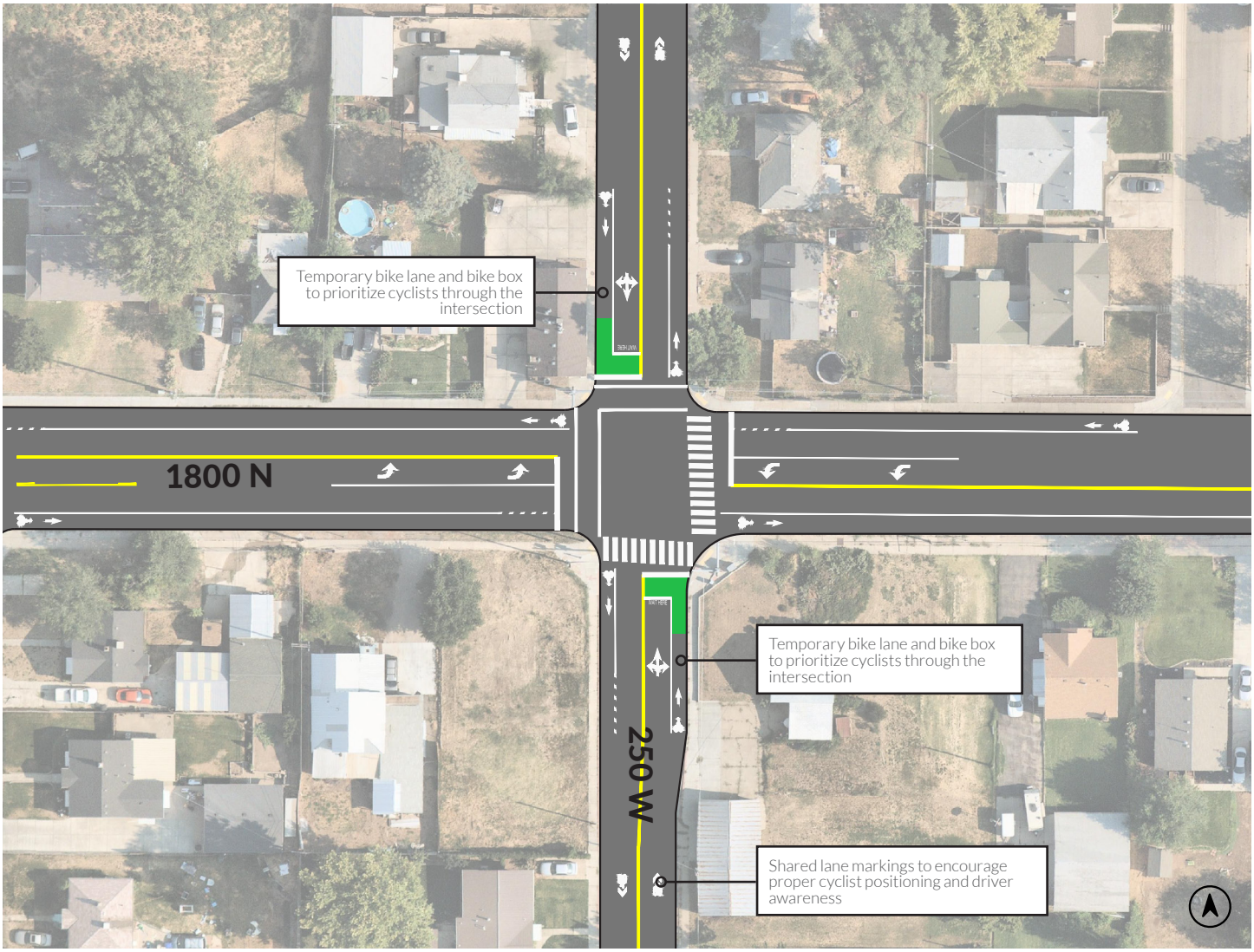


250 W at 1800 N

Statistically, most vehicle-bike conflicts occur at intersections, and a bikeway is only as comfortable and safe as its most uncomfortable, dangerous intersections and crossings, which is why special attention should be given to intersections such as 1800 N along the the 250 W corridor. The illustration below provides conceptual design for the intersection of 250 W and 1800 N in Sunset.

Key considerations include:

- Using short bike lanes approaching and exiting the intersection to position cyclists in a predictable way that is visible to motorists
- The incorporation of green bike boxes to prioritize bicycles at the intersection and increase visibility



Traffic Calming Along 250 W

Traffic calming is the implementation of physical infrastructure that serves the purpose of mitigating high vehicle speeds and cut-through traffic. These infrastructural interventions typically fall into one of two categories: vertical deflection and horizontal deflection. Vertical deflection is achieved with elements such as speed bumps, speed humps, or raised crossings. Horizontal deflection is achieved with elements such as curb bulbouts (or extensions), traffic circles, traffic diverters, or chicanes (slight bends in the travel lane). Both vertical and horizontal deflection interventions encourage drivers to slow down and give more attention to the roadway.

Recommended traffic calming elements for 250 W:

- Curb bulbouts. Curb bulbouts are most common and easily implemented at intersections. On-street parking is typically prohibited within a certain distance from intersection corners, indicated with red paint and/or "No Parking" signage, so this space on the side of the road at intersections becomes wasted space that can be better utilized with curb bulbouts. Curb bulbouts, also referred to as curb extensions, not only create perceived pinch points for motorists (thus encouraging slower speeds), but they also make pedestrians waiting to cross more visible and reduce the distance required to cross. Curb bulbouts can also occur mid-block to accommodate mid-block crossings or to slow traffic on a longer stretch of road. The plan suggests that curb bulbouts be explored for the intersections of 2400 N, 2300 N, 1300 N, 800 N, and at mid-block school crossings for the 250 W neighborhood byway.
- Traffic circles. Traffic circles are small circles placed at intersections or mid-block and function much like a roundabout in terms of traffic flow. These circles can be constructed with permanent or temporary materials, and can be used to beautify the community with vegetation or pavement art. Traffic circles differ from roundabouts in their size and only require motorists to make a slight horizontal adjustment in their line of travel, but enough to encourage slow speeds and awareness. The 250 W corridor could benefit from a traffic circle at 2400 N (in lieu of curb bulbouts).
- Pavement treatments. Although not categorized as vertical or horizontal deflection, pavement treatments such as painted murals or changes in material (e.g. pavers) can significantly influence the feel of the street by making it feel more pedestrian-oriented, thus encouraging slower speeds and more careful motorist behavior. This plan suggest the community of Sunset explore opportunities for pavement treatments in front of one or several schools located along the corridor.

1800 N

From Hooper Irrigation Canal to Layton Canal

Project Summary

1800 N serves as a major east-west connector in North Davis County across three jurisdictions: West Point, Clinton, and Sunset. From a bicycle and pedestrian perspective, 1800 N in West Point plays a significant role in network connectivity, spanning between two planned north-south canal trails: Hooper Irrigation Canal and Layton Canal. The recommendation for this corridor is conventional bike lanes in both directions.

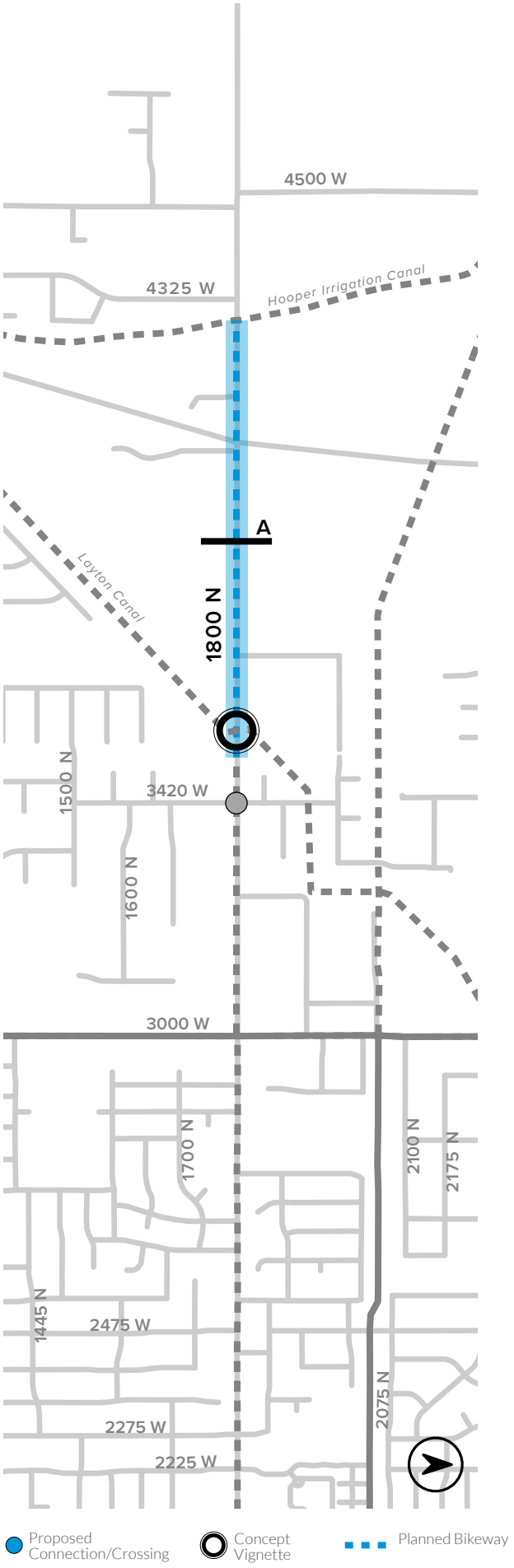
Estimated Cost (not including road widening): $58,519

Benefits

EAST/WEST CONNECTIVITY Bike lanes on 1800 W will accommodate bicyclists who currently share travel lanes with 45 mph traffic and narrow shoulders, also connecting them to Clintons commercial node at 2000 W. This particular segment in West Point serves as a critical connection between two future off-street, north-south corridors.

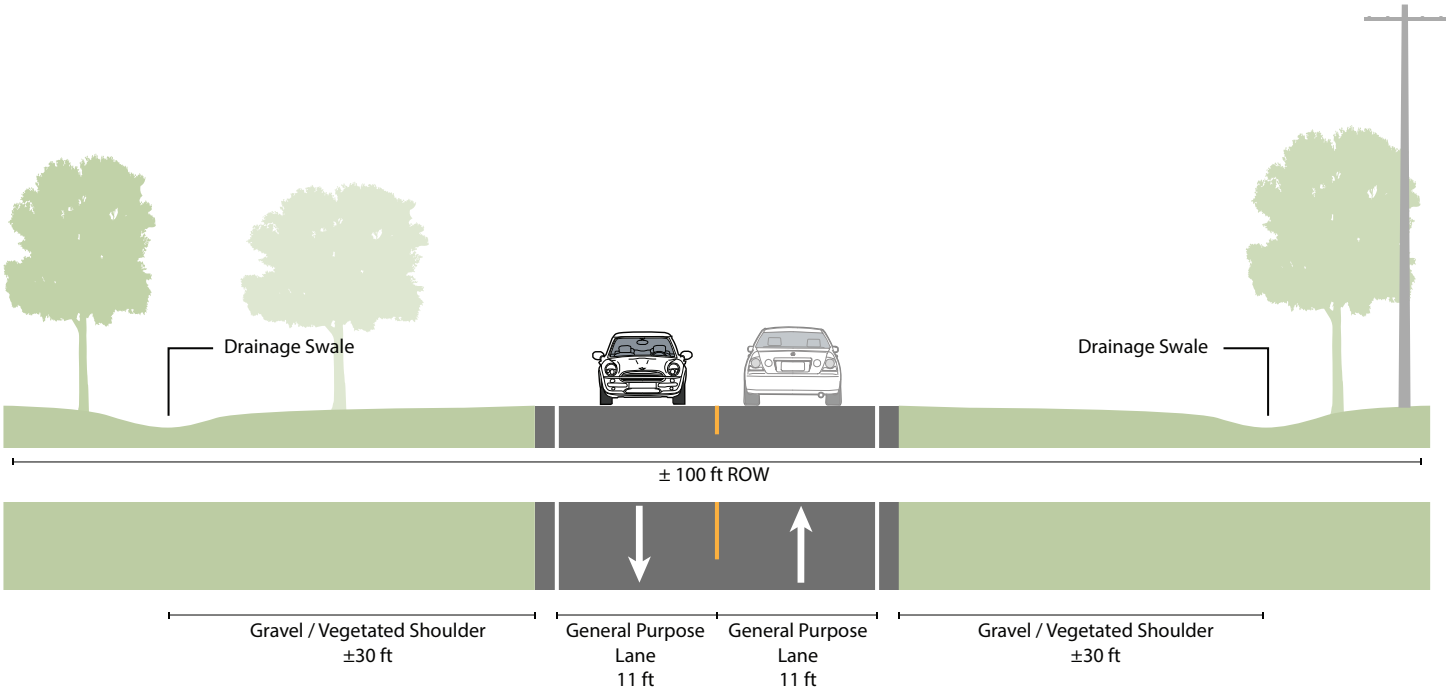
Key Considerations

- Coordinate with UDOT to piggy back on any potential future plans for the corridor
- Current conditions include a very narrow shoulder, so implementing bike lanes would require widening in most cases along the corridor in West Point
- Any wide shoulders should be utilized to implement buffered bike lanes when possible
- Alternatively, consider utilizing the wide right-of-way to implement a high-comfort, separated sidepath

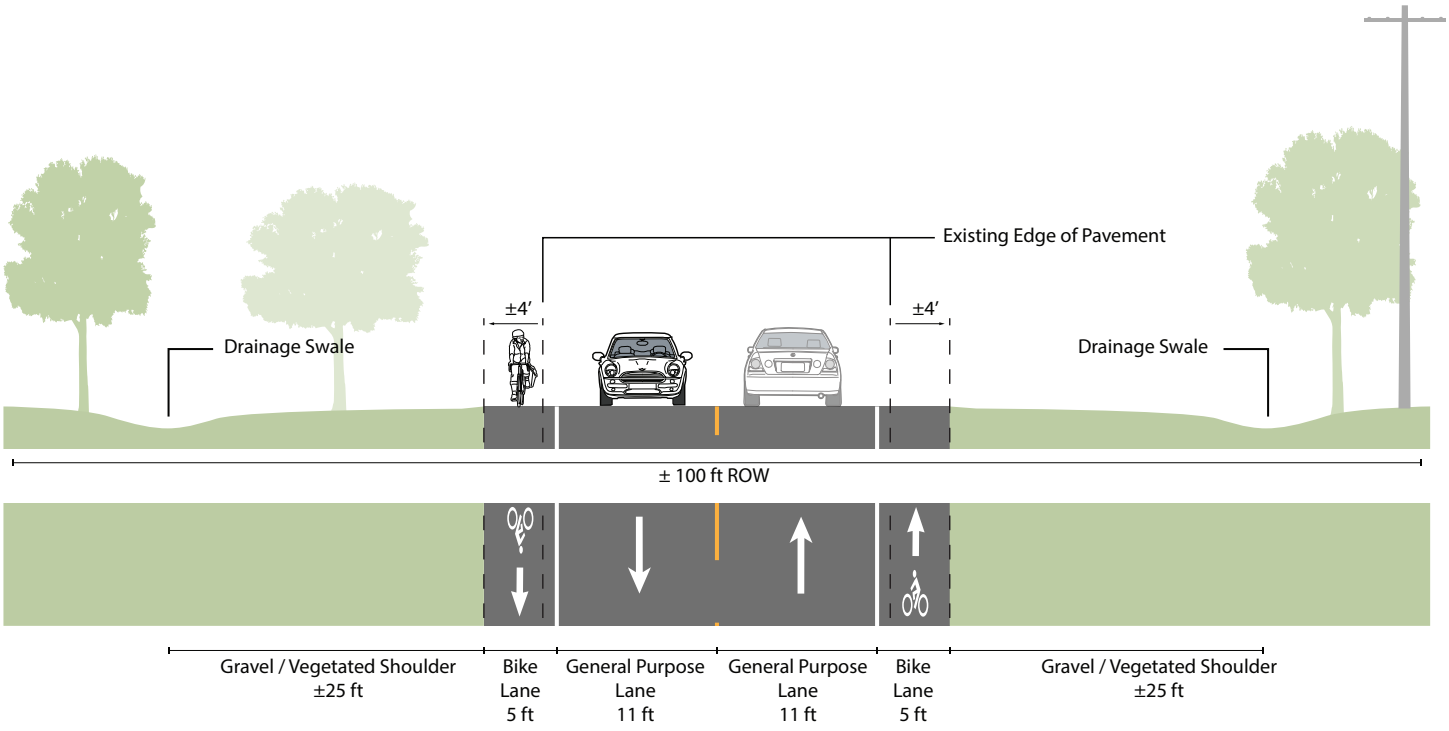


Typical Cross Section **A**

Existing Conditions



Proposed Bike Lanes

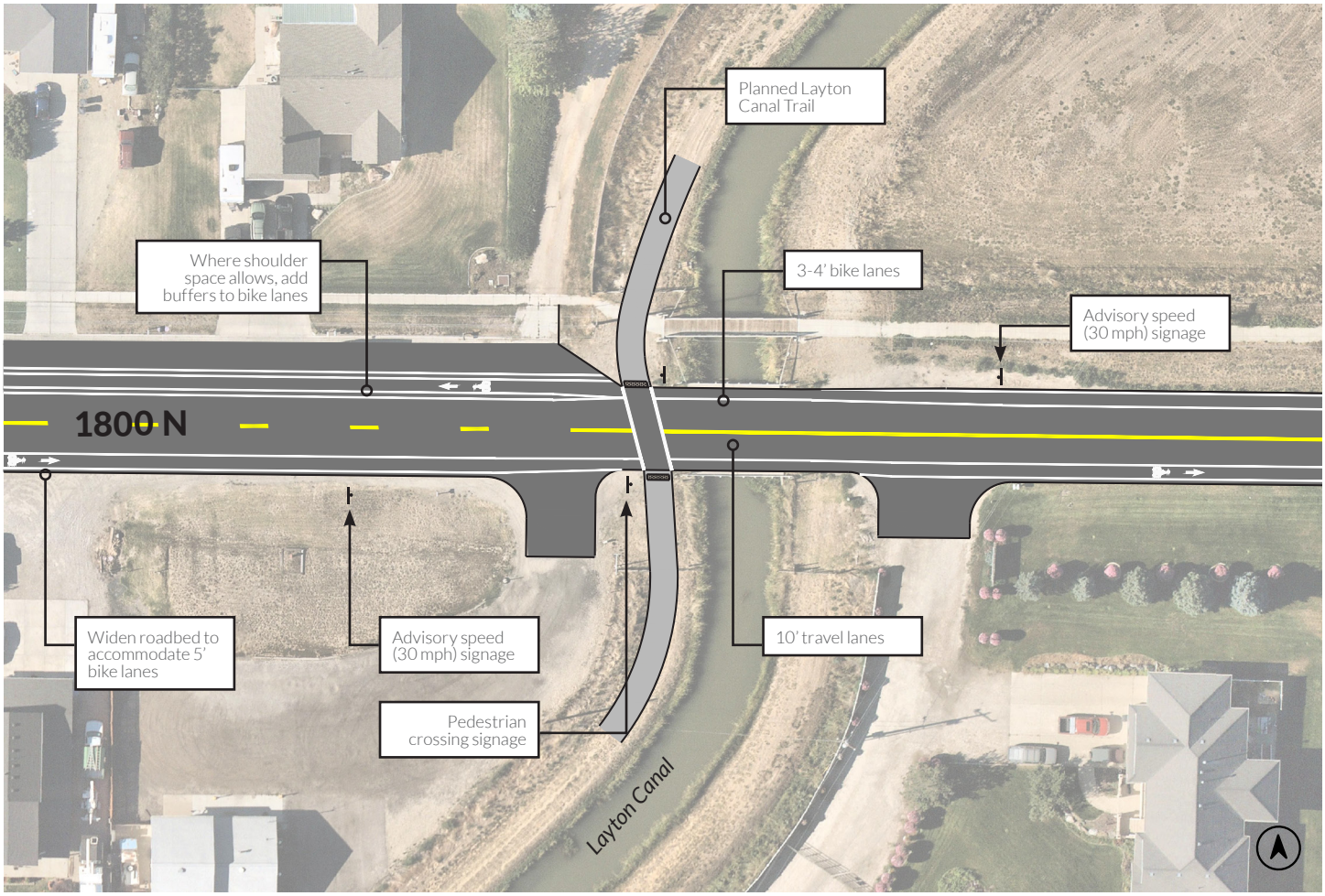


1800 N at Future Layton Canal Trail | Concept 1

Where 1800 N crosses the Layton Canal presents challenges for safely accommodating cyclists along and across the corridor. Without widening the existing canal bridge or providing newly constructed separated bike/ped bridges, options for carrying the typical cross section across the bridge are limited. The first concept, illustrated below, looks at narrowing travel lanes from 11' to 10' and striping bike lanes across the bridge that would only be 3-4' in width. While not ideal for cyclists, short distance and constrained travel lanes make it a possible solution and is preferred over forcing cyclists to merge into the travel lane to cross the bridge.

Key considerations:

- UDOT plans indicate an intent to widen 1800 N in Phase II of the West Davis Corridor implementation; depending on timing, this could affect bikeway plans for the corridor
- Include ample warning signage, including a bridge advisory speed of 30 mph

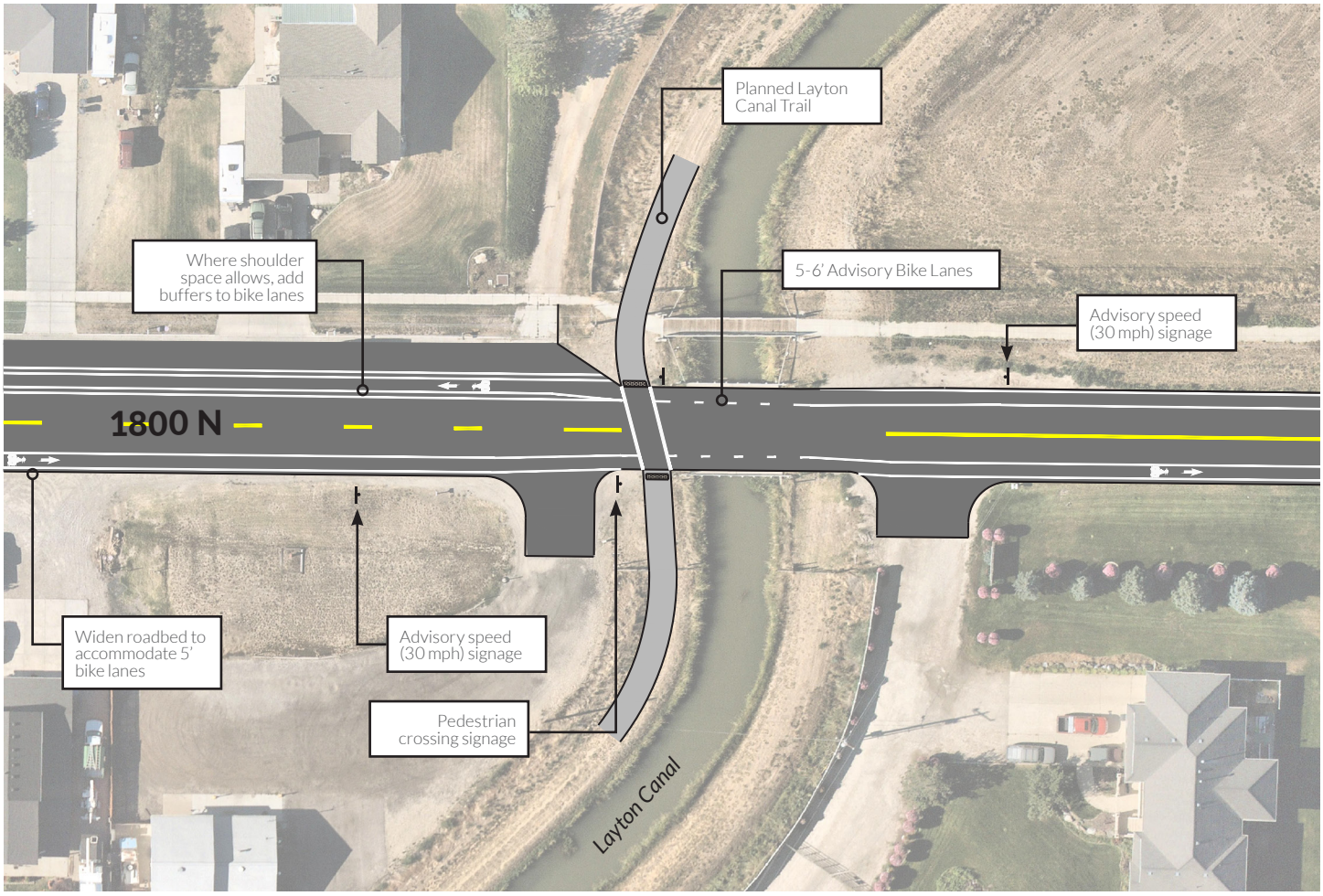


1800 N at Future Layton Canal Trail | Concept 2

A second concept for accommodating bicyclists across the bridge is the implementation of Advisory Bike Lanes (ABLs). This treatment removes the center striping and provides a roughly 18' clearance for motorists to cross the bridge. Dashed striping of the bike lane indicates that motorists are allowed to use the bike lane when oncoming traffic is crossing the bridge at the same time. This allows for wider bike lanes (5-6') across the bridge to better accommodate people on bikes. In the rare case that two-way motor traffic and one or more bicyclists approach the bridge at the same time, ABLs and their associated signage dictate that motorists yield to bicyclists and negotiate with oncoming traffic until it's safe for both motorists to pass each other. While ABLs are typically recommended on streets with lower speeds, low traffic volumes (±3,000 ADT) along 1800 N and the short length for which this treatment would be implemented alleviates major concerns.

Key considerations:

- UDOT plans indicate an intent to widen 1800 N in Phase II of the West Davis Corridor implementation; depending on timing, this could affect bikeway plans for the corridor
- Include ample warning signage, including a bridge advisory speed of 30 mph



Clinton City Community Trail

Project Summary

The Clinton City Community Trail is developing into a signature trail for Clinton and North Davis County residents, with meaningful connections to parks, schools, and neighborhoods. This project aims to fill gaps in the existing trail and extend it west. Implementation feasibility is fairly high due to the available canal right-of-way and current use as a maintenance vehicle access road. Most effort will need be focused on making an intuitive, safe connection near 2000 W where a current gap in the trail exists.

Estimated Cost (not including ROW acquisition): $1.04 million

Benefits

EXPANDS EAST/WEST CONNECTIVITY By expanding the existing Clinton City Community Trail west and closing crucial gaps, this trail becomes a regional asset and connects more residents to several parks and schools in Clinton.

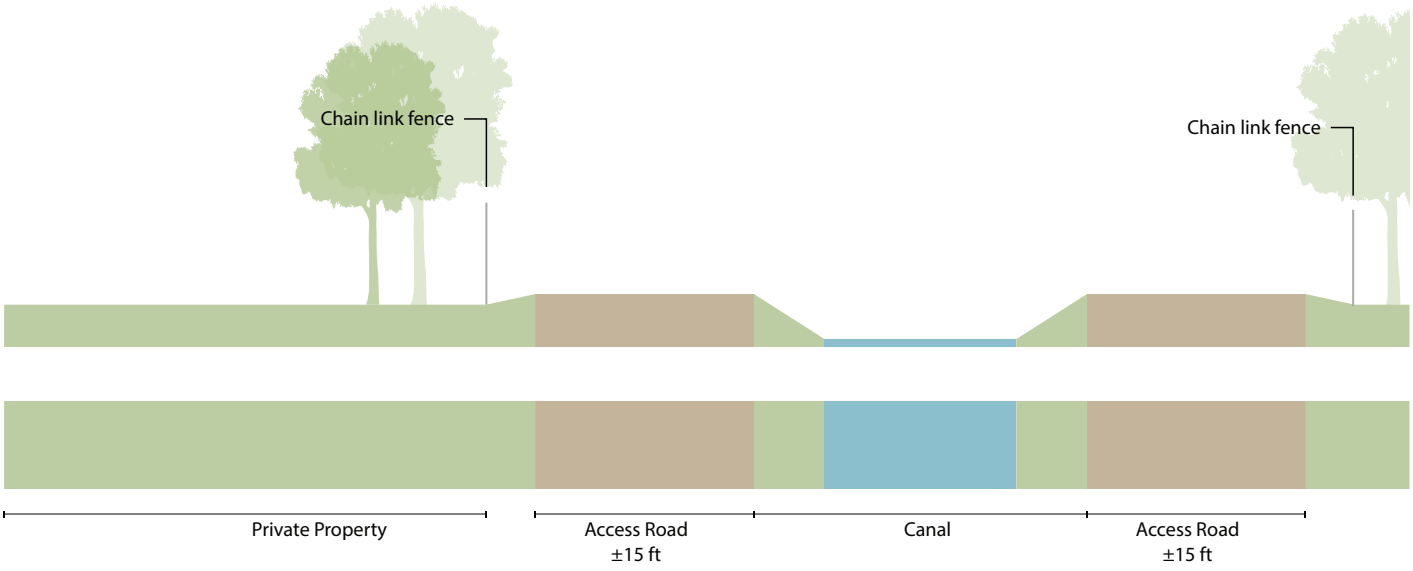
LINKS EXISTING AND PLANNED TRAILS The completion of this project would create a cohesive linkage between the planned Layton Canal Trail to the west and the existing Denver and Rio Grande Western Rail Trail to the east, expanding the regions family-friendly, high-comfort network of trails.

Key Considerations

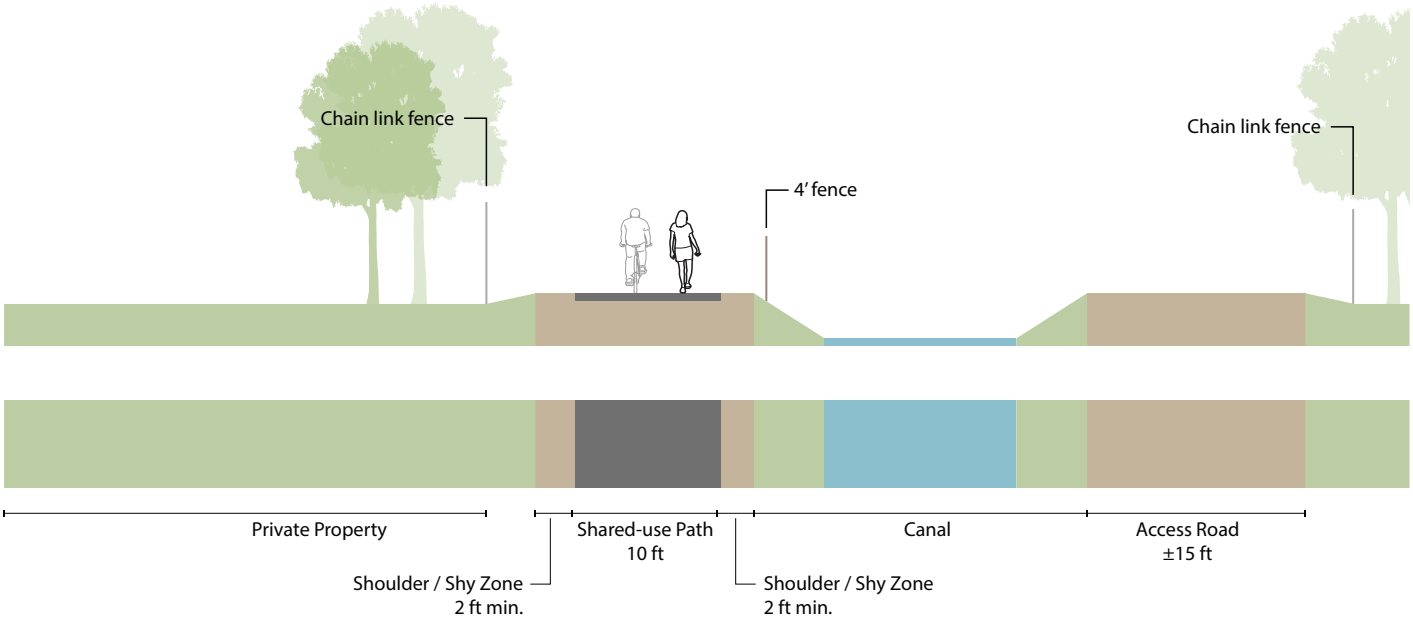
- Ensure safe crossings where trail intersects surface streets, namely 2000 W, 2475 W, and 3000 W
- Take measures to ensure safety along canals, considering canal maintenance and operations

Typical Cross Section **A**

Existing Conditions



Proposed Shared Use Path

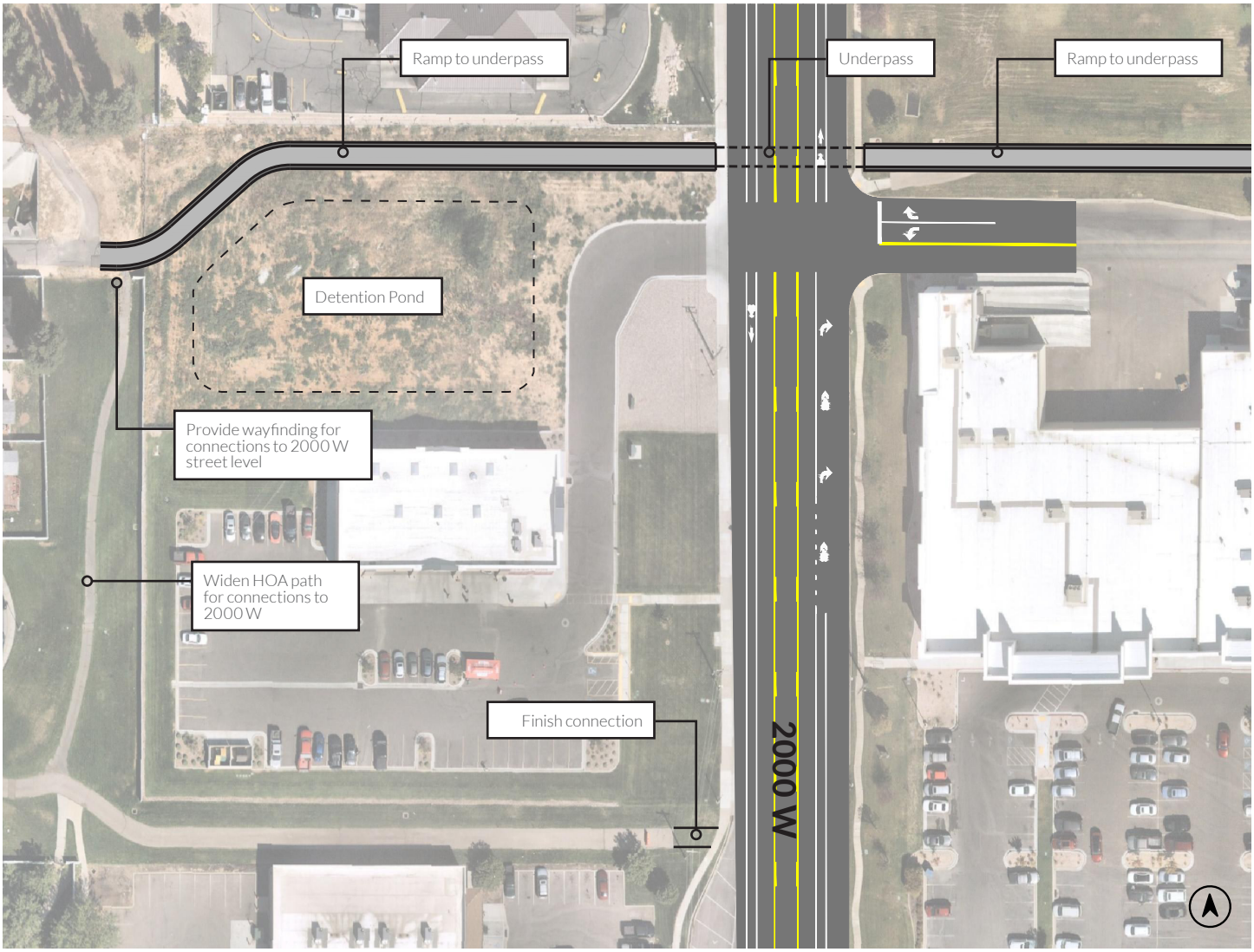


Clinton City Nature Trail at 2000 W | Grade-separated Crossing

Concurrent with this study, plans and design for a grade-separated crossing of 2000 W are in progress. The initial concept for the underpass is illustrated below. The North Davis County Active Transportation Plan recommends that the final design ensure convenient connections to 2000 W and surrounding commercial land uses, as current design concepts don't account for trail users accessing street level destinations along 2000 W. Additional concepts for at-grade crossings and trail connections are outlined and illustrated on the following pages.

Key considerations:

- Would require collaboration with private property owner to obtain easement (15' minimum for 10' trail and appropriate shy distance on both sides)
- Provides a direct route and safe crossing for east-west trail users
- Current design does not provide connections to and from the trail at 2000 W
- Requires collaboration with HOA to provide access to 2000 W

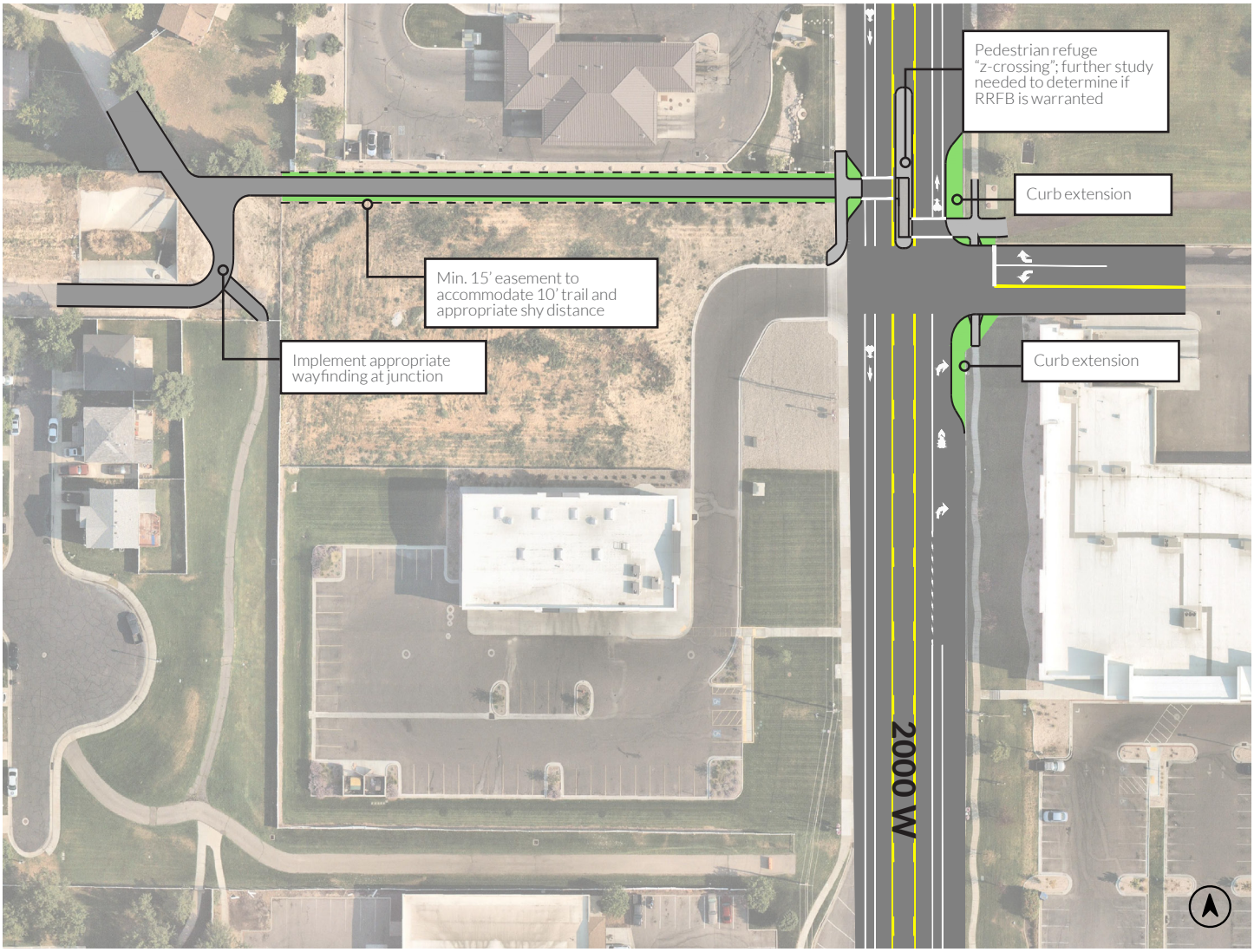


Clinton City Nature Trail at 2000 W | At-Grade Crossing, Concept 1

This concept vignette looks at closing a critical gap in the Clinton City Community Trail near 2000 W via an easement through private property as illustrated below. Both Concepts 1 and 2 include an enhanced, at-grade crossing of 2000 W.

Key considerations:

- Would require collaboration with private property owner to obtain easement (15' minimum for 10' trail and appropriate shy distance on both sides)
- Provides the most direct route to fill gap in existing trail network
- Would eliminate southbound left turns at pedestrian refuge island into shopping center rear entrance, potentially impacting delivery operations; however, southbound left turn access is still provided from 2000 W further south.

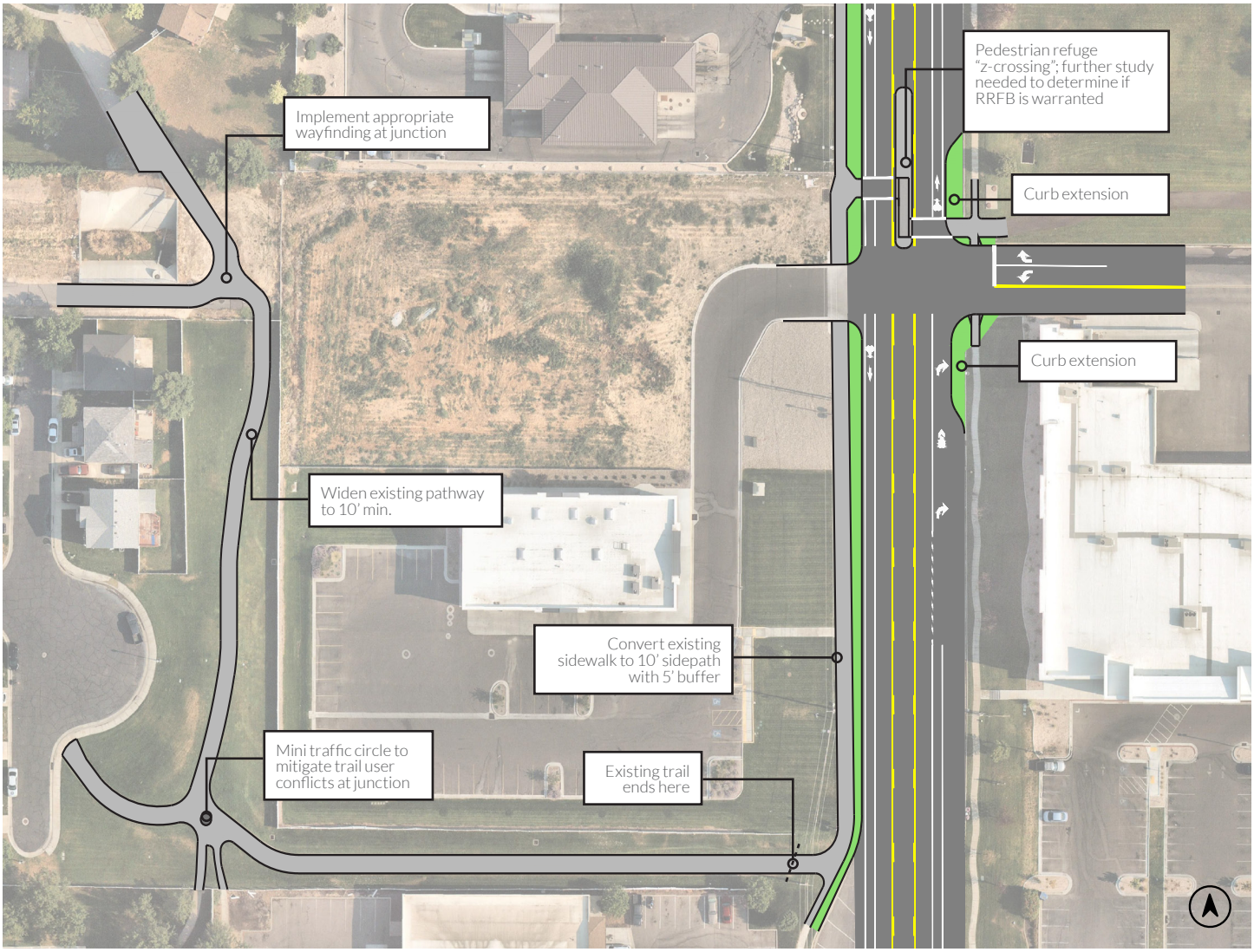


Clinton City Nature Trail at 2000 W | At-Grade Crossing, Concept 2

This concept vignette looks at closing a critical gap in the Clinton City Nature Trail near 2000 W via a new sidepath along the west side of 2000 W from the end of the existing trail to the proposed crossing as illustrated below.

Key considerations:

- Would require collaboration with HOA to widen trail
- Less direct route than concept 1
- Will likely still require ROW acquisition or easement along 2000 W, depending on future UDOT plans for 2000 W
- Would eliminate southbound left turns at pedestrian refuge island into shopping center rear entrance, potentially impacting delivery operations; however, southbound left turn access is still provided from 2000 W further south.



6. Implementation

The final chapter of the Plan gives the North Davis communities a set of actionable items for implementing the Plan's recommendations. This section includes cost estimates for each facility, potential funding sources available in Utah and their suitability for implementing recommended facilities, and best practices for wayfinding and facility maintenance.

On-street projects, like bike lanes, can often be implemented quickly and efficiently when coordinated with planned roadway projects or pavement management activities like overlays or seal coatings. Conversely, shared-use path projects may require more extensive easement negotiations, permitting, or fundraising to reach construction. This chapter outlines planning-level project cost estimates and different funding sources and strategies.

Cost Estimates

Table 4 outlines planning level, unit costs (in 2020 dollars) of basic infrastructural elements for the various facility types proposed in the plan. Each line item is combined to include a per linear foot cost estimate, which can then be applied to each of the recommended projects based on their length. It is important to note that applying general, planning level cost estimates on a network scale presents a handful of potential discrepancies when compared to actual implementation costs. Therefore, it is recommended that a conservative contingency of 30 percent be added to the numbers below to account for associated costs such as final engineering and design, mobilization, traffic control, permitting, or the removal of existing pavement striping. When budgeting and programming costs of future projects, cost inflation from the 2020 baseline should be accounted for. Additionally, the cost estimates reflected in the table assume that existing curb and gutter will remain. Any relocation of curb and gutter will need to be factored in as an additional cost.

Overall and project-level cost estimates are included in **Appendix B: Projects by Community**.

Funding Sources

Many funding sources are potentially available at the federal, state, regional, and local levels for North Davis County to implement the projects in this plan. The majority of non-local public funds for bicycle and pedestrian projects are derived through a core group of federal and state programs. Federal funds from the Surface Transportation Block Grant Program (STBGP) are allocated to UDOT and Wasatch Front Regional Council (WFRC) and distributed by these agencies proportional to population, allowing funding to get to as many different types of communities as possible.

Tables 5 and 6 provides a list of state and federal funding sources that may be applicable to projects identified in this plan. Most of these sources are competitive and require applications. For multi-agency projects, applications may be more successful if prepared jointly with other local and regional agencies.

The communities should also take advantage of private contributions, if appropriate, in developing the proposed system. This could include a variety of resources, such as right-of-way donations. Additionally, Davis

County could develop a dedicated local funding source for active transportation improvements through a general fund allocation, which will be sustainable funding that can be used to leverage other sources as well as develop projects. In addition to these funds, active transportation projects can be funded through a variety of measures at the local level, as described in Table 7 below.

Table 4. General Cost Estimates

FACILITY TYPE	UNIT	UNIT COST	ASSUMPTIONS
Neighborhood Byways (per direction)	**LF**	**$3.25**	**cost assumes one way/side of street**
Shared lane marking	EACH	$430.00	thermoplastic, spaced every 200’
Regulatory sign	EACH	$660.00	spaced every 600’
Crossings and traffic calming			see individual items below
Bike Lanes (per direction)	**LF**	**$5.46**	**cost assumes one way/side of street**
6” white striping	LF	$3.50	thermoplastic
Bike lane symbol pavement marking	EACH	$430.00	thermoplastic, spaced every 500’
Sign	EACH	$660.00	spaced every 600’
Buffered Bike Lanes (per direction)	**LF**	**$9.59**	**cost assumes one way/side of street**
Bike lane total cost	LF	$5.46	
6” white striping	LF	$3.50	thermoplastic
8” buffer hatching	LF	$0.63	thermoplastic, 30’ spacing
Separated Bike Lanes (per direction)	**LF**	**$74.36**	**cost assumes one way/side of street**
18” wide concrete curb	LF	$70.00	cast in place
Bike lane symbol pavement marking	EACH	$430.00	thermoplastic, spaced every 500’
Flex post installation	EACH	$175.00	50’ spacing
Sidepath	**LF**	**$160.00**	
10’ wide concrete path	LF	$160.00	8” concrete, saw cut joints
Shared-Use Path	**LF**	**$130.00**	
10’ wide path - asphalt	LF	$130.00	
10’ wide path - concrete	LF	$160.00	8” concrete, saw cut joints
Crossings and Traffic Calming			
Install RRFB with ped refuge island	EACH	$25,000.00	mast arm mounted
Install pedestrian hybrid beacon	EACH	$113,000.00	mast arm mounted
Curb extensions (per corner)	EACH	$7,100.00	no inlet/drainage relocation

Table 5. Federal Funding Sources

SOURCE	SUMMARY	MORE INFORMATION
Fast Act	In Utah, federal monies are administered through the Utah Department of Transportation (UDOT) and Council of Governments (COG's) or Metropolitan Planning Organizations (MPOs). Most, but not all, of these programs are oriented toward transportation versus recreation, emphasizing reducing auto trips and providing inter-modal connections. Federal funding is intended for capital improvements and safety and education programs, and projects must relate to the surface transportation system. A number of programs are identified within the Fixing America's Surface Transportation Act (FAST Act) that apply to pedestrian and bicycle projects. These programs are discussed below.	www.fhwa.dot.gov/fastact
Transportation Alternatives	The FAST Act recently replaced the former Transportation Alternatives Program (TAP) with set-aside funds under the Surface Transportation Block Grant Program (STBG). For administrative purposes, the Federal Highway Administration (FHWA) refers to these funds as TA Set- Aside. Projects eligible for TA Set-Aside funds include on- and off-road active transportation facilities, improvements to non-driver access to transit, recreational trails, and safe routes to school.	TAP: https://www.fhwa.dot.gov/map21/qandas/qatap.cfm STBG: https://www.fhwa.dot.gov/fastact/factsheets/stbgfs.cfm Application Deadline: Selection occurs every other year. Local Match: 20%
Surface Transportation Block Grant Program (STBG)	The FAST Act converts the long-standing Surface Transportation Program (STP) into the Surface Transportation Block Grant Program. The STGB promotes flexibility in State and local transportation decisions and provides flexible funding to best address State and local transportation needs. Eligible projects include all prior STP eligibility; additional eligibility can be found on FHWA's website using the link at right. The WFRC and the State are responsible for distributing these funds, which are allocated by FHWA.	https://www.fhwa.dot.gov/fastact/factsheets/stbgfs.cfm

Recreational Trails	These funds may be used to develop and maintain recreational trails and trail-related facilities for both active and motorized recreational trail uses. Examples of trail uses include hiking, bicycling, in-line skating, equestrian use, and other active and motorized uses. These funds are available for both paved and unpaved trails but may not be used to improve roads for general passenger vehicle use or to provide shoulders or sidewalks along roads. Recreational Trails Program funds may be used for: • Maintenance and restoration of existing trails • Purchase and lease of trail construction and maintenance equipment • Construction of new trails, including unpaved trails • Acquisition or easements of property for trails • State administrative costs related to this program (limited to seven percent of a state's funds) • Operation of educational programs to promote safety and environmental protection related to trails (limited to five percent of a state's funds) • Grant applications are typically due in April each year.	https://stateparks.utah.gov/resources/grants/recreational-trails-program/ Application Deadline: May 1, annually Local Match: 50/50 sponsor match
Highway Safety Improvement Program (HSIP)	HSIP provides $2.4 billion nationally for projects and programs that help communities achieve significant reductions in traffic fatalities and serious injuries on all public roads, bikeways, and walkways. Infrastructure and non-infrastructure projects are eligible for HSIP funds. Pedestrian and bicycle safety improvements, enforcement activities, traffic calming projects, and crossing treatments for active transportation users in school zones are examples of eligible projects. All HSIP projects must be consistent with the State's Strategic Highway Safety Plan (SHSP).	For information specific to HSIP in the State of Utah, visit: https://site.utah.gov/connect/business/public-entities/local-government-program-assistance/ Application Deadline: Ongoing
Centers for Disease Control And Prevention (CDC) Grants	The CDC provides funding opportunities for several different organization and jurisdiction types that can potentially support pedestrian and bicycle infrastructure, planning, or other support programs.	https://www.cdc.gov/grants/ Application Deadline: Varies

Rivers, Trails, and Conservation Assistance Program	The Rivers, Trails, and Conservation Assistance Program (RTCA) is a National Parks Service (NPS) program providing technical assistance via direct NPS staff involvement to establish and restore greenways, rivers, trails, watersheds, and open space. The RTCA program provides only for planning assistance—there are no implementation monies available. Projects are prioritized for assistance based on criteria, including conserving significant community resources, fostering cooperation between agencies, serving a large number of users, encouraging public involvement in planning and implementation, and focusing on lasting accomplishments. This program may benefit trail development in the region indirectly through technical assistance, particularly for community organizations, but should not be considered a future capital funding source.	https://www.nps.gov/orgs/rtca/apply.htm Application Deadline: June 30, annually
Community Development Block Grant Program (CDBG)	The Community Development Block Grants (CDBG) program provides money for streetscape revitalization, which may be largely comprised of pedestrian improvements. Federal CDBG grantees may "use Community Development Block Grants funds for activities that include (but are not limited to): acquiring real property; reconstructing or rehabilitating housing and other property; building public facilities and improvements, such as streets, sidewalks, community, and senior citizen centers, and recreational facilities; paying for planning and administrative expenses, such as costs related to developing a consolidated plan and managing Community Development Block Grants funds; provide public services for youths, seniors, or the disabled; and initiatives such as neighborhood watch programs." Trails and greenway projects that enhance accessibility are the best fit for this funding source. CDBG funds could also be used to create an ADA Transition Plan. States designate CDBG funds to "entitlement communities" – generally major cities with more than 50,000 people – and "non-entitlement communities."	https://www.daviscountyutah.gov/ced/planning/grant-program/cdbg Application Deadline: Mandatory "How to Apply" workshops held annually in October/November

Federal Lands Access Program (FLAP)	The FLAP program funds improvement to transportation facilities that provide access to Federal lands. These funds supplement State and local resources for public roads, transit systems, and other transportation facilities, emphasizing high-use recreation sites and economic generators. Administered by the State, funds are allocated based on road mileage, the number of bridges, land area, and visitation. A Programming Decision Committee (PDC) selects projects established in each State.	https://flh.fhwa.dot.gov/programs/flap/ Application Deadline: Varies.
Land and Water Conservation Fund	The Land and Water Conservation Fund (LWCF) provides grants for planning and acquiring outdoor recreation areas and facilities, including trails. Funds can be used for right–of–way acquisition and construction. The program is administered by Utah State parks as a grant program. Any projects located in future parks could benefit from planning and land acquisition funding through the LWCF. Funding is also available for new parks, and trail corridor acquisition can be funded with LWCF grants.	https://www.nps.gov/subjects/lwcf/stateside.htm Application Deadline: Spring, annually Local Match: 50/50 match
EPA Green Infrastructure Grants	The EPA offers a number of grant resources that serve to improve clean water in communities, such as the EPA Clean Water State Revolving Fund, EPA Clean Water Act Non-point Source Grant, and EPA Community Action for a Renewed Environment (CARE) Grants.	More information on these and other funding sources can be found through the EPA's website: https://www.epa.gov/green-infrastructure/green-infrastructure-funding-opportunities
Enhanced Mobility of Seniors and Individuals Disabilities	Section 5310 of the FAST ACT – Enhanced Mobility of Seniors and Individuals with Disabilities provides capital and operating costs to provide transportation services and facility improvements that exceed those required by the Americans with Disabilities Act. Examples of pedestrian/accessibility projects funded in other rural communities include installing Accessible Pedestrian Signals (APS), enhancing transit stops to improve accessibility, and establishing regional one-click systems.	https://www.transit.dot.gov/funding/grants/enhanced-mobility-seniors-individuals-disabilities-section-5310 Local Match: 20% minimum
Additional FTA Funding Sources for Bike/Ped Infrastructure	Most Federal Transit Administration (FTA) funding can be used to fund pedestrian and bicycle projects that "enhance or are related to public transportation facilities."	https://www.transit.dot.gov/

Table 6. State Funding Sources

SOURCE	SUMMARY	MORE INFORMATION
Class B & C Road Funds	Class B & C roads are all public roads that are not state or federal roads. Funds are generated from a combination of state fuel taxes, registration fees, driver license fees, and other revenue sources. County roads are financed by Class B funds, while Class C funds finance roads owned by incorporated municipalities. Enhancement of traffic and pedestrian safety, including sidewalks, safety features, signals, and bicycle facilities are examples of permissible uses of these funds.	Regulations Governing Class B & C Road Funds: https://site.utah.gov/connect/business/public-entities/local-government-program-assistance/
Safe Routes To School (SRTS) & Safe Routes Utah	The SRTS and Safe Routes Utah programs are sources of funding for education, enforcement, evaluations, and infrastructure improvements (e.g., sidewalks, bike parking, etc.) that encourage elementary and middle school students to walk or bike to school. The Utah Department of Transportation (UDOT) administers these programs using Federal Surface Transportation Block Grant Set-Aside funds and Highway Safety Improvement Program funds.	https://site.utah.gov/connect/business/public-entities/local- government-program-assistance/ Application Deadline: July, annually
Safe Sidewalk Program	The legislature of the State of Utah has recognized the need for adequate sidewalk and pedestrian safety devices. State policy declares that "pedestrian safety" considerations shall be included in all State highway engineering and planning for all projects where pedestrian traffic would be a significant factor. The Safe Sidewalks Program provides a legislative funding source for the construction of new sidewalks adjacent to state routes where sidewalks do not currently exist and where major construction or reconstruction of the route, at that location, is not planned for ten or more years.	https://site.utah.gov/connect/business/public-entities/local-government-program-assistance/ Local Match: 25%
UDOT - Maintenance Program	UDOT's routine street resurfacing can be used as an opportunity to add bikeways or buffers to existing facilities. This option does not require additional funding. The FHWA provides a handout on using routine resurfacing projects to implement bike facilities (see more information link).	https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/resurfacing/resurfacing_workbook.pdf

Utah Outdoor Recreation Grant	The Utah Outdoor Recreation Grant is intended to improve recreational opportunities by constructing trails, pathways, and other recreational amenities. The program is administered through the Governor's Office of Economic Development. Grant awards in 2019 may range from $5,000 to $250,000. A 50% match is required; however, 25% of the total grant award may be provided through in-kind services.	https://business.utah.gov/outdoor/uorg/ Application Deadline: March, annually Local Match: 50/50
UDOT Transportation Investment Funds (TIF)	Transportation investment funds are a relatively new funding source for active transportation projects in Utah. The program, created in 2005, has traditionally funded roadway capacity projects. However, in 2018, SB 72 added standalone active transportation projects as an approved project type. Active transportation projects should help mitigate congestion and be included in an active transportation plan approved by UDOT. Projects require a 40% non-state match and can be used to design, construct, or maintain TIF-constructed facilities.	https://wfrc.org/PublicInvolvement/GovernmentalAffairs/2019/SB72TransportationGovFundRevs.pdf Local Match: 40%
UDOT Transit Transportation Investment Funds (TTIF)	The UDOT Transit Transportation Investment Fund (TTIF) can be used for public transit capital development of new capacity projects. This fund can also be used to aid in first mile/last mile decisions.	https://wfrc.org/PublicInvolvement/GovernmentalAffairs/2019/SB72TransportationGovFundRevs.pdf Local Match: 40%
Bike Utah 1,000 Miles Campaign	In 2017, Governor Herbert initiated the 1,000 Miles Campaign to build 1,000 miles of family-friendly bike paths, lanes, and trails by 2027. Bike Utah supports this effort by offering strategic planning, technical assistance, and connections to financial resources so that communities can begin or continue developing bicycling in their area.	https://www.bikeutah.org/1000miles/

Table 7. Local Funding Sources

SOURCE	SUMMARY
Voter-approved sales taxes	Voter-passed initiatives can be used to pay for transportation infrastructure, such as Davis County's 2015 Proposition 1, which increased sales tax to 1 cent for every $4 spent, and dedicates funds to transportation improvements, including roadway maintenance, transit service, other transportation-related costs such as trails, bikeways, sidewalks, etc.
Recreation, Arts, and Parks (RAP) Tax	Davis County does not have a county-wide RAP tax like Salt Lake County's ZAP tax, but instead allows individual cities to put it on the ballot for their respective jurisdictions. In most counties and cities in Utah where this tax has been implemented, 1 cent of every $10 spent (sales tax) is applied to various recreation, arts, and parks projects.
Business Improvement Districts	Business improvement districts are often self-taxing districts of commercial property owners within a municipality. Revenue generated from a BID can be applied to infrastructure improvements that benefit the district and the City. Legislation is necessary to permit local governments to create BIDs.
Private Sources	Private entities such as developers, hospitals, universities, businesses, or philanthropic organizations are often interested in contributing to projects that add significant value to the community. For example, trail and bikeway construction can be required as a condition of developers receiving a building permit. Additionally, local bike shops or part manufacturers have a vested interested in improving conditions for active transportation in their communities.

Wayfinding

At its heart, wayfinding is the process of orienting ourselves to our surroundings to navigate through physical space. Wayfinding involves four key steps:

- Location Orientation: determining where we are in relation to nearby places and where we want to go;
- Route Decision: selecting a desired route towards our destination;
- Route Monitoring: paying attention to our surroundings to make sure we are staying on course towards our destination; and,
- Destination Recognition: recognizing when we have arrived at our desired destination.

A successful wayfinding strategy helps users successfully and easily accomplish each of these four steps. Clear, consistent visual cues and signage can help travelers easily recognize where they are and where they are going, monitor how far they have left to travel, and easily navigate junctions and decision points. These cues can include signage marking designated bicycle routes, directions and distances to key destinations, and cues for turns; branded graphical elements drawing attention to signature high-comfort facilities; named and/or numbered routes; navigational kiosks; and pavement markings to indicate turns.

Wayfinding is a key element in making individual bicycle and pedestrian facilities work together as a coherent network that residents and visitors can easily navigate. As North Davis communities build out their planned regional active transportation network, the addition of consistent wayfinding elements can help users find their way to the most safe, convenient, and comfortable route to their destination, improve awareness of the variety of destinations accessible on the active transportation network, and make traveling by active modes a more enjoyable experience.

Appendix A: Design Guidelines provides specific design guidance regarding wayfinding sign types, placement, and related considerations.

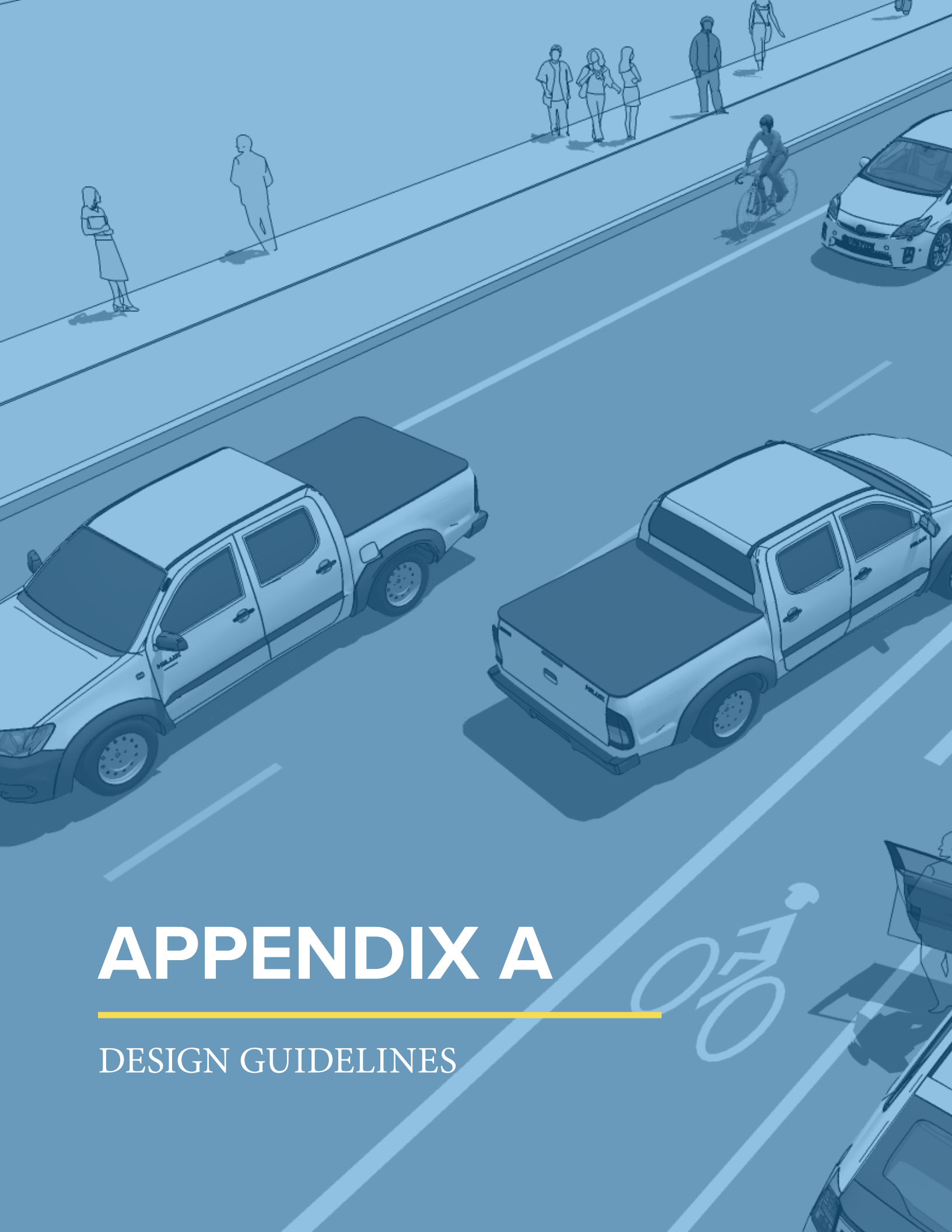
Maintenance

As North Davis communities implement planned bicycle and pedestrian facilities, attention should be paid to how facilities will need to be maintained once built. Maintaining active transportation facilities to ensure they remain safe and comfortable to all users can require additional attention to and prioritization of sweeping, maintenance of drainage grates and gutters, and landscaping. **Appendix A: Design Guidelines** provides specific design guidance regarding maintenance needs of various facility types.

Appendices

Appendix A: Design Guidelines

Appendix B: Projects by Community



APPENDIX A

DESIGN GUIDELINES

OVERVIEW

The sections that follow serve as an inventory of bicycle and trail design treatments and provide guidelines for their development. These treatments and design guidelines are important because they represent the tools for creating a safe and accessible community. The guidelines are not, however, a substitute for a more thorough evaluation by a professional engineer.

01

CONTEXT

NATIONAL GUIDANCE

The following standards and guidelines are referred to in this guide:

- The Federal Highway Administration's (FHWA) ***Manual on Uniform Traffic Control Devices (MUTCD)*** defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public traffic. The MUTCD is the primary source for guidance on lane striping requirements, signal warrants, and recommended signage and pavement markings.
- American Association of State Highway and Transportation Officials (AASHTO) ***Guide for the Development of Bicycle Facilities*** (2012) provides guidance on dimensions, use, and layout of specific bicycle facilities.
- The National Association of City Transportation Officials' (NACTO) ***Urban Bikeway Design Guide*** (2012) is the newest publication of nationally recognized bikeway design standards, and offers guidance on the current state of the practice designs.
- The ***AASHTO A Policy on Geometric Design of Highways and Streets*** (2011) commonly referred to as the "Green Book," contains the current design research and practices for highway and street geometric design.

STATE GUIDANCE

- The ***UDOT's Pedestrian and Bicycle Guide*** provides design guidance and maintenance best practices for pedestrian and bicycle facilities. It also includes resources on funding, education, enforcement, and UDOT's project development process.
- ***UDOT's 2014 State Bike Plan*** incorporated a route condition inventory and safety gap analysis for each UDOT urban region and identified a regional bicycle network that includes key connections to transit and existing bicycle facilities as a part of the Utah Collaborative Active Transportation Study.

IMPACT ON SAFETY AND CRASHES

Bicycle facilities can have a significant influence on user safety. The Federal Highway Administration Crash Modification Factor Clearinghouse (http://www.cmfclearinghouse.org/) is a web-based database of Crash Modification Factors (CMF) to help transportation engineers identify the most appropriate countermeasure for their safety needs. Where available and appropriate, CMFs or similar study results are included for treatments in this guide.

User Design Dimensions

The purpose of this section is to provide the facility designer with an understanding of how bicyclists operate and how their bicycle influences that operation. Bicyclists, by nature, are much more affected by poor facility design, construction, and maintenance practices than motor vehicle drivers.

Bicyclists lack the protection from the elements and roadway hazards provided by an automobile's structure and safety features. By understanding the unique characteristics and needs of bicyclists, a facility designer can provide quality facilities and minimize user risk.

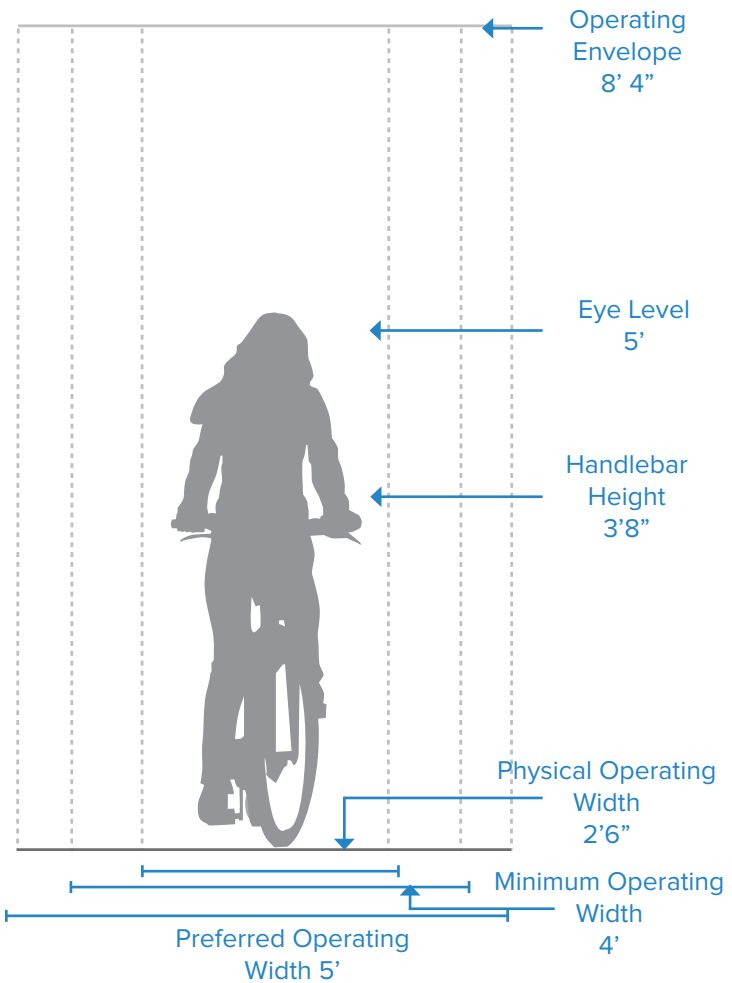
BICYCLE AS A DESIGN VEHICLE

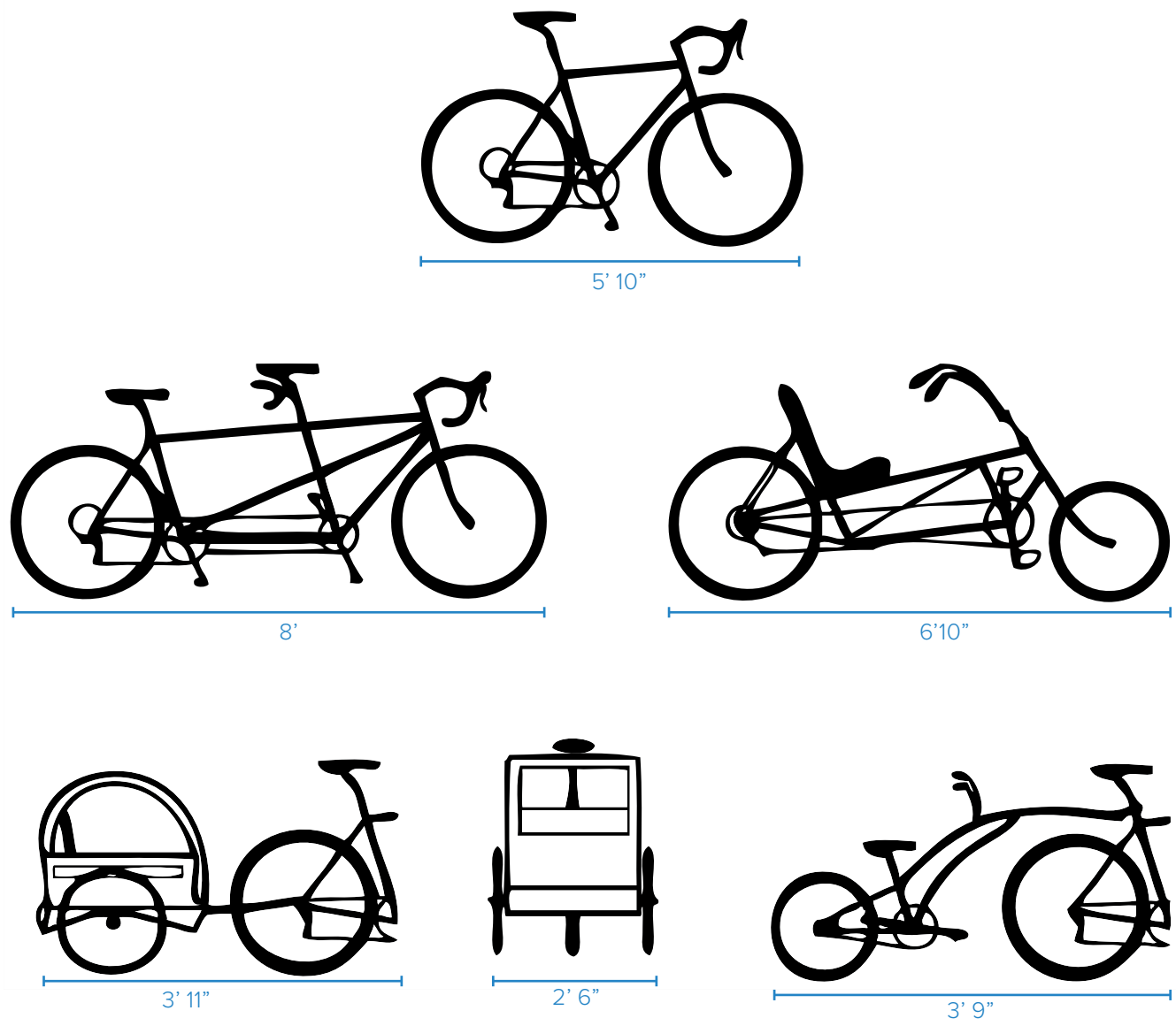
Similar to motor vehicles, bicyclists and their bicycles exist in a variety of sizes and configurations. These variations occur in the types of vehicle (such as a conventional bicycle, a recumbent bicycle or a tricycle), and behavioral characteristics (such as the comfort level of the bicyclist). The design of a bikeway should consider reasonably expected bicycle types on the facility and utilize the appropriate dimensions.

The figure to the right illustrates the operating space and physical dimensions of a typical adult bicyclist, which are the basis for typical facility design. Bicyclists require clear space to operate within a facility. This is why the minimum operating width is greater than the physical dimensions of the bicyclist. Bicyclists prefer five feet or more operating width, although four feet may be minimally acceptable.

In addition to the design dimensions of a typical bicycle, there are many other commonly used pedal-driven cycles and accessories to consider when planning and designing bicycle facilities. The most common types include tandem bicycles, recumbent bicycles, and trailer accessories. The figure to the left summarizes the typical dimensions for bicycle types.

Bicycle Rider - Typical Dimensions





Source: AASHTO *Guide for the Development of Bicycle Facilities*, 4th Edition

The expected speed that different types of bicyclists can maintain under various conditions also influences the design of facilities such as shared use paths. The table to the right provides typical bicyclist speeds for a variety of conditions.

Bicycle as Design Vehicle - Design Speed Expectations

Bicycle Type	Feature	Typical Speed
Upright Adult Bicyclist	Paved level surfacing	8-12 mph*
	Crossing Intersections	10 mph
	Downhill	30 mph
	Uphill	5 -12 mph
Recumbent Bicyclist	Paved level surfacing	18 mph

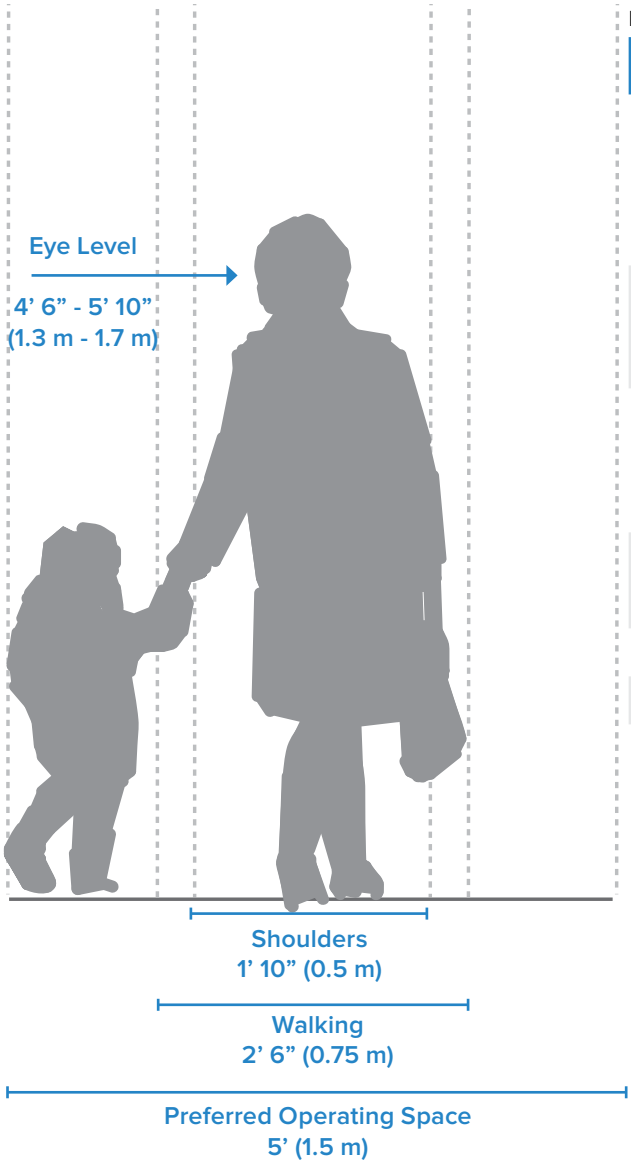
* Typical speed for causal riders per AASHTO 2013.

PEDESTRIAN DESIGN NEEDS

Types of Pedestrians

Pedestrians have a variety of characteristics and the transportation network should accommodate a variety of needs, abilities, and possible impairments. Age is one major factor that affects pedestrians' physical characteristics, walking speed, and environmental perception. Children have low eye height and walk at slower speeds than adults. They also perceive the environment differently at various stages of their cognitive development. Older adults walk more slowly and may require assistive devices for walking stability, sight, and hearing. The table below summarizes common pedestrian characteristics for various age groups.

The MUTCD recommends a normal walking speed of 3.5 feet per second when calculating the pedestrian clearance interval at traffic signals. The walking speed can drop to 3 feet per second for areas with older populations and persons with mobility impairments. While the type and degree of mobility impairment varies greatly across the population, the transportation system should accommodate these users to the greatest reasonable extent.



Pedestrian Characteristics by Age

Age	Characteristics
0-4	Learning to walk
	Requires constant adult supervision
	Developing peripheral vision and depth perception
5-8	Increasing independence, but still requires supervision
	Poor depth perception
9-13	Susceptible to "darting out" in roadways
	Insufficient judgment
	Sense of invulnerability
14-18	Improved awareness of traffic environment
	Insufficient judgment
19-40	Active, aware of traffic environment
41-65	Slowing of reflexes
65+	Difficulty crossing street
	Vision loss
	Difficulty hearing vehicles approaching from behind

ADDITIONAL REFERENCES AND GUIDELINES

AASHTO. Guide for the Planning, Design, and Operation of Pedestrian Facilities, Exhibit 2-1. 2004.

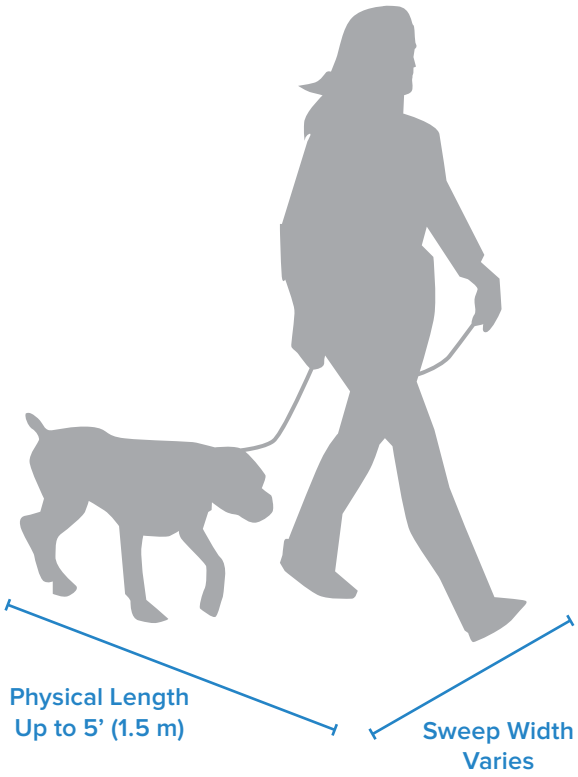
DESIGN NEEDS OF DOG WALKERS

Dog walking is a common and anticipated use on shared use paths. Dog sizes vary largely, as does leash length and walking style, leading to wide variation in possible design dimensions.

Shared use paths designed to accommodate wheelchair users are likely to provide the necessary dimensions for the average dog walker. Amenities such as dog waste stations may enhance conditions for dog walkers.

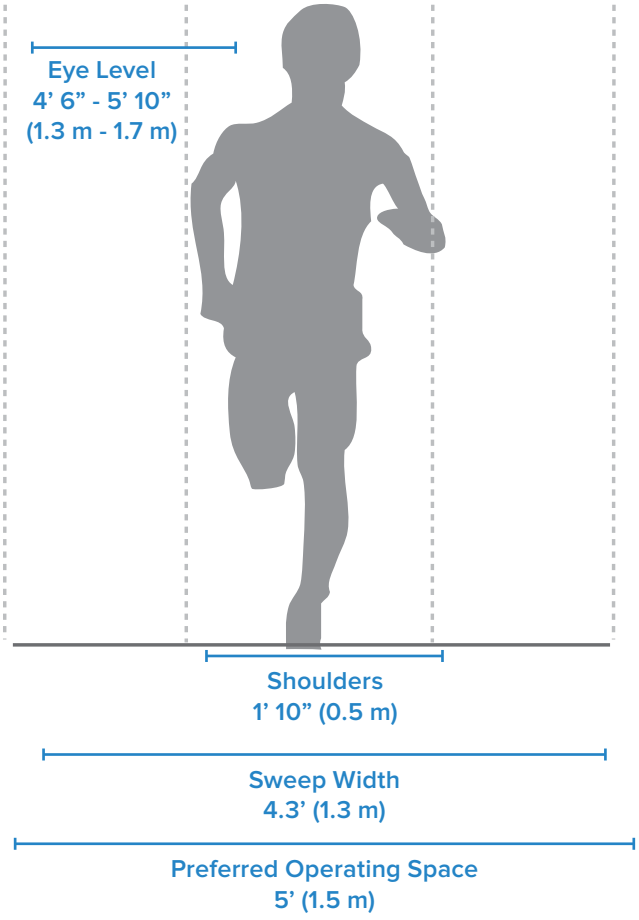
DESIGN NEEDS OF RUNNERS

Running is an important recreation and fitness activity commonly performed on shared use paths. Many runners prefer softer surfaces (such as rubber, bare earth or crushed rock) to reduce impact. Runners can change their speed and direction frequently. If high volumes are expected, controlled interaction or separation of different types of users should be considered.



Runner Typical Speed

User	Typical Speed
Runner	6.2 mph



ADDITIONAL REFERENCES AND GUIDELINES

FHWA. Characteristics of Emerging Road and Trail Users and Their Safety. (2004).

DESIGN NEEDS OF WHEELCHAIR USERS

As the American population ages, the number of people using mobility assistive devices (such as manual wheelchairs, powered wheelchairs) increases.

Manual wheelchairs are self-propelled devices. Users propel themselves using push rims attached to the rear wheels. Braking is done through resisting wheel movement with the hands or arm. Alternatively, a second individual can control the wheelchair using handles attached to the back of the chair.

Power wheelchairs user battery power to move the wheelchair. The size and weight of power wheelchairs limit their ability to negotiate obstacles without a ramp. Various control units are available that enable users to control the wheelchair movement, based on their ability (e.g., joystick control, breath controlled, etc).

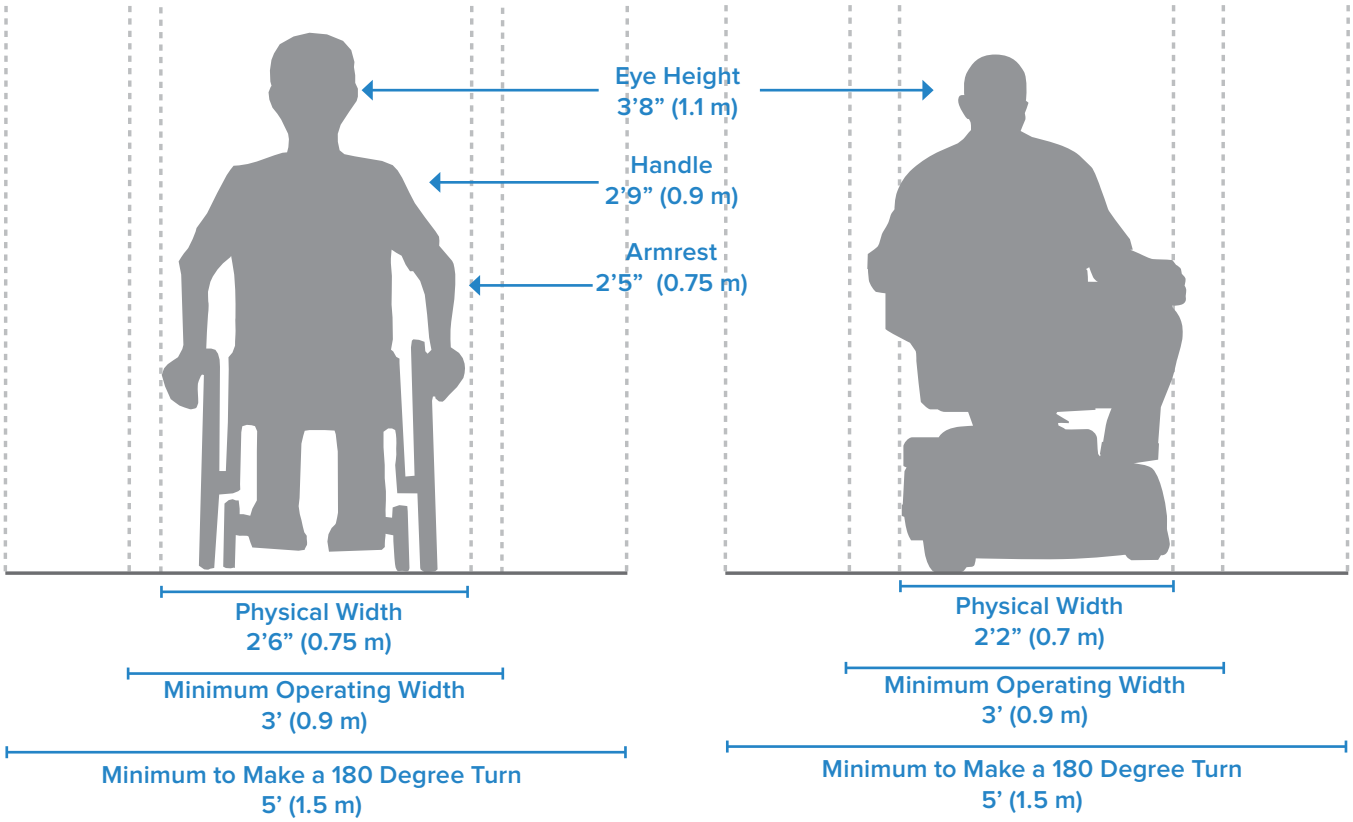
Maneuvering around a turn requires additional space for wheelchair devices. Providing adequate space for 180 degree turns at appropriate locations is an important element for accessible design.

Wheelchair User Typical Speed

User	Typical Speed
Manual Wheelchair	3.6 mph
Power Wheelchair	6.8 mph

Wheelchair User Design Considerations

Effect on Mobility	Design Solution
Difficulty propelling over uneven or soft surfaces.	Firm, stable surfaces and structures, including ramps or beveled edges.
Cross-slopes cause wheelchairs to veer downhill.	Cross-slopes of less than two percent.
Require wider path of travel.	Sufficient width and maneuvering space.



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02

PEDESTRIAN FACILITIES

Pedestrian Crossing Location and Facility Selection

CROSSING TREATMENT SELECTION

The specific type of treatment at a crossing may range from a simple marked crosswalk to full traffic signals or grade separated crossings. Crosswalk lines should not typically be used by themselves and appropriate selection of crossing treatment enhancements should be evaluated in an engineering study.

The engineering study should consider the number of lanes, the presence of a median, the distance from adjacent signalized intersections, the pedestrian volumes and delays, the average daily traffic (ADT), the posted or statutory speed limit or 85th-percentile speed, the geometry of the location, the possible consolidation of multiple crossing points, the availability of street lighting, and other appropriate factors.

MIDBLOCK CROSSINGS

Midblock crossings are an important street design element for pedestrians. They can provide a legal crossing at locations where pedestrians want to travel, and can be safer than crossings at intersections because traffic is only moving in two directions. Locations where midblock crossings should be considered include:

- Long blocks (longer than 600 feet) with destinations on both sides of the street.
- Locations with heavy pedestrian traffic, such as schools, shopping centers.
- At midblock transit stops, where transit riders must cross the street on one leg of their journey.

PEDESTRIAN CROSSING CONTEXTUAL GUIDANCE
At unsignalized locations

	FACILITY TYPE	Local Streets 15-25 mph		Collector Streets 25-30 mph			Arterial Streets 30-45 mph							
		2 lane	3 lane	2 lane	2 lane with median refuge	3 lane	2 lane	2 lane with median refuge	3 lane	4 lane	4 lane with median refuge	5 lane	6 lane	6 lane with median refuge
1	Crosswalk Only (high visibility)	✓	✓	EJ	EJ	X	EJ	EJ	X	X	X	X	X	X
2	Crosswalk with warning signage and yield lines	EJ	✓	✓	✓	✓	EJ	EJ	EJ	X	X	X	X	X
3	Active Warning Beacon (RRFB)	X	EJ	✓	✓	✓	✓	✓	✓	X	✓	X	X	X
4	Hybrid Beacon	X	X	EJ	EJ	EJ	EJ	✓	✓	✓	✓	✓	✓	✓
5	Full Traffic Signal	X	X	EJ	EJ	EJ	EJ	EJ	EJ	✓	✓	✓	✓	✓
6	Grade separation	X	X	EJ	EJ	EJ	X	EJ	EJ	EJ	EJ	EJ	✓	✓

LEGEND

Most Desirable	✓
Engineering Judgement	EJ
Not Recommended	X

Sidewalk Zones and Widths

Sidewalks are the most fundamental element of the walking network, as they provide an area for pedestrian travel separated from vehicle traffic. Providing adequate and accessible facilities can lead to increased numbers of people walking, improved safety, and the creation of social space.

Curbside Lane	Buffer Zone	Pedestrian Through Zone	Frontage Zone
The curbside lane can act as a flexible space to further buffer the sidewalk from moving traffic., and may be used for a bike lane. Curb extensions and bike corrals may occupy this space where appropriate. In the **edge zone** there should be a 6 inch wide curb.	The buffer zone, also called the furnishing or landscaping zone, buffers pedestrians from the adjacent roadway, and is also the area where elements such as street trees, signal poles, signs, and other street furniture are properly located.	The through zone is the area intended for pedestrian travel. This zone should be entirely free of permanent and temporary objects. Wide through zones are needed in downtown areas or where pedestrian flows are high.	The frontage zone allows pedestrians a comfortable "shy" distance from the building fronts. It provides opportunities for window shopping, to place signs, planters, or chairs.

TYPICAL APPLICATION

- Sidewalks should be provided on both sides of urban commercial streets, and should be required in areas of moderate residential density (1-4 dwelling units per acre).
- When retrofitting gaps in the sidewalk network, locations near transit stops, schools, parks, public buildings, and other areas with high concentrations of pedestrians should be the highest priority.

DESIGN FEATURES

- It is important to provide adequate width along a sidewalk corridor. A pedestrian through zone width of six feet enables two pedestrians (including wheelchair users) to walk side-by-side, or to pass each other comfortably.
- In areas of high demand, sidewalks should contain adequate width to accommodate the high volumes and different walking speeds of pedestrians.
- Appropriate placement of street trees in the furnishing zone (minimum width 4 feet) helps buffer pedestrians from the travel lane and increases facility comfort.

CONSTRUCTION COSTS

The cost of building sidewalks vary based on the location, type of material, the scale, and whether it is part of a broader street construction project. A five-foot concrete sidewalk is approximately $32 per linear foot on average, with the additional cost of new curbs and drainage likely to be substantially higher.

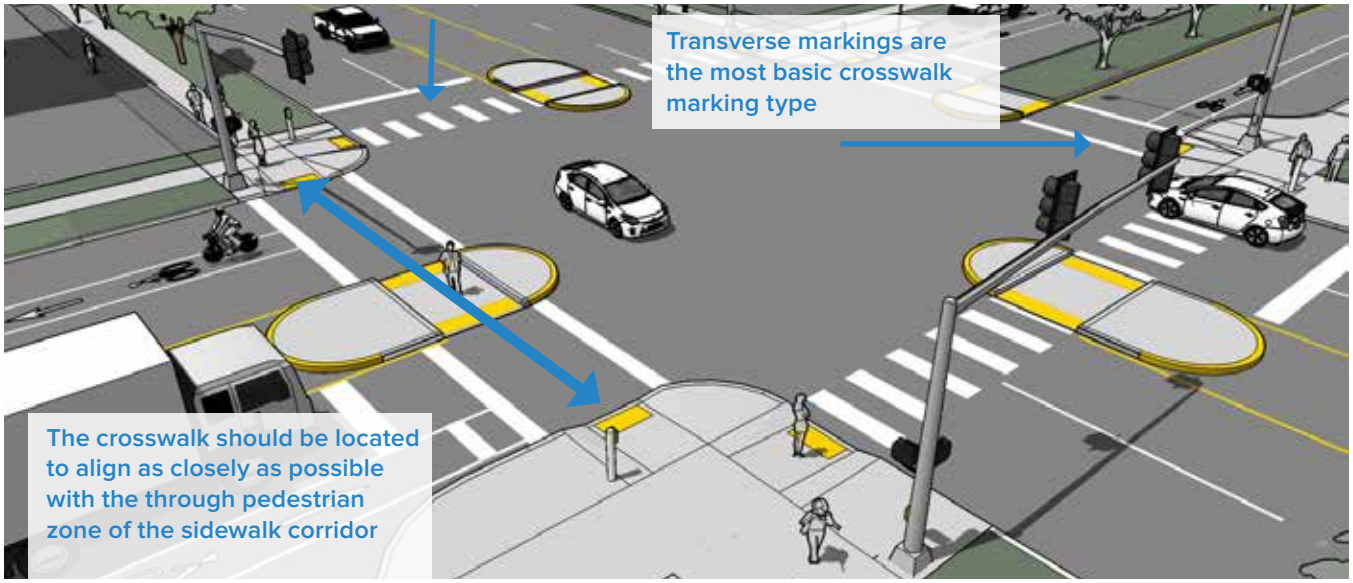
03

PEDESTRIAN FACILITIES AT INTERSECTIONS

Marked Crosswalks

A marked crosswalk signals to motorists that they must stop for pedestrians and encourages pedestrians to cross at designated locations. Installing crosswalks alone will not necessarily make crossings safer, especially on multi-lane roadways.

At mid-block locations, crosswalks must be marked to establish a legal crossing.



TYPICAL APPLICATION

At signalized intersections, all crosswalks should be marked. At unsignalized intersections, crosswalks may be marked under the following conditions:

- At a complex intersection, to orient pedestrians in finding their way across.
- At an offset intersection, to show pedestrians the shortest route across traffic with the least exposure to vehicular traffic and traffic conflicts.
- At an intersection with visibility constraints, to position pedestrians where they can best be seen by oncoming traffic.
- At an intersection within a school zone on a walking route.

DESIGN FEATURES

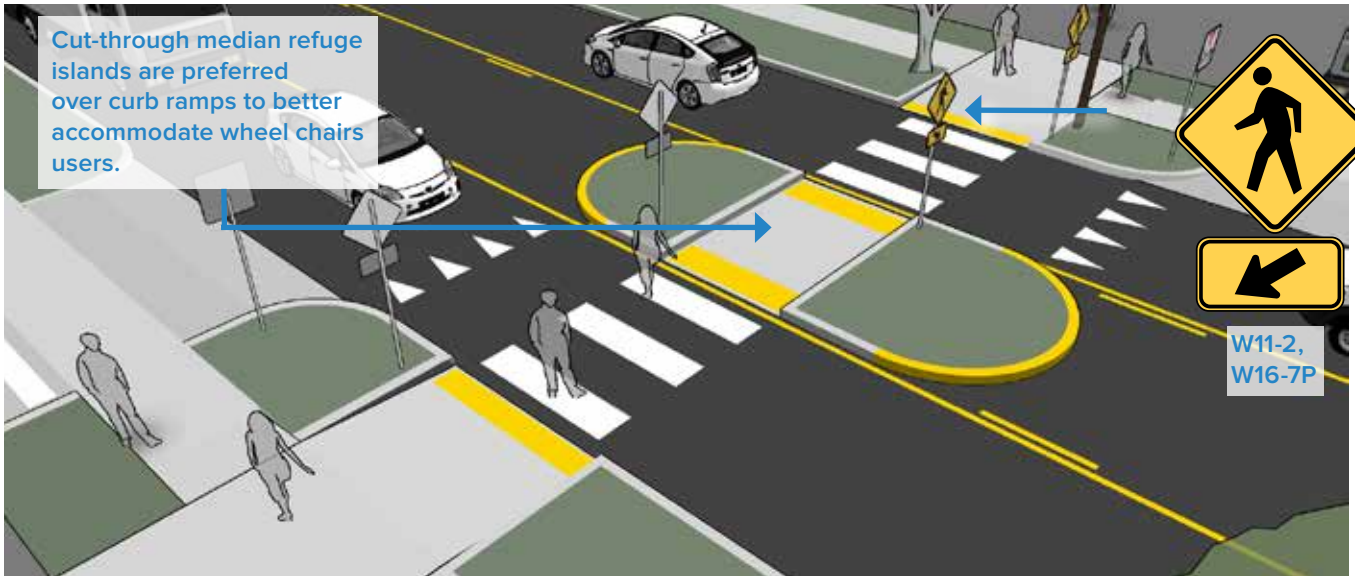
- Because the effectiveness of marked crossings depends entirely on their visibility, maintaining marked crossings should be a high priority.
- Thermoplastic markings offer increased durability than conventional paint.

ADDITIONAL REFERENCES AND GUIDELINES

FHWA. Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations. 2005.
FHWA. Crosswalk Marking Field Visibility Study. 2010.
NACTO. Urban Street Design Guide. 2013.

Median Refuge Island

Median refuge islands are located at the mid-point of a marked crossing and help improve pedestrian safety by allowing pedestrians to cross one direction of traffic at a time. Refuge islands minimize pedestrian exposure by shortening crossing distance and increasing the number of available gaps for crossing.



TYPICAL APPLICATION

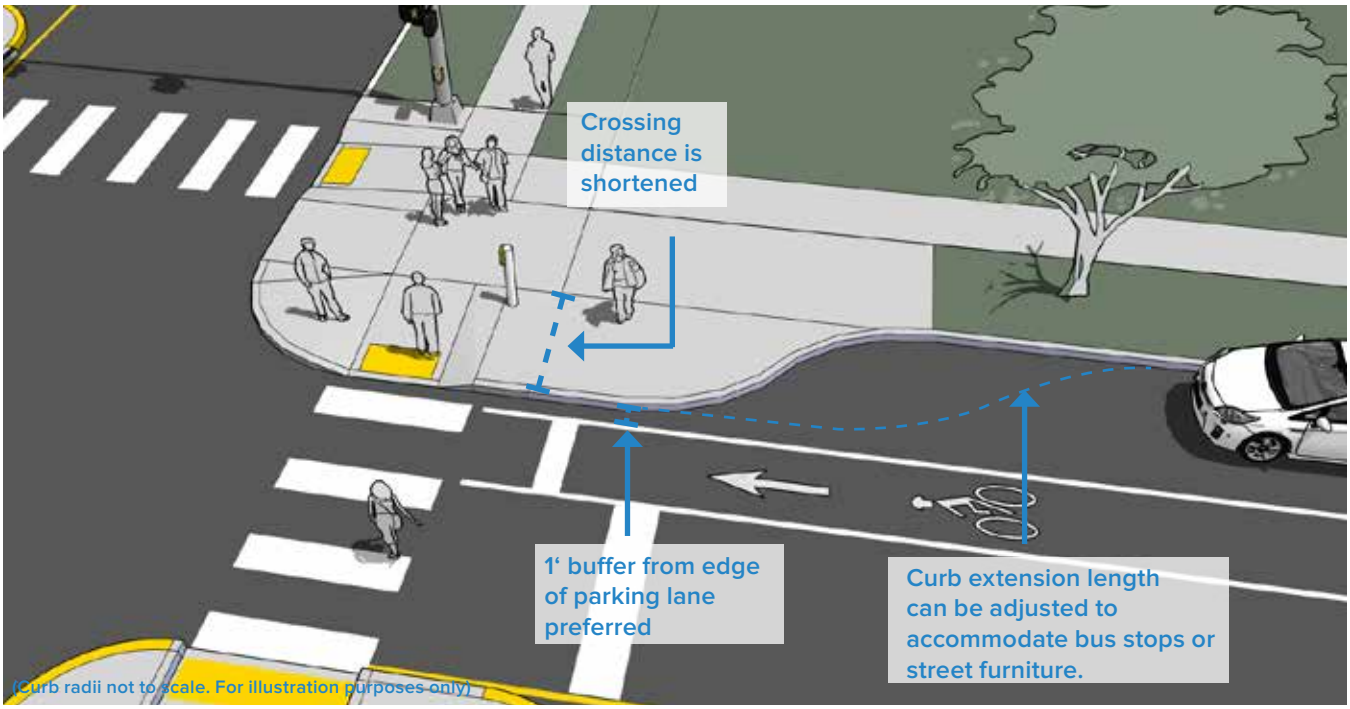
- Can be applied on any roadway with a left turn center lane or median that is at least 6 feet wide.
- Appropriate at signalized or unsignalized crosswalks.
- On multi-lane roadways, consider configuration with active warning beacons for improved yielding compliance.

DESIGN FEATURES

- The refuge island must be accessible, preferably with an at-grade passage through the island rather than ramps and landings.
- The island should be at least 6 feet wide to be a legal refuge and be wider to accommodate cargo bikes or bikes with child trailers. It should be at least 20 feet long.
- On streets with speeds higher than 25 mph there should also be double centerline marking, reflectors, and “KEEP RIGHT” signage.
- If a refuge island is landscaped, the landscaping should not compromise the visibility of pedestrians crossing in the crosswalk. Shrubs and ground plantings should be no higher than 1 .5 feet.

Curb Extensions

Curb extensions minimize pedestrian exposure during crossing by shortening crossing distance and giving pedestrians a better chance to see and be seen before committing to crossing. They are appropriate for any crosswalk where it is desirable to shorten the crossing distance and there is a parking lane adjacent to the curb.



TYPICAL APPLICATION

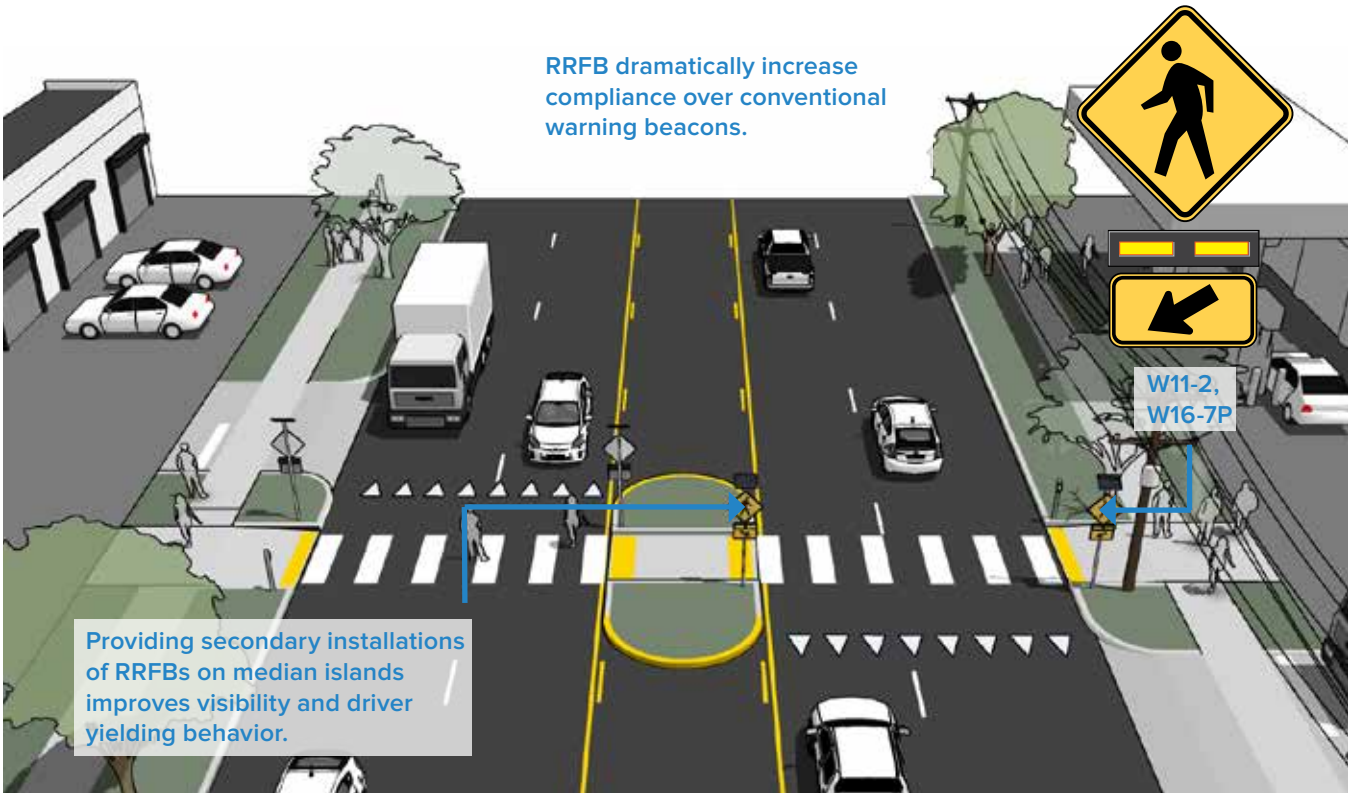
- At signalized intersections with marked crosswalks.
- At unsignalized intersections with marked crosswalks.
- At an intersection with visibility constraints, to position pedestrians where they can best be seen by oncoming traffic.
- At an intersection within a school zone on a walking route.
- Do not block bicycle lanes or shoulders being used by bicyclists with a curb extension. Turning performance by larger vehicles including buses may be impacted by curb extensions.

DESIGN FEATURES

- In most cases, the curb extensions should be designed to transition between the extended curb and the running curb in the shortest practicable distance.
- For purposes of efficient street sweeping, the minimum radius for the reverse curves of the transition is 10 feet and the two radii should be balanced to be nearly equal.
- Curb extensions should terminate 1 foot short of the parking lane to maximize bicyclist safety.
- Planted curb extensions may be designed as a bioswale, a vegetated system for stormwater management.

Active Warning Beacons (RRFBs)

Active warning beacons are user actuated illuminated devices designed to increase motor vehicle yielding compliance at crossings of multi-lane or high volume roadways. Types of active warning beacons include conventional circular yellow flashing beacons, in-roadway warning lights, or Rectangular Rapid Flash Beacons (RRFB). RRFBs are recommended as the preferred beacon treatment.



TYPICAL APPLICATION

- At marked crosswalks where increased pedestrian visibility is needed.
- RRFBs have the most increased compliance of all the warning beacon enhancement options. A study of the effectiveness of going from a no-beacon arrangement to a two-beacon RRFB installation increased yielding from 18 percent to 81 percent.

DESIGN FEATURES

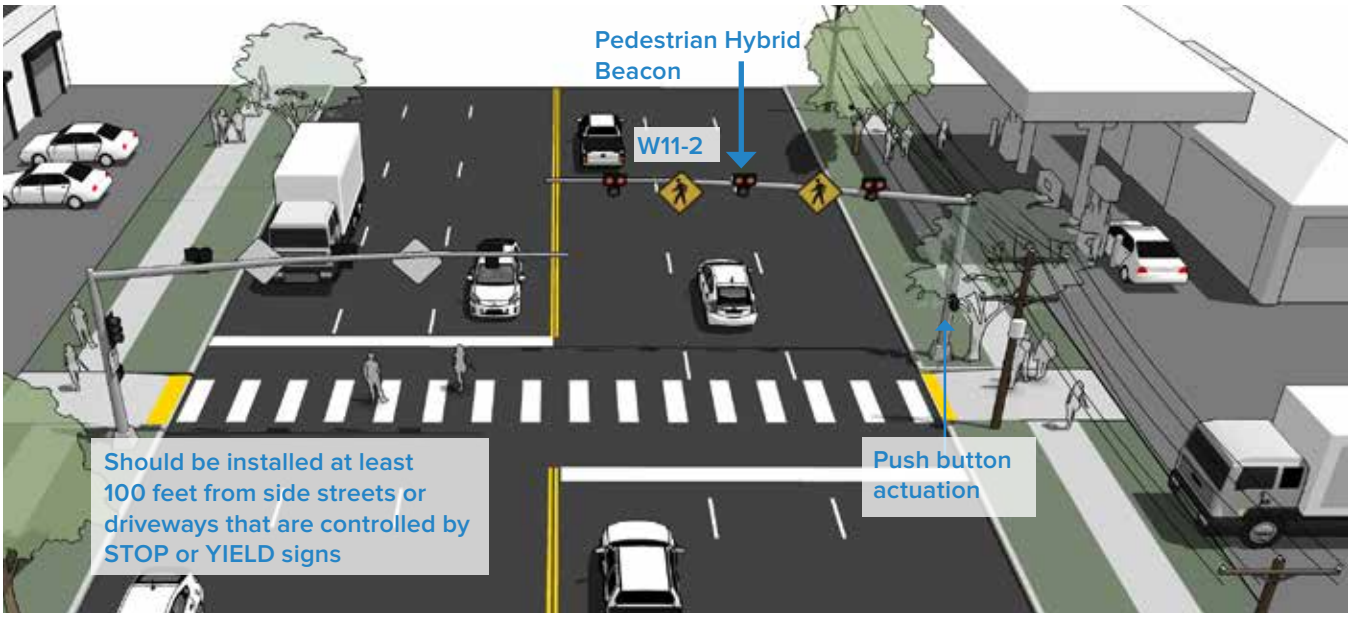
- Warning beacons shall not be used at crosswalks controlled by YIELD signs, STOP signs, or traffic signals.
- Warning beacons shall initiate operation based on pedestrian or bicyclist actuation and shall cease operation at a predetermined time after actuation or, with passive detection, after the pedestrian or bicyclist clears the crosswalk.

ADDITIONAL REFERENCES AND GUIDELINES

FHWA. MUTCD - Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-21). 2018.

Pedestrian Hybrid Beacons

Hybrid beacons are used to improve non-motorized crossings of major streets. A hybrid beacon consists of a signal-head with two red lenses over a single yellow lens on the major street, and a pedestrian signal head for the crosswalk.



TYPICAL APPLICATION

- At unsignalized intersections with high volumes of pedestrians.
- At an intersection within a school zone on a walking route.
- Each crossing, regardless of traffic speed or volume, requires additional review by a registered engineer to identify sight lines, potential impacts on traffic progression, timing with adjacent signals, capacity, and safety.
- If being considered at an existing unsignalized intersection, blank out signs prohibiting conflicting vehicle turning movements with the crosswalk are recommended to be illuminate when the crossing is active.

ADDITIONAL REFERENCES AND GUIDELINES

FHWA, Pedestrian Hybrid Beacon Guide - Recommendations and Case Study. 2014.

DESIGN FEATURES

- Hybrid beacons have less stringent warrants than full signals.
- If installed within a signal system, signal engineers should evaluate the need for the hybrid signal to be coordinated with other signals.
- Parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the marked crosswalk to provide adequate sight distance.
- Hybrid beacon signals are normally activated by push buttons, but may also be triggered by infrared, microwave or video detectors. The maximum delay for activation of the signal should be two minutes, with minimum crossing times determined by the width of the street.

04

BICYCLE FACILITIES

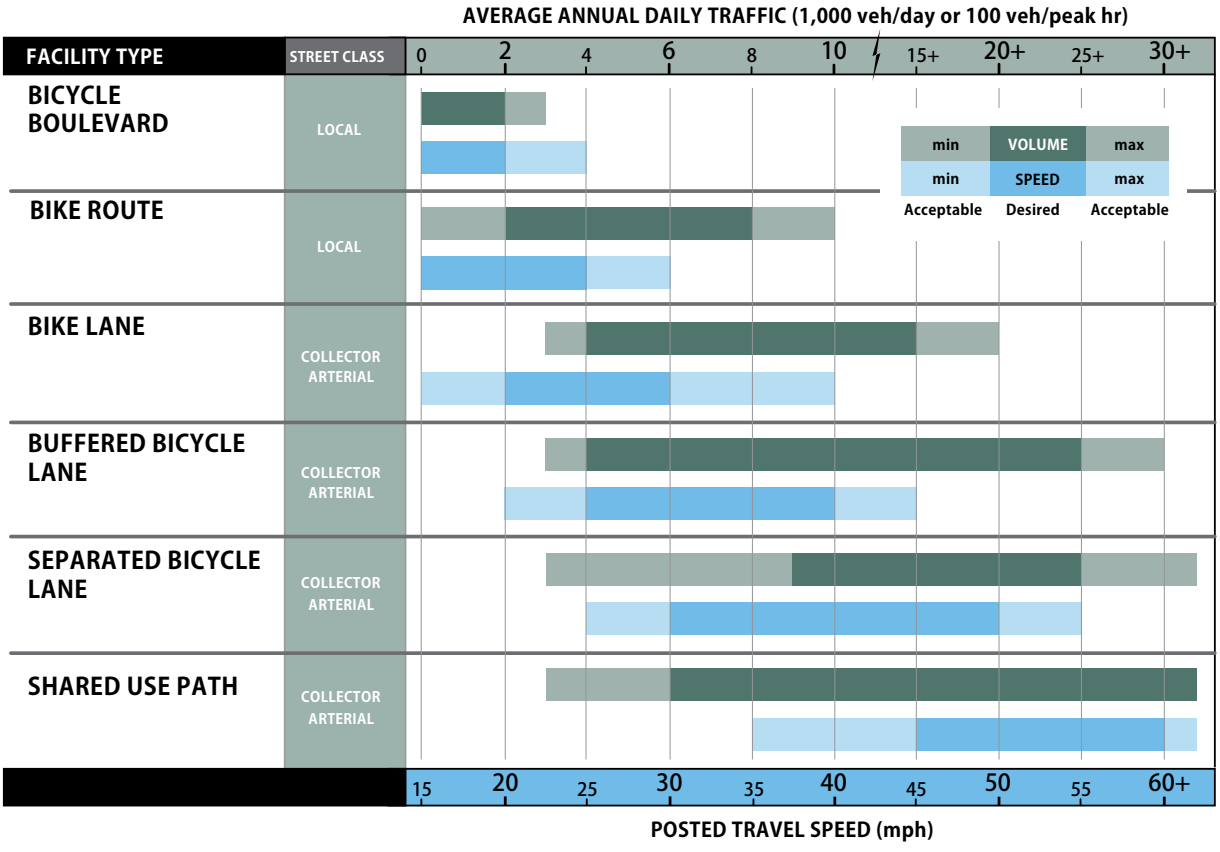
Facility Selection

Selecting the best bikeway facility type for a given roadway can be challenging, due to the range of factors that influence bicycle users' comfort and safety. There is a significant impact on bicycling comfort when the speed differential between bicyclists and motor vehicle traffic is high and motor vehicle traffic volumes are high.

Facility Selection Table

As a starting point to identify a preferred facility, the chart below can be used to determine the recommended type of bikeway to be provided in particular roadway speed and volume situations. To use this chart, identify the appropriate daily traffic volume and travel speed on the existing or proposed roadway, and locate the facility types indicated by those key variables.

Other factors beyond speed and volume which affect facility selection include traffic mix of automobiles and heavy vehicles, the presence of on-street parking, intersection density, surrounding land use, and roadway sight distance. These factors are not included in the facility selection chart below, but should always be considered in the facility selection and design process.



Bicyclist User Type

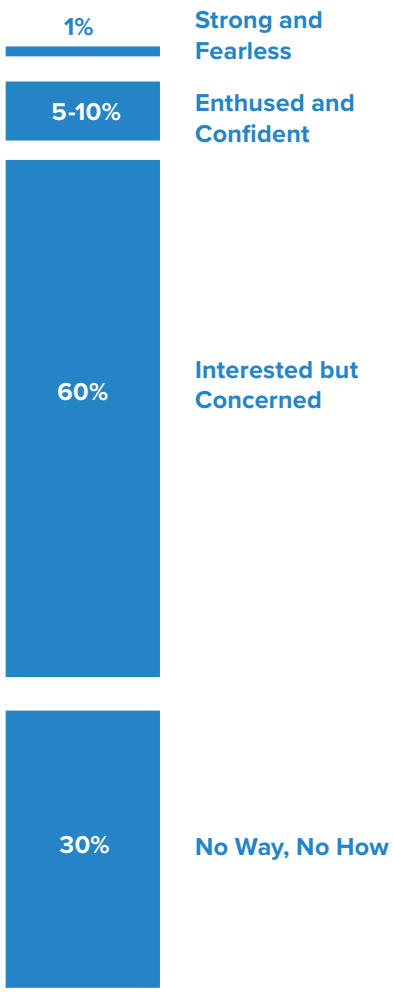
The 2012 AASHTO Guide to the Development of Bicycle Facilities encourages designers to identify their rider type based on the trip purpose (Recreational vs Transportation) and on the level of comfort and skill of the rider (Casual vs Experienced). A user-type framework for understanding a potential rider's willingness to bike is illustrated in the figure below. Developed by planners in Portland, OR and supported by research, this classification identifies four distinct types of bicyclists.

Strong and Fearless – Characterized by bicyclists that will typically ride anywhere regardless of roadway conditions or weather. These bicyclists can ride faster than other user types, prefer direct routes and will typically choose roadway connections (even if shared with vehicles) over separate bicycle facilities such as shared-use paths.

Enthused and Confident - This user group encompasses bicyclists who are fairly comfortable riding on all types of bikeways but usually choose low traffic streets or shared-use paths when available. These bicyclists may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of bicyclists such as commuters, recreationalists, racers and utilitarian bicyclists.

Interested but Concerned – This user type comprises the bulk of the cycling population and represents bicyclists who typically only ride a bicycle on low traffic streets or shared-use paths under favorable weather conditions. These bicyclists perceive significant barriers to their increased use of cycling, specifically traffic and other safety issues. These people may become "Enthused & Confident" with encouragement, education and experience.

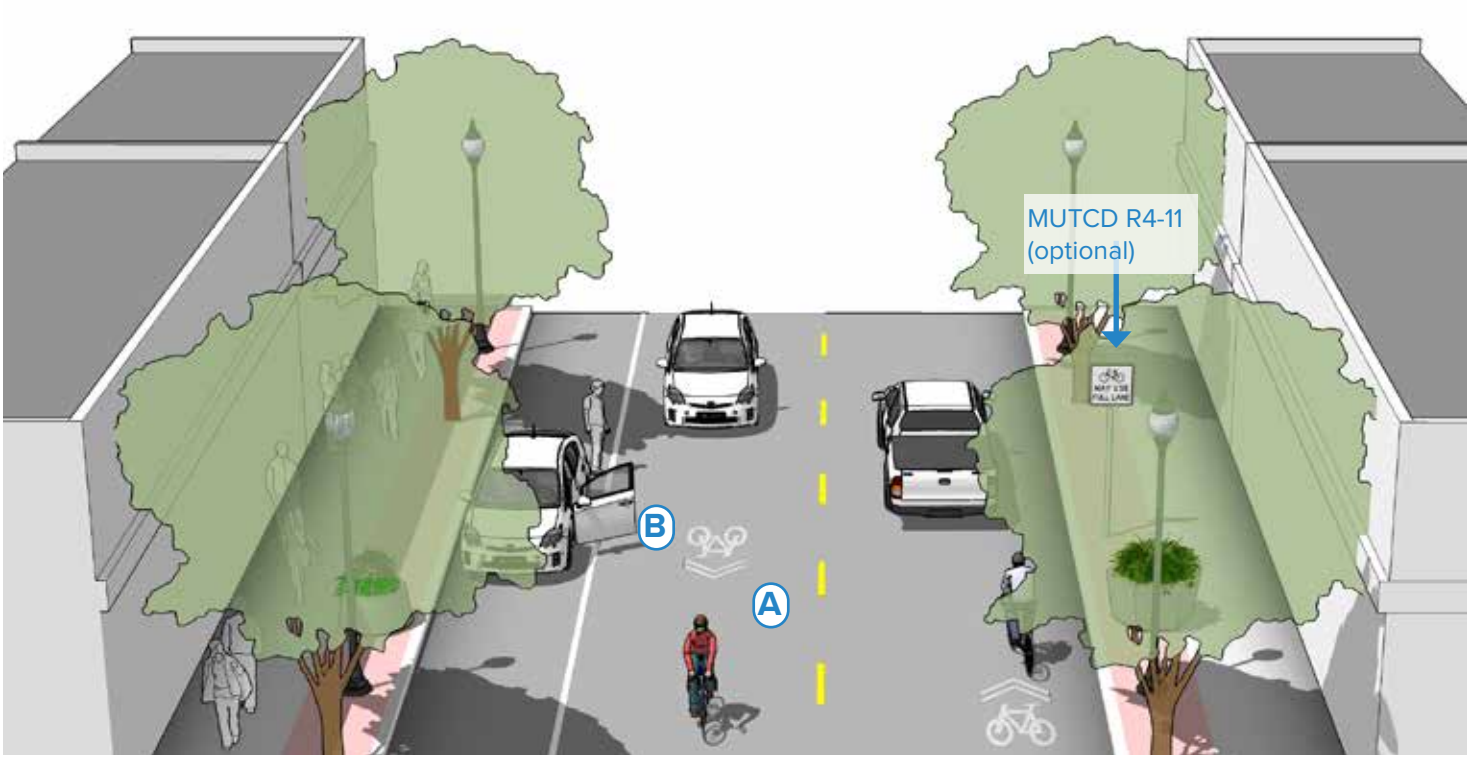
No Way, No How – Persons in this category are not bicyclists, and perceive severe safety issues with riding in traffic. Some people in this group may eventually become more regular cyclists with time and education. A significant portion of these people will not ride a bicycle under any circumstances.



Typical Distribution of Bicyclist Types

Signed & Marked Shared Roadway

Signed shared roadways are facilities shared with motor vehicles. They are typically used on roads with low speeds and traffic volumes, however can be used on higher volume roads with wide outside lanes or shoulders. A motor vehicle driver will usually have to cross over into the adjacent travel lane to pass a bicyclist, unless a wide outside lane or shoulder is provided. A marked shared roadway is a general purpose travel lane marked with shared lane markings (SLM) used to encourage bicycle travel and proper positioning within the lane.



TYPICAL APPLICATION

- In constrained conditions, the SLMs are placed in the middle of the lane. On a wide outside lane, the SLMs can be used to promote bicycle travel to the right of motor vehicles.
- In all conditions, SLMs should be placed outside of the door zone of parked cars.

DESIGN FEATURES

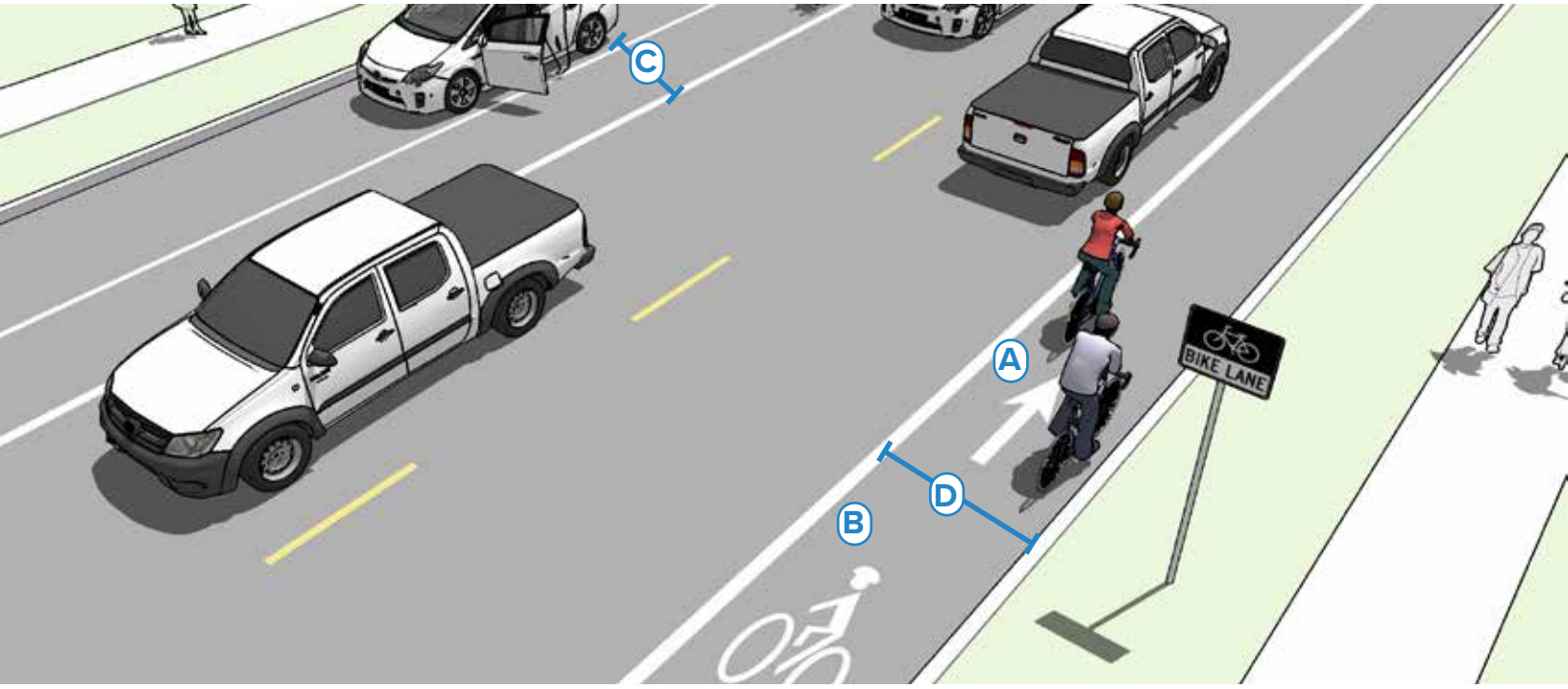
- May be used on streets with a speed limit of 35 mph or under. Lower than 30 mph speed limit preferred.

(A) In constrained conditions, preferred placement is in the center of the travel lane to minimize wear and promote single file travel.

(B) Minimum placement of SLM marking centerline is 11 feet from edge of curb where on-street parking is present, 4 feet from edge of curb with no parking. If parking lane is wider than 7.5 feet, the SLM should be moved further out accordingly.

On-Street Bicycle Lanes

On-street bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signs. The bike lane is located directly adjacent to motor vehicle travel lanes and is used in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge or parking lane.



TYPICAL APPLICATION

- Bike lanes may be used on any street with adequate space, but are most effective on streets with moderate traffic volumes greater than or equal to 6,000 ADT (with a greater than 3,000 ADT min.).
- Bike lanes are most appropriate on streets with low to moderate speeds (25 mph).
- Appropriate for skilled riders on most streets.
- May be appropriate for children when configured as 6+ feet wide lanes on lower-speed, lower-volume streets with one lane in each direction.

EXAMPLE PROJECTS

- Bike lanes on 1800 N in Clinton
- Bike lanes on 1000 W in Syracuse
- Bike lanes on 300 N in Clearfield

DESIGN FEATURES

(A) Mark inside line with 6” stripe. Mark 4” parking lane line or “Ts”.

(B) Include a bicycle lane marking (MUTCD FIGURE 9C-3) at the beginning of blocks and at regular intervals along the route (MUTCD 9C.04).

(C) 6 feet width preferred adjacent to on-street parking (5 feet min.).

(D) 6 feet preferred (5 feet min.) adjacent to curb and gutter (4 feet min.) or 4 feet more than the gutter pan width.

- 6 feet preferred where no curb and gutter exists (4 feet minimum).

Place Bike Lane Symbols to Reduce Wear

Bike lane word, symbol, and/or arrow markings (MUTCD Figure 9C-3) shall be placed outside of the motor vehicle tread path in order to minimize wear from the motor vehicle path (NACTO 2012).

Bicycle Lane

Bicycle lanes provide an exclusive space, but may be subject to unwanted encroachment by motor vehicles.

FURTHER CONSIDERATIONS

On high speed streets (greater than or equal to 40 mph) the minimum bike lane should be 6 feet.

On streets where bicyclists passing each other is to be expected, where high volumes of bicyclists are present, or where added comfort is desired, consider providing extra wide bike lanes up to 7 feet wide, or configure as a buffered bicycle lane.

It may be desirable to reduce the width of general purpose travel lanes in order to add or widen bicycle lanes.

On multi-lane and/or high speed streets, the most appropriate bicycle facility to provide for user comfort may be buffered bicycle lanes or physically separated bicycle lanes.

Manhole Covers and Grates

Manhole surfaces should be manufactured with a shallow surface texture in the form of a tight, nonlinear pattern.

If manholes or other utility access boxes are to be located in bike lanes within 50 feet of intersections or within 20 ft of driveways or other bicycle access points, special manufactured permanent, nonstick surfaces will be required to ensure a controlled travel surface for cyclists breaking or turning.

Manholes, drainage grates, or other obstacles should be set flush with the paved roadway. Roadway surface inconsistencies pose a threat to safe riding conditions for bicyclists. Construction of manholes, access panels or other drainage elements will be constructed with no variation in the surface. The maximum allowable tolerance in vertical roadway surface will be 1/4 of an inch.

CRASH REDUCTION

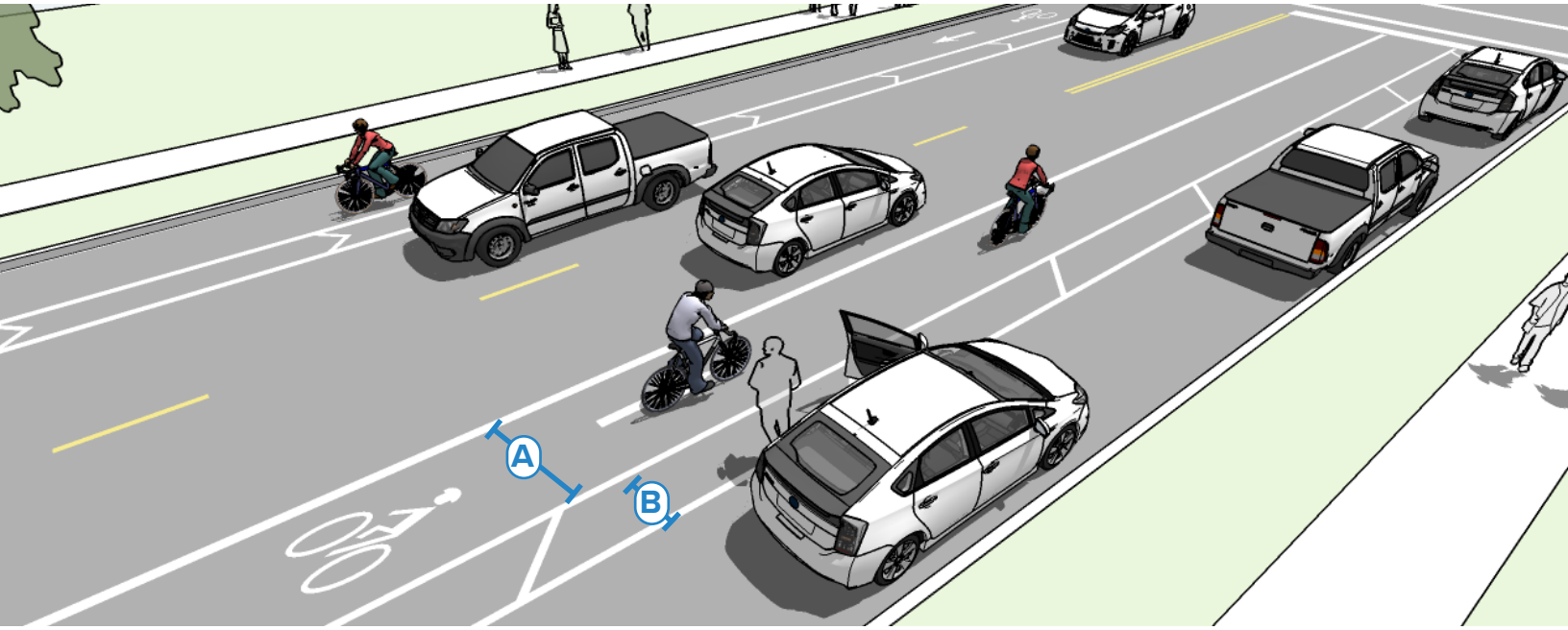
Before and after studies of bicycle lane installations show a wide range of crash reduction factors. Some studies show a crash reduction of 35 percent (CMF ID: 1719) for vehicle/bicycle collisions after bike lane installation.

CONSTRUCTION COSTS

The cost for installing bicycle lanes will depend on the implementation approach. Typical costs are $16,000 per mile for restriping.

Buffered Bicycle Lanes

Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space, separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane.



TYPICAL APPLICATION

- Anywhere a conventional bike lane is being considered.
- On streets with high speeds and high volumes or high truck volumes.
- On streets with extra lanes or lane width.
- Appropriate for skilled adult riders on most streets.

EXAMPLE PROJECTS

- Buffered bike lanes on 2000 West in Clinton
- Buffered bike lanes on Main St in Sunset
- Buffered bike lanes on State St / Main St in Clearfield

DESIGN FEATURES

(A) The minimum bicycle travel area (not including buffer) is 5 feet wide.

(B) Buffers should be at least 2 feet wide. If buffer area is 4 feet or wider, white chevron or diagonal markings should be used.

- For clarity at driveways or minor street crossings, consider a dotted line.
- There is no standard for whether the buffer is configured on the parking side, the travel side, or a combination of both.

Buffered Bicycle Lanes

The use of pavement markings delineates space for bicyclists to ride in a comfortable facility.

The use of pavement markings delineates space for bicyclists to ride in a comfortable facility.

FURTHER CONSIDERATIONS

- Color may be used within the lane to discourage motorists from entering the buffered lane.
- A study of buffered bicycle lanes found that, in order to make the facilities successful, there needs to also be driver education, improved signage and proper pavement markings.
- On multi-lane streets with high vehicle speeds, the most appropriate bicycle facility to provide for user comfort may be physically separated bike lanes.
- NCHRP Report #766 recommends, when space in limited, installing a buffer space between the parking lane and bicycle lane where on-street parking is permitted rather than between the bicycle lane and vehicle travel lane.

CRASH PERCEPTION

A before and after study of buffered bicycle lane installation in Portland, OR found an overwhelmingly positive response from bicyclists, with 89 percent of bicyclists feeling safer riding after installation and 91 percent expressing that the facility made bicycling easier.

CONSTRUCTION COSTS

The cost for installing buffered bicycle lanes will depend on the implementation approach. Typical costs are $16,000 per mile for restriping. However, the cost of large-scale bicycle treatments will vary greatly due to differences in project specifications and the scale and length of the treatment.

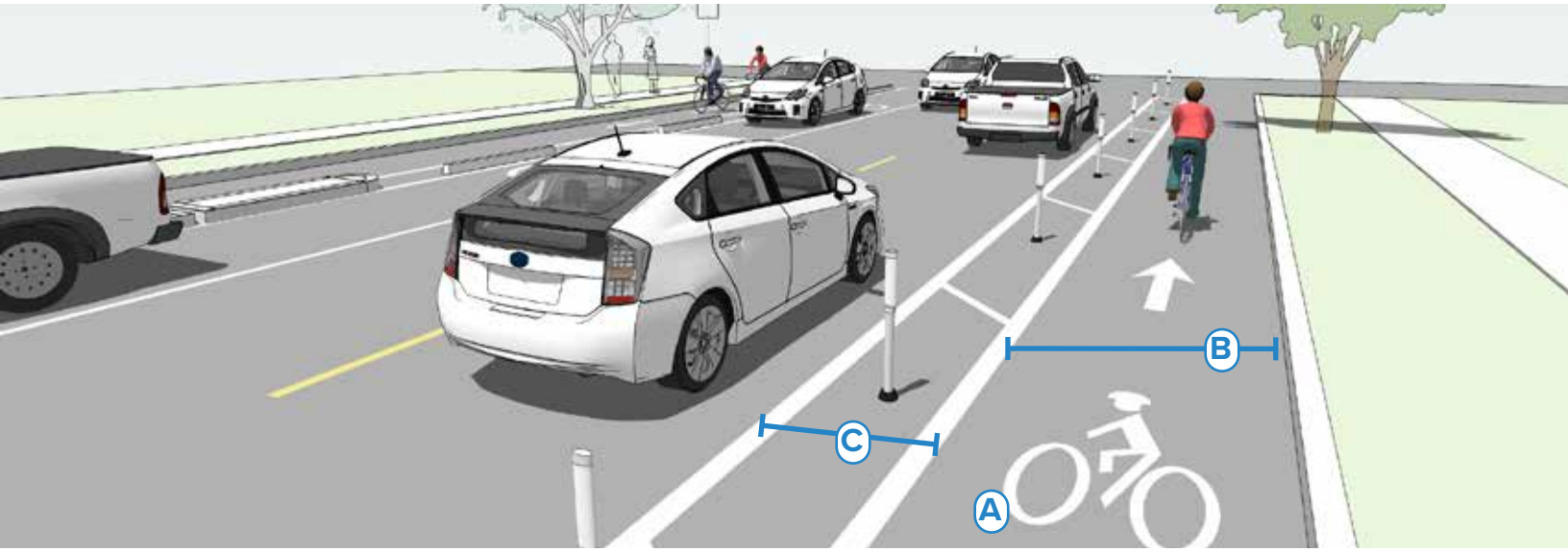
ADDITIONAL REFERENCES AND GUIDELINES

Monsere, C.; McNeil, N.; and Dill, J., “Evaluation of Innovative Bicycle Facilities: SW Broadway Cycle Track and SW Stark/Oak Street Buffered Bike Lanes. Final Report” (2011).Urban Studies and Planning Faculty Publications and Presentations.

National Cooperative Highway Research Program. Report #766: Recommended Bicycle Lane Widths for Various Roadway Characteristics.

One-Way Separated Bicycle Lanes

When retrofitting separated bike lanes onto existing streets, a one-way street-level design may be most appropriate. This design provides protection through physical barriers and can include flexible delineators, curbs, on-street parking or other barriers. A street level separated bike lane shares the same elevation as adjacent travel lanes.



TYPICAL APPLICATION

- Street retrofit projects with limited funds for relating curbs and drainage.
- Streets with high motor vehicle volumes and/or speeds and high bicycle volumes.
- Streets for which conflicts at intersections can be effectively mitigated using parking lane setbacks, bicycle markings through the intersection, and other signalized intersection treatments.
- Appropriate for most riders on most streets.

DESIGN FEATURES

(A) Pavement markings, symbols and/or arrow markings must be placed at the beginning of the separated bike lane and at intervals along the facility (MUTCD 9C.04).

(B) 7 feet width preferred to allow bicyclists to pass each other (5 feet minimum).

(C) 3 foot minimum buffer width adjacent to parking. 18 inch minimum adjacent to travel lanes. Channelizing devices should be placed in the buffer area (NACTO, 2012).

- If buffer area is 4 feet or wider, white chevron or diagonal markings should be used.

Separated Bicycle Lane

Separated Bicycle Lanes can be separated from the street with parking, planters, bollards, or other design elements.

FURTHER CONSIDERATIONS

- Separated bike lane buffers and barriers are covered in the MUTCD as preferential lane markings (section 3D.01) and channelizing devices (section 3H.01). Curbs may be used as a channeling device, see the section on islands (section 3I.01).
- A retrofit separated bike lane has a relatively low implementation cost compared to road reconstruction by making use of existing pavement and drainage and by using the parking lane as a barrier.
- Gutters, drainage outlets and utility covers should be designed and configured as not to impact bicycle travel.
- Special consideration should be given at transit stops to manage bicycle and pedestrian interactions.

CRASH REDUCTION

A before and after study in Montreal of physically separated bicycle lanes shows that this type of facility can result in a crash reduction of 74 percent for collisions between bicyclists and vehicles. (CMF ID: 4097) In this study, there was a parking buffer between the bike facility and vehicle travel lanes. Other studies have found a range in crash reductions due to SBL, from 8 percent (CMF ID: 4094) to 94 percent (CMF ID: 4101).

CONSTRUCTION COSTS

The implementation cost is low if the project uses existing pavement and drainage, but the cost significantly increases if curb lines need to be moved. A parking lane is the low-cost option for providing a barrier. Other barriers might include concrete medians, bollards, tubular markers, or planters.

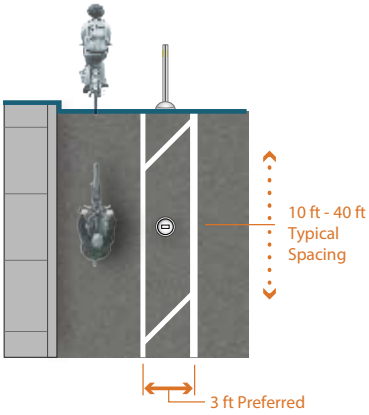
ADDITIONAL REFERENCES AND GUIDELINES

FHWA. Separated Bike Lane Planning and Design Guide. 2016.

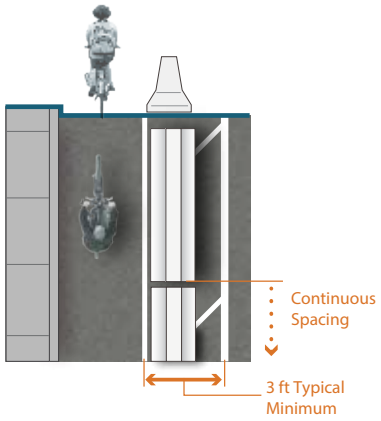
Separation Methods

Separated bikeways may use a variety of vertical elements to physically separate the bikeway from adjacent travel lanes. Barriers may be robust constructed elements such as curbs, or may be more interim in nature, such as flexible delineator posts.

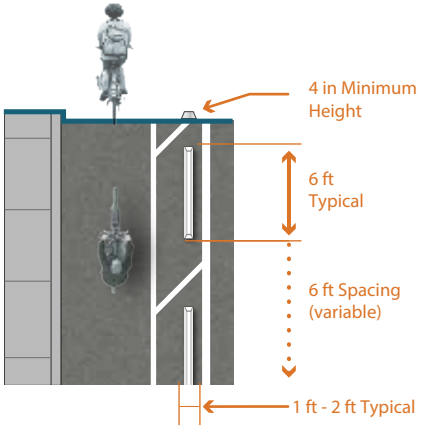
Delineator Posts



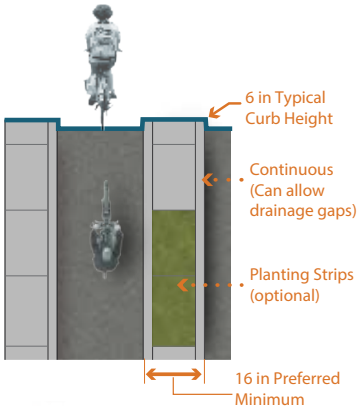
Concrete Barrier



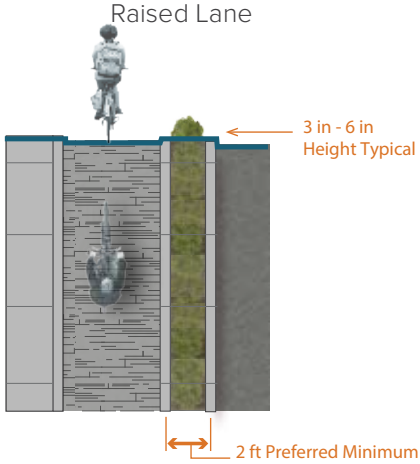
Parking Stops



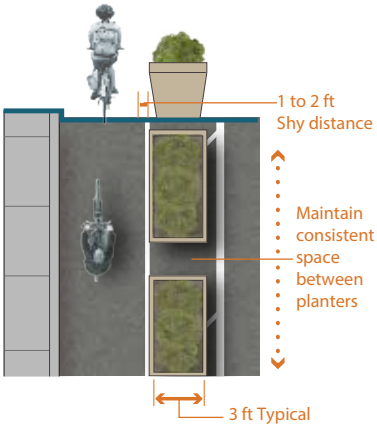
Raised Media



Raised Lane



Planters



TYPICAL APPLICATION

Appropriate barriers for retrofit projects:

- Parked Cars
- Flexible delineators
- Bollards
- Planters
- Parking stops

Appropriate barriers for reconstruction projects:

- Curb separation
- Medians
- Landscaped Medians
- Raised separated bike lane with vertical or mountable curb
- Pedestrian Safety Islands

Bikeway Separation Methods

Raised separated bikeways are bicycle facilities that are vertically separated from motor vehicle traffic.

DESIGN FEATURES

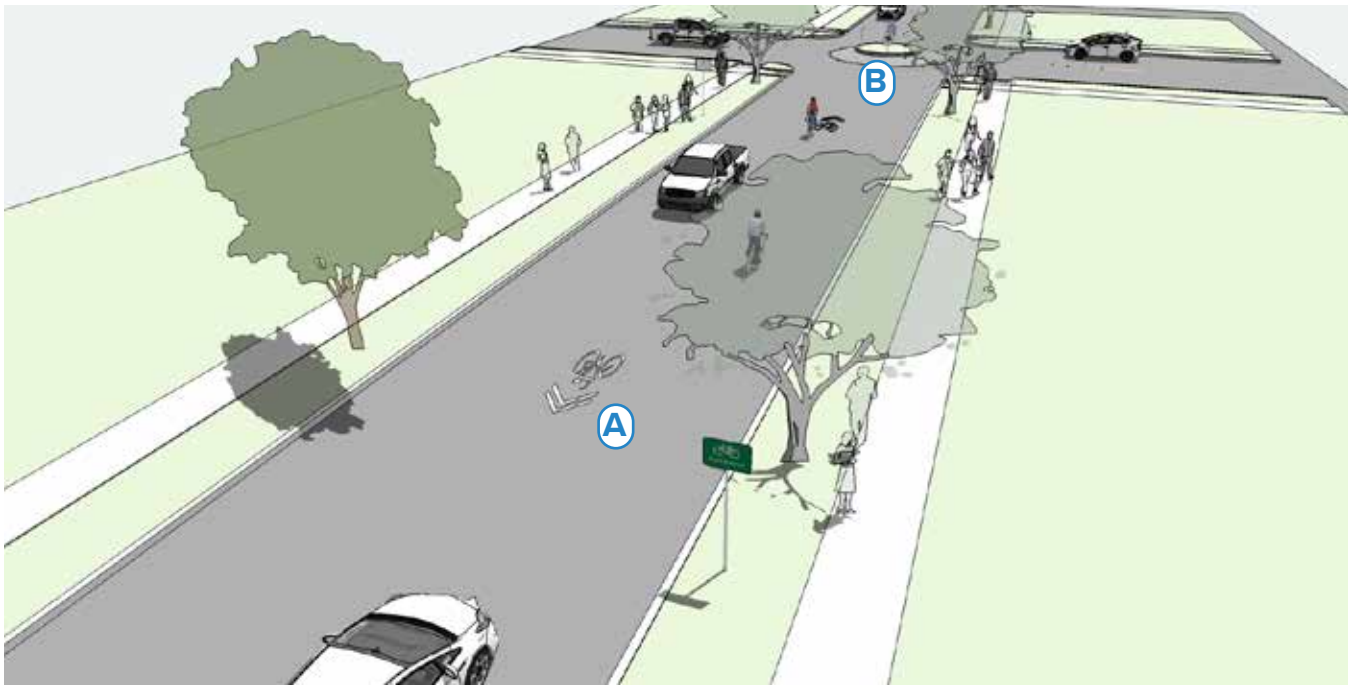
- Maximize effective operating space by placing curbs or delineator posts as far from the through bikeway space as practicable.
- Allow for adequate shy distance of 1 to 2 feet from vertical elements to maximize useful space.
- When next to parking allow for 3 feet of space in the buffer space to allow for opening doors and passenger unloading.
- The presences of landscaping in medians, planters and safety islands increases comfort for users and enhances the streetscape environment.

FURTHER CONSIDERATIONS

- Separated bikeway buffers and barriers are covered in the MUTCD as preferential lane markings (section 3D.01) and channelizing devices (section 3H.01). Curbs may be used as a channeling device, see the section on islands (section 3I.01).
- With new roadway construction a raised separated bikeway can be less expensive to construct than a wide or buffered bicycle lane, because of shallower trenching and sub-base requirements.
- Parking should be prohibited within 30 feet of the intersection to improve visibility.

Neighborhood Byways

Neighborhood byways are low-volume, low-speed streets modified to enhance bicyclist and pedestrian comfort by using treatments such as signage, pavement markings, traffic calming and/or traffic reduction, and intersection modifications. These treatments allow through movements of bicyclists while discouraging similar through-trips by non-local motorized traffic.



TYPICAL APPLICATION

- Parallel with and in close proximity to major thoroughfares (1/4 mile or less).
- Follow a desire line for bicycle travel that is ideally long and relatively continuous (2-5 miles).
- Avoid alignments with excessive zigzag or circuitous routing. The bikeway should have less than 10 percent out of direction travel compared to shortest path of primary corridor.
- Streets with travel speeds at 25 mph or less and with traffic volumes of fewer than 3,000 vehicles per day.

DESIGN FEATURES

(A) Signs and pavement markings are the minimum treatments necessary to designate a street as a bicycle boulevard.

(B) Intersection crossings should be designed to enhance safety and minimize delay for bicyclists. Midblock crossings, traffic diverters, curb extensions, traffic circles, and/or signals such as RRFB's are appropriate treatments

EXAMPLE PROJECTS

- 550 North in West Point
- Doral Drive in Syracuse
- 2200 S / Chelemes Way in Clearfield
- 250 W in Sunset

Bicycle Boulevards

Neighborhood byways are established on streets that improve connectivity to key destinations and provide a direct, low-stress route for bicyclists, with low motorized traffic volumes and speeds, designated and designed to give bicycle travel priority over other modes.

Traffic Calming

Streets along classified neighborhood byways may require additional traffic calming measures to discourage through trips by motor vehicles.

FURTHER CONSIDERATIONS

Neighborhood byway retrofits to local streets are typically located on streets without existing signalized accommodation at crossings of collector and arterial roadways. Without treatments for bicyclists, these intersections can become major barriers along the bicycle boulevard and compromise safety.

Traffic calming can deter motorists from driving on a street. Anticipate and monitor vehicle volumes on adjacent streets to determine whether traffic calming results in inappropriate volumes. Traffic calming can be implemented on a trial basis.

CRASH REDUCTION

In a comparison of vehicle/cyclist collision rates on traffic-calmed side streets signed and improved for cyclist use, compared to parallel and adjacent arterials with higher speeds and volumes, the bicycle boulevard as found to have a crash reduction factor of 63 percent, with rates two to eight times lower when controlling for volume (CMF ID: 3092).

CONSTRUCTION COSTS

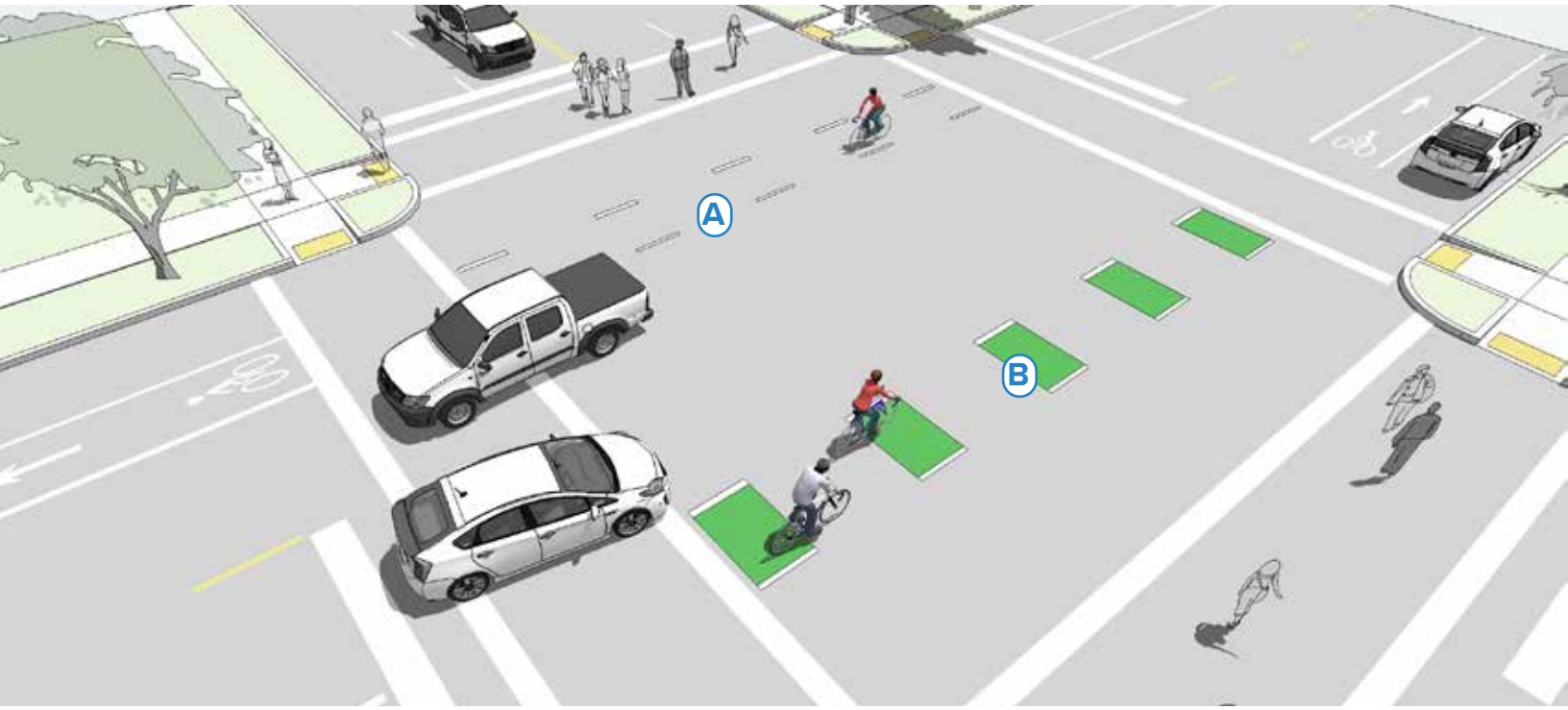
Costs vary depending on the type of treatments proposed for the corridor. Simple treatments such as wayfinding signage and markings are most cost-effective, but more intensive treatments will have greater impact at lowering speeds and volumes, at a higher cost.

05

BICYCLE FACILITIES AT INTERSECTIONS

Intersection Crossing Markings

Bicycle pavement markings through intersections guide bicyclists on a safe and direct path through the intersection and provide a clear boundary between the paths of through bicyclists and vehicles in the adjacent lane.



TYPICAL APPLICATION

- Streets with conventional, buffered, or separated bike lanes.
- At direct paths through intersections.
- Streets with high volumes of adjacent traffic.
- Where potential conflicts exist between through bicyclists and adjacent traffic.

DESIGN FEATURES

- Intersection markings should be the same width and in line with leading bike lane.

(A) Dotted lines should be a minimum of 6 inches wide and 4 feet long, spaced every 12 feet.

- All markings should be white, skid resistant and retro-eflective (MUTCD 9C.02.02).

(B) Green pavement markings may be used between the dotted lines to enhance visibility.

Intersection Crossing Markings

Intersection crossing markings can be used at signalized intersections or high volume minor street and driveway crossings, as illustrated above.

FURTHER CONSIDERATIONS

Dropped lanes, where a through lane transitions to the right turn lane, can be particularly challenging for bicyclists and should be avoided where practicable.

CRASH REDUCTION

A study on the safety effects of intersection crossing markings found a reduction in accidents by 10 percent and injuries by 19 percent.

A study in Portland, OR found that significantly more motorists yielded to bicyclists after the colored pavement had been installed (92 percent in the after period versus 72 percent in the before period).

CONSTRUCTION COSTS

The cost for installing intersection crossing markings will depend on the implementation approach. On roadways with adequate width for reconfiguration or restriping, costs may be negligible when provided as part of routine overlay or repaving projects.

Typical shared lane markings cost $180 each.

Additional References and Guidelines

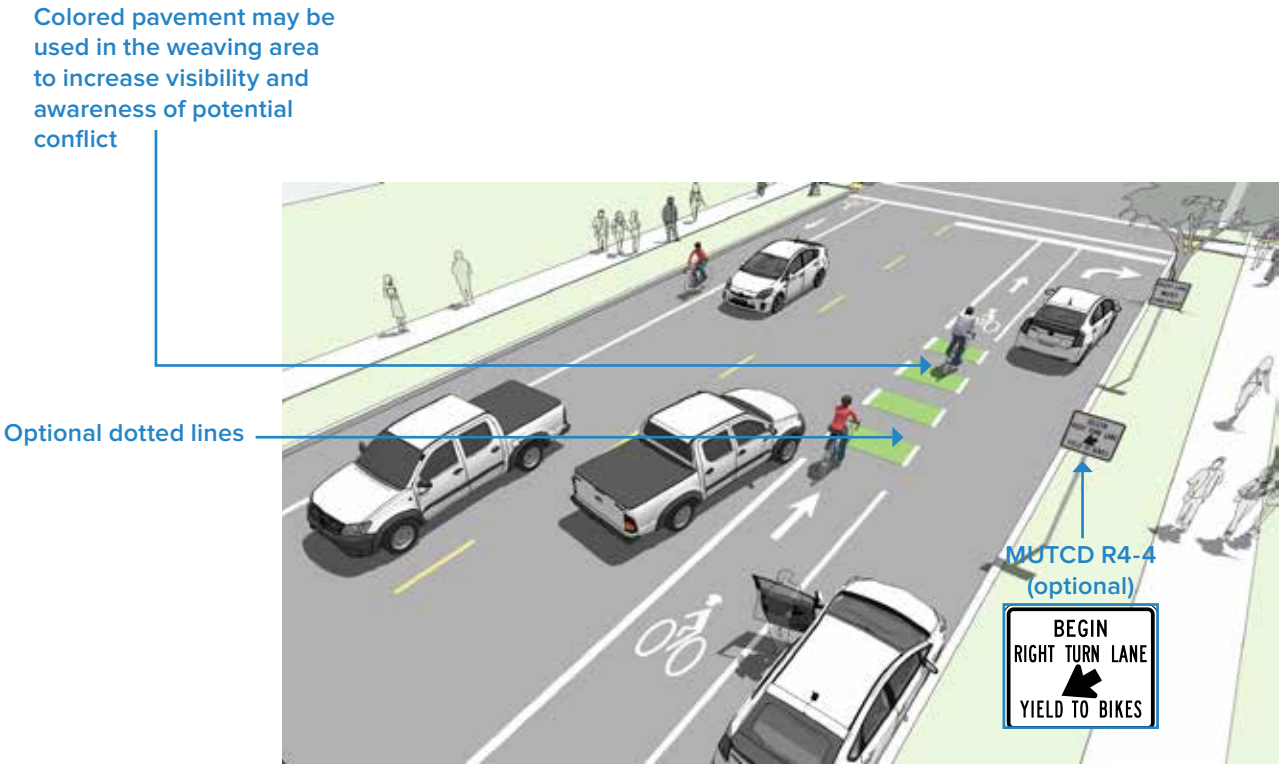
Letter to FHWA from the Bicycle Technical Committee for the MUTCD. Bicycle Lane Extensions through Intersections. June 2014.

Jensen, S.U. (2008). Safety effects of blue cycle crossings: A before-after study. Accident Analysis & Prevention, 40(2), 742-750.

Hunter, W.W. et al. (2000). Evaluation of Blue Bike-Lane Treatment in Portland, Oregon. Transportation Research Record, 1705, 107-115.

Bike Lanes at Right Turns

The appropriate treatment at right-turn lanes is to place the bike lane between the right-turn lane and the right-most through lane or, where right-of-way is insufficient, to use a shared bike lane/turn lane.



TYPICAL APPLICATION & DESIGN FEATURES

At auxiliary right turn only lanes (add lane):

- Continue existing bike lane width; standard width of 5 to 6 feet or 4 feet in constrained locations.
- Use signage to indicate that motorists should yield to bicyclists through the conflict area.
- Consider using colored conflict areas to promote visibility of the mixing zone.

Where a through lane becomes a right turn only lane:

- Do not define a dotted line merging path for bicyclists.
- Drop the bicycle lane in advance of the merge area.
- Use shared lane markings to indicate shared use of the lane in the merging zone.

Bike Lanes at Right Turns

Drivers wishing to enter the right turn lane must transition across the bicycle lane in advance of the turn.

FURTHER CONSIDERATIONS

- The bicycle lane maintains a straight path, and drivers must weave across, providing clear right-of-way priority to bicyclists.
- Maintaining a straight bicycle path reinforces the priority of bicyclists over turning cars. Drivers must yield to bicyclists before crossing the bike lane to enter the turn only lane.
- Through lanes that become turn only lanes are difficult for bicyclists to navigate and should be avoided.
- The use of dual right-turn-only lanes should be avoided on streets with bike lanes (AASHTO, 2013). Where there are dual right-turn-only lanes, the bike lane should be placed to the left of both right-turn lanes, in the same manner as where there is just one right-turn-only lane.

CRASH REDUCTION

Studies have shown a 3 percent decrease in crashes at signalized intersections with exclusive right turn lanes when compared to sharing the roadway with motor vehicles (CMF ID: 3257).

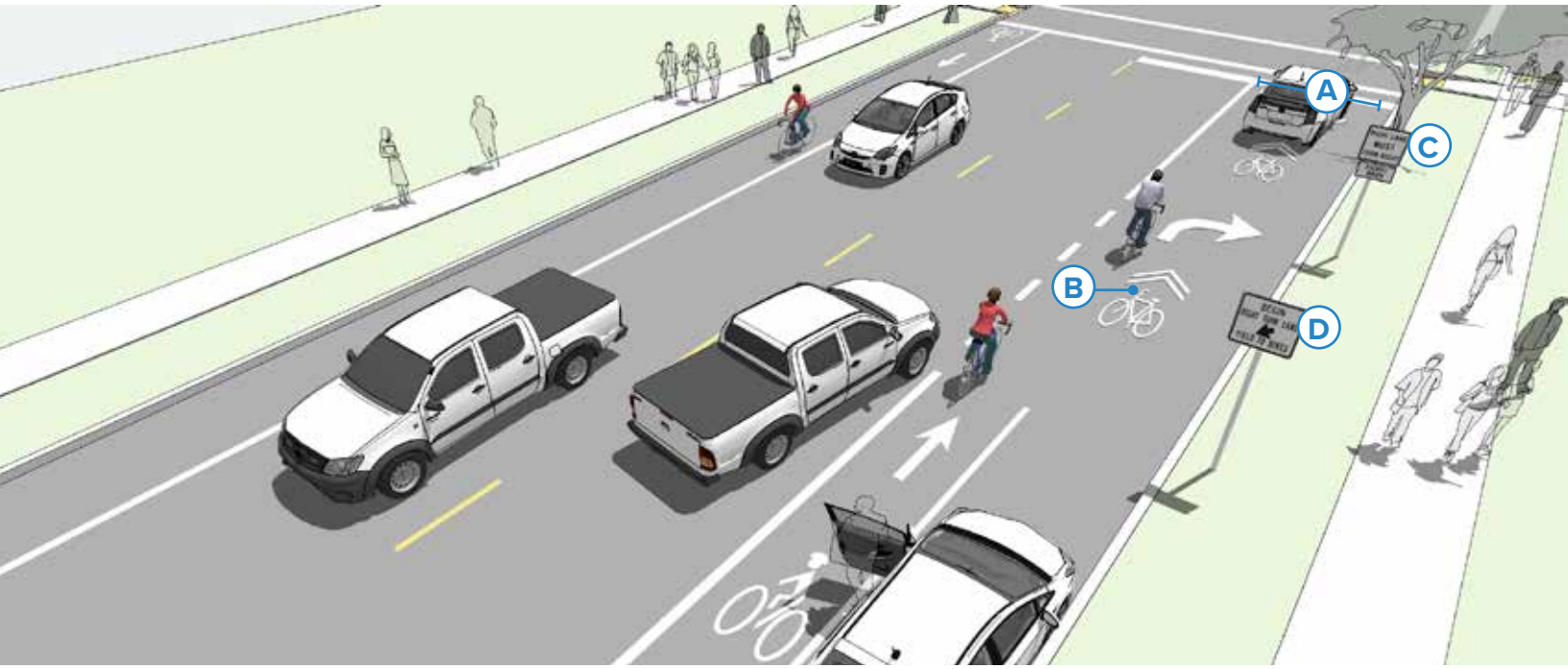
CONSTRUCTION COSTS

The cost for installing bicycle lanes will depend on the implementation approach. On roadways with adequate width for reconfiguration or restriping, costs may be negligible when provided as part of routine overlay or repaving projects.

Typical costs are $16,000 per mile for restriping.

Combined Bike Lane/Turn Lane

Where there isn't room for a conventional bicycle lane and turn lane a combined bike lane/turn lane creates a shared lane where bicyclists can ride and turning motor vehicles yield to through traveling bicyclists. The combined bicycle lane/turn lane places shared lane markings within a right turn only lane.



TYPICAL APPLICATION

- Most appropriate in areas with lower posted speeds (30 MPH or less) and with lower traffic volumes (10,000 ADT or less).
- May not be appropriate for high speed arterials or intersections with long right turn lanes.
- May not be appropriate for intersections with large percentages of right-turning heavy vehicles.

DESIGN FEATURES

(A) Maximum shared turn lane width is 13 feet; narrower is preferable (NACTO, 2012).

(B) Shared Lane Markings should indicate preferred positioning of bicyclists within the combined lane.

(C) A "Right Lane Must Turn Right" (MUTCD R3-7R) sign with an "EXCEPT BIKES" plaque may be needed to permit through bicyclists to use a right turn lane.

(D) Use "Begin Right Turn Lane Yield To Bikes" signage (MUTCD R4-4) to indicate that motorists should yield to bicyclists through the conflict area.

Combined Bike Lane/Turn Lane

Shared lane markings and signs indicate that bicyclists should ride on the left side of this right turn only lane.

FURTHER CONSIDERATIONS

- This treatment is recommended at intersections lacking sufficient space to accommodate both a standard through bike lane and right turn lane.
- Not recommended at intersections with high peak motor vehicle right turn movements.
- Combined bike lane/turn lane creates safety and comfort benefits by negotiating conflicts upstream of the intersection area.

CRASH REDUCTION

A survey in Eugene, OR found that more than 17 percent of the surveyed bicyclists using the combined turn lane felt that it was safer than the comparison location with a standard-width right-turn lane, and another 55 percent felt that the combined-lane site was no different safety-wise than the standard-width location.

CONSTRUCTION COSTS

The cost for installing a combined turn lane will depend on the implementation approach. On roadways with adequate width for reconfiguration or restriping, costs may be negligible when provided as part of routine overlay or repaving projects.

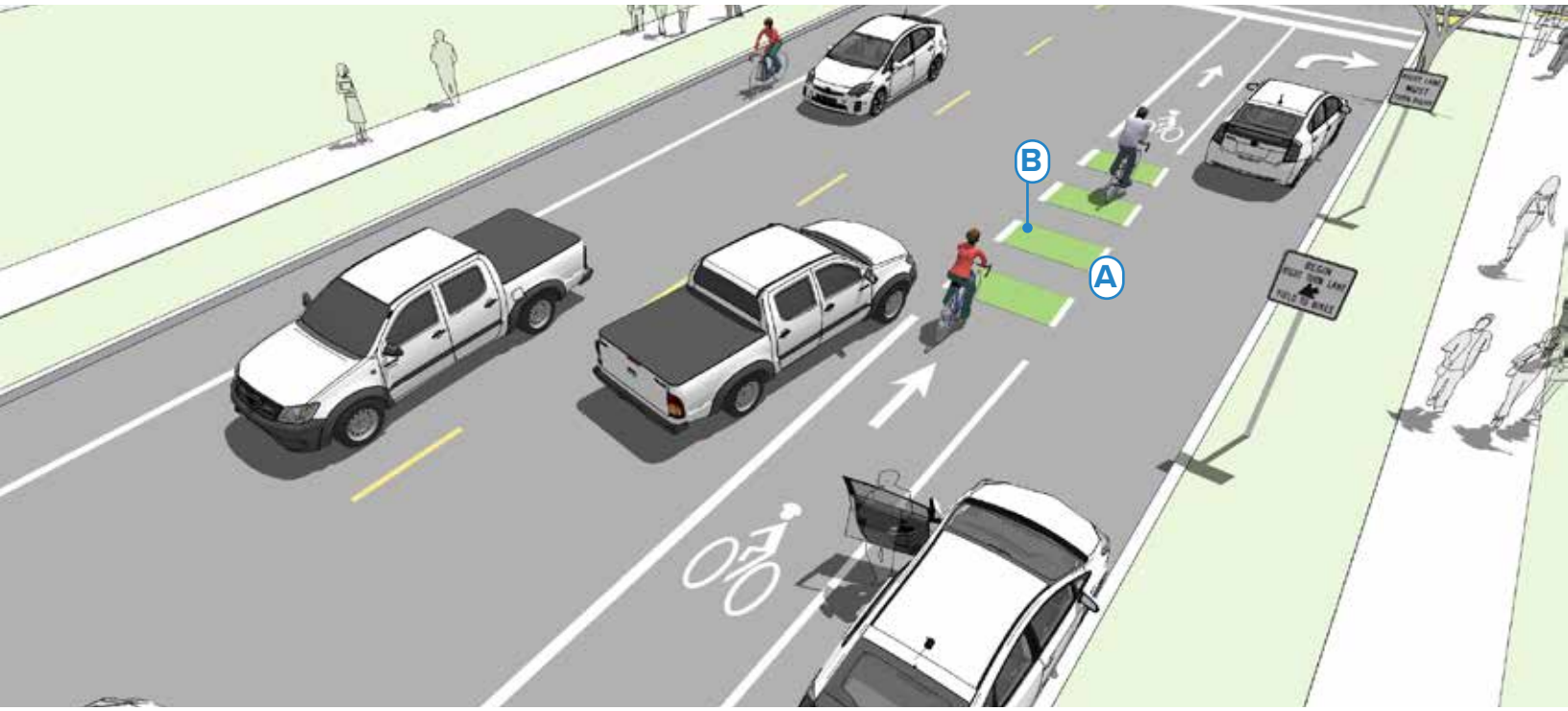
Typical costs are $16,000 per mile for restriping. Typical yield lines cost $10 per square foot or $320 each. Typical shared lane markings cost $180 each.

Additional References and Guidelines

Hunter, W.W. (2000). Evaluation of a Combined Bicycle Lane/Right-Turn Lane in Eugene, Oregon. Publication No. FHWA-RD-00-151, Federal Highway Administration, Washington, DC.

Colored Bicycle Lanes

Colored pavement within a bicycle lane may be used to increase the visibility of the bicycle facility, raise awareness of the potential to encounter bicyclists and reinforce priority of bicyclists in conflict areas.



TYPICAL APPLICATION

- Within a weaving or conflict area to identify the potential for bicyclist and motorist interactions and assert bicyclist priority.
- Across intersections, driveways and stop or yield-controlled cross-streets.

DESIGN FEATURES

(A) Typical white bike lanes (solid or dotted 6 inch stripe) are used to outline the green colored pavement.

(B) In weaving or turning conflict areas, preferred striping is dashed, to match the bicycle lane line extensions.

- The colored surface should be skid resistant and retro-reflective (MUTCD 9C.02.02).
- In exclusive use areas, such as bike boxes, color application should be solid green.

Colored Bicycle Lane

A colored bicycle lane on Laurel Street in Santa Cruz, CA alerts users to potential merging in advance of an intersection.

FURTHER CONSIDERATIONS

- Green colored pavement shall be used in compliance with FHWA Interim Approval (FHWA IA-14.10).
- While other colors have been used (red, blue, yellow), green is the recommended color in the US.
- The application of green colored pavement within bicycle lanes is an emerging practice. The guidance recommended here is based on best practices in cities around the county.

CRASH REDUCTION

Before and after studies of colored bicycle lane installations have found a reduction in bicycle/vehicle collisions by 38 percent and a reduction in serious injuries and fatalities of bicyclists by 71 percent. A study in Portland, OR found a 38 percent decrease in the rate of conflict between bicyclists and motorists after colored lanes were installed.

CONSTRUCTION COSTS

The cost for installing colored bicycle lanes will depend on the materials selected and implementation approach. Typical costs range from $1.20/sq. foot installed for paint to $14/sq. foot installed for Thermoplastic. Colored pavement is more expensive than standard asphalt installation, costing 30-50 percent more than non-colored asphalt.

Additional References and Guidelines

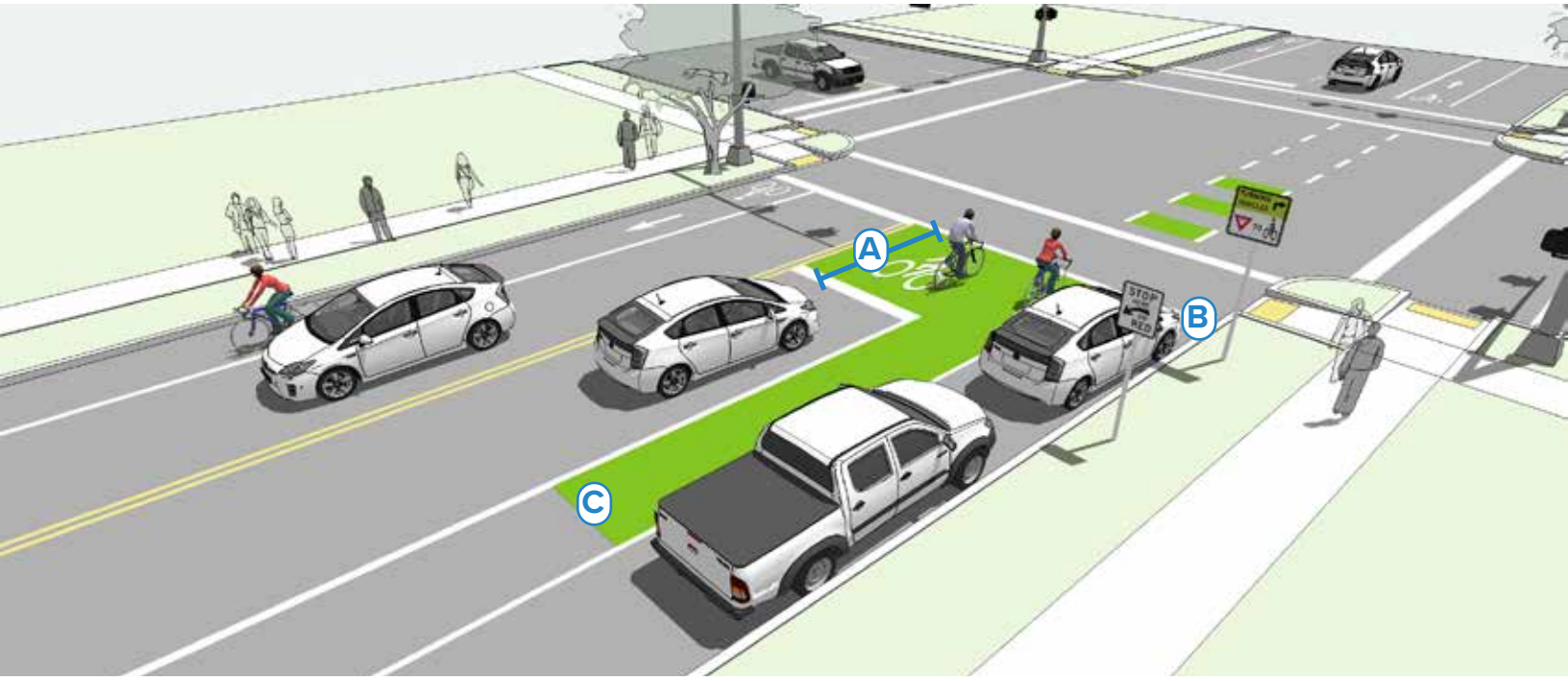
FHWA. Interim Approval for Optional Use of Green Colored Pavement for Bike Lanes (IA-14). 2011.

Jensen, S.U., et. al., "The Marking of Bicycle Crossings at Signalized Intersections," Nordic Road and Transport Research No. 1, 1997, pg. 27.

Hunter, W. W., et. al., Evaluation of the Blue Bike-Lane Treatment Used in Bicycle/Motor Vehicle Conflict Areas in Portland, Oregon, McLean, VA: FHWA, 2000, pg. 25.

Bike Box

A bike box is a designated area located at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible space to get in front of queuing traffic during the red signal phase. Motor vehicles must queue behind the white stop line at the rear of the bike box. On a green signal, all bicyclists can quickly clear the intersection.



TYPICAL APPLICATION

- At potential areas of conflict between bicyclists and turning vehicles, such as a right or left turn locations.
- At signalized intersections with high bicycle volumes.
- At signalized intersections with high vehicle volumes.

DESIGN FEATURES

(A) 14 foot minimum depth from back of crosswalk to motor vehicle stop bar (NACTO, 2012).

(B) A “No Turn on Red” (MUTCD R10-11) sign shall be installed overhead to prevent vehicles from entering the Bike Box. A “Stop Here on Red” (MUTCD R10-6) sign should be post mounted at the stop line to reinforce observance of the stop line.

(C) A 50 foot ingress lane should be used to provide access to the box.

- Use of green colored pavement is optional.

Bike Box

A bike box allows for cyclists to wait in front of queuing traffic, providing high visibility, and a head start over motor vehicle traffic.

FURTHER CONSIDERATIONS

- This treatment positions bicycles together and on a green signal, all bicyclists can quickly clear the intersection, minimizing conflict and delay to transit or other traffic.
- Pedestrians also benefit from bike boxes, as they experience reduced vehicle encroachment into the crosswalk.

CRASH REDUCTION

A study of motorist/bicyclist conflicts at bike boxes indicate a 35 percent decrease in conflicts (CMF ID: 1718). A study done in Portland in 2010 found that 77 percent of bicyclists felt bicycling through intersections was safer with the bike boxes.

CONSTRUCTION COSTS

Costs will vary due to the type of paint used and the size of the bike box, as well as whether the treatment is added at the same time as other road treatments.

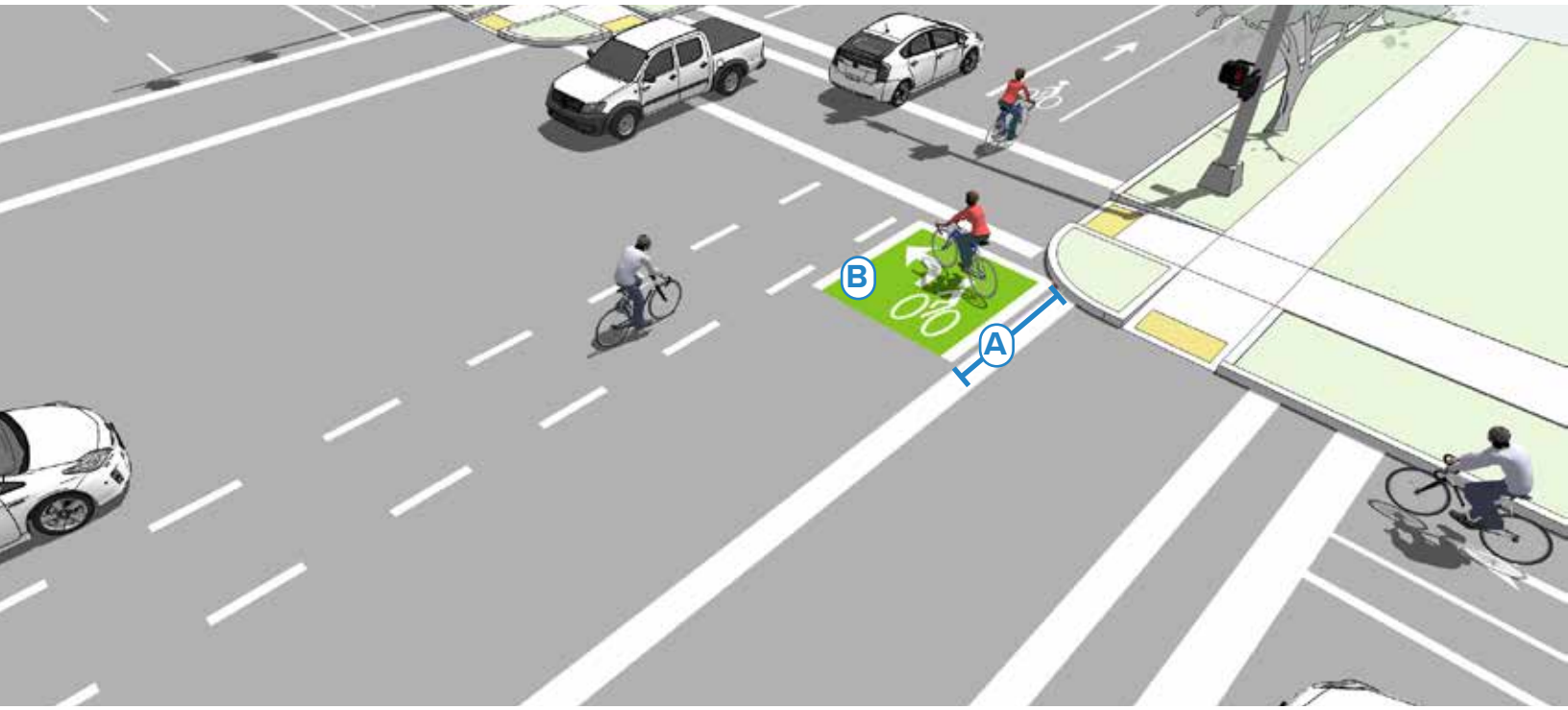
The typical cost for painting a bike box is $11.50 per sq. foot.

Additional References and Guidelines

Monsere, C. & Dill, J. (2010). Evaluation of Bike Boxes at Signalized Intersections. Final Draft. Oregon Transportation Research and education Consortium.

Two-Stage Turn Boxes

Two- stage turn boxes offer bicyclists a safe way to make turns at multi-lane signalized intersections from a physically separated or conventional bike lane. On physically separated bike lanes, bicyclists are often unable to merge into traffic to turn due to physical separation, making the provision of two-stage turn boxes critical.



TYPICAL APPLICATION

- Streets with high vehicle speeds and/or traffic volumes.
- At intersections locations of multi-lane roads with signalized intersections.
- At signalized intersections with a high number of bicyclists making a left turn from a right side facility.

DESIGN FEATURES

- The two-stage turn box shall be placed in a protected area. Typically this is within the shadow of an on-street parking lane or separated bike lane buffer area and should be placed in front of the crosswalk to avoid conflict with pedestrians.

(A) 8 foot by 6 foot preferred depth of bicycle storage area (6 foot by 3 foot minimum).

(B) Bicycle stencil and turn arrow pavement markings shall be used to indicate proper bicycle direction and positioning (NACTO, 2012).

Jughandle Turn Box

This MUTCD compliant design carves a jughandle out of the sidewalk to provide space for waiting bicyclists.

Separated Bike Lane Turn Box

On separated bike lanes, the two-stage turn box can be located in the protected buffer/parking area.

FURTHER CONSIDERATIONS

- Consider providing a “No Turn on Red” (MUTCD R10-11) on the cross street to prevent motor vehicles from entering the turn box.
- This design formalizes a maneuver called a “box turn” or “pedestrian style turn.”
- Some two-stage turn box designs are considered experimental by FHWA.
- Design guidance for two-stage turns apply to both bike lanes and separated bike lanes.
- Two-stage turn boxes reduce conflicts in multiple ways; from keeping bicyclists from queuing in a bike lane or crosswalk and by separating turning bicyclists from through bicyclists.
- Bicyclist capacity of a two-stage turn box is influenced by physical dimension (how many bicyclists it can contain) and signal phasing (how frequently the box clears).

CRASH REDUCTION

There are no Crash Modification Factors (CMFs) available for this treatment.

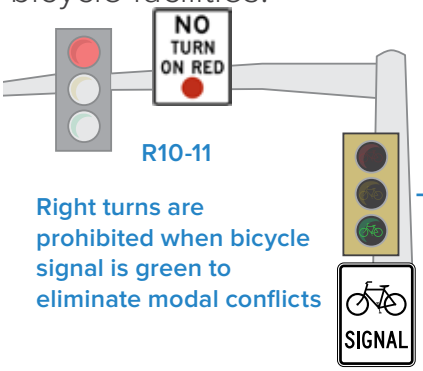
CONSTRUCTION COSTS

Costs will vary due to the type of paint used and the size of the two-stage turn box, as well as whether the treatment is added at the same time as other road treatments.

The typical cost for painting a two-stage turn box is $11.50 per square ft.

Bike Signal Head

A bicycle signal is an electrically powered traffic control device that should only be used in combination with an existing traffic signal. Bicycle signals are typically used to improve identified safety or operational problems involving bicycle facilities.

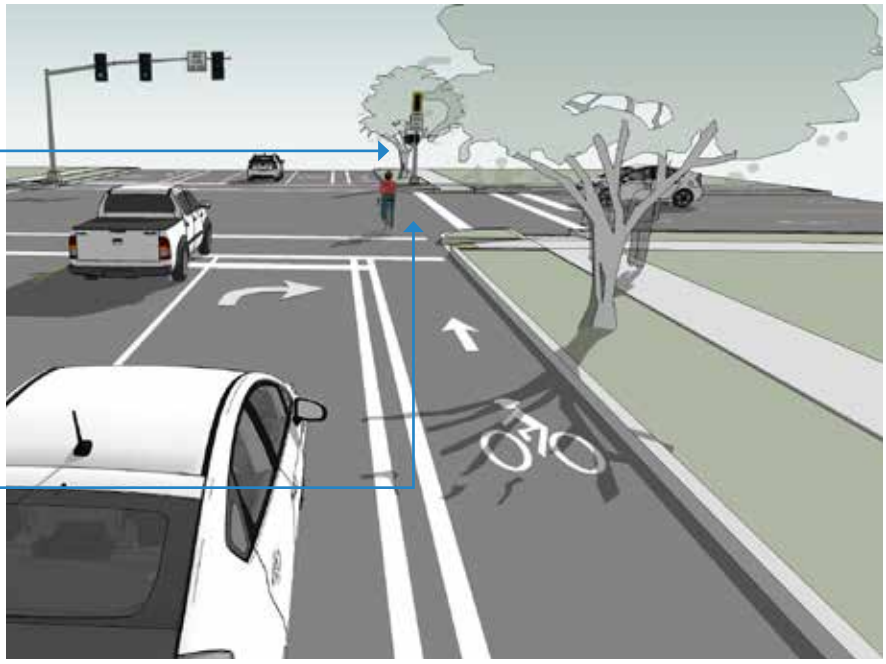


R10-11

Right turns are prohibited when bicycle signal is green to eliminate modal conflicts

R10-10b sign clarifies proper usage

Bicycle signals must utilize appropriate detection and actuation



TYPICAL APPLICATION

- Bicycle signal heads may be installed at signalized intersections to indicate bicycle signal phases and other bicycle-specific timing strategies. Bicycle signals can be actuated with bicycle sensitive loop detectors, video detection, or push buttons.
- Bicycle signals are typically used to provide guidance for bicyclists at intersections where they may have different needs from other road users (e.g. bicycle-only movements).

DESIGN FEATURES

Specific locations where bicycle signals have had a demonstrated positive effect include:

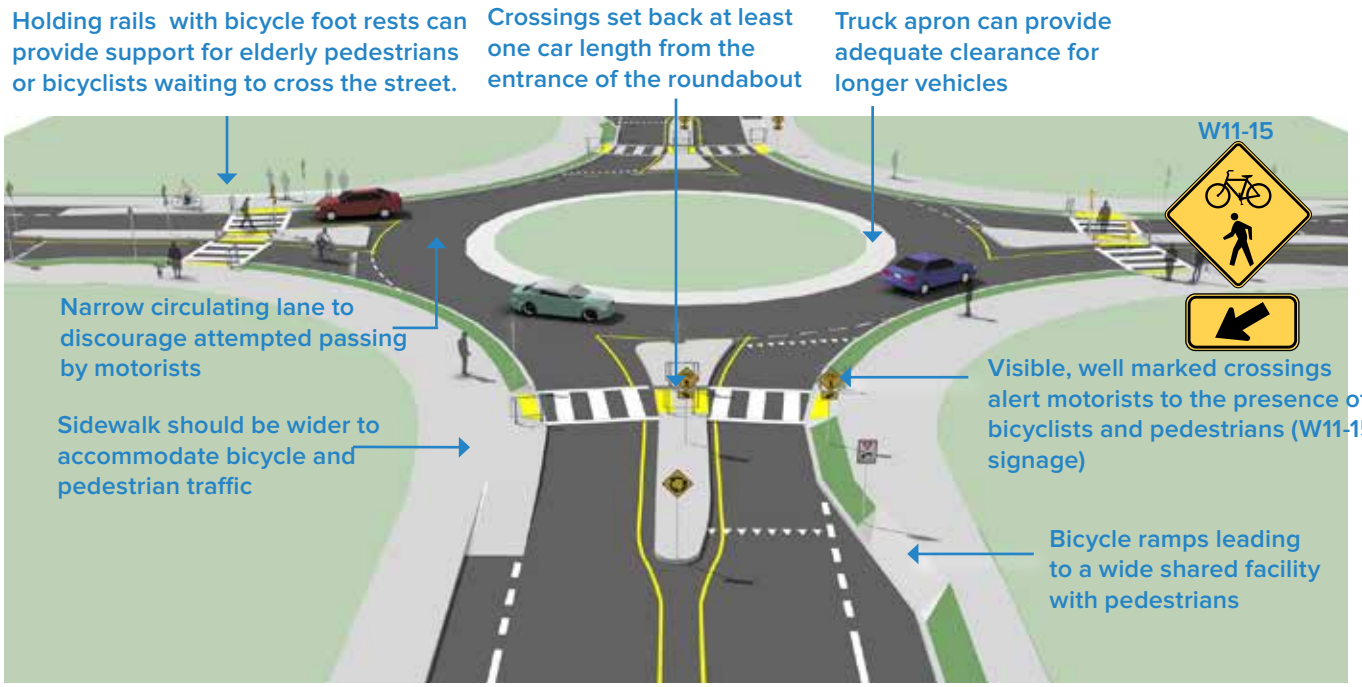
- Those with high volume of bicyclists at peak hours
- Those with high numbers of bicycle/motor vehicle crashes, especially those caused by turning vehicle movements
- At T-intersections with major bicycle movement along the top of the "T."
- At the confluence of an off-street bike path and a roadway intersection
- Where separated bike paths run parallel to arterial streets

ADDITIONAL REFERENCES AND GUIDELINES

FHWA. MUTCD - Interim Approval for Optional Use of a Bicycle Signal Face (IA-16). 2013.

Bicyclists at Single Lane Roundabouts

Roundabouts are circular intersection designed with yield control for all entering traffic, channelized approaches and geometry to induce desirable speeds. They are used as an alternative to intersection signalization.



TYPICAL APPLICATION

- On bicycle routes a roundabout or neighborhood traffic circle is preferable to stop control as bicyclists do not like to lose their momentum due to physical effort required.
- At intersections of multi-use paths, pedestrian and bicycle only roundabouts are an excellent form of non-motorized user traffic control.

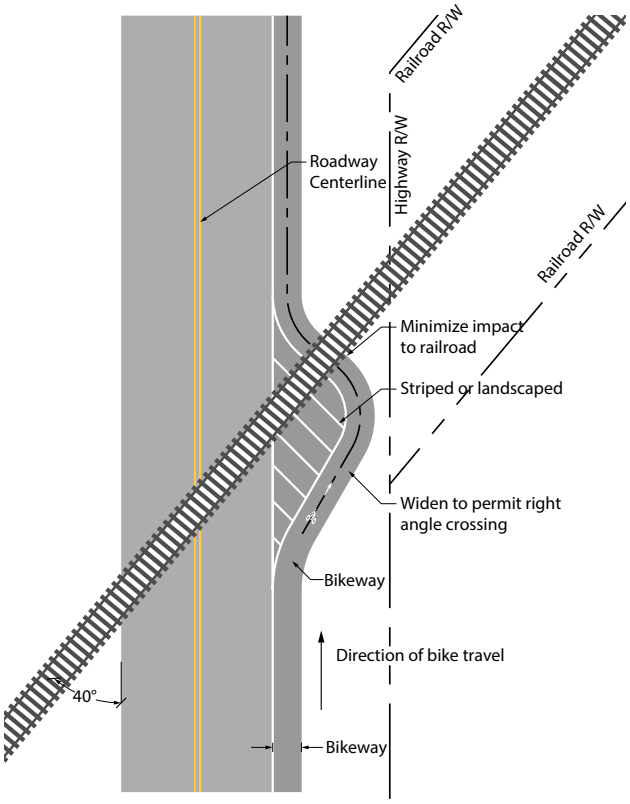
DESIGN FEATURES

It is important to indicate to motorists, bicyclists and pedestrians the right-of-way rules and correct way for them to circulate, using appropriately designed signage, pavement markings, and geometric design elements.

- 25 mph maximum circulating design speed.
- Design approaches/exits to the lowest speeds possible.
- Encourage bicyclists navigating the roundabout like motor vehicles to “take the lane.”
- Maximize yielding rate of motorists to pedestrians and bicyclists at crosswalks.
- Provide separated facilities for bicyclists who prefer not to navigate the roundabout on the roadway.

Railroad At-grade Crossings

Railroad tracks intersecting with bicycle facilities can be hazardous for bicyclists, people in wheelchairs, and other small-wheeled transportation devices. Rails can cause steering difficulties, wheel damage, or loss of control of the bicycle. Additionally, pavement surfaces, rails, and gaps may be uneven, causing additional obstacles for bicyclists, and metal rails can be slippery when wet.



TYPICAL APPLICATION

- Any bicycle facility on streets that intersect railroads
- Off-street facilities (shared use paths) that intersect railroads

DESIGN FEATURES

- Crossing angles should be designed as close to 90 degrees as possible, but no less than 60 degrees. The angle is important to reduce the likelihood of bicycle wheels getting stuck in the flangeway.
- Where 90 degrees cannot be achieved, pavement markings may be added to help guide bicyclists through at the correct angle
- Minimum width of bicycle facilities crossing railroad tracks is 6' to allow for lateral maneuvering if necessary
- Avoid reverse curves when possible as reverse curves require bicyclists to cross tracks when leaning
- Warning signs or markings should be used to inform bicyclists of upcoming rail crossing. Advance warning sign (MUTCD W10-1) and STOP (R1-1) or YIELD (R1-2) signs are required at all railroad crossings that are not equipped with train activated flashing lights
- Detectable warnings are required for any pedestrian facilities at railroad crossings for ADA compliance

ADDITIONAL REFERENCES AND GUIDELINES

AASHTO, Guide for the Development of Bicycle Facilities. Fourth Edition (2012).

06

BICYCLE FACILITY AMENITIES

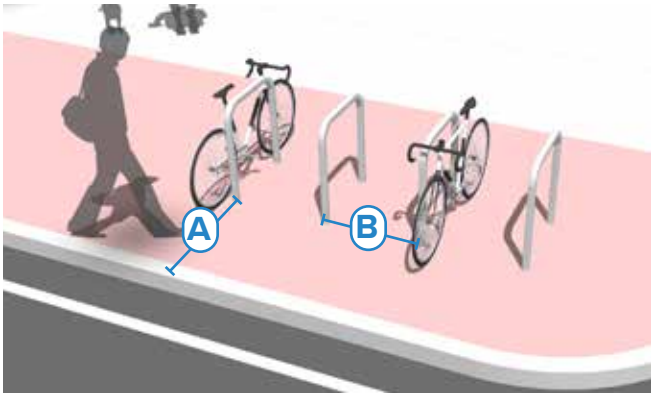
Bike Parking

Bicyclists expect a safe, convenient place to secure their bicycle when they reach their destination. This may be short-term parking of two hours or less, or long-term parking for employees, students, residents, and commuters.

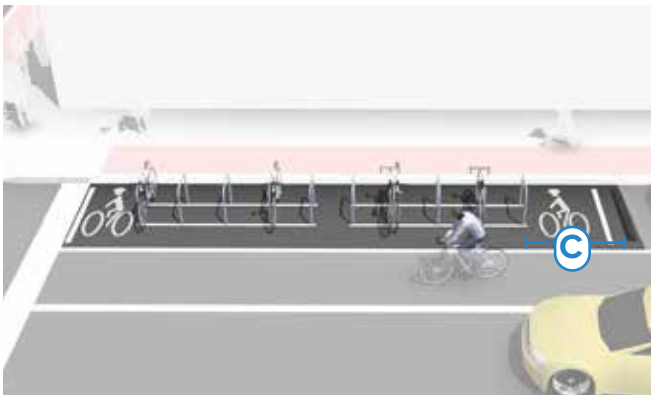
TYPICAL APPLICATION

- Bicycle parking facilities shall be located in highly visible well-lighted areas. In order to maximize security, whenever possible short-term bicycle parking facilities shall be located in areas highly visible from the street and from the interior of the building they serve (i.e. placed adjacent to windows).
- Bike racks provide short-term bicycle parking and is meant to accommodate visitors, customers, and others expected to depart within two hours. It should be an approved standard rack, appropriate location and placement, and weather protection.
- On-street bike corrals (also known as on-street bicycle parking) consist of bicycle racks grouped together in a common area within the street traditionally used for automobile parking. Bicycle corrals are reserved exclusively for bicycle parking and provide a relatively inexpensive solution to providing high-volume bicycle parking. Bicycle corrals can be implemented by converting one or two on-street motor vehicle parking spaces into on-street bicycle parking. Each motor vehicle parking space can be replaced with approximately 6-10 bicycle parking spaces.

Perpendicular Bike Racks



Bike Corral



CONSTRUCTION COSTS

Costs can vary based on the design and materials used. Bicycle rack costs can range from approximately $60 to $3,600, depending on design and materials used. On average the cost is approximately $660. Bicycle lockers costs range from $1,280 to $2,680.

Wayfinding Sign Types

The ability to navigate through a city is informed by landmarks, natural features, and other visual cues. Signs throughout the city should indicate to bicyclists the direction of travel, the locations of destinations and the travel time/distance to those destinations. A bicycle wayfinding system consists of comprehensive signing and/or pavement markings to guide bicyclists to their destinations along preferred bicycle routes.

D11-1c

D1-1

D11-1/D1-3a

TYPICAL APPLICATION

- Wayfinding signs will increase users' comfort and accessibility to the bicycle network.
- Signage can serve both wayfinding and safety purposes including:
    - Helping to familiarize users with the bicycle network
    - Helping users identify the best routes to destinations
    - Helping to address misconceptions about time and distance
    - Helping overcome a "barrier to entry" for people who are not frequent bicyclists (e.g., "interested but concerned" bicyclists)

DESIGN FEATURES

(A) 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 but do not include arrows.

(B) Turn signs indicate where a bikeway turns from one street onto another street. These can be used with pavement markings and include destinations and arrows.

(C) Decisions signs indicate the junction of two or more bikeways and inform bicyclists of the designated bike route to access key destinations. These include destinations, arrows and distances. Travel times are optional but recommended.

Community Logos on Signs

Wayfinding signs can include a local community identification logo, as this example from Oakland, CA.

Custom Street Signs (Berkeley, CA)

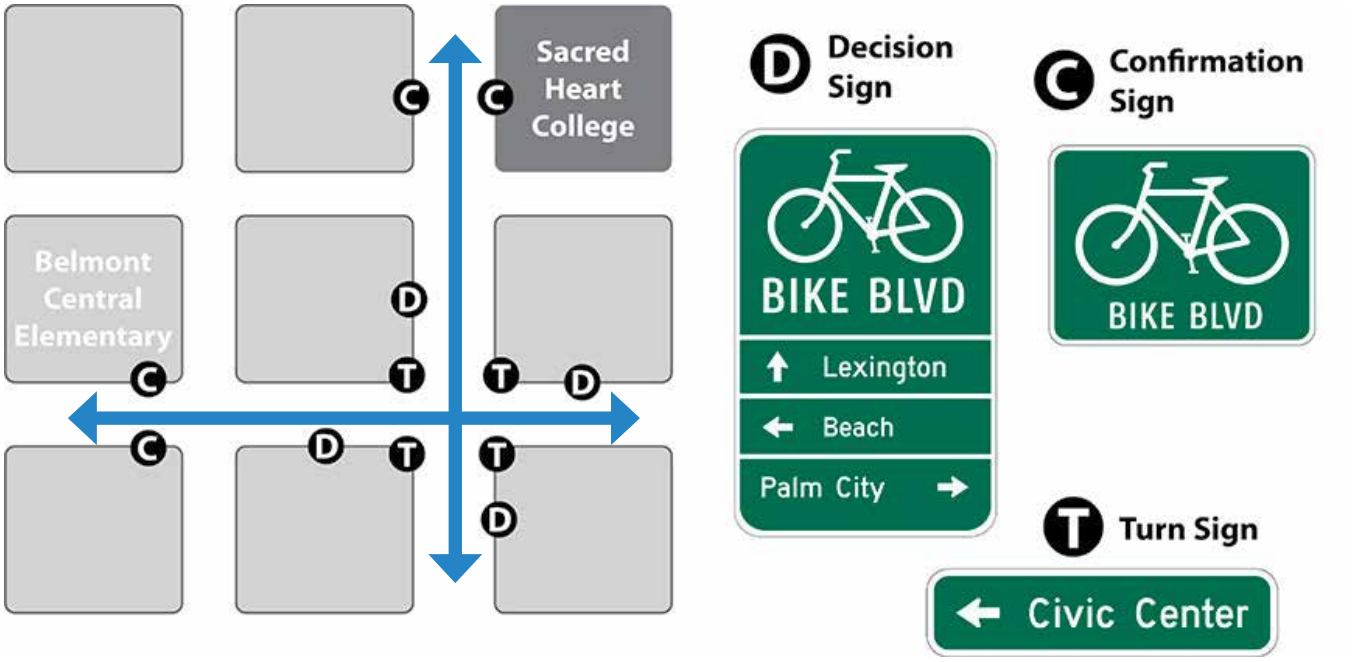
Custom street signs can also act as a type of confirmation sign, to let all users know the street is prioritized for bicyclists.

FURTHER CONSIDERATIONS

- Bicycle wayfinding signs also visually cue motorists that they are driving along a bicycle route and should use caution. Signs are typically placed at key locations leading to and along bicycle routes, including the intersection of multiple routes.
- Too many road signs tend to clutter the right-of-way, and it is recommended that these signs be posted at a level most visible to bicyclists rather than per vehicle signage standards.
- A community-wide bicycle wayfinding signage plan would identify:
    - Sign locations
    - Sign type – what information should be included and design features
    - Destinations to be highlighted on each sign – key destinations for bicyclists
    - Approximate distance and travel time to each destination
- Green is the color used for directional guidance and is the most common color of bicycle wayfinding signage in the US, including those in the MUTCD.
- Check wayfinding signage along bikeways for signs of vandalism, graffiti, or normal wear and replace signage along the bikeway network as-needed.

Wayfinding Sign Placement

Signs are 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.



TYPICAL APPLICATION

Confirmation Signs

- Placed every ¼ to ½ mile on off-street facilities and every 2 to 3 blocks along on-street 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

- 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

- Near-side of intersections in advance of a junction with another bicycle route.
- Along a route to indicate a nearby destination.

DESIGN FEATURES

- MUTCD guidelines should be followed for wayfinding sign placement, which includes mounting height and lateral placement from edge of path or roadway.
- Pavement markings can be used to reinforce routes and directional signage.

Wayfinding Pavement Markings

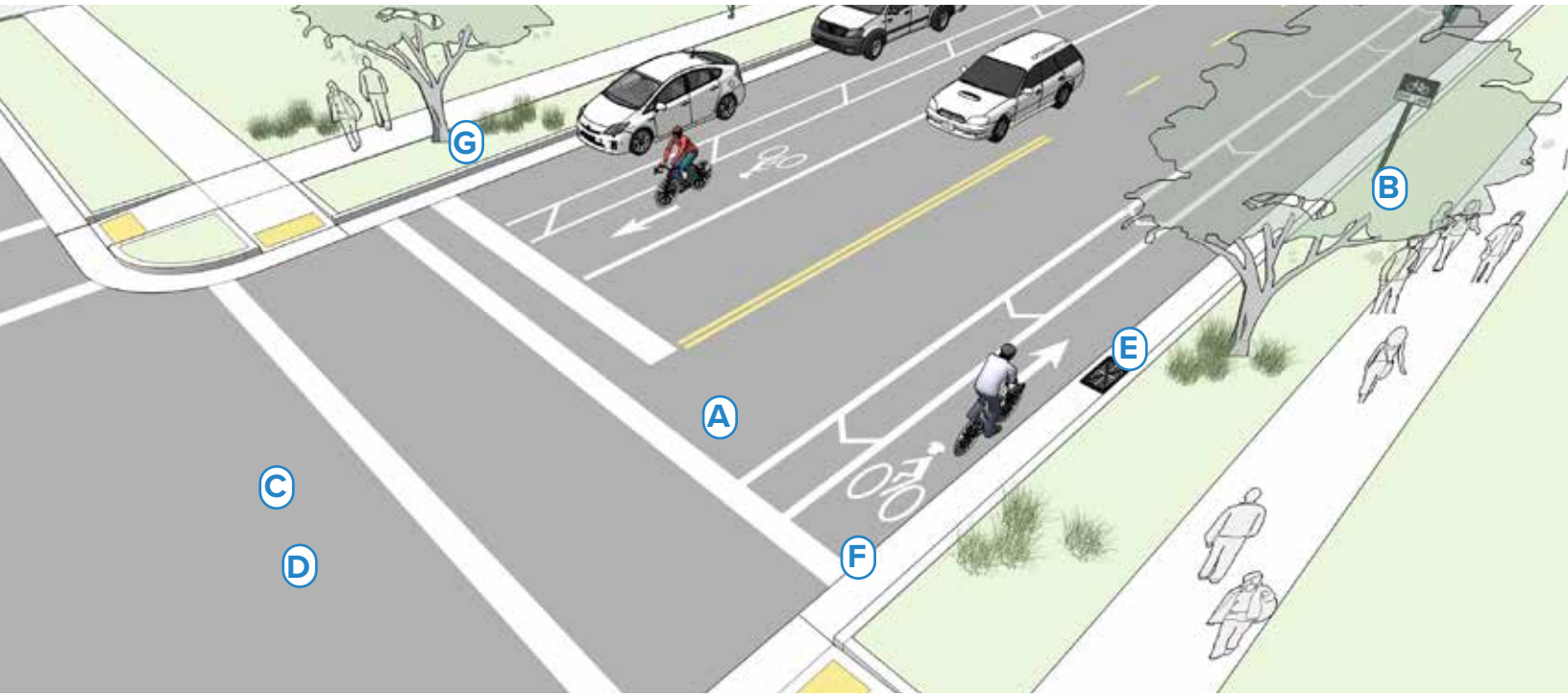
Some cities use pavement markings to indicate required turns along the bicycle route.

FURTHER CONSIDERATIONS

It can be useful to classify a list of destinations for inclusion on the signs based on their relative importance to users throughout the area. A particular destination's ranking in the hierarchy can be used to determine the physical distance from which the locations are signed. For example, primary destinations (such as the downtown area) may be included on signage up to 5 miles away. Secondary destinations (such as a transit station) may be included on signage up to two miles away. Tertiary destinations (such as a park) may be included on signage up to one mile away.

Bikeway Maintenance

Regular bicycle facility maintenance includes sweeping, maintaining a smooth roadway, ensuring that the gutter-to-pavement transition remains relatively flush, and installing bicycle-friendly drainage grates. Pavement overlays are a good opportunity to improve bicycle facilities. The following recommendations provide a menu of options to consider to enhance a maintenance regimen.



MAINTENANCE

A Sweeping

- Establish a seasonal sweeping schedule that prioritizes roadways with major bicycle routes.
- Sweep walkways and bikeways whenever there is an accumulation of debris on the facility.
- In curbed sections, sweepers should pick up debris; on open shoulders, debris can be swept onto gravel shoulders.

B Signage

- Check regulatory and wayfinding signage along bikeways for signs of vandalism, graffiti, or normal wear.
- Replace signage along the bikeway network as-needed.
- Perform a regularly-scheduled check on the status of signage with follow-up as necessary.
- Create a Maintenance Management Plan.

C Roadway Surface

- Maintain a smooth pothole-free surface.
- Ensure that on new roadway construction, the finished surface on bikeways does not vary more than ¼ inch.
- Maintain pavement so ridge buildup does not occur at the gutter-to-pavement transition or adjacent to railway crossings.
- Inspect the pavement 2 to 4 months after trenching construction activities are completed to ensure that excessive settlement has not occurred.

D Pavement Overlays

- Extend the overlay over the entire roadway surface to avoid leaving an abrupt edge.
- If the shoulder or bike lane pavement is of good quality, it may be appropriate to end the overlay at the shoulder or bike lane stripe provided no abrupt ridge remains.
- Ensure that inlet grates, manhole and valve covers are within ¼ inch of the finished pavement surface and are made or treated with slip resistant materials.

E Drainage Grates

- Require all new drainage grates be bicycle-friendly, including grates that have horizontal slats on them so that bicycle tires and assistive devices do not fall through the vertical slats.
- Create a program to inventory all existing drainage grates, and replace hazardous grates as necessary – temporary modifications such as installing rebar horizontally across the grate should not be an acceptable alternative to replacement.

F Gutter to Pavement Transition

- Ensure that gutter-to-pavement transitions have no more than a ¼ inch vertical transition.
- Examine pavement transitions during every roadway project for new construction, maintenance activities, and construction project activities that occur in streets.

G Landscaping

- Ensure that shoulder plants do not hang into or impede passage along bikeways.
- After major damage incidents, remove fallen trees or other debris from bikeways as quickly as possible.

Maintenance Management Plan

- Provide fire and police departments with map of system, along with access points to gates/bollards.
- Enforce speed limits and other rules of the road.
- Enforce all trespassing laws for people attempting to enter adjacent private properties.

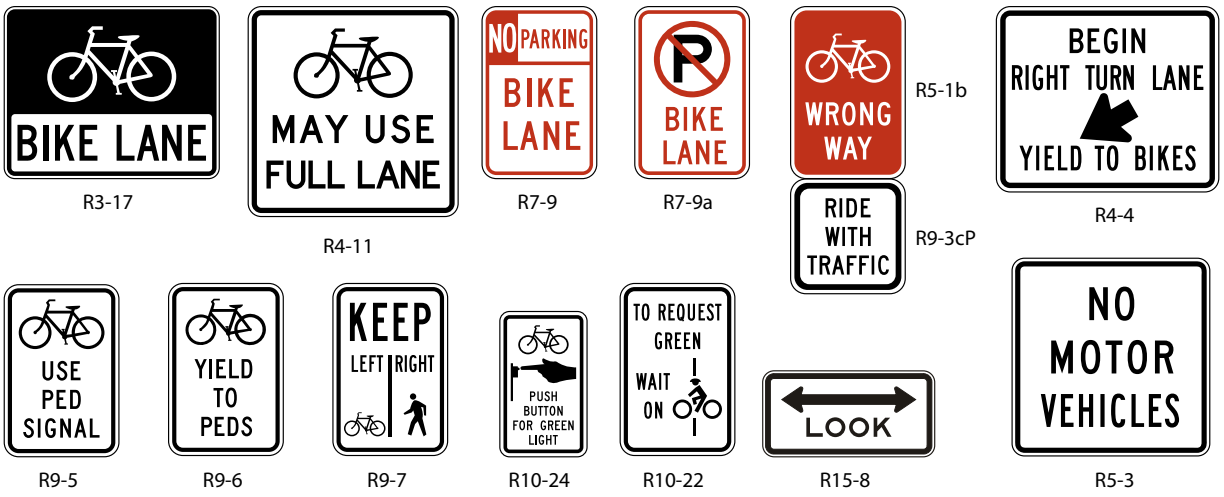
Recommended Walkway and Bikeway Maintenance Activities

Maintenance Activity	Frequency
Inspections	Seasonal – at beginning and end of Summer
Pavement sweeping/ blowing	As needed, with higher frequency in the early Spring and Fall
Pavement sealing	5 - 15 years
Pothole repair	1 week – 1 month after report
Culvert and drainage grate inspection	Before Winter and after major storms
Pavement markings replacement	As needed
Signage replacement	As needed
Shoulder plant trimming (weeds, trees, brambles)	Twice a year; middle of growing season and early Fall
Tree and shrub plantings, trimming	1 – 3 years
Major damage response (washouts, fallen trees, flooding)	As soon as possible

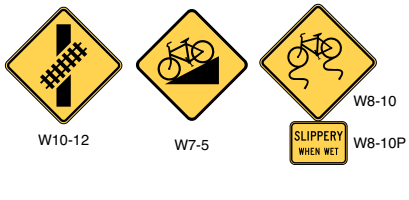
Regulatory and Warning Signs

Regulatory signs give a direction that must be obeyed, and apply to intersection control, speed, vehicle movement and parking.

Common Bicycle Oriented Regulatory Signs

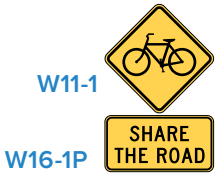


Additional Bicycle-Oriented Warning Signs



Bicycle Crossing Assembly

Additional warnings are available to call attention to unexpected conditions for people riding bicycles, such as steep grades, rail crossings, and slippery conditions. A Bicycle Crossing Assembly using W11-1 and W16-7P arrow plaque may be used at the location of a bikeway crossing to warn other road users.



Share the Road Sign

The sign serves to make motorists aware that bicyclists might be on the road, and that they have a legal right to use the roadway.

TYPICAL APPLICATION

- Warning signs call attention to unexpected conditions on or adjacent to a street, and to situations that might not be readily apparent to road users.
- Warning signs alert users to conditions that might call for a reduction of speed or an action in the interest of safety and efficient traffic operations.

DESIGN FEATURES

- Small-sized signs or plaques may be used for bicycle-only traffic applications, such as along shared use paths.
- See the MUTCD 9B for a detailed list of regulatory sign application and guidance.
- Fieldwork and engineering judgment are necessary to fine-tune the placement of signs.
- The SHARE THE ROAD plaque (W16-P) shall not be used alone, and must be mounted below a W11-1 vehicular traffic warning sign. It is typically placed along roadways with high levels of bicycle usage but relatively hazardous conditions for bicyclists. The sign should not be used to designate a preferred bicycle route, but may be used along short sections of designated routes where traffic volumes are higher than desirable.

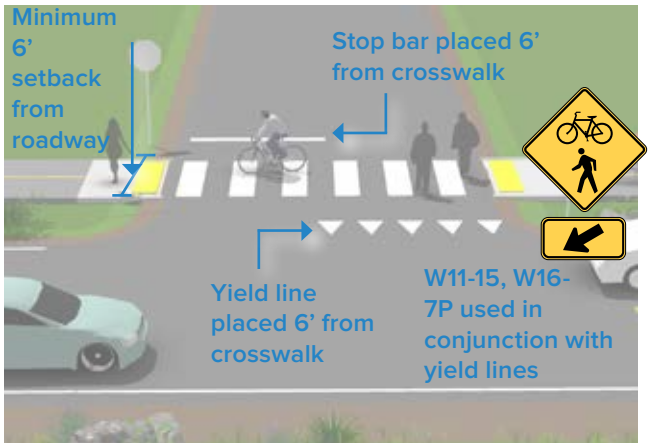
07

OFF STREET FACILITIES

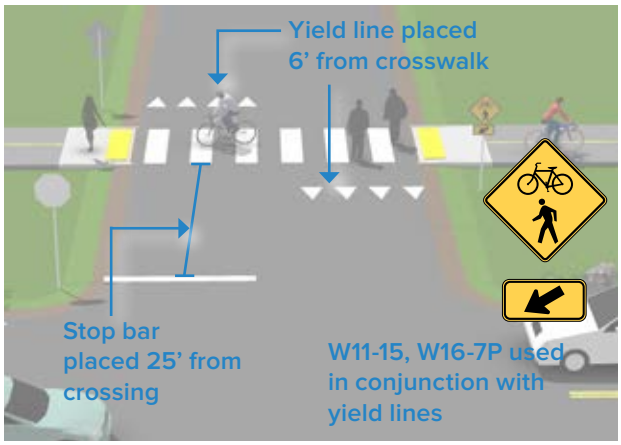
Sidepaths

Shared use paths along roadways, also called sidepaths, are a type of path that run adjacent to a street.

Adjacent Crossing - A separation of 6 feet emphasizes the conspicuous of riders at the approach to the crossing.



Setback Crossing - A set back of 25 feet separates the path crossing from merging/turning movements that may be competing for a driver's attention.



TYPICAL APPLICATION

Along roadways, these facilities create a situation where a portion of the bicycle traffic rides against the normal flow of motor vehicle traffic and can result in wrong-way riding where bicyclists enter or leave the path. The AASHTO Guide for the Development of Bicycle Facilities cautions practitioners of the use of two-way sidepaths on urban or suburban streets with many driveways and street crossings. Well designed sidepaths with logical terminations, and good driveway and local street crossings can be safe and valuable components of a transportation system.

In general, there are two approaches to crossings: adjacent and setback crossings, illustrated above.

DESIGN FEATURES

- Guidance for sidepaths should follow that for general design practices of shared use paths.
- A high number of driveway crossings and intersections create potential conflicts with turning traffic. Consider alternatives to sidepaths on streets with a high frequency of intersections or heavily used driveways.
- Where a sidepath terminates, special consideration should be given to transitions so as not to encourage unsafe wrong-way riding by bicyclists.
- Crossing design should emphasize visibility of users and clarity of expected yielding behavior. Crossings may be STOP or YIELD controlled depending on sight lines and bicycle motor vehicle volumes and speeds.

Shared Use Path

Shared use paths can serve transportation, recreation or both types of trips and are desirable for users of all skill levels preferring separation from traffic. Shared use paths use exclusive rights-of-way with minimal cross flow by motor vehicles.

TYPICAL APPLICATION

- In abandoned rail corridors (commonly referred to as Rails-to-Trails or Rail-Trails).
- In active rail corridors, trails can be built adjacent to active railroads (referred to as Rails-with-Trails.
- In utility corridors, such as powerline and sewer corridors.
- In waterway corridors, such as along canals, drainage ditches, rivers and beaches.
- Along roadways.

EXAMPLE PROJECTS

- Layton Canal Shared Use Path in West Point
- Emigrant Trail in Syracuse
- Shared Use Path along Antelope Drive in Clearfield

DESIGN FEATURES

Width

- 8 feet is the minimum allowed for a two-way bicycle path and is only recommended for low traffic situations.
- 10 feet is recommended in most situations and will be adequate for moderate to heavy use.
- 12 feet is recommended for heavy use situations with high concentrations of multiple users. A separate track (5 foot minimum) can be provided for pedestrian use.

Lateral Clearance

- A 2 foot or greater shoulder on both sides of the path should be provided. An additional ft of lateral clearance (total of 3 feet) is required by the MUTCD for the installation of signage or other furnishings.
- If bollards are used at intersections and access points, they should be colored brightly and/or supplemented with reflective materials to be visible at night.

Overhead Clearance

- Clearance to overhead obstructions should be 8 feet at minimum, with 10 feet recommended.

Striping

- When striping is desired, use a 4 inch dashed yellow centerline stripe.
- Solid centerlines can be provided on tight or blind corners, and on the approaches to roadway crossings.

Slopes

- Vertical grades should generally not exceed 5%, with no more than 30% of the entire trail length having grades in excess of 8%.

FURTHER CONSIDERATIONS

The provision of a shared use path adjacent to a road is not a substitute for the provision of on-road accommodation such as paved shoulders or bike lanes, but may be considered in some locations in addition to on-road bicycle facilities.

CRASH REDUCTION

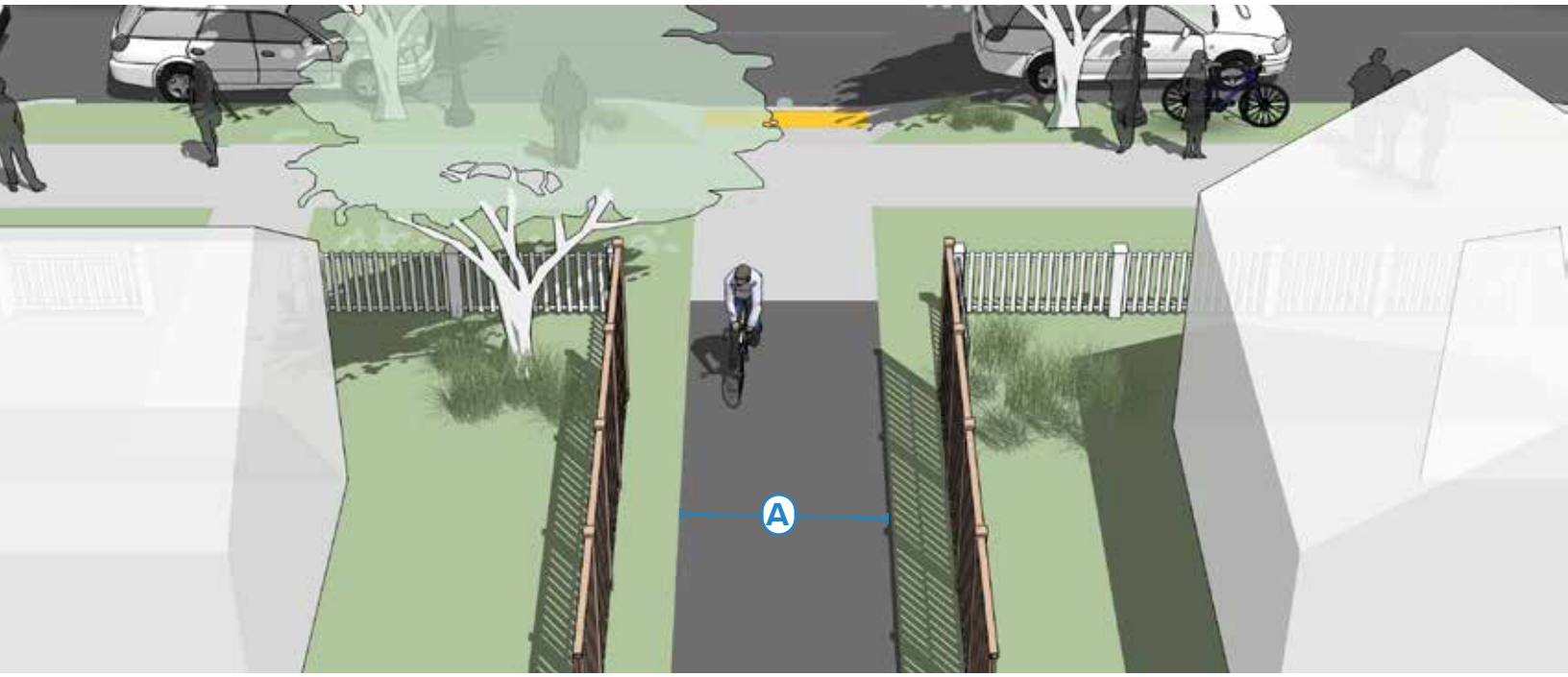
Shared use paths reduce injury rates for cyclists, pedestrians, and other nonmotorized modes by 60 percent compared with on street facilities.

CONSTRUCTION COSTS

The cost of a shared use path can vary, but typical costs are between $65,000 per mile to $4 million per mile.

Local Neighborhood Accessways

Neighborhood accessways provide residential areas with direct bicycle and pedestrian access to parks, trails, greenspaces, and other recreational areas. They most often serve as small connections to and from the larger network, typically having their own rights-of-way and easements.



TYPICAL APPLICATION

- Neighborhood accessways should be designed into new subdivisions at every opportunity and should be required by City/ County subdivision regulations.
- For existing subdivisions, neighborhood and homeowner association groups are encouraged to identify locations where such connects would be desirable. Nearby residents and adjacent property owners should be invited to provide landscape design input.

DESIGN FEATURES

- Neighborhood accessways should remain open to the public.

(A) Trail pavement shall be at least 8 feet wide to accommodate emergency and maintenance vehicles and be considered suitable for multi-use.

- Trail widths should be designed to be less than 8 feet wide only when necessary to protect large mature native trees over 18 inches in caliper, wetlands or other ecologically sensitive areas.

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08

OFF STREET FACILITIES AT INTERSECTIONS

Marked Crossing

A marked/unsignalized crossing typically consists of a marked crossing area, signage, and other markings to raise awareness of the crossing and to reinforce proper yielding behavior. The approach to designing crossings at mid-block locations depends on an evaluation of vehicle volume, line of sight, pathway volume, use patterns, vehicle speed, road type, road width, and other safety issues such as proximity to major attractions.

TYPICAL APPLICATION

- Maximum Traffic Volumes
  - 9,000-12,000 Average Daily Traffic (ADT) volume
- Maximum travel speed of 35 MPH
- Minimum Sight Lines for motorists to yield to bicyclists. If the path has a stop sign, the below does not apply.
  - 25 MPH zone: 155 feet
  - 35 MPH zone: 250 feet
  - 45 MPH zone: 360 feet

DESIGN FEATURES

- On roadways with low to moderate traffic volumes (less than 12,000 ADT) and a need to control traffic speeds, a raised crosswalk may be the most appropriate crossing design to improve pedestrian visibility and safety.

Median Crossing

On roadways with higher volumes, higher speeds and multi-lanes of vehicular traffic, a median crossing is preferred. A median refuge island can improve user safety by providing pedestrians and bicyclists space to perform the safe crossing of one side of the street at a time.

TYPICAL APPLICATION

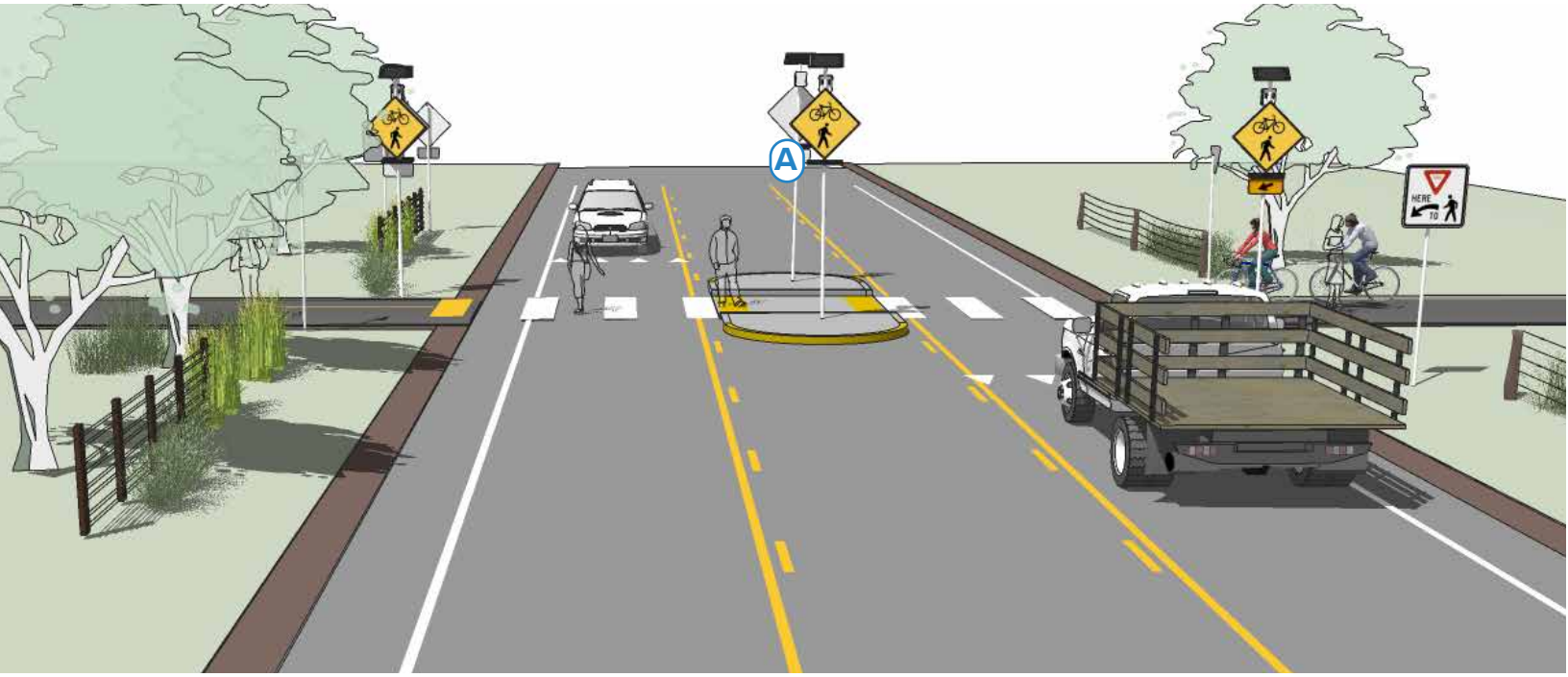
- Maximum Traffic Volumes
    - Up to 15,000 ADT on two-lane roads, preferably with a median
    - Up to 12,000 ADT on four-lane roads with median

DESIGN FEATURES

- Unsignalized crossings of multi-lane arterials over 15,000 ADT may be possible with features such as sufficient crossing gaps (more than 60 per hour), median refuges, and/or active warning devices like rectangular rapid flash beacons or in-pavement flashers, and excellent sight distance. For more information see the discussion of active warning beacons.

Active Enhanced Crossing

Active enhanced crossings are unsignalized crossings with additional treatments designed to increase motor vehicle yielding compliance on multi-lane or high volume roadways. These enhancements include pathway user or sensor actuated warning beacons and Rectangular Rapid Flash Beacons (RRFB) shown below.



TYPICAL APPLICATION

- Guidance for marked/unsignalized crossings applies.
- Warning beacons shall not be used at crosswalks controlled by YIELD signs, STOP signs, or traffic control signals.
- Warning beacons shall initiate operation based on user actuation and shall cease operation at a predetermined time after the user actuation or, with passive detection, after the user clears the crosswalk.

DESIGN FEATURES

(A) RRFBs are user actuated lights that supplement warning signs at unsignalized intersections or mid-block crossings.

- RRFBs should be paired with a marked crosswalk and yield teeth.
- Push buttons should be easy to identify and located on the right-hand side of the path. They should be positioned so that bicyclists do not have to dismount to activate.
- Where possible, RRFBs work well as multi-beacon installations on mast arms or in median refuge island crossings to improve driver yielding behavior.

Route Users to Signalized Crossing

Path crossings within approximately 400 feet of an existing signalized intersection with pedestrian crosswalks are typically diverted to the signalized intersection to avoid traffic operation problems when located so close to an existing signal.

TYPICAL APPLICATION

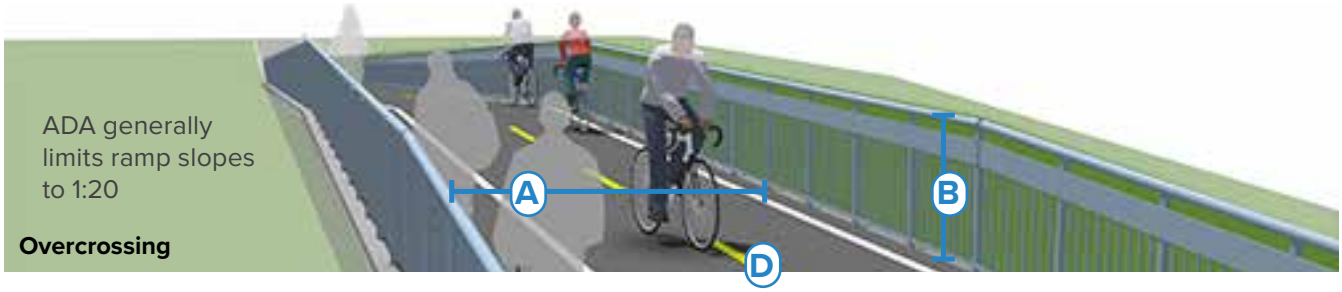
- For this restriction to be effective, barriers and signing may be needed to direct path users to the signalized crossing. If no pedestrian crossing exists at the signal, modifications should be made.
- Path crossings should not be provided within approximately 400 feet of an existing signalized intersection. If possible, route path directly to the signal.

DESIGN FEATURES

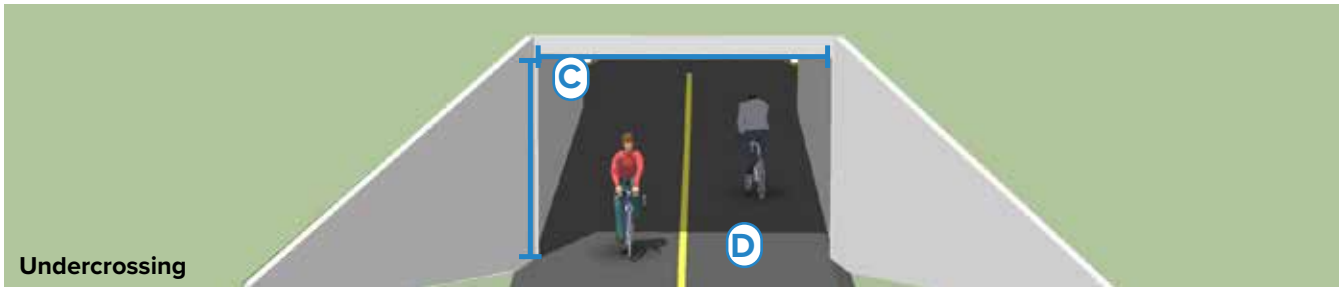
- In the US, the minimum distance a marked crossing can be from an existing signalized intersection varies from approximately 250 to 660 feet.
- Engineering judgment and the context of the location should be taken into account when choosing the appropriate allowable setback. Pedestrians are particularly sensitive to out of direction travel and undesired mid-block crossing may become prevalent if the distance is too great.

Grade-Separated Crossings

Grade-separated crossings provide critical non-motorized system links by joining areas separated by barriers such as railroads, waterways, and highway corridors. In most cases, these structures are built in response to user demand for safe crossings where they previously did not exist. There are no minimum roadway characteristics for considering grade separation.



Overcrossing



Undercrossing

TYPICAL APPLICATION

- Where shared-use paths cross high-speed and high-volume roadways where an at-grade signalized crossing is not feasible or desired, or where crossing railways or waterways.
- Depending on the type of facility or the desired user group, grade separation may be considered in many types of projects.

DESIGN FEATURES

(A) Overcrossings should be at least 8 feet wide with 14 feet preferred and additional width provided at scenic viewpoints.

(B) Railing height must be a minimum of 42 inches for overcrossings.

(C) Undercrossings should be designed at minimum 10 feet in height and 14 feet in width, with greater widths preferred for lengths over 60 feet.

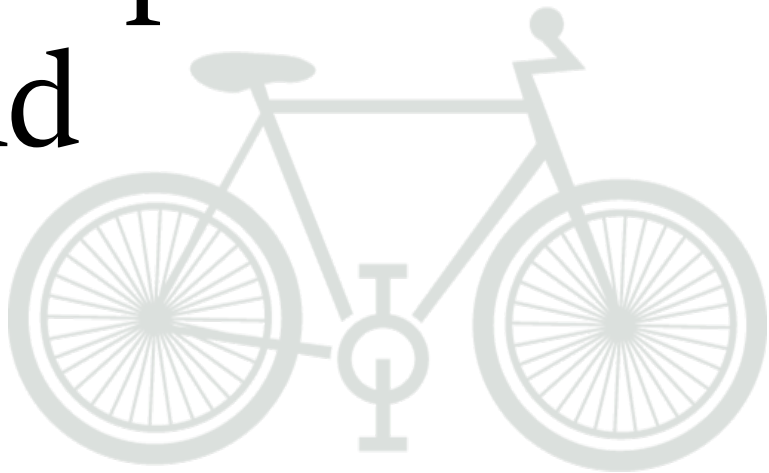
(D) Centerline stripe is recommended for grade-separated facility.

Appendix B: Projects by Community

Prepared as part of the
North Davis Active Transportation Plan

FEHR PEERS

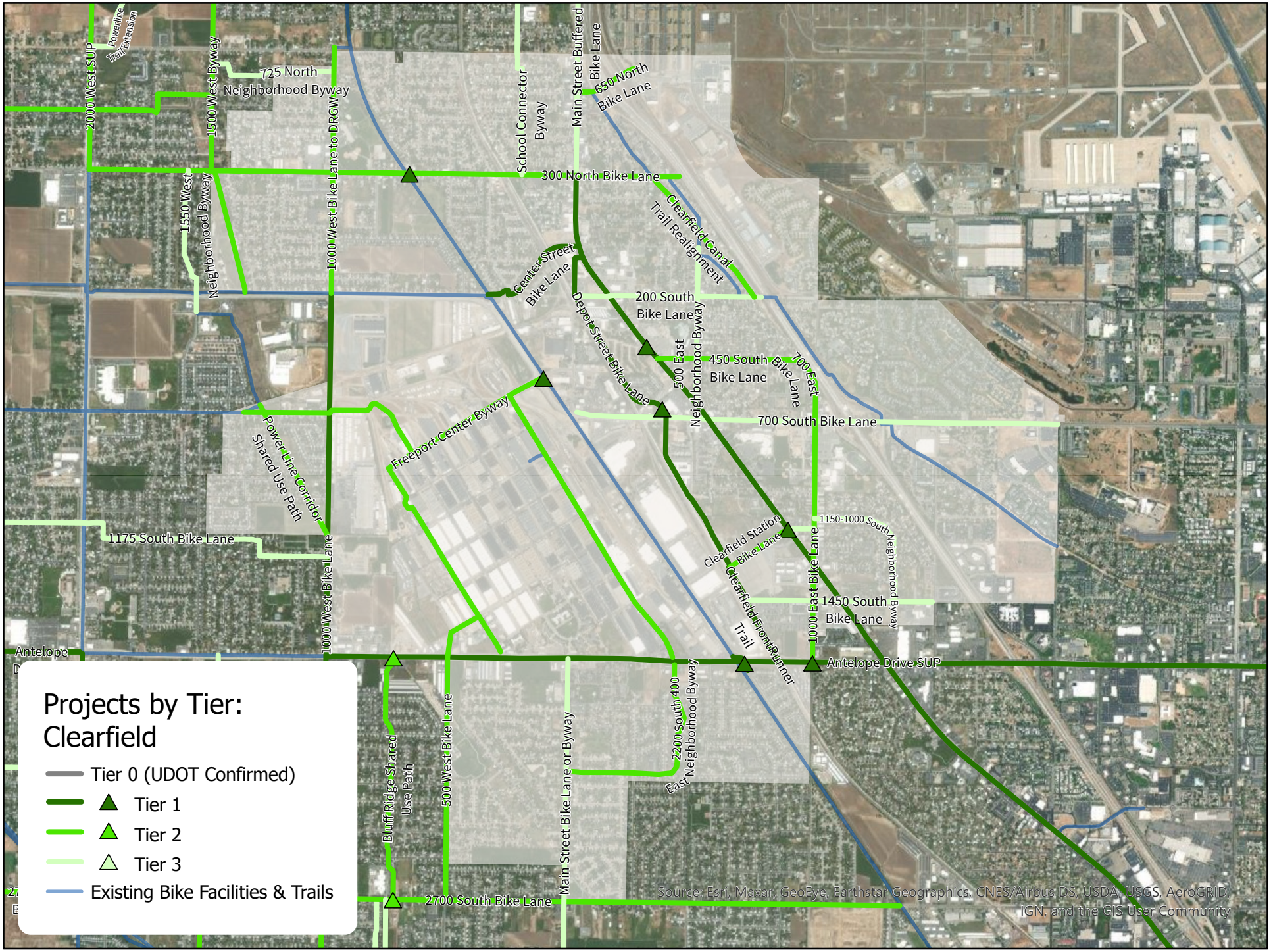
Tiered Active Transportation Projects: Clearfield

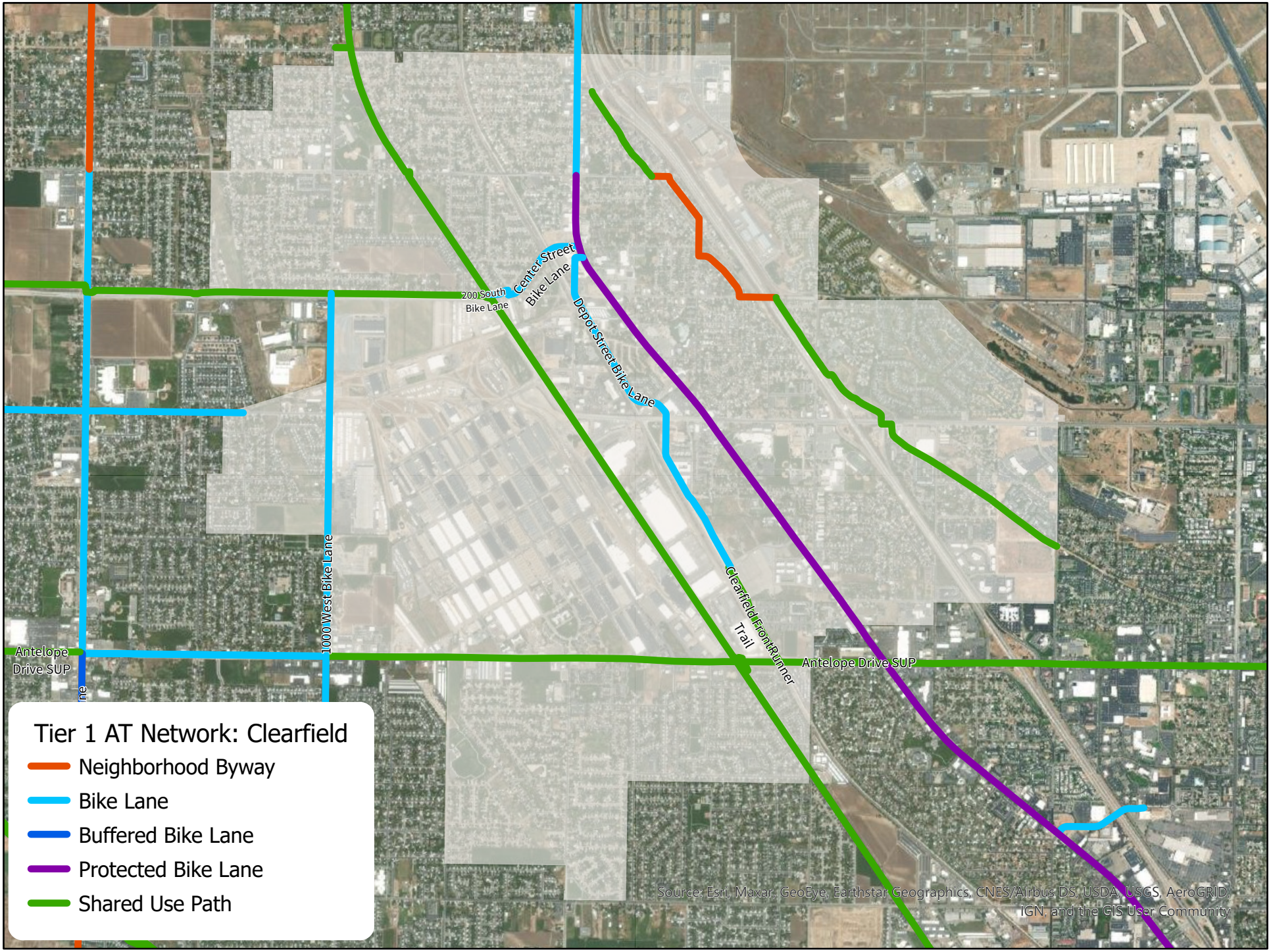


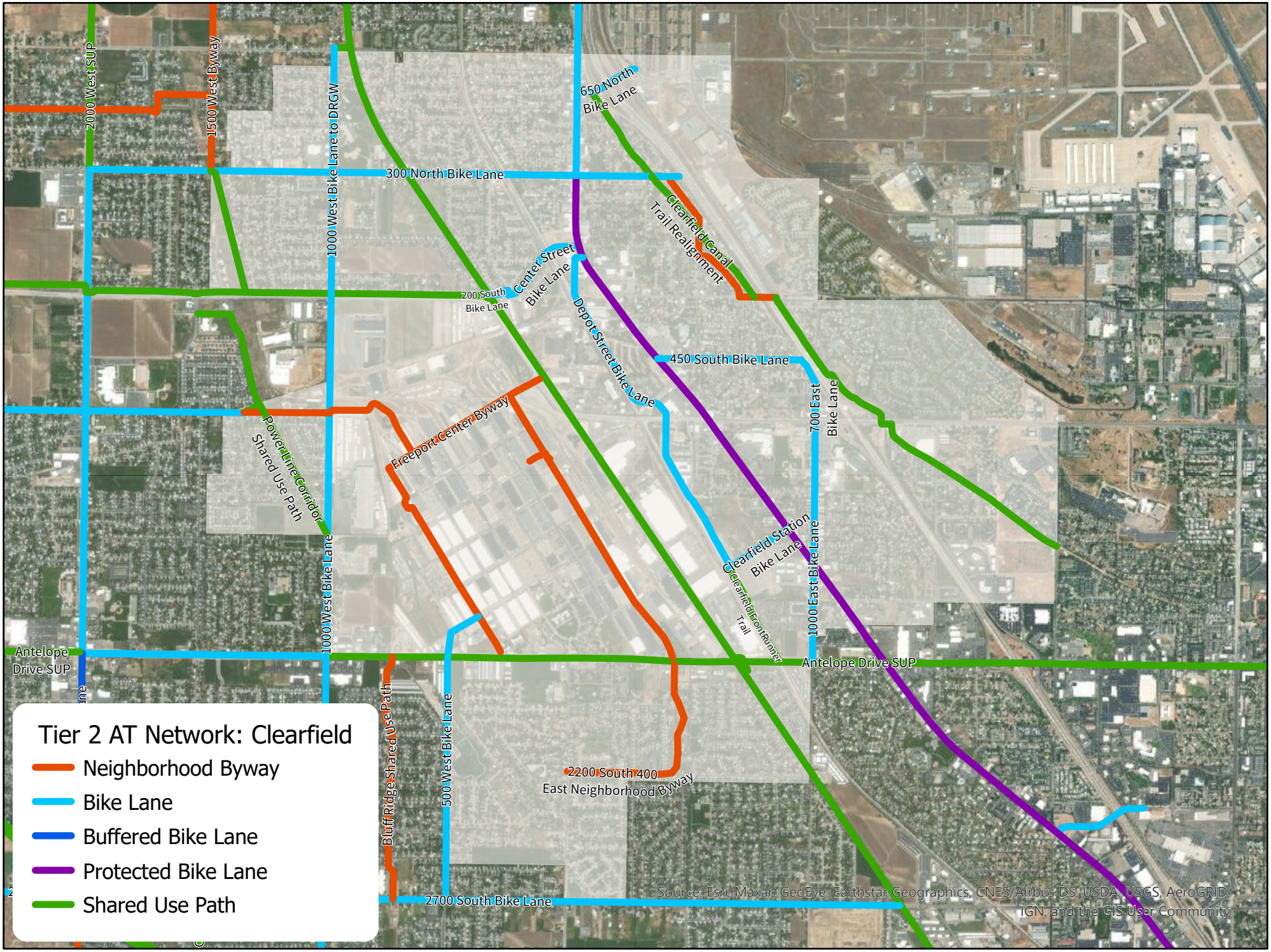
Prepared as part of the
North Davis Active Transportation Plan

Included maps of proposed facilities for this community:

- Projects by Tier: Clearfield
- Tier 1 Active Transportation Network
- Tier 2 Active Transportation Network
- Tier 3 Active Transportation Network


Projects by Tier:
Clearfield
Tier 0 (UDOT Confirmed)
Tier 1
Tier 2
Tier 3
Existing Bike Facilities & Trails
2000 West SUP
Powerline Trail Extension
1500 West Byway
725 North Neighborhood Byway
1000 West Bike Lane to DRGW
School Connector Byway
Main Street Buffered Bike Lane
650 North Bike Lane
300 North Bike Lane
1550 West Neighborhood Byway
Center Street Bike Lane
Clearfield Canal Trail Realignment
200 South Bike Lane
Depot Street Bike Lane
500 East Neighborhood Byway
450 South Bike Lane
700 East Bike Lane
700 South Bike Lane
Power Line Corridor Shared Use Path
Freeport Center Byway
1175 South Bike Lane
1000 West Bike Lane
Clearfield Station Bike Lane
1150-1000 South Neighborhood Byway
1000 East Bike Lane
1450 South Bike Lane
Clearfield FrontRunner Trail
Antelope Drive SUP
Antelope
2200 South 400 East Neighborhood Byway
Bluff Ridge Shared Use Path
500 West Bike Lane
Main Street Bike Lane or Byway
2700 South Bike Lane
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Tier 1 AT Network: Clearfield
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
200 South Bike Lane
Center Street Bike Lane
Depot Street Bike Lane
1000 West Bike Lane
Clearfield FrontRunner Trail
Antelope Drive SUP
Antelope Drive SUP
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community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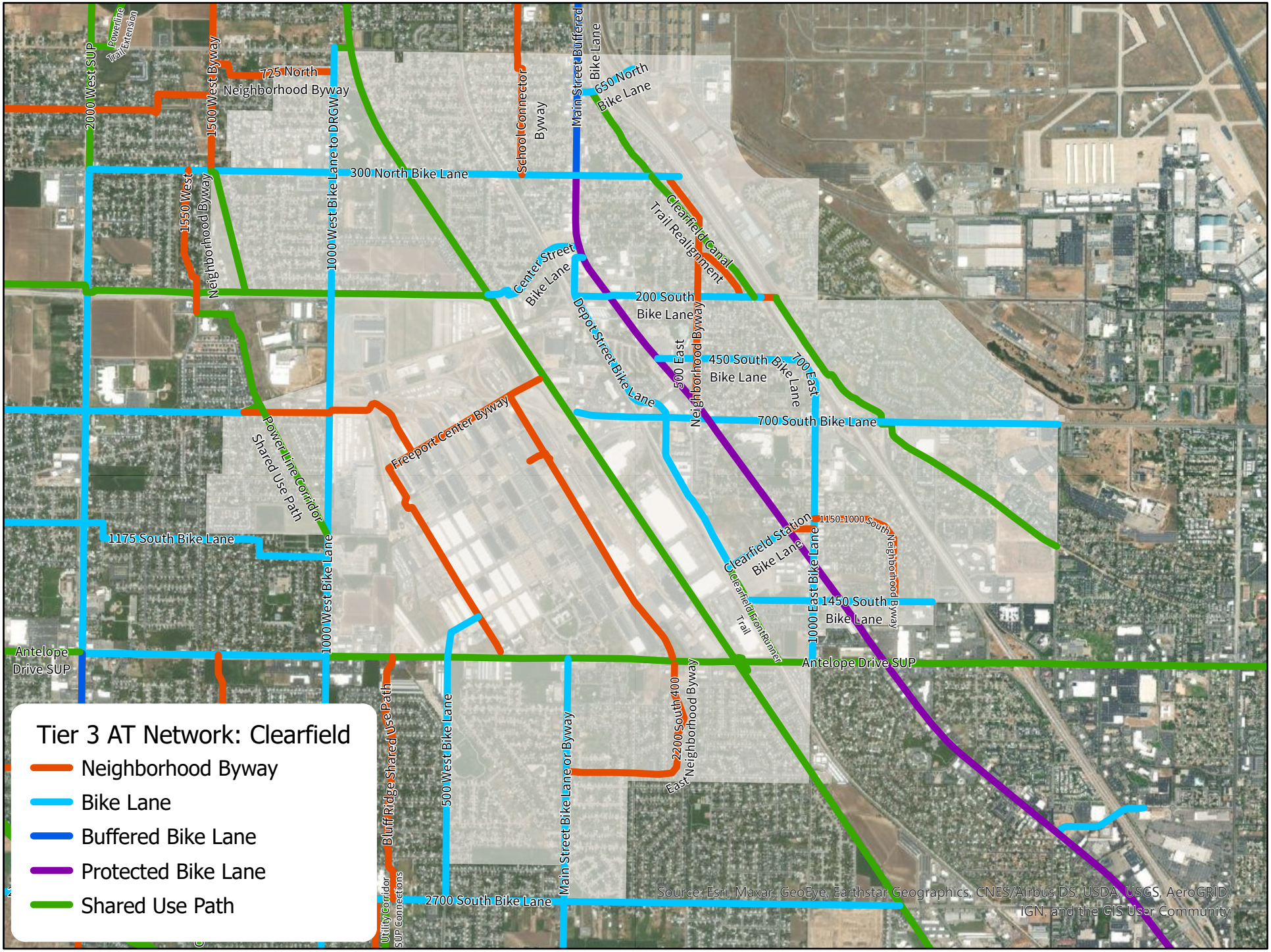
Antelope Drive SUP
Antelope Drive SUP
Bluff Ridge Shared use Path
500 West Bike Lane
2200 South 400 East Neighborhood Byway
2700 South Bike Lane
Tier 2 AT Network: Clearfield
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Tier 3 AT Network: Clearfield
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
2000 West SUP
Powerline Trail Extension
1500 West Byway
725 North Neighborhood Byway
1000 West Bike Lane to DRGW
School Connector Byway
Main Street Buffered Bike Lane
650 North Bike Lane
300 North Bike Lane
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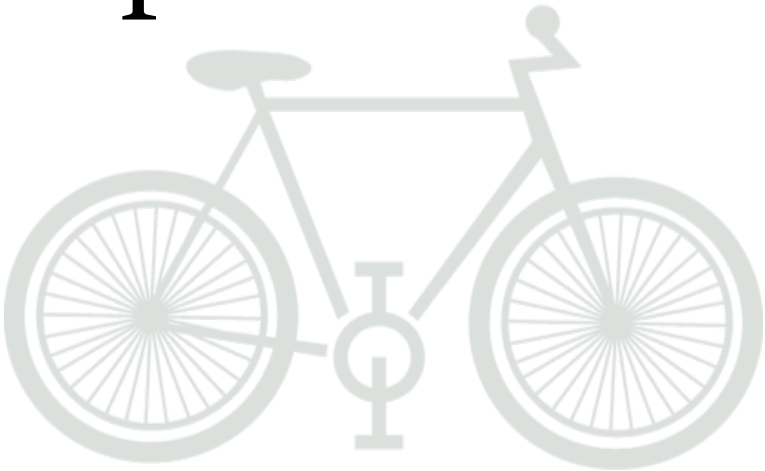
2700 South Bike Lane
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Clearfield Project List

Project Details			Estimated Costs	
Project Name	**Facility Type**	**Tier**	**Clearfield Cost**	**Countywide Cost**
650 North Bike Lane	Bike Lane	2	$15,200	$15,200
Center Street Bike Lane	Bike Lane	1	$22,100	$22,100
200 South Bike Lane	Bike Lane	1	$6,200	$6,200
700 South Bike Lane	Bike Lane	3	$114,500	$114,500
Antelope Drive Shared Use Path	Shared Use Path	1	$1,449,200	$5,409,600
1000 West Bike Lane	Bike Lane	1	$57,400	$143,200
Main Street Buffered Bike Lane	Buffered Bike Lane	3	$50,800	$241,600
State Street / Main Street Protected Bike Lane	Protected Bike Lane	1	$1,757,200	$4,307,500
Clearfield FrontRunner Trail	Shared Use Path	1	$305,500	$305,500
1000 East Bike Lane	Bike Lane	2	$57,300	$57,300
Freeport Center Byway	Neighborhood Byway	2	$128,000	$128,000
Depot Street Bike Lane	Bike Lane	1	$88,700	$88,700
300 North Bike Lane	Bike Lane	2	$111,300	$140,200
450 South Bike Lane	Bike Lane	2	$34,200	$34,200
1000 West Bike Lane to DRGW	Bike Lane	2	$58,500	$58,500
200 South Bike Lane	Bike Lane	3	$44,300	$44,300
School Connector Byway	Neighborhood Byway	3	$17,900	$79,200
1500 West Byway	Neighborhood Byway	2	$8,600	$81,800
1150-1000 South Neighborhood Byway	Neighborhood Byway	3	$25,000	$25,000
Power Line Corridor Shared Use Path	Shared Use Path	2	$773,500	$773,500
Main Street Bike Lane or Byway	Bike Lane	3	$57,300	$141,500
Clearfield Station Bike Lane	Bike Lane	2	$16,600	$16,600
1450 South Bike Lane	Bike Lane	3	$43,700	$43,700
700 East Bike Lane	Bike Lane	2	$15,600	$15,600
500 East Neighborhood Byway	Neighborhood Byway	3	$21,700	$21,700
500 West Bike Lane	Bike Lane	2	$71,200	$71,200
2200 South 400 East Neighborhood Byway	Neighborhood Byway	2	$30,900	$30,900
725 North Neighborhood Byway	Neighborhood Byway	3	$8,500	$18,400
Clearfield Canal Trail Realignment	Shared Use Path	2	$450,100	$450,100
Total Project Costs			**$5,841,000**	**$12,885,800**

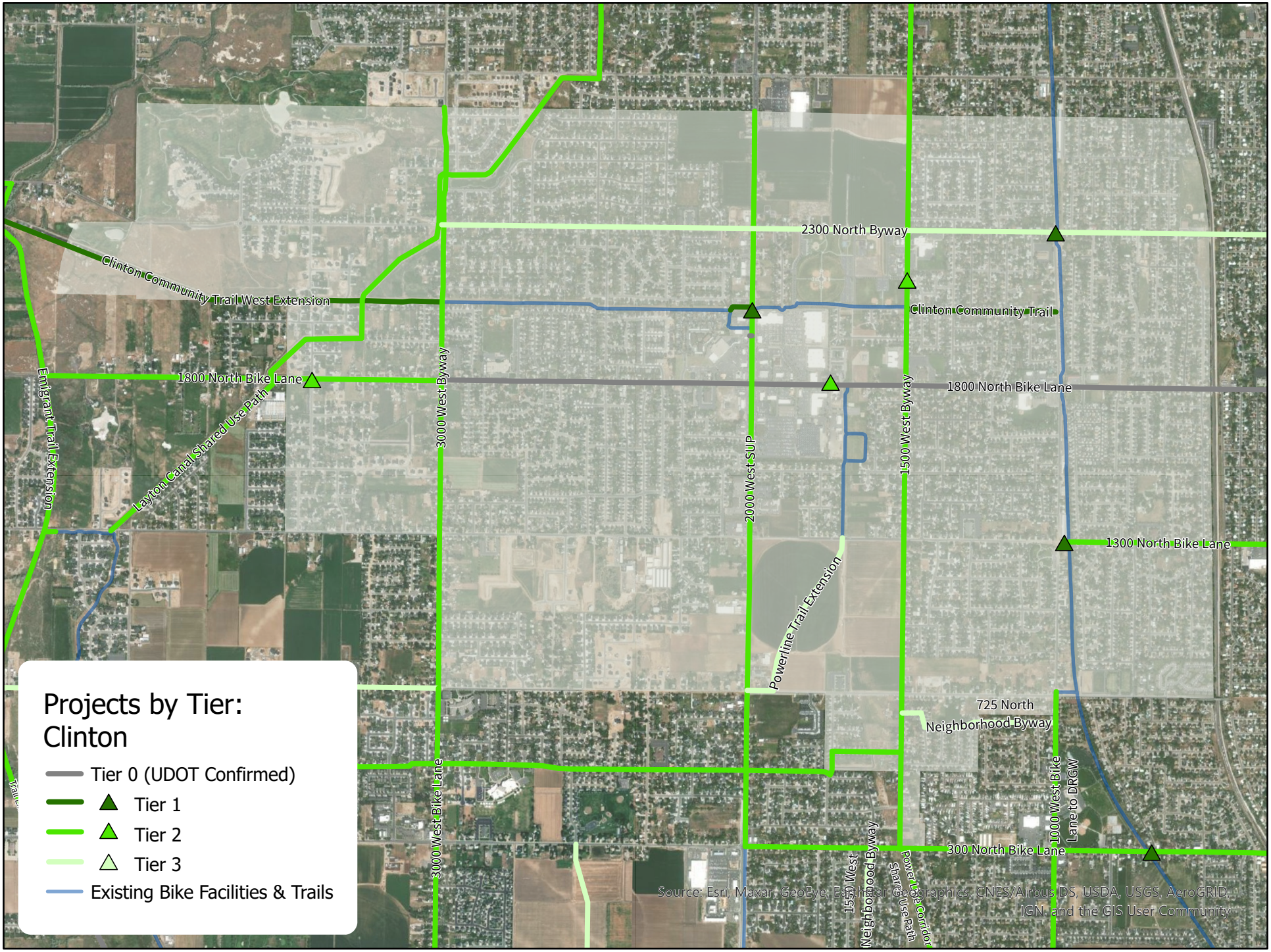
Tiered Active Transportation Projects: Clinton

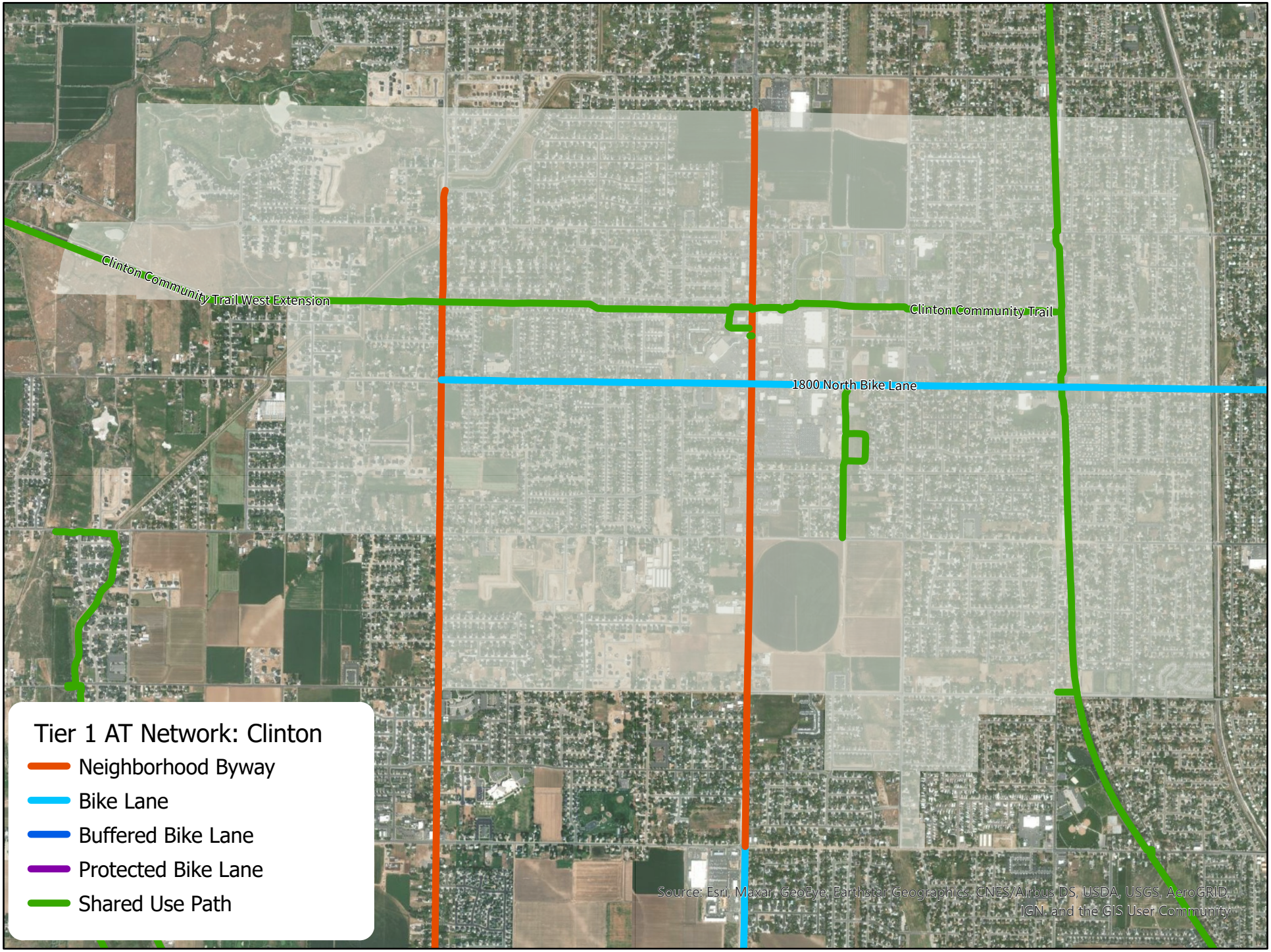


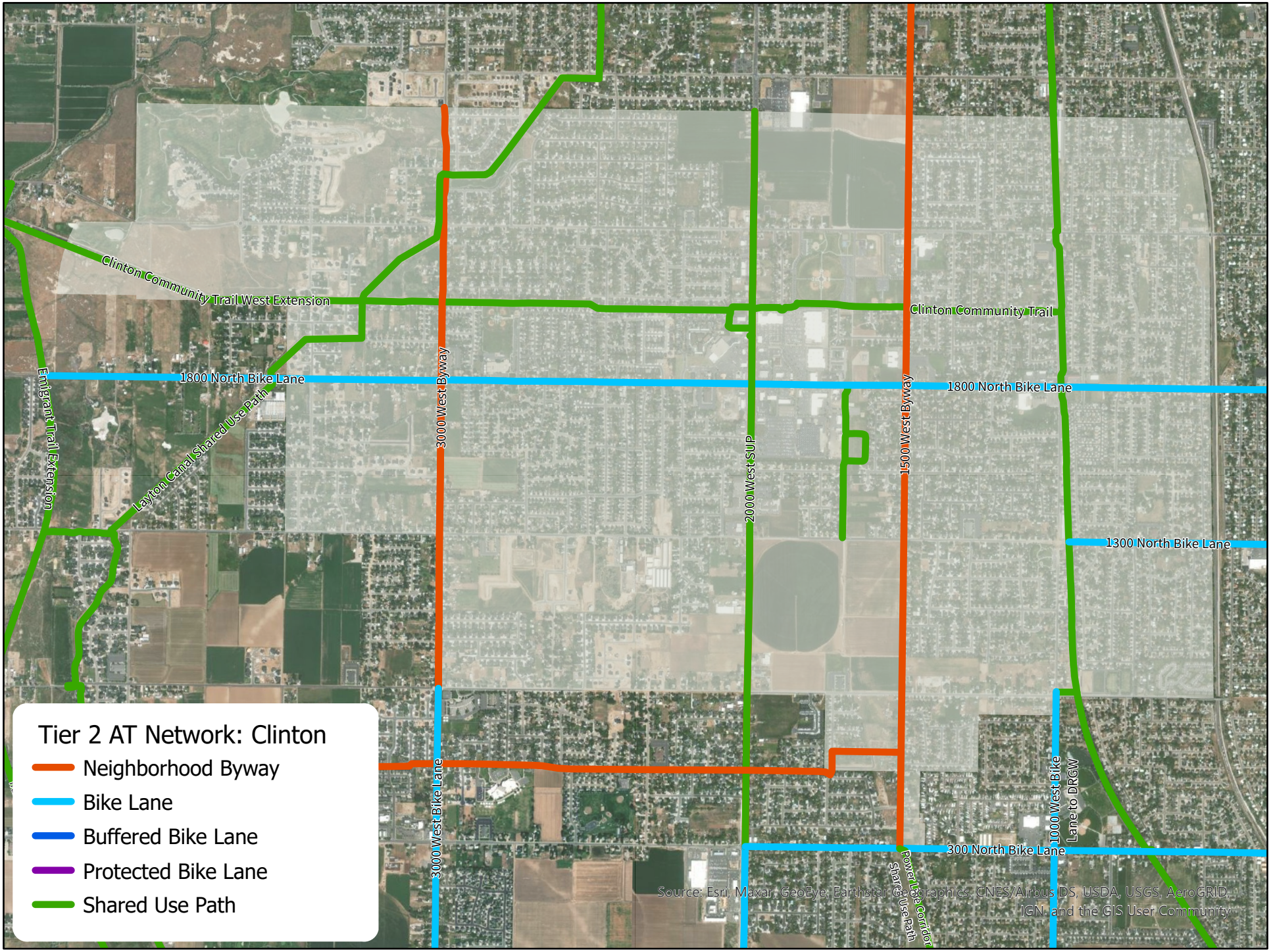
Prepared as part of the
North Davis Active Transportation Plan

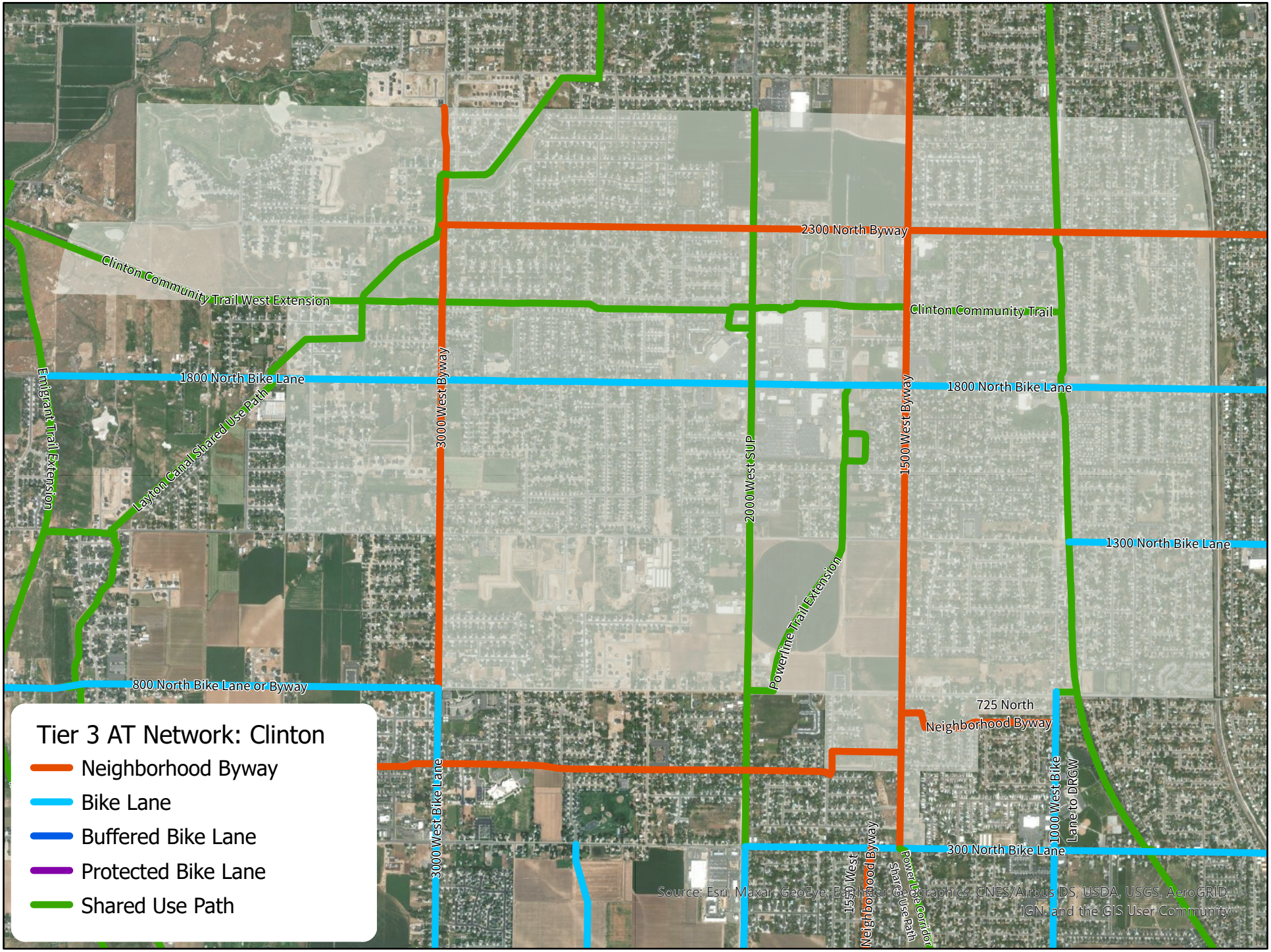
Included maps of proposed facilities for this community:

- Projects by Tier: Clinton
- Tier 1 Active Transportation Network
- Tier 2 Active Transportation Network
- Tier 3 Active Transportation Network


Clinton Community Trail West Extension
2300 North Byway
Clinton Community Trail
1800 North Bike Lane
1800 North Bike Lane
Emigrant Trail Extension
Layton Canal Shared Use Path
3000 West Byway
2000 West SUP
1500 West Byway
1300 North Bike Lane
Powerline Trail Extension
725 North
Neighborhood Byway
3000 West Bike Lane
1550 West
Neighborhood Byway
Powerline Trail Shared Use Path Corridor
300 North Bike Lane
1000 West Bike Lane to DRGW
Projects by Tier:
Clinton
Tier 0 (UDOT Confirmed)
Tier 1
Tier 2
Tier 3
Existing Bike Facilities & Trails
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Clinton Community Trail West Extension
Clinton Community Trail
1800 North Bike Lane
Tier 1 AT Network: Clinton
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

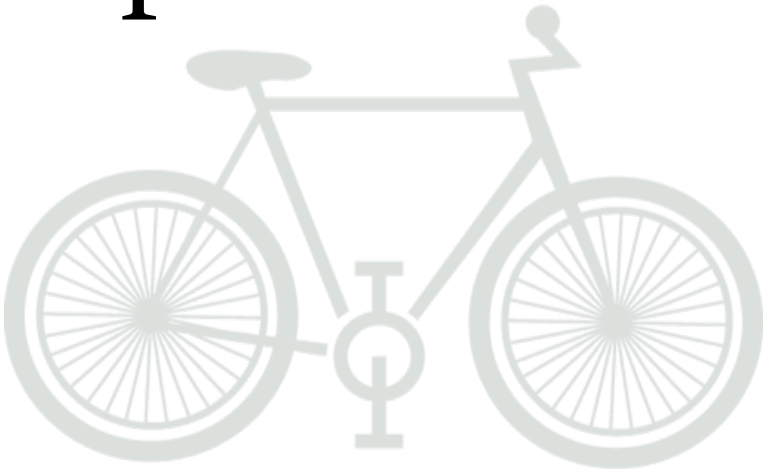

Clinton Community Trail West Extension
Clinton Community Trail
1800 North Bike Lane
1800 North Bike Lane
Emigrant Trail Extension
Layton Canal Shared Use Path
3000 West Byway
2000 West SUP
1500 West Byway
1300 North Bike Lane
3000 West Bike Lane
1000 West Bike Lane to DRGW
300 North Bike Lane
Power Line Corridor Shared Use Path
Tier 2 AT Network: Clinton
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Tier 3 AT Network: Clinton
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
2300 North Byway
Clinton Community Trail West Extension
Clinton Community Trail
1800 North Bike Lane
1800 North Bike Lane
Emigrant Trail Extension
Layton Canal Shared Use Path
3000 West Byway
2000 West SUP
1500 West Byway
1300 North Bike Lane
Powerline Trail Extension
800 North Bike Lane or Byway
725 North
Neighborhood Byway
3000 West Bike Lane
1000 West Bike Lane to DRGW
300 North Bike Lane
1550 West Neighborhood Byway
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Clinton Project List

Project Details			Estimated Costs	
Project Name	**Facility Type**	**Tier**	**Clinton Cost**	**Countywide Cost**
Clinton Community Trail West Extension	Shared Use Path	1	$861,500	$1,024,200
1800 North Bike Lane	Bike Lane	0	$144,100	$189,400
1300 North Bike Lane	Bike Lane	2	$26,800	$55,900
3000 West Byway	Neighborhood Byway	2	$64,800	$64,800
2000 West Shared Use Path	Shared Use Path	2	$1,295,100	$1,639,700
Clinton Community Trail	Shared Use Path	1	$386,000	$386,000
1500 West Byway	Neighborhood Byway	2	$73,200	$81,800
Layton Canal Shared Use Path	Shared Use Path	2	$919,600	$1,482,800
1800 North Bike Lane	Bike Lane	2	$28,900	$74,400
2300 North Neighborhood Byway	Neighborhood Byway	3	$85,600	$102,900
725 North Neighborhood Byway	Neighborhood Byway	3	$9,900	$18,400
300 N / 550 N / 600 N Byway	Neighborhood Byway	2	$9,800	$99,000
Powerline Trail Extension	Shared Use Path	3	$440,600	$440,600
Total Project Costs			**$4,345,900**	**$5,659,900**

Tiered Active Transportation Projects: Sunset



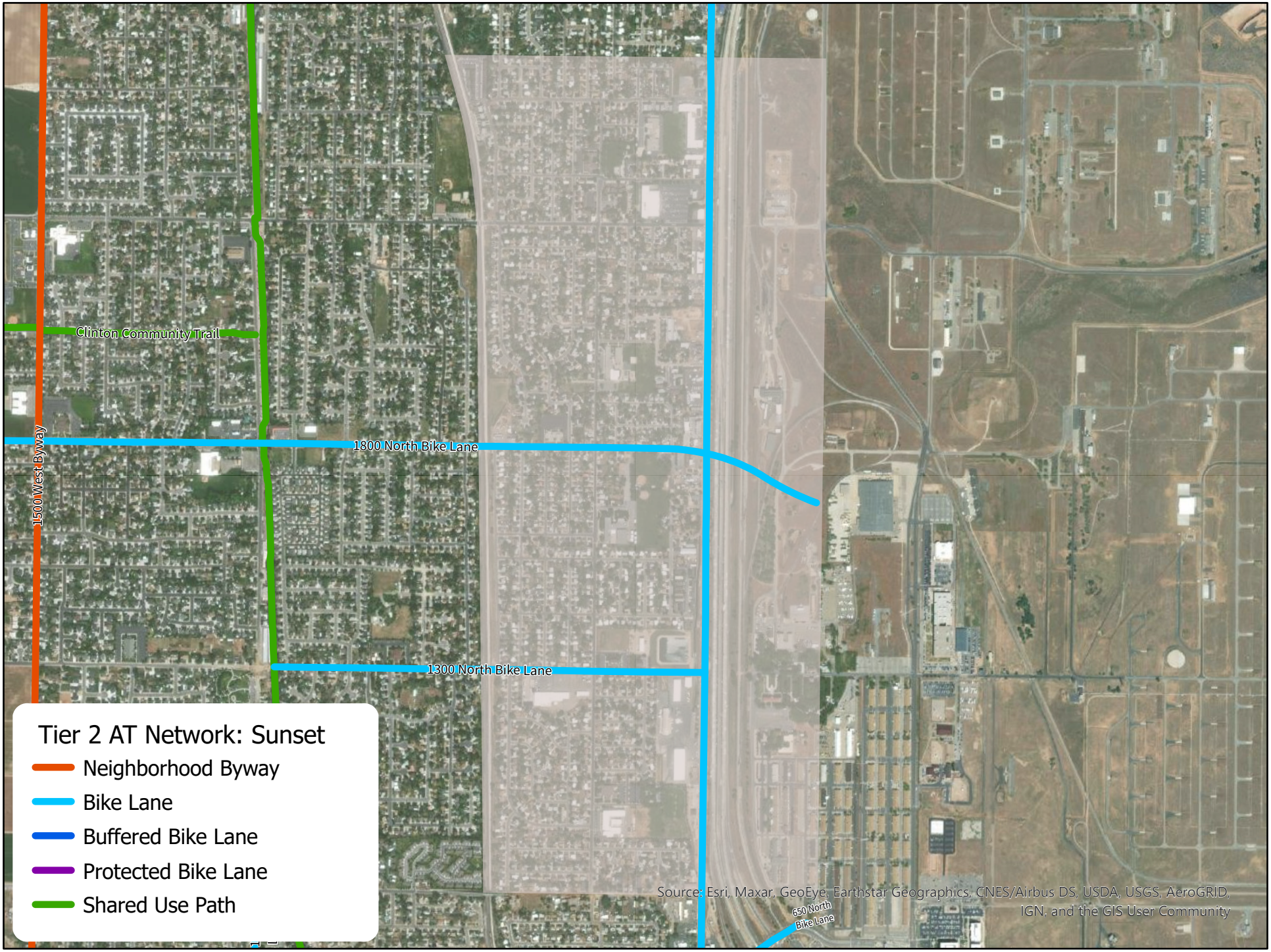
Prepared as part of the
North Davis Active Transportation Plan

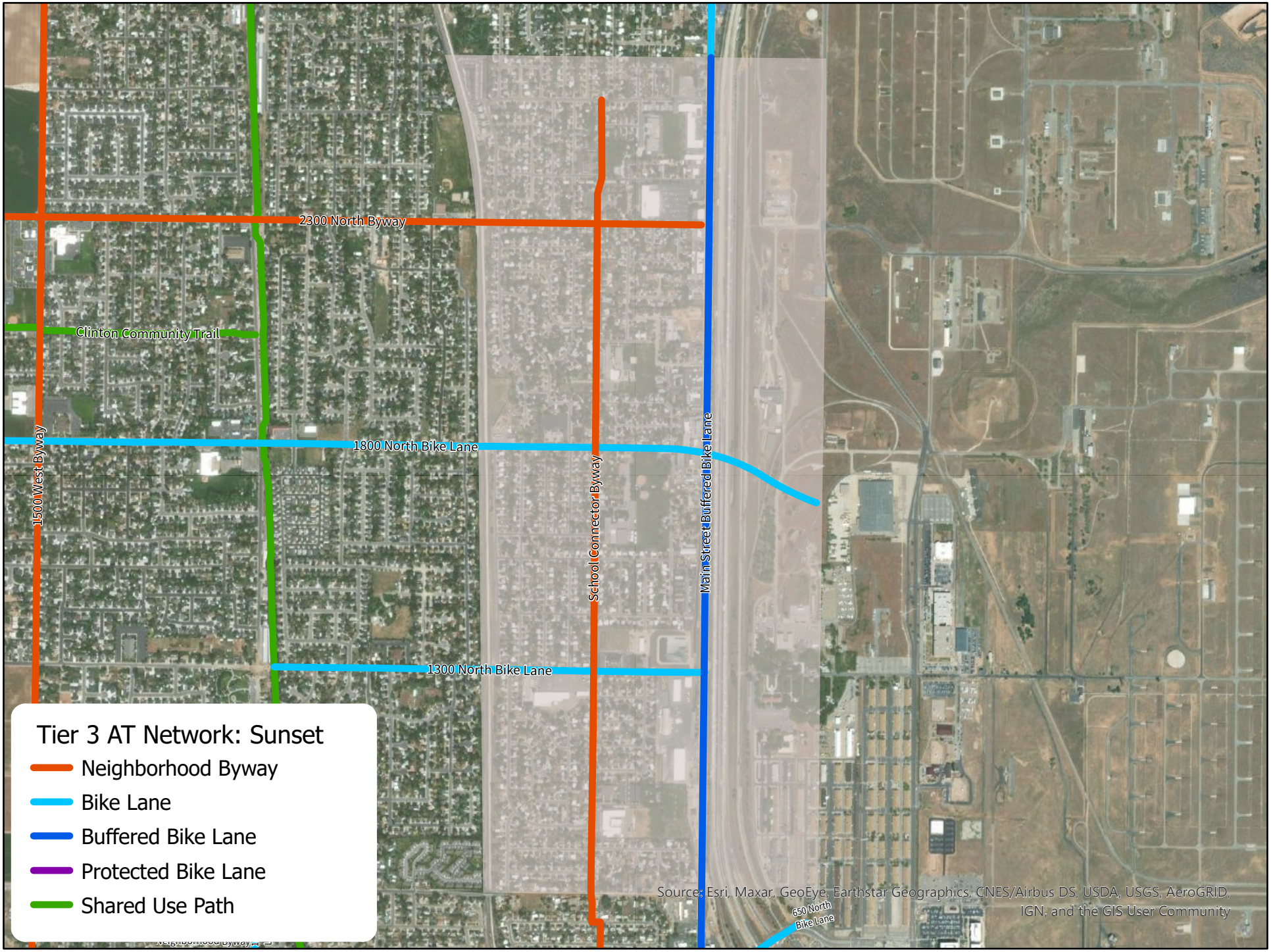
Included maps of proposed facilities for this community:

- Projects by Tier: Sunset
- Tier 1 Active Transportation Network
- Tier 2 Active Transportation Network
- Tier 3 Active Transportation Network


2300 North Byway
Clinton Community Trail
1500 West Byway
1800 North Bike Lane
School Connector Byway
Main Street Buffered Bike Lane
1300 North Bike Lane
650 North Bike Lane
Neighborhood Byway
Projects by Tier:
Sunset
Tier 0 (UDOT Confirmed)
Tier 1
Tier 2
Tier 3
Existing Bike Facilities & Trails
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Clinton Community Trail
1800 North Bike Lane
Tier 1 AT Network: Sunset
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Clinton Community Trail
1500 West Byway
1800 North Bike Lane
1300 North Bike Lane
650 North Bike Lane
Tier 2 AT Network: Sunset
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


2300 North Byway
Clinton Community Trail
1500 West Byway
1800 North Bike Lane
School Connector Byway
Main Street Buffered Bike Lane
1300 North Bike Lane
650 North Bike Lane
Tier 3 AT Network: Sunset
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Sunset Project List

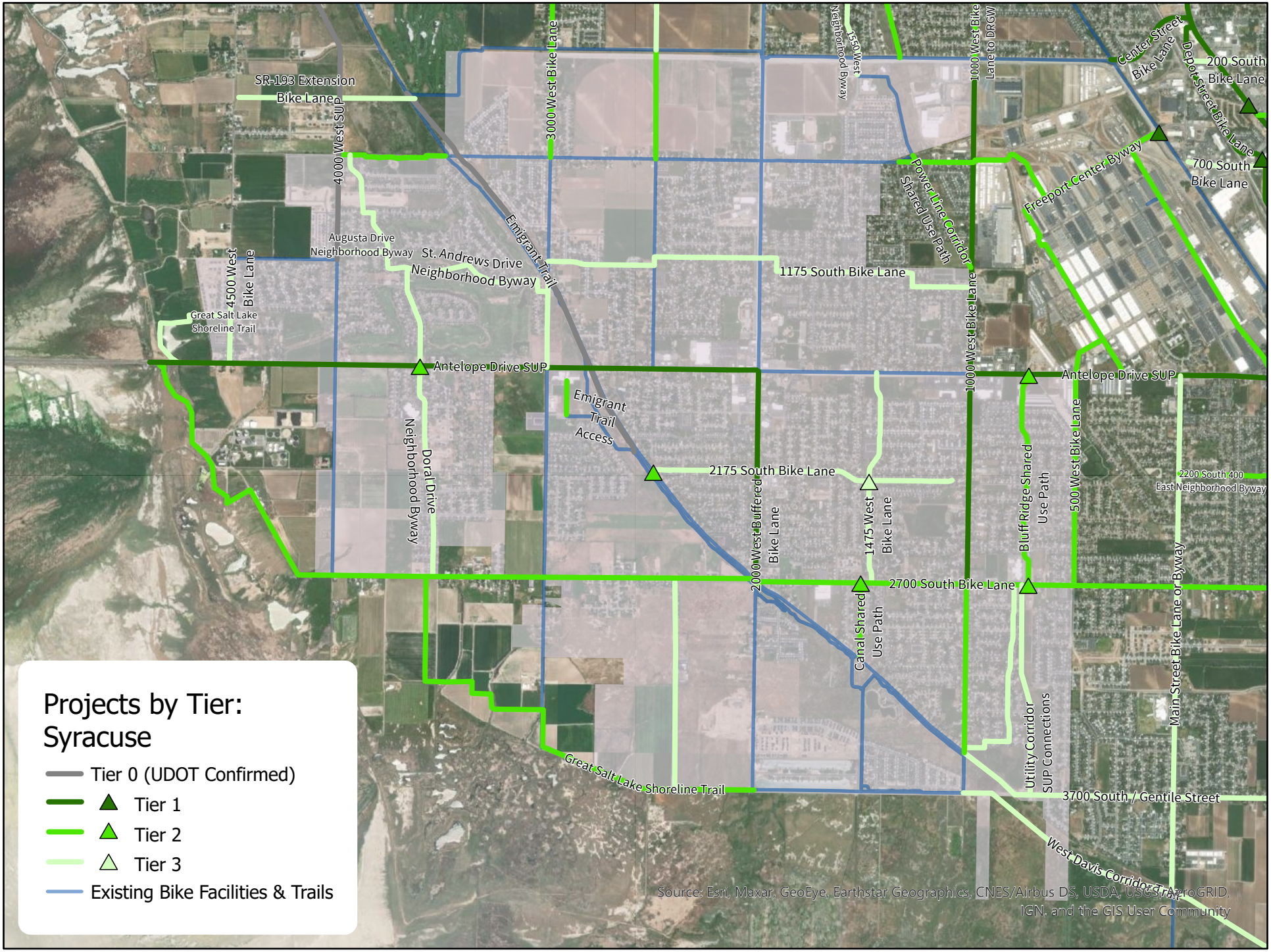
Project Details			Estimated Costs	
Project Name	**Facility Type**	**Tier**	**Sunset Cost**	**Countywide Cost**
1800 North Bike Lane	Bike Lane	0	$45,300	$189,400
1300 North Bike Lane	Bike Lane	2	$29,100	$55,900
Main Street Buffered Bike Lane	Buffered Bike Lane	3	$190,800	$241,600
School Connector Byway	Neighborhood Byway	3	$61,300	$79,200
2300 North Neighborhood Byway	Neighborhood Byway	3	$17,300	$102,900
Total Project Costs			**$343,800**	**$669,000**

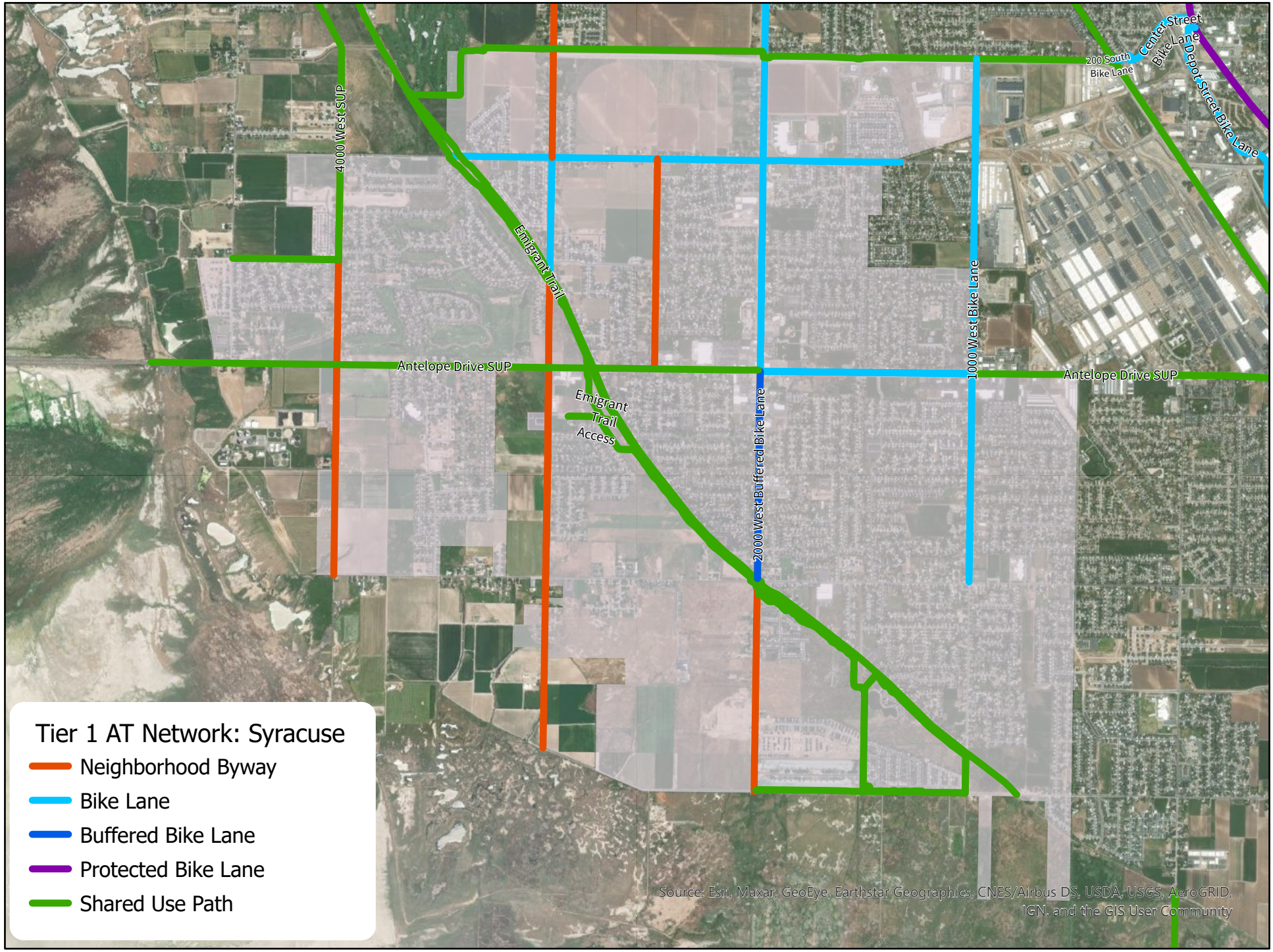
Tiered Active Transportation Projects: Syracuse

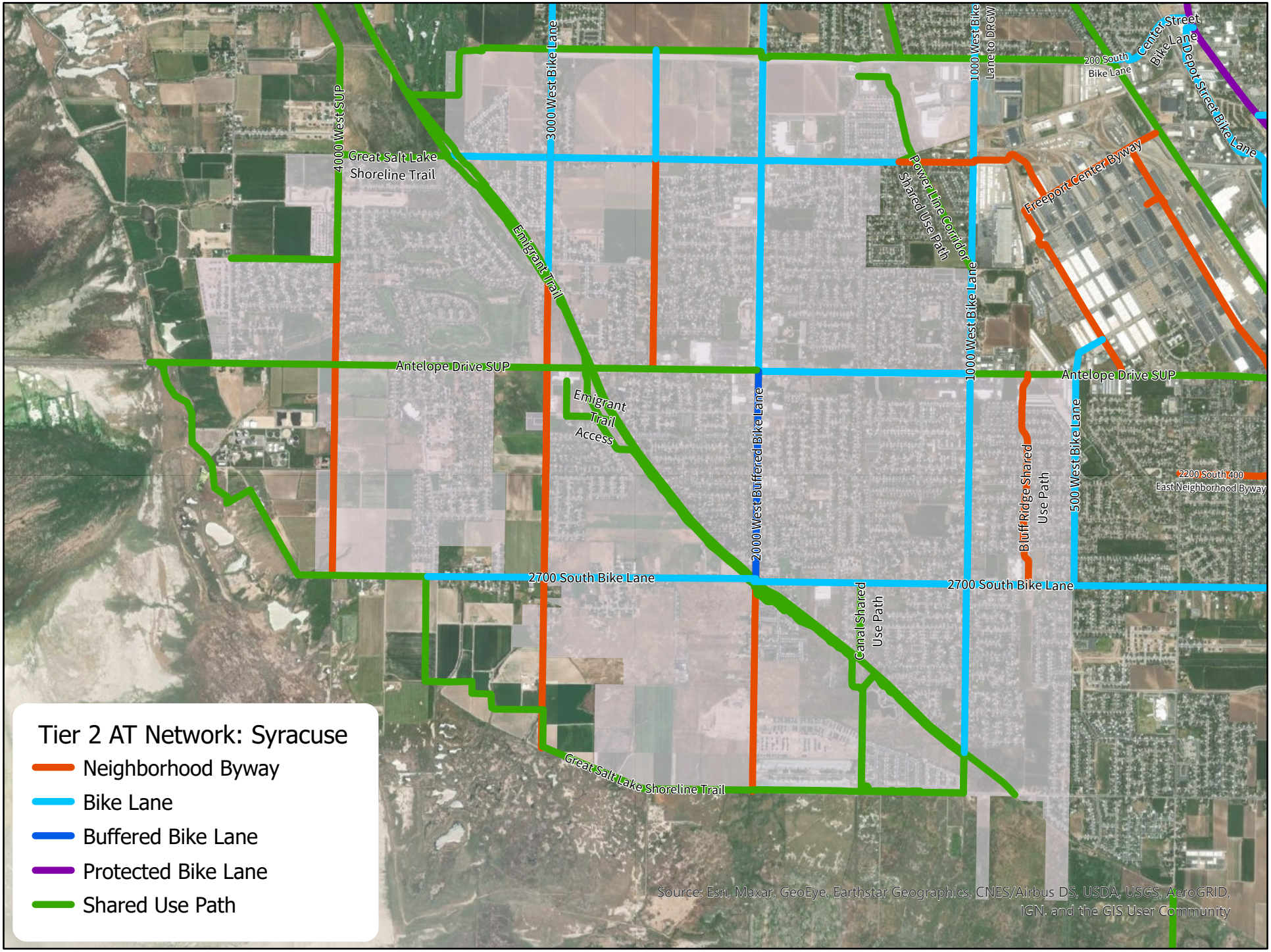
Prepared as part of the
North Davis Active Transportation Plan

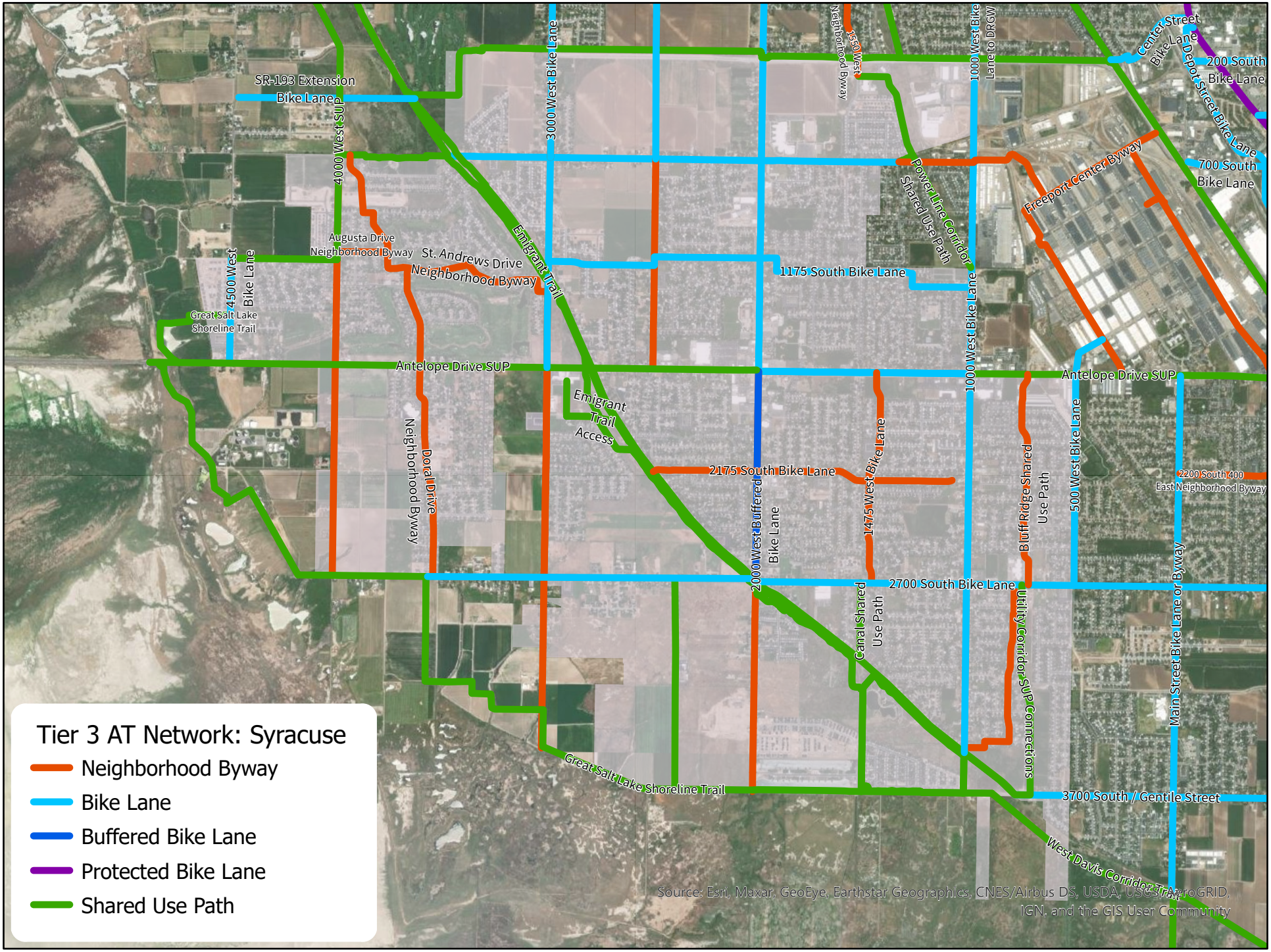
Included maps of proposed facilities for this community:

- Projects by Tier: Syracuse
- Tier 1 Active Transportation Network
- Tier 2 Active Transportation Network
- Tier 3 Active Transportation Network


Projects by Tier:
Syracuse
Tier 0 (UDOT Confirmed)
Tier 1
Tier 2
Tier 3
Existing Bike Facilities & Trails
SR-193 Extension Bike Lane
4000 West SUP
3000 West Bike Lane
1550 West Neighborhood Byway
1000 West Bike Lane to DRGW
Center Street Bike Lane
Depot Street Bike Lane
200 South Bike Lane
700 South Bike Lane
Freeport Center Byway
Power Line Corridor Shared Use Path
Emigrant Trail
Augusta Drive Neighborhood Byway
St. Andrews Drive Neighborhood Byway
1175 South Bike Lane
4500 West Bike Lane
Great Salt Lake Shoreline Trail
Antelope Drive SUP
1000 West Bike Lane
Emigrant Trail Access
Doral Drive Neighborhood Byway
2175 South Bike Lane
2000 West Buffered Bike Lane
1475 West Bike Lane
Bluff Ridge Shared Use Path
500 West Bike Lane
2200 South 400 East Neighborhood Byway
2700 South Bike Lane
Canal Shared Use Path
Utility Corridor SUP Connections
Main Street Bike Lane or Byway
Great Salt Lake Shoreline Trail
3700 South / Gentile Street
West Davis Corridor Trail
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


4000 West SUP
Emigrant Trail
Antelope Drive SUP
Emigrant Trail Access
2000 West Buffered Bike Lane
1000 West Bike Lane
200 South Bike Lane
Center Street Bike Lane
Depot Street Bike Lane
Antelope Drive SUP
Tier 1 AT Network: Syracuse
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

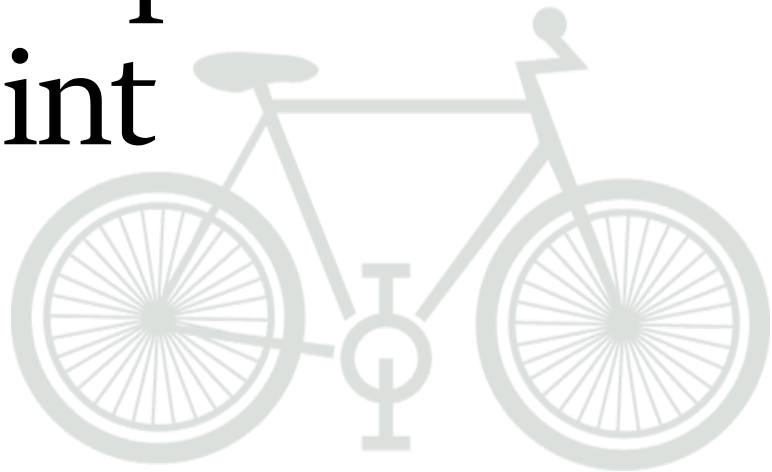

Tier 2 AT Network: Syracuse
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
4000 West SUP
3000 West Bike Lane
1000 West Bike Lane to DRGW
200 South Bike Lane
Center Street Bike Lane
Depot Street Bike Lane
Great Salt Lake Shoreline Trail
Emigrant Trail
Power Line Corridor Shared Use Path
Freeport Center Byway
1000 West Bike Lane
Antelope Drive SUP
Emigrant Trail Access
2000 West Buffered Bike Lane
Bluff Ridge Shared Use Path
500 West Bike Lane
2200 South 400 East Neighborhood Byway
2700 South Bike Lane
Canal Shared Use Path
Great Salt Lake Shoreline Trail
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Tier 3 AT Network: Syracuse
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
SR-193 Extension Bike Lane
4000 West SUP
3000 West Bike Lane
1550 West Neighborhood Byway
1000 West Bike Lane to DRGW
Center Street Bike Lane
200 South Bike Lane
Depot Street Bike Lane
700 South Bike Lane
Freeport Center Byway
Power Line Corridor Shared Use Path
Augusta Drive Neighborhood Byway
St. Andrews Drive Neighborhood Byway
Emigrant Trail
1175 South Bike Lane
4500 West Bike Lane
Great Salt Lake Shoreline Trail
Antelope Drive SUP
1000 West Bike Lane
Emigrant Trail Access
Dorial Drive Neighborhood Byway
2175 South Bike Lane
1475 West Bike Lane
2000 West Buffered Bike Lane
Bluff Ridge Shared Use Path
500 West Bike Lane
2200 South 400 East Neighborhood Byway
2700 South Bike Lane
Canal Shared Use Path
Utility Corridor SUP Connections
Main Street Bike Lane or Byway
Great Salt Lake Shoreline Trail
3700 South / Gentile Street
West Davis Corridor Trail
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Syracuse Project List

Project Details			Estimated Costs	
Project Name	**Facility Type**	**Tier**	**Syracuse Cost**	**Countywide Cost**
Great Salt Lake Shoreline Trail	Shared Use Path	2	$1,104,400	$3,381,400
Great Salt Lake Shoreline Trail	Shared Use Path	3	$82,200	$407,600
Antelope Drive Shared Use Path	Shared Use Path	1	$1,772,900	$5,409,600
Emigrant Trail Access	Shared Use Path	0	$151,900	$151,900
Bluff Road Roundabout	Shared Use Path	2	$62,000	$62,000
3700 South / Gentile Street	Bike Lane	3	$14,900	$268,200
West Davis Corridor Trail	Shared Use Path	3	$198,600	$1,565,200
4500 West Bike Lane	Bike Lane	3	$28,700	$28,700
Emigrant Trail	Shared Use Path	0	$1,209,000	$1,398,900
2000 West Buffered Bike Lane	Buffered Bike Lane	1	$99,800	$99,800
1000 West Bike Lane	Bike Lane	1	$85,800	$143,200
Emigrant Trail to Syracuse Arts Academy Connection	Shared Use Path	2	$110,400	$110,400
Gentile Street Trail Connection to 2400 W	Shared Use Path	3	$677,100	$677,100
Bluff Ridge Shared Use Path	Neighborhood Byway	3	$33,900	$33,900
Canal Shared Use Path	Shared Use Path	2	$250,300	$250,300
Doral Drive Neighborhood Byway	Neighborhood Byway	3	$76,000	$76,000
1175 South Bike Lane	Bike Lane	3	$125,600	$125,600
2700 South Bike Lane	Bike Lane	2	$177,100	$285,500
1475 West Bike Lane	Neighborhood Byway	3	$35,000	$35,000
2175 South Bike Lane	Neighborhood Byway	3	$49,200	$49,200
Utility Corridor Shared Use Path Connections	Shared Use Path	3	$952,800	$952,800
1550 West Neighborhood Byway	Neighborhood Byway	3	$3,000	$20,800
1000 West Bike Lane	Bike Lane	2	$46,100	$46,100
St. Andrews Drive Neighborhood Byway	Neighborhood Byway	3	$25,900	$25,900
Augusta Drive Neighborhood Byway	Neighborhood Byway	3	$8,200	$8,200
3000 West Bike Lane	Bike Lane	3	$24,800	$24,800
Bluff Ridge Shared Use Path	Neighborhood Byway	2	$35,100	$35,100
2500 West Bike Lane Extension to Antelope Island Drive	Bike Lane	2	$28,800	$29,900
4000 West Shared Use Path	Shared Use Path	0	$342,800	$1,069,900
3000 West Bike Lane	Bike Lane	2	$28,700	$86,200
Total Project Costs			**$7,841,000**	**$16,859,200**

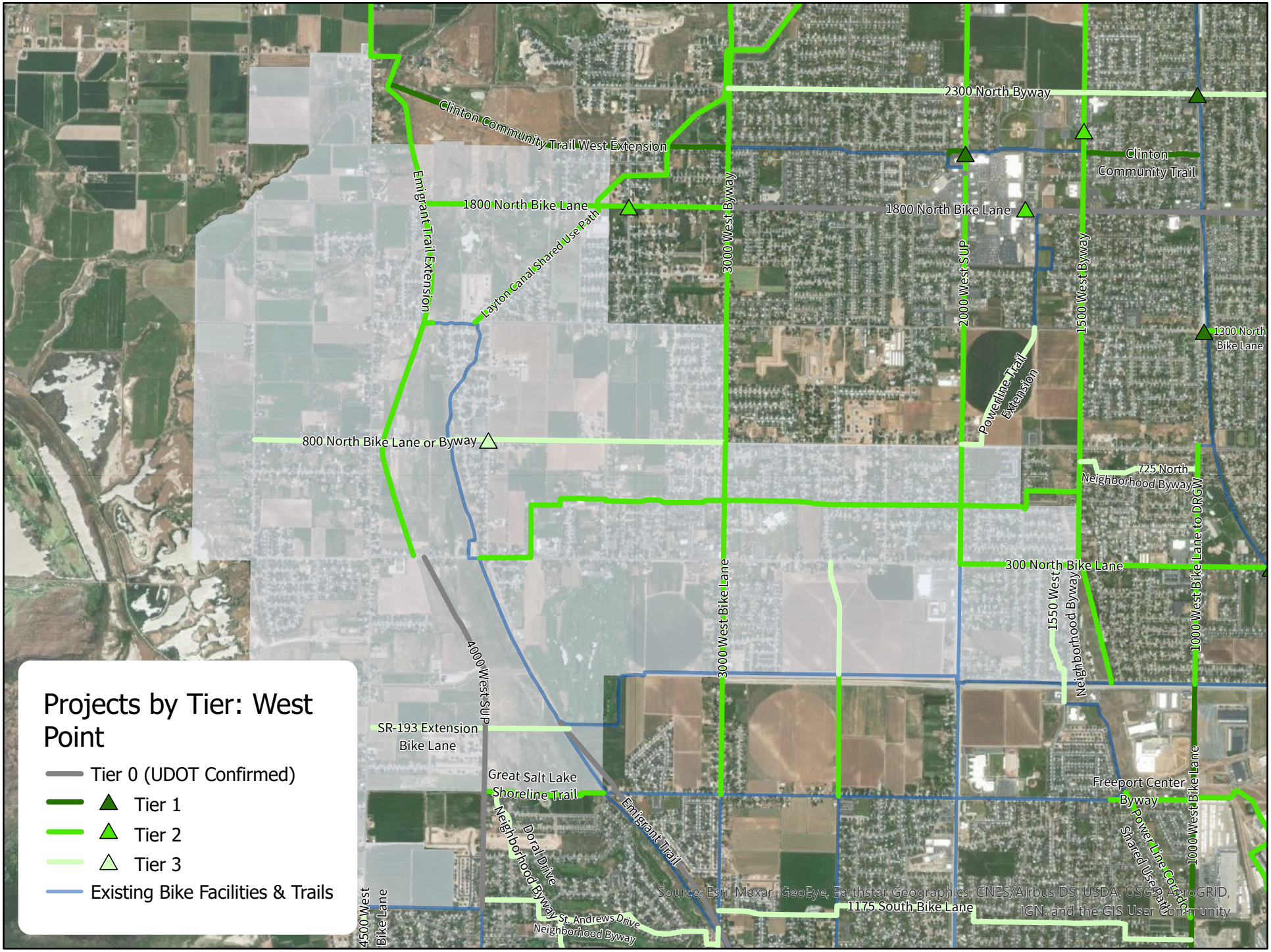
Tiered Active Transportation Projects: West Point

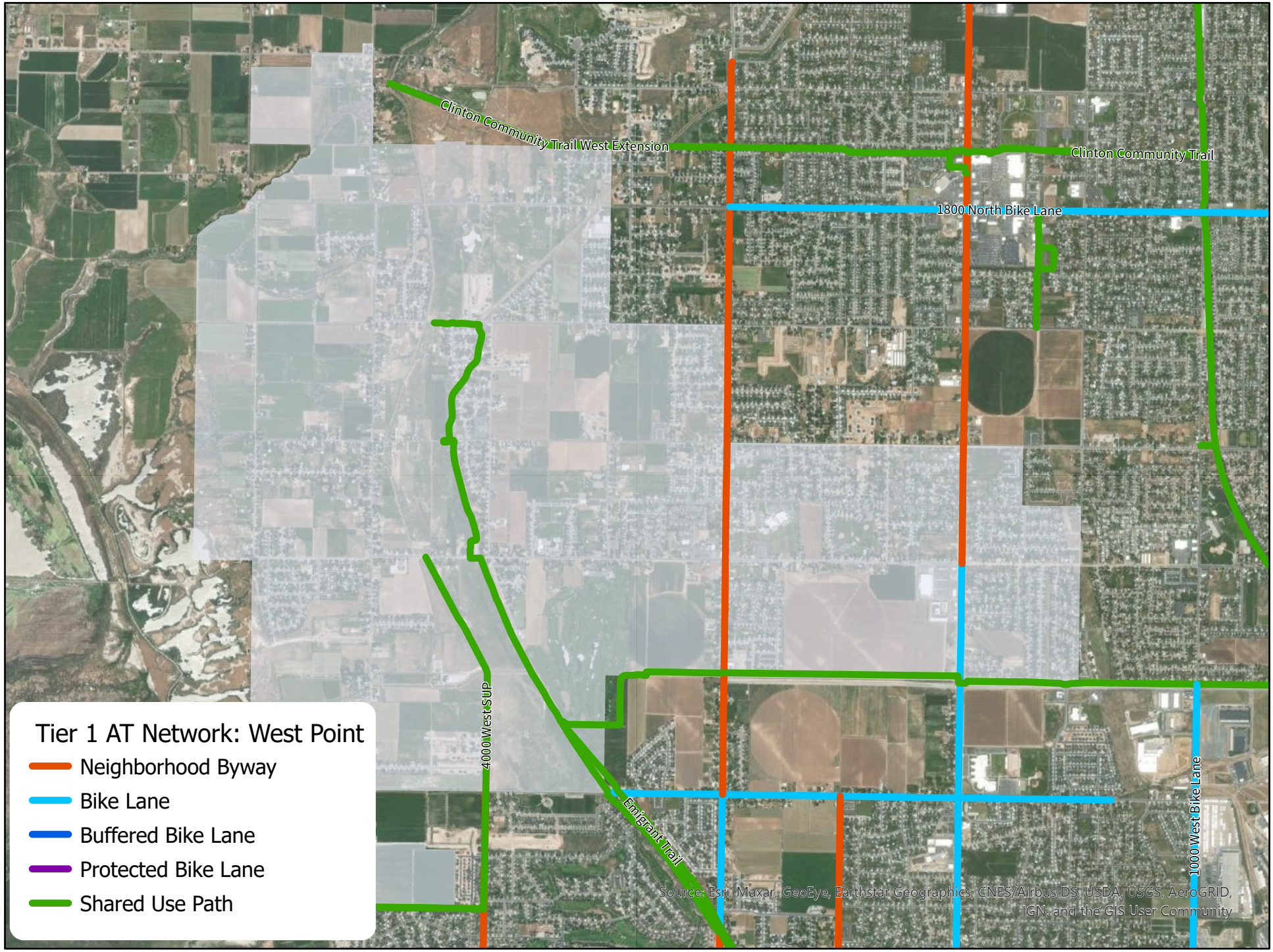


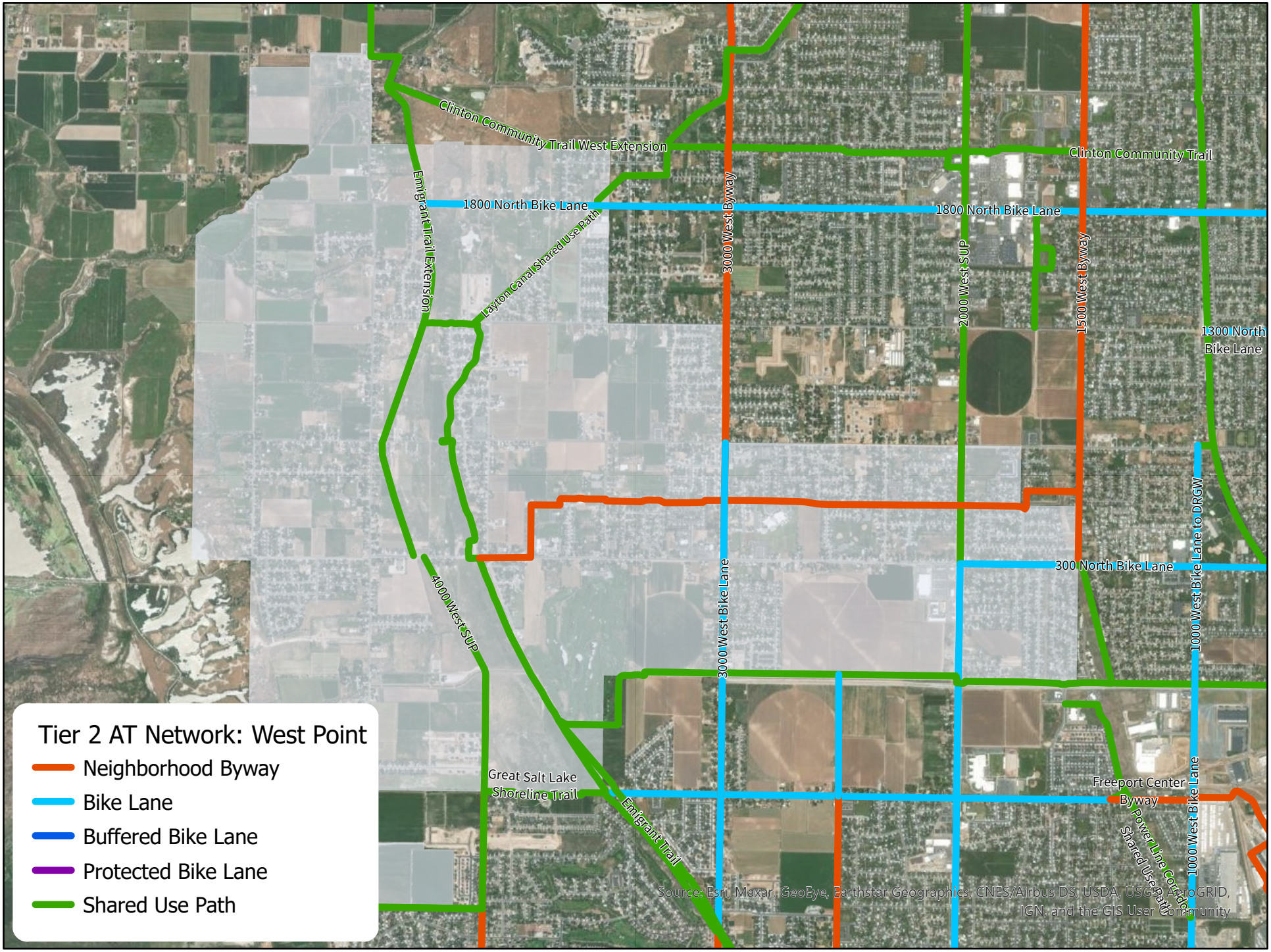
Prepared as part of the
North Davis Active Transportation Plan

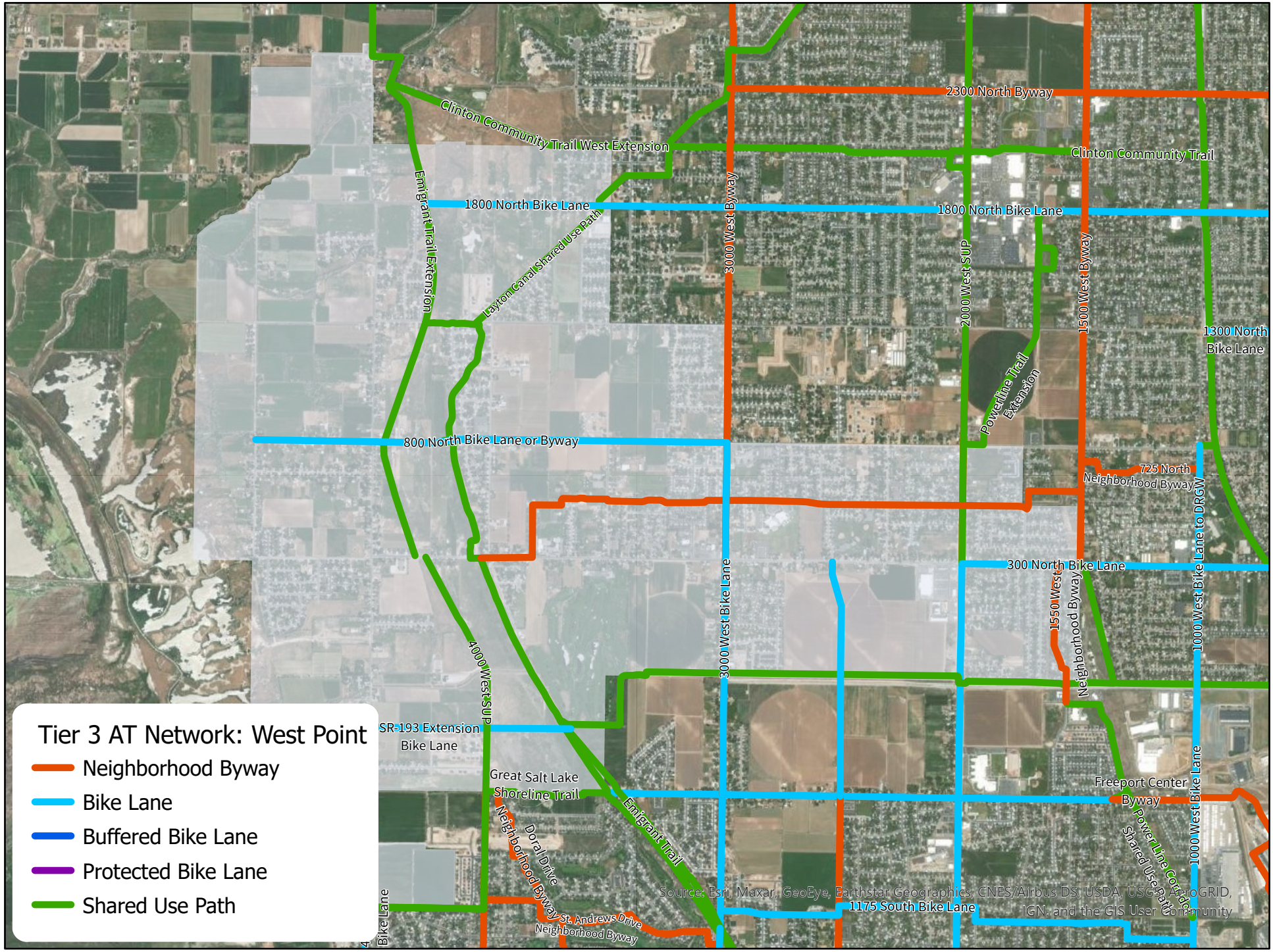
Included maps of proposed facilities for this community:

- Projects by Tier: West Point
- Tier 1 Active Transportation Network
- Tier 2 Active Transportation Network
- Tier 3 Active Transportation Network


Projects by Tier: West Point
Tier 0 (UDOT Confirmed)
Tier 1
Tier 2
Tier 3
Existing Bike Facilities & Trails
Clinton Community Trail West Extension
2300 North Byway
Clinton Community Trail
1800 North Bike Lane
1800 North Bike Lane
Emigrant Trail Extension
Layton Canal Shared Use Path
3000 West Byway
2000 West SUP
1500 West Byway
1300 North Bike Lane
Powerline Trail Extension
800 North Bike Lane or Byway
725 North Neighborhood Byway
1000 West Bike Lane to DRGW
300 North Bike Lane
3000 West Bike Lane
1550 West Neighborhood Byway
4000 West SUP
SR-193 Extension Bike Lane
Great Salt Lake Shoreline Trail
Emigrant Trail
Doral Drive Neighborhood Byway
Freeport Center Byway
Power Line Corridor Shared Use Path
1000 West Bike Lane
4500 West Bike Lane
St. Andrews Drive Neighborhood Byway
1175 South Bike Lane
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Clinton Community Trail West Extension
Clinton Community Trail
1800 North Bike Lane
4000 West SUP
Emigrant Trail
1000 West Bike Lane
Tier 1 AT Network: West Point
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Clinton Community Trail West Extension
Clinton Community Trail
1800 North Bike Lane
1800 North Bike Lane
Emigrant Trail Extension
Layton Canal Shared Use Path
3000 West Byway
2000 West SUP
1500 West Byway
1300 North Bike Lane
3000 West Bike Lane
300 North Bike Lane
1000 West Bike Lane to DRGW
4000 West SUP
Great Salt Lake Shoreline Trail
Emigrant Trail
Freeport Center Byway
Power Line Corridor Shared Use Path
1000 West Bike Lane
Tier 2 AT Network: West Point
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Tier 3 AT Network: West Point
Neighborhood Byway
Bike Lane
Buffered Bike Lane
Protected Bike Lane
Shared Use Path
2300 North Byway
Clinton Community Trail West Extension
Clinton Community Trail
Emigrant Trail Extension
1800 North Bike Lane
1800 North Bike Lane
3000 West Byway
Layton Canal Shared Use Path
2000 West SUP
1500 West Byway
1300 North Bike Lane
Powerline Trail Extension
800 North Bike Lane or Byway
725 North Neighborhood Byway
1000 West Bike Lane to DRGW
300 North Bike Lane
1550 West
Neighborhood Byway
3000 West Bike Lane
4000 West SUP
SR-193 Extension Bike Lane
Great Salt Lake Shoreline Trail
Freeport Center Byway
Emigrant Trail
Neighborhood Byway
Doral Drive
Power Line Corridor Shared Use Path
1000 West Bike Lane
Bike Lane
St. Andrews Drive Neighborhood Byway
1175 South Bike Lane
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

West Point Project List

Project Details			Estimated Costs	
Project Name	**Facility Type**	**Tier**	**West Point Cost**	**Countywide Cost**
Great Salt Lake Shoreline Trail	Shared Use Path	2	$152,200	$3,381,400
Emigrant Trail Extension	Shared Use Path	2	$1,308,700	$1,811,600
Emigrant Trail	Shared Use Path	0	$189,900	$1,398,900
2000 West Shared Use Path	Shared Use Path	2	$344,600	$1,639,700
300 North Bike Lane	Bike Lane	2	$28,900	$140,200
1550 West Neighborhood Byway	Neighborhood Byway	3	$17,800	$20,800
SR-193 Extension Bike Lane	Bike Lane	3	$48,200	$48,200
800 North Bike Lane or Byway	Bike Lane	3	$115,200	$115,200
Layton Canal Shared Use Path	Shared Use Path	2	$563,200	$1,482,800
1800 North Bike Lane	Bike Lane	2	$45,500	$74,400
300 N / 550 N / 600 N Byway	Neighborhood Byway	2	$89,200	$99,000
2500 West Bike Lane Extension to Antelope Island Drive	Bike Lane	2	$1,100	$29,900
2500 West Bike Lane Extension to 300 North	Bike Lane	3	$27,800	$27,800
4000 West Shared Use Path	Shared Use Path	0	$727,100	$1,069,900
3000 West Bike Lane	Bike Lane	2	$57,500	$86,200
Total Project Costs			**$3,716,900**	**$11,426,000**