IRONHORSE
REGIONAL TRAIL

CONTRA COSTA COUNTY

Active Transportation Corridor Study

DRAFT | JANUARY 2020

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Map 1 **Iron Horse Trail Context**

Iron Horse Regional Trail

Contra Costa County Study Area

01 Why Improve the Iron Horse Trail?

The Iron Horse Trail Active Transportation Corridor Study presents an opportunity to re-imagine the existing trail into an active transportation corridor for the future.

The Iron Horse Regional Trail serves as a major regional connector, providing a 32-mile biking and walking corridor for the people of Contra Costa and Alameda counties. The majority of the trail—22 miles—lies within Contra Costa County, which is the focus of this Study. Improving the Iron Horse Trail can provide health, economic, environmental, and transportation benefits to the region.

The Iron Horse Trail corridor has the potential to serve a much greater number of people than it does today. Encouraging a shift from people making personal vehicle trips to more active transportation trips could result in lower traffic congestion, lower greenhouse gas emissions, improved air quality, and higher levels of physical activity, improving the health and wellbeing of the region's residents. Increased use of the trail for commuting and utilitarian purposes could also increase the number of transit users in the area, which could further reduce the number of vehicles on the road.

Additionally, because modes such as walking and biking provide some of the lowest-cost forms of transportation, improving the trail could have positive economic, transportation, and equity benefits for the communities surrounding the corridor.

The Trail Today

Established in 1986, the trail follows the Southern Pacific Railroad right-of-way that was abandoned in 1978.[1] In Contra Costa County, the trail runs north to south through the communities of Concord, Pleasant Hill, Walnut Creek, Alamo, Danville, and San Ramon, passing through commercial, residential, and rural areas along the way.

The Iron Horse Trail corridor lies within 1.5 miles, or a comfortable walking distance, of over 340,000 residents (151,000 commuters) and 3 miles, or a comfortable bicycling distance, of 425,000 residents (200,000 commuters). The corridor is only a few blocks from both the Pleasant Hill and Dublin/Pleasanton BART stations. The trail connects workers to dense employment areas like Bishop Ranch in San Ramon and Contra Costa Centre Transit Village in Walnut Creek, and provides recreational users with an active transportation route that is separated from vehicles.

The Iron Horse Trail is one of the largest and oldest multi-use trails in the San Francisco Bay Area, and is a treasured community asset. Because it is so well-used, the trail often runs into capacity issues as it exists today.

1 State grants from the 1980s that facilitated the acquisition of the corridor obligated the County to 1) implement some form of mass transit and 2) set aside exclusive right-of-way for vehicle operations. On October 12, 2019, the Governor approved Assembly Bill 1025, relieving the County of these obligations. With this new law in effect, the County has more flexibility in planning improvements in the corridor.

The existing Iron Horse Trail is a 10-foot-wide shared-use trail, requiring bicyclists and pedestrians to share the same space. During peak times, this narrow configuration can lead to uncomfortable conditions in which conflicts arise between users traveling at different speeds. For some users, a lack of low-stress on-street connections prohibit them from using the trail for commuting or other utilitarian trip purposes. The Iron Horse Trail Active Transportation Corridor Study seeks to improve these conditions to make the trail safe and convenient for all users and trip types.

STUDY PURPOSE

Given the high monetary and environmental costs associated with building more auto-oriented infrastructure, the corridor offers a chance to build a sustainable alternative that can provide an efficient route for bicyclists, pedestrians, and people using shared mobility devices, improving connectivity across the region.

The scope of the Study includes the entire length (approximately 22 miles) of the Iron Horse Trail within Contra Costa County (State Route 4 to County Line). While the Iron Horse Regional Trail begins in Concord near Highway 4, it should be distinguished from the Iron Horse Corridor (approximately 18.5 miles) that begins in Concord at Mayette Avenue.

The Study provides an overview of existing corridor conditions and corridor needs to frame the context of the Iron Horse Trail today (Chapter 2). These analyses are tied together with community and stakeholder feedback and design tools to develop a new vision for the corridor—one that better accommodates pedestrians and bicyclists of all ages and abilities, as well as users of other emerging mobility options such as e-bikes and e-scooters (Chapter 3). The Study also envisions a corridor that would not preclude the use of shared autonomous vehicles (SAVs) in the future. Chapter 3 also provides initial recommendations for a SAV pilot project.

The existing trail corridor offers a number of opportunities for improvements. These include widening the trail and separating users to enhance user comfort, improving intersections and crossings, improving access points and adding amenities such as landscape, shade, and benches, and creating connections to the existing and planned trail and bicycle networks. Recommended projects along the project corridor incorporate a number of these different improvements (Chapter 4).

Evaluating projects through a prioritization process helps to define which projects will have a greater impact in meeting the project vision. Chapter 4 also presents a goal-based evaluation process and project ranking.

Chapter 5 presents planning-leve cost estimates for the proposed improvements, operations and maintenance considerations for the trail, and potential funding sources for capital improvements, operations, and maintenance. In addition, it examines the trail's existing governance structure and highlights strategies that could be used to enhance its current capacity to opperate and maintain the vision set forth in this Study.

VISION AND GOALS

Vision Statement

The Study envisions a trail that can serve as an active transportation spine that supports the region's mobility goals and continues to provide a treasured recreational resource for users of all ages and abilities.

The Iron Horse Trail today

Goals

The goals of the Iron Horse Trail Active Transportation Corridor Study include:

Safety	Enhances trail condition and improves traffic and intersection safety
Mobility	Provides connections to transit, trails and on-street facilities; accommodates user demand and enhances user comfort
Access & Equity	Provides access to jobs, destinations, parks and open space, and health services; presents opportunities for new access points
User Experience	Improves trail conditions and amenities; presents opportunities for stormwater filtration, ecology, new amenities, and placemaking
Project Synergy	Aligns with planned projects and existing land uses and allows for future expansion of new technologies

The goals were developed through a community engagement process, collaboration with the Technical Advisory Committee (TAC), and through an analysis of existing conditions, existing and planned projects, and regional priorities.

These goals drive the focus of the Study to ensure that the recommended priority projects are consistent with the existing context of the trail as well as the vision presented by the community during the engagement process.

BICYCLE SUPERHIGHWAY

The future Iron Horse Trail could serve as a bicycle superhighway.

A bicycle superhighway can provide an efficient route for long-distance bicycle travel, making bicycling a comfortable option for commuting and other utilitarian purposes. Bicycle superhighways are typically characterized by long-distance routes separated from vehicles with well-maintained pavement, wide lanes, separated users, and enhanced or grade-separated crossings. Two important elements include lighting and wayfinding signage, while additional amenities can include bicycle repair shops and high-capacity bicycle parking. Bicycle superhighways offer an opportunity to highlight bicycling as a key mode by centering businesses, services, and amenities around them, prioritizing them over adjacent roadways and making them desirable destinations in themselves.

The Iron Horse Trail has the potential to become a bicycle superhighway if consistent and cohesive improvements are made. Design considerations seek to enhance the experience for existing users of the Iron Horse Trail while creating an efficient, dependable, and convenient alternative to using an automobile to get to work, school and run errands. Multi-jurisdictional coordination and collaboration would be required to establish consistent conditions along the trail that allow for and encourage its continuous, long-distance use.

Case Studies

REGIONAL

San Tomas Aquino Creek Trail in Santa Clara County serves as a regional example of a bicycle superhighway. The trail connects residential communities to employment and commercial centers via a continuous path with few at-grade crossings.

INTERNATIONAL

The Radschnellweg Ruhr (Bike Freeway) (RS1) is currently being constructed in Germany, the first stretch of which has already been completed. The route will eventually span 62 miles and connect 10 cities in northwest Germany. RS1 is characterized by a wide path, separated from pedestrians, with lighting, passing lanes, and overpasses and underpasses at intersections.

A separated path with a fast lane can provide a comfortable experience for numerous user groups. One can imagine a woman who is commuting to BART to make her way into the city and is dependent upon the new lighting because she will be commuting back home after the sun sets. A parent on an e-bike commuting from Concord to San Ramon who is able to drop their child off at daycare located along the route. Teens in groups heading to school and a morning group ride from a local bicycle club. With a dedicated lane for faster users, the trail could support e-scooters or other shared micromobility devices. The trail improvements will provide a facility for neighborhood families of all ages and abilities traveling by bike.

A side-path conjures the spirit of the existing Iron Horse trail. Here friends stroll and engage with amenities and seating areas. Even on a hot summer day the cool respite of new trees gives a grandparent and their grandchild in a stroller a moment to rest. Pedestrians would require their own lane to comfortably use the trail, while equestrians would require their own unpaved path in the right-of-way adjacent to the trail.

COMMUNITY ENGAGEMENT

The Iron Horse Trail community engagement process helped shape the vision of the Study and identified needed improvements along the trail.

The community engagement process utilized a variety of outreach methods to gather community input on the Iron Horse Trail's existing challenges and potential future improvements. These outreach methods included sharing project information via a project website, conducting stakeholder interviews, holding pop-up events along and near the trail, hosting an interactive webmap tool that enabled community members to leave site-specific comments and 'like' other users' ideas, and conducting a survey for business owners, employees, students, and residents.

In-Person Engagement

Two rounds of engagement occurred.

In the Spring of 2019, the project team hosted three outreach events to introduce the community to the project corridor as well as promote the online survey and interactive webmap. The events included:

- A food truck event outside the Pleasant Hill/Contra Costa Centre BART station, March 29, 2019
- Fair Oaks Elementary Bike to School Day in Pleasant Hill in partnership with Contra Costa 511 Safe Routes to School Program, April 30, 2019
- San Ramon Bike to Work Day at Bishop Ranch, May 9, 2019

Following the initial rounds of in-person engagement, three additional pop-up events were held along the Iron Horse Trail in Summer 2019:

Above: *On-trail pop-up engagement event in San Ramon.*

- San Ramon Central Park, July 27, 2019
- Contra Costa Centre (Intersection of the Iron Horse Trail and the Canal Trail), July 28, 2019
- East Bay Regional Park District (EBRPD) Trail Etiquette event, August 7, 2019

Feedback from 260 people was gathered during these three events. Community members were asked questions such as: How can we improve the trail in your neighborhood? What do you want to see addressed at intersections? Which trail type do you prefer and why? Overall, a majority of the feedback received involved the desire for:

- Adding amenities such as lighting, shade, and bike stations
- Increasing the number of access points
- Prioritizing users and user separation on the trail

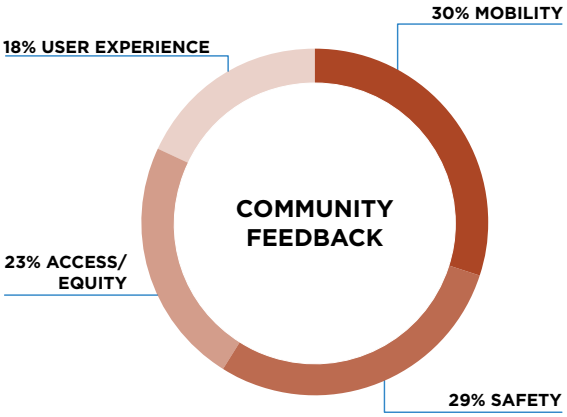
Online Engagement

An interactive webmap was available from mid-January to mid-August 2019. Community members were invited to identify locations of destinations accessible from the Iron Horse Trail, barriers preventing access or providing a high quality user experience, and routes to access the trail. They were also given the opportunity to suggest locations for trail improvements. People could then like/vote on previously posted comments.

The webmap collected 407 comments and 769 likes/votes. The majority of the comments were clustered in the northern half of the corridor.

The comments were summarized by theme and translated into draft project goals. Of the comments received:

- **30% were related to Mobility**
  - Improve network and connectivity to regional trails, BART, and other transit
  - Create priority ROW for trail users; consider overpasses at high volume corridors; facilitate direct connections and shorter wait times
- **29% were related to Safety**
  - Address intersection safety with improved signals, increased visibility, and slower traffic
  - Improve personal safety at access points; improve lighting; reduce user conflicts
- **23% were related to Access/Equity**
  - Improve connectivity to regional downtown cores, commercial hubs, schools, and open spaces



- **18% were related to User Experience**
  - Improve shade, amenities, and overall user experience
  - Prioritize maintenance and wayfinding

Certain locations along the corridor were repeatedly highlighted as needing specific improvements. These included Monument Boulevard (increased connectivity and overall improved intersection safety), Bollinger Canyon Road (intersection improvements), Danville Boulevard (wayfinding and intersection improvements), and Walnut Creek, Pleasant Hill, Concord (a desire to connect with BART). Repeated comments were noted and summarized by segment to highlight which trail segments were considered to be the most in need of improvement.

The results of the community engagement process were one of several factors used to identify important potential improvements along the trail and understand key community priorities that the Study can address through its recommendations.

02 What are the Corridor Needs?

In order for the Iron Horse Trail to meet the new vision, it is important to understand the current and future needs of the corridor.

A data driven corridor analysis documented how the trail connects to the regional networks and adjacent land uses, as well as how it currently serves surrounding communities. In addition, an existing conditions assessment detailed the corridor's various physical conditions, intersections, access points, and amenities.

The data gathered as part of the corridor and existing conditions analyses were combined with the feedback received from the community to identify specific corridor needs.

In order to summarize and communicate the needs of the 22 mile Iron Horse Trail study corridor, the trail was divided into 15 segments based on jurisdiction, adjacent land context, and physical conditions, as shown in Map 2. There are two types of segments, each of which have different needs.

Activity Centers are categorized as Main Streets, activity hubs, and commercial development, and contain destinations that users are likely to travel to.

Parks & Housing segments are passive, residential, or park-like, and are the areas that users are more likely to travel through.

Each jurisdiction the trail passes through has 2-3 segments, ranging from 0.5 to 3.0 miles.

Analysis Factors

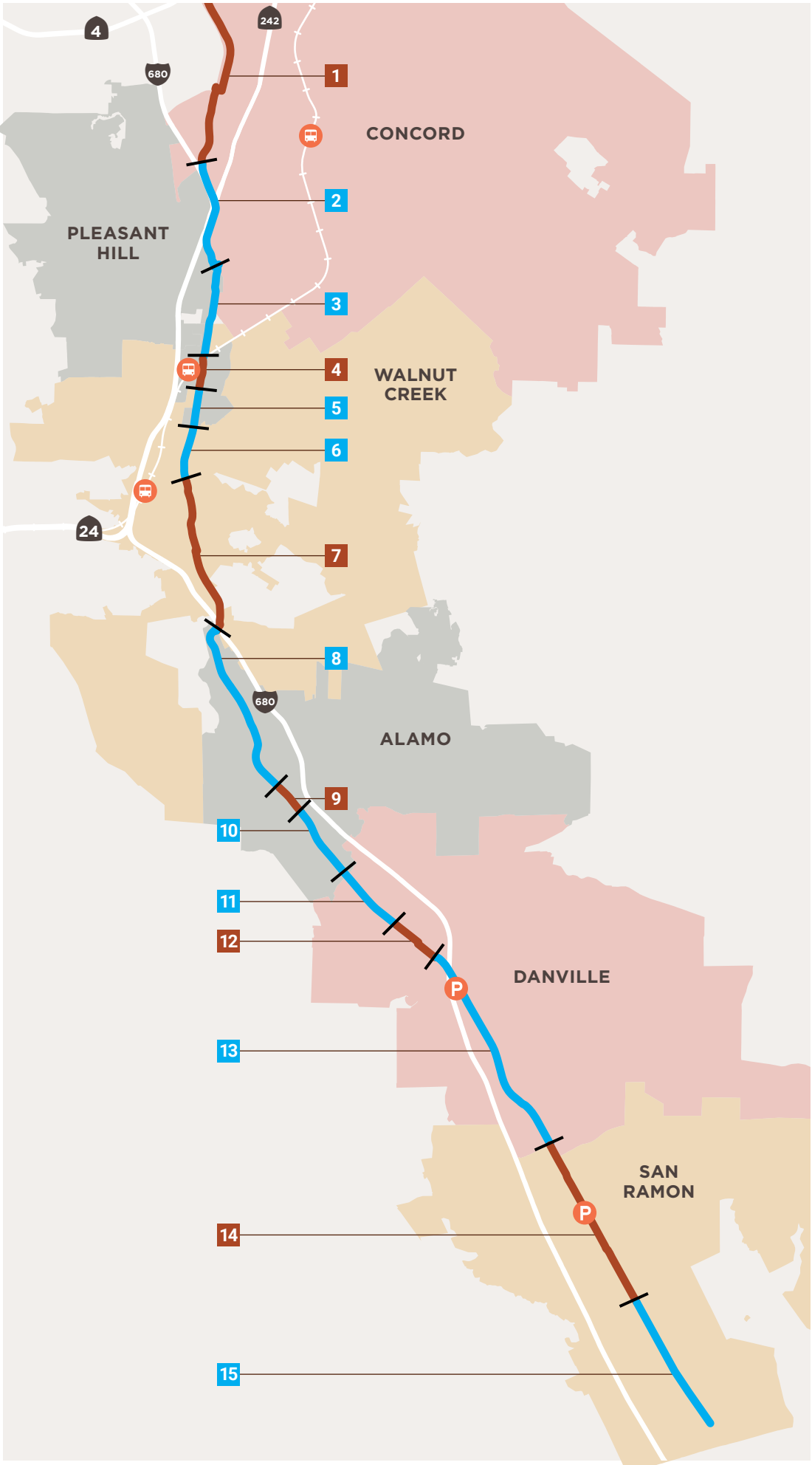
To compare and assess the needs of trail segments throughout the corridor, the segments were evaluated based on a number of factors. These factors included:

- User Demand
- Access Needs
- Connections
- Intersections
- Constraints/Barriers
- Community-Identified Needs

Each factor includes an overall scale from low to high, and each segment was ranked based on these criteria. The following pages describe each factor in greater detail and a summary comparison of all segments is shown at the end of the chapter in Table 6.

See Appendix A and B for more information on Existing Conditions and Corridor Analysis.

Map 2 **Trail Design Segments**



Trail Segments by Type

- **Activity Centers:** Main Street, Commercial, Destination, Development, Transit
- **Parks & Housing Segments:** Residential, Passive, Landscape, Park
- Segment Extents
- BART Station
- Park & Ride

0 1 2 MILES

USER DEMAND

People Who Live Here

There are over 425,000 residents and 200,000 commuters within three miles of the Iron Horse Trail in Contra Costa County. Most walk and bike trips to work are concentrated near employment centers in the northern end of the corridor near Walnut Creek, Pleasant Hill, and Concord, with an additional concentration in the south near San Ramon. Currently, however, over 70 percent of commuters near the corridor drive alone to work.

This may be due, in part, to the relative wealth of the communities along the Iron Horse Trail. People who live near the trail tend to have access to multiple vehicles, with only 2% of all commuters without access to a car, and 80% of commuters with access to two or more vehicles. Many of these motor-vehicle commute trips are relatively short, with 39% taking less than 20 minutes. The largest concentrations of households with zero-vehicles and of relatively lower median household incomes are in the same census tracts with lower average drive alone to work mode share.

Population and employment growth are expected along the trail near BART stations and at the Concord Naval Weapons Station redevelopment site, meaning that an improved active transportation corridor will be critical for providing an efficient and sustainable transportation network for commuters in the area.

Potential User Demand

Trip demand along the Iron Horse Trail was calculated using data generated by the Metropolitan Transportation Commission's (MTC) travel demand model. Using pairs of origins and destinations, total daily trips between "traffic analysis zones" (TAZs) were simulated along the street network. Trips that utilized the Iron Horse Trail with a perceived distance of less than 5 miles were then aggregated to produce potential daily trip estimates that could be made by bicycle.

Bicycle and pedestrian mode shares were then determined by using mode share data from the MTC travel demand model as well as guidance from the FHWA Shared-Use Level of Service Calculator (SUPLOS). The typical utilitarian bicycle mode share among TAZs within the study area (1.3%) was applied to the total number of trips within bikeable distance to determine a more representative number of biking trips that would be likely to use the trail. A 40% utilitarian pedestrian mode share (the typical pedestrian mode share used by the FHWA SUPLOS tool) was applied to estimate pedestrian trips. Finally, a conservative recreational mode split (60%) was applied to account for recreational bike and pedestrian trips likely to use the trail. This percentage was determined following a review of recreational use on similar trail examples throughout the United States.

The results of the demand analysis show a range of potential demand between the segments of the trail (see Table 6). Results are shown on a scale of increasing demand. Segments that have particularly high demand (such as those in Pleasant Hill and San Ramon) would benefit from a wider trail than the existing 10-foot shared-use path to comfortably accommodate potential demand. Additionally, these high-demand areas may also benefit from separate lanes for people walking and bicycling in order to minimize conflicts between users. Segments with lower demand (such as those in Alamo) may benefit from improvements such as increased access points, network connections, and intersection improvements.

ACCESS NEEDS

Access from the Trail

The corridor was evaluated for its accessibility via low stress routes to different destinations such as transit, schools, parks, and commercial or shopping areas. Low stress routes were identified as Level of Traffic Stress (LTS) 2 or below, which is comfortable to a beginner adult bicycle rider. Low stress access was identified to select destinations including:

- **Transit:** the Pleasant Hill and Dublin/ Pleasanton BART stations directly connect to the trail and other BART stations could be connected in the future. Several bus transit routes also have stops that may provide connections to the Iron Horse Trail.
- **Schools:** 17 schools are immediately adjacent to the trail and many others are served by the trail. The Iron Horse Trail provides connectivity for 24 public schools that have catchment areas that overlap the trail in a significant way.
- **Parks:** Eight parks are within 1,000 feet of the trail and an additional 9 parks are within a 1/2 mile of the trail.
- **Employment centers:** areas like Bishop Ranch in San Ramon (600 companies and growing) and Contra Costa Centre Transit Village in Walnut Creek (over 6,000 employees) are well served by the trail as are many smaller employment areas in the region.
- **Commercial areas:** the trail crosses through downtown San Ramon, Danville, and unincorporated Alamo. The Contra Costa Canal Trail provides a connection to downtown Pleasant Hill and connections could be made to downtown Concord and Walnut Creek. Several shopping centers lie directly adjacent to or within a short distance of the trail, providing access to services, retail business, and other similar opportunities.

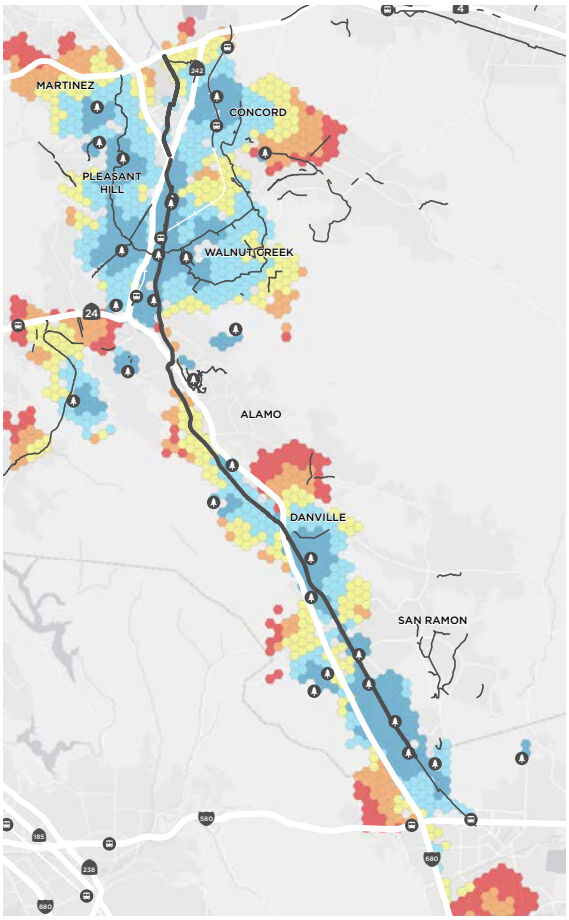
Access to the Trail

Sixty formal access points connect the trail to residential neighborhoods, retail centers, downtowns, and parks. In addition to these formal access points, numerous informal access points such as private access points to individual homes exist along the corridor.

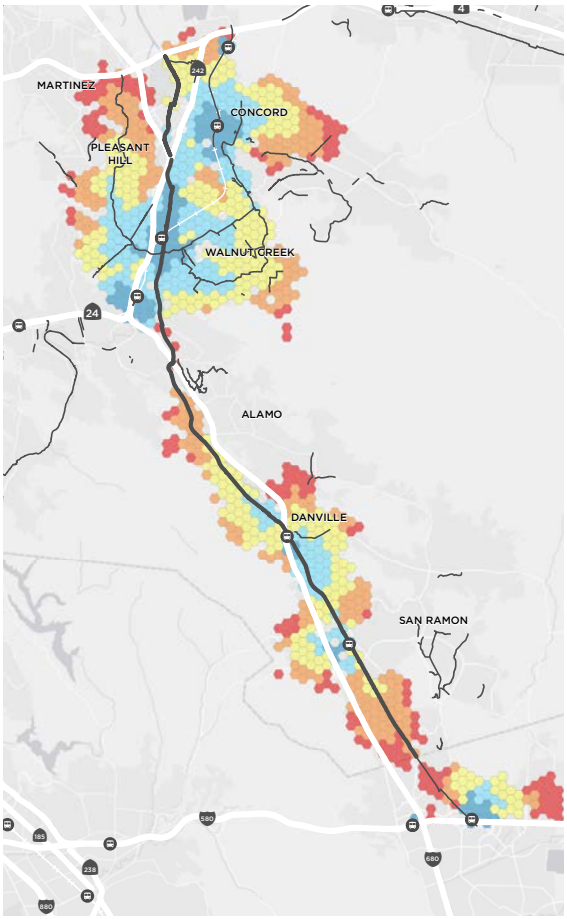
Amenities at Access Points

Amenities along the existing trail are scarce. Small staging areas with and without parking are sporadic along the corridor. Shade structures with seating are found adjacent to the trail within San Ramon, and there is enhanced greenway and linear park space north of the Pleasant Hill BART station. The San Ramon Transit Center and Hemme Park have restrooms and water open to the public and are directly adjacent to the trail, and there are seven restrooms at public park facilities less than a quarter mile from the trail (three in San Ramon, two in Danville and two in Walnut Creek).

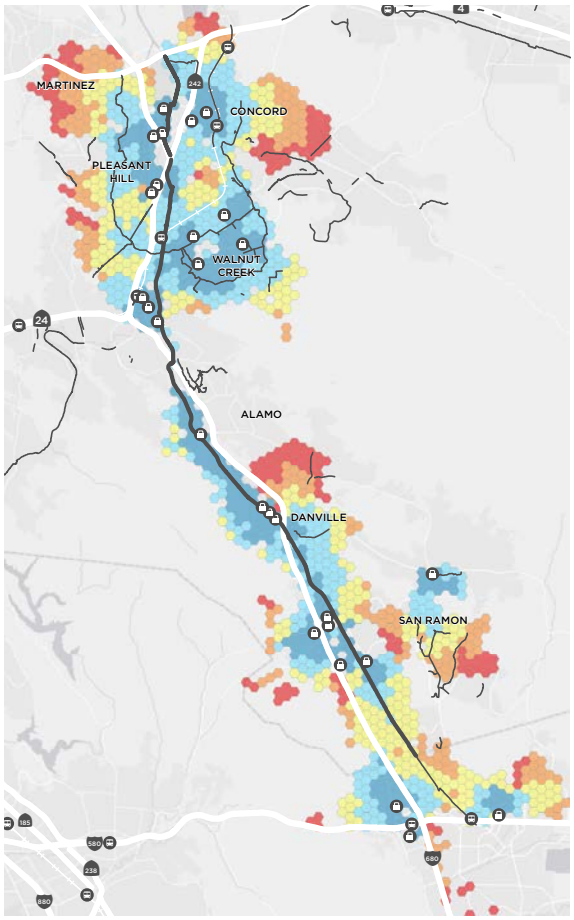
Map 3 **Park Accessibility**



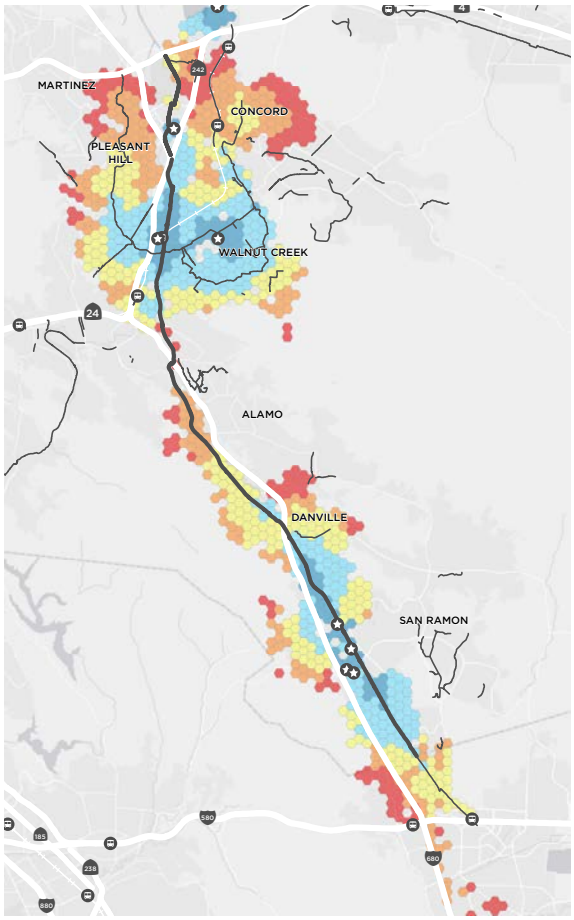
Map 4 **Transit Accessibility**



Map 5 **Shopping Accessibility**



Map 6 **Office Accessibility**



Network Distance to Nearest Point of Interest

- 0 - 1 Mile
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5 Miles

0 1 2 MILES

N

DESTINATION TYPES

Each segment has a variety of destination types and quantities. Identifying opportunities to enhance or add connections to education, employment, and recreation centers will build on the existing importance of the Iron Horse Trail's role in connecting the region. Understanding where and what types of destinations are along the trail, as well as where existing access points are located, will impact where and what types of new access points might be appropriate.

- **Lower need:** Segments with comparably low-density housing and few other destination types may have less need for frequent access points and amenities.
- **Medium need:** Segments with moderate density housing and other destination types may have some need for frequent access points and amenities.
- **Higher need:** Segments with high density housing, commercial, employment, educational and recreational destinations may have higher need for frequent access points and amenities.

CONNECTIONS

Reviewing the region's active transportation network reveals the importance and potential that the Iron Horse Trail holds in enhancing regional connectivity. There are a number of existing and planned regional connections along the existing trail (see Table 1 and Map 7). Segments were evaluated based on their existing regional and local bikeway connections, as well as their potential to connect to planned bikeways. Segments with a greater number of existing and planned regional connections may have a higher priority for connectivity improvements. Segments with lower numbers of existing or planned bikeways are considered to have a higher need for improvement.

Existing and Planned Regional Connections

Segments with few or no existing or planned regional connections are categorized as having lower needs, while segments with a substantial number of connections are categorized as having higher needs.

- **Lower needs:** Few or no existing or planned regional connections
- **Medium needs:** Some existing or planned regional connections
- **Higher needs:** Several existing or planned regional connections

Existing Bikeways

Segments' existing bikeways were evaluated by frequency of existing bikeway per half mile. Since the segments have different lengths, a ratio was used to compare segments. Segments with fewer numbers of existing bikeways may be considered to have higher need for network improvements.

- **Lower need:** > 1.5 existing bikeways per half mile
- **Medium need:** > 0.5 and < 1.5 existing bikeways per half mile
- **Higher need:** < 0.5 existing bikeways per half mile

Table 1 **Existing and Planned Regional Connections**

Segment	Connections
1	Future trail extension to connect to Bay Trail to the north; Future trail connection to the Delta de Anza Regional Trail; Willow Pass Rd and Concord Ave future Class II improvements to connect to Downtown Concord; Concord BART and future Class I along State Route 242
2	Monument Corridor Trail (City of Concord); Walnut Creek Trail (Planned)
3	Bancroft Rd Class II, Walnut Creek Trail (Planned)
4	Pleasant Hill BART, Treat Ave Class II (Proposed)
5	Contra Costa Canal Trail
6	None
7	Ygnacio Valley Rd Class III (approved/signed sidewalk use) west to BART and east to Class III sidepath; Ygnacio Canal Trail to Contra Costa Canal Trail and Mt Diablo State Park; Lincoln Ave connection to Downtown/Main Street; Newell Ave to Mt Diablo/Olympic Blvd connection to Lafayette-Moraga Trail
8	Tice Valley Class I (Proposed) to Olympic Blvd connection to Lafayette-Moraga Trail, Danville Blvd Class II
9	Stone Valley Rd Class II, Danville Blvd Class II
10	Danville Blvd Class II
11	Danville Blvd Class II to El Cerro Blvd/Diablo Rd to Mt Diablo State Park
12	Danville Blvd/San Ramon Valley Blvd Class II
13	Sycamore Valley Class II to Camino Tassajara Class II/Class I
14	Bollinger Canyon Rd Class III/Class II (approved/signed sidewalk use), Alcosta Blvd Class III, Crow Canyon Road Class III/Class II; Norris Canyon Class II; City Center San Ramon (Transit); San Ramon Transit Center
15	Montevideo Dr Class III, San Ramon Cross Valley Trail Class I; Pine Valley Rd Class III; Alcosta Blvd Class III; Dublin/Pleasanton BART

Planned Bikeways

Segments' planned bikeways were evaluated by frequency of planned bikeway per half mile. Since the segments have different lengths, a ratio was used to compare segments. Segments with fewer numbers of planned bikeways may be considered to have a higher need for network improvements.

- **Lower need:** > 1.5 planned bikeways per half mile
- **Medium need:** > 0.5 and < 1.5 planned bikeways per half mile
- **Higher need:** < 0.5 planned bikeways per half mile

INTERSECTIONS

Trail Convenience

There are 45 roadway crossings along the length of the Iron Horse Trail corridor in Contra Costa County. These include arterial, collector controlled, collector uncontrolled, local, and grade separated crossings. Map 7 shows the locations of these crossings along the trail.

Segments of the trail with more frequent or challenging intersections are considered to be less convenient for users and may have a higher need for improvement.

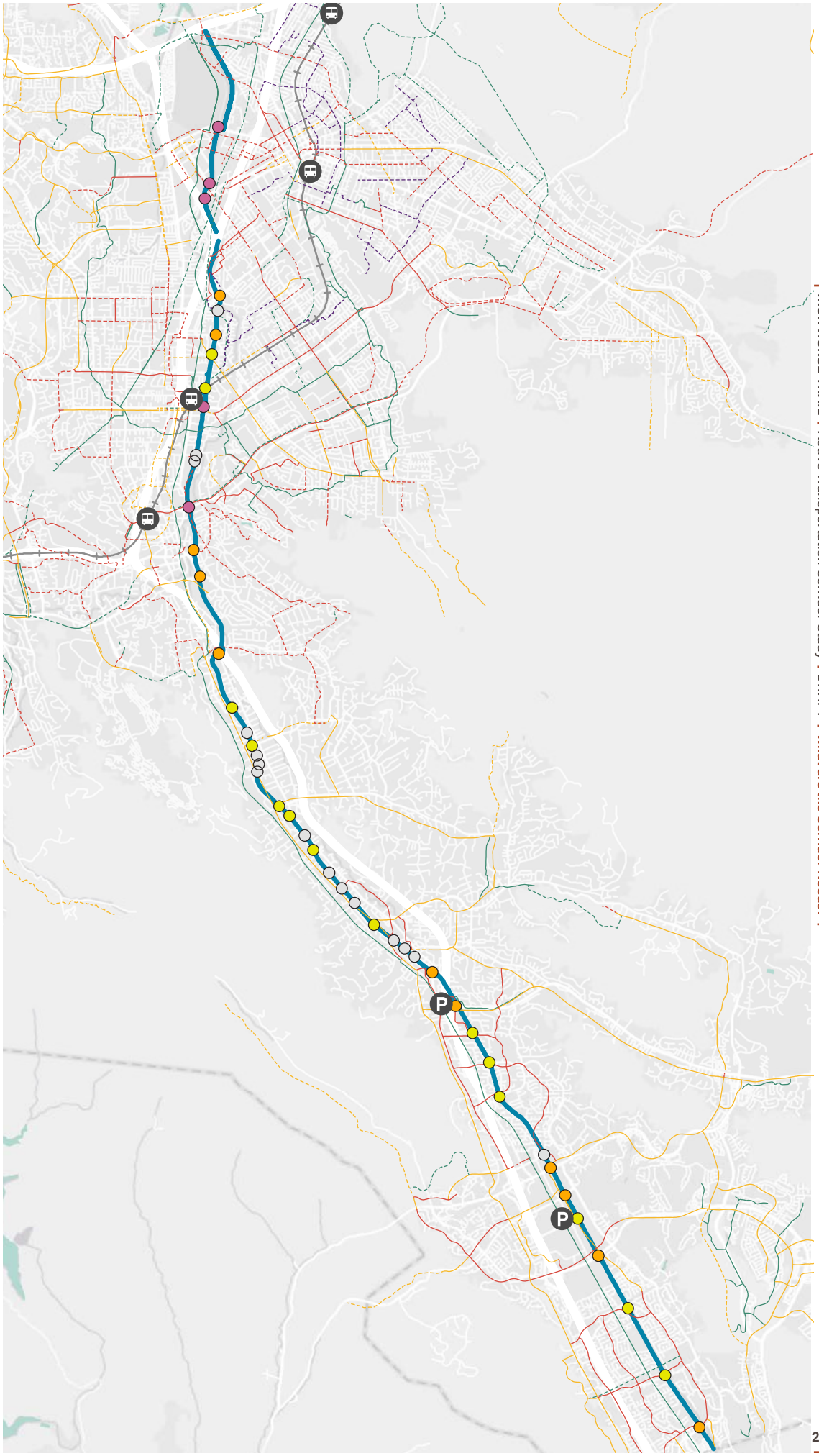
A point system was developed to rate different intersection types to determine the level of need of each segment. Arterial road crossings require trail users to stop at a signalized intersection, causing delay, and have a lower degree of comfort. Therefore, arterial crossings were assigned the highest number of points (5). Collector road crossings were assigned 3 points. Local road crossings require users to make a stop but are generally comfortable, therefore they were assigned a lower value (1). Some crossings require users to divert off of the trail. Those cases were assigned an additional 1 point. Finally, grade separated crossings do not result in inconvenient use of the trail so they were assigned 0 points. Points were summed along each segment and used to rank segments by level of convenience, as described below:

- ○ **Most Convenient** (≤ 5 points)
- ◔ **Convenient:** (6-10 points)
- ● **Least Convenient:** (>10 points)

Table 2 **Trail Convenience**

Segment	# of Arterial Crossings *(5 Points)*	# of Collector Crossings *(3 Points)*	# of Local Crossings *(1 Points)*	# of Intersection Diversions *(1 Points)*	# of Grade Separated Separated Crossings *(0 Points)*	Trail Convenience
1				1	2	○
2	1			1	1	◔
3	1	1	1			◔
4		1			1	○
5			1			○
6			1			○
7	3			1	1	●
8		2	4	1		●
9		2				◔
10		1	3			◔
11		1	2			○
12	1	2		1		●
13	1	3	1			●
14	3	1				●
15	1	2				●

Map 7 **Trail Intersections**



Existing Crossing Type

- Arterial Crossing
- Collector Crossing
- Local Crossing
- Separated Crossing
- Iron Horse Trail
- BART Station
- Park and Ride

Existing Bikeways

- Class I Shared-Use Path
- Class II Bicycle Lane
- Class III Bicycle Route

Proposed Bikeways

- Class I Shared-Use Path
- Class II Bicycle Lane
- Class III Bicycle Route
- Class IIIB Bicycle Boulevard

Intersection Safety

In the five most recent years with data available (2013-2017), there were 203 bicycle and pedestrian collisions on local streets within a quarter mile of the trail and 761 within 2 miles. There were 14 bicycle and pedestrian fatalities within 2 miles of the trail. Table 3 identifies the number of bicycle and pedestrian collisions by city and distance from the trail for the five cities and unincorporated areas.

Identifying the need for safer crossings and access routes to the Iron Horse Trail is a key goal of this project. There were 43 injuries of bicyclists or pedestrians within 100 feet of the trail. Locations with 3 or more bicycle or pedestrian injuries are shown in Table 4.

For the needs analysis, intersection safety was ranked based on the reported bicycle or pedestrian involved crossing injuries on the following scale:

- **Lower need:** Less than 3 crossing injuries
- **Medium need:** 3 to 4 crossing injuries
- **Higher need:** 5 or more crossing injuries

Table 3 **Collisions**

City	Miles from Trail				Total
	0.25	0.5	1	2	
Concord	35	27	108	87	257
Pleasant Hill	13	2	4	8	27
Walnut Creek	5	50	40	23	118
Danville	30	10	27	14	81
San Ramon	44	4	12	15	75
Unincorporated County	76	67	36	24	203
Total	**203**	**160**	**227**	**171**	**761**

Table 4 **Bicycle or Pedestrian Involved Crossing Injuries**

Location	Injuries
Treat Blvd & Jones Rd	11
Monument Blvd & Mohr Dr	9
South Broadway & Newell Ave	4
Hemme Ave	3
Sycamore Valley Rd & Camino Ramon	3
Willow Pass Rd	3
Ygnacio Valley Rd	3
Total	**36**

CONSTRAINTS/BARRIERS

Right-of-Way (ROW) Width

The ROW width that the Iron Horse Trail travels through varies throughout the corridor from nearly 300 feet in its widest area near Hookston in Pleasant Hill to less than 20 feet in its most constrained areas through the Broadway corridor in Walnut Creek. Throughout the majority of the trail the ROW width allows for room for future trail improvements. However, pinch points caused by narrow rights-of-way pose challenges to trail design continuity. A variation of cross sections are required to address the changes along the trail. ROW widths are broken down into four basic categories:

- **Constrained:** <25'
- **Narrow:** 25'-50'
- **Wide:** 50'-100'
- **Very wide:** >100'

These categories highlight whether segments have opportunities for certain trail improvements or are constrained due to lack of available space.

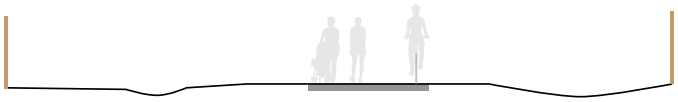
Physical Constraints

In addition to available ROW, certain elements along the trail present a barrier to comfortable, safe user travel, or possible impacts to future trail improvements. Examples of physical constraints include existing infrastructure, nearby water features, difficult intersections, and challenging landscape features. Different from constraints posed by narrow ROW, physical constraints can be solved through unique design solutions. Higher level constraints may require a higher level of capital investment and coordination.

Physical constraints are summarized into three basic categories:

- **Major:** includes significant physical constraints such as existing infrastructure adjacent to the trail, narrow bridges, or challenging landscape features
- **Minor:** includes some physical constraints such as frequent intersections
- **Unconstrained:** does not include any physical constraints

For example, Segment 13/Danville is one that can be summarized as minimally constrained. This segment is characterized by wide ROW width, no physical obstructions, and direct approaches to roadway crossings. Segment 7/ Walnut Creek, however, has many challenging constraints including the narrow ROW along the South Broadway corridor, the alignment jog at Newell Avenue, and the infrastructure surrounding the channelized Walnut Creek.

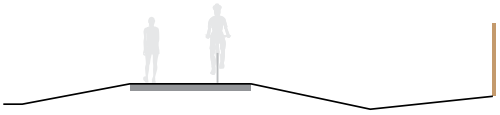


VERY WIDE

A portion of the corridor faces few constraints, with 50 to 100 feet of generally flat right of way available. Relevant sections of this type are found near Walnut Creek and Alamo.

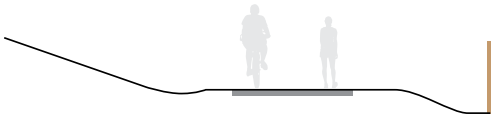
WIDE: TRAIL ON CREEK BANK

Another common trail condition is when the trail follows the top of bank along a naturalized creek. This is primarily found in the northern section of the trail near Concord where the trail parallels Walnut Creek.



WIDE: RAISED RAIL BED

Portions of the trail run along a raised rail bed with moderate drainage ditches along portions of the corridor. These conditions are found in most of San Ramon and Danville.



NARROW: ADJACENT TOPOGRAPHY

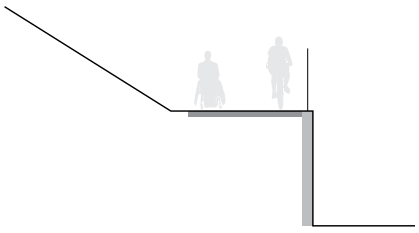
While most of the trail is in generally flat topography, a small portion (0.8) miles in Danville is adjacent to topography that may limit any additional trail width.

NARROW: ADJACENT COMMERCIAL

For 2.3 miles in parts of Danville and San Ramon, commercial businesses are directly adjacent to the trail. In Downtown Danville, the trail narrows to approximately 30 feet in width.

CONSTRAINED: LIMITED RIGHT-OF-WAY

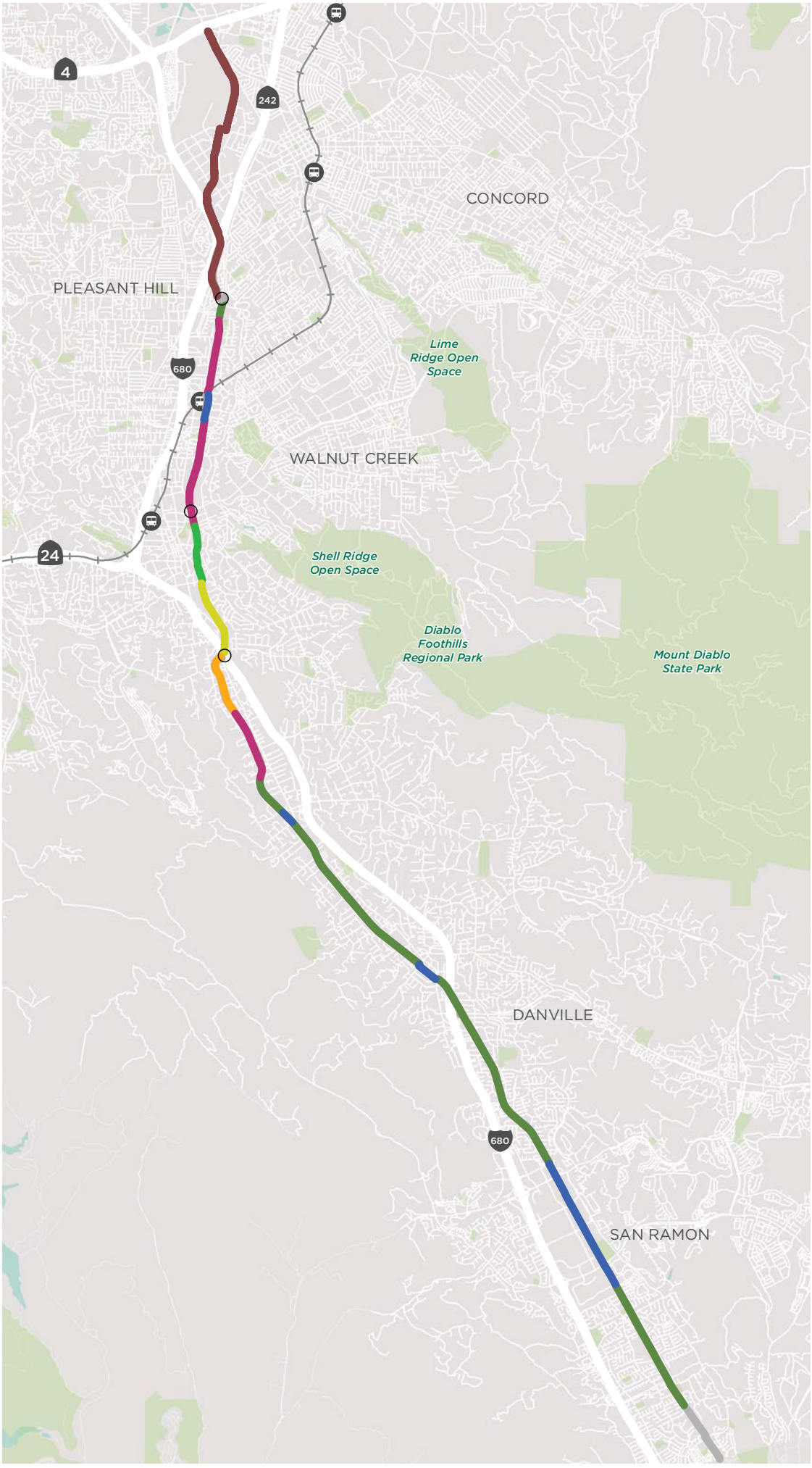
For just under a mile in south Walnut Creek, South Broadway and the adjacent soundwall narrow the trail corridor width to approximately 20 feet.



CONSTRAINED: CHANNELIZED CREEK

The trail corridor is approximately 25 feet wide adjacent to the channelized creek between Newell Avenue and Ygnacio Valley Road in Walnut Creek (0.7 miles).

Map 8 **Corridor Conditions**



Corridor Conditions

- **Very Wide**
- **Wide:** Trail on Creek Bank
- **Wide:** Rasied Rail Bed
- **Narrow:** Adjacent Topography
- **Narrow:** Adjacent Commercial
- **Constrained:** Limited Right of Way
- **Constrained:** Channelized Creek

Iron Horse Trail

BART Station

Park

0 1 2 MILES

Utilities

There are a number of utilities that are located within and adjacent to the Iron Horse Trail corridor. These include both overhead power lines as well as underground utilities. Primary utility easements along the corridor are highlighted below.

- A 10 to 36-foot Contra Costa County Sanitary District easement traverses the majority of the corridor.
- A 10-foot gas pipeline easement, granted to SFPP/Kinder-Morgan, runs along the majority of the corridor.
- Intermittent PG&E easements for underground vault access or overhead power lines are present throughout the corridor.
- Sporadic storm drain easements perpendicular to the trail and East Bay Municipal Utilities District water lines are present within the corridor.

Map 9 shows example locations of the types and sizes of utilities that exist within the Iron Horse Trail corridor ROW. Available survey provides boundary information for the utilities south of Monument Boulevard, but does not provide information regarding depth. Confirmation of the depth of existing utilities requires further study.

Recommendations outlined in this Study are considered feasible based on the current understanding of the location of utilities within the corridor. Potential shallow utility conflicts could be mitigated by trail improvements built on fill to minimize excavation.

Map 9 **Utilities**

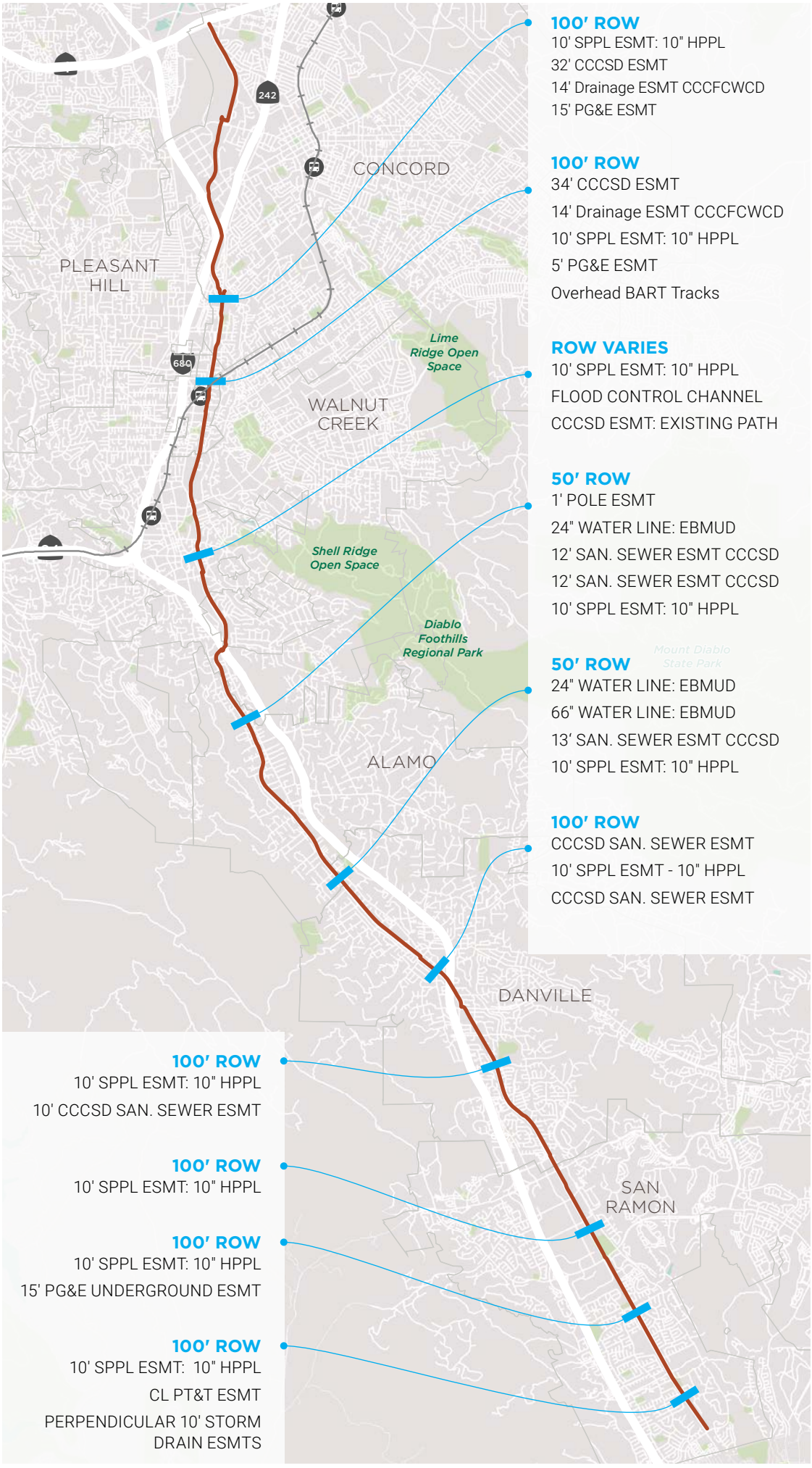
Notes: *Only utilities within the ROW are listed on this map*

The utilities are listed from east side of ROW to west side of ROW line

Iron Horse Trail

BART Station

Park



100′ ROW
10' SPPL ESMT: 10" HPPL
32' CCCSD ESMT
14' Drainage ESMT CCCFCWCD
15' PG&E ESMT

100′ ROW
34' CCCSD ESMT
14' Drainage ESMT CCCFCWCD
10' SPPL ESMT: 10" HPPL
5' PG&E ESMT
Overhead BART Tracks

ROW VARIES
10' SPPL ESMT: 10" HPPL
FLOOD CONTROL CHANNEL
CCCSD ESMT: EXISTING PATH

50′ ROW
1' POLE ESMT
24" WATER LINE: EBMUD
12' SAN. SEWER ESMT CCCSD
12' SAN. SEWER ESMT CCCSD
10' SPPL ESMT: 10" HPPL

50′ ROW
24" WATER LINE: EBMUD
66" WATER LINE: EBMUD
13′ SAN. SEWER ESMT CCCSD
10' SPPL ESMT: 10" HPPL

100′ ROW
CCCSD SAN. SEWER ESMT
10' SPPL ESMT - 10" HPPL
CCCSD SAN. SEWER ESMT

100′ ROW
10' SPPL ESMT: 10" HPPL
10' CCCSD SAN. SEWER ESMT

100′ ROW
10' SPPL ESMT: 10" HPPL

100′ ROW
10' SPPL ESMT: 10" HPPL
15' PG&E UNDERGROUND ESMT

100′ ROW
10' SPPL ESMT: 10" HPPL
CL PT&T ESMT
PERPENDICULAR 10' STORM DRAIN ESMTS

0 1 2 MILES

WHAT DOES THE COMMUNITY WANT?

Community-Identified Needs

Community feedback was received throughout the majority of the corridor. In order to identify the areas along the corridor that the community felt most strongly needed improvements, comments were summarized by number of comments/likes, type, and location and organized by segment. The segments were then ranked based on the following criteria:

Less Concerned: had comments spread throughout the area, without a particular theme or trend.

Somewhat Concerned: had similar trends of comments with lower repetition.

Most Concerned: had a high frequency and repetition of comments noting where there are deficiencies along the trail, such as noting unsafe or difficult intersections to navigate.

While community-identified needs were summarized based on both in-person and online engagement results, Map 10 highlights the comments received through the interactive webmap described in Chapter 1.

Some themes that emerged include:

PROVIDE USER SEPARATION ALONG THE TRAIL

"This area provides a huge safety concern especially for the many school age children that use these access routes to go to and from numerous schools in the area"

INCREASE THE NUMBER OF ACCESS POINTS

"There is no easy access from the large park and ride and the trail. This limits people from driving part way and then using the trail either walking or biking to their destination"

PRIORITIZE TRAIL USERS AT ROAD CROSSINGS

"[Traffic] lights definitely favor cars; long, long wait times at some times of the day for lights to allow pedestrians/ cyclists to cross. Tempts people to cross against the lights rather than wait"

"There needs to be a foot bridge over Monument Blvd. Not only is this intersection dangerous, but it also impedes the flow of traffic"

ADD AMENITIES SUCH AS LIGHTING, SHADE, AND BIKE STATIONS

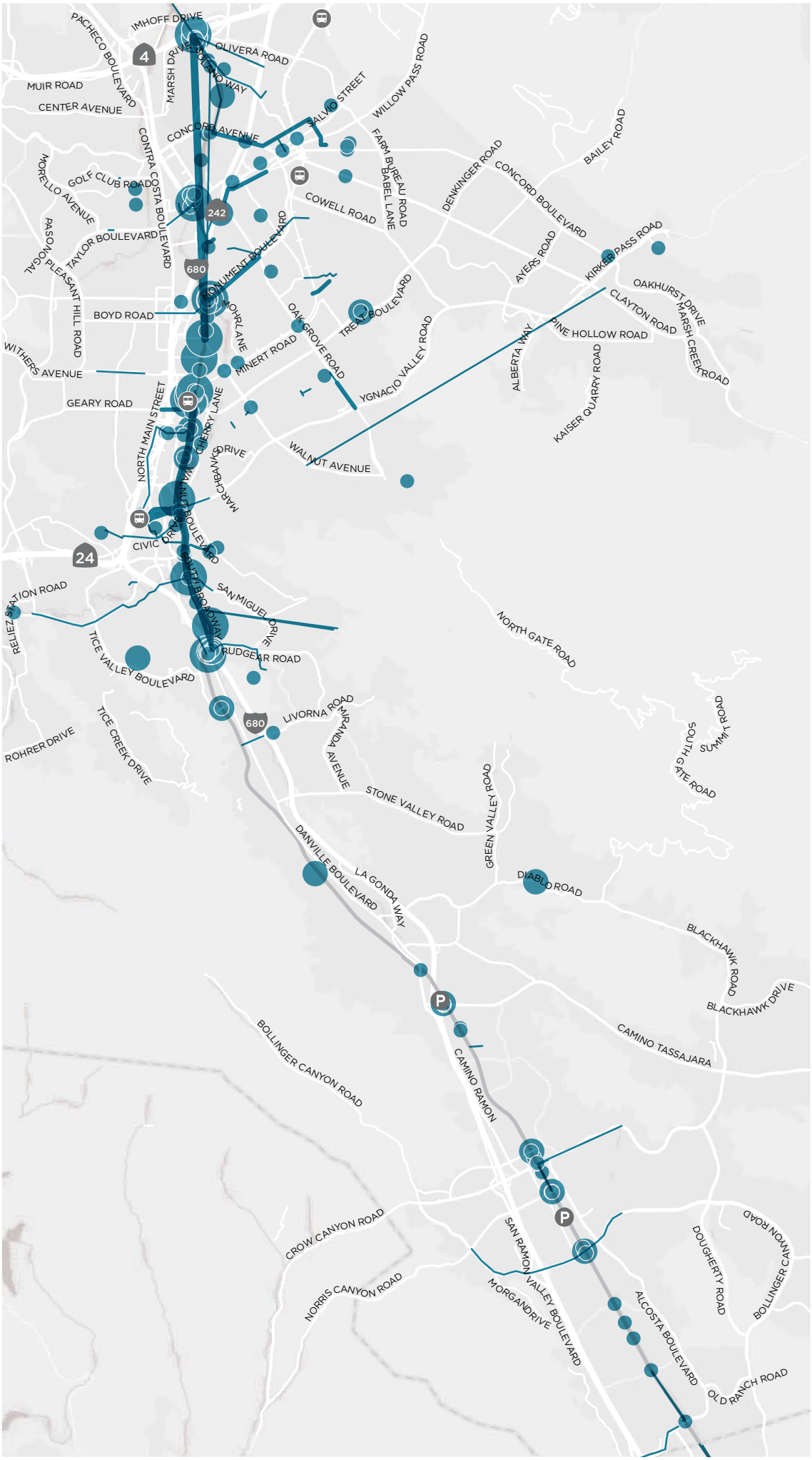
"This section of the trail is a very long and dark corridor confined by a concrete wall fence along the canal. Add lighting to deter people from loitering and show trail users what they are walking into. Murals along the block wall and the back of Safeway could help activate this sad looking area"

"Need better wayfinding signs that are easy to read at a distance or while riding a bike"

IMPROVE BICYCLE AND WALKING CONNECTIONS TO THE TRAIL

"I have two young children and we need a safer route to get to the trails for the bike rides we often take to enjoy the local parks and restaurants located near the trail"

Map 10 **Public Input Web Map Results**



Input on Destinations, Barriers, Routes, and Trail Improvements

- 1 - 5
- 6 - 10
- 11 - 25
- 1 Comment
- 2 - 4 Comments
- 5 - 9 Comments
- BART Station
- Park & Ride
- Iron Horse Trail

0 1 2 MILES

Table 6 **Needs Summary**

DESCRIPTION					USER DEMAND
#	Segment	Start/End	Length (Miles)	Land Use	Estimated Daily Trip Demand
1	**Concord**	From Marsh Dr to Willow Pass Rd	2.50		
2	**Concord**	Willow Pass Rd through Monument Blvd	1.50		
3	**Pleasant Hill/CCC**	From Monument Blvd to Las Juntas Way	1.80		
4	**Pleasant Hill/CCC**	Las Juntas Way through Jones Rd	0.40		
5	**Pleasant Hill/CCC**	From Jones Rd through Walden Rd	0.50		
6	**Walnut Creek**	From Walden Rd to Ygnacio Valley Rd	0.75		
7	**Walnut Creek**	Ygnacio Valley Rd through Danville Blvd	1.50		
8	**Alamo**	From Danville Blvd to Stone Valley Rd	2.40		
9	**Alamo**	Stone Valley Rd to South Ave	0.50		
10	**Alamo**	South Ave through Wayne Ave	1.00		
11	**Danville**	Wayne Ave through Love Lane	1.00		
12	**Danville**	From Love Lane through San Ramon Valley Blvd	0.70		
13	**Danville**	From San Ramon Valley Blvd through Fostoria Way	3.00		
14	**San Ramon**	From Fostoria Way to Montevideo Dr	2.40		
15	**San Ramon**	Montevideo Dr through Alcosta	1.90		

LEGEND

Land Use

RESIDENTIAL · PARK CREEK · COMMERCIAL MAIN STREET · CIVIC SCHOOLS · TRANSIT HIGHWAY · BUSINESS PARK INDUSTRIAL

ACCESS NEEDS	CONNECTIONS			INTERSECTIONS		CONSTRAINTS / BARRIERS		COMMUNITY FEEDBACK
Trip Destination	Regional Connections	Existing Bikeways	Planned Bikeways	Trail Convenience	Intersection Safety	ROW Width	Physical Constraints	Public Perception
●	●	●	◪	○	○	Very wide	Major	●
○	◪	●	◪	◪	●	Very wide	Major	◪
◪	◪	●	◪	◪		Very wide	Major	◪
●	◪	◪	○	○	●	Wide	Minor	○
◪	●	◪	●	○	○	Very wide	Un-constrained	◪
●	○	●	◪	○	○	Very wide	Minor	◪
●	●	◪	○	●	●	Constrained	Major	●
◪	◪	●	●	●	○	Wide	Minor	◪
●	◪	●	●	◪	○	Narrow	Minor	◪
○	◪	●	●	◪	◪	Narrow	Minor	◪
◪	◪	●	●	○	○	Narrow	Minor	◪
●	◪	◪	●	●	○	Constrained	Major	◪
●	◪	◪	○	●	◪	Very wide	Minor	◪
●	●	●	●	●	○	Wide	Minor	●
◪	●	◪	●	●	○	Very wide	Minor	◪

Need

○ → ◪ → ●

INCREASING NEED

Demand

INCREASING DEMAND →

03 What Does the Future of the Iron Horse Trail Look Like?

There are a number of design tools that can be used to improve the physical characteristics of the trail which increase user safety and comfort while also improving connectivity and access.

These proposed design tools take into consideration ways in which the quality of the trail experience can be enhanced for existing users, as well as the way in which new users, especially those using some of the new micromobility modes, might interface with the trail.

To address the user comfort, connectivity, and access needs described in the previous chapter, potential trail improvements were categorized into three main types:

- Trail corridor improvements,
- Intersection improvements, and
- Access enhancements.

All three main types of trail improvements are impacted and informed by trail users and demand. These factors are described on the following pages.

There are a variety of ways to implement each type of improvement, and the appropriate design tools depend on the context of the segment, intersection, or access point in question. Examples of potential interventions are included in the following pages, which highlight best practices and design precedents utilized for other successful trails.

Implementing some of the design tools outlined in this chapter will help ensure the trail is designed so that it can accommodate all potential user groups—from those who use the trail today to future modes that may not yet exist.

Users & Demand

Current Trail Users

The current Iron Horse Trail is designed for users of all ages and abilities. Existing trail users include people walking, people running, people rolling (riding skateboards, rollerblading, and rollerskating), and people bicycling. Additional existing user groups of the trail include people using electric bicycles, people riding horses, and people with disabilities. These users and their needs are outlined in Table 7.

PEOPLE USING ELECTRIC BICYCLES

Electric bicycles, commonly referred to as e-bikes, are a relatively new, but increasingly important mode of sustainable transportation. E-bikes benefit people who are interested in bicycling but may be limited because of physical fitness, age, disability, or because their trips are too far or the terrain too difficult to be completed by a regular bicycle. E-bikes resemble regular bicycles, but incorporate an electric motor to assist users while pedaling. E-bikes enable users to make trips that are 22% longer than trips using regular bicycles.

As of March 3, 2019, Class 1 e-bikes with a speed limit of 20 mph that must be pedaled to operate, and Class 2 e-bikes with a speed limit of 20 mph that can be operated by using a throttle are allowed on select trails managed by the East Bay Regional Parks District (EBRPD), including the Iron Horse Trail.

PEOPLE RIDING HORSES

Equestrians travel along the corridor, typically along the land adjacent to the paved trail. Equestrians are required to clean up after their horses on paved trails.

PEOPLE WITH DISABILITIES

The term "people with disabilities" includes individuals with physical or cognitive impairment, as well as those with hearing or visual limitations. According to the Centers for Disease Control and Prevention (CDC), in 2016, one out of every four Americans had a disability that limits their mobility.

Additionally, nearly everyone will experience a disability at some point in their life, whether through injury, aging, or other circumstances. Trails that are physically separated from motor vehicle traffic, such as the Iron Horse Trail, provide a safe and comfortable place for people with disabilities to enjoy.

Potential Trail Users

PEOPLE USING MICROMOBILITY DEVICES

Micromobility devices such as e-scooters and dockless bikes and e-bikes can offer an efficient commute mode for trail users, and are popular rental options in areas with dense employment or residential centers. Micromobility devices can also be used for the first-last mile trip to and from transit stations. Maximum speeds typically range from 15-20 mph and maximum travel distances typically range from 15-40 miles. Implementing shared mobility options for the Iron Horse Trail will be most effective if they are also implemented in adjacent communities. Creating a regional e-bike/e-scooter share system will ensure that micromobility devices can provide a seamless connection between the trail and surrounding communities.

Table 7 **Trail users, abilities, and needs**

	User Type	Speed of Travel	Path Needs
	**WALKERS**	1 to 3 mph	• Need wider areas for traveling in groups or walking dogs. • Comfortable on sidewalks and paths that are grade separated from vehicles and fast active users.
	**RUNNERS**	5 to 9 mph	• Prefer off-street paths with consistent lighting. • Fast runners may prefer to share space with cyclists during periods of high pedestrian traffic.
	**WHEELCHAIR USERS**	1 to 3 mph (non-motorized) 3-5 mph (motorized)	• Comfortable on sidewalks and paths that are grade separated from vehicles and fast cyclists.
	**EQUESTRIANS**	3 to 8 mph (trot)	• Prefer a soft surface tread separated from people riding bicycles. • Comfortable along open space areas along the Iron Horse Trail Corridor.
	**CASUAL AND NEW CYCLISTS**	6 to 12 mph	• Prefer riding on off-street facilities. • Compared to experienced cyclists, casual cyclists are more likely to utilize rest areas.
	**EXPERIENCED CYCLISTS**	12 to 25 mph	• Very experienced cyclists may choose to use roadways over paths. • Most prefer fewer crossings, separated paths, and room to pass slower cyclists.
	**E-BIKE USERS**	16 to 20 mph	• Class I and II allowed on IHT. Electric Tricycles; Electric Cargo Bikes; and Pedal-less E-bikes • Most prefer fewer crossings, separated paths, and room to pass slower cyclists. • Opportunities for shared mobility docking stations with charging stations.
	**E-SCOOTER USERS**	Up to 20 mph	• Stand-up and seated versions, e-skateboards, hoverboards, balance board • Access to on-street corrals, racks in the furnishing zones, shared mobility parking zones

ANTICIPATING CHANGES IN TRANSPORTATION TECHNOLOGY AND SERVICES

Technology is quickly changing the way people travel. Mobile devices are making it easier to check transit status in real-time, call a ride sharing service, or access a bike share system. They will also create opportunities to integrate modes, making it easier to use more than one mode to complete a trip. Additionally, shared autonomous vehicles (SAVs) vehicles may soon be a regular part of travel options for individuals and transit services. New technologies could be used to expand travel options and reduce vehicle trips in the surrounding communities by utilizing the Iron Horse Trail Corridor.

Trail Configuration Based on User Demand

In order to properly plan for and serve different trail users, it is important to first understand potential user demand and expected use of the trail. Understanding potential user demand can guide design decisions about trail width and the potential separation of users on the trail. For example, segments of the trail that have particularly high user demand may require a wider, user separated facility than segments with lower demand in order to provide a high level of service and comfort for trail users of all ages and abilities.

Measuring the Level of Service (LOS) of a trail can be done by using the Federal Highway Administration's Shared-Use Path Level of Service (SUPLOS) Calculator, which analyzes the interplay between trail width and user demand. The tool enables planners and designers to understand the current level of service of a trail given its current use, as well as its ability to serve users in the future if user demand were to increase. With the SUPLOS model, if the expected user demand of a trail is to increase, the trail width must increase in order to provide the same level of service for trail users. Separating users on the trail will always provide a higher level of service, and is considered to be an appropriate design option for areas with high demand.

The FHWA SUPLOS Calculator is scored on a scale of A-F, with A being considered "Excellent" and F "Failing". An "A" score indicates that the trail provides a high quality user experience, has optimum conditions for individual bicyclists, and retains enough space to accommodate more users of all modes. An "F" score signals that the trail provides a poor user experience for trail users and has frequent and significant user conflicts.

A second tool that can be used to understand trail width, user demand, and user comfort is the Level of Comfort (LOC) tool. This tool utilizes LOS as a weighted factor, but includes other additional factors that impact user comfort such as solar index, slopes, vehicle stress, context & views, and perceived crime risk. While the results of the tool still show that a wider trail will provide a higher level of service and comfort for trail users, it provides a way to improve user comfort in the event that existing corridor conditions or cost limits preclude the trail from being as wide as it should be to achieve high LOS.

Both the LOS and LOC tools can be used to develop different trail widths and configurations that serve different users. Figure 1 shows how trail width and configurations transition when expected demand and the presence of different user groups with more variable speeds change. For example, as a trail starts to see higher volumes of users, a wider trail with separated paths for people rolling and people walking is necessary to maintain an optimal LOS score. Figure 1 also shows howtrail design needs change with the introduction of Neighborhood Electric Vehicles (NEV), which is not currently a projected user type of the Iron Horse Trail.

The existing Iron Horse Trail is a 10-foot-wide shared-use trail. Widening the trail and separating users based on speed, user type, or experience will allow the trail to accommodate a greater number of users, as well as users who are traveling at higher speeds such as those on electric bikes and electric scooters.

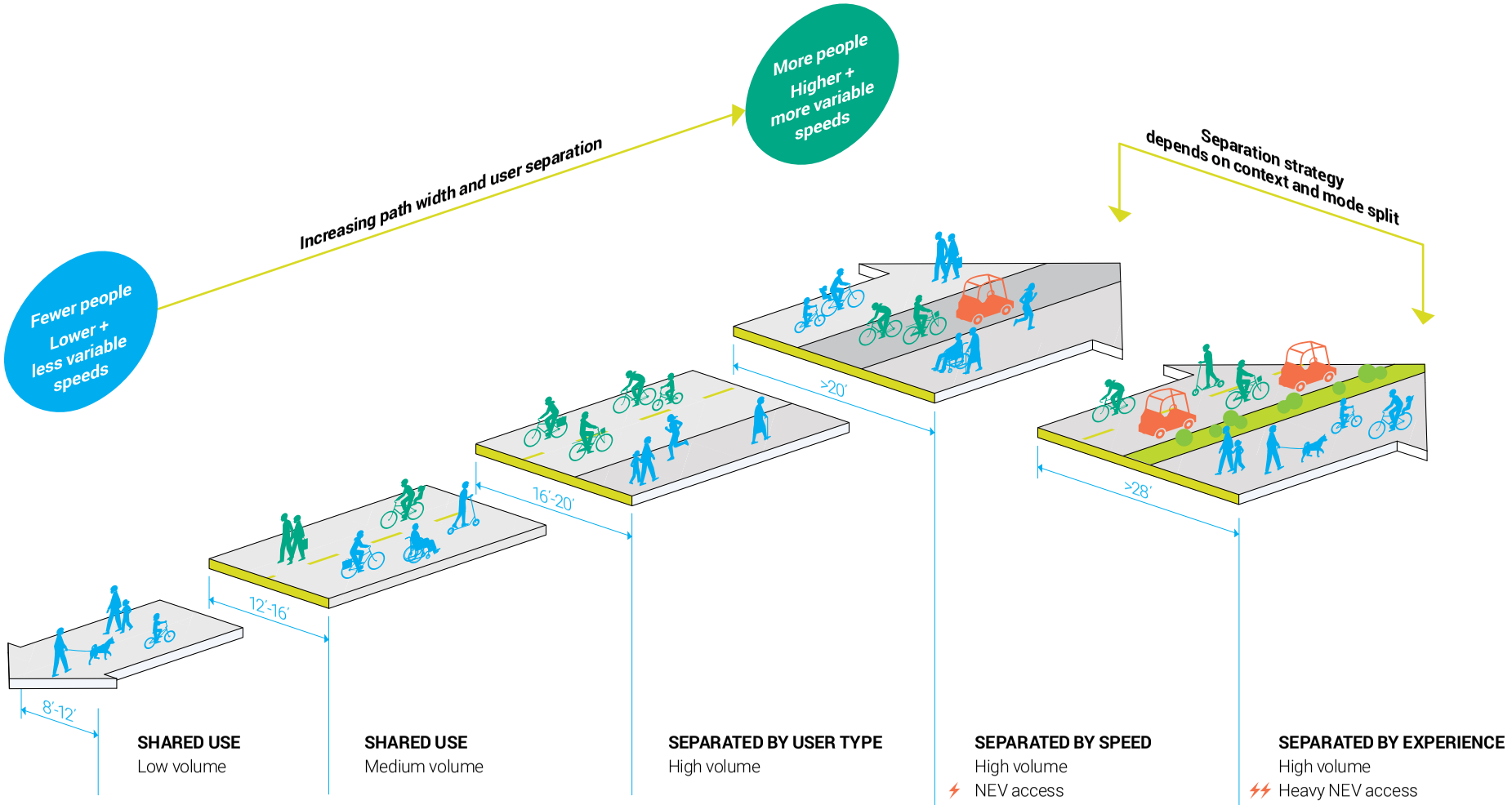


Figure 1 **Path Configurations**

ACCOMMODATE NEW TECHNOLOGIES

The Iron Horse Trail corridor has the potential to become a corridor for other emerging mobility modes such as SAVs. This new mode, though not yet commercial, could provide an alternative to worsening congestion patterns in the areas surrounding the Iron Horse Trail by providing a new dedicated motorized route along the corridor.

Shared Autonomous Vehicles (SAVs) Needs

There are a number of considerations and steps involved in introducing this technology-forward option to the Iron Horse Trail corridor:

1. **Establish a goal for the program.**

Would it be used to connect employees and employment centers to BART stations? Children to schools? Seniors or people with disabilities to key destinations and services? Having a clear goal for the SAV pilot program will help determine the appropriate route, find and allocate resources, and measure challenges and successes.

2. **Understand the policy, technical, infrastructure, and operational requirements of running a SAV program.**

   - **Policy:** Federal and state regulations and requirements for SAV programs are constantly changing. It is important to coordinate with the National Highway Traffic Safety Administration (NHTSA), the California Public Utility Commission (CPUC), the California Department of Motor Vehicles (DMV), and the California Air Resources Board (CARB) to ensure the pilot program is adhering to all current requirements.

   - **Technical requirements** include the SAV itself (vehicle, hardware, and software); parking, covered storage, and charging station; fleet automation platform and apps; Mobility on Demand (MOD) application; and a Computational Aided Dispatch (CAD)/ Automated Vehicle Location (AVL) systems.
   - **Infrastructure requirements** include trail widening, installation of fiber, intersection/signal improvements, striping and signage, and Dedicated Short Range Communication (DSRC).
   - **Operational considerations** include the testing of the program, agency coordination, staff needs, and stakeholder partnerships.

Regional Examples

Two SAV pilot programs in the Contra Costa region have been tested to date. The first of these programs was a two-year study (2017-2019) by the Contra Costa Transportation Authority (CCTA) of low-speed, electric and autonomous EZ10 shuttles manufactured by EasyMile. The CCTA's SAV Program operated two generations of the EZ10 shuttles, and Phase 1 of the study piloted the SAVs at the GoMentum Station, an Autonomous Vehicle Proving Grounds in Concord. Phase 2 of the study operated the vehicles at the Bishop Ranch Business Park in San Ramon. CCTA continues to test at Bishop Ranch. CCTA was also recently awarded federal grant funds to implement an Automated Driving

Map 11 **Potential SAV Corridor**

System Demonstration Program (ADS) in Rossmoor, Martinez, and along the I-680 corridor.

The second pilot program will be deployed by the Livermore Amador Valley Transit Agency (LAVTA) to study the viability of SAVs as a first and last mile solution to connect local residents to the Dublin/Pleasanton Bay Area Rapid Transit (BART) station.

Considerations for the Iron Horse Trail

SAVs could serve as a way to provide first/last mile connections to fixed-route transit, improve mobility options for people along the corridor, and reduce vehicle miles traveled (VMT) and greenhouse gas (GHG) emissions. However, because it is such a new technology, there are current limitations that must be considered.

First, it is important to consider how integrating SAVs would change the existing culture and identity of the corridor. Community outreach is recommended to help identify community goals and concerns.

Second, to date, SAVs have not been tested in a naturalized environment such as the Iron Horse Trail, and could face challenges when first implemented along the corridor. Objects in their path, including other modes, are seen as a perceived obstacle and require the SAV to stop, which would increase travel time and reduce efficiency. As the technology stands today, SAVs would require a dedicated lane to travel in.

Map 11 shows the segments along the Iron Horse Corridor that could be candidates for a pilot program. These segments connect to BART as well as employment hubs. They also have available ROW for a dedicated SAV path. Improvements to intersections would be required.

See Appendix C for more information on SAVs.

Trail Corridor

NEEDS & OPPORTUNITIES:

Trail corridor improvements greatly enhance safety, mobility, user experience, and project synergy. Wider trails with separated spaces for different user groups can make the trail feel safer and more efficient. User separated trails can accommodate increased demand and emerging technologies such as e-bikes and e-scooters, and support this Study's vision of creating a mobility spine for the region. Elements such as trail approaches to intersections, material changes, striping, and consistent lighting improve safety and user experience.

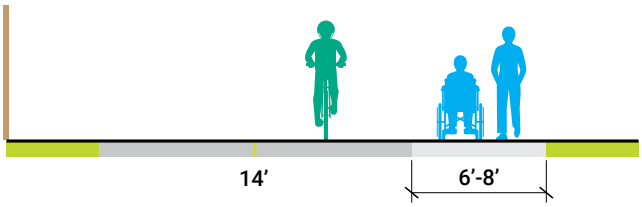
DESIGN TOOLS:

- Trail Cross-Sections
- Trail Approaches
- Cantilevered Trail
- Transitions and Mixing Zones
- Green Infrastructure and Shade Trees
- Lighting

Trail Cross-Sections

Separating users along the Iron Horse Trail could be implemented by using a range of design interventions. The trail could be separated by user, speed, or experience, enabling users of all ages and abilities to comfortably travel along the trail with minimal user conflicts.

Design interventions that could be used to develop user separated facilities include signage, painting and striping, and surface material that can help inform users of the best area to travel for their speed or experience. Widening the path can also serve a similar purpose, providing more space for fast user groups to pass slower or recreational users.

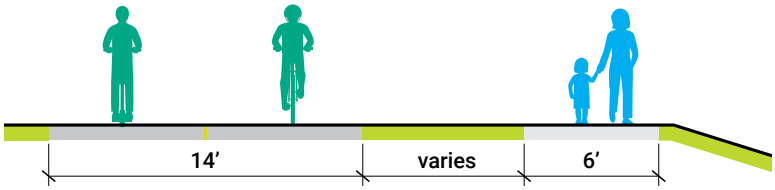


SEPARATED BY USER

Creating space for people rolling and people walking can be accomplished through signs, paint, and surface material. These treatments will help inform users of the best place to travel.

Applicable to:

- Physically constrained sections
- **Activity Centers / Adjacent to Commercial**

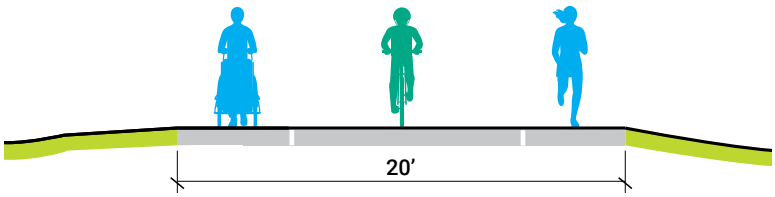


SEPARATED BY EXPERIENCE

Parallel paths provide different user experiences creating a fast and active path and a complementary passive and leisurely path.

Applicable to:

- Areas with demands for multiple user types and minimally constrained rights-of-way
- **Activity Centers + Parks & Housing Segments**



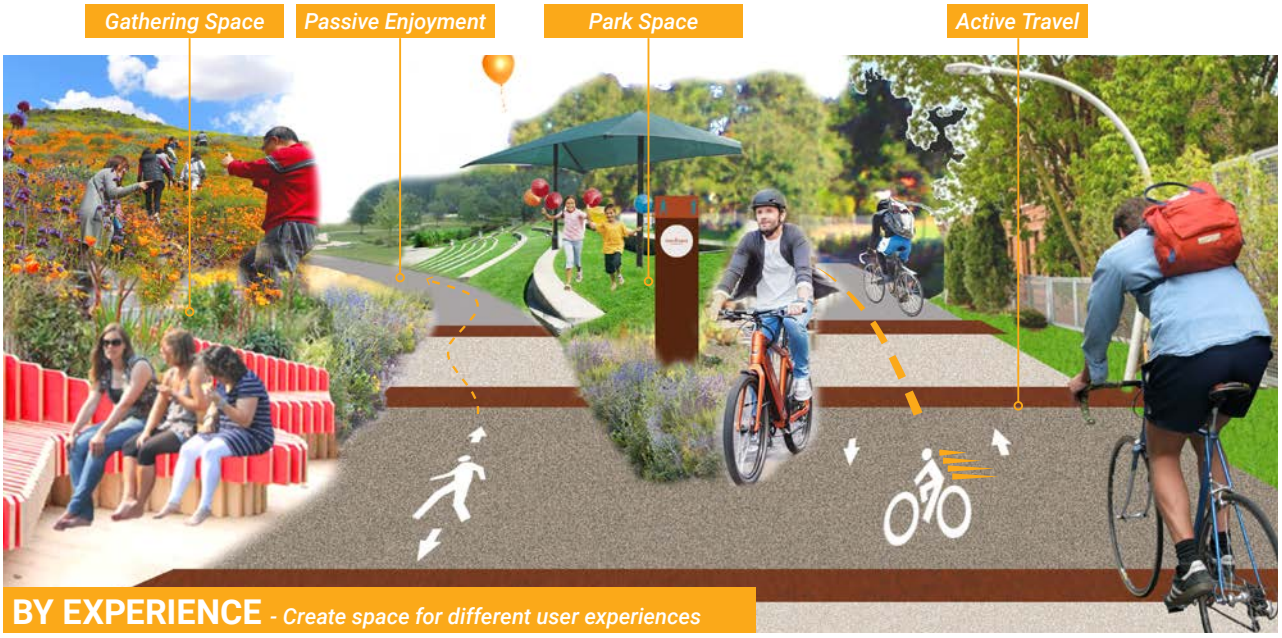
SEPARATED BY SPEED

The goal of this design option is to create space for people traveling at different speeds. User conflict can be reduced by providing space for safe passing (center) and relaxed travel (edges).

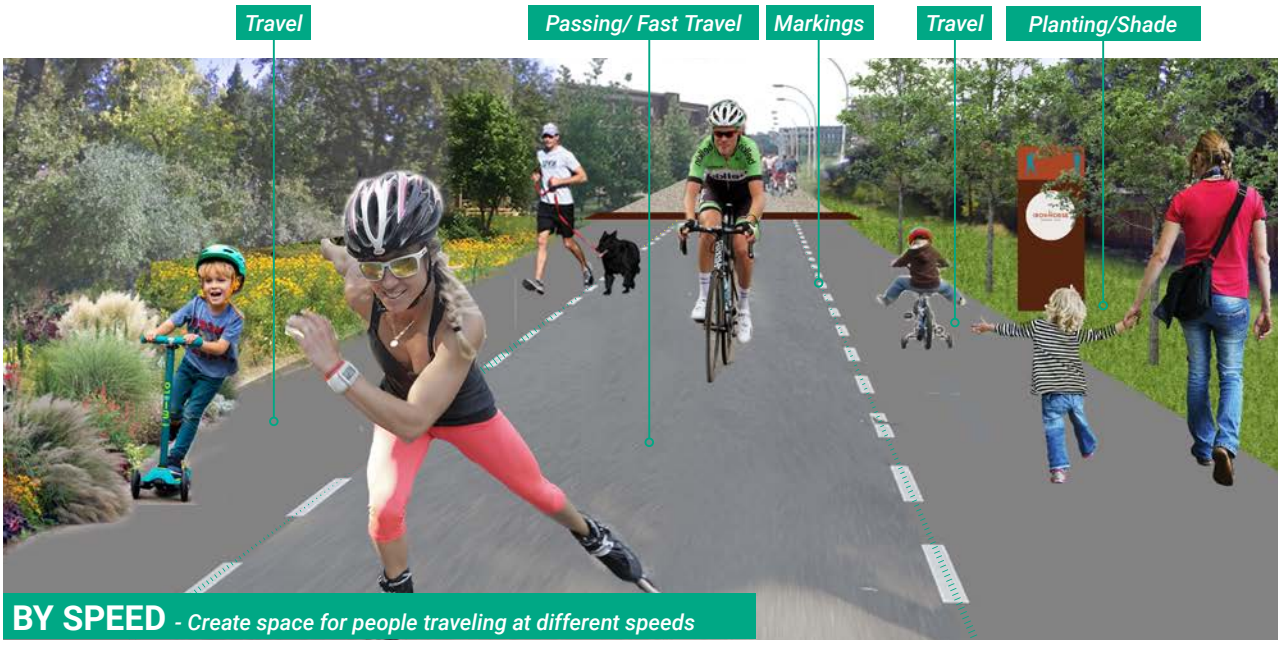
Applicable to:

- Areas with minimally constrained rights-of-way
- **Parks & Housing Segments**

BY USER - *Create space for people rolling and people walking*



BY EXPERIENCE - *Create space for different user experiences*



BY SPEED - *Create space for people traveling at different speeds*

Trail Approaches

The Iron Horse Trail intersects with roads, access points and other trails. As the trail approaches these areas design tools such as mixing zones, optical speed bars, a change in pavement materials, and lighting can warn trail users to slow down and expect a crossing. The figures on the following page provide examples of these treatments. Design tools at road intersections are described in the next section of this chapter.

TRAIL APPROACH AT ROAD CROSSING

Bollards are physical barriers designed to restrict motor vehicle access to a multi-use trail. Unfortunately, physical barriers are often ineffective at preventing access, and create obstacles to legitimate trail users. Alternative design strategies use signage, landscaping and curb cut design to reduce the likelihood of motor vehicle access.

Typical Application

• Bollards or other barriers should not be used unless there is a documented history of unauthorized intrusion by motor vehicles.

• If unauthorized use persists, assess whether the problems posed by unauthorized access exceed the risks and issues posed by bollards and other barriers.

Design Features

- At intersections, split the path tread into two sections separated by low landscaping.
- Vertical curb cuts should be used to discourage motor vehicle access.
- Low landscaping preserves visibility and emergency access.
- "No Motor Vehicles" signage (MUTCD R5-3) may be used to reinforce access rules.

TRAIL APPROACH AT ACCESS POINT

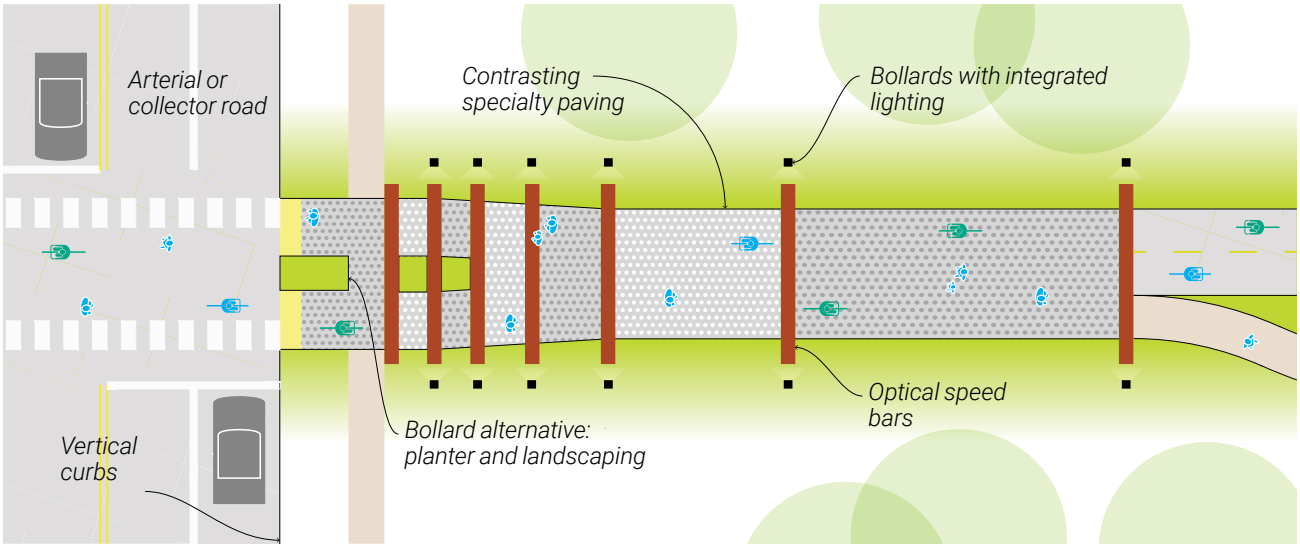
To improve visibility of access points along the Iron Horse Trail, design treatments could include mixing zones, optical speed bars and lighting.

TRAIL CROSSINGS / TRAIL ROUNDABOUTS

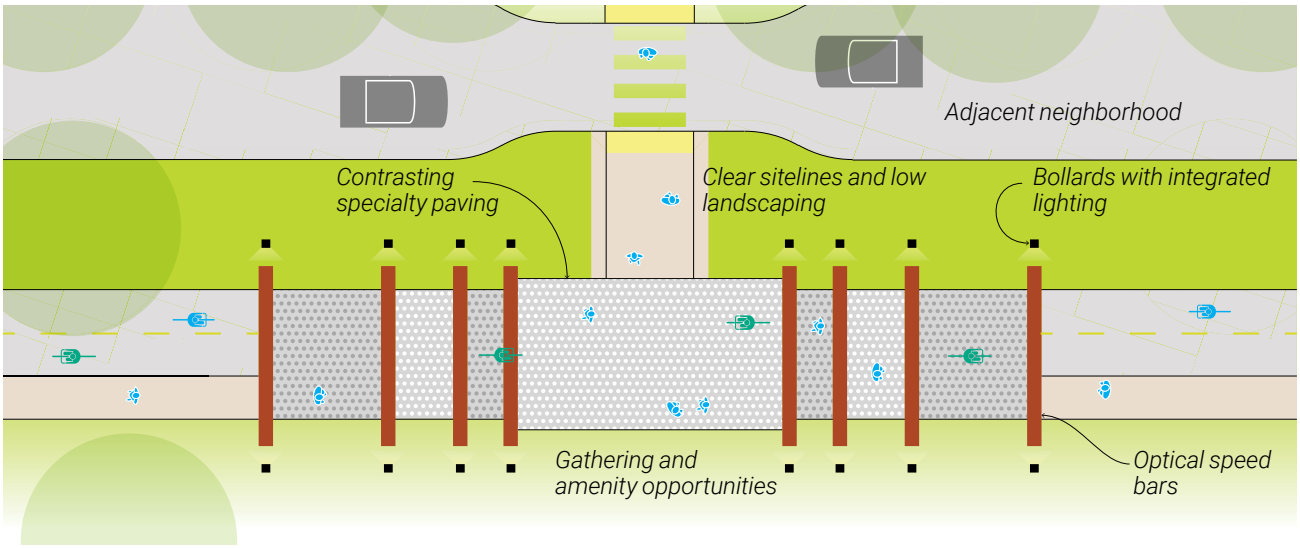
Special considerations should also be applied when the Iron Horse Trail intersects another trail. Mixing zone treatments could also be applied to the intersecting trail to warn both path users of the upcoming intersection. Bicycle roundabouts can also be applied at these crossings to minimize potential conflicts.

Bicycle roundabouts at trail intersections are used to counter safety concerns of mixing high-speed bicyclists with high volumes of pedestrians. Where space allows, a trail roundabout can minimize potential conflicts. Trail roundabout designs are based on conventional roundabout intersections, scaled to bicycle operating dimensions and speeds.

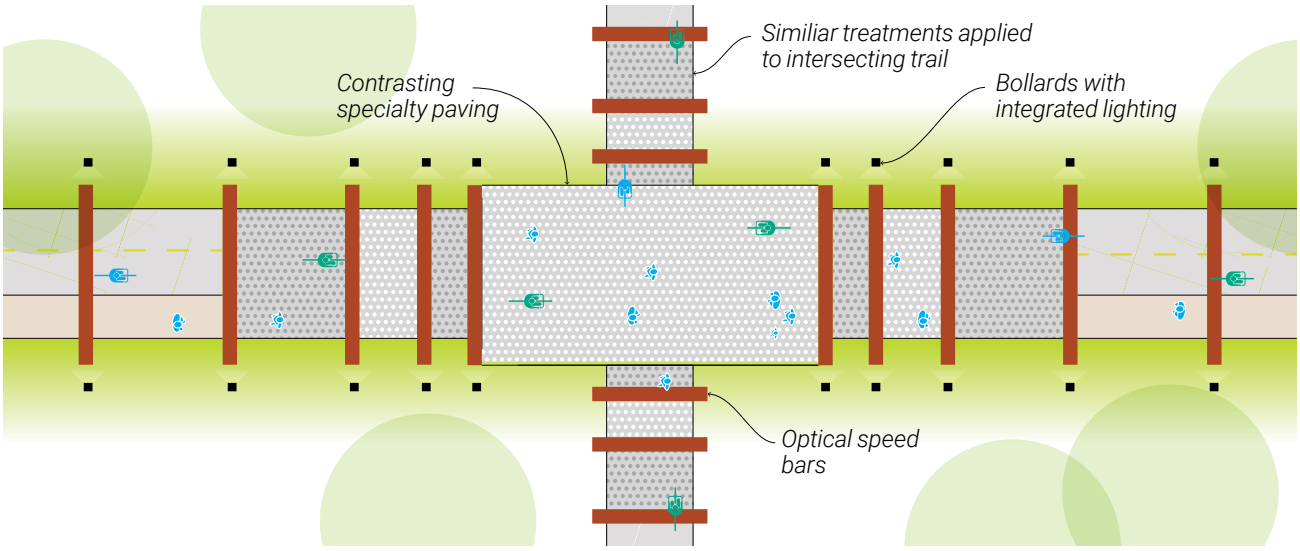
On separated use trails, user separation should be maintained and pedestrians should have crosswalks and sidewalk connections, similar to with a full-size roundabout.



Trail approach at road crossing



Trail approach at access point



Trail approach at trail crossing

Constrained Areas / Cantilevered Trail

In some locations, the Iron Horse Trail runs parallel to creek channels and the width is physically constrained by the built environment. In these areas, a cantilevered trail can be considered to meet the project vision and goals.

A cantilevered trail uses a structure that hangs over the top of the channel wall and is supported at the top-of-bank. It would have an anchored base at top-of-bank with a path superstructure that hangs over the edge of the river channel. It would be unsupported over the channel. This is a valuable approach where there is available space at top-of-bank, but less than the width needed for the desired trail width to meet future demand. The benefit of a cantilever is that it keeps the trail above the high water surface elevation, minimizing impacts to the flood control capacity and allowing the trail to be open year-round.

Transitions and Mixing Zones

Throughout the corridor there are locations that demand special attention and consideration. These include locations at the convergence of paths, where the trail transitions to a narrow bridge or at undercrossings, and at road crossings. In these locations, additional design features may be needed to create a safe and continuous trail.

MIXING ZONES

At the convergence of two or more paths, it is important to provide the user with advance warning of the changing conditions and guidance on how to move through the mixing zone. Mixing zones are locations where users will be required to interact cautiously through the space. The transition between the trail and the mixing zone where the advance warning is located may be between 50-100 feet long.

The design of mixing zones should clearly communicate yield priority, user positioning, and safe speeds. Interactions between users should be clearly managed with crosswalks, yield markings, and materials to indicate the degree of yielding or mixing expected of trail users.

OPTICAL SPEED BARS

Optical speed bars are pavement markings used to increase user awareness of an upcoming change to the physical environment and caution the user to decrease their speed. The speed bars are a series of white or colored rectangular pavement markings, 2 feet wide, placed inside both edges of the trail travel area. The markings are progressively spaced more closely together to visually narrow the lane and increase awareness of an upcoming change.

MATERIALS

Path materials may be used to indicate a change in operating conditions. Crossing areas, mixing zones, and tactile paving have all been used for this purpose. Thermoplastic rumble strips may be used in advance of transition areas or crosswalks. A change in paving materials, such as transitioning from asphalt to brick, can also warn users of an upcoming change. The use of different or contrasting materials can also differentiate use, such as constructing a soft surface pedestrian path and an asphalt bike path.

Pavement markings may include bicycle lane markings, high-visibility crosswalks, and colored concrete crosswalks. Other options include inlays or paving surface changes to signal critical areas.

Green Stormwater Infrastructure and Shade Trees

Green infrastructure treats and slows runoff from impervious surface areas such as roadways, sidewalks, and buildings. Sustainable stormwater strategies may include bioretention swales, rain gardens, tree box filters, and pervious pavements (pervious concrete, asphalt and pavers).

Bioswales are natural landscape elements that manage water runoff from a paved surface, reducing the risks of erosion or flooding of local streams and creeks, which can threaten natural habitats. Plants in the swale trap pollutants and silt from entering a river system.

Trees can be used to provide shade, manage runoff, reduce greenhouse gases, aid in carbon sequestration, and increase urban habitat.

Lighting

Trail lighting that is properly designed can improve visibility and natural surveillance, increase trail access and use, provide a sense of safety and security, and extend operating hours during shorter days. In addition, properly lit trails reduce bicycle and pedestrian collisions during night time hours.

Lighting along the Iron Horse Trail should be analyzed per segment context with full consideration for safety needs, wildlife habitat, trail function, cost benefit, and maintenance commitments. Street lighting can improve visibility of roadways at crossings and trails. Lighting may also be necessary for day-time use in underpasses.

Lighting can either be wired or solar. Wired lighting is recommended in areas except for those where utility connection is infeasible or when alternative energy sources are desired.

LIGHTING GUIDELINES

- Lighting should be at pedestrian scale. Placement, spacing, and other finish specifications depend on the fixture and optical needs/conditions.
- Lighting fixture types include bollard lights, pole mounted lights and integrated lighting (i.e. within architectural or wayfinding elements, planting beds, handrails, etc.)
- Lighting should minimize energy usage, operating costs, light trespass, light pollution and glare.
- Consider timers, sensors, and remote-control technology which can enhance the sense of security and conserve energy.
- Illuminate only the intended targeted areas and use cut-off fixtures that aim lights down instead of above or behind the fixture, which causes light pollution and trespass.
- Lighting should avoid trees and be placed outside of canopy edge.
- Consider Crime Prevention Through Environmental Design (CPTED) principles whenever lighting is introduced, such as color rendering, areas of concealment, and abstracted illumination.
- Use energy efficient lamps that comply with environmental guidelines, and that provide supreme color rendering, such as white lights.
- Solar powered lighting should be considered only where utility connection is not feasible or when alternative energy sources are desired. Daylight hours should be analyzed per season prior to specifying solar lighting.
- Avoid light fixtures at eye level that could cause glare and impair visibility.

SOLAR VS. CONVENTIONAL LIGHTING FIXTURES

BENEFITS OF SOLAR LIGHTING

+ **No electrical grid connection cost**
+ **Avoid trenching costs**
+ **Reduce site disruption and restoration**
+ **Faster installation**
+ **No power outages**
+ **Sustainable light**

CONSTRAINTS OF SOLAR LIGHTING

- Higher upfront investment
- Solar battery lifespan, need periodic replacement
- Indirect or variable sunlight conditions
- Limited aesthetic

BENEFITS OF CONVENTIONAL LIGHTING

+ **Higher level of dependability for safety lighting**
+ **Market availability/competitiveness; lower fixture cost**
+ **Wider range of fixture styles and finishes**
+ **Flexibility in color temperature**
+ **Lower maintenance cost**

CONSTRAINTS OF CONVENTIONAL LIGHTING

- Trenching requirement
- Availability of power source
- Operating cost

Intersections

NEEDS & OPPORTUNITIES:

Intersections that provide consistency, prioritize trail users, feature simple approaches with clear sight-lines, and encourage traffic calming can greatly improve both safety and mobility. Community members noted long wait times at signalized crossings and frequent stop signs along the Iron Horse Trail. Many suggested that trail intersections at roadways could benefit from design features that warn trail users of roadway traffic, and roadway traffic of trail users. Existing constrained and offset intersections make it challenging for bidirectional travel for all trail users, especially during heavy-use hours.

DESIGN TOOLS:

- Continuity of Crossings
- At-Grade Crossing Improvements by Road Classification
- Grade Separated Crossings

Continuity of Crossings

While the design of each intersection will vary based upon the particular context and right-of-way configuration, specific design treatments should optimize visibility, improve sight lines, and enhance user experience. The following items are recommended to improve the continuity of crossings along the Iron Horse Trail corridor:

1. Optical speedbars and standardized mixing zone design at each road crossing approach (see pages 42-43)
2. Improve sight lines and remove bollards at intersections, which may require realigning trail to provide a direct approach to the road crossing
3. Enhanced lighting and high visibility crosswalks

At-Grade Crossing Improvements

Individual jurisdictions along the corridor will prescribe the locally appropriate at-grade crossing treatments to increase awareness and visibility, reduce exposure and crossing distance, and calm traffic. The following examples are effective tools to improve at-grade crossings along the Iron Horse Trail.

REORIENT STOP SIGNS

Changing the priority of which mode stops when the trail crosses a local, low-volume road could improve convenience and comfort for trail users. This treatment could be appropriate where trail user volumes exceed traffic volumes. Traffic calming features such as raised crossings, curb extensions, or chicanes should be used in conjunction when reorienting stop signs that require vehicles to stop and trail users to yield to ensure clear sight lines and slow traffic speeds.

CROSSWALK WITH FLASHING BEACONS

Flashing beacons like Rectangular Rapid Flashing Beacons (RRFBs) and High-Intensity Activated Crosswalk (HAWK) beacons improve the visibility of marked crosswalks. Flashing lights and signage alert drivers of the upcoming crosswalk and provide greater visibility for pedestrians.

PASSIVE DETECTION AND SIGNAL ACTIVATION

Passive detection along the trail can help to shorten wait times for trail users when they approach a signalized crossing. Accessible push buttons offer trail users the opportunity to activate a signal to stop traffic thereby facilitating a safer crossing.

HIGH VISIBILITY MARKINGS

High visibility pavement markings improve driver awareness of crosswalk areas and the presence of trail users, making crossings safer.

PEDESTRIAN REFUGE ISLAND

Pedestrian refuge islands reduce the crossing distance of crosswalks by providing a dedicated space for pedestrians in the center of the roadway.

CURB EXTENSION

Curb extensions can be implemented at intersections to make crossings safer. Curb extensions visually and physically narrow the street, and can give trail users a better chance to see and be seen before crossing.

EXAMPLE APPLICATIONS BASED ON ROAD CLASSIFICATION

The road classification system—local, collector and arterial roadways—offers a convenient format for organizing potential improvements that take into consideration the differing roadway widths, travel speeds and vehicular travel utilization that often distinguishes the various road types. The table to the right provides a menu of potential design interventions.

LOCAL INTERSECTIONS

Intersections between the trail and local streets can include design improvements that enhance the comfort and safety for all users

Potential improvements include:

- Reorient stop signs
- Flashing beacons
- Raised crossing
- Median dividers
- Chicanes
- High visibility crosswalk
- Enhanced lighting
- Remove barriers and bollards

COLLECTOR INTERSECTIONS

The intersection of a collector street with the trail offers the opportunity for an enhanced collection of indicators that assist users in safely navigating through the intersection

Potential improvements include:

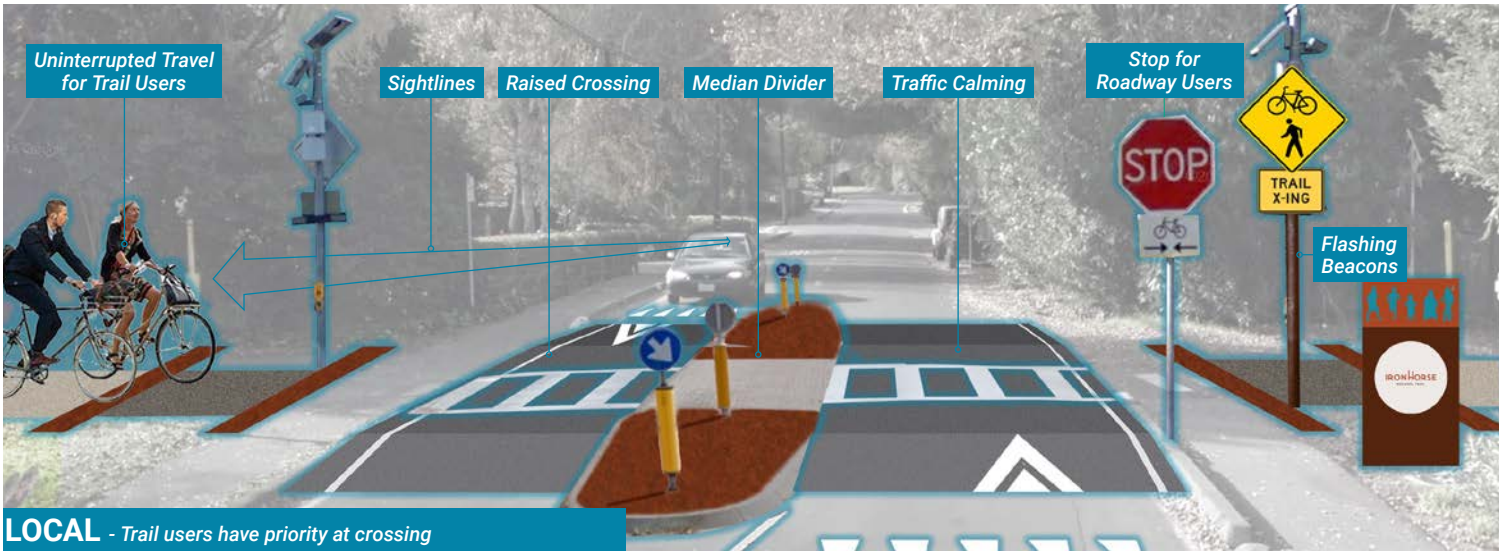
- Crosswalk beacon
- Flashing beacon
- Trail signal detection (passive and active)
- Pedestrian median island
- Curb extension
- High visibility crosswalk
- Enhanced lighting
- Remove barriers and bollards

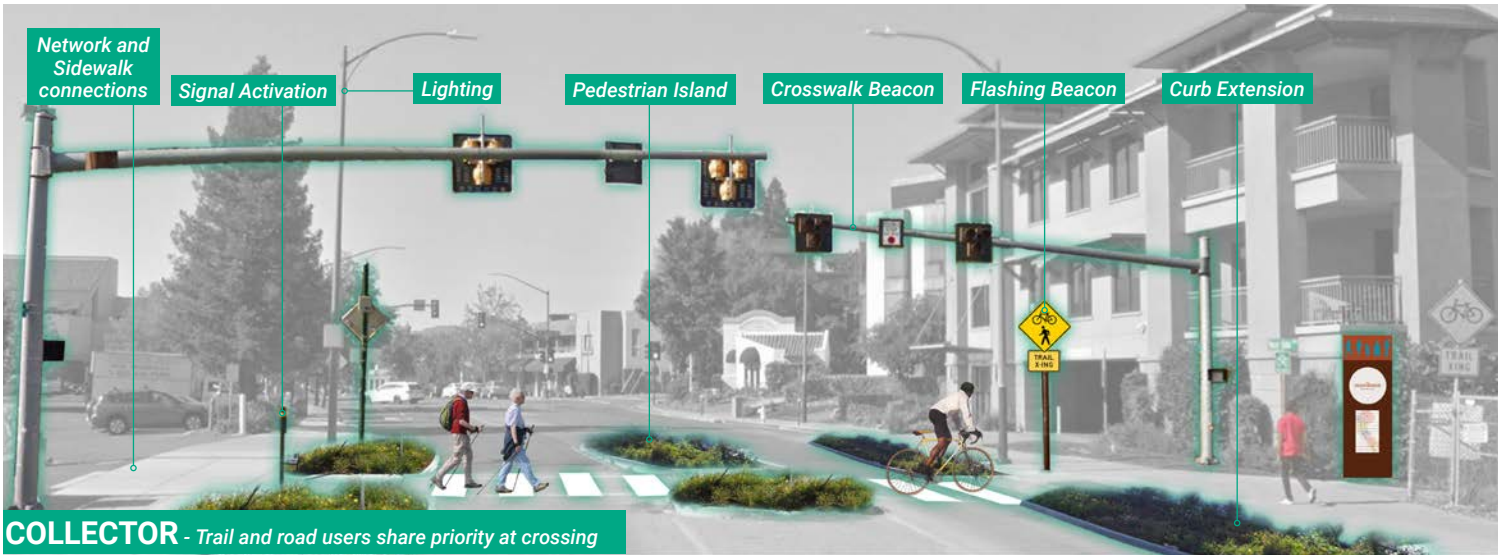
ARTERIAL INTERSECTIONS

An intersection between an arterial street and the trail can benefit from an expanded number of design interventions to ensure that vehicles and trail users alike understand how to safely proceed through the intersection

Potential improvements include:

- Grade separated crossing
- Crosswalk beacon
- Flashing beacon
- Trail signal detection (passive and active)
- Pedestrian median island
- Curb extension
- High visibility crosswalk
- Enhanced lighting
- Remove barriers and bollards


Uninterrupted Travel for Trail Users
Sightlines
Raised Crossing
Median Divider
Traffic Calming
Stop for Roadway Users
STOP
TRAIL X-ING
Flashing Beacons
LOCAL - Trail users have priority at crossing


Network and Sidewalk connections
Signal Activation
Lighting
Pedestrian Island
Crosswalk Beacon
Flashing Beacon
Curb Extension
COLLECTOR - Trail and road users share priority at crossing


Lighting
HighVis Markings
Pedestrian Island
Coordinated Signal
Curb Extension
Network and Sidewalk connections
Auto Priority
Direct path approach
Remove trail bollards for clear path
Direct path approach
ARTERIAL - Road users have priority at crossing

Grade Separated Crossings

Grade separated crossings that disconnect the trail from the roadway provide trail users with an enhanced safety and convenience experience.

BRIDGES

Bicycle/pedestrian bridges allow for trail continuity or access areas separated by barriers such as high volume roads and adjacent creeks. Overcrossings at road intersections along the Iron Horse Trail could improve existing crossings where the trail alignment requires users to cross multiple intersection legs, ADT exceeds 25,000 vehicles, and where 85th percentile speeds exceed 45 miles per hour. In addition, bridges could also provide new access to the trail for communities who are currently separated by a creek or other physical constraint.

Overcrossings require a minimum of 17 feet of vertical clearance over a roadway and typically fall under the Americans with Disabilities Act (ADA), which strictly limits ramp slopes to 5% (1:20) with landings at 400 foot intervals, or 8.33% (1:12) with landings every 30 feet. Average slope, elevation change, and wind level all impact user comfort while ascending a ramp. The average slope of a ramp impacts user comfort significantly more than ramp length. Therefore, providing slopes that are lower than 5% will provide a better user experience for all ages and abilities along the core route of the Iron Horse Trail.

Bridges offer an opportunity to create a focal point which enhances the trail experience and supports community identity. Modular design and innovative materials such as lightweight composites should be considered for overcrossings.

UNDERCROSSINGS

Undercrossings along the Iron Horse Trail provide grade-separated crossings from roads and freeways. Some undercrossings could be improved to provide additional vertical clearance (minimum 8 feet, preferred 12 feet) and width for future trail use.

Undercrossings should meet the following design objectives:

- **User feels invited to pass through.** Undercrossing should maximize available natural light and supplement with artificial lighting that is integrated into the overall design. Undercrossing should be well-maintained; clear of trash and other debris.
- **Undercrossing must avoid hiding places**, and discourage lingering and loitering. Implementing sound or other sensory elements to reduce user anxieties should be considered.
- **User is protected from harm.** Railing should be integrated into design and should be transparent to maximize visibility.

Access & Amenities

NEEDS & OPPORTUNITIES:

Access improvements increase connections to trails, existing and planned bikeways, and local and regional destinations. New and improved access points better integrate the Iron Horse Trail into the regional bike and pedestrian network, and provide direct access to key destinations such as schools and transit. Amenities such as art, seating, wayfinding, and linear parks make the trail more desirable and accessible to a broader range of users. Programming, trail-oriented development, and mobility hubs help to activate the trail and improve synergy with new technologies and land uses.

DESIGN TOOLS:

- New & Improved Access Points by Context
- Amenities
- Linear Parks
- Programming
- Trail Oriented Development
- Mobility Hubs
- Wayfinding & Branding

New and Improved Access Points by Context

Access improvements can make the trail more inviting to users by improving connections to the existing network and providing amenities. These improvements may vary depending on land use context. For example, amenities appropriate for an access point in a commercial area may differ from those recommended for a residential street. However, the design tools available to make improvements are consistent throughout.

Design tools that may be used to improve trail access points include amenities such as new wayfinding signage, seating, lighting, shade, landscaping, and public art. Some or all of these tools can be combined to create gathering spaces for community members, as well as spaces for events or other activities.

Additionally, design interventions can include removing existing barriers at existing or potential new access points, with the aim of increasing the number and quality of access points available to trail users.

ACCESS IN RESIDENTIAL AREAS

Residential access areas present small-scale opportunities to serve the surrounding neighborhood.

Potential improvements include:

- Increasing the number of neighborhood access points
- Removing both visual and physical barriers to existing access points
- Accommodating different user types & speeds
- Providing amenities such as: wayfinding, lighting, and seating

ACCESS AT OPEN SPACE AREAS

Opportunities for new or improved access are located in areas with minimally constrained rights-of-way or adjacent to parks.

Potential improvements include:

- New passive uses such as: art, community gardens, and seating
- New active recreational opportunities such as: fitness equipment, mountain bike pump track, bocce, etc.
- Upgrades to existing park landscape
- Provide amenities such as: restrooms, water, and shade

ACCESS AT COMMERCIAL AREAS

Commercial areas are great opportunities to activate trail access areas.

Potential improvements include:

- Flex space for temporary programming such as: food trucks, farmers markets, and concerts
- Reorient existing businesses & services to the trail (restaurants, bike shops, cafes)
- Support future trail oriented development
- Provide amenities such as: secure bike parking, tables & chairs, and bike share

RESIDENTIAL

OPEN SPACE

COMMERCIAL

Amenities

PUBLIC ART

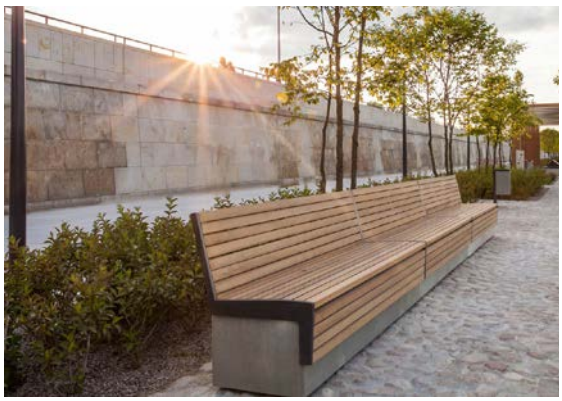
Public art installations and murals contribute to and enhance a community's identity and character, creating a strong "sense of place" branding. Public art provides visual cues that the facility is "owned" and cared for by the community. Art installations also can encourage play, function as interpretive aids, or serve as a trail's primary attraction. Long-term public art installations such as public pianos or other features can also attract users to the trail. From a CPTED perspective, the use of public art in the landscape is an effective 'target hardening' strategy. Public art has the potential to deter graffiti vandalism, define path edges, improve the appearance of the community, and discourage unwanted behaviors.

INTERPRETIVE ELEMENTS

Interpretive elements can enrich the trail with a "sense of place" and enrich the experience of the trail for locals and visitors to the area. Historical and ecological inspiration is abundant, and a creative educational approach that is tied into site amenities and placemaking will highlight the beauty, ecology, and rich history of the area. Potential themes for exploration include; history of Southern Pacific Railroad, native wildlife and plant communities, and health benefits of active transportation.

LANDSCAPE AT ACCESS POINTS

Landscape design can be used at access points to highlight gateways to the communities and neighborhoods along the Iron Horse Trail, and to create a sense of place. Based on the scale and context of the access point, the landscape design should be grounded in native and drought-tolerate plants and may range from minimal accent and buffer plantings to larger plantings with sizable canopy trees. The landscape may be used to provide shade, provide green infrastructure, provide local habitat, reduce urban heat island effect, and enhance aesthetics.



SITE FURNISHINGS

Site furniture helps to ensure comfort along the trail, providing places for people to pause and rest, and for activity and shared experiences.

Seating

Public seating contributes to the user experience by making walkways and open space an enjoyable place to rest, congregate, or contemplate. Seating opportunities along the trail provide a short relief and also promote an added enjoyment of the scenic environment. Tables and chairs could be provided at access points adjacent to commercial activities.

Drinking Fountains

Drinking fountains along the trail enable a greater diversity of users to utilize the trail for longer durations without risking dehydration. Fountains should be spaced at regular intervals that correspond with key gateways and landmarks. Locating fountains with multiple heights will help accommodate a range of user ages and physical abilities, as well as pets.

Trash and Recycling

Providing places to dispose of trash and recycling may help to encourage stewardship both of the trail and the open space corridor.

Bicycle Tools and Parking

Clearly delineated and secure places to lock bicycles should be placed at access points that provide connections to community destinations. Bicycle fix-it stations typically provide tools for minor repairs.

Electric Charging Stations

Charging stations for privately owned e-scooters and e-bikes can provide micromobility users with an additional amenity along the trail.

Linear Parks

Passive Parks

Parks and open space can provide opportunities for passive uses such as contemplation and reflection, passive enjoyment of the natural environment, and community gathering. Amenities such as seating, shade, art, and community gardens can help make the spaces more attractive for residents and visitors.

Active Parks

Active parks can provide new recreational opportunities for trail users, promoting physical activity for users of all ages and abilities. Amenities could include stationary fitness equipment, playground equipment, a mountain bike pump track, or a bocce ball court, among other possibilities. Programming such as yoga or dance classes can help activate the spaces.

Programming

A range of programming activities could be implemented at access points to serve the community and attract residents and visitors to the trail. These include active programming such as yoga, dance, or other fitness classes; children's programming such as organized playtime events and storytelling; and educational programming such as outdoor classrooms and community gardens. Additionally, access points could host bicycle education workshops for community members to improve comfort and safety on the trail.

Trail-Oriented Development

Trail-oriented development presents an opportunity for economic development and growth along the corridor. With the trail serving as an active mobility spine for the region, adjacent land uses could be designated for new housing and commercial centers that would not drastically increase the number of car trips in the area. Revenue generated by the new development could be invested back into the community or used for trail enhancements, operations, and maintenance.

Mobility Hubs

Mobility hubs are a collection of transportation-oriented elements that make it easier to access the shared and active mobility network. The key elements can be mixed and matched to create a mobility hub that is customized for each access point. Mobility hubs are places where different modes, such as walking, bicycling, transit, and shared mobility services such as bike share, scooter share, car share, and TNCs, come together to provide a suite of transportation options for people. Additionally, the potential to introduce shared autonomous vehicles (SAVs) in the future is also being considered at mobility hubs.

Some access points may provide an appropriate location for mobility hubs as places where the Iron Horse Trail provides a connection to community needs. Providing additional mobility services at strategic access points will increase the connectivity and mobility options of trail users, who may combine transit, active modes, and shared mobility options found at the mobility hubs to create seamless transportation connections throughout the region.

Mobility hubs support first–last mile solutions by providing multimodal transportation services and activities around transit stations to maximize connectivity and access for transit riders.

Along the Iron Horse Trail, there are strategic locations where mobility hubs would provide important connections to the surrounding network and destinations. By providing a robust set of transportation options at mobility hubs, the unique and complex mobility needs of trail users can be met, increasing the connectivity of the system and the destinations that can be reached by non single occupancy vehicles.

Amenities that may be found at a mobility hub include, but are not limited to:

- Adequate bus stop and layover zones
- Transit shelters with real-time arrival information
- Bicycle share stations
- Scooter-share or other micromobility options
- SAV transit stops
- Car share facilities
- Taxi or ride hailing waiting/call areas
- Wi-fi service
- Bicycle storage & repair facilities
- Retail
- Open space

By providing a robust array of options at mobility hubs, a variety of different needs can be accommodated, greatly increasing the number of destinations reachable by transit.

Wayfinding for Active Mobility

Well-crafted wayfinding systems foster a sense of place and encourage people walking and bicycling to go that extra mile and explore new areas.

Places that are arranged intuitively so that we can see obvious destinations from a distance, determine pathways, and recognize areas of different character are more legible. The "legibility" of a place describes how easy it is to understand.

Legible wayfinding systems enable individuals to:

- Easily and successfully find their destination
- Understand where they are with respect to other key locations
- Orient themselves in an appropriate direction with little misunderstanding or stress
- Discover new places and services
- Feel safe (enhance the sense of safety)

The following six core principles aim to guide the placement and design of a wayfinding system in order to create a clear wayfinding experience and achieve a more navigable trail.

1. CONNECT PLACES

Effective wayfinding information should enable local residents as well as visitors to travel between destinations and discover new destinations and services. Wayfinding should help improve local economic well-being by encouraging people to utilize services along the Iron Horse Trail. Wayfinding should enhance connections within the region and to neighboring communities and expand the active transportation network.

2. PROMOTE ACTIVE TRAVEL

Wayfinding should encourage increased walking and rolling by revealing a clear and attractive system that is easy to understand and navigate. The presence of wayfinding signs should validate walking and rolling as transportation options, as well as reduce fear amongst those interested in making more trips by walking or rolling. Wayfinding should expand the awareness and use of active transportation facilities.

3. MAINTAIN MOTION

Walking and rolling require physical effort, and frequent stopping and starting to check directions may lead to frustration and discouragement. Consistent, clear, and visible wayfinding elements allow people walking and rolling to navigate while maintaining their state of motion. To help users maintain motion, wayfinding information also needs to be presented so that it can be quickly read and easily comprehended.

4. BE PREDICTABLE

Effective wayfinding systems are predictable. When information is predictable, patterns emerge, and users of the network will be able to rely on the system to provide information when they expect it. Predictability also helps users to understand new situations quickly, whether it be navigating a new intersection or traveling to a destination for the first time.

Predictability should relate to all aspects of wayfinding placement and design (i.e., sign materials, dimensions, colors, forms, and placement). Similarly, maps should employ consistent symbology, fonts, colors, and style. The system should be designed in accordance with local, state, and federal guidelines, ensuring that it can be funded through state and federal sources.

5. KEEP INFORMATION SIMPLE

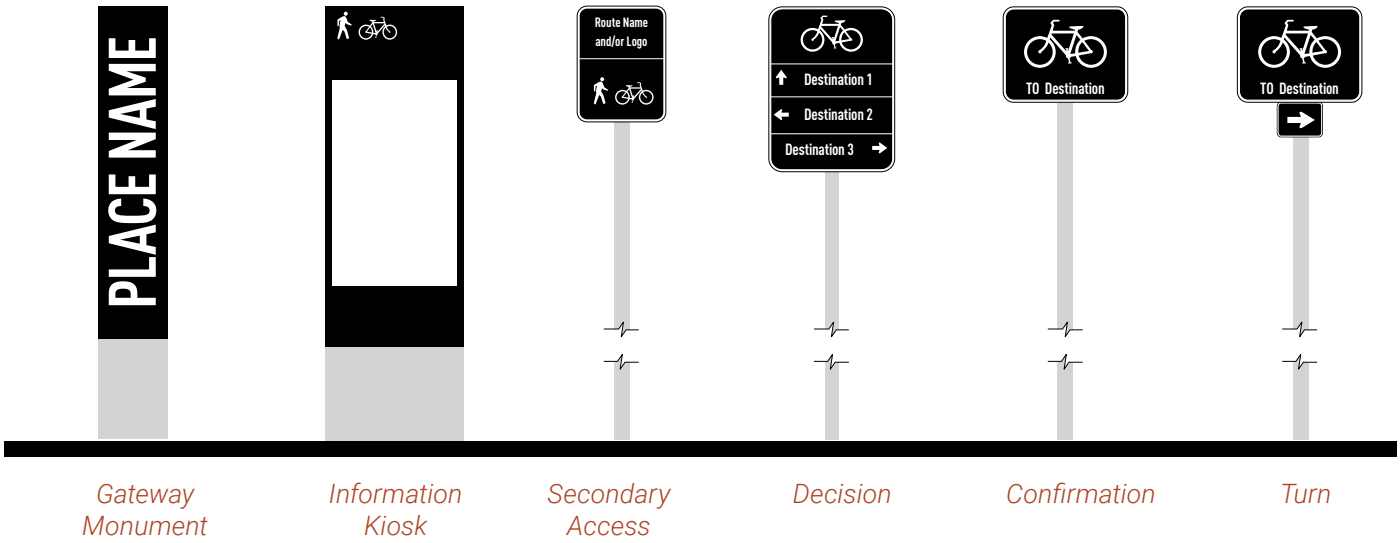
For a wayfinding network to be effective, information needs to be presented clearly and logically. It is important to provide information in manageable amounts. Too much information can be difficult to understand; too little and decision-making becomes difficult.

The placement of signs and the information provided at each placement are also critical. Information should be provided in advance of where major changes in direction occur and confirmed when the maneuver is complete.

6. MAKE IT ACCESSIBLE

Wayfinding signage should be accessible and be designed to be comprehensible by a wide range of users, including people of all ages and ability levels. As wayfinding systems often relate to accessible routes or pedestrian circulation, it is important to consider technical guidance from the Americans with Disabilities Act (ADA) to implement wayfinding signs and other elements that do not impede travel or create unsafe situations for pedestrians, bicyclists, and/or those with disabilities.

ACCESS ELEMENTS FUNDAMENTAL ELEMENTS



Gateway Monument *Information Kiosk* *Secondary Access* *Decision* *Confirmation* *Turn*

Wayfinding Elements

The goal of a wayfinding system is to simplify navigation in urban environments. This section describes the spectrum of elements that may be used in the Iron Horse Trail Wayfinding Signage Plan.

ACCESS ELEMENTS

Gateway Monument

Define the entry into a distinct neighborhood, or mark trailheads, access points, and landmarks. Opportunity for community-directed placemaking and integrated artwork.

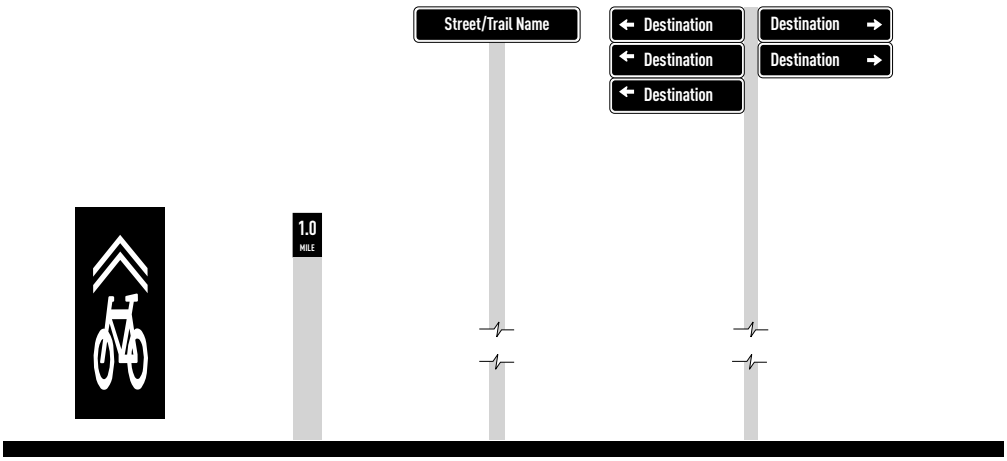
Information Kiosk

Provide system map and navigational information; most effective when placed in plazas, rest areas, or other locations where users may congregate, rest, or enter a trail or path.

Secondary Access Signage

Mark entry to trails or paths at locations where limited user traffic may not necessitate as much information as information kiosks.

ENHANCED ELEMENTS



FUNDAMENTAL NAVIGATIONAL ELEMENTS

Decision

Clarify route options where two or more routes converge, or at complex intersections.

Confirmation

Placed after a turn or intersection to reassure path users that they are on the correct route.

Turn

Placed before a turn or intersection to help users stay on the designated path.

ENHANCED NAVIGATIONAL ELEMENTS

Pavement Marking

Reinforce route direction, bicyclist positioning, intermodal cooperation, and/or system branding.

Mile Marker

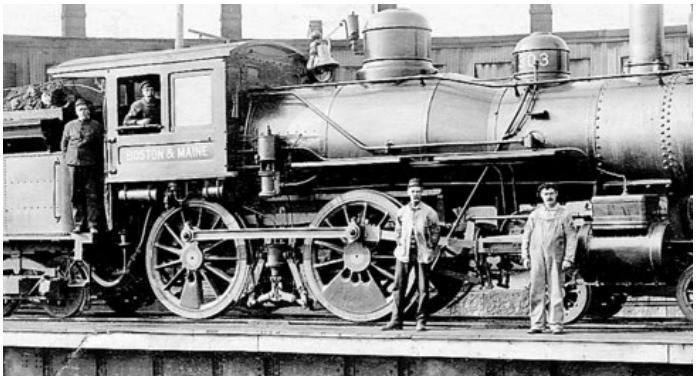
Reinforce system branding and orient users along off-street trails or paths.

Street/Trail Intersection

Orient off-street trail users at street crossings and inform vehicular traffic of trail crossing.

Fingerboard

Clarify route options where two or more routes converge, or at complex intersections.



Branding

In addition to physical design consistency of the trail, establishing unique and consistent trail branding can draw attention, attract new users, build familiarity and inspiration, and maximize the trail's potential for supporting economic development. Branding can provide a consistent voice to the project, with a visual identity that is distinct, harmonious, and memorable, reflecting the unique character of the region.

A branding exercise looks at what colors, typefaces, visual elements, forms, materials, and design features can help to define the Iron Horse Trail helping to create a connected and user-friendly experience for visitors and residents.

Branding and visual identity components may include: logos, color palette, typography, iconography, and wayfinding system signage.

A unified brand and visual identity system for the Iron Horse Trail will:

- Create a sense of place
- Provide a memorable, clear, and distinctive voice
- Build recognition and visibility for the Iron Horse Trail
- Provide consistency for familiarity
- Increase accessibility
- Prioritize clarity and legibility to help visitors and residents navigate
- Coordinate with existing landscape features and materials

Proposed Logo Concepts

Drawing from the history and geographical components of the Iron Horse Trail, a variety of inspired branding concepts were generated and presented to the project's Tecnical Advisory Committee (TAC).

The text-based branding options pay homage to the shape of the railroad tracks and pull geometric elements from traditional railroad stakes.

By contrast, the bridge branding options give a nod to some of the iconic and historic bridges found along the Iron Horse Trail.

See Appendix D, Iron Horse Trail Design Brief, for a summary of the TACs three preferred logo concepts for future consideration.

IRON HORSE
REGIONAL TRAIL

IRON
HORSE
REGIONAL TRAIL

IRON HORSE
REGIONAL TRAIL

IRON HORSE
REGIONAL TRAIL

IRON HORSE
REGIONAL TRAIL

04 How to Achieve the Vision?

The proposed projects identify improvements to help the Iron Horse Trail achieve this Study's vision of becoming an active transportation spine that supports the region's mobility goals and continues to provide a treasured recreational resource for users of all ages and abilities.

The recommendations in this chapter were developed by pairing the corridor and community needs outlined in Chapter 2 with the potential design tools described in Chapter 3 to identify improvements for

- Trail corridors;
- Intersections; and
- Access points.

In addition, projects that would create connections to existing or planned bikeways beyond the project corridor were also identified.

When there are limited capital improvement funds, a prioritization process is a useful planning tool to help understand which projects will have a greater impact in meeting the project vision. In addition, a prioritization process brings transparency and rationality to the decision-making process. It allows the public to see how projects were ranked and why. Finally, it allows the public to influence which types of projects are prioritized to meet community needs.

This chapter describes the prioritization framework used to prioritize projects and presents three scenarios to help understand the impacts particular projects can have on future ridership. It then summarizes the recommended projects by jurisdiction and project segment, and highlights the top ranked projects based on the outcomes of the prioritization process.

PRIORITIZATION FRAMEWORK

Overview

A goal-based evaluation process was used to prioritize the proposed projects. The project goals were developed through collaboration with the project's Technical Advisory Committee (TAC) and through community input. Criteria were identified for each of the five project goals as well as for the needs identified by the community. Proposed projects were then measured against the evaluation criteria to determine how well they respond to the project goals and community needs.

The evaluation criteria were used to evaluate the performance of each project type per segment. The ratings for each trail segment do not result in a total "score" that indicates the "most important" projects, but rather they provide qualitative guidance to inform a discussion of trade-offs by the project's TAC, local jurisdictions, community members, and elected officials. The ratings were used to create an overall ranking of all the projects.

Evaluation Criteria

Table 8 shows the project goals, relative weight, related evaluation criteria, and the types of projects prioritized by each criterion. In addition to the five project goals, projects desired by the community were also included in the evaluation process.

Each project was scored against the criteria on a score of 0 through 2, with 2 indicating the project directly met the criterion, 1 indicating the project indirectly met the criterion and 0 indicating the project did not meet the criterion.

The goals were weighted based on two factors. One factor was related to the project's TAC. The TAC ranked the project goals based on how well the goals aligned with their jurisdiction's goals. The second factor was related to the results of an evaluation of 'Benefits of Improvements' described in the following pages. The goals and weighting are as follows:

- **Community Desired Projects:** Projects identified by the community through the public engagement effort were included in the evaluation process with a weight of (1).
- **Safety:** Enhances trail condition and traffic and intersection safety. In the TAC's overall goal rankings, Safety was given the highest ranking. Therefore, it was given the highest weight (2.5) in the evaluation process.
- **Mobility:** Provides connections to transit, trails and on-street facilities; accommodates user demand and enhances user comfort. The mobility goal was also highly ranked by the TAC. In addition, the 'Benefits of Improvements' evaluation showed that providing strong connections to the trail would have a positive impact on trail demand. Therefore, the Mobility goal was given the second highest weight (2) to prioritize projects that connect to transit, trails, and existing and planned bikeways in areas of higher trail demand.
- **Access & Equity:** Provides access to jobs, destinations, parks and open space, and health services; presents opportunities for new access points. This goal was also given a weight of (1).
- **User Experience:** Improves trail conditions and amenities; presents opportunities for stormwater filtration, ecology, new amenities, and placemaking. This goal prioritizes projects that bring extra amenities to the trail and was given a weight of (0.5).
- **Project Synergy:** Aligns with planned projects and existing land uses and allows for future expansion of new technologies. This goal was the lowest ranking goal by the TAC and was given a weight of (0.5).

Table 8 **Evaluation Criteria**

Goal	Weight	Criteria	Prioritizes Projects That:
Community Desired Project	1	Community Identified Need	Were identified by the community during the community engagement events
Safety 	2.5	Traffic Safety	Provide grade-separated crossings
		Intersection Improvement	Improve the quality of at-grade crossings
		Trail User Separation	Improve separation of slow and faster user groups
Mobility 	2	Connections to High Quality Transit	Provide connections to BART
		Connections to Park & Ride	Provide connections to Park and Ride facility
		Connections to Trail	Provide connections to existing or planned trails
		Connections to Existing On-Street Bikeways	Provide connections to existing on-street bikeways
		Connections to Planned On-Street Bikeway	Provide connections to planned on-street bikeways
		Trail Corridor Demand	Improve trail corridor to meet potential demand
Access & Equity 	1	Access to Jobs	Provide access to high employment centers
		Access to Destinations	Provide access to high employment centers and key destinations
		Access to Schools	Provide access to schools
		Access to Parks & Open Space	Provide access to parks and open spaces
		Enhanced Connectivity	Provide new access points
User Experience 	0.5	Area of Opportunity and Amenities	Provide opportunities for expanded public space, gathering areas, enhanced recreation, and for new or improved amenities
		Stormwater & Urban Ecology	Provide opportunities for green infrastructure
Project Synergy 	0.5	Aligns with Key Land Uses	Synergy with planned projects and opportunities for future trail oriented development

BENEFITS OF IMPROVEMENTS

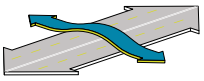
In addition to the evaluation process described in the previous pages which prioritized projects that would best meet the Study vision, the proposed improvements were also evaluated for how they would impact future use of the trail. This evaluation modeled three proposed improvements (intersections, access, E-Bikes) and measured how they would impact future demand as well as perception of trip and travel time along the trail.

The expected increase in users based on different types of improvements was considered when weighting the goals during the evaluation process. Each type of improvement relates directly to a specific goal. Intersections relate strongly to Safety and Mobility, access relates to Access & Equity and Mobility, and capacity for e-bikes relates to Mobility.

Safety and Mobility were the two highest weighted goals in the evaluation process, and both prioritize projects that would most directly increase future use of the trail.

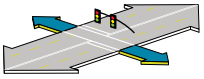
The proposed improvements outlined in the following pages all contribute to one or more of these scenarios. While recommendations are listed by segment and ranked based on the prioritization process, these scenarios illustrate the importance of implementing improvements consistently across the corridor, as their coordinated implementation would result in the greatest overall increase in users for the trail.

13 Arterial Crossings



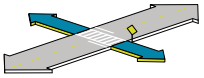
Separate trail from the street (bridge or tunnel)

15 Collector Crossings



Install traffic signals or similar improvement to minimize waiting for trail users

14 Local Crossings



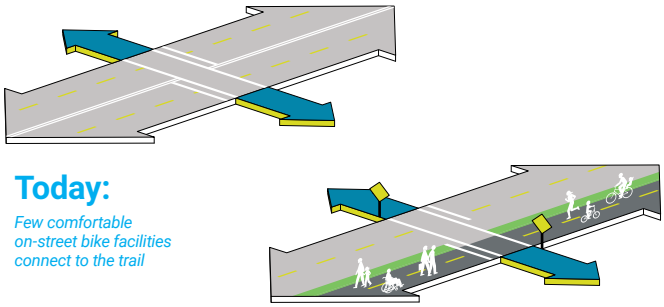
Require people in vehicles to stop at trail crossings

Prioritizing trail crossings could make the trail feel

"I can maintain a comfortable pace with less stopping and starting"

Improved Intersections Make the Trail Feel Shorter

This study evaluated how trail priority at all intersections would impact trail users and total bikeable trips. If arterial crossings were separated from the street, collector crossings had signals to decrease trail user waiting times, and local crossings required vehicles to stop, the trail would feel 14% shorter in length than existing conditions. Though the results did not indicate a large increase in the number of bikeable trips (only 1%), trail priority would enhance user experience and could encourage more bicyclists to use the trail.



Today:

Few comfortable on-street bike facilities connect to the trail

Envisioned:

Comfortable connections at regular intervals

23%

More trips are bikeable

"I can bike from home to work to the park and beyond!"

Expanded Access to the Trail Makes Trips More Bikeable

This study modeled better trail connections. Currently, few comfortable on-street bike facilities connect users to the trail. With the addition of comfortable low-stress bikeways leading to the trail at regular intervals, 23% more trips would be bikeable.

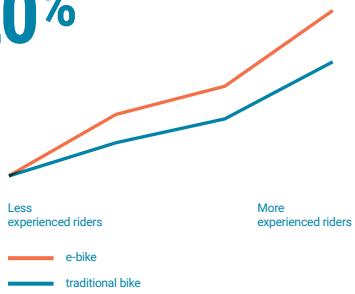
People on e-bikes make trips that are 22% longer

27%

More trips are bikeable

People on e-bikes travel about 20% faster than people on traditional bikes

Greater speeds mean that people will likely travel further



"I can run errands car-free—no sweat!"

E-Bikes Allow Users to Take Longer Trips

This study considered how the presence of e-bikes would impact trail usage. With an increase of electric bikes and scooters, trail user speeds would increase and allow for longer and faster trips. E-bikes would allow users to make trips that are 22% longer and would make 27% of trips more bikeable.

PROPOSED IMPROVEMENTS

The following section provides recommendations for projects that help meet the project vision.

Meeting this vision will require multi-jurisdictional coordination and consistent implementation of the proposed projects across the Iron Horse Trail corridor. However, priority projects are identified that could provide the greatest benefit to the communities that live there today, and could bring the greatest immediate enhancement to the existing corridor. The overall ranking of projects is provided at the end of this chapter.

How to Use this Section

Figure 2 highlights how the recommendations are presented.

1 Proposed projects are organized by jurisdiction and segment number. (See Map 2 for an overview of all 15 segments).

2 Recommendations are organized into four following project types. The tables on the following pages provide detailed recommendations for each segment. Some recommendations apply to the entire corridor and are not specifically called out in the tables.

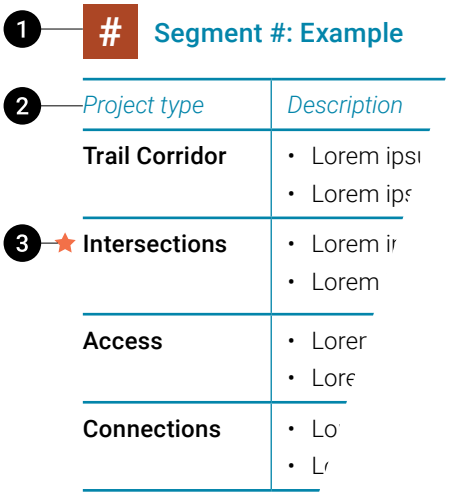


Figure 2 **Example Projects by Segment Table**

Trail corridor projects provide recommendations for trail configurations and widths that respond to physical conditions, adjacent land uses, and future user demand. Lighting and wayfinding improvements are recommended for the entire trail.

Lighting improvements are recommended for all corridor projects in order for the trail to serve as a dependable transportation facility.

Wayfinding along streets and corridors is recommended to help people get to the trail. In addition, wayfinding improvements along the trail are also recommended to allow users to access directional information while in motion and help users navigate along the trail.

- **Intersection improvement projects** aim to improve the safety and convenience of the trail at intersections.

  Improving sight lines at crossings and replacing bollards and/or fences with alternative design solutions are recommended across the Iron Horse Trail corridor.

- **Access projects** identify locations for potential new access points as well as provide recommendations to enhance existing access points. They also all include programming opportunities and community amenities such as community gardens, creek or water restoration, or linear parks.

  Access along commercial or downtown areas is recommended at 300'-500' intervals to allow permeability, and increase perceived safety and vibrancy.

  Access improvements incorporate seating, shade, and amenities.

  ADA parking at regular intervals (approximately every 5 miles) is also recommended along the entire corridor to improve access for people with disabilities.

- **Connection projects** identify locations to improve connectivity to existing and planned bikeways and trails.

3 Stars identify the three top-ranked projects per jurisdiction, based on the goal-based evaluation model. A list of the overall project rankings is provided at the end of this chapter.

NOTES

Some intersections in these segments may be within one jurisdiction but operated and maintained by another. Proposed improvements in these segments will require multi-jurisdictional coordination.

All proposed projects considered adopted studies, previous plans, and other current projects. Notable current projects are noted on Maps 12-17 as being completed by others.

Map 12 **Concord**

PROJECT TYPE IMPROVEMENTS

Trail Corridor

- Separated by User
- Separated by Speed
- Separated by Experience

Intersections

- Arterial
- Collector
- Local
- Undercrossing
- Regional Trail

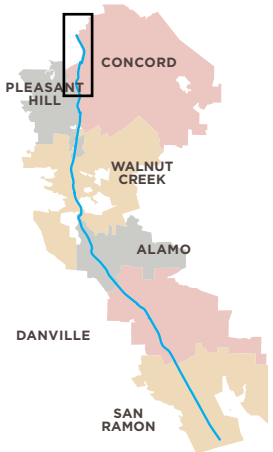
Access

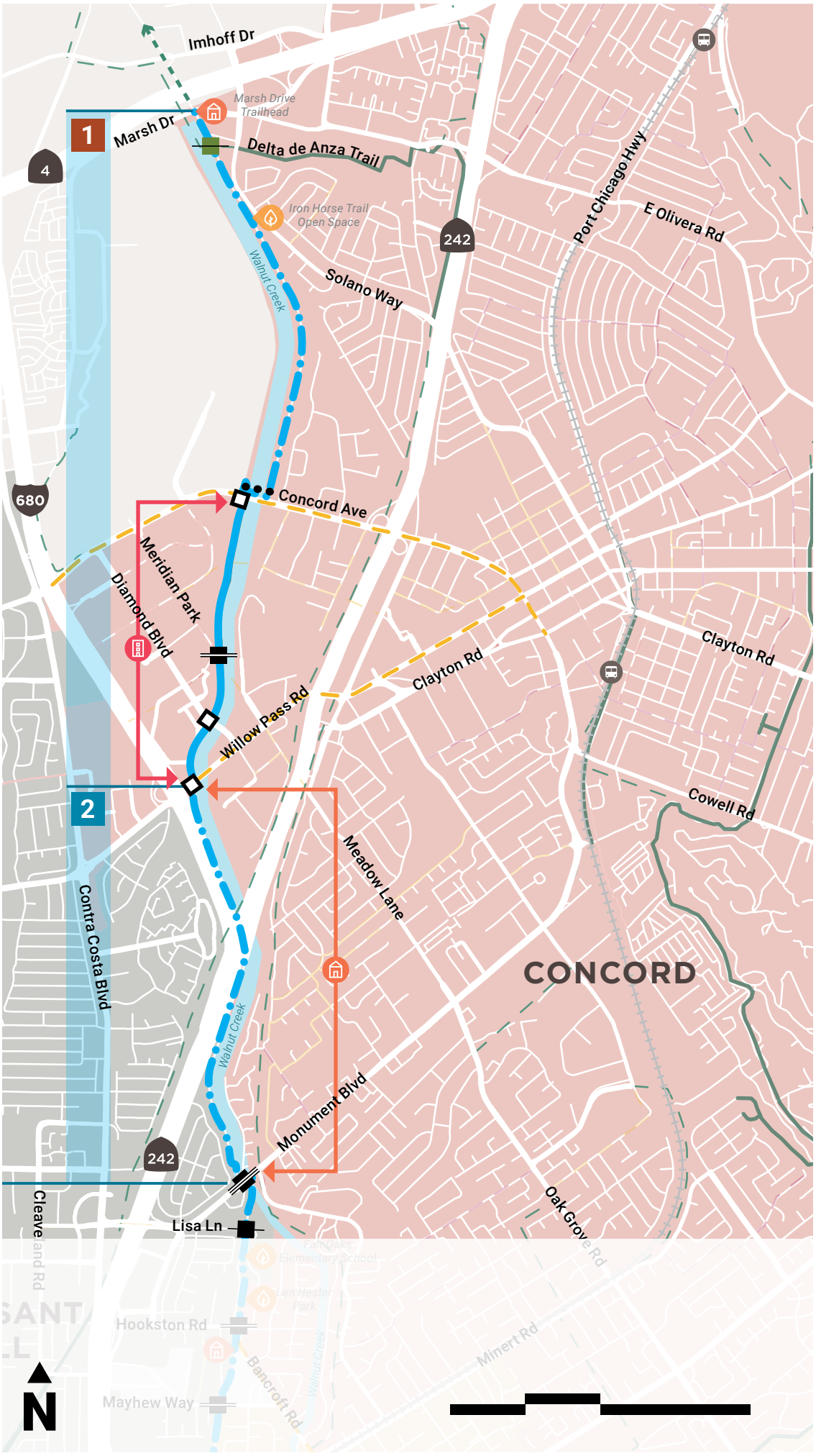
- School/Open Space/Trail
- Residential/Street
- Business/ Commercial/Retail

Connections

- Trail Connection
- On Street Bikeway Connection
- Existing Trail
- BART Connection
- Park and Ride Connection

KEY MAP





CONCORD PROJECTS

Concord consists of two segments. Segment 1 travels through a large commercial center, while Segment 2 is adjacent to parks and housing. Both segments have medium expected user demand and ample available ROW. Both segments have a high need to improve access.

Segment 1 could improve access to existing commercial areas and Segment 2 could provide better access to people who live on the east side of Walnut Creek and improve the multi-legged trail crossing at Monument Boulevard.

1 Segment 1: Marsh through Willow Pass

Project type	*Description*
★ **Trail Corridor**	• North of Concord Avenue » Separated by experience (open space): 14ft rolling path with adjacent 6 ft pedestrian path (optional soft surface along creek). » Improve trail connection to existing bicycle/pedestrian bridge. • South of Concord Avenue » Separated by user (urban): 14ft rolling path with 6 ft pedestrian path. • Retrofit two undercrossings at Concord Ave and Diamond Blvd. • Provide shade trees. • Opportunities for green stormwater infrastructure.
Intersections	• Improve two collector intersections at Marsh Drive and Willow Way/Meridian Park. • Improve trail crossing at Delta de Anza Regional Trail.
Access	• Add eight commercial access points and two office/business park access points. • Enhance existing access at Iron Horse Trail Open Space and at Marsh Drive Trailhead.
★ **Connections**	• Close four mile gap to regional Bay Trail. • Improve trail connection to planned Class II at Concord Ave.

2 Segment 2: Willow Pass through Monument

Project type	*Description*
Trail Corridor	• Separated by experience (open space): 14ft rolling path with adjacent 6 ft pedestrian path (optional soft surface along creek). • Retrofit undercrossing at Willow Pass Rd. • Provide shade trees. • Opportunities for green stormwater infrastructure.
★ **Intersections**	• Improve crossing at Monument Boulevard » Alt 1: Realign trail with new overcrossing with street access to Monument Corridor Trail, and future Walnut Creek Trail. (Alt 1 used in cost estimate) » Alt 2: Improve arterial at-grade crossing by realigning trail with possible existing bridge improvements
Access	• New bicycle/pedestrian bridge(s) to connect the residential neighborhoods east of Walnut Creek to the trail
Connections	• Connect trail to planned Class II at Willow Pass Rd.

Map 13 **Pleasant Hill/CCC**

PLEASANT HILL/CONTRA COSTA CENTRE PROJECTS

Pleasant Hill/Contra Costa Centre includes three segments that connect through the highest density of zero vehicle households in the study area and have high expected demand overall. Segment 3 could benefit from enhancements to access points around schools. The trail connects to the Pleasant Hill/Contra Costa Centre BART station in Segment 4 and serves as a critical regional connection to transit. Segment 4 has elements of successful trail design including the Treat Boulevard overcrossing and the separated use trails through CCC Transit Village Park. Additional improvements can be seen in trail configuration to reduce user conflicts and improve connections

PROJECT TYPE IMPROVEMENTS

Trail Corridor

- Separated by User
- Separated by Speed
- Separated by Experience

Intersections

- Arterial
- Collector
- Local
- Undercrossing
- Regional Trail

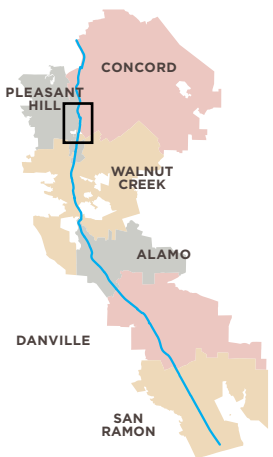
Access

- School/Open Space/Trail
- Residential/Street
- Business/ Commercial/Retail

Connections

- Trail Connection
- On Street Bikeway Connection
- Existing Trail
- BART Connection
- Park and Ride Connection

KEY MAP



to BART. Segment 5 connects to the Contra Costa Canal Trail, an important regional connection, and could improve access to adjacent open space at Walden Park.

3 Segment 3: Monument to Las Juntas

Project type	*Description*
Trail Corridor	• Separated by experience (open space): 14ft rolling path with adjacent 6 ft pedestrian path.
Intersections	• Improve collector intersection at Hookston Rd. • Improve three local crossings at Lisa Ln, Mayhew Way, and Coggins Rd.
Access	• Add school access point at Fair Oaks Elementary School, open space access point at Len Hester Park, and enhance one residential access point. • Opportunities for community based programs including outdoor classrooms or student gardens. • Incorporate micromobility such as bike share or dockless options at major intersections or destination sites.
Connections	• Improve connection to Class II on Bancraft Rd at Hookston Rd.

4 Segment 4: Las Juntas through Jones

Project type	*Description*
★ **Trail Corridor**	• Separated by experience (urban): 16ft rolling path with 6-10 ft pedestrian path.
★ **Intersections**	• Improve two collector intersections at Las Juntas Way and Jones Rd.
Access	• Add one commercial access point. • Improve one residential access point at Honey Trail. • Incorporate micromobility such as bike share or dockless options at major intersections or destination sites.
★ **Connections**	• Improve trail connection to planned Class II at Treat Blvd. • Improve direct connection to BART.

5 Segment 5: Jones through Walden

Project type	*Description*
Trail Corridor	• Separated by experience (open space): 14 ft rolling path with adjacent 6 ft pedestrian path.
Intersections	• Improve trail crossing at Contra Costa Canal Trail. Proposed bicycle roundabout. • Improve one local crossing at Walden Rd.
Access	• Enhance one open space access point at Walden Park. • Incorporate micromobility such as bike share or dockless options at major intersections or destination sites.

Map 14 **Walnut Creek**

PROJECT TYPE IMPROVEMENTS

Trail Corridor

- Separated by User
- Separated by Speed
- Separated by Experience

Intersections

- Arterial
- Collector
- Local
- Undercrossing
- Regional Trail

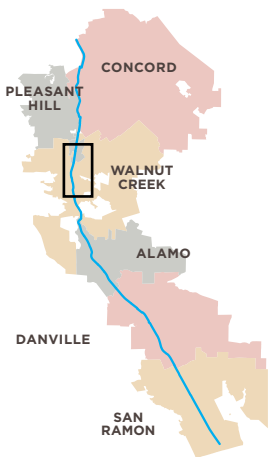
Access

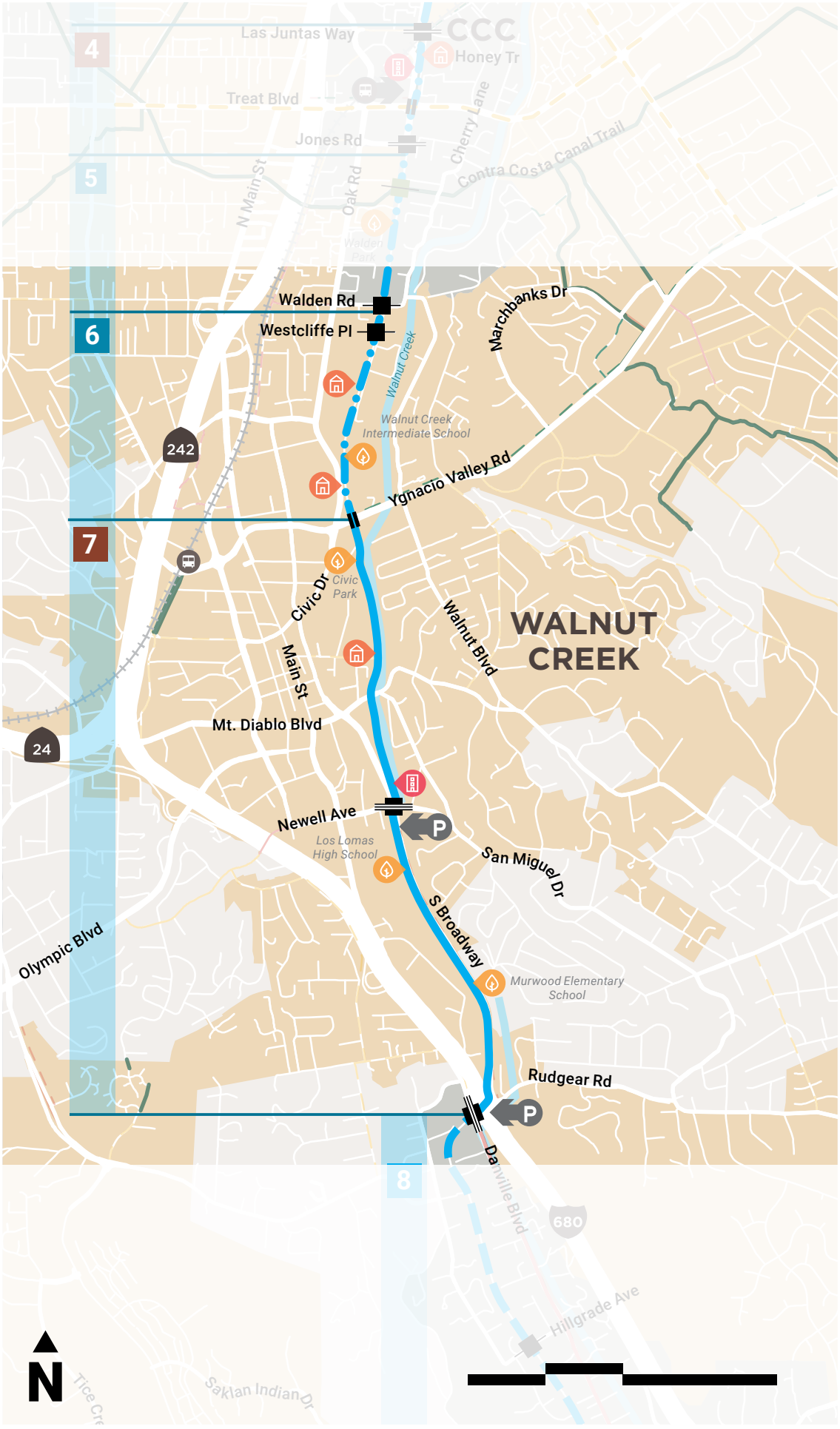
- School/Open Space/Trail
- Residential/Street
- Business/ Commercial/Retail

Connections

- Trail Connection
- On Street Bikeway Connection
- Existing Trail
- BART Connection
- Park and Ride Connection

KEY MAP





WALNUT CREEK PROJECTS

Walnut Creek includes the census tract with the potential for the highest population growth along the trail within the study area. There is a need to improve access along all three segments and potential for adding mobility hubs to provide first/last mile connections to the Walnut Creek BART station. Segment 7 shows the highest need for improvements to access, connectivity, and trail convenience. The community also identified a high number of needs along this segment. This segment also has the least available right-of-way. The Study explores trail realignment alternatives in Segment 7 that address public perception of safety, improve intersection crossings, and enhance connectivity to downtown Walnut Creek and BART.

6 Segment 6: Walden to Ygnacio Valley

Project type	*Description*
★ **Trail Corridor**	• Separate users by experience: 14 ft rolling path and 6'-8' walking path.
Intersections	• Improve one local crossing at Westcliffe Pl.
Access	• Enhance one residential access point, one school access point at Walnut Creek Intermediate School, and one street access point. • Incorporate micromobility such as bike share or dockless options at major intersections or destination sites.

7 Segment 7: Ygnacio Valley through Danville/I-680

Project type	*Description*
★ **Trail Corridor**	• Trail improvements from Ygnacio Valley Blvd to Newell Ave » Alt 1: Realign trail and separate users by expanding the trail to 12-16 ft and add 6 ft pedestrian path on east side of canal (Alt 1 used in cost estimate). » Alt 2: Separate users by providing a Class IV on-street adjacent route for cyclists. » Alt 3: Widen trail to 12-16 ft cantilevering over channelized canal. • Trail improvements from Newell Ave to Danville Blvd/Rudgear Rd » Alt 1: Remove soundwall and widen trail to 12-16 ft with buffer/amenity zone (Alt 1 used in cost estimate). » Alt 2: Realign trail on east side of S Broadway Rd and widen trail to 12-16 ft with buffer/amenity zone.
Intersections	• Improve two arterial intersections at Newell Ave and Danville Blvd.
★ **Access**	• Enhance one residential access point, one open space access point at Civic Park, one commercial access point, and two school access points at Los Lomas High School and Murwood Elementary School.
Connections	• Improve Park and Ride connections at Newell and S Broadway/I-680 intersection.

Map 15 **Alamo**

PROJECT TYPE IMPROVEMENTS

Trail Corridor

- Separated by User
- Separated by Speed
- Separated by Experience

Intersections

- Arterial
- Collector
- Local
- Undercrossing
- Regional Trail

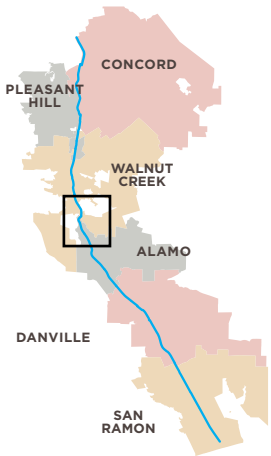
Access

- School/Open Space/Trail
- Residential/Street
- Business/ Commercial/Retail

Connections

- Trail Connection
- On Street Bikeway Connection
- Existing Trail
- BART Connection
- Park and Ride Connection

KEY MAP



ALAMO PROJECTS

Alamo includes three segments of the lowest user demand in the study corridor. This is due to lower density of origins and destinations as well as limited low stress on-street bikeway connections. The local activity in Alamo is expected to be largely recreational, however, utilitarian users will pass through Alamo. Improving local intersections so that trail users would have priority would improve trail convenience. Segment 8 has a large right-of-way with open space. There are opportunities for trail-oriented development and stronger connections to commercial activity in Segment 9. In Segment 10, access could be improved to Rancho Romero School and Hemme Station Park.

8 Segment 8: Danville/I-680 to Stone Valley

Project type	*Description*
Trail Corridor	• Separate users by speed with a 22' paved trail with marked shoulders.
★ **Intersections**	• Improve five local crossings at Hilgrade Ave, Cervato Dr, Ramona Way, Litina Ave, and Ridgewood Rd. • Improve one collector intersection at Livorna Rd.
Access	• Add two commercial access points adjacent to Stone Valley commercial areas. • Enhance Alamo/IHT Trailhead at Stone Valley Rd. • Enhance planting.

9 Segment 9: Stone Valley to South Ave

Project type	*Description*
★ **Trail Corridor**	• Separate users by speed with a 20' paved trail with marked shoulders.
Intersections	• Improve two collector intersections at Stone Valley Rd and Las Trampas Rd.
Access	• Enhance three existing commercial access points.
★ **Connection**	• Connect trail to Class II at Stone Valley Rd.

10 Segment 10: South Ave through Wayne

Project type	*Description*
Trail Corridor	• Separate users by speed with a 20' paved trail with marked shoulders.
Intersections	• Improve three local crossings at Hemme Ave, Camille Ave, and Wayne Ave.
Access	• Enhance existing residential/street access at South Ave, existing open space access at Hemme Station Park, and existing school access at Hemme Ave for Rancho Romero Elementary School.

Map 16 **Danville**

DANVILLE PROJECTS

Danville's adjacent Main Street district provides a unique destination along the study area. Segment 11 is a wide shaded corridor connecting residents with Del Amigo High School and downtown Danville. Segment 12 connects to downtown Danville and has opportunities for trail-oriented development, improving connections and wayfinding to connect Main Street activities and the trail. Segment 13 is a

PROJECT TYPE IMPROVEMENTS

Trail Corridor

- Separated by User
- Separated by Speed
- Separated by Experience

Intersections

- Arterial
- Collector
- Local
- Undercrossing
- Regional Trail

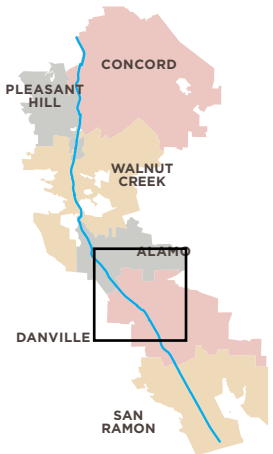
Access

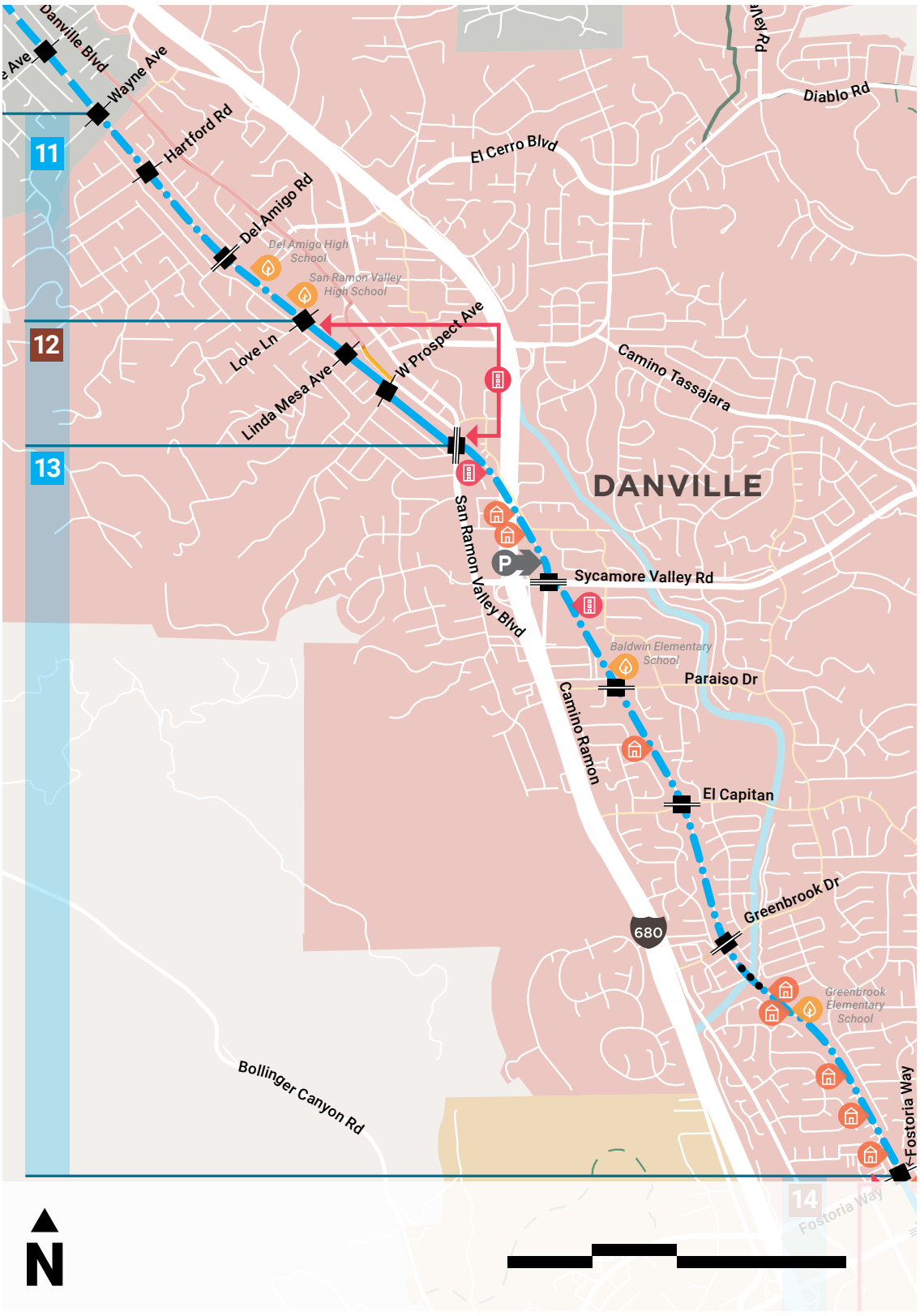
- School/Open Space/Trail
- Residential/Street
- Business/ Commercial/Retail

Connections

- Trail Connection
- On Street Bikeway Connection
- Existing Trail
- BART Connection
- Park and Ride Connection

KEY MAP





large unconstrained corridor with opportunities for linear park amenities. Improvements to collector and arterial intersection crossings would improve trail convenience. Access to destinations such as schools and Danville Park and Ride could also be improved.

11 Segment 11: Wayne through Love Lane

Project type	*Description*
Trail Corridor	• Separated by experience: 14ft rolling path with 6 ft pedestrian path. • Opportunities for green stormwater infrastructure.
Intersections	• Improve two local crossings at Hartford Rd and Love Ln. • Improve collector road intersection at Del Amigo Rd.
Access	• Add two school access points for San Ramon Valley High School and Del Amigo High School. • Incorporate micromobility at major intersections or destination sites.

12 Segment 12: Love Lane through San Ramon Valley

Project type	*Description*
Trail Corridor	• Separated by user (urban): 14ft rolling path with 6 ft pedestrian path.
★ **Intersections**	• Improve arterial intersection at San Ramon Valley Blvd. • Improve trail alignment and intersection at Linda Mesa Ave and W. Prospect Ave.
Access	• Add five new commercial access points. • Incorporate micromobility at major intersections or destination sites.
Connections	• Enhance connection to adjacent Danville Class II bikeway

13 Segment 13: San Ramon Valley through Fostoria

Project type	*Description*
★ **Trail Corridor**	• Separated by experience: 14ft rolling path with 6 ft pedestrian path. • Improve creek overpass to accommodate higher demand » Alt 1: Add additional bridge or retrofit existing (Alt 1 used in cost estimate). » Alt 2: Create mixing zones, slowing users prior to pinch point. • I-680 Undercrossing improvements: improve lighting, clearances and engage with potential open space such as skate parks or murals. • Opportunities for green stormwater infrastructure.
★ **Intersections**	• Improve local crossing at Fostoria Way. • Improve three collector road intersections at Paraiso Dr, El Capitan Dr, and Greenbrook Dr. • Sycamore Valley Rd » Alt 1: Improve trail alignment and arterial intersection at Sycamore Valley Rd (Alt 1 used in cost estimate). » Alt2: Add overcrossing at Sycamore Valley Rd.
Access	• Add one new residential access point and one commercial access point. • Enhance five residential access points and two school access points at John F. Baldwin Elementary School and Greenbrook Elementary School. • Enhance access at Danville Park and Ride. • Incorporate micromobility at major intersections or destination sites.

Map 17 **San Ramon**

PROJECT TYPE IMPROVEMENTS

Trail Corridor

- Separated by User
- Separated by Speed
- Separated by Experience

Intersections

- Arterial
- Collector
- Local
- Undercrossing
- Regional Trail

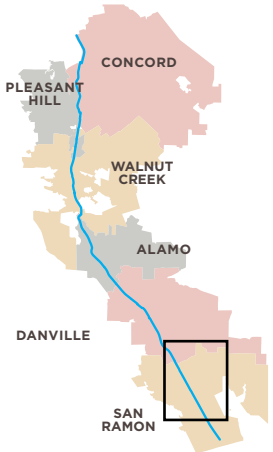
Access

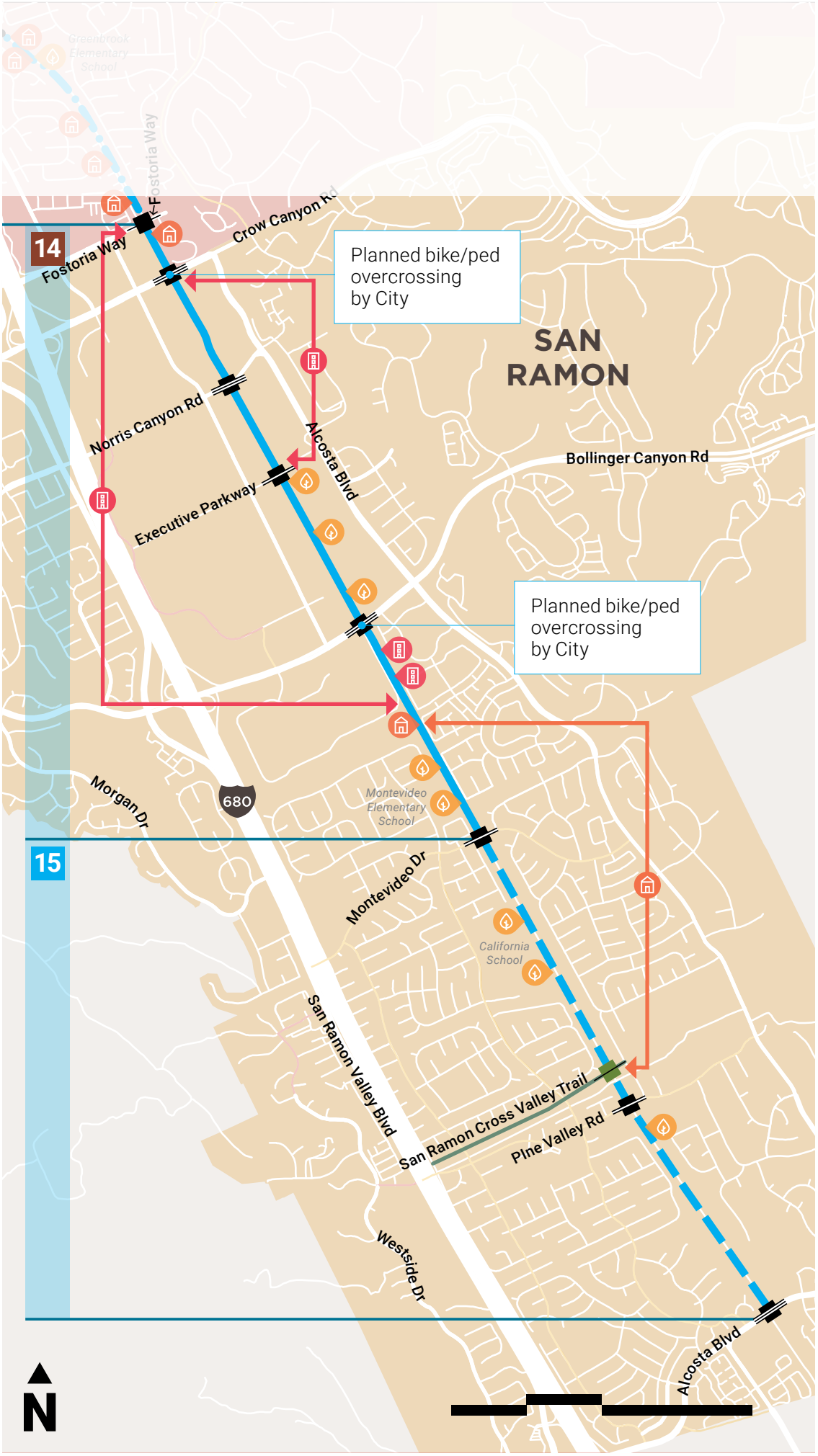
- School/Open Space/Trail
- Residential/Street
- Business/ Commercial/Retail

Connections

- Trail Connection
- On Street Bikeway Connection
- Existing Trail
- BART Connection
- Park and Ride Connection

KEY MAP





SAN RAMON PROJECTS

San Ramon includes two segments with high expected user demand. San Ramon has the highest projected employment growth in the study area. Segment 14 connects to the employment and commercial area around Bishop Ranch and has a high need and great potential for improving access, connectivity, and intersection improvements. Segment 15 runs through and connects directly to neighborhoods, and shows high connectivity and intersection improvement needs. Opportunities include improving the connection to San Ramon Cross Valley Trail, and adding shade for a comfortable riding experience with additional access points to California High School and Montevideo Elementary School. Both segments have wide available ROW.

14 Segment 14: Fostoria to Montevideo

Project type	*Description*
★ **Trail Corridor**	• Separate users by type. 14' rolling path and 6' walking path • Separate users by speed and experience. Provide a 16'-20' path for fast user types and 8-12' for slow user types with 4' green infrastructure or amenity zone. • Opportunity for new linear park. Implement community based programs including outdoor classrooms, student gardens, or community gardens.
★ **Intersections**	• Improve two collector intersections at Montevideo Dr and Executive Pkwy. • Improve arterial intersection at Norris Canyon Rd.
★ **Access**	• Provide two new gateway access points to adjacent business parks, 13 new minor business park access points, one new residential access point, and one new open space access point. • Enhance up to seven existing business park access points, four existing residential access points, two existing open space, and two existing school access points at Montevideo Elementary School. • Incorporate micromobility such as bike share or dockless options at major intersections or destination sites.

15 Segment 15: Montevideo through Alcosta

Project type	*Description*
Trail Corridor	• Separate users by speed with a 20' paved trail with marked shoulders. • Shade trees. • Opportunities for green stormwater infrastructure.
Intersections	• Improve two collector intersections at Pine Valley Rd and Alcosta Blvd. • Improve trail crossing at San Ramon Cross Valley Trail. Proposed bicycle trail roundabout.
Access	• Enhance one school access point at California School and one residential access point. • Add one school access point at California School, one open space access point, and one residential access point. • Incorporate micromobility such as bike share or dockless options at major intersections or destination sites.

PROJECT RANKING

The results of the prioritization process provide a ranking of projects based on the goal-based evaluation model. Table 9 shows the overall ranking of projects along the corridor.

While all of the proposed projects described in the previous pages are important for ensuring a consistent and cohesive long-term vision for the Iron Horse Trail, identifying priority projects can help target improvements that can provide the greatest immediate benefit to the corridor and its surrounding communities.

The top-tier projects align with areas of greater expected demand such as Pleasant Hill, Walnut Creek, and San Ramon. Trail corridor improvements in these areas will help ensure the trail is wide enough to accommodate anticipated user demand. Implementing these specific trail corridor improvements will also benefit the corridor as a whole, as widening the trail to improve user comfort and efficiency in all locations will help enable the trail to function as a bicycle superhighway.

The communities with higher expected demand also have higher levels of destinations adjacent to the trail, and will benefit from improvements that enhance safe and convenient access to the trail. In all communities, intersection, access, and connection improvements will help connect trail users to the various points of interest along the trail.

The trail improvements have been organized into segments and improvement types to help jurisdictions build projects that align with various funding sources. Projects should be grouped together to maximize resources and provide the most comprehensive enhancements to different sections of the trail.

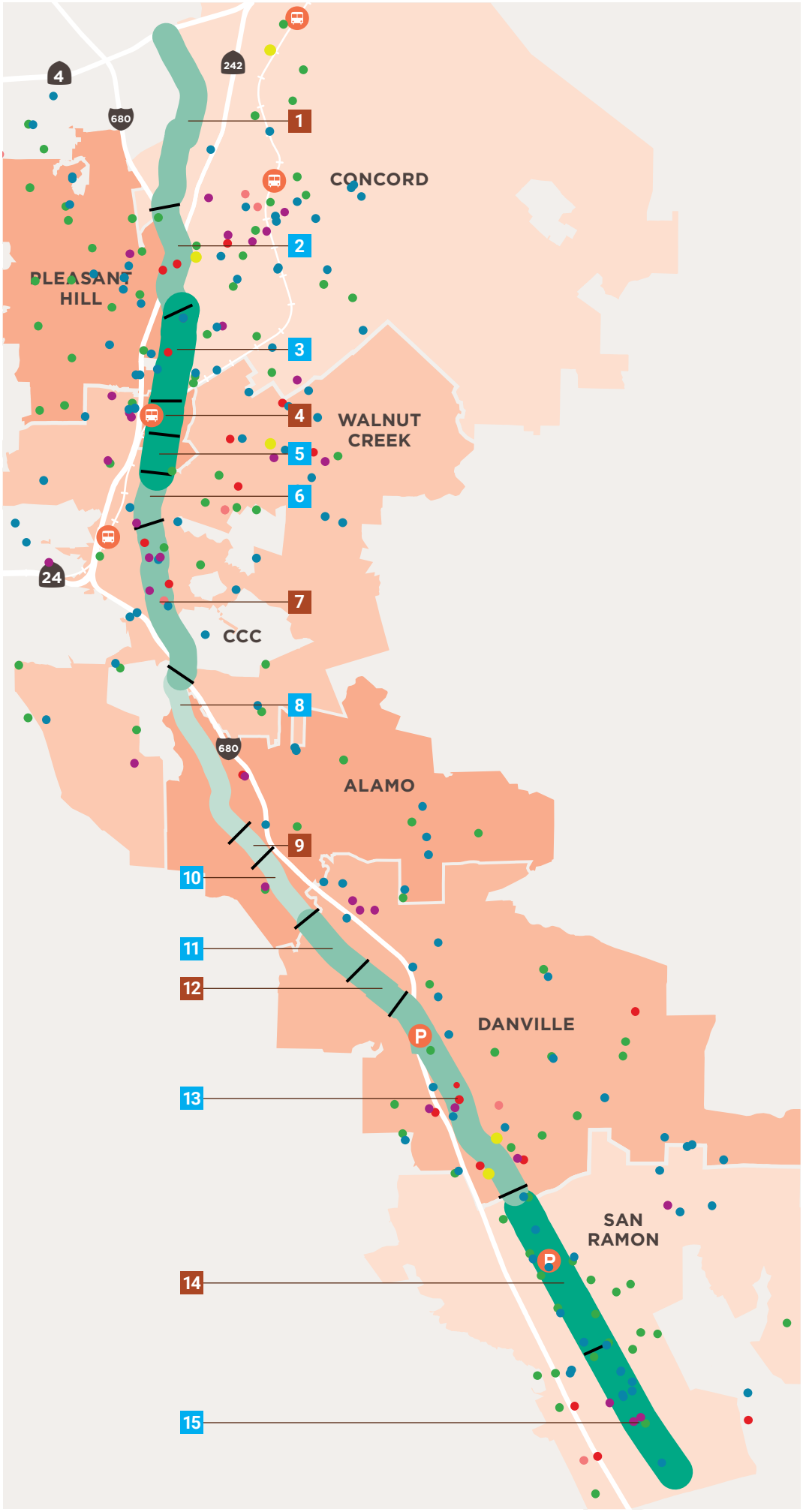
A long-term implementation plan for all of the proposed improvements will require multi-jurisdictional coordination and collaboration. Cost estimates for the proposed projects as well as implementation strategies and funding opportunities are outlined in the next chapter.

Table 9 **Top Overall Projects**

Rank	*City*	*Segment*	*Improvement Type*
1	Pleasant Hill	4	Trail Corridor
2	Walnut Creek	7	Trail Corridor
3	Pleasant Hill	4	Connection
4	Concord	1	Trail Corridor
5	San Ramon	14	Access
6	Danville	13	Intersection
7	Concord	2	Intersection
8	Danville	13	Trail Corridor
9	Pleasant Hill	4	Intersection
10	Pleasant Hill	3	Trail Corridor
11	San Ramon	14	Trail Corridor
12	Walnut Creek	7	Access
13	San Ramon	14	Intersection
14	Walnut Creek	6	Trail Corridor
15	Alamo	9	Connection

Continued on next spread

Map 18 **Trip Demand + Activity Centers**



Existing Destinations

- Office
- School
- Hospital
- Shopping
- Library, Museum
- Park

Demand

Increasing Demand

BART Station

Park & Ride

Segments

Activity Centers: Main Street, Commercial, Destination, Development, Transit

Parks & Housing Segments: Residential, Passive, Landscape, Park

Segment Extents

0 1 2 MILES

Table 9 Top Overall Projects continued

Rank	City	Segment	Improvement Type
16	Pleasant Hill	5	Trail Corridor
17	Walnut Creek	7	Intersection
18	Concord	1	Connection
19	Pleasant Hill	4	Access
20	Danville	12	Intersection
21	Danville	12	Connection
22	Danville	12	Trail Corridor
23	Alamo	9	Trail Corridor
24	Danville	13	Access
25	Alamo	8	Intersection
26	Pleasant Hill	5	Intersection
27	Concord	1	Intersection
28	Concord	2	Access
29	San Ramon	15	Intersection
30	Alamo	9	Intersection
31	Alamo	9	Access
32	Walnut Creek	7	Connection
33	Alamo	8	Trail Corridor
34	Danville	12	Access

Rank	City	Segment	Improvement Type
35	San Ramon	15	Trail Corridor
36	Pleasant Hill	3	Intersection
37	Pleasant Hill	3	Access
38	Concord	1	Access
39	Concord	2	Trail Corridor
40	Walnut Creek	6	Access
41	Concord	2	Connection
42	Walnut Creek	6	Intersection
43	Danville	11	Trail Corridor
44	Pleasant Hill	3	Connection
45	San Ramon	15	Access
46	Pleasant Hill	5	Access
47	Alamo	10	Trail Corridor
48	Alamo	10	Access
49	Alamo	8	Access
50	Danville	11	Intersection
51	Danville	11	Access
52	Alamo	10	Intersection


IRONHORSE

05 How to Implement the Proposed Projects?

This chapter presents planning-level cost estimates for the proposed improvements, operations and maintenance considerations for the trail, and potential funding sources for capital improvements, operations, and maintenance. In addition, it examines the trail's existing governance structure and highlights strategies that could be used to enhance its current capacity.

To implement the recommended improvements for the Iron Horse Trail, the projects will first need to proceed into detailed design, engineering, potential environmental review, and construction. Each of these project phases will have costs associated with their implementation. Once implemented, the improvements will require a long-term operations and maintenance plan to ensure the Iron Horse Trail remains a safe and comfortable experience for trail users.

COST ESTIMATING

Planning-level cost estimates were developed for the projects. Each project (Chapter 4) is defined by a unique set of typical design elements (Chapter 3). Each design element has a typical linear foot cost (trail configuration and trail amenities) or per unit cost (intersection and access point types) associated with it. The unique combination of design elements and associated unit costs are summed for each project to produce a planning-level cost estimate.

Unit costs were developed by calculating the hard costs and soft costs for each design element. Hard costs include material, equipment, and labor. Soft costs include consultant contracts, project administration, and construction management. Both hard and soft costs are informed by typical costs for the region and similar project types.

Table 10 provides a description of the typical unit costs for the Iron Horse Trail Active Transportation Study, and the various features associated with each design element.

Table 10 **Unit Costs** *continues on next page*

Item	*Unit*	*Unit Cost (w/ soft costs and contingency)*	*Assumptions*
Trail Corridor			
20' Asphalt Trail	MI	$1,370,000	20'-wide asphalt trail, base materials, and shoulders
14' Asphalt Trail	MI	$960,000	14'-wide asphalt trail, base materials, and shoulders
6' Asphalt Trail	MI	$680,000	6'-wide asphalt trail, base materials, and shoulders
6' Cantilever Pedestrian Trail	MI	$12,550,000	6'-wide pedestrian trail, cantilever structure and footings, and railings
Undercrossings & Bridges			
Undercrossing Retrofit	EA	$320,000	Regrading of 200 LF of existing trail, incised trail at undercrossing (does not include cost of trail surface)
Channel Crossing	EA	$650,000	14'-wide trail, 75'-long culvert structure (average dimension)
Channel Crossing Retrofit	EA	$180,000	6'-widening of an existing short channel crossing

Table 10 Unit Costs continued

Item	*Unit*	*Unit Cost (w/ soft costs and contingency)*	*Assumptions*
Trail Amenities			
Wayfinding	MI	$20,000	Typical cost for wayfinding design and implementation along trail and at access points including gateway signs and mapboard kiosks.
Lighting	MI	$890,000	Pedestrian-scale post lights, 30' O.C. spacing
Shade Trees	MI	$150,000	100' O.C. average spacing, assumed to have closer spacing near amenity areas
Green Infrastructure	LF	$300	10'-wide bioswale or rain garden
Linear Park	LF	$400	30'-wide linear park, includes clearing and grubbing, seating, landscaping, hydration station, shade structures, and flexible lawn space
Native Plantings	LF	$100	10'-wide planting strip, no irrigation
Intersections			
Overcrossing	EA	$21,000,000	16'-wide overcrossing, 80ft-long roadway span, 400'-long ramps from each direction, and railings
Local Intersection	EA	$60,000	Clearing and grubbing to open up sightlines, trail approach improvement to replace bollard with raised median and planting, pavement widening, and ADA ramps
Collector Intersection	EA	$60,000	Clearing and grubbing to open up sightlines, trail approach improvement to replace bollard with raised median and planting, pavement widening, and ADA ramps
Arterial Intersection	EA	$70,000	Clearing and grubbing to open up sightlines, trail approach improvement to replace bollard with raised median and planting, significant pavement widening, and ADA ramps
Connection from Trail to On-Street Bikeway / Street Access	EA	$20,000	Specialty striping, curb cut, ADA ramp, ADA parking, and signage
Trail Crossing Improvements	EA	$51,000	Benches, asphalt pavement, roundabout, landscape, irrigation, and decorative fence
Access Points			
New Residential/ Open Space Access	EA	$24,000	Clearing and grubbing, boulder seating, asphalt paving, landscape, irrigation, and decorative fence
New Commercial/ Business Park Access	EA	$115,000	Clearing and grubbing, benches, plaza paving, landscape, irrigation, and bike racks
New Access to Adjacent Parking Lot	EA	$3,500	Clearing and grubbing, asphalt paving, and signage
New School Access	EA	$90,000	Clearing and grubbing, benches, plaza paving, landscape, irrigation, school garden, and decorative fence and gate
Existing Access Improvements	EA	$18,000	Clearing and grubbing, benches, asphalt widening, landscape, irrigation, and decorative fence
Access Channel Crossing	EA	$2,160,000	12'-wide concrete trail, 250'-long bridge structure (average dimension), and railings

Project Costs

Overall project costs are shown for improvements required to achieve this Study's vision and provide a comfortable user experience. An estimated $80 million would be required to provide for the identified trail corridor improvements, trail amenities such as lighting, wayfinding, shade trees, and landscaping, intersection improvements, and access enhancements. The average per mile cost is approximately $2.5 million, excluding segment 2 which has a per mile cost of $18 million because it includes a new grade separated crossing at Monument Boulevard.

Approximately $30 million of opportunities for green infrastructure and new and enhanced linear parks along the study area were also identified. These improvements could greatly enhance user experience, recreation, water quality, and ecology, but are not critical for achieving the Study vision.These additional costs are provided as a footnote to Table 11.

Project costs are shown in Table 11 by segment and summed by jurisdiction, and the top-ranked projects per jurisdiction are starred for reference.

Table 11 **Planning-Level Cost Estimates by Jurisdiction** *continues on next page*

Concord

Segment	1	2
Extents	Mash through Willow Pass	Willow Pass through Monument
Length (mi)	2.5	1.5
Per Mile Cost	$2,753,200	$18,175,900
Total Cost	**$6,883,000**	**$27,263,800**
Hard Costs	$4,779,900	$18,933,200
Trail Corridor	★ $2,034,490	$1,153,200
Undercrossings & Bridges	$442,772	$221,400
Trail Amenities	$1,816,932	$1,029,800
Intersections	$129,400	★ $12,000
Intersection overcrossing	$0	$15,000,000
Access Points	$356,280	$1,516,800
Soft Costs	$955,975	$3,786,600
Contingency	$1,147,170	$4,544,000
Cost Per Jurisdiction		**$34,146,800**

**Opportunities for $7.1 million of green infrastructure improvements*

Pleasant Hill/CCC

Segment	3	4	5
Extents	Monument to Las Juntas	Las Juntas through Jones	Jones through Walden
Length (mi)	1.8	0.4	0.5
Per Mile Cost	$2,343,200	$2,607,500	$2,474,800
Total Cost	**$4,217,700**	**$1,043,000**	**$1,237,400**
Hard Costs	$2,928,900	$724,300	$859,300
Trail Corridor	★ $1,507,300	$304,800	$436,600
Undercrossings & Bridges	$0	$0	$0
Trail Amenities	$1,152,900	$233,100	$333,900
Intersections	★ $176,000	$94,000	$76,400
Intersection overcrossing	$0	$0	$0
Access Points	$92,700	$92,400	$12,400
Soft Costs	$585,800	$144,900	$171,900
Contingency	$703,000	$173,800	$206,200
Cost Per Jurisdiction			**$6,498,100**

**Opportunities for $3.9 million of linear park improvements*

Table 11 Planning-Level Cost Estimates by Jurisdiction continued

Walnut Creek

Segment	6	7
Extents	Walden to Ygnacio Valley	Ygnacio Valley through Danville/I-680
Length (mi)	0.75	1.5
Per Mile Cost	$2,132,000	$3,026,700
Total Cost	**$1,599,000**	**$4,540,100**
Hard Costs	$1,110,400	$3,152,900
Trail Corridor	★ $584,800	★ $1,123,400
Undercrossings & Bridges	$0	$900,000
Trail Amenities	$447,300	$951,300
Intersections	$41,000	$116,000
Intersection overcrossing	$0	$0
Access Points	$37,300	★ $62,200
Soft Costs	$222,100	$630,600
Contingency	$266,500	$756,700
Cost Per Jurisdiction		**$6,139,100**

**Opportunities for $1.6 million of green infrastructure improvements*

Alamo

Segment	8	9	10
Extents	Danville/I-680 to Stone Valley	Stone Valley to South Ave	South Ave through Wayne
Length (mi)	2.5	0.5	1.0
Per Mile Cost	$2,914,800	$2,380,800	$2,415,600
Total Cost	**$6,995,400**	**$1,190,400**	**$2,415,600**
Hard Costs	$4,857,800	$826,700	$1,677,500
Trail Corridor	$2,223,900	★ $418,200	$912,400
Undercrossings & Bridges	$0	$0	$0
Trail Amenities	$2,215,500	$277,200	$604,800
Intersections	★ $246,000	$94,000	$123,000
Intersection overcrossing	$0	$0	$0
Access Points	$172,400	$37,300	$37,300
Soft Costs	$971,600	$165,300	$335,500
Contingency	$1,165,900	$198,400	$402,600
Cost Per Jurisdiction			**$10,601,400**

Table 11 Planning-Level Cost Estimates by Jurisdiction continued

Danville

Segment	11	12	13
Extents	Wayne through Love Lane	Love Lane through San Ramon Valley	San Ramon Valley through Fostoria
Length (mi)	1.0	0.7	3.0
Per Mile Cost	$2,411,400	$2,823,000	$2,561,800
Total Cost	**$2,411,400**	**$1,976,100**	**$7,685,300**
Hard Costs	$1,674,600	$1,372,300	$5,337,000
Trail Corridor	$807,200	$560,100	★ $2,413,400
Undercrossings & Bridges	$0	$0	$671,400
Trail Amenities	$617,400	$428,400	$1,845,900
Intersections	$123,000	★ $140,000	★ $210,000
Intersection overcrossing	$0	$0	$0
Access Points	$127,000	$243,800	$196,300
Soft Costs	$334,900	$274,500	$1,067,400
Contingency	$401,900	$329,400	$1,280,900
Cost Per Jurisdiction			**$12,072,800**

**Opportunities for $10 million of green infrastructure and linear park improvements*

San Ramon

Segment	14	15
Extents	Fostoria to Montevideo	Montevideo through Alcosta
Length (mi)	2.4	1.9
Per Mile Cost	$2,301,000	$2,391,300
Total Cost	**$5,522,400**	**$4,543,500**
Hard Costs	$3,835,000	$3,155,300
Trail Corridor	★ $1,927,400	$1,540,300
Undercrossings & Bridges	$0	$0
Trail Amenities	$1,474,200	$1,375,600
Intersections	★ $128,000	$117,400
Intersection overcrossing	$0	$0
Access Points	★ $305,400	$122,000
Soft Costs	$767,000	$631,000
Contingency	$920,400	$757,300
Cost Per Jurisdiction		**$10,065,900**

**Opportunities for $8.5 million of green infrastructure and linear park improvements*

OPERATIONS AND MAINTENANCE (O+M)

To realize the vision set forth in this Study, the Iron Horse Trail will require a new approach to governance—one that provides a new funding stream for trail operations and maintenance (O+M).

Existing O+M

The existing Iron Horse Trail corridor is owned by Contra Costa and Alameda Counties and is maintained by several agencies, including the East Bay Regional Park District (EBRPD), the two counties, and some of the other jurisdictions along the corridor.

The formal agreement between Contra Costa County and EBRPD is a license agreement, which outlines the specific areas and tasks that each entity is responsible for maintaining.

EBRPD is responsible for maintaining the paved 10-foot wide trail and five feet of the corridor on either side of the trail, as well as specific driveway sections, access points, and other areas along the corridor. EBRPD manages weed abatement within 5 feet of the trail and maintains the pavement, gravel shoulders, gates, signs, fences, and bollards, among other tasks. The County's Public Works Department is responsible for maintaining the remaining areas of the corridor, except those managed by other local jurisdictions.

EBRPD's maintenance funds come from a mix of sources, including Measure WW, Measure J, and revenue generated from Community Facilities Districts (CFDs). The County's maintenance funds come from easements and licenses from private entities and utilities.

An Iron Horse Corridor Management Program Advisory Committee was authorized in 1997 to assist Contra Costa County in developing a management program for the Iron Horse Corridor. The Committee typically meets four times per year to review the trail's financial resources and discuss current projects along the corridor.

COST ESTIMATE BENCHMARKING

EBRPD estimates its maintenance costs for paved trails to be approximately $25,000/mile/year. In addition to EBRPD maintenance costs, Contra Costa County typically spends an average of $115,000 annually on the Iron Horse Trail corridor for tree trimming, mowing, and spraying. The maintenance costs (per mile per year) of other comparable trails are shown in Table 13. The improvements outlined in this Study will increase these costs significantly, closer to that of the American River Parkway, and will require a new strategy for O+M.

Table 13 **O+M Cost Estimate Benchmarking**

Cost/ mile/year	Length (mi)	Facility
$10,600	2	**Mill Valley to Corte Madera Trail** Northern California
$24,000	12	**East Bay Greenway** Northern California
$29,390	<1	**Central Marin Ferry Connector**
$7.9 mil	1.45	**High Line** New York City
$1.13 mil	15	**San Antonio River Walk** San Antonio, Texas
$256,500	23	**American River Parkway** Sacramento, CA
$285,700	3.5	**Katy Trail** Dallas, TX

Management Structures

There are several different structures that are typically used for trails and can be considered for the Iron Horse Trail. Table 14 identifies some common management structures used by trails across the United States, and lists the pros and cons associated with each type.

Table 14 **Trail Management Structures**

Management Structure	Pros/Cons
A **single governmental organization** directly oversees management of path O+M.	+ **Management structure used for paths managed by a single agency.** - Not conducive to multi-jurisdictional coordination.
A **non-profit organization** establishes an independent group to coordinate the various jurisdictions and run O+M.	+ **Able to draw funding from a larger pool of sources, including private funding** + **More flexibility with program development, advocacy, and communications** - No authority of an elected body or landowner - No dedicated funding source without assistance from local, state, or federal funding mechanisms
A **cooperative agreement** may divide the responsibilities for O+M among multiple agencies.	+ **Allows for agencies to manage the trail within their jurisdiction, while a non-profit group or authority oversees the project vision through planning, programming, and fundraising** - Potential for inconsistent management throughout corridor
A **Joint Powers Authority** (JPA), typically guided by a governing board, is a legal entity that allows two or more public agencies to jointly exercise common powers.	+ **Allows for one entity to oversee a trail over multiple jurisdictions** + **Can pursue donations and grants by establishing a nonprofit** - Cost considerations for establishing and running a new entity (admin, overhead, etc.)
In a **commission**, governmental and non-governmental entities are part of a governing board.	+ **Governmental and non-governmental entities are part of governing board** + **Stable funding source from membership fees** + **Can pursue donations and grants by establishing a nonprofit** - Membership fees are relative to population and trail length, which may result in unequal distribution across the corridor
A **Special District** is a public agency created to provide one or more specific services to a community.	+ **Creates a designated funding stream** + **Provides local accountability as board members are elected by the districts' voters** - Funding requires voter approval

A NEW MANAGEMENT APPROACH

The existing management structure for the Iron Horse Trail has been successful in managing the trail as it exists today, which involves a narrow paved path and limited amenities. However, a new strategy will be needed to ensure there are adequate funds available to implement and maintain the proposed projects outlined in Chapter 4.

One consideration would be to formalize the existing management structure, in which different entities are responsible for maintaining different sections of the trail, by creating a Joint Powers Authority (JPA). The JPA would be a new separate legal entity with a shared vision and responsibility for managing and maintaining the trail.

The creation of a JPA could formalize the existing partnership between Contra Costa County, EBRPD, and other entities along the trail, enabling them to more effectively share resources and coordinate O+M tasks. It would also offer an opportunity to bring additional partners into the governance strategy for the trail. Each member agency of the JPA could allocate a portion of their funding to support the administrative and operating expenses of the new entity. Potential partners include Contra Costa and Alameda Counties, EBRPD, the Contra Costa Transportation Authority (CCTA), and the cities and other local jurisdictions along the corridor (see Table 15).

Additional funding resources for O+M could come through state and federal funding sources as well as private sources. Local bond measures may also provide a potential future funding source for the trail. While bond measures such as Measure WW have been successful in funding parks and recreation projects in Contra Costa County in the past, they can be challenging to implement because they must have a majority approval to get on the ballot, and once there, typically require a two-thirds approval vote by county voters.

Table 15 **Iron Horse Trail O+M Structure**

Existing Partners
Contra Costa County
Alameda County
East Bay Regional Park District (EBRPD)
Potential Additional Partners
Contra Costa Transportation Authority (CCTA)
Local Jurisdictions: Concord, Pleasant Hill, Walnut Creek, Alamo, Danville, San Ramon, Dublin, Pleasanton

Because the trail is transitioning from a recreational resource to an active mobility corridor focused on transportation, new transportation-related funding may become available. Additionally, trail-oriented development could provide funding opportunities through new taxes, fees, and revenue generated through programming and other events.

Finally, a nonprofit group such as a "Friends of the Iron Horse Trail" could be established to help provide funding for O+M through private donations. These could include foundation, corporate, and individual donations. This nonprofit could help develop the vision of the trail through programming and events, coordinate volunteers for maintenance and restoration tasks, and increase revenue through fundraising activities. The nonprofit organization could also pursue state and federal grants.

Operations and Maintenance (O+M)

Maintenance activities for the trail may be routine or remedial, and will vary depending on the trail configuration, amenities, and specific context of different locations along the trail. Areas that have higher demand, such as those near San Ramon or Walnut Creek, may require higher levels of maintenance than those areas that have lower demand. Table 16 provides examples of typical O+M tasks for trails along with their suggested frequencies.

ROUTINE

Routine maintenance refers to the day-to-day regimen of litter pick-up, trash and debris removal, weed and dust control, path sweeping, vegetation trimming, and other regularly scheduled activities. Some routine maintenance may be conducted on a seasonal basis.

REMEDIAL

Remedial maintenance refers to repairing, replacing, or restoring major components that have been destroyed, damaged, or significantly deteriorated from normal usage and old age. Some items ("minor repairs") may occur on a five to ten-year cycle, such as repainting or replacing signage. Major reconstruction items will occur over a longer period or after an event such as a flood. Examples of major reconstruction include repaving a path surface or replacing railings and other site elements.

Table 16 **O+M Tasks and Cost Estimates for the Iron Horse Trail**

Task	Type	Suggested Frequency	National Averages
Path sweeping and debris removal		Weekly; after rain events	$1,200-$2,500
Concrete repair (periodic removals)		As needed	$5,000-$10,000
Re-mark pavement symbols and striping		1-3 years, as needed	$250-$1,500
Sign repair/ replacement		1-3 years	$200-$800
Gates and fencing repair		As needed	$500-$1,500
Clearing of drainage culverts		After storm events	$400-$800
Structures maintenance (cyclic)		Bi-annually	$500-$2,000
Structures maintenance (periodic renewals)		Bi-annually	$1,000-$3,500
Lighting maintenance		As needed	$1,000-$3,000
Site furnishings		As needed	$800-$2,000
Graffiti removal		Immediately	$800-$1,500
Restroom maintenance		Daily	$500-$1,000
Landscaping		Weekly	$5,000-$8,000
Enforcement and safety		Daily	Two FTE

O+M COST CONSIDERATIONS FOR THE IRON HORSE TRAIL

By implementing the projects outlined earlier in this Study, the O+M costs for the corridor are expected to rise. Enhanced lighting and amenities would likely result in an additional need for routine maintenance along the corridor. Additionally, enhanced or new access points may require new security measures, which are not included in the trail's current O+M costs. Specialty paving at mixing zones, signage and pavement markings, and the presence of a wider trail would also require additional maintenance. A full-time trail coordinator could help ensure that all O+M needs are addressed in a timely manner, which would increase the trail's existing administrative and personnel costs.

O+M AND CAPITAL IMPROVEMENT FUNDING OPPORTUNITIES

There are several potential funding sources that can be considered for the Iron Horse Regional Trail capital improvements and O+M costs. These potential sources are outlined in the following pages. Local and private funding sources can potentially be used for both routine and remedial maintenance, while grant programs are mainly relevant for major capital improvement costs. Grant programs typically cannot be used for maintenance.

LOCAL GOVERNMENT FUNDING/TAXES/FEES

Local and regional funding opportunities may take several forms, from government budget allocation to local fees and taxes. Specific opportunities may include:

Allocation in Government Budget

General Fund

Local Bond Measures

- Measure J: Contra Costa County's Measure J program provides funding for pedestrian, bicycle, and trail facilities as well as local street maintenance and improvements.
- Measure WW: Measure WW provides funding to expand regional parks and trails in Contra Costa County, as well as to preserve local open space and recreation areas.

Utility Lease Revenue

Enhanced Infrastructure Financing Districts (EIFDs)

- EIFDs were approved by the California Legislature in 2015 to allow communities to establish specific districts in which they can collect local property tax revenues to fund local infrastructure projects.

REGIONAL SOURCES

Bay Area Air Quality Management District (BAAQMD) Grant Programs

- BAAQMD funds support bicycle facility and other greenhouse gas reduction projects.

One Bay Area Grants

- Grant program administered by the Metropolitan Transportation Commission that provides federal funds for regional transportation priorities. Eligible projects include local street and road maintenance, streetscape enhancements, and bicycle and pedestrian improvements, among others.

STATE SOURCES

State-administered programs include:

Active Transportation Program (ATP)

- The program consolidates previous existing state and federal transportation programs, including the Transportation Alternatives Program (TAP) and Safe Routes to School (SRTS) Program into a single program for improving active transportation facilities in the state of California. Eligible projects include improvements to existing bikeways and walkways which improve mobility, access, or safety for non-motorized users.

Recreational Trails and Greenways Grant Program

- The California Natural Resources Agency provides funding for non-motorized infrastructure development and improvement projects that promote access to parks, waterways, and outdoor recreational pursuits.

Parks and Water Bond Act of 2018 (Proposition 68)

- The Per Capita Program, Statewide Park Program (SPP), and Recreational Infrastructure Revenue Enhancement (RIRE) Program provide funding for projects that create or improve parks and recreation infrastructure.

FEDERAL SOURCES

Grants are one potential source of funding, typically available on a one time per cycle basis. Specific federal grant programs may include:

Recreational Trails Program (RTP)

- Annual federal funding program for recreational trails and trails-related projects. Eligible applicants include cities, counties, public agencies, and nonprofit organizations. The program is administered by the California Department of Parks and Recreation.

Highway Safety Improvement Program (HSIP)

- HSIP is a data-driven program aimed at reducing traffic fatalities and injuries on all public roads. Eligible projects include crossing treatments, traffic calming projects, and other bicycle and pedestrian safety improvements.

Rivers, Trails, and Conservation Assistance Program (RTCA)

- A National Park Service program that supports community-led natural resource conservation and outdoor recreation projects.

PRIVATE FUNDING

Private funding may come in the form of trail-oriented development, advertising opportunities, individual donations, crowdfunding, fundraising programming and events, and corporate sponsorships.

Private Donations

- A nonprofit could solicit individual and corporate private donations for the trail through various fundraising activities.

Trail-Oriented Development

- Revenue generated by new development along the trail could be used for trail enhancements, operations, and maintenance.

Events and Programming

- The trail may present opportunities for programming and events at some of its access points. Revenue generated from ticket sales, or fees collected from vendors such as pop-up stores and food trucks, can potentially be used for trail O+M.

Advertising Revenue

- Advertising opportunities may include advertisements placed on informational and wayfinding kiosks, benches and shade structures, and charging stations for e-bicycles, scooters, or other personal mobility devices. Revenue generated from these advertisements could provide funding for trail O+M.

IN-KIND

Adopt-a-Trail

- Corporate Adopt-a-Trail programs could potentially provide the trail with resources for needed maintenance work, such as keeping it free of litter and other debris. Local businesses can adopt a section of the trail, providing them with a sense of ownership and the opportunity to prominently display their names. Although this is not a comprehensive solution to trail maintenance, it serves as a way to enhance central operations and provide committed partners with a way to give back to their communities.

Table 17 **Funding Sources**

Source	*Design & Engineering*	*ROW Acquisition/ Construction*	*O+M*
Local & Regional Sources			
General Fund/Local Government Allocation			●
Local Bond Measures	●	●	●
Utility Lease Revenue			●
EIFDs			●
One Bay Area Grants	●	●	
BAAQMD Grants		●	
State Sources			
Active Transportation Program (ATP)	●	●	
Recreational Trails and Greenways Grant Program	●	●	
Proposition 68	●	●	
Federal Sources			
Recreational Trails Program	●	●	●
Highway Safety Improvement Program (HSIP)	●	●	
Rivers, Trails, and Conservation Assistance Program (RTCA)	●		
Private Funding			
Private Donations	●		●
Trail-Oriented Development	●		●
Advertising Revenue			●
In-Kind			
Adopt-a-Trail			●

NEXT STEPS

This Study envisions a long-term improvement strategy for the Iron Horse Trail corridor. Although most of the proposed improvement projects will take time to implement, there are some near term steps that can be taken to move the vision for the Iron Horse Trail forward.

The most important near term step is to seek capital improvement funds for priority projects. The priority projects identified in this Study can be selected for early implementation in a number of ways. They can either be bundled as part of a larger regional effort that sets forth improvements for the entire corridor, or they can be included in targeted efforts that prioritize specific segments or intersections of the corridor.

Additionally, the existing governance structure for the Iron Horse Trail should be evaluated to determine if it will be able to adequately manage the enhanced corridor or if the trail would benefit from a new strategy. This Study identifies typical governance structures and funding mechanisms to consider, which can be used to help identify an appropriate structure for the trail.

Finally, targeted efforts can be made to promote new mobility options within the corridor. An e-scooter pilot program could be implemented to introduce the devices to the corridor before any major policy changes are made. An additional SAV study could be conducted to develop goals for a pilot program, further evaluate corridor conditions and needs, and determine next steps for implementation.

Long term actions for the corridor include implementing the proposed projects, developing regional policy recommendations regarding micromobility devices, and establishing a SAV pilot program.