City of Santa Clara Bicycle Plan Update 2018

Prepared by
Alta Planning + Design
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Prepared for

City of Santa Clara
The Center of What's Possible

Acknowledgments

City of Santa Clara

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Executive Summary

Vision Statement:

The City of Santa Clara is a healthy, thriving, and safe city where people of all ages and abilities may easily and comfortably ride a bicycle as a part of their daily lives.

The City of Santa Clara Bicycle Plan Update 2018 (Plan) establishes a long-term vision for improving bicycling in Santa Clara through policy, program, and project recommendations. Through the implementation of this Plan, the city can become a world-class bicycle community that prioritizes health and sustainability for its residents and visitors. This Executive Summary provides an overview of the challenges and opportunities currently experienced by bicyclists in the city as well as a summary of the high-priority projects recommended in this Plan.

Challenges and Needs

- Santa Clara has invested in a 70-mile bicycle network that includes over 11 miles of car-free, shared-use paths.
- Despite the expansion of bike lanes over the past five years, a lack of comfortable bikeways along major arterials and gaps at major barriers leave people who want to bicycle disconnected from employment, transit, school, and retail destinations.
- Over the past five years, 160 people riding a bike were injured as a result of a collision with a motor vehicle (seven percent were serious injuries and none were fatal).
- The lack of a connected and low-stress network may account for the fact that the percentage of people who bicycle to work has not increased over the past five years (less than two percent of commuters bicycle regularly).
- The Calabazas Creek Trail and Guadalupe River Trail frame the City's boundaries near the Bay and provide comfortable bicycle facilities; however, neither trail extends south of Highway 101 to help provide a viable transportation option for the majority of Santa Clara's residents. San Tomas Aquino Creek Trail runs through the center of Santa Clara and crosses several barriers, but access to trailheads from within neighborhoods on low-stress bikeways is limited. All remaining bicycle facilities are painted bicycle lanes or share the road facilities where novice bicyclists and young riders may not feel safe mixing with vehicle traffic.

Opportunities

- Many of Santa Clara's roads are striped with wide travel lanes (12 feet or more) that can be slightly narrowed to create additional space for new or expanded bikeways. Narrowing travel lanes to 10 or 11 feet also has a traffic calming effect that supports a safer travel experience for drivers, bicyclists, and pedestrians.
- Several stormwater channels pass through Santa Clara and wide utility roads that parallel these waterways have been converted to trails (see image below). The City's Creek Trail Master Plan is working to identify opportunities to further expand this network.
- Streets that move fewer than 20,000 motor vehicles per day may be candidates for reconfiguration where two travel lanes in each direction are converted to one in each direction with a two-way center left turn lane. This configuration typically does not add delay to the flow of traffic, provides an easier opportunity for motor vehicles to turn into driveways, makes crossing streets safer for pedestrians, reduces collisions between motor vehicles, and calms traffic speeds. Excess space can be converted into bicycle lanes. Further analysis and community outreach will be required before implementing these recommendations.
- Where parking is underutilized and capacity for parking is available on private property, repurposing on-street parking for bicycle facilities may be an option. The City will conduct further analysis of these areas as part of the implementation of these recommendations.

To read more about the bicycling needs, challenges, and opportunities in Santa Clara today, see Chapter 1.

ROADMAP FOR SUCCESS

Plan Goals

Safety: Design bicycle facilities that are accessible and comfortable for people of all ages and abilities.

Connectivity: Identify, develop, and maintain a complete and convenient bicycle network.

Bicycle Friendliness: Increase bicycling as a comfortable and convenient transportation option through citywide programs and initiatives that encourage and celebrate a strong bicycling culture, educate all roadway users, enforce safe behaviors, and evaluate the City's progress in achieving its vision.

To read more about the City's Vision, Goals, Objectives, and Policies to make Santa Clara a safer, more connected and bicycle friendly community, see Chapter 2.

Plan Recommendations

This Plan recommends 70 miles of new and upgraded on-street bicycle facilities, nine miles of shared use paths (trails), 32 crossing location enhancements, 50 locations for new bicycle parking, and 20 strategic city-wide programs. Recognizing that the City has limited resources, the Plan prioritized thirty-one (31) corridor projects and nine (9) spot improvements for short-term implementation. See Tables ES-1 and ES-2 for a summary of these recommendations and Figure ES-1 for a map of project locations. Projects were prioritized based on the following criteria:

- **Safety/collision reduction**
- **Connectivity**
- **Gap closure**
- **Comfort**
- **Community identified need**
- **Feasibility**

Table ES-1: High Priority Corridor Recommendations

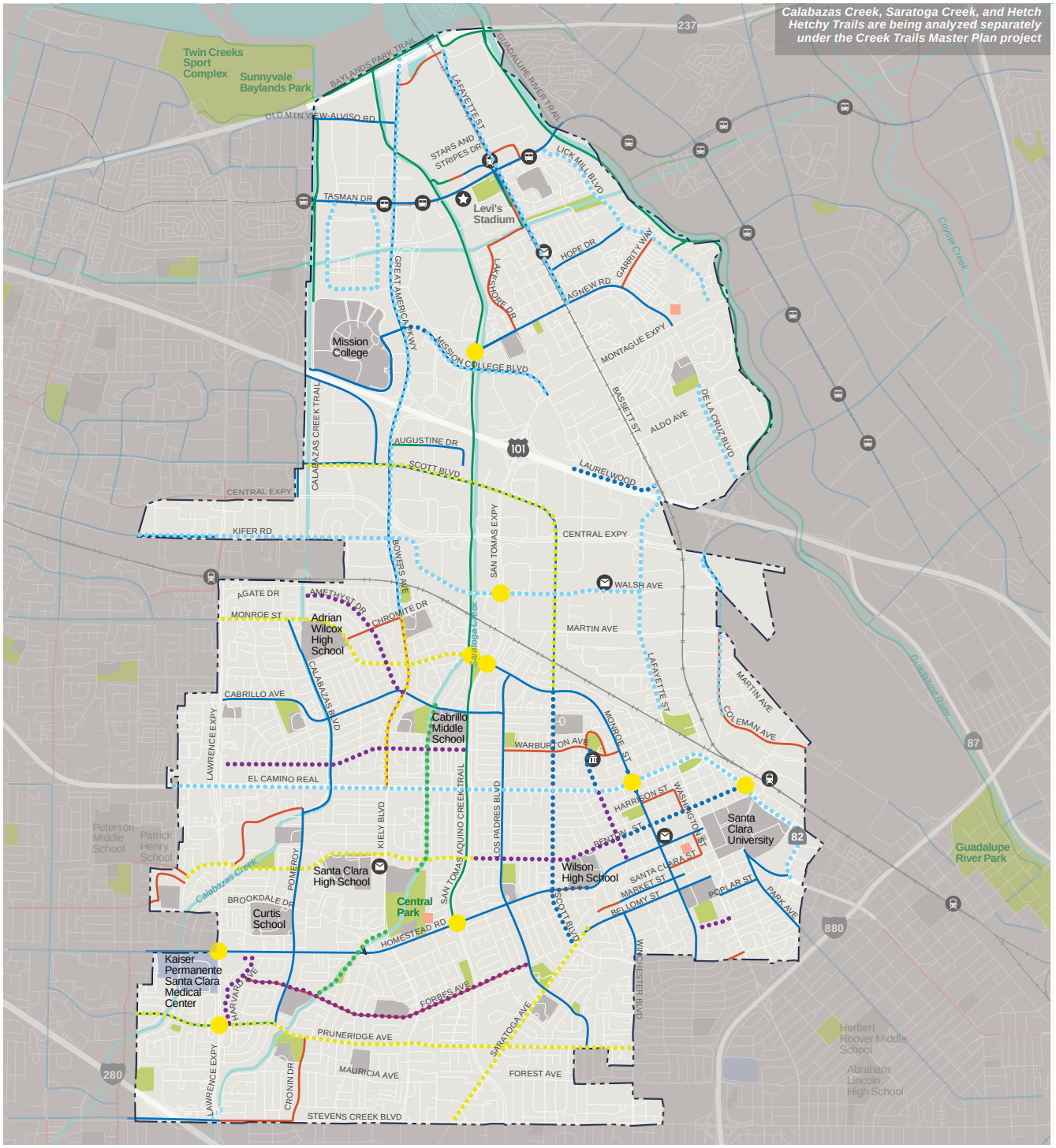
Bikeway Type	Miles	Cost Estimate – Low	Cost Estimate – High
Class I Shared Use Paths	5.83	$4,083,000	$5,832,000
Class II Bicycle Lanes	3.66	$292,000	$1,549,000
Class II Buffered Bicycle Lanes	11.40	$1,482,000	$4,821,000
Class III Bicycle Boulevards	6.58	$495,000	$922,000
Class IV Separated Bikeways	19.21	$4,801,000	$14,885,000
Total	**46.68**	**$11,153,000**	**$28,009,000**

Table ES-2: High Priority Spot Improvement Recommendations

Improvement Type	Number of Recommendations	Cost Estimate – Low	Cost Estimate – High
Intersection Improvements (several)	5	$32,500	$465,000
Protected Intersection	4	$2,255,000	$6,000,000

For full recommendations list and priority projects rankings, see Chapters 3 and 4.

Figure ES-1



Source: City of Santa Clara, Caltrans, US Census, ESRI, VTA. Map produced March 2018.

High-Priority Recommendations & Existing Bikeways

Santa Clara Bicycle Plan Update 2018

N

0 0.5 1 MILES

Existing Bikeways
- Bridge or Undercrossing
- Class I Shared-Use Path
- Class II Bicycle Lane
- Class III Bicycle Route

Recommended Bikeways
- Class I Shared-Use Path
- Class II Bicycle Lane
- Class IIB Buffered Bicycle Lane
- Class III Bicycle Route
- Class IIIB Bicycle Boulevard
- Class IV Separated Bikeway

Proposed Improvements
- Spot Improvement

Destinations + Boundaries
- City Hall
- Train Station
- Light Rail Station
- USPS Office
- Sport Stadium
- School
- Hospital
- Park
- Library

Santa Clara Today

This chapter describes the bicycling environment in Santa Clara today, including a discussion of community needs that will inform the development of recommended infrastructure projects and programs in the community.

Introduction

Santa Clara is well poised to increase bicycling for transportation. It has a mild climate most of the year, is relatively flat, and has a growing network of on-street bikeways and off-street shared use paths. The City has installed bicycle parking in much of the downtown area, and transit services connect to destinations in the region and beyond.

These investments and natural assets provide a foundation upon which the City can continue to build a high-quality citywide network for bicycling—one that is safe and comfortable for everyday use by people of all ages and abilities. This, in turn, promotes a culture that respects and encourages bicycling.

Key Findings

- Santa Clara has invested in a 70-mile bicycle network that includes over 11 miles of car-free shared-use paths
- Despite the expansion of bike lanes over the past five years, a lack of safe and comfortable bikeways along major arterials such as El Camino Real and gaps at major barriers such as US 101 leaves people who want to bicycle disconnected from employment, transit, school, and retail destinations
- The percentage of people who bicycle to work has not increased over the past five years
- Between 2013 and 2017, 160 people riding a bike were injured as a result of a collision with a motor vehicle (seven percent were serious injuries and none were fatal)

Purpose of the Plan

This Bicycle Master Plan Update 2018 establishes a long-term vision for improving bicycling in Santa Clara by updating the previous plan adopted by the City Council in 2009. The Plan Update 2018 provides a strategy to develop a comprehensive bicycling network that creates access to transit, schools, and other destinations. These corridor, intersection, and end-of-trip improvements are paired with education, encouragement, enforcement, and evaluation programs. This document also identifies a plan to implement these projects and programs through prioritization to ensure the City invests scarce resources efficiently for maximum benefit.

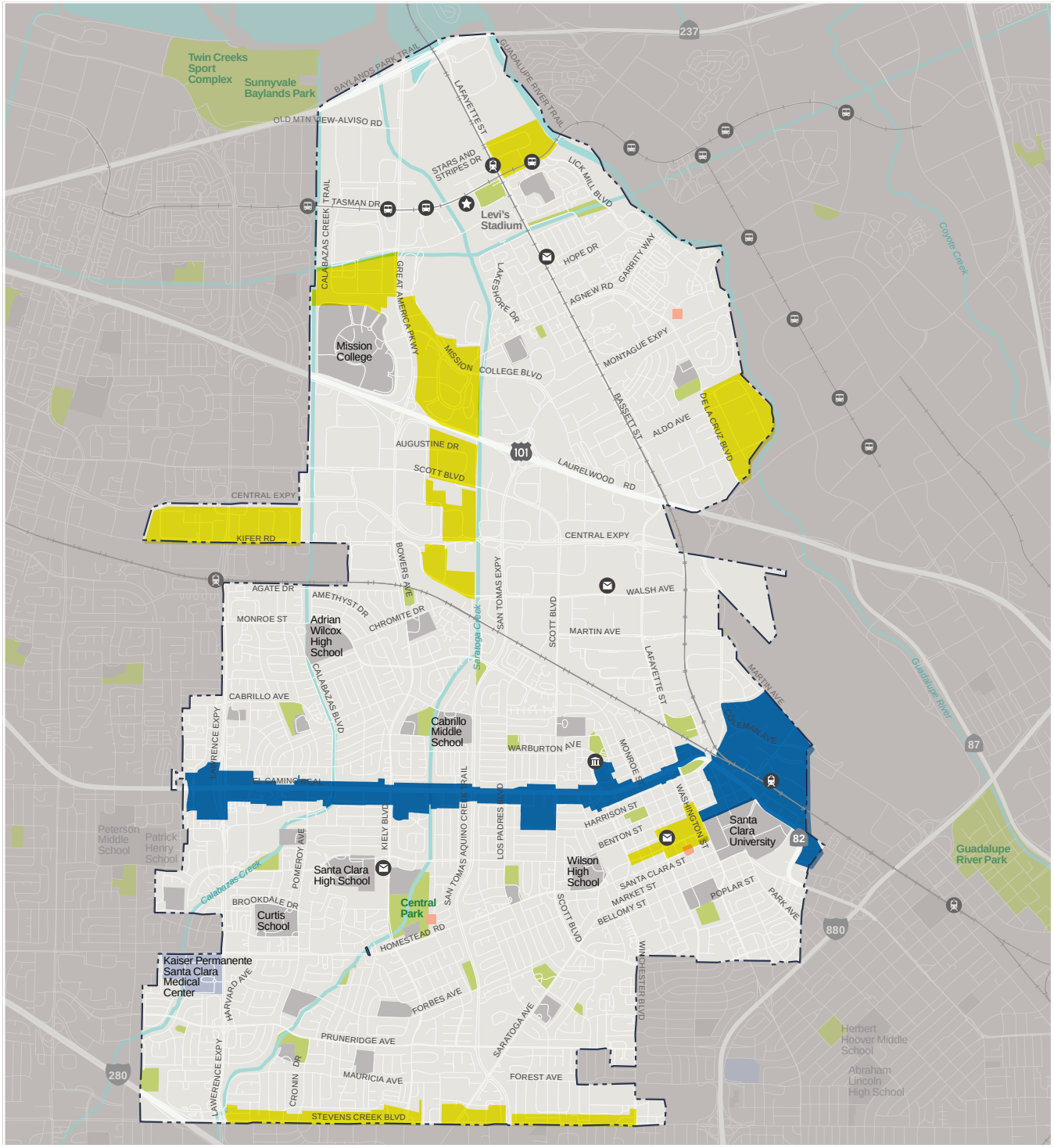
The Plan Update 2018 process provided opportunities for members of the City's Bicycle and Pedestrian Advisory Committee (BPAC) and the public to participate in the development of the Plan Update 2018 by evaluating, commenting, and suggesting ideas for bicycling needs in the city. Updates to the Plan are necessary, as a progressive city is rarely static and the needs of a viable city are dynamic. Ideally, the Plan Update 2018 should be reviewed every five years to update maps, project lists, and priorities as facilities are completed and to keep pace with the development landscape.

Local Context

Land Use & Major Destinations

This Bicycle Plan Update will support Santa Clara's Priority Development Areas (PDAs), the areas where the City plans to focus development in denser, mixed-use areas along transit routes shown in Figure 1. In conjunction with denser development and increased transit service, high-quality bicycling infrastructure both within and that connect to PDAs is intended to offer improved transportation options. The existing and planned land uses in Santa Clara will inform the recommendations in this Plan in an effort to maximize the number of people who will have access to bicycling networks.

Figure 1



Source: City of Santa Clara, Caltrans, US Census, ESRI, VTA. Map produced March 2018.

General Plan Focus Areas

Santa Clara Bicycle Plan Update 2018

N

0 0.5 1 MILES

Focus Areas

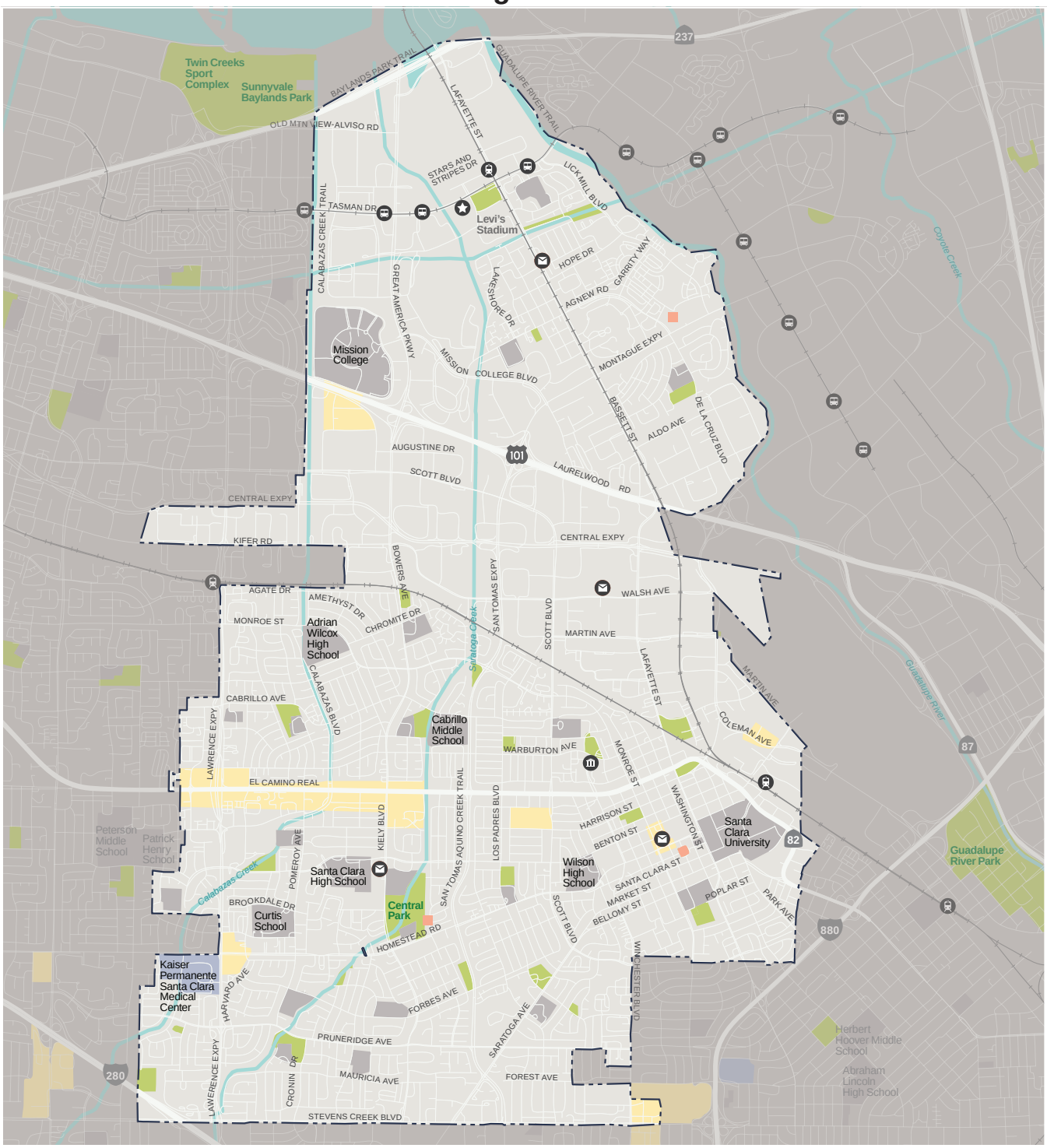
Priority Development Area

***Areas identified by local jurisdictions for new and/or intensified development as part of the region's Sustainable Communities Strategy work.*

Destinations + Boundaries

- City Hall
- Train Station
- Light Rail Station
- USPS Office
- Sport Stadium
- School
- Hospital
- Park
- Library

Figure 2



Source: City of Santa Clara, Caltrans, US Census, ESRI, VTA. Map produced March 2018.

Major Destinations

Santa Clara Bicycle Plan Update 2018

N

0 0.5 1 MILES

Destinations + Boundaries

- City Hall
- Train Station
- Light Rail Station
- USPS Office
- Sport Stadium
- School
- Hospital
- Park
- Shopping Center
- Library

Major destinations in Santa Clara include schools, community centers, parks, libraries, healthcare facilities, shopping centers, city hall, and transit stations, some of which are shown in Figure 2. These destinations are dispersed throughout the city, and will require a comprehensive network of active transportation facilities to encourage people to walk or bicycle instead of driving. Employment density is highest in central and northern Santa Clara along El Camino Real, Lawrence Expressway, Central Expressway, and Highway 101.

Major employers include:

- AMD
- Applied Materials
- Arista
- BAE Systems
- Citrix
- Dell
- Hitachi
- Intel
- Ixia
- Kaiser Permanente
- Marvell
- Mission College
- Nvidia
- Oracle
- Palo Alto Networks
- Santa Clara University
- Texas Instruments
- Vishay

Demographics

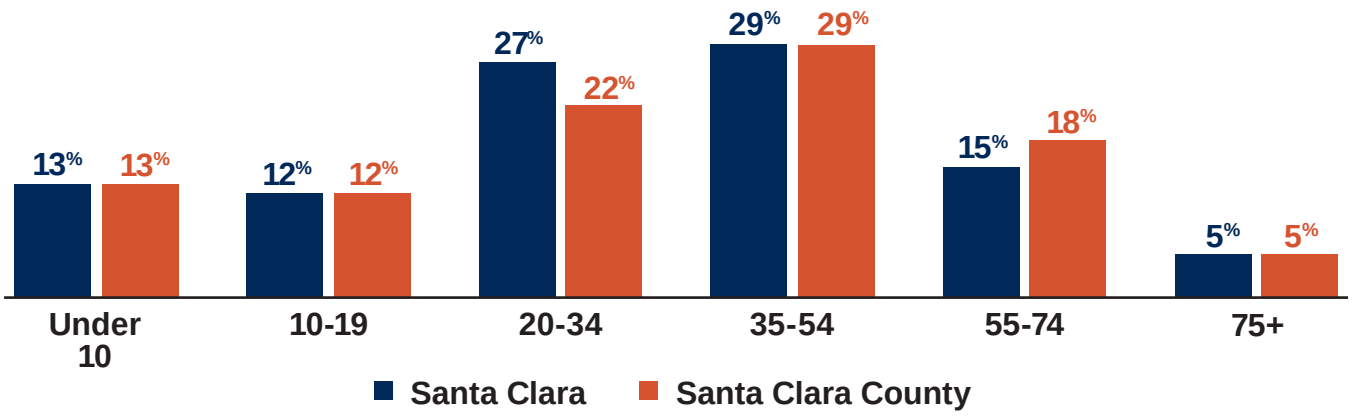
Santa Clara is home to 122,725 residents, according to 2016 American Community Survey five-year estimates. When compared to the county population, Santa Clara (home to Santa Clara University) is slightly younger, with more residents between 20-34 years old, as shown in Figure 3.

A majority of workers commute out of Santa Clara to surrounding cities to work. Only 15.9 percent of commuters who live in Santa Clara work and live in Santa Clara. The average Santa Clara commuter commutes less than 10 miles each way.

Transit Access

Santa Clara is served by several transit providers and routes that offer connections to local and regional destinations. Santa Clara Valley Transportation Authority (VTA) offers local bus and light rail service, and Caltrain connects to San Jose to the south and north up the peninsula to San Francisco. Amtrak and Altamont Corridor Express (ACE) trains connect to the East Bay and Sacramento regions.

Figure 3: Population by Age in Santa Clara and Santa Clara County



Equity

Equity issues are an important part of all planning processes, including development of this Bicycle Master Plan. Historically, communities with large populations of people of non-white races or ethnicities and low-income households have received less neighborhood investment, including less support for facilities and safety improvements for people bicycling. An equity analysis of Santa Clara evaluated citywide factors related to walking and bicycling in addition to identifying neighborhoods that are disproportionately burdened by pollution or other negative impacts. These and other considerations will inform the types of projects and prioritization recommended in this Plan.

Income and Motor Vehicle Access

Santa Clara County has a higher median household income at $101,173 than the state of California at $63,783. Santa Clara is slightly more affluent than the county overall with a median household income of $102,533, as shown in Figure 4.

Just three percent of households in Santa Clara lack access to a vehicle, as shown in Figure 5. Over 75 percent of households have access to two or more motor vehicles. These rates are similar to countywide vehicle access, where over 80 percent of households have access to two or more motor vehicles.

With such widespread vehicle access, few households rely on bicycling out of necessity. To create significant shifts in trips away from driving, bicycling must be convenient and comfortable options to attract more people.

Figure 4: Median Household Income (Source: American Community Survey)

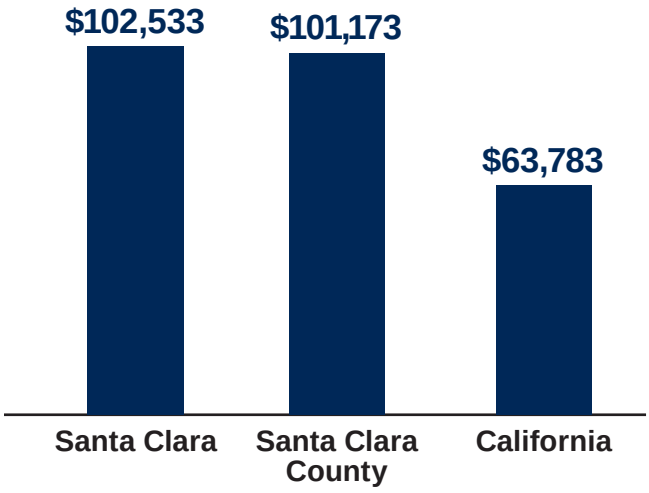
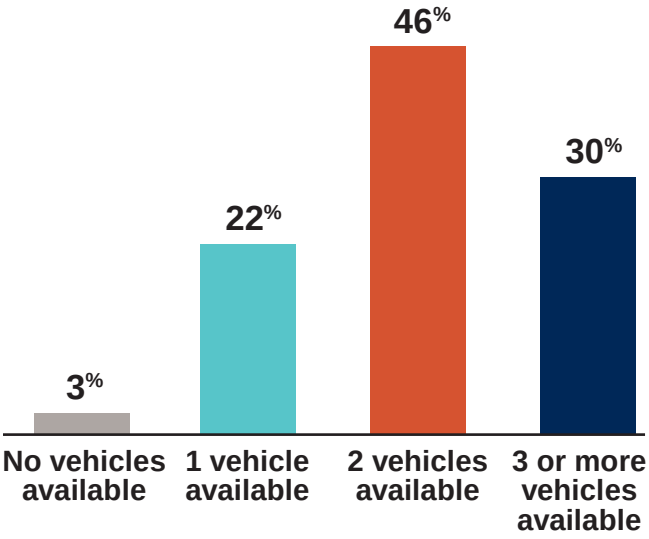


Figure 5: Motor Vehicles Available (Source: American Community Survey)



Communities of Concern

As part of the San Francisco Bay Area's long-range integrated transportation and land use/housing strategy, *Plan Bay Area*, the Association of Bay Area Governments (ABAG), and the Metropolitan Transportation Commission (MTC) analyzed the distribution of benefits and burdens that would result from implementation of the region's preferred planning scenario. To conduct this analysis, ABAG and MTC, in coordination with extensive input from an Equity Working Group and other stakeholders, identified "Communities of Concern" throughout the Bay Area region that meet at least four thresholds listed in Table 1.

Table 1: Community of Concern Factors and Thresholds

Factor	% of Regional Pop.	Community of Concern Threshold
Minority Pop.	54%	70%
Low Income (<200% of poverty) Pop.	23%	30%
Limited English Proficiency Pop.	9%	20%
Zero-Vehicle Households	9%	10%
Seniors 75 and Older	6%	10%
Population with a Disability	18%	25%
Single-Parent Families	14%	20%
Cost-Burdened Renters	10%	15%

Source: Appendix A: Detailed Methodology, Plan Bay Area (2013). http://planbayarea.org/pdf/Draft_Plan_Bay_Area/Appendices_to_Draft_Equity_Analysis_Report.pdf

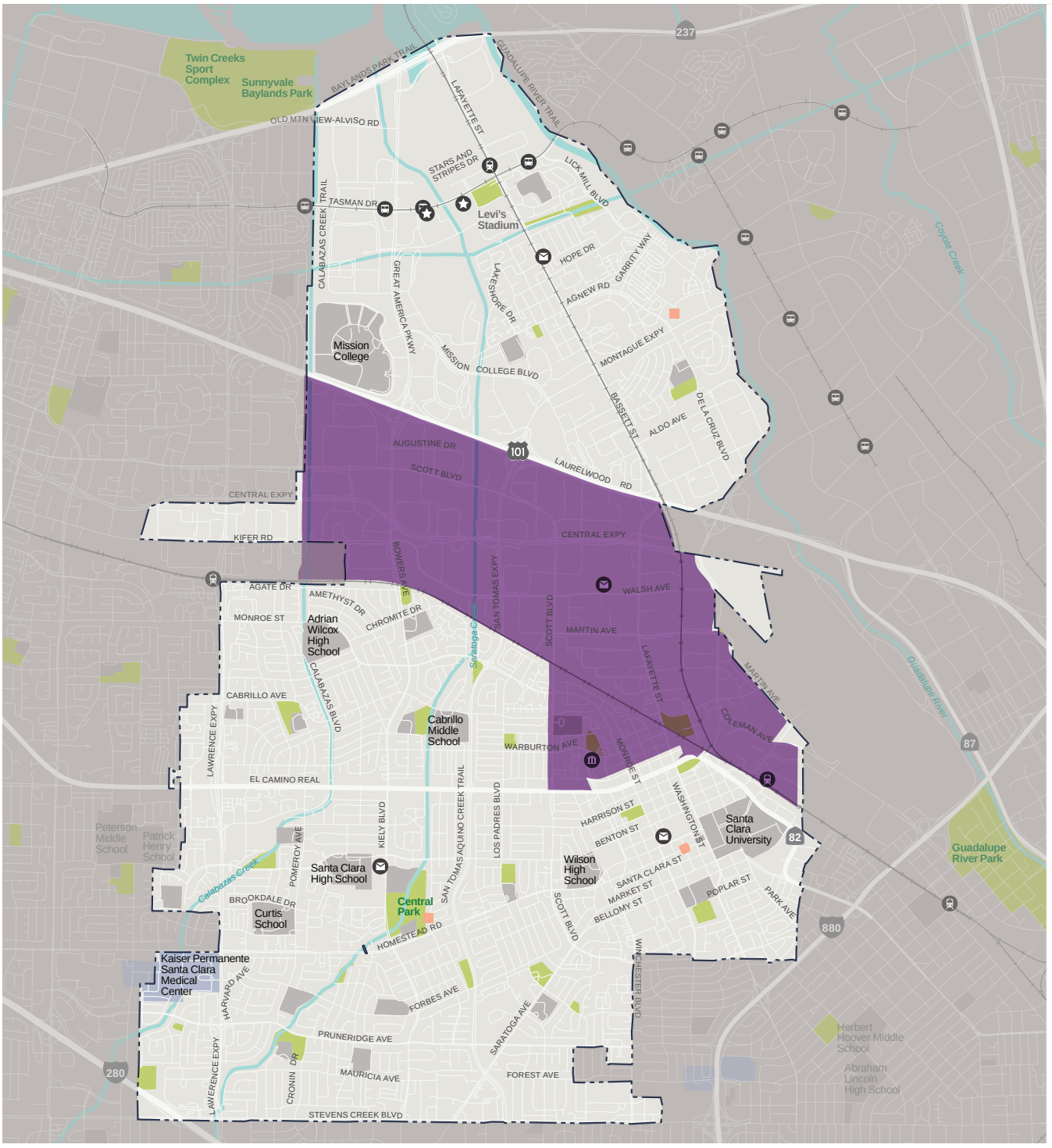
In the City of Santa Clara, there is one Community of Concern, located between US 101 and the Caltrain train tracks. See Figure 6 for a map of Communities of Concern. The bicycling improvements recommended in this Plan will consider the benefits and burdens of those projects on these communities.

CalEnviroScreen

The California Office of Environmental Health Hazard Assessment developed the CalEnviroScreen tool to help identify communities that are disproportionately burdened by multiple sources of pollution. It combines pollution data (such as ozone concentrations and drinking water contaminants) with population indicators (such as birth weight and educational attainment).

This is also a tool used in California's Active Transportation Program grant application scoring. Communities that score in the highest 25 percent of the state are considered to be disadvantaged and receive a small advantage in the competitive funding process. Areas in Santa Clara that meet this threshold are mapped in Figure 7.

Figure 6



Source: City of Santa Clara, Caltrans, US Census, ESRI, VTA. Map produced March 2018.

Communities of Concern

Santa Clara Bicycle Plan Update 2018

N

0 0.5 1 MILES

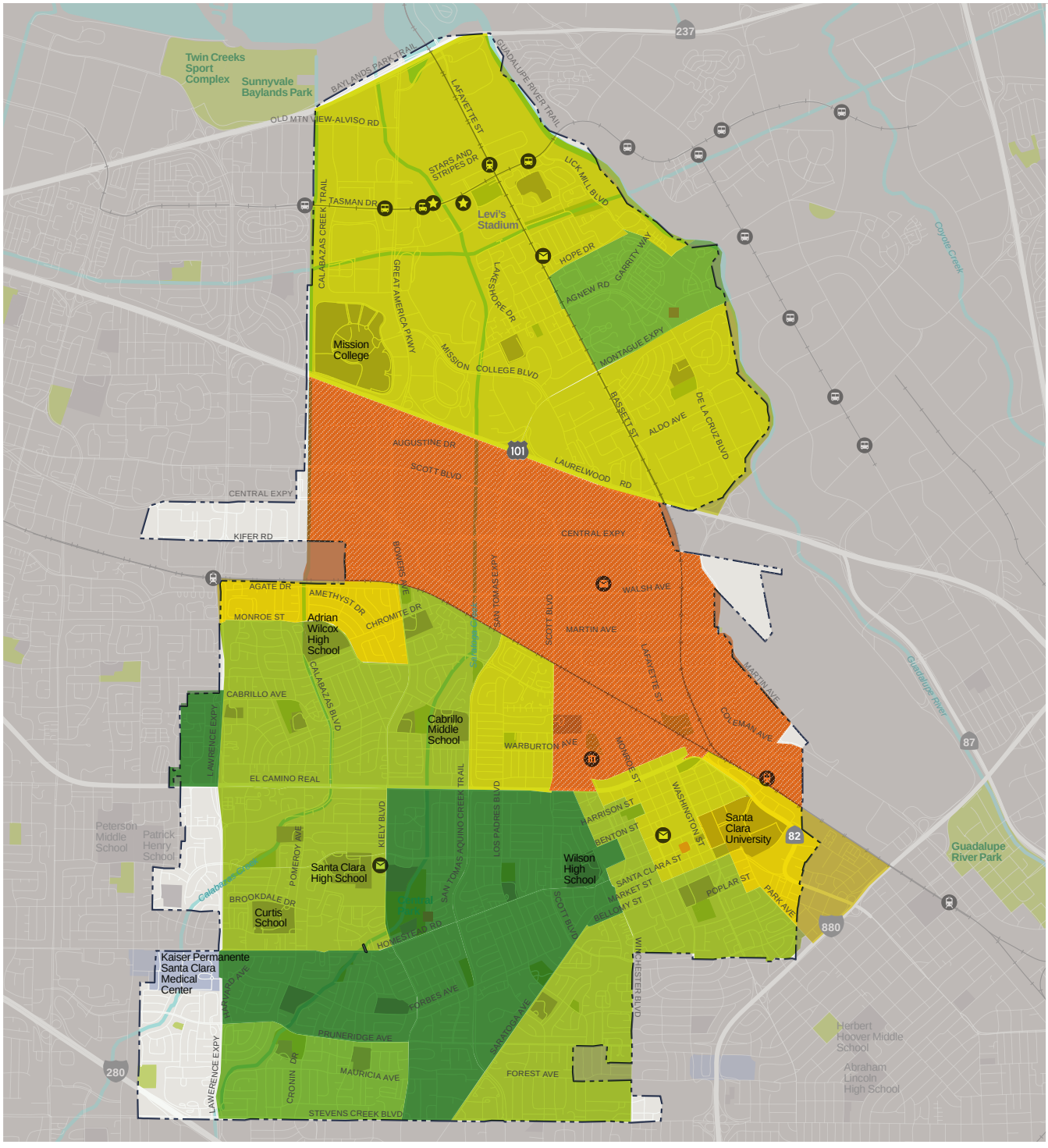
Community of Concern

**As defined by the Metropolitan Transportation Commission

Destinations + Boundaries

- City Hall
- Train Station
- Light Rail Station
- USPS Office
- Sport Stadium
- School
- Hospital
- Park
- Library

Figure 7



Source: City of Santa Clara, Caltrans, US Census, ESRI, VTA. Map produced March 2018.

Cal EnviroScreen 3.0 and Communities of Concern

Santa Clara Bicycle Plan Update 2018

N

0 0.5 1 MILES

Score* (Percentile)

- 0 - 10%
- 11 - 20%
- 21 - 30%
- 31 - 40%
- 41 - 50%
- 51 - 60%
- 61 - 70%
- 71 - 80%
- 81 - 90%
- 91 - 100%
- Community of Concern

*Scoring is based on environmental, health, and socioeconomic conditions. Areas with higher scores are faced with more adverse conditions and areas with lower scores are faced with less adverse conditions.

Destinations + Boundaries

- City Hall
- Train Station
- Light Rail Station
- USPS Office
- Sport Stadium
- School
- Hospital
- Park
- Library

Biking Today

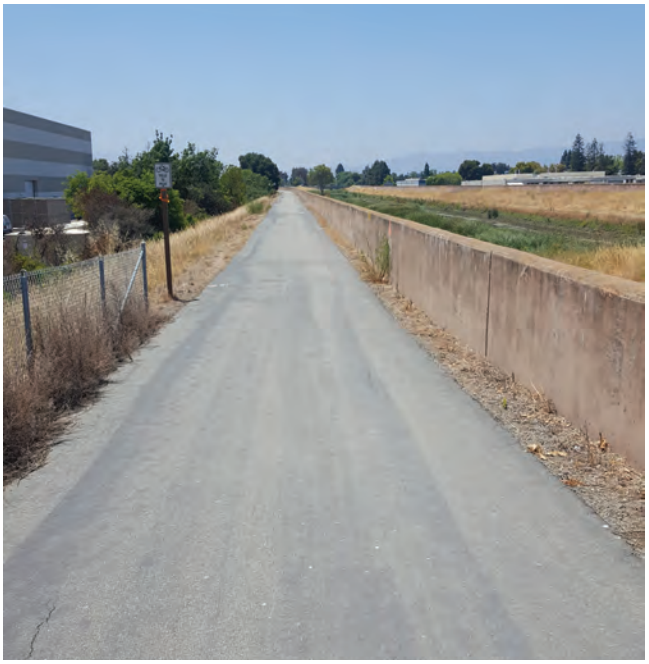
Existing Bicycle Network

The California Department of Transportation (Caltrans) designates four classes of bicycle facilities: Class I shared use paths, Class II bicycle lanes, Class III bicycle routes, and Class IV separated bikeways. The City's current bicycle network has approximately 70 miles of bikeways. Descriptions of each bikeway class are included in the following section, and bikeways are mapped in Figure 8. The County of Santa Clara considers the county expressways as Class III bicycle routes and are counted separately in Table 2.

Table 2: Bikeway 2018 Mileage

Bikeway Type	Miles
Class I Shared Use Paths	10.7
Class II Bicycle Lanes	34.0
Class III Bicycle Routes	13.0
Class III Bicycle Routes on Expressways	11.6
Class IV Separated Bikeways	0
Total	69.3

Class I Shared Use Paths



Class I shared use paths are paved trails completely separated from the street. They allow two-way travel by people bicycling and walking, and are among the most comfortable facilities for children and inexperienced riders as there are few potential conflicts between people bicycling and people driving.

There are currently 10.7 miles of Class I shared use paths in Santa Clara.

Class II Bicycle Lanes

Class II bicycle lanes are striped preferential lanes on the roadway for one-way bicycle travel. Some bicycle lanes include a striped buffer on one or both sides to increase separation from the traffic lane or from parked cars, where people may open doors into the bicycle lane.

There are currently 34 miles of Class II bicycle lanes in Santa Clara.

Class III Bicycle Routes

Class III bicycle routes are signed routes where people bicycling share a travel lane with people driving. Because they are shared facilities, bicycle routes are most appropriate for low-speed and low-volume streets. However, Santa Clara County classifies the County expressways as Class III bicycle routes, with bicycle travel generally expected in the shoulder. Although there are bicycle routes on some of the expressways, the expressways should only be used by bicyclists with advanced skills. Some Class III bicycle routes include shared lane markings or "sharrows" that recommend proper bicycle positioning in the center of the travel lane and alert drivers that bicyclists may be present.

There are currently 24.5 miles of Class III bicycle routes in Santa Clara, which includes bicycle routes on expressways.

Class IV Separated Bikeways

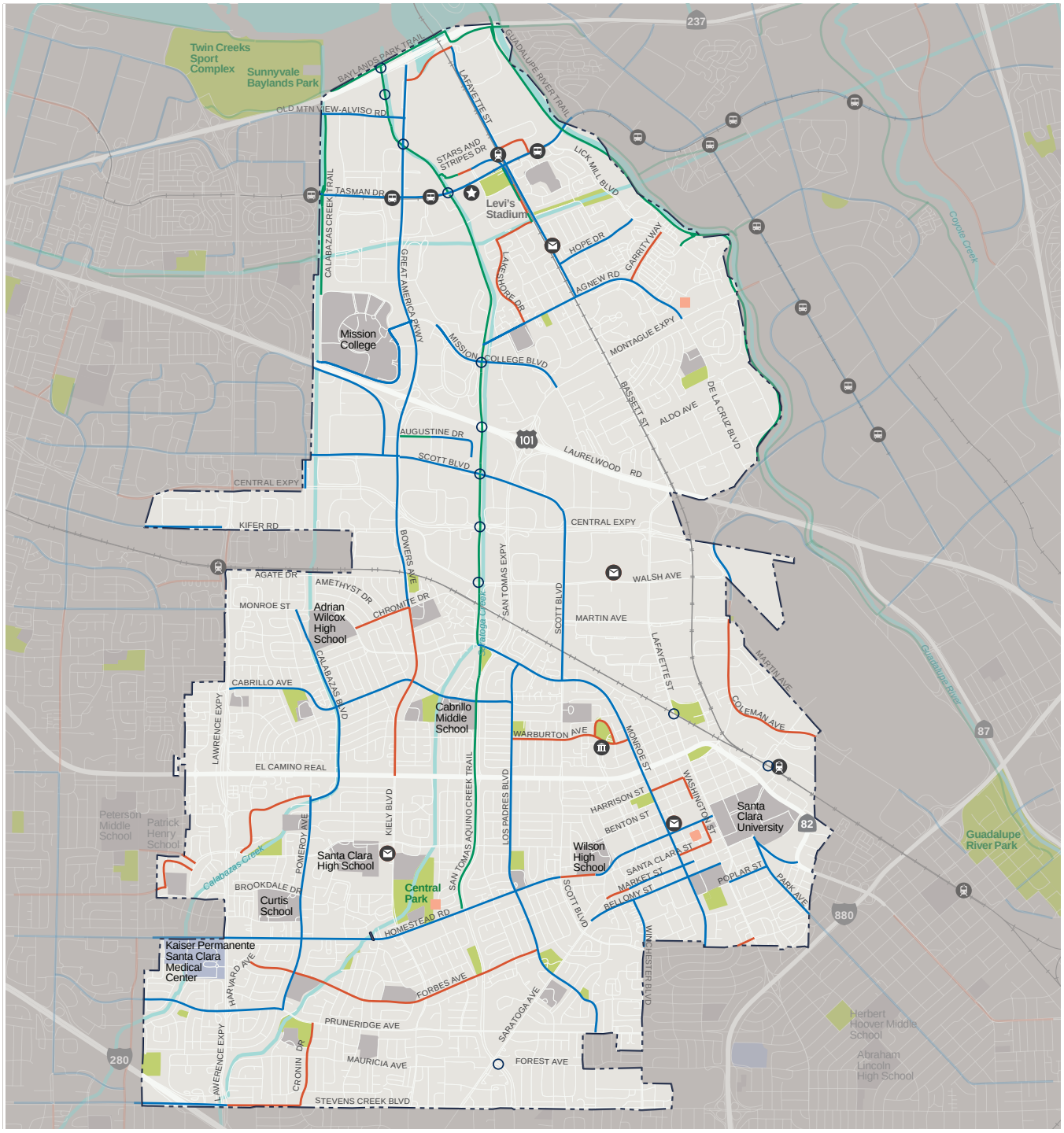
Class IV separated bikeways are on-street bicycle facilities that are physically separated from motor vehicle traffic by a vertical element or barrier, such as a curb, bollards, or vehicle parking aisle. They can allow for one- or two-way travel on one or both sides of the roadway.

No Class IV separated bikeways exist in Santa Clara.

Barriers to Active Transportation

Two freeways cross the City: Highway 101 runs east-west through Santa Clara and State Route (SR) 237 runs east-west along the top border of the city. The Caltrain rail line also runs east-west through the City, south of Highway 101. San Tomas Expressway/ Montague Expressway runs north-south through the center of the city, Lawrence Expressway runs along much of the western border of the city, and Central Expressway runs east-west through the city south of Highway 101. These transportation features create challenges for people walking and bicycling in some places, as crossings are limited.

Figure 8



Source: City of Santa Clara, Caltrans, US Census, ESRI, VTA. Map produced March 2018.

Existing Bikeways

Santa Clara Bicycle Plan Update 2018

N

0 0.5 1 MILES

Bikeways

- Bridge or Undercrossing
- Class I Shared-Use Path
- Class II Bicycle Lane
- Class III Bicycle Route

Destinations + Boundaries

- City Hall
- Train Station
- Light Rail Station
- USPS Office
- Sport Stadium
- School
- Hospital
- Park
- Library

Support Facilities

Support facilities consider bicyclist needs throughout their journey. People are less likely to ride their bicycles to destinations without secure bicycle parking and other amenities, including showers or lockers at destinations, repair stations with basic tools, and wayfinding or guide signs to help bicyclists navigate along the way.

Bicycle Parking

A complete bicycle network includes secure bicycle parking at each trip end. Bicycle parking can generally be divided into two categories: short-term bicycle racks and long-term higher-security parking.

The City has installed short-term bicycle parking throughout the city on sidewalks and in plazas. These racks have been funded primarily through the Transportation Fund for Clean Air, provided by the Bay Area Air Quality Management District.

Long-term bicycle parking is available in the form of on-demand bike lockers. BikeLink, a private vendor, has installed 60 lockers at 12 locations across the city shown in Table 3. To use the lockers, bicyclists purchase a BikeLink card online or at one of three vendors in the city. Once activated, the card can be loaded with funds to purchase time at 3-5 cents per hour.

New development projects within Santa Clara are required to provide bicycle parking and locker facilities consistent with Chapter 18.74 of Santa Clara's Municipal Code. For information on bicycle parking placement, see Appendix B: Bicycle Facility Design Guidelines and VTA's Bicycle Technical Guidelines, Chapter 10.

Table 3: Bicycle Locker Locations

Locker Location	Spaces
Santa Clara Great America Station	12
Lawson Lane Building A	24
Lawson Lane Building B	24

Caltrain also offers bike parking at many stations, including Santa Clara. There are 18 bike racks and 54 bike locker spaces at the Santa Clara Train Station.

Bicycle Trips

The most consistent bicycling data comes from American Community Survey 5-year estimates, which record the mode of transportation people use to commute to work. Over the most recent five years of available data, shown in Table 4, bicycling has fluctuated from 1.2 percent to 1.8 percent.

Table 4: Bicycling to Work Mode Share

Year	Bicycle Mode Share
2012	1.6%
2013	1.2%
2014	1.6%
2015	1.7%
2016	1.8%

Bicycle counts were also gathered for this Plan. Figure 9 shows the locations of these counts.

Programs

Programs help support walking and bicycling by sharing information, promoting safety, and creating a vibrant active transportation culture. Communities that have the highest rates of walking and bicycling consistently use a "5 Es" approach, with four types of programs complementing Engineering improvements:

Education – providing safety education for people walking, riding bicycles, and driving, as well as education about the environmental and health benefits of active transportation and the facilities available in the community

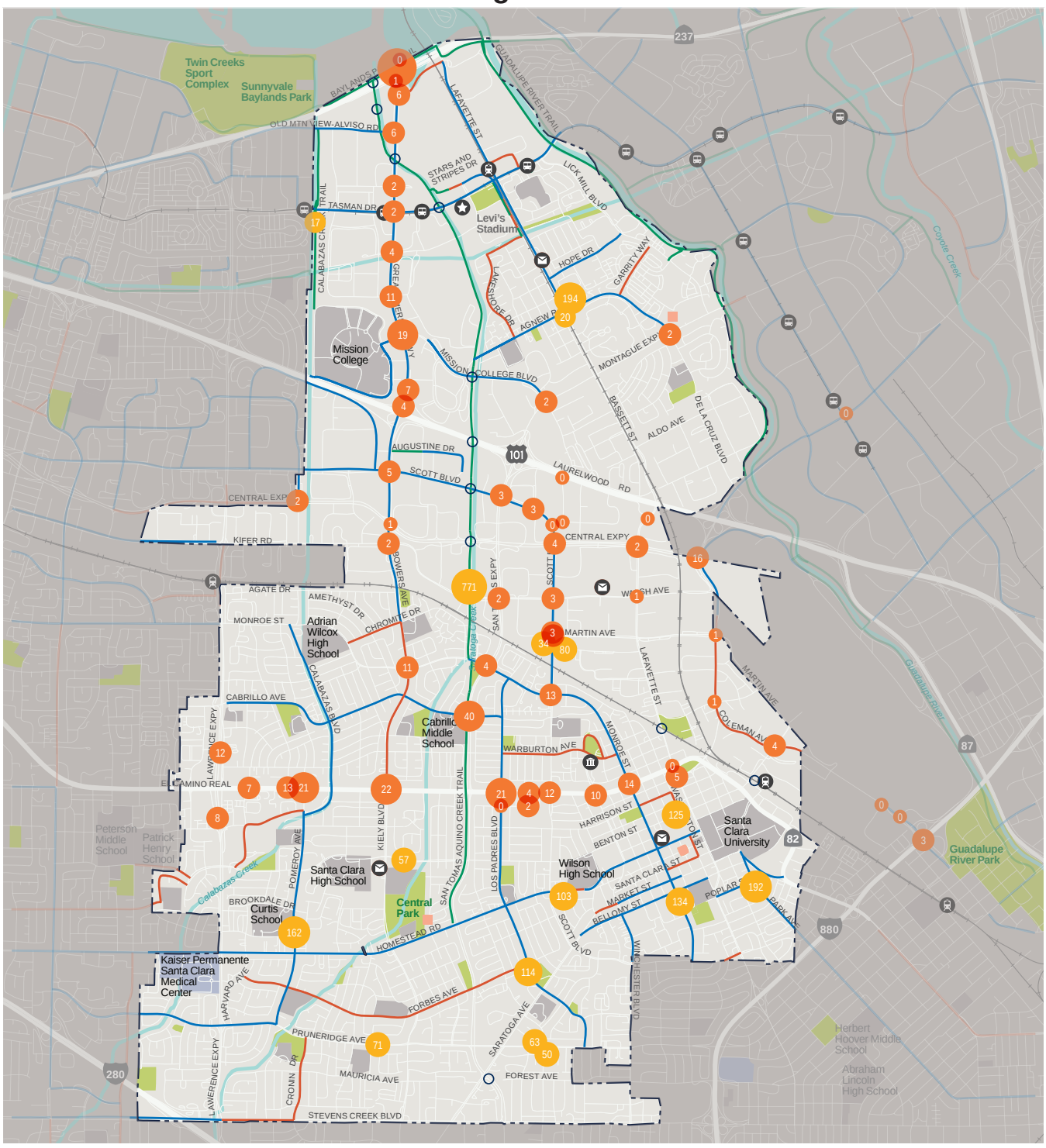
Encouragement – promoting bicycling and walking as fun and efficient modes of transportation and recreation

Enforcement – enforcing laws and good behavior for people walking, bicycling, and driving

Evaluation – monitoring the success of the effort through counts, surveys, and review of relevant data

The City and its partners have been carrying out the following programs in recent years to support bicycling and walking.

Figure 9



Source: City of Santa Clara, Caltrans, US Census, ESRI, VTA. Map produced March 2018.

Bicycle Counts & Existing Bikeways

Santa Clara Bicycle Plan Update 2018

N

0 0.5 1 MILES

Counts

- Alta All Day Bicycle Counts
- All Day Bicycle Counts

Bikeways

- Bridge or Undercrossing
- Class I Shared-Use Path
- Class II Bicycle Lane
- Class III Bicycle Route

Destinations + Boundaries

- City Hall
- Train Station
- Light Rail Station
- USPS Office
- Sport Stadium
- School
- Hospital
- Park
- Library

Safe Routes to School

The City recently recontinued its Safe Routes to School (SRTS) program which involves 12 Santa Clara schools. This is the second phase with funding through Vehicle Emissions Reduction Based at Schools (VERBS), a federally funded program. Funding from this grant will be used for such items as developing or revising Safe Routes to School maps and developing more training and toolkits for parents, teachers, and community education. All of these items have the goal of encouraging children to walk or bicycle to school so they have a healthier lifestyle and safer, cleaner environment.

The City is also updating its (SRTS) Plan that will re-evaluate program components and include project and programmatic recommendations for the 12 schools.

Bike to Work Day

Bike to Work Day, celebrated in May each year, is a day when people are encouraged to try bicycling to work. Coordinated by the Silicon Valley Bicycle Coalition, civic organizations and local business partners host “energizer stations” along popular commute routes to offer snacks and other giveaways to people who participate. The City participates by staffing an energizer station.

Bicycle and Pedestrian Advisory Committee

The Bicycle and Pedestrian Advisory Committee (BPAC) is an advisory body to the City Council on matters relative to modifying or expanding the City's utilitarian, commuter, and recreational bikeway and pedestrian walkway systems. Its goal is to encourage recreational and commuter bicycling by promoting safe, convenient, well-designed facilities and by evaluating local bicycle-related projects.

The BPAC meets five times a year with a City Council member serving on the committee. One Santa Clara BPAC member also represents the city at VTA BPAC meetings. The Santa Clara Police Department also sends an officer to meetings to report collision and safety information.

Bicycle Safety Workshops

The Santa Clara Police Department hosts bicycle safety workshops and bicycle rodeos at Santa Clara schools on an on-going basis.

School Crossing Guards

Several schools around Santa Clara have crossing guards stationed nearby to assist with safe and visible roadway crossings for students and their families who walk or ride a bicycle to school. The Santa Clara Police Department funds this program.

Safety

Collisions

Data on bicycle-related collisions can provide insight into locations or roadway features that tend to have higher collision rates, as well as behaviors and other factors that contribute to collisions. These insights will inform the recommendations in this Plan to address safety challenges facing people bicycling and walking.

Collision data involving people walking and bicycling was acquired from the Transportation Injury Mapping System (TIMS) and supplemented by information from the Santa Clara Police Department. Five years of data were evaluated, from January 1, 2013 to December 31, 2017. Collision data was not available for 2018 at the start of the study.

A total of 2,219 collisions occurred in Santa Clara during the study period, 8.2 percent of which involved people bicycling.

Bicycle-Related Collisions During the study period, 181 collisions in Santa Clara involved a person riding a bicycle. None of these were fatal, but over 160 people riding a bike were injured as a result of the collision. Some collisions had more than one victim. Overall during the study period, over seven percent resulted in severe injury, and approximately five percent did not result in any injury. Figure 10 shows collision severity for the study period. See Table 5 and Figure 11.

Table 5: Annual Bicycle Collisions

Year	Bicycle Collisions	Injuries
2013	43	36
2014	41	37
2015	61	56
2016	25	23
2017	12	9
Total	**181**	**161**

Figure 10: Bicycle Collision Severity

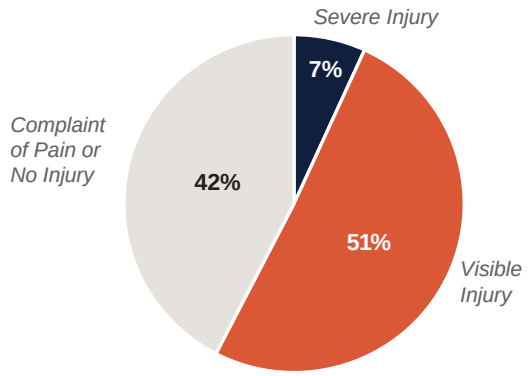
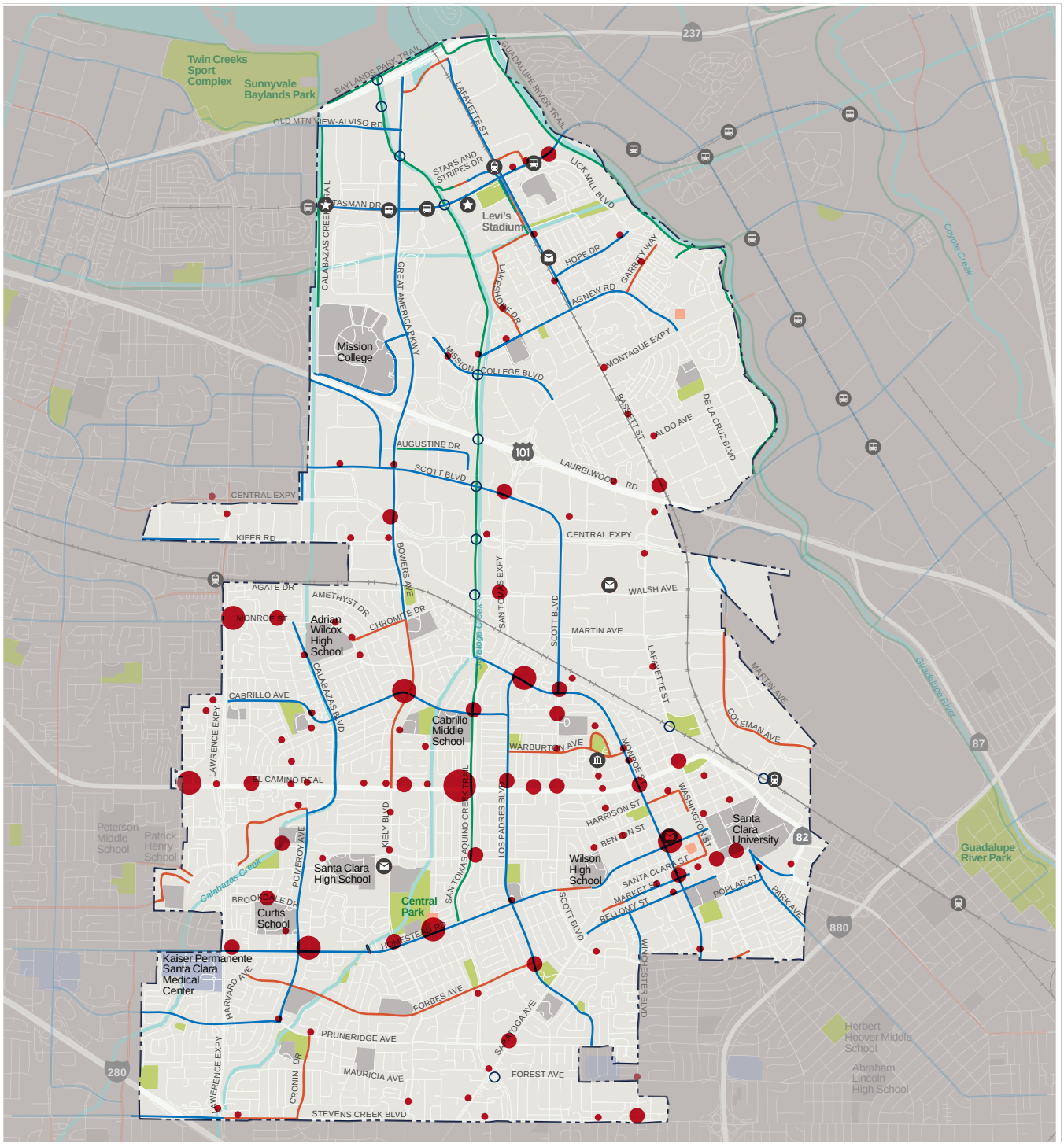


Figure 11



Source: City of Santa Clara, Caltrans, US Census, ESRI, VTA. Map produced March 2018.

Bicycle Safety

Santa Clara Bicycle Plan Update 2018

N

0 0.5 1 MILES

Number of Collisions

- 1
- 2
- 3 - 5
- 6 - 9

Bikeways

- Bridge or Undercrossing
- Class I Shared-Use Path
- Class II Bicycle Lane
- Class III Bicycle Route

Destinations + Boundaries

- City Hall
- Train Station
- Light Rail Station
- USPS Office
- Sport Stadium
- School
- Hospital
- Park
- Library

Figure 12: Collisions by Bicyclist Age Range

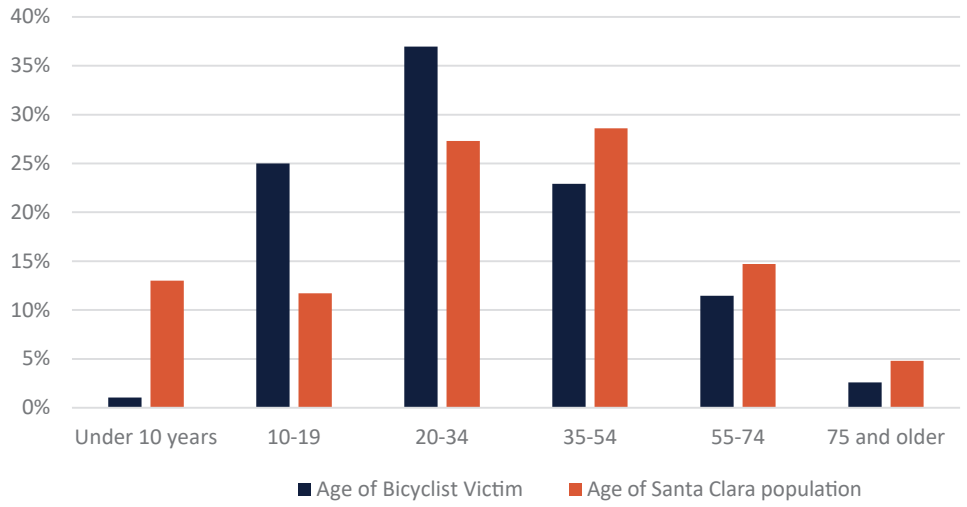


Figure 12 compares the age distribution of bicyclist collision victims to the overall population. Bicyclists between 10 and 34 years old are overrepresented among collision victims compared to the general population, with bicyclists between 10-19 years old showing the largest discrepancy.

Over 70 percent of collisions occurred during daylight hours, and an additional 25 percent occurred at night where street lights were present and functioning.

The majority of the bicycle-involved collisions during the study period were attributed to three violations that lend insight into behaviors that contribute to collisions:

- Violating the right of way of a driver (19 percent)
- Improper turning (19 percent)
- Wrong side of the road (12 percent)

Eight areas/intersections had more collisions during the study period:

- El Camino Real near San Tomas Expressway
- El Camino Real near Lawrence Expressway
- Monroe Street near Los Padres Boulevard
- Monroe Street near Homestead Road
- Monroe Street near Lawrence Expressway
- Homestead Road near Pomeroy Avenue
- Homestead Road near Las Palmas Drive
- Bowers Avenue near Cabrillo Avenue

Peer City Comparison

Overview

Three California cities of similar land use patterns, transportation network, population and population density to Santa Clara were selected for a peer comparison of bicycle commute rates, crashes, and fatalities, shown in Table 6 below. Data is also shown for Santa Clara County.

Bicycle Safety Information

Using the criteria from the League of American Bicyclists, the most recent five years of collision data (January 1, 2013 to December 31, 2017) was used to calculate crash and fatality data, shown in Table 7 below. This information was queried from the Statewide Integrated Traffic Records System (SWITRS). The crashes reported involve motor vehicles where the bicyclist was the victim.

Table 6: Peer City Comparison

City	Population	Population Density (per square mile)	Bicycle Commute Rate	Bicycle Friendly Community
Santa Clara County	1,885,056	1,460	2%	-
Santa Clara	122,725	6,670	2%	Bronze
Sunnyvale	149,596	6,800	2%	Bronze
Mountain View	78,827	6,570	6%	Silver
Campbell	40,788	6,950	1%	-
San Jose	1,035,317	5,752	0.9%	Bronze
Fremont	230,964	2,636	0.6%	-

Table 7: Bicycle Crashes per Capita

City	Bicycle Crashes	Crashes per Capita	Bicycle Fatalities	Fatalities per Capita
Santa Clara County	3,617	0.0019	40	2.12e-5
Santa Clara	196	0.0016	0	-
Sunnyvale	252	0.0017	4	2.67e-5
Mountain View	206	0.0026	2	2.54e-5
Campbell	85	0.0021	3	7.35e-5
San Jose	1,535	0.0015	22	2.12e-5
Fremont	262	0.0011	3	1.30e-5

User Experience and Comfort

Traffic stress is the perceived sense of danger associated with riding in or adjacent to vehicle traffic. Studies have shown that traffic stress is one of the greatest deterrents to bicycling. The less stressful—and therefore more comfortable—a bicycle facility is, the wider its appeal to a broader segment of the population. A bicycle network will attract a large portion of the population if it is designed to reduce stress associated with potential motor vehicle conflicts and if it connects people bicycling with where they want to go.

Bikeways are considered low stress if they involve very little traffic interaction by nature of the roadway's vehicle speeds and volumes (e.g., a shared, low-traffic neighborhood street) or if greater degrees of physical separation are placed between the bikeway and traffic lane on roadways with higher traffic volumes and speeds (e.g., a separated bikeway on a major street).

Types of Bicyclists

Research indicates that the majority of people in the United States (56–73 percent) would bicycle if dedicated bicycle facilities were provided. However, only a small percentage of Americans (one to three percent) are willing to ride if no facilities are provided.[1] This research into how people perceive bicycling as a transportation choice has indicated that most people fall into one of four categories, illustrated below.

1-3%

Strong & Fearless

Very comfortable and willing to ride on streets without designated facilities

5-10%

Enthusiastic & Confident

Very comfortable but prefer streets with designated bike lanes

50-60%

Interested, but Concerned

Comfortable on trails and streets with buffered or separated bike lanes and interested in biking more

30%

Not Currently Interested

Physically unable or very uncomfortable even on streets with separated bike lanes

Bicycle Level of Traffic Stress

To better meet the needs of the "Interested, But Concerned" cyclist, planners developed the Bicycle Level of Traffic Stress (Bicycle LTS) analysis as an objective, data-driven evaluation model to help identify streets with high levels of traffic stress.[2] The analysis uses roadway network data (i.e. posted speed limit, street width, number of travel lanes, intersection conditions, presence and character of bikeway facilities, and land use context) to determine bicyclist comfort level.

The combination of these criteria creates four levels of traffic stress for the existing roadway network. The lower the number, the lower the stress and the higher the level of comfort for people on bicycles. LTS 1 and 2 roads are typically the roadways that appeal to the "Interested, but Concerned" cyclists.

1 Roger Geller, City of Portland Bureau of Transportation. Four Types of Cyclists. http://www.portlandonline.com/transportation/ index.cfm?&a=237507. 2009; 2 Dill, J., McNeil, N. Four Types of Cyclists? Testing a Typology to Better Understand Bicycling Behavior and Potential. 2012.

2 The Level of Traffic Stress (LTS) analysis used for Santa Clara is from the 2018 VTA Countywide Bicycle Plan.

Level 1: All Ages and Abilities

Level 1 includes low-stress roadways suitable for all ages and abilities, as well as paved shared use paths.

Santa Cruz Avenue is an example of a Level 1 street

Level 2: Average Adult

Level 2 includes roadways that are comfortable enough that the mainstream adult population would ride a bicycle on them.

Homestead Road is an example of a Level 2 street

Level 3: Confident Adult

Level 3 includes roadways that are probably only comfortable for an experienced, confident bicyclist.

Great America Parkway is an example of a Level 3 street. Note that having standard Class II bicycle lanes does not outweigh other factors such as traffic volume and speeds for this road to be considered low-stress

Level 4: Fearless Adult

Level 4 includes roadways ridden only by strong or fearless bicyclists.

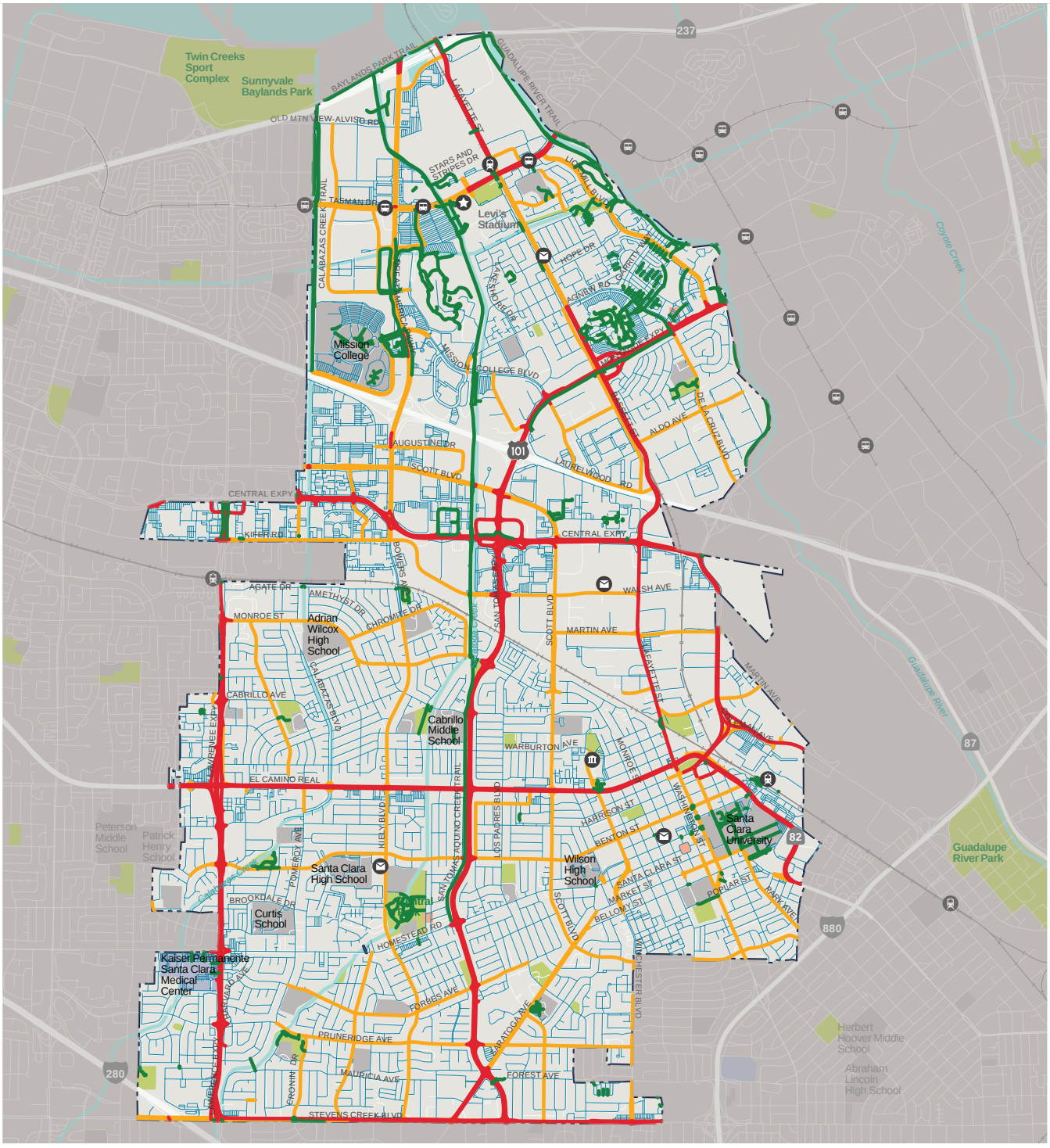
El Camino Real is an example of a Level 4 street

Results

The level of traffic stress scores were derived from analysis conducted during the VTA Countywide Bicycle Plan. Figure 13 illustrates the LTS for the roadways throughout Santa Clara. The Bicycle LTS results map approximates the user experience for the majority of Santa Clara residents, however people may have differing opinions of traffic stress depending on their own experiences. While much of Santa Clara's road network scored a Level 1 and 2 most of these roads are minor local roads typically surrounded by high stress Level 4 arterials where most average adults would not feel comfortable riding.

Multi-use trails offer a low stress route that helps cut across these barriers, however many residents may not feel comfortable bicycling outside their immediate neighborhood using local streets. This means that getting from residential areas to major destinations may not be possible given most people's tolerance for mixing with traffic—even on streets that have bicycle lanes.

Figure 13



Source: City of Santa Clara, Caltrans, US Census, ESRI, VTA. Map produced March 2018.

Bicycling Level of Traffic Stress

Santa Clara Bicycle Plan Update 2018

N

0 0.5 1 MILES

Score

- Level 1 All Ages and Abilities
- Level 2 Average Adult
- Level 3 Confident Adult
- Level 4 Fearless Adult

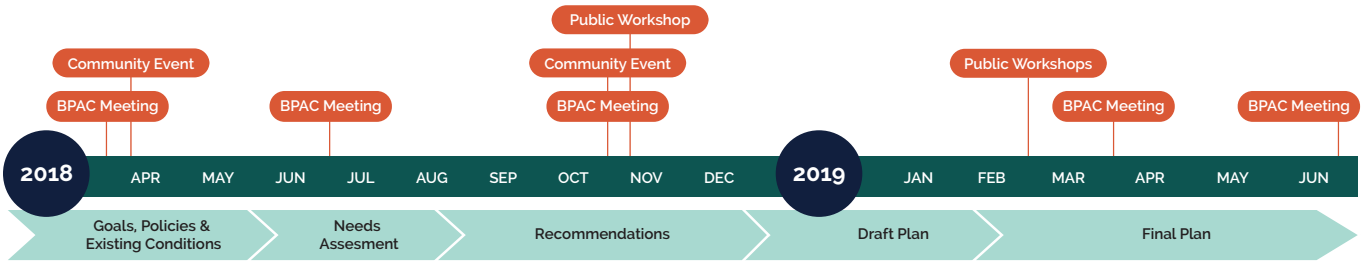
Destinations + Boundaries

- City Hall
- Train Station
- Light Rail Station
- USPS Office
- Sport Stadium
- School
- Hospital
- Park
- Library

Public Engagement Summary

Engaging the Santa Clara community has been a priority throughout the Plan Update 2018 process. A variety of outreach opportunities were used to seek input from diverse Santa Clara residents and community members. The Plan development process also included extensive coordination with partner agencies and stakeholders including the City of San Jose, VTA, the County of Santa Clara, and the City of Sunnyvale. Coordination helps to ensure that this Plan meets community needs, advances initiatives of local and regional partners, and includes projects and programs that can feasibly be implemented.

Ongoing outreach ensured a continuous feedback loop that informed the final project list and implementation plan. Specific events and opportunities included community meetings/pop-up events, Bicycle and Pedestrian Advisory Committee (BPAC) meetings, and online engagement.



Plan Development Timeline

Public Outreach

The City held one community meeting and four pop-up events during the data collection and recommendation phases of the Plan development. Additionally, the City's BPAC was updated and consulted at key milestones throughout the development process.

- **March 26, 2018 – BPAC Meeting:** The City officially announced the development of the Bicycle Master Plan Update 2018. Committee members were given an overview of the Plan and planning process and were engaged in a series of short activities to craft the Plan's vision statement and goals, shared in Chapter 2: Vision, Goals, Objectives, and Policies.
- **April 13, 2018 – Earth Day/Arbor Day celebration pop-up:** The annual Earth Day/ Arbor Day event, held at Central Park had over 400 people stop by the Bicycle Plan Update 2018 booth to identify locations where they would like to see new or upgraded bikeways on a large map, and on a board, suggest locations for specific bicycle infrastructure and programs. Information cards with the project website were also handed out, requesting attendees interact with the online mapping tool.
- **May 18, 2018 – Health and Wellness Fair pop-up:** The Santa Clara Senior Center pop-up event was similar to the Earth Day/Arbor Day event with attendees providing input on where bicycle upgrades are needed and notified about the online mapping tool.
- **June 25, 2018 – BPAC Meeting:** BPAC members and meeting attendees were led in an activity that identified the destinations, barriers/crossings, network gaps, upgrades, and potential new bike parking locations to consider when developing the Plan recommendations.

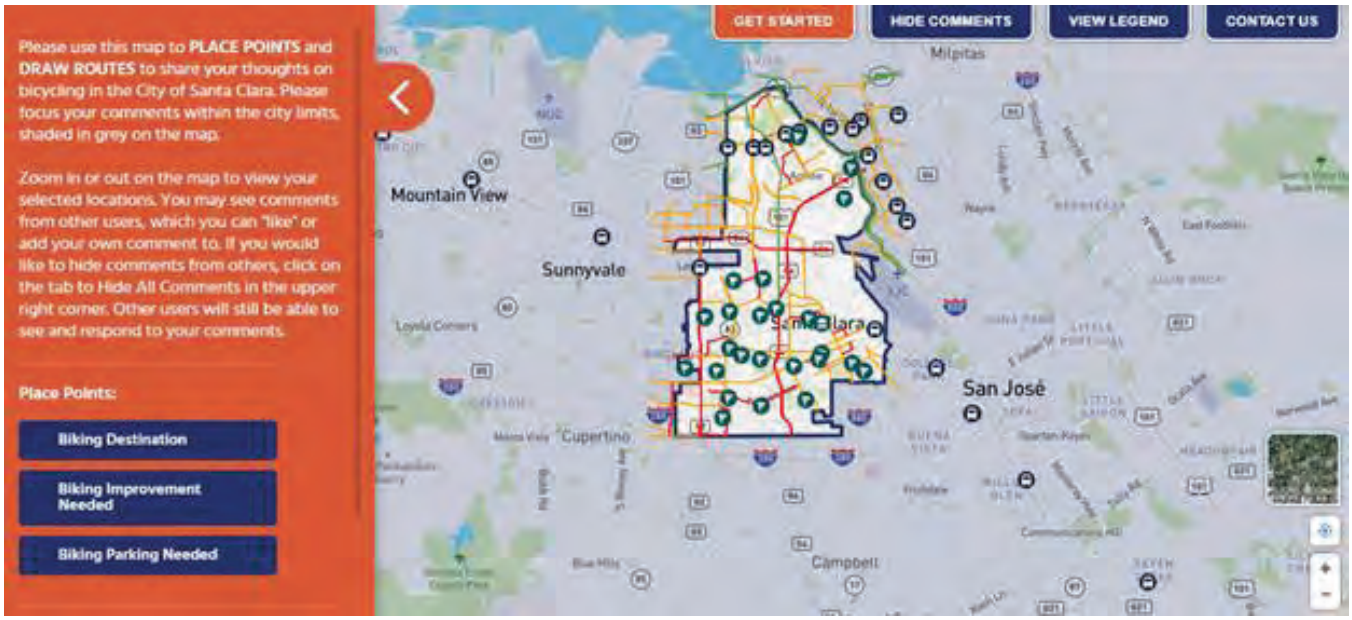
- **October 23, 2018 – BPAC Meeting:** This meeting presented the updated Vision, Goals, Objectives, and Policies based on comments received from the BPAC. It also presented the draft project recommendations, allowing members and attendees to provide comments on the draft recommendations.
- **November 3, 2018 – Farmer's Market and Northside Library pop-ups:** The project team tabled at the Farmer's Market and Northside Library to present the draft recommendations to the public. Passersby were asked to provide feedback on the draft projects and to indicate which projects they would like to be built first.

- **November 7, 2018 – Public Open House:** The project team held a public open house at the Central Park Library to also gather input on the draft recommendations. The open house included a short presentation with information about the project background, more information on the types of projects being proposed, and next steps. Like the "pop-up" events on November 3, attendees were able to view the maps of the proposed projects at a larger scale and discuss opportunities and constraints with fellow community members and the project team. Attendees were also able to share the projects they would like to be prioritized.
- **March 2019 – Public Open Houses:** Two public meetings were held at the Central Park Library and the Northside Library to present the draft Plan to the community.
- **March 25, 2019 – BPAC Meeting:** The final BPAC meeting for the Plan development resolved any outstanding comments by the BPAC. BPAC members were invited to provide comments and ask questions about the draft Plan.

- **June 24, 2019 - BPAC Meeting**: The final BPAC meeting for the Plan development presented the draft Final Plan to the BPAC and the BPAC formally recommended that City Council adopt the Bicycle Master Plan Update 2018.
- **August 20, 2019 - City Council Meeting:** The City Council adopted the Bicycle Master Plan Update 2018 after hearing a presentation about the Plan from staff and the recommendation from BPAC.

Online Interactive Mapping Tool

An interactive mapping tool was posted on the City's website and used throughout development of this Plan Update 2018 to gather input and feedback from the community directly on a map of the city. Community members were encouraged to draw routes or place pins on the map and add comments to identify desired bicycling improvements, challenging locations, and other information about the bicycling environment. The survey was made available online in both Spanish and English from March through July 2018 and advertised at all outreach events; through City newsletter, social media, and email notifications; and distributed by community groups. More than 350 individual comments were shared on the map, with many more people "liking," "disliking," or commenting on other respondents' comments. This input was used to help develop the project recommendations.



Online Survey Screenshot

City Website and Social Media

For all community outreach opportunities, including the online survey and interactive mapping tool, the City leveraged their existing website, social media accounts, City Manager's Blog, and newsletter mailing list to share information about the Plan Update 2018 process and encourage Santa Clara residents to engage with the project team.

Vision, Goals, Objectives, and Policies

Vision Statement:

The City of Santa Clara is a healthy, thriving, and safe city where people of all ages and abilities may easily and comfortably ride a bicycle as a part of their daily lives.

Vision

The City of Santa Clara is a healthy, thriving, and safe city where people of all ages and abilities may easily and comfortably ride a bicycle as a part of their daily lives.

Goals

SAFETY

Design bicycle facilities that are accessible and comfortable for people of all ages and abilities.

CONNECTIVITY

Identify, develop, and maintain a complete and convenient bicycle network.

BICYCLE FRIENDLINESS

Increase bicycling as a comfortable and convenient transportation option through citywide programs and initiatives that **encourages and celebrates a strong bicycling culture, educates** all roadway users, **enforces** safe behaviors, and **evaluates** the City's progress in achieving its vision.

Objectives and Policies

1. Safety

Design bicycle facilities and roadways that are accessible and comfortable for people of all ages and abilities.

Objective 1.A: Study implementing a Vision Zero policy before 2024.

Policy 1.A.1: Annually review the number, locations, and contributing factors of bicycling related collisions to identify and implement ongoing improvements at key locations throughout the transportation network.

Policy 1.A.2: Identify opportunities to reduce exposure for people bicycling by reducing crossing distances or providing dedicated facilities.

Policy 1.A.3: Study the need for 15 mph School Zone speed limits and adopt in appropriate locations by 2022.

Policy 1.A.4: Develop an online or printed brochure to educate people of all ages on how to bicycle safely and drive with an awareness of bicyclists. Share this information with driver education providers and high schools and post information on the City's website.

2. Connectivity

Identify, develop, and maintain a complete and convenient bicycle network.

Objective 2.A: Obtain funding for all high priority project recommendations from the Bicycle Master Plan Update 2018 by 2026.

Policy 2.A.1: Submit dedicated bicycle projects into the City's Capital Improvement Program Streets and Highways Fund during each budget cycle for future funding subject to City Council appropriation and adoption of the Bicycle Plan.

Policy 2.A.2: Actively pursue external grant funding to supplement City resources.

Policy 2.A.3: At every BPAC meeting, the City shall present a "grant funding spreadsheet" to the BPAC that will explain upcoming grant opportunities. In addition, prior to submitting a grant application, the City shall discuss with BPAC the bicycle projects that would be the most competitive for each respective grant source.

Objective 2.B: Plan, design, and construct a complete bicycle network that accommodates the needs of all mobility types, users, and ability levels.

Policy 2.B.1: Coordinate implementation of cross county corridor recommendations identified by the Santa Clara Countywide Bicycle Plan with neighboring jurisdictions and VTA.

Policy 2.B.2: Upgrade and improve the existing arterial bikeway network to increase bicyclist comfort and lower barriers for more risk-averse users.

Policy 2.B.3: Implement bicycle detection at signalized intersections within the City.

Policy 2.B.4: Incorporate green stormwater infrastructure to the greatest extent possible into bikeway projects considered for new City streets or reconstruction of existing City streets. Green infrastructure helps to reduce GHG emissions and stormwater runoff.

Objective 2.C: Enhance standard operating practices for installing new bicycle facilities and for bicycle facility maintenance.

Policy 2.C.1: Develop a trail pavement management plan by 2020 and request funding through the capital budget process to perform necessary pavement maintenance.

Policy 2.C.2: Identify opportunities for parking removal or roadway reallocation where there is excess capacity now and in the future in order to provide new or improved bicycle facilities.

Policy 2.C.3: Review striping plans for all roadways prior to resurfacing projects to consider upgrading or installing new bicycle facilities. The City's Complete Streets Policy shall be used as guidance and followed related to roadway resurfacing projects.

Policy 2.C.4: Maintain bicycle lanes next to construction zones wherever feasible. The City's Complete Streets Policy shall be used as guidance and followed related to construction of projects.

Policy 2.C.5: Maintain bicycle facilities by street sweeping trails and roadways with bike facilities and conducting pavement repair or filling pot holes in a timely manner to keep all bicycle facilities clear and in good, ridable condition.

Policy 2.C.6: Install green colored bicycle lanes at high conflict zones such as at significant weaving areas, freeway on/off-ramps, trap lanes, or any other unusual condition.

3. Bicycle Friendliness

Increase bicycling as a comfortable and convenient transportation option through citywide programs and initiatives that encourages and celebrates a strong bicycling culture, educates all roadway users, enforces safe behaviors, and evaluates the City's progress in achieving its vision.

Objective 3.A: Increase bicycle mode share to five percent by 2026.

Policy 3.A.1: Encourage large employers and retail establishments to pursue designation as part of the League of American Bicyclists Bicycle Friendly Business program. Annually recognize Bicycle Friendly Businesses through a press-release and City Council proclamation to encourage a more welcoming atmosphere for bicycling employees, customers and the community. Consider developing an award program to highlight private sector partners that are helping the City achieve its vision.

Policy 3.A.2: Develop a city-wide bicycle wayfinding system providing access to various City destinations such as schools, commercial centers, libraries, government facilities, and parks.

Policy 3.A.3: Update the MySantaClara app and online service request website to permit requests for maintenance on bicycle facilities by 2020.

Policy 3.A.4: Prioritize the installation of bicycle parking in the public right-of-way and work with private property owners to install them at key commercial and retail destinations. Consider updating the Municipal Code to increase the amount of bicycle parking required for new developments. Also add multi-family housing to the list of development types that require bicycle parking. Where possible, locate bicycle parking under coverings or add coverings/shelter to locations where several bike racks are installed close together.

Policy 3.A.5: Support Safe Routes to School programs with City staff resources.

Policy 3.A.6: Work with the Santa Clara Police Department to host an annual bike light or required reflector giveaways before/around Daylight Savings time each fall.

Policy 3.A.7: Evaluate opportunities for new mobility technology such as bike share and electric scooters in Santa Clara. Using lessons learned from other jurisdictions, craft policies to ensure safe use and accountability.

Objective 3.B: Conduct ongoing planning and evaluation for bicycle facilities.

Policy 3.B.1: Conduct before studies prior to implementing a new bicycle project in order to compare baseline data with post-implementation data. Collecting pre and post data will help the City measure how well its investments are performing.

Policy 3.B.2: Whenever vehicle Level of Service (LOS) studies are required, include measures that account for bicyclists and pedestrians as part of the overall throughput of the corridor.

Policy 3.B.3: Encourage local community input in the planning and implementation of significant bikeways and other bicycle-related improvements by holding public meetings and workshops within the neighborhood where the project will be implemented.

Policy 3.B.4: Explore opportunities for implementing a bicycle share program within Santa Clara.

Policy 3.B.5: Work with the Santa Clara Police Department to improve the reporting and analysis of bicycle collisions.

Policy 3.B.6: Regularly monitor implementation of the Plan, and initiate the review and update of the recommended bike facilities and Plan every five years.

Policy 3.B.7: Strive to improve the city's Bicycle Friendly Community (BFC) status by 2026.

Policy 3.B.8: Annually evaluate progress in meeting mode share targets by reviewing results of the American Community Survey administered by the U.S. Census Bureau.

Recommendations

Provide the Santa Clara community with convenient and comfortable transportation choices.

Introduction

This chapter summarizes the bicycling challenges and needs in Santa Clara and proposes several strategies to address those needs. Challenges were identified through an analysis of existing data and through community input. The draft recommendations identify the corridors and spot locations where bicycle infrastructure is both feasible and provides strategic value toward achieving the City's goals for a more bicycle friendly community.

Recommendations

Built on the needs and opportunities identified through the evaluation of existing conditions, extensive community input, and data-driven analyses, this chapter presents the recommended bikeway network for the City of Santa Clara.

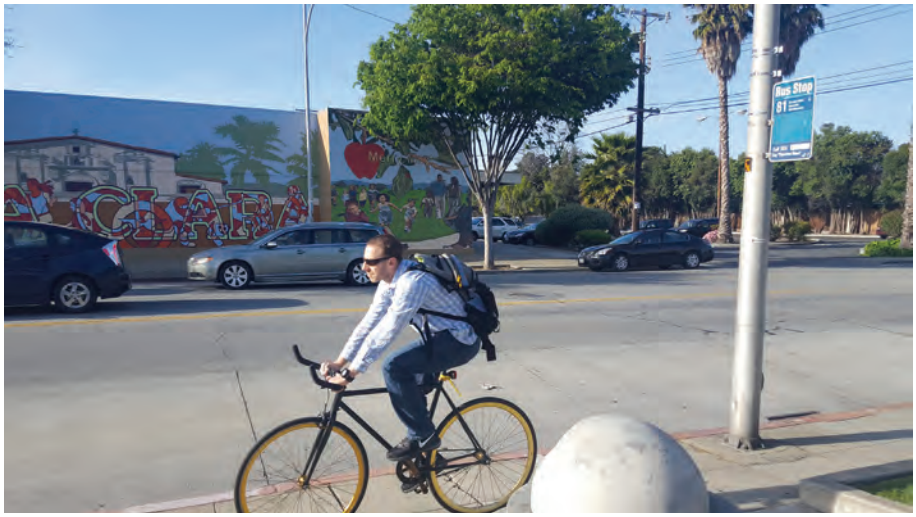
Recommendations are considered planning-level, meaning they should be used as a guide when implementing projects. In some cases, traffic analysis, parking study, more detailed design analysis, and additional community input will be required to evaluate specific site conditions and develop designs that reflect conditions and constraints.

Network Recommendations

Strategies

Through extensive community input and needs analysis, the major barriers that prevent more people from bicycling in Santa Clara include:

- Missing gaps in the bicycle network that prevent people from reaching their destination
- Bicycle facilities feel uncomfortable along major roads and at intersections due to lack of separation from motor vehicles
- Lack of adequate bicycle parking once people reach their destination



Sidewalk riding is typically observed in areas where there are no dedicated bikeways or where there are high volumes of fast-moving motor vehicles

To resolve these challenges, projects were selected using the following three strategies:

Strategy 1: Identify Gaps in the Bicycle Network

- Step 1. Close gaps in the bicycle network with a particular focus on high demand arterials.
- Step 2. Evaluate north-south and east-west corridors that cross multiple barriers and connect residential areas with schools, parks, libraries, transit, employment, and retail.
- Step 3. Incorporate trail recommendations from the City's Creek Trail Master Plan process.

Notable gaps include Mission College Boulevard between Great America Parkway and the Marriott Hotel entrance and a neighborhood connection between the bike facilities on Park Avenue and Monroe Street that avoid Santa Clara University.

Strategy 2: Select Recommendations Best Suited for Safety & Comfort

- Step 1. Evaluate opportunities to add a painted buffer or physical barrier between bicyclists and motor vehicles on high stress roadways and roadways where most bicycle-motor vehicle collisions have occurred over the past five years.
- Step 2. Expand existing Class II bicycle lanes to add a painted buffer or a physically separated barrier to motor vehicles by narrowing travel lanes, removing on-street parking (one or both sides of the street), or reallocate space on the roadway where excess capacity allows.
- Step 3. Evaluate Class IV separated bikeways on streets that can accommodate a minimum five-foot bikeway (not including the gutter pan), three-foot buffer and have infrequent driveway conflicts. Priority should be placed on streets with speeds above 35mph and traffic volumes greater than 10,000 motor vehicles per day.
- Step 4. Identify a Class III bicycle boulevard network on neighborhood streets where sharing the road may be comfortable due to the low volume and speeds of motor vehicles. Where volumes or speeds are high, traffic calming may be required.

One example of these is Monroe Street, which has a shared parking aisle and bike lane. Another is on Great America Parkway which has bike lanes installed, but has a lower number of bicycle riders due to the higher vehicle speeds and wide vehicle travel lanes.

Strategy 3: Recommend Intersection Treatments and End-of-Trip Facilities (Spot Improvements)

- Step. 1. Identify intersections where existing bicycle lanes end prior to the intersection forcing bicyclists to mix with traffic.
- Step 2. Identify signals that need bicycle detection to trigger a green light when motor vehicles are not present.
- Step 3. Identify intersections or crossing locations that require roadway or signal changes to facilitate more convenient and comfortable experience for bicyclists.
- Step 4. Identify opportunities to add bicycle parking at major destinations.

One example of an intersection where bike lanes end prior to the intersection is at Homestead Road and Lawrence Expressway. This intersection is also challenging to cross as a bicyclist due to vehicle speeds and the wide configuration.

Bicycle network projects are categorized based on the four classifications recognized by Caltrans, along with two sub-classifications, described in detail in the Existing Conditions chapter. These include:

- **Class I Shared Use Paths:** Dedicated paths for walking and bicycling completely separate from the roadway
- **Class II Bicycle Lanes:** Striped lanes for bicyclists
- **Class II Buffered Bicycle Lanes:** Bicycle lanes that include a striped "buffer" area either between the bicycle lane and travel lane or between the bicycle lane and parked cars
- **Class III Bicycle Routes:** Signed routes for bicyclists on low-speed, low-volume streets where lanes are shared with motorists
- **Class III Bicycle Boulevards:** Bicycle routes that are further enhanced with traffic calming features or other treatments to prioritize bicyclist comfort
- **Class IV Separated Bikeways:** On-street bicycle facilities with a physical barrier between the bicycle space and motor vehicle lanes, including bollards, curbs, or parking

This Plan recommends over 70 miles of new or upgraded bikeways, summarized in Tables 8 and 9 and shown in Figures 14 and 17.

Table 8: Existing and Proposed Bikeway Mileage

Bikeway Type	Existing Miles	Proposed Miles	TOTAL
Class I Shared Use Paths	11.5	9.9	21.4
Class II Bicycle Lanes	34.5	10.4	44.9
Class II Buffered Bicycle Lanes**	-	13.6	13.6
Class III Bicycle Routes	24.4	1.5	25.9
Class III Bicycle Boulevards	0	14.1	14.1
Class IV Separated Bikeways	0	22.2	22.2
Total	70.4	71.7	142.1

***Prior to this Plan Update, the City combined Buffered Bicycle Lanes with regular Bicycle Lanes.*

Table 9: Summary of Bikeway Corridor Recommendations

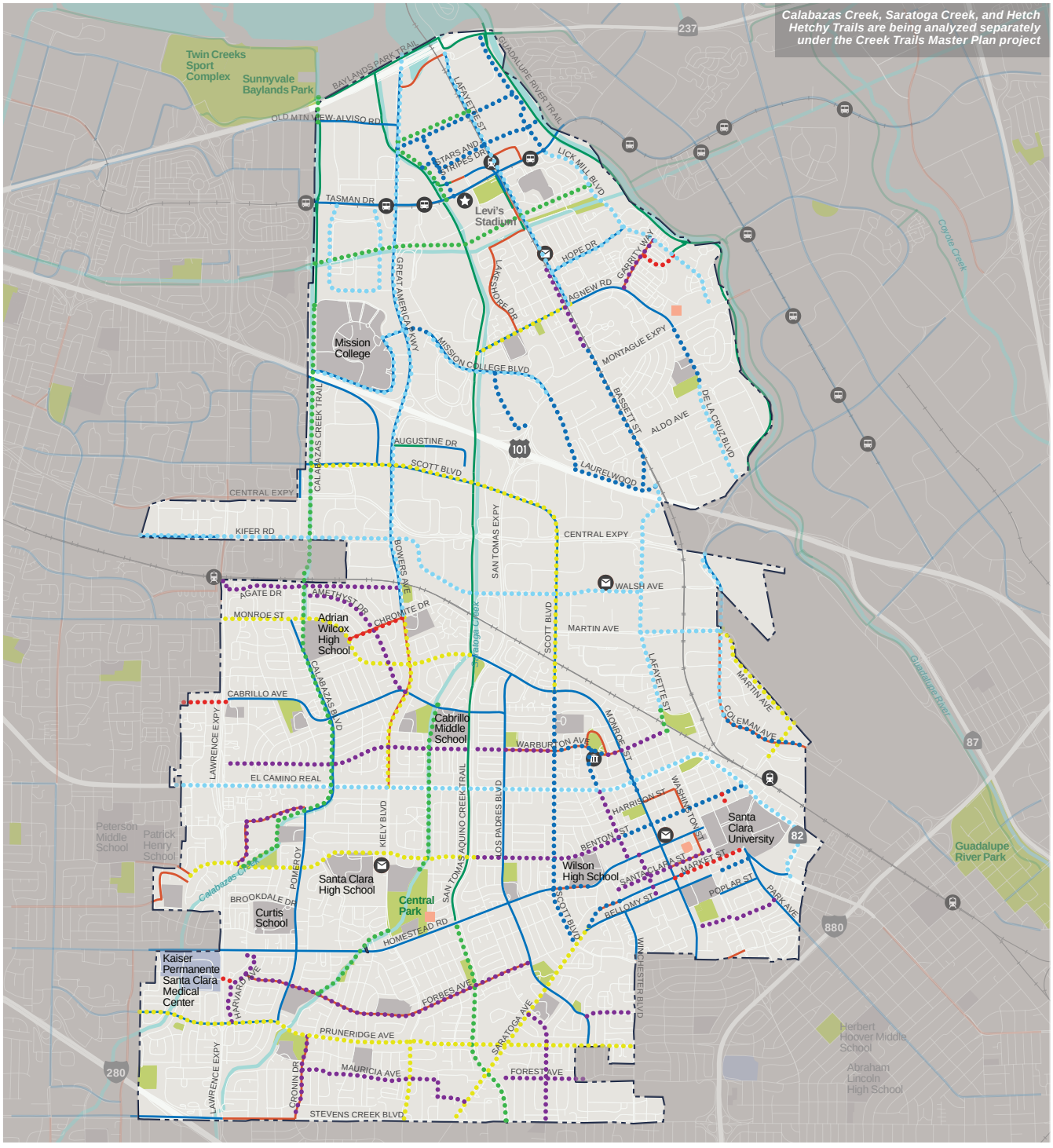
Bikeway Type	Miles	Cost Estimate – Low	Cost Estimate – High
Class I Shared Use Paths	9.9	$6,913,000	$9,875,000
Class II Bicycle Lanes	10.4	$829,000	$4,392,000
Class II Buffered Bicycle Lanes	13.6	$1,762,000	$5,733,000
Class III Bicycle Routes	1.5	$15,000	-
Class III Bicycle Boulevards	14.1	$1,055,000	$1,966,000
Class IV Separated Bikeways	22.2	$5,544,000	$17,191,000
Total	**71.7**	**$16,118,000**	**$39,157,000**

Project Feasibility and Design

Project recommendations should be implemented using the Bicycle Facility Design Guidelines developed as part of this Plan and presented as an appendix, and engineering judgment. Several project recommendations will need further evaluation based on additional study and community input. Based on the detailed engineering analysis to be conducted, roadway travel lanes may need to be narrowed, underutilized parking may need to be removed, or the road may need to be reconfigured in order to accommodate the recommendations. City Council will need to approve any project where parking may be removed or the roadway may be reconfigured. Should City Council not approve removal of parking or roadway reallocation, the project will not be built or move forward. Projects recommendations where tradeoffs may occur are shown in Appendix D.

Intersection of Homestead Road and Lawrence Expressway is a recommended spot improvement and an example of a project that will require further evaluation to specify design changes

Figure 14



Source: City of Santa Clara, Caltrans, US Census, ESRI, VTA. Map produced March 2018.

Recommended & Existing Bikeways

Santa Clara Bicycle Plan Update 2018

N

0 0.5 1 MILES

Existing Bikeways
- Bridge or Undercrossing
- Class I Shared-Use Path
- Class II Bicycle Lane
- Class III Bicycle

Recommended Bikeways
- Class I Shared-Use Path
- Class II Bicycle Lane
- Class IIB Buffered Bicycle Lane
- Class III Bicycle Route
- Class IIIB Bicycle Boulevard
- Class IV Separated Bikeway

Destinations + Boundaries
- City Hall
- Train Station
- Light Rail Station
- USPS Office
- Sport Stadium
- School
- Hospital
- Park
- Library

Spot Improvements

Spot improvements are designed to address locations where there are specific biking challenges identified through the planning process. Most spot improvements are located at intersections, but also include bicycle parking recommendations.

The subsections below provide details on some of these projects. Table 10 summarizes these recommendations and they are shown in Figures 16 and 17.

Intersection Improvements

Intersection improvement recommendations can include intersection reconfiguration including tightening vehicle turning radii, installing bike lane markings through the intersection, signal detection, or creating protected intersections as shown in Figure 15 (see Appendix B: Bicycle Facility Design Guidelines for more information).

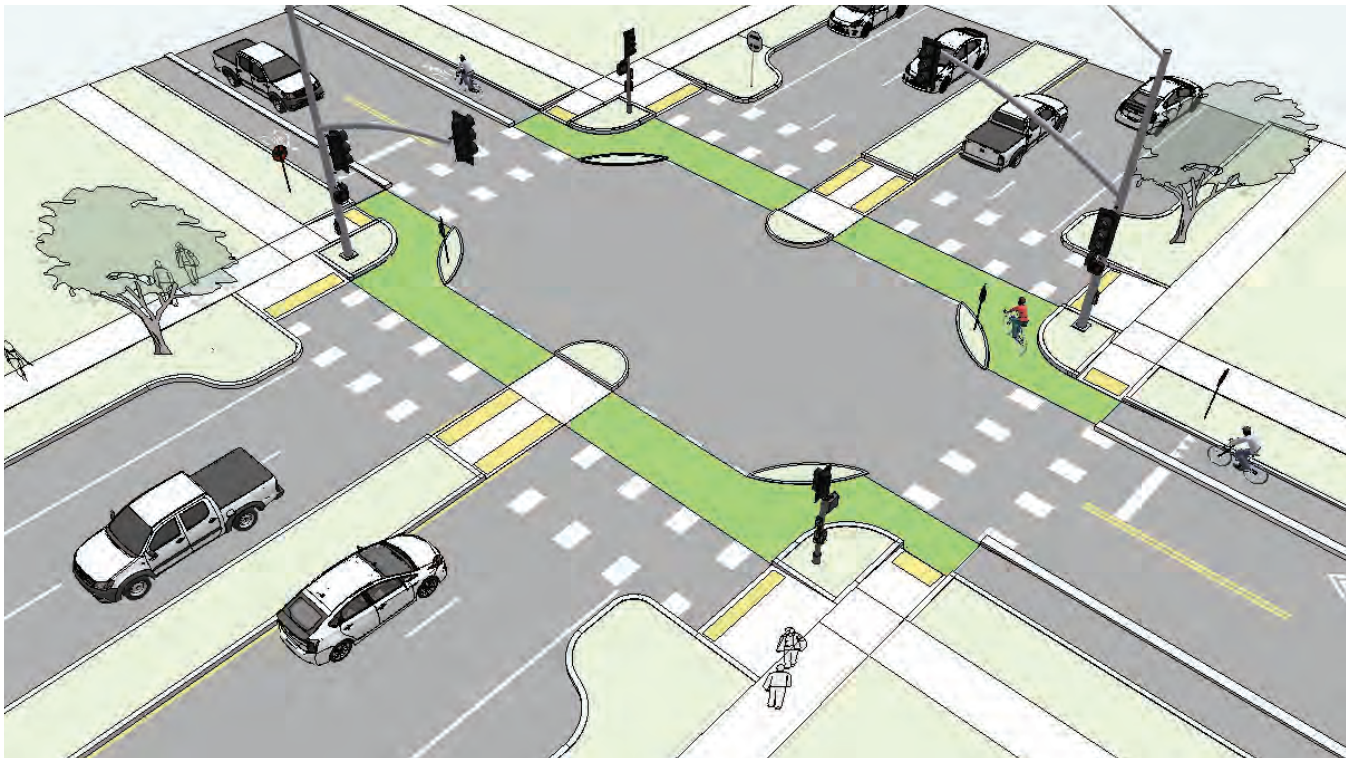
Bicycle Detection

Through the public engagement process, many community members identified signalized intersections where bicyclists are not detected and rely on a motor vehicle to trigger a green light. There are two main types of signal detection used by the City of Santa Clara: loop detection and video detection.

Loop Detection

Loop detectors are installed under the pavement of a roadway and trigger a change in the traffic signal when a bicycle rides or stops over the detector. California law requires loop detectors to have a pavement marking that indicates where the loop detector is placed.

Figure 15: Protected Intersection



Video Detection

Video detection cameras use digital image processing to detect a change in the image at a location. Like loop detection, pavements markings shall be placed as to indicate to bicycle riders where they should stop in order to be detected by the cameras.

Bicycle Parking

Bicycle parking is typically divided into short-term and long-term parking. Short-term parking is meant to accommodate bicyclists who park up to two hours, e.g., shoppers, post office customers, and library patrons. Long-term parking, such as bike lockers, is for riders who park over two hours, e.g., employees, students, and residents. More information about bike parking can be found in Appendix B: Bicycle Facility Design Guidelines.

Table 10: Summary of Spot Improvement Recommendations

Improvement Type	Number of Recommendations
Intersection Improvements (several)	14
Bike Detection	6
Bike Parking	49
Protected Intersection	5
Overcrossing/ Undercrossing access	5

Support Facilities

In addition to the network projects described in the previous section, some additional facilities and amenities are necessary to complete the bicycling network in Santa Clara.

Wayfinding

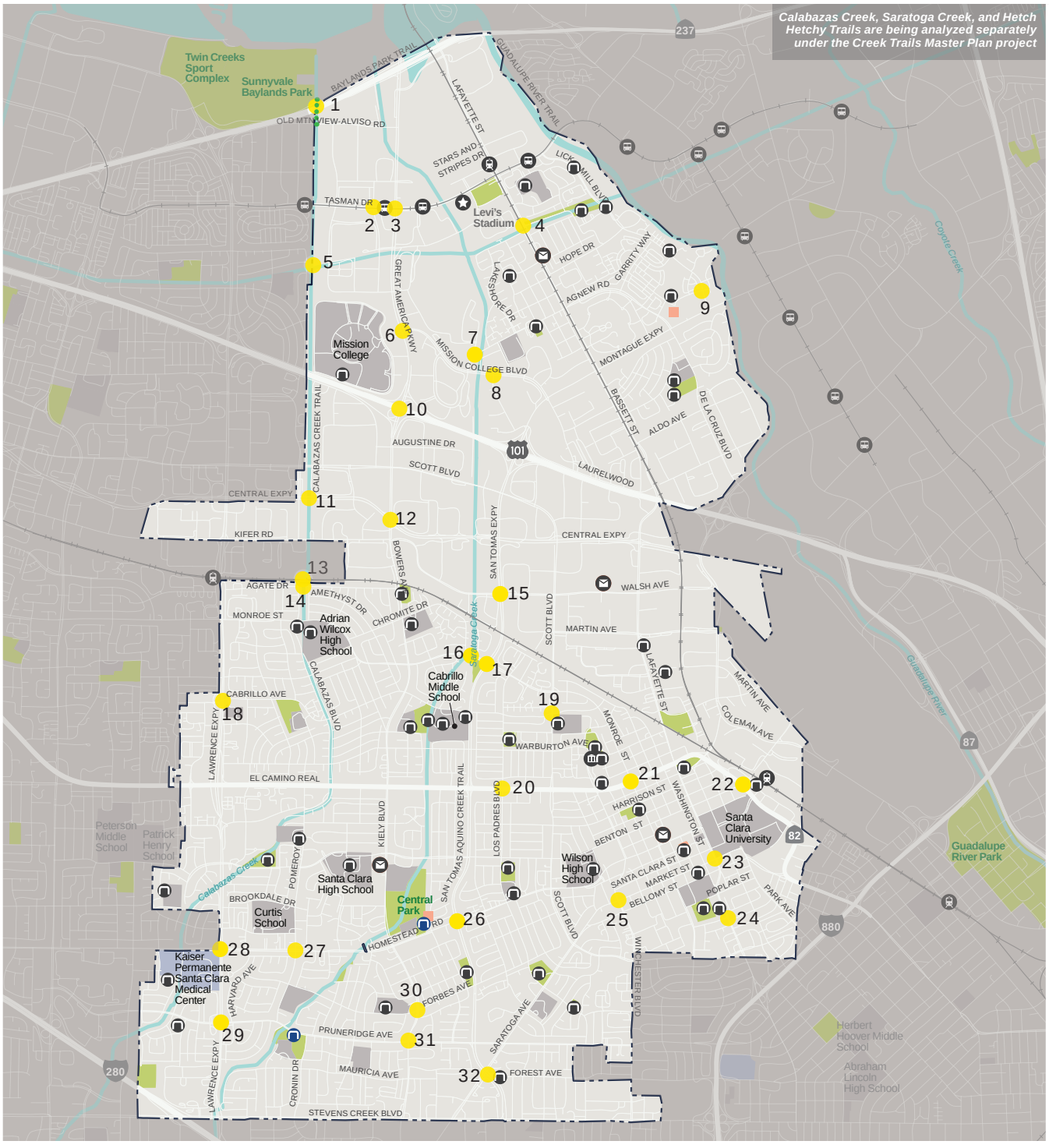
A good bicycling environment includes both supportive facilities and an easily navigable network. Wayfinding assists residents, tourists, and visitors in finding key community destinations. Signs may also include "distance to" information, which displays mileage to community destinations. The Design Guidelines provide more information about wayfinding. A citywide wayfinding system can raise awareness and improve access for residents and visitors to community assets such as downtown, the San Tomas Aquino Creek Trail, and Calabazas Creek Trail.

Principles of Wayfinding

A wayfinding system plan should be legible and easy to navigate. Principles to guide design, placement, and destination include:

- **Connect Places:** Effective wayfinding should enable locals and visitors to travel between destinations and discover new destinations and services.
- **Promote Active Travel:** Wayfinding should encourage people to walk and bicycle by creating a clear, attractive system that is easy to navigate.
- **Maintain Motion:** Wayfinding should be easy to understand while bicycling or walking.
- **Be Predictable:** Wayfinding should be predictable and consistent, including consistent sign materials, dimensions, colors, forms, and placement.
- **Keep Information Simple:** Information should be presented in a clear and logical form so that it is usable for the widest possible demographic.

Figure 16



Source: City of Santa Clara, Caltrans, US Census, ESRI, VTA. Map produced March 2018.

Recommended Spot Improvements

Santa Clara Bicycle Plan Update 2018

N

0 0.5 1 MILES

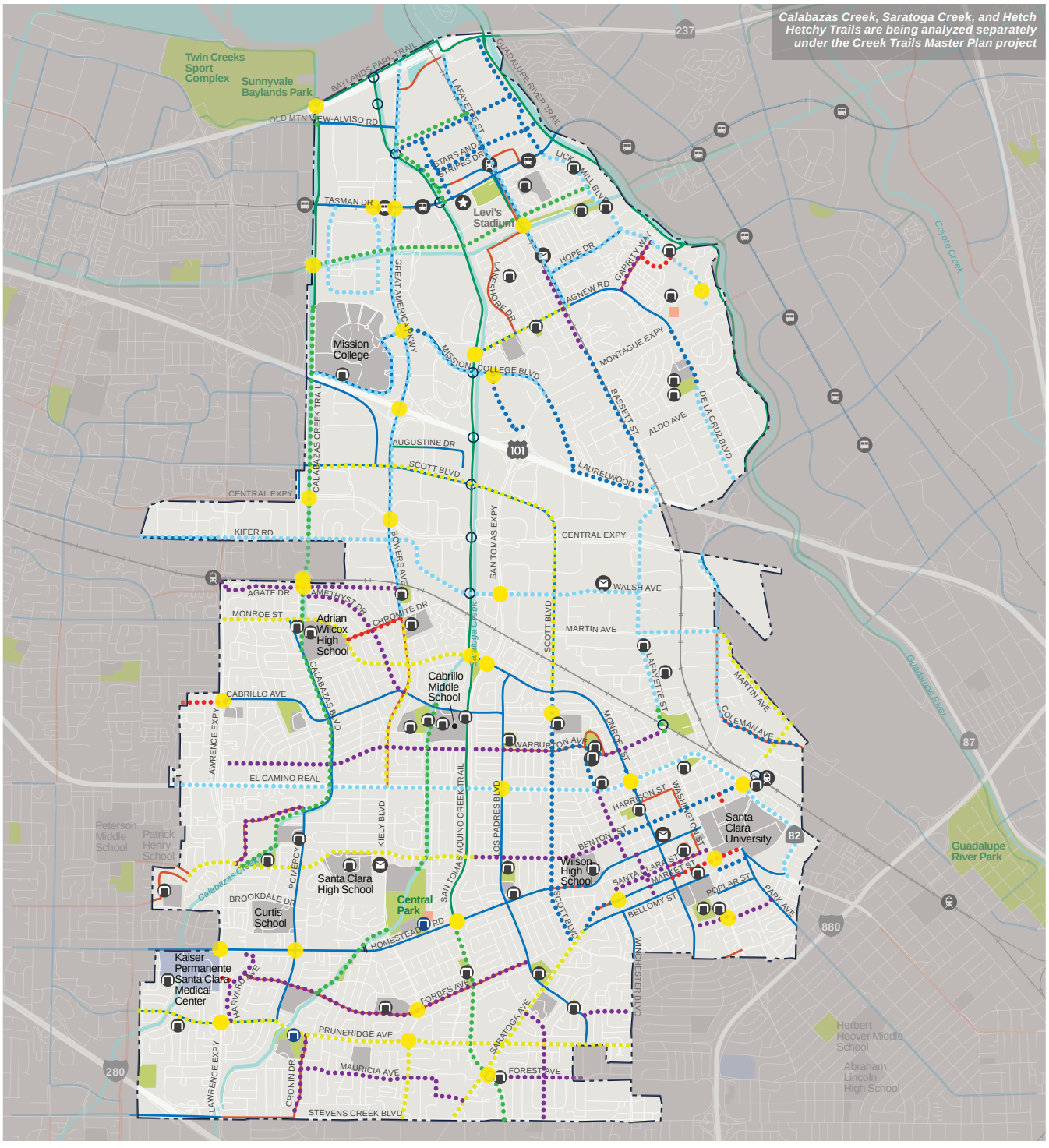
Proposed Improvements

- Spot Improvement
- New Bicycle Parking
- Additional Bicycle Parking

Destinations + Boundaries

- City Hall
- Train Station
- Light Rail Station
- USPS Office
- Sport Stadium
- School
- Hospital
- Park
- Library

Figure 17



Source: City of Santa Clara, Caltrans, US Census, ESRI, VTA. Map produced March 2018.

All Recommendations & Existing Bikeways

Santa Clara Bicycle Plan Update 2018

Existing Bikeways
- Bridge or Undercrossing
- Class I Shared-Use Path
- Class II Bicycle Lane
- Class III Bicycle Route

Recommended Bikeways
- Class I Shared-Use Path
- Class II Bicycle Lane
- Class IIB Buffered Bicycle Lane
- Class III Bicycle Route
- Class IIIB Bicycle Boulevard
- Class IV Separated Bikeway

Proposed Improvements
- Spot Improvement
- New Bicycle Parking
- Additional Bicycle Parking

Destinations + Boundaries
- City Hall
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Navigational Elements

The fundamental family of signs that provide cyclists with navigational information consists of decision, confirmation, and turn signs (Figure 18 and Table 11). Figure 19 provides typical locations of signs. Decision signs (D) are located prior to an intersection of two routes. Turn signs (T) are located prior to turns. Confirmation signs (C) are located after the turn movement and periodically along routes for reassurance.

Signage Technical Guidance

A variety of standards and guidelines influence both the designs and placement of wayfinding elements in Santa Clara. The Manual of Traffic Control Devices (MUTCD) provides standards and guidelines for the design, size, and content of wayfinding signs. However, many jurisdictions have implemented unique signs to enhance visibility while reinforcing local identity.

Table 11: Sign Types

Decision Sign	Confirmation Sign	Turn Sign
• Clarify route options when more than one is available • Typically include a system brand • Up to 3 destinations • Distance in time or miles (based on 10 mph or 6 minutes per mile) • FHWA standard size for 3 destinations is 18” H x 30” W • Municipalities can modify, often 24” W x 30” or 36” H, and place bicycle symbol at top • Generally, 6” of vertical space per destination • Sign width not standardized by the CA MUTCD	• Placed after turn movement or intersection to reassure that they are on the correct route • Standard D11-1 series signs, system brand mark and route or pathway name may be included • Minimum size of 24”W x 18”H should be used for bike route signs, both on-and off-street	• Clarify a specific route at changes in direction • Used when only one route option is available • Standard D1-1 series sign: system brand mark, route or pathway name, and/or a directional arrow may be included • A minimum height of 6” should be used for arrow plaque, width may vary with destination length • Standard turn arrows (M5 and M6 series) may be used to clarify movements

Figure 18: On-street wayfinding tools

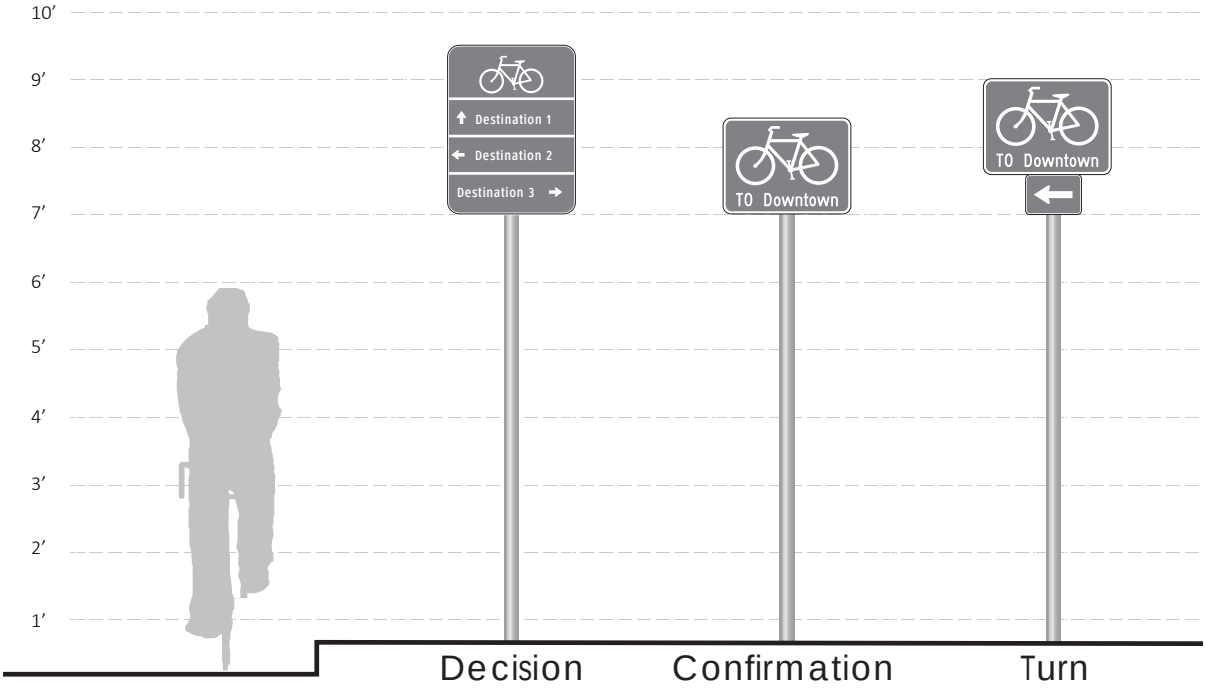
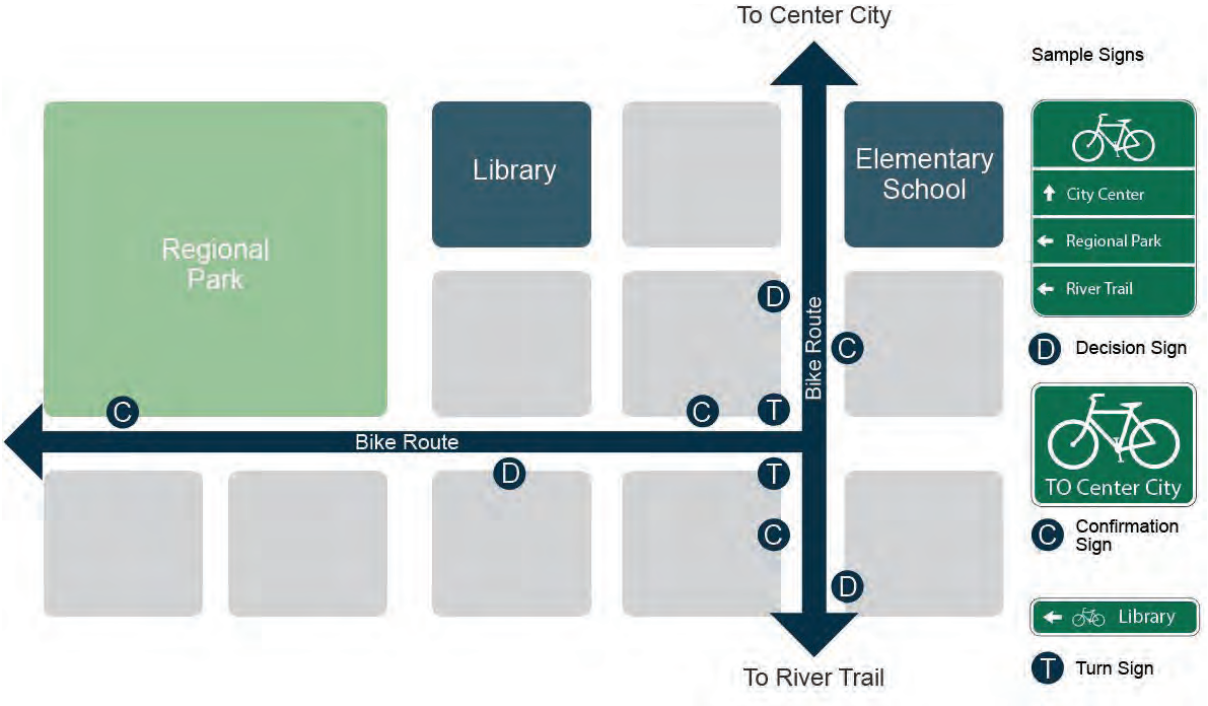


Figure 19: Typical wayfinding locations



Bicycle Guide Signs

Both on-street and off-street bicycle facilities are required to follow the standards within the MUTCD. The State of California has adopted specific state standards for all traffic control devices called the CA MUTCD, which supersedes the MUTCD:

- D11-1: Bicycle Route Guide Sign
- D1-1b: Destination Supplemental Sign
- M7-1 through M7-7: Directional Arrow Supplemental Sign

The combination of standard signs with modifications allows for signage that is consistent throughout Santa Clara while branding the network.

Community Wayfinding

Community wayfinding signs allow for an expression of community identity, reflect local values and character, and may provide more information. California has not yet adopted MUTCD community wayfinding standards, but many communities use these.

Other Wayfinding Elements

In addition to the core elements, several other wayfinding elements should be considered, including:

- **Distance and time** - Adding distance in familiar units can be an effective encouragement tool for bicycling and walking. Cities sometimes include travel time.
- **Street name sign blades and sign toppers** - Some cities have enhanced street name sign blades to provide additional recognition of bikeways and major pedestrian routes. For example, some cities use purple street signs to indicate bicycle boulevards.
- **Pavement markings** - Directional pavement markings indicate confirmation of bicycle or pedestrian presence on a designated route and can indicate turns. Especially in urban settings, pavement markings can often be more visible and can help supplement or reinforce signage.

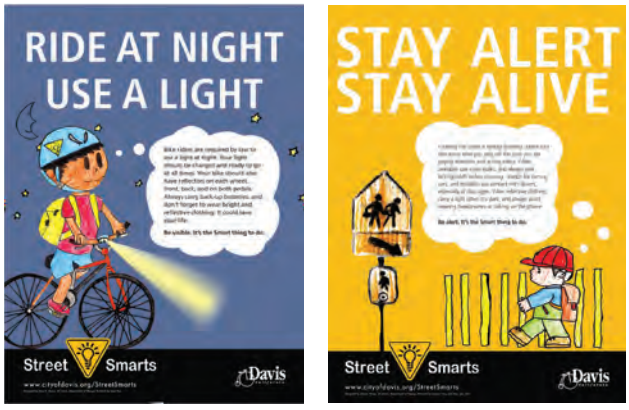
  Recommendation: It is recommended Santa Clara develop a citywide wayfinding program that offers guidance to destinations including downtown, schools, trails, adjacent communities, landmarks, and civic buildings.

Programs

This section describes recommended bicycle related programs for the City of Santa Clara. Programs are one of three goals identified in the Santa Clara Bicycle Plan Update 2018. The programs are organized in four E's:

- **Education** programs are designed to improve safety and awareness. They can include programs that teach students how to safely cross the street, or teach drivers where to anticipate bicyclists and how to share the road safely.
- **Encouragement** programs provide incentives and support to help people leave their car at home and try bicycling instead.
- **Enforcement** programs enforce legal and respectful bicycling and driving. They include a variety of approaches, ranging from police enforcement to neighborhood signage campaigns.
- **Evaluation** programs are an important component of any investment. They help measure success at meeting the goals of this Plan and identify adjustments that may be necessary.

A fifth E commonly included in discussions of active transportation is **Equity**, which should be incorporated throughout all program recommendations in this Plan along with any other bicycle-related program implemented in Santa Clara.



Davis, CA Street Smarts Campaign Posters

Education

Education programs are important for teaching safety rules and laws as well as increasing awareness regarding bicycling opportunities and existing facilities. Education programs may need to be designed to reach groups at varying levels of knowledge and there may be many different audiences: pre-school age children, elementary school students, teenage and college students, workers and commuters, families, retirees, the elderly, new immigrants, and non-English speakers. The programs listed in this chapter are not exhaustive and will be further detailed when designed and implemented.

StreetSmarts Campaign

On a citywide scale, the city could start a StreetSmarts media campaign, similar to those in San José, Marin County, Davis, and other California cities. Developed by the City of San José, StreetSmarts uses print media, radio spots, and television spots to educate people about safe driving, bicycling, skateboarding, and walking behavior. More information about StreetSmarts can be found at www.getstreetsmarts.org.

Outreach conducted during this planning effort identified a need to raise public awareness of bicycling and walking as viable forms of transportation, and to combat negative stereotypes about people who choose to walk or bicycle.

Local resources for conducting a StreetSmarts campaign can be maximized by assembling a group of local experts, law enforcement officers, businesspeople, civic leaders, and dedicated community volunteers. These allies could assist with a successful safety campaign based on the local concerns and issues. It may be necessary to develop creative strategies for successful media placement in order to achieve campaign goals.

Recommendation: This Plan recommends the city consider implementation of a public awareness program such as StreetSmarts.

Adult Bicycling Skills Classes

Most bicyclists do not receive training on safe bicycling practices, the rules of the road, and bicycle handling skills. Adult education programs were identified as a need by the community through the survey and public workshop.

Bicycling skills classes can address this education gap. The League of American Bicyclists (LAB) offers classes taught by certified instructors. Information can be found at www.bikeleague.org. The Silicon Valley Bicycle Coalition (SVBC) and Santa Clara Valley Transportation Authority (VTA) offers adult bicycle education classes periodically and at the request of local jurisdictions. More information can be found at bikesiliconvalley.org and www.vta.org/SmartCycling.

Recommendation: This Plan recommends the city support adult bicyclist skills classes, especially at the city's largest employers.

Student Bicycle Traffic Safety Information

Student education programs are an essential component of bicycle education. Students are taught traffic safety skills that help them understand basic traffic laws and safety rules.

Bicycle education curriculum typically includes two parts: knowledge and skills. Knowledge lessons are typically in-class, while skills are practiced on a bicycle. Lessons can include helmet and bicycle fit, hand signals, and riding safely with traffic.

The city in partnership with The Santa Clara Unified School District is implementing a Safe Routes to School Program emphasizing the Education, Encouragement, and Evaluation aspects of the program at 12 schools.

Recommendation: This Plan recommends the city continue its education program and expand it to include all Santa Clara schools.

Encouragement

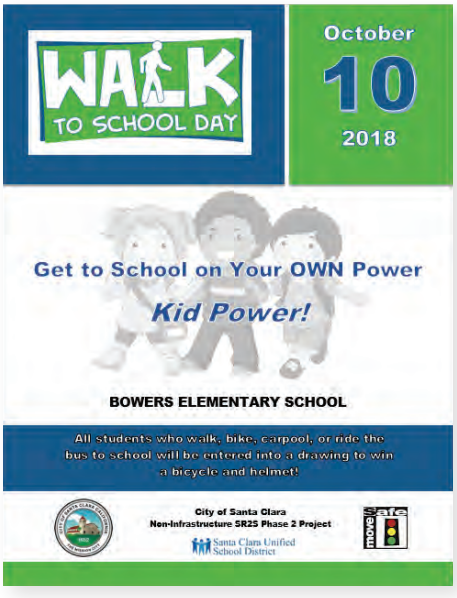
Everyone from young children to elderly residents can be encouraged to increase their rates of bicycling or to try bicycling instead of driving for short trips.

Back-to-School Encouragement Marketing

Families set transportation habits during the first few weeks of the school year and are often not aware of the multiple transportation options and routes available to them. Because of this, many families will develop the habit of driving to school using the same congested route as everyone else.

A back-to-school encouragement marketing campaign can promote bus, carpool, walking, and bicycling to school. The marketing campaign can include suggested route maps, safety education materials, volunteer opportunities, event calendars, and traffic safety enforcement notices. It can also include an illustrative guide that includes the Suggested Walking and Biking to School maps.

Recommendation: This Plan recommends the city continue its education program and expand it to include all Santa Clara schools.



Bowers Elementary Safe Routes to School Flyer

Employer-Based Encouragement Programs

Though the city cannot host these programs, it can work with or provide information to employers about commuting by bicycle. Popular employer-based encouragement programs include hosting a bicycle user group to share information about how to bicycle to work and to connect experienced bicyclists with novice bicyclists. Employers can host bicycle classes and participate in Bike to Work Day.

Employers can also set up a National Bike Challenge (nationalbikechallenge.org) account so that employees can log their hours and set up an internal contest for who logs the most hours.

Recommendation: This Plan recommends the city collaborate with employers to implement bicycle related programs.

Bicycle Friendly Community

LAB recognizes communities that improve bicycling conditions through education, encouragement, enforcement, and evaluation programs. Communities can achieve diamond, platinum, gold, silver, or bronze status, or an honorary mention. Bicycle friendliness can indicate that a community is healthy and vibrant. Like good schools and attractive downtowns, bicycle friendliness can increase property values, spur business growth, and increase tourism.

Santa Clara is currently a Bronze-level Bicycle Friendly Community.

Recommendation: This Plan recommends the city reapply for a Bicycle Friendly Community status after implementation of the priority projects and many of the recommended programs identified in this Plan. This Plan is a valuable resource for completing the LAB application efficiently.

More information and application steps: www.bikeleague.org/bfa

Bicycle Helmet Giveaway

The California Office of Traffic Safety (OTS) grant program can fund bicycle helmets for giveaways to children at schools or children observed bicycling without wearing helmets. This type of program is typically a partnership with the Police Department.

Recommendation: This Plan recommends the city seek an OTS grant and continue to conduct helmet giveaways for children.

Open Streets Events

Open Streets events, sometimes called "Ciclovia," celebrate walking and bicycling by closing key streets to vehicle traffic for a set amount of time and opening them up for walking, bicycling, and other community activities. These events can create opportunities for people to try walking or bicycling away from the potential stresses of adjacent vehicle traffic. Open Streets events of comparable size in California have ranged in cost from $50,000 to $200,000. These events require a high level of coordination between various city and county departments, and it is recommended the city find a partner non-profit organization to lead the event planning and logistics work.

Recommendation: This Plan recommends the city work with local community groups to host Open Streets events on a semi-annual basis. For the first event, partner with the City of San José for their annual Viva Calle open streets event.

Bike to Work Month and Day

Bike Month (bikeleague.org/bikemonth) is a regional event to promote bicycling to work and is typically held in May. SVBC organizes Bike Month and provides ideas for events. The City of Santa Clara sponsors an Energizer Station each Bike to Work Day.

Popular events include:

- Bike to Work Day (typically the 3rd Thursday of May)
- Bike education classes
- BikePools or Bike Trains (group rides)

Recommendation: This Plan recommends the city continue sponsoring a Bike to Work Day Energizer Station and begin to sponsor a different event. The event can include a Bike to Work Day celebration with Pedal Pools (group rides), raffles and prizes, and speeches from Council Members or the Mayor. The type of events held can be developed through community input.

Bike to Shop Day

SVBC helps organize an annual Bike to Shop Day during May Bike Month. Local shop owners typically reward shoppers who arrive by bike through discounts and prizes.

Recommendation: Work with the BPAC, SVBC, and local businesses owners to bring this event to Santa Clara.

Walk & Roll Days

Walk and Bike to School Days are events to encourage students to try walking or bicycling to school. The most popular events of this type are International Walk to School Day (held in early October) and Bike to School Day (held in early May). Many communities have expanded on this once-a-year event and hold monthly or weekly events such as Walk and Roll the First Friday (of every month) or Walk and Roll Wednesdays (held every Wednesday).

Holding weekly or monthly Walk & Roll to School Day promotes regular use of active transportation and helps establish good habits. Events can take on a wide range of activities.

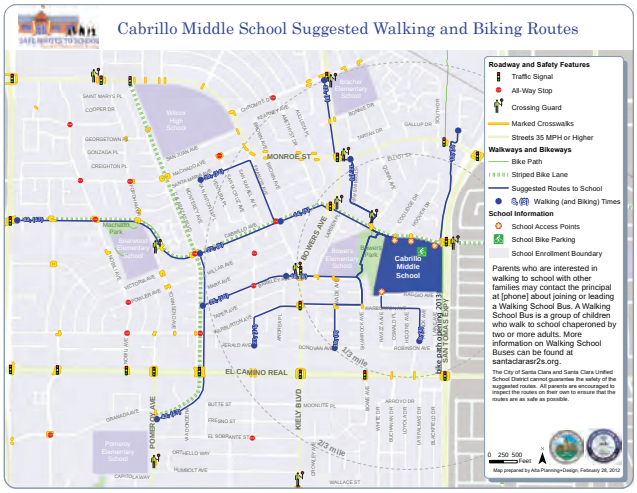
Recommendation: It is recommended the city, school districts, schools, PTAs, and parent champions work together to expand Walk and Bike to School days to be held on a weekly basis.

Walking School Buses and Bike Trains

A Walking School Bus is an organized group of students who walk to school under the supervision of a parent/adult volunteer. Bike Trains are similar to Walking School Buses, with students bicycling together. Parent champions take turns walking or bicycling along a set route to and from school, collecting children from designated "bus stops" along the way.

Schools and parent champions can encourage parents to form Walking School Buses or Bike Trains at the back-to-school orientation or other fall events. The school districts can provide safety vests or marked umbrellas to indicate the leader(s). Incentives for the parent volunteers can include coffee at the school or gift cards for coffee shops.

Recommendation: This Plan recommends the city continue to work with school districts, schools and parent champions with a "Walking School Bus and Bike Train" program. More information and resources can be found at www.walkingschoolbus.org *or* guide.saferoutesinfo.org/walking_school_bus.



Example Suggested Routes to School map

Suggested Routes to School Maps

Suggested Walking and Biking Routes to School Maps can help parents overcome fears related to traffic and/or lack of knowledge of family friendly routes to school. These types of maps show stop signs, traffic signals, crosswalks, paths, overcrossings, crossing guard locations, and similar elements that can help parents make decisions about choosing the route that best fits their family's walking or biking needs. Figure 2 shows an example of these maps. Santa Clara has Suggested Routes to School Maps for seven schools, six elementary and one middle school, although none of the school websites feature the maps.

Recommendation: This Plan recommends the city update the Suggested Walking and Biking Routes to School maps for the seven SRTS schools. It is recommended to update these maps for each Santa Clara school as they are incorporated into the SRTS Program. These maps should be reviewed and updated every four years to reflect improvements as they are implemented in the community.

Enforcement

Enforcement programs enforce legal and respectful use of the transportation network. These programs will help educate motorists, bicyclists, and pedestrians about the rules and responsibilities of the road.

Bicycle-Related Ticket Diversion Class

Diversion classes are classes offered to bicyclist offenders of certain traffic violations, such as running a stoplight.

California Assembly Bill 209, signed by Governor Brown on September 21, 2015, allows for such programs for violations not committed by a driver of a motor vehicle. This program is a good way to educate bicyclists about rights and responsibilities.

The Santa Clara Sheriff's Office offers ticket diversion classes to juveniles. No classes are currently offered to those 18 years of age or older.

Recommendation: This Plan recommends the city continue to encourage the Sheriff's Office to offer juvenile diversion classes, AND further encourage the Sheriff's Office to offer classes to all age groups. It is recommended to give warnings to first time offenders, then offer diversion classes on the second offense.

Crosswalk Stings/Enforcement Campaigns

In a crosswalk sting operation, the Police Department targets drivers who fail to yield to pedestrians in a school crosswalk. A plain-clothes decoy police officer ventures into a crosswalk and motorists who do not yield are given a citation by a second officer stationed nearby. The Police Department or School District may alert the media to the crosswalk stings to increase public awareness of the crosswalk safety issue. Other common enforcement campaigns include targeting driver violations including speeding or talking/texting on cellphones.

Recommendation: It is recommended the city and school district work with the Police Department to conduct crosswalk stings and enforcement campaigns near schools and other key destinations for bicyclists and pedestrians.

Vision Zero Targeted Enforcement

Cities that adopt Vision Zero policies, such as San Francisco and San José, have adopted enforcement goals targeting the vehicle code infractions most likely to result in injury collisions or fatalities. Law enforcement officers are then tasked with the goal that a certain percentage of their traffic stops be related to these high-risk infractions.

Recommendation: This Plan recommends that, if a Vision Zero policy is adopted, the city coordinate with the Police Department to implement targeted enforcement within the City of Santa Clara. Targeted enforcement goals will be determined following comprehensive study of historical collision data in Santa Clara.

Evaluation

Evaluation programs help the city measure how well it is meeting the goals of this Plan and the General Plan and evaluation is a key component of any engineering or programmatic investment. It is also a useful way to communicate success with elected officials as well as local residents.

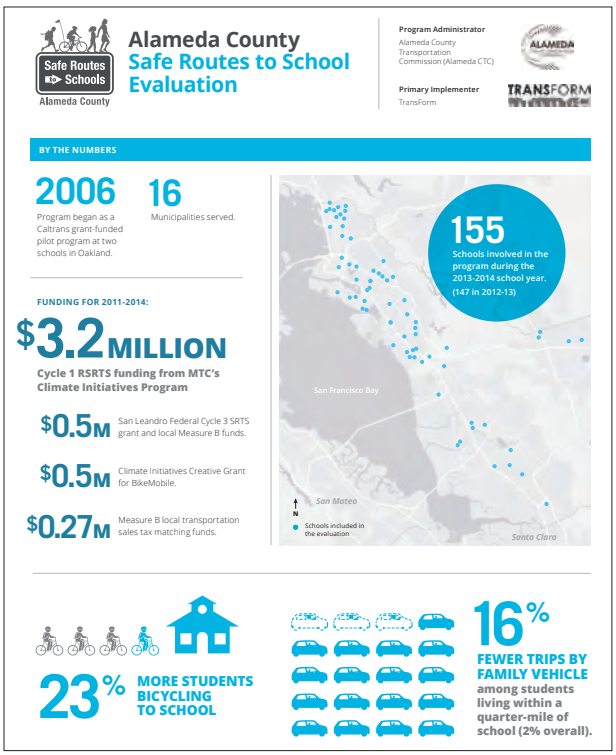
Annual Collision Data Review

Reviewing bicycle related collisions and near-misses on an annual basis can help the city identify challenging intersections or corridors. This review should include an assessment of the existing infrastructure to determine whether improvements can be made to reduce the number of collisions in the community.

Recommendation: This Plan recommends the city and Police Department review bicycle related collision data on an annual basis to identify annual trends and needed improvements.

Parent Surveys

The National Center for Safe Routes to School provides a standard parent survey, collecting information on modes of travel, interest in walking or biking to school, and challenges to walking and bicycling to school. The information gathered from the parent surveys can help craft programs that are attractive to parents and measure parent attitudes and changes in attitude towards walking and biking to school.



Manual Student Walking and Biking Counts

Student hand tallies are one way to count the number of students who walk, bicycle, take transit or carpool to school. The National Center for Safe Routes to School provides the standard tally form.

Recommendation: This Plan recommends the Santa Clara Unified School District conduct student tallies on an annual basis.

Annual Report Card

An annual report card assesses the City's progress toward goals and objectives outlined in this Plan, implementation of its projects and programs, and changing bicycle mode share. It should also include how many new bike lane miles were installed and how many bike lane miles were upgraded during the previous year. As part of the report card development process, the City can collect the rate of bicycle commuting as reported by the American Community Survey and collect bike counts at select locations. Completed report cards may be shared with City Council, members of the BPAC, and community leadership to celebrate achievements and identify priorities for the following year.

Recommendation: This Plan recommends the City work with appropriate partners to develop a bicycle report card on an annual basis.

Implementation

This chapter describes the process for evaluating project recommendations in order to help Santa Clara prioritize projects that generate the greatest value at the lowest cost.

Methodology

Recommended projects were analyzed against six evaluation criteria that help meet the vision and goals of the Bicycle Plan Update. The prioritization criteria were:

- **Safety/collision reduction** - Corridor recommendations that are within close proximity of at least two (2) bicycle-related collisions between 2013 and 2017
- **Connectivity** - Corridor recommendations that connect to schools, hospitals, parks, and shopping centers and are at least 0.25 miles in length
- **Gap closure** - Corridor recommendations that close critical north-south and east-west gaps in the existing bicycle network
- **Comfort** - Corridor recommendations and spot improvement recommendations that help create a more comfortable bicycling experience for the greatest number of people on the most stressful roadways. These projects are located on roadways with a level of traffic stress (LTS) score of 4, as computed by VTA, and would improve this score to a 2 or 1 (comfortable for most families and novice bicyclists).
- **Community identified need** - Corridors and intersections that received the highest number of comments and expressions of interest/concern directly from the community through the planning process
- **Feasibility** – Lower cost projects within the City's right-of-way are prioritized

Priority Projects

Forty (40) out of 159 recommended projects partially met at least one of the criteria listed above and will be prioritized for implementation. Thirty-one (31) projects are corridor projects and nine (9) are spot improvements. The corridor projects are a combination of all bikeway facility types and the spot improvements all involve intersection reconfiguration, including locations where existing trails cross roadways. The projects toward the bottom of the list will take more time to implement due to design, further study, staff time, resources, and funding availability. Table 12 shows the 40 projects the City will prioritize for implementation in rank order. Projects will be completed by the City based on funding availability and may not be built in the order shown in Table 12. Please note that the table may have projects combined to show the full combined network recommendation.

Table 12: Priority Projects by Ranking

● = FULLY MET CRITERIA ◐ = PARTIALLY MET CRITERIA EMPTY = DID NOT MEET CRITERIA FOR PRIORITIZATION

Rank	Recommendation/Notes	Safety	Comfort	Connectivity	Gap Closure	Community Identified	Feasibility
1	El Camino Real between western city limit and eastern city limit – Corridor: Class IV separated bikeway	●	●	●		●	
2	Pruneridge Avenue between western city limit and eastern city limit – Corridor: Class II buffered bike lanes	◐		●	●	●	
3	Scott Boulevard between Monroe Street and Saratoga Avenue – Corridor: Class II bike lanes	◐		●		●	◐
4	Benton Street between El Camino Real and Lincoln Street – Corridor: Class II bike lanes					●	●
5	Bowers Avenue between Chromite Drive and El Camino Real – Corridor: Class II buffered bike lanes	●		●			◐
6	El Camino Real at Benton Street - Spot #22: Signal detection, tighten turning radii		●				●
7	El Camino Real at Monroe Street - Spot #21: Signal detection, tighten turning radii		●				●
8	Harvard Avenue between Homestead Road and Pruneridge Avenue – Corridor: Class III bicycle boulevard				●		●
9	Homestead Road between Scott Boulevard and Viader Court – Corridor: Class II bike lanes				●		●
10	Lincoln Street between Warburton Avenue and Homestead Road – Corridor: Class II bike lanes and Class III bicycle boulevard				●		●
11	Manchester Drive/Camino Drive between Monroe Street and Park Avenue – Corridor: Class III bicycle boulevard				●		●
12	Mission College Boulevard between Great America Parkway and Marriott entrance – Corridor: Class II bike lanes				●		●
13	Monroe Street between Lawrence Expressway and the San Tomas Aquino Creek Trail - Corridor: Class II buffered bike lanes	●			●		◐

● = FULLY MET CRITERIA ◐ = PARTIALLY MET CRITERIA EMPTY = DID NOT MEET CRITERIA FOR PRIORITIZATION

Rank	Recommendation/Notes	Safety	Comfort	Connectivity	Gap Closure	Community Identified	Feasibility
14	San Tomas Expressway at Monroe Street – Spot #17: Reconfigure intersection - Consistent with VTA Bike Plan		●				●
15	Saratoga Creek Trail between Cabrillo Avenue and Forbes Avenue – Corridor: Class I shared-use path - Project being analyzed separately under the Creek Trail Master Plan project			●	◐	●	
16	Benton Street between Dunford Way and Maryann Drive - Corridor: Class II buffered bicycle lanes	◐		●		●	
17	Benton Street between Maryann Drive and Lincoln Street – Corridor: Class III bicycle boulevard	◐					●
18	Calabazas Creek Crail extension between Calabazas Creek Trail and Benton Street - Corridor: Class I shared-use path - Project being analyzed separately under the Creek Trail Master Plan project	◐		●	●		
19	Forbes Avenue between Harvard Avenue and Los Padres Boulevard - Corridor: Class III bicycle boulevard	◐		●			◐
20	Laurelwood Road between Thomas Road and Bassett Street – Corridor: Class II bike lanes	◐					●
21	Monroe Street between Civic Center Drive and Lewis Street – Corridor: Class II bike lanes	◐					●
22	Amethyst Drive between Glad Drive and Bowers Avenue – Corridor: Class III bicycle boulevard	●					◐
23	Bowers/Great America Parkway between Bay Trail and Chromite Drive - Corridor: Class IV separated bikeway	◐	◐	●			
24	Homestead Road at San Tomas Expressway – Spot # 26: Install protected intersection - Short Term: bike lane markings through intersection		●			●	
25	Kifer Road/Walsh Avenue between City Limit and Lafayette Street – Corridor: Class IV separated bikeway	◐	◐		●		

● = FULLY MET CRITERIA ◐ = PARTIALLY MET CRITERIA EMPTY = DID NOT MEET CRITERIA FOR PRIORITIZATION

Rank	Recommendation/Notes	Safety	Comfort	Connectivity	Gap Closure	Community Identified	Feasibility
26	Pruneridge Avenue at Lawrence Expressway – Spot #29: Install protected intersection - Coordinate with VTA		●			●	
27	San Tomas Aquino Creek Trail at Monroe Street – Spot # 16: Reconfigure intersection - Redesign striping across Monroe St to better signal to drivers where to stop at red light					●	◐
28	Warburton Avenue between Lawrence Road and Laine Avenue – Corridor: Class III bicycle boulevard			●			◐
29	De La Cruz Boulevard between Montague Park and Trimble Road - Corridor: Class IV separated bikeway		◐				◐
30	Lafayette Street between Laurelwood Road and Reed Street - Corridor: Class IV separated bikeway	◐	●				
31	Mission College Boulevard between Bowers Avenue and Montague Expressway - Corridor: Class IV separated bikeway		◐				◐
32	Saratoga Avenue between Stevens Creek Boulevard and Market Street – Corridor: Class II buffered bike lanes	◐					◐
33	De La Cruz Boulevard between Central Expressway and Martin Avenue - Corridor: Class IV separated bikeway		●				
34	Homestead Road at Lawrence Expressway – Spot #28: Install protected intersection - Coordinate with VTA		●				
35	Lick Mill Boulevard between Tasman Drive and Montague Expressway - Corridor: Class IV separated bikeway	◐	◐				
36	San Tomas Aquino Creek Trail at Agnew Road – Spot #7: Reconfigure intersection					●	
37	San Tomas Expressway at Walsh Avenue - Spot #15: Install protected intersection - Consistent with VTA Bike Plan		●				

● = FULLY MET CRITERIA ◐ = PARTIALLY MET CRITERIA EMPTY = DID NOT MEET CRITERIA FOR PRIORITIZATION

Rank	Recommendation/Notes	Safety	Comfort	Connectivity	Gap Closure	Community Identified	Feasibility
38	Lafayette Street between SR 237 and Agnew Road - Corridor: Class IV separated bikeway		◐				
39	Patrick Henry Drive/Old Ironsides Drive between Tasman Drive and Tasman Drive - Corridor: Class IV separated bikeway		◐				
40	Scott Boulevard between western city limit and Monroe Street – Corridor: Class II buffered bike lanes	◐					

Tables 13 and 14 summarizes the number of priority projects by type along with the mileage, where applicable. Figure 20 maps these projects.

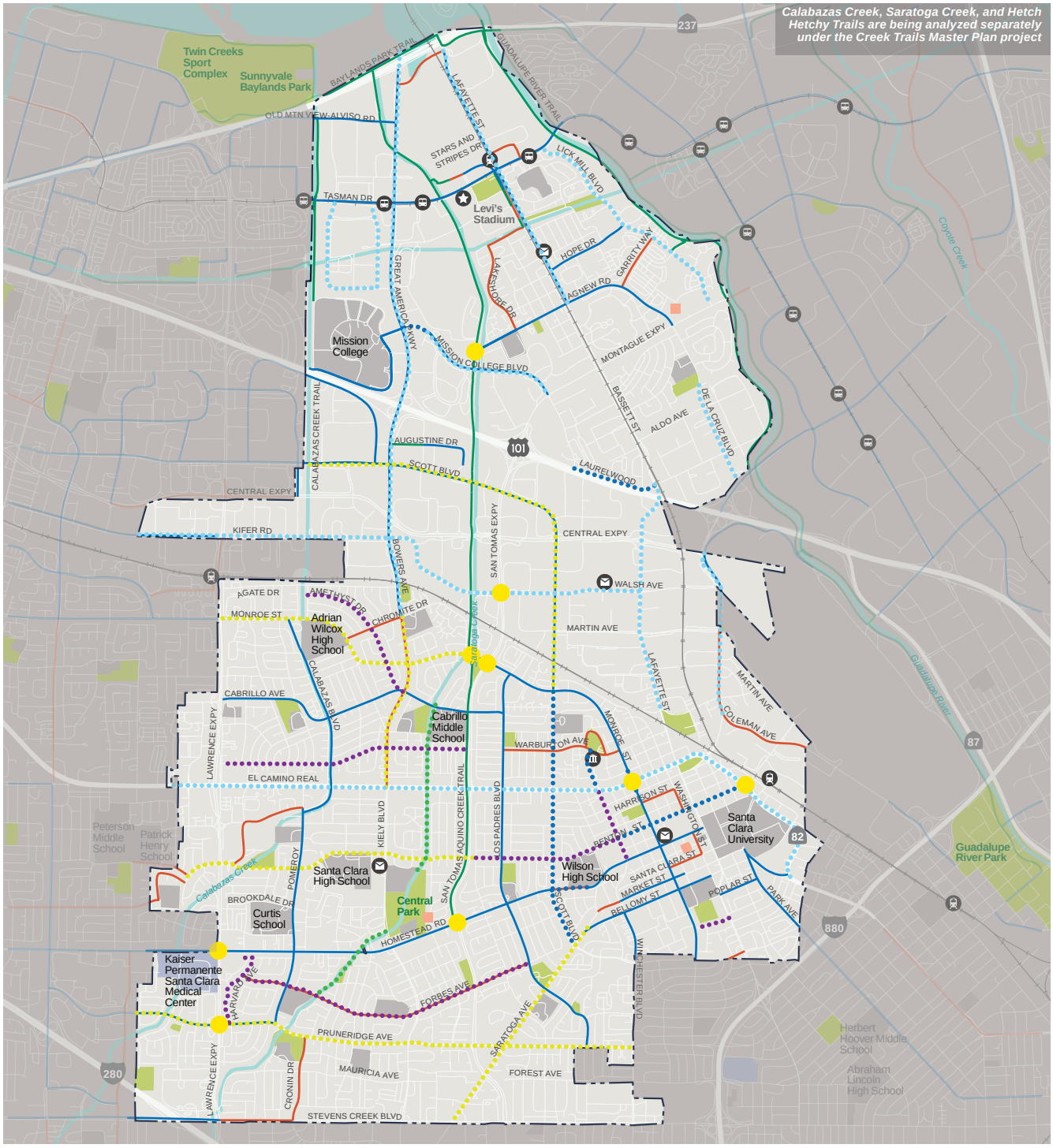
Table 13: Summary of Priority Bikeway Corridor Recommendations

Bikeway Type	Miles	Cost Estimate – Low	Cost Estimate – High
Class I Shared Use Paths	5.83	$4,083,000	$5,832,000
Class II Bicycle Lanes	3.66	$292,000	$1,549,000
Class II Buffered Bicycle Lanes	11.40	$1,482,000	$4,821,000
Class III Bicycle Boulevards	6.58	$495,000	$922,000
Class IV Separated Bikeways	19.21	$4,801,000	$14,885,000
Total	**46.68**	**$11,153,000**	**$28,009,000**

Table 14: Summary of Priority Spot Improvement Recommendations

Improvement Type	Number of Recommendations	Cost Estimate – Low	Cost Estimate – High
Intersection Improvements (several)	5	$32,500	$465,000
Protected Intersection	4	$2,255,000	$6,000,000

Figure 20



Source: City of Santa Clara, Caltrans, US Census, ESRI, VTA. Map produced March 2018.

High-Priority Recommendations & Existing Bikeways

Santa Clara Bicycle Plan Update 2018

N

0 0.5 1 MILES

Existing Bikeways
- Bridge or Undercrossing
- Class I Shared-Use Path
- Class II Bicycle Lane
- Class III Bicycle Route

Recommended Bikeways
- Class I Shared-Use Path
- Class II Bicycle Lane
- Class IIB Buffered Bicycle Lane
- Class III Bicycle Route
- Class IIIB Bicycle Boulevard
- Class IV Separated Bikeway

Proposed Improvements
- Spot Improvement

Destinations + Boundaries
- City Hall
- Train Station
- Light Rail Station
- USPS Office
- Sport Stadium
- School
- Hospital
- Park
- Library

Funding

Funding Strategies

A variety of sources exist to fund bicycle and pedestrian infrastructure projects, programs, and studies. Local and regional funding sources that can be used for construction or maintenance of bicycle or pedestrian improvements, along with competitive grant programs, are described below. Table 15 identifies the types of projects that can be funded through these sources. "Santa Clara will make every effort to collaborate with neighboring jurisdictions to coordinate project implementation.

Local and Regional Funding Sources

Transportation Funds for Clean Air

Money in the Transportation Funds for Clean Air program, established by Assembly Bill 434, is generated by a $4 vehicle registration surcharge in the nine Bay Area counties. The funds may be used on projects that reduce vehicle emissions, including bicycle and pedestrian projects, and can also be used as a match for competitive state or federal programs.

Funds are programmed by the Bay Area Air Quality Management District (BAAQMD) and Santa Clara Valley Transportation Authority (VTA).

Bicycle Facilities Grant Program

Throughout the nine-county Bay Area, the Bicycle Facilities Grant program strives to reduce emissions from on-road motor vehicles and improve air quality by helping residents and commuters shift modes to bicycling and walking as alternatives to driving for short distances and first-and-last mile trips. BAAQMD has grant programs that fund both on-street facilities and bicycle parking facilities.

Funds are programmed by the BAAQMD.

One Bay Area Grant

The competitive grant funding program emphasizes funding for projects within Priority Development Areas in the region that are in-line with housing and land-use goals.

Funds are programmed by the Metropolitan Transportation Commission (MTC) and VTA.

Transportation Development Act Article 3

Transportation Development Act Article 3 (TDA 3) provides funding annually for bicycle and pedestrian projects. Two percent of TDA funds collected within the county are used for TDA 3 projects. Metropolitan Transportation Commission policies require that all projects be reviewed by a BPAC or similar body before approval.

Funds are programmed by VTA.

Measure B

Measure B is a one-half cent sales tax in Santa Clara County to fund transportation projects including maintenance, transit, and traffic safety improvement projects. Measure B is expected to raise $6.3 billion (2017 dollars) over 30 years; $250 million of that has been allocated for bicycle and pedestrian improvements.

Funds are programmed by VTA.

Traffic Impact Fees

A traffic impact fee is a one-time city fee intended to ensure new development and redevelopment projects pay a fair share to mitigate traffic impacts. The fees are used for transportation infrastructure needed to accommodate new growth in the city. Santa Clara collects traffic impact fees on seven types of land uses that can be used for projects identified through the Traffic Mitigation Program such as bicycle projects. The amount of funding collected from traffic impact fees are subject to the level of development.

Funds are programmed by City of Santa Clara.

Multimodal Improvement Plan

The Multimodal Improvement Plan (MIP) was developed as a result of the City Place project and the anticipated impacts the project will have on the transportation network. The MIP identifies and implements a set of actions, improvements, and programs that will improve system-wide transportation and air quality in the City of Santa Clara. The seven intersections identified by the MIP and their responsible agencies are:

- Great America Parkway and Tasman Drive (City)
- Great America Parkway and Mission College Boulevard (City)
- Agnew Road/De La Cruz Boulevard and Montague Expressway (County)
- Scott Boulevard and Central Expressway (County)
- De La Cruz Boulevard and Central Expressway (County)
- San Tomas Expressway and Monroe Street (County)
- Lafayette Street and El Camino Real (Caltrans)

Regional Measure 3

Regional Measure 3 uses toll revenue from the Bay Area's seven state-owned toll bridges. The money from Regional Measure 3 funds a variety of highway and transit projects throughout the region.

Funds are programmed by MTC.

Vehicle Emissions Reduction Based at Schools Program (VERBS)

The Vehicle Emissions Reduction Based at Schools (VERBS) program receives funds from MTC's Climate Initiative Safe Routes to School Program. The goal of this includes reducing greenhouse gases by promoting walking, biking, transit, and carpooling to school. These federal CMAQ funds are allocated to each county based on school enrollment. The VERBS Program places an additional focus on improving safety and reducing collisions.

Funds are programmed by VTA.

Competitive Grant Programs

California Active Transportation Program

California's Active Transportation Program (ATP) funds infrastructure and programmatic projects that support the program goals of shifting trips to walking and bicycling, reducing greenhouse gas emissions, and improving public health. Competitive application cycles occur every one to two years, typically in the spring or early summer. Eligible projects include construction of bicycling and walking facilities, new or expanded programmatic activities, or projects that include a combination of infrastructure and non-infrastructure components. Typically no local match is required, though extra points are awarded to applicants who do identify matching funds.

Funds are programmed by the California Transportation Commission (CTC).

Sustainable Transportation Planning Grants

Caltrans Sustainable Transportation Planning Grants are available to communities for planning, study, and conceptual design work to identify and evaluate projects, including conducting outreach or implementing pilot projects. Communities are typically required to provide an 11.47 percent local match, but staff time or in-kind donations are eligible to be used for the match provided the required documentation is submitted.

Funds are programmed by Caltrans.

Highway Safety Improvement Program

Caltrans offers Highway Safety Improvement Program (HSIP) grants every one to two years. Projects on any publicly owned road or active transportation facility are eligible, including bicycle and pedestrian improvements. HSIP focuses on projects that explicitly address documented safety challenges through proven countermeasures, are implementation-ready, and demonstrate cost-effectiveness.

Funds are programmed by Caltrans.

Solutions for Congested Corridors Program

Funded by SB1, the Congested Corridors Program strives to reduce congestion in highly traveled and congested corridors through performance improvements that balance transportation improvements, community impacts, and environmental benefits. This program can fund a wide array of improvements including bicycle facilities and pedestrian facilities. Eligible projects must be detailed in an approved corridor-focused planning document. These projects must include aspects that benefit all modes of transportation using an array of strategies that can change travel behavior, dedicate right of way for bikes and transit, and reduce vehicle miles traveled.

Funds are programmed by the CTC.

Office of Traffic Safety

Under the Fixing America's Surface Transportation (FAST) Act, five percent of Section 405 funds are dedicated to addressing nonmotorized safety. These funds may be used for law enforcement training related to pedestrian and bicycle safety, enforcement campaigns, and public education and awareness campaigns.

Funds are programmed by the California Office of Traffic Safety.

Recreational Trails Program

The Recreational Trails Program helps provide recreational trails for both motorized and nonmotorized trail use. Eligible products include: trail maintenance and restoration, trailside and trailhead facilities, equipment for maintenance, new trail construction, and more.

Funds are programmed by the California Department of Parks and Recreation.

Affordable Housing and Sustainable Communities Program

The AHSC program funds land-use, housing, transportation, and land preservation projects that support infill and compact development that reduces greenhouse gas emissions. Projects must fall within one of three project area types: transit-oriented development, integrated connectivity project, or rural innovation project areas. Fundable activities include: affordable housing developments, sustainable transportation infrastructure, transportation-related amenities, and program costs.

Funds are programmed by the Strategic Growth Council and implemented by the Department of Housing and Community Development.

Cultural, Community and Natural Resources Grant Program – Proposition 68

Proposition 68 authorizes the legislature to appropriate $40 million to the California Natural Resources Agency to protect, restore, and enhance California's cultural, community, and natural resources. One type of eligible project that this program can fund are projects that develop future recreational opportunities including: creation or expansion of trails for walking, bicycling, and/or equestrian activities and development or improvement of trailside and trailhead facilities, including visitor access to safe water supplies.

Funds are programmed by the California Natural Resources Agency.

Urban Greening Grants

Urban Greening Grants support the development of green infrastructure projects that reduce GHG emissions and provide multiple benefits. Projects must include one of three criteria, most relevantly: reduce commute vehicle miles traveled by constructing bicycle paths, bicycle lanes or pedestrian facilities that provide safe routes for travel between residences, workplaces, commercial centers, and schools. Eligible projects include green streets, green alleyways, and non-motorized urban trails that provide safe routes for travel between residences, workplaces, commercial centers, and schools.

Funds are programmed by the CA NRA.

Other State Funds

Senate Bill 1: Road Maintenance and Rehabilitation Program

Senate Bill 1 created the Road Maintenance and Rehabilitation Program (RMRP) to address deferred maintenance on state highways and local road systems. Program funds can be spent on both design and construction efforts. On-street active transportation-related maintenance projects are eligible if program maintenance and other thresholds are met. Funds are allocated to eligible jurisdictions.

Funds are programmed by the State Controller's Office.

Senate Bill 1: Local Partnership Program

As part of the RMRP, the Local Partnership Program provides local and regional agencies that have passed sales tax measures, developer fees or other transportation-imposed fees to fund road maintenance and rehabilitation, sound walls, and other transportation improvement projects. Jurisdictions with these taxes or fees are then eligible for a formulaic annual distribution of no less than $100,000. These jurisdictions are also eligible for a competitive grant program. Local Partnership Program funds can be used for a wide variety of transportation purposes including roadway rehabilitation and construction, transit capital and infrastructure, bicycle and pedestrian improvements, and green infrastructure.

Funds are programmed by CTC.

Table 15: Funding Eligibility Table

Funding Source	On-Street Bikeways	Trails	Safe Routes to School	Safe Routes to Transit	Crossings/ Intersections	Programs	Studies
Local and Regional Programs							
Transportation Funds for Clean Air (VTA & BAAQMD)	●	●	●	●	●		
Bicycle Facilities Program (BAAQMD)	●	●	●	●			
One Bay Area (MTC & VTA)	●	●	●	●			
Transportation Development Act, Article 3 (VTA)	●	●	●	●	●		
Measure B (VTA)	●	●	●	●	●	●	●
Regional Measure 3 (MTC)				●			
Vehicle Emissions Reductions Based at Schools Program (VTA)	●	●		●	●		
Competitive Grant Programs							
Active Transportation Program (CTC)	●	●	●	●	●	●	
Sustainable Transportation Planning Grants (Caltrans)							●
Highway Safety Improvement Program (Caltrans)	●		●	●	●		

Funding Source	On-Street Bikeways	Trails	Safe Routes to School	Safe Routes to Transit	Crossings/ Intersections	Programs	Studies
Competitive Grant Programs							
Solutions for Congested Corridors (CTC)	●	●			●		
Office of Traffic Safety (CA OTS)						●	
Recreational Trails Program (CA DPR)		●					
Affordable Housing & Sustainable Communities (CA HCD)	●			●		●	
Cultural, Community, and Natural Resources (CA NRA)		●					
Urban Greening Grants (CA NRA)	●	●	●	●			
Other State Funds							
Local Partnership Program (CTC)	●		●	●	●		
Road Maintenance and Rehabilitation Program (Controller's Office)	●		●	●			

Cost Estimates

Planning-level cost estimates were developed for most of the project recommendations based on the construction costs for comparable projects in nearby jurisdictions (see Table 16). These cost estimates include required signage. The projects without cost estimates will require further study to determine the costs. All costs are shown in 2018 dollars.

Table 16: Planning-Level Cost Estimates in 2018 Dollars

Facility Type	Unit	Cost Estimate - Low	Cost Estimate - High	Notes
Class I Shared Use Path	Mile	$700,000	$1,000,000	12-feet wide with 2-foot shoulders
Class II Bicycle Lanes	Mile	$80,000	$423,000	High cost estimate assumes $8 per square foot for roadway grinding, overlay, and slurry seal for an 80 feet wide roadway
Class II Buffered Bicycle Lanes	Mile	$130,000	$423,000	High cost estimate assumes $8 per square foot for roadway grinding, overlay, and slurry seal for an 80 feet wide roadway
Class III Bicycle Route	Mile	$10,000		With sharrows
Class III Bicycle Boulevard	Mile	$75,000	$140,000	Appropriate treatments TBD
Class IV Separated Bikeway	Mile	$250,000	$775,000	Low cost estimate assumes painted buffer with flexible post separation. High cost estimate assumes a more permanent type of separation
Bike Racks	Each	$800	–	
Bike Lockers	Each	$2,000	–	
Signal Detection	Each	$1,500	$30,000	Loop detection vs. video detection
Protected Intersection	Each	$750,000	$1,500,000	
Intersection Crossing Markings	Each	$5,000	–	
Curb Extensions/Tighten Turning Radii	Each	$35,000	$150,000	

Table 17 lists the priority projects with their planning-level cost estimates. Cost estimates may change depending on final design and additional implementation costs not known at this time.

Table 17: Priority Project Recommendations, by Rank

Rank	Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High
1	El Camino Real	Class IV Separated Bikeway		City limit	City limit	4.29	$1,071,000	$3,321,000
2	Pruneridge Ave	Class IIB Buffered Bicycle Lane		Winchester Blvd	City Limit/ Meadow Ave	3.03	$393,000	$1,280,000
3	Scott Blvd	Class II Bicycle Lane		Monroe St	Saratoga Ave	1.55	$124,000	$658,000
4	Benton St	Class II Bicycle Lane		Lincoln St	El Camino Real	0.83	$66,000	$350,000
5	Bowers Ave	Class IIB Buffered Bicycle Lane		Chromite Dr	El Camino Real	1.06	$138,000	$450,000
6	El Camino Real at Benton St	Intersection Improvements	Signal detection, tighten turning radii. Spot Improvement #22	El Camino Real	Benton St	-	$6,500	$180,000
7	El Camino Real at Monroe St	Intersection Improvements	Bicycle detection, Install bike lane markings across intersection, tighten turning radii. Spot Improvement #21	El Camino Real	Monroe St	-	$6,500	$180,000
8	Harvard Ave, Bing Dr/Princeton Way	Class III Bicycle Boulevard		Homestead Rd	Pruneridge Ave	0.55	$41,000	$77,000
9	Homestead Rd	Class II Bicycle Lane		Scott Blvd	Viader Ct	0.23	$18,000	$98,000
10a	Lincoln St	Class II Bicycle Lane		Warburton Ave	El Camino Real	0.25	$20,000	$104,000

Rank	Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High
10b	Lincoln St	Class III Bicycle Boulevard		El Camino Real	Homestead Rd	0.44	$33,000	$61,000
11a	Camino Dr	Class III Bicycle Boulevard		Washington St	Park Ave	0.29	$22,000	$41,000
11b	Manchester Dr	Class III Bicycle Boulevard		Monroe St	Washington St	0.21	$16,000	$29,000
12	Mission College Blvd	Class II Bicycle Lane		Great America Pkwy	Marriott Entrance	0.15	$12,000	$64,000
13	Monroe St	Class IIB Buffered Bicycle Lane		Lawrence Expy	San Tomas Aquino Creek Trail	1.62	$211,000	$685,000
14	San Tomas Expy at Monroe St	Intersection Improvements	Consistent with VTA Bike Plan. Spot Improvement #17	San Tomas Expy	Monroe St	-	$6,500	$35,000
15a	Saratoga Creek Trail	Class I Shared-Use Path	Project being analyzed separately under the Creek Trail Master Plan project	Central Park	Forbes Ave	0.58	$407,000	$581,000
15b	Saratoga Creek Trail	Class I Shared-Use Path	Project being analyzed separately under the Creek Trail Master Plan project	Central Park/Benton St	Cabrillo Ave	1.41	$988,000	$1,411,000
16	Benton St	Class IIB Buffered Bicycle Lane		Dunford Way	Maryann Dr	1.68	$219,000	$712,000
17	Benton St	Class III Bicycle Boulevard		Maryann Dr	Lincoln St	0.88	$66,000	$123,000
18a	Calabazas Creek Trail	Class I Shared-Use Path	Project being analyzed separately under the Creek Trail Master Plan project	Calabazas Creek Trail	Benton St	3.72	$2,604,000	$3,720,000

Rank	Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High
18b	Calabazas Creek Trail Extension - North	Class I Shared-Use Path	Project being analyzed separately under the Creek Trail Master Plan project	Bay Trail	Old Mountain View-Alviso Rd	0.12	$84,000	$120,000
19	Forbes Ave	Class III Bicycle Boulevard		Harvard Ave	Los Padres Blvd	1.84	$138,000	$258,000
20	Laurelwood Rd	Class II Bicycle Lane		Thomas Rd	Bassett St	0.51	$41,000	$217,000
21	Monroe St	Class II Bicycle Lane		Civic Center Dr	Lewis St	0.14	$11,000	$58,000
22	Amethyst Dr	Class III Bicycle Boulevard		Glade Dr	Bowers Ave	0.90	$68,000	$126,000
23	Bowers Ave/Great America Parkway	Class IV Separated Bikeway		Bay Trail	Chromite Dr	3.45	$863,000	$2,674,000
24	Homestead Road at San Tomas Expy	Intersection Improvements	Short Term: bike lane markings through intersection. Spot Improvement #26	Homestead Rd	San Tomas Expy	-	$5,000	$1,500,000
25	Kifer Rd/ Walsh Ave	Class IV Separated Bikeway		City Limit	Lafayette St	3.20	$800,000	$2,480,000
26	Pruneridge Ave at Lawrence Expy	Protected Intersection	Coordinate with VTA. Spot Improvement #29	Pruneridge Ave	Lawrence Expy	-	$750,000	$1,500,000
27	Monroe St at San Tomas Aquino Creek Trail	Intersection Improvements	Redesign striping across Monroe St to better signal to drivers where to stop at red light. Spot Improvement #16	Monroe St	San Tomas Aquino Creek Trail	-	$6,500	$35,000

Rank	Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High
28	Warburton Ave	Class III Bicycle Boulevard		Lawrence Rd	Laine Ave	1.48	$111,000	$207,000
29	De La Cruz Blvd	Class IV Separated Bikeway		Montague Park	Trimble Rd	0.63	$158,000	$491,000
30	Lafayette St	Class IV Separated Bikeway		Laurelwood Rd	Reed St	1.42	$355,000	$1,101,000
31	Mission College Blvd	Class IV Separated Bikeway		Bowers Ave	Montague Expy	0.87	$218,000	$676,000
32	Saratoga Ave	Class IIB Buffered Bicycle Lane		Stevens Creek Blvd	Market St/ Bellomy St	1.42	$185,000	$600,000
33	De La Cruz Blvd	Class IV Separated Bikeway		Central Expy	Reed St	0.89	$223,000	$690,000
34a	Homestead Rd at Lawrence Expy	Intersection Improvements	Short Term: Bike lane markings through intersection. Coordinate with VTA. Spot Improvement #28	Homestead Rd	Lawrence Expy	-	$1,500	$30,000
34b	Homestead Rd at Lawrence Expy	Intersection Improvements	Long Term: Protected Intersection. Coordinate with VTA. Spot Improvement #28	Homestead Rd	Lawrence Expy	-	$750,000	$1,500,000
35	Lick Mill Blvd	Class IV Separated Bikeway		Tasman Dr	Montague Expy	1.43	$358,000	$1,109,000
36	San Tomas Aquino Creek Trail at Agnew Rd	Intersection Improvements	Reconfigure intersection. Spot Improvement #7	San Tomas Aquino Creek Trail	Agnew Rd	-	-	-
37	San Tomas Expy at Walsh Ave	Protected Intersection	Consistent with VTA Bike Plan. Spot Improvement #15	San Tomas Expy	Walsh Ave	-	$750,000	$1,500,000

Rank	Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High
38	Lafayette St	Class IV Separated Bikeway		SR 237	Agnew Rd	1.73	$431,000	$1,337,000
39	Patrick Henry Dr/Old Ironsides Dr	Class IV Separated Bikeway		Tasman Dr	Tasman Dr	1.30	$324,000	$1,006,000
40	Scott Blvd	Class IIB Buffered Bicycle Lane		City Limit	Monroe St	2.59	$336,000	$1,094,000

Opportunity Projects

The remaining projects can be implemented over time in no particular order in conjunction with repaving or redevelopment projects (see Table 18). Planning-level cost estimates for these projects can be found in Appendix C: Recommendations Tables.

Table 18: Opportunity Projects, Alphabetically

Name	Project	Notes	Start	End	Mileage
Agate Dr	Class III Bicycle Boulevard		City Limit	Bowers Ave	1.11
Agate Dr at Calabazas Creek Trail	Intersection Improvements	Project being analyzed separately under the Creek Trail Master Plan project. Spot Improvement #14	Agate Dr	Calabazas Creek Trail	-
Agnew Park	Bicycle Parking		-	-	-
Agnew Rd	Class IIB Buffered Bicycle Lane		San Tomas Aquino Creek Trail	Lafayette St	0.65
Alvarez Jr Park	Bicycle Parking		-	-	-
Bassett St	Class II Bicycle Lane		Chestnut St	Laurelwood Rd	0.97
Bassett St	Class III Bicycle Boulevard		Kingsbury Cir	Chestnut St	0.52
Bellomy St	Class II Bicycle Lane		Lafayette St	Park Ave	0.17
Bowers Ave at Central Expy	Install intersection crossing markings	Spot Improvement #12	Bowers Ave	Central Expy	-
Bowers Elementary School	Bicycle Parking		-	-	-
Bowers Park	Bicycle Parking		-	-	-
Bracher Elementary	Bicycle Parking		-	-	-
Bracher Park	Bicycle Parking		-	-	-
Brokaw Rd	Class IIB Buffered Bicycle Lane		Costco access road	Martin Ave	0.29
Buschser Middle School	Bicycle Parking		-	-	-

Name	Project	Notes	Start	End	Mileage
Cabrillo Ave at Lawrence Expy	Intersection Improvements	Short term: Intersection crossing markings. Spot Improvement #18	Cabrillo Ave	Lawrence Expy	-
Cabrillo Ave at Lawrence Expy	Intersection Improvements	Long Term: Protected intersection. Spot Improvement #18	Cabrillo Ave	Lawrence Expy	-
Cabrillo Ave at Scott Blvd	Bike Detection	Spot Improvement #19	Cabrillo Ave	Scott Blvd	-
Cabrillo Middle School	Bicycle Parking		-	-	-
Calabazas Creek Trail at Caltrain rail lines	Connect Calabazas Creek Trail accross Caltrain rail lines (over or under)	Project being analyzed separately under the Creek Trail Master Plan project. Spot Improvement #13	Calabazas Creek Trail	Caltrain Rail Lines	-
Calabazas Creek Trail at Central Expressway	Connect the Calabaza Creek Trail across Central Expressway (over or under)	Project being analyzed separately under the Creek Trail Master Plan project. Spot Improvement #11	Calabazas Creek Trail	Central Expressway	-
Calabazas Creek Trail at SR 237	Connect Calabazas Creek Trail to Bay Trail	Project being analyzed separately under the Creek Trail Master Plan project. Spot Improvement #1	Calabazas Creek Trail	SR 237	-
Calle del Mundo	Class II Bicycle Lane		Lafayette St	Street End	0.35
Caltrain Station	Bicycle Parking	Bike lockers	-	-	-
Carli Park	Bicycle Parking		-	-	-
Carmichael Park	Bicycle Parking		-	-	-
Central Park Library	Bicycle Parking	Bike lockers	-	-	-
Chromite Dr	Class III Bicycle Route		Monroe St	Bowers Ave	0.33

Name	Project	Notes	Start	End	Mileage
City Hall	Bicycle Parking	Bike racks and lockers	-	-	-
Civic Center Park	Bicycle Parking		-	-	-
Coleman Ave	Class II Bicycle Lane		Reed St	Aviation Ave	0.84
Cronin Dr	Class III Bicycle Boulevard		Pruneridge Ave	Stevens Creek Blvd	0.51
Cypress Ave	Class III Bicycle Boulevard		Saratoga Ave	Stevens Creek Blvd	0.69
De La Cruz Blvd	Class II Bicycle Lane		Montague Expy	Montague Park	0.38
Dolores Ave	Class III Bicycle Boulevard		Los Padres Blvd	Winchester Blvd	0.29
East River Pkwy	Class III Bicycle Route		Garrity Way	Lick Mill Blvd	0.23
Flora Vista Ave	Class III Bicycle Boulevard		Benton St	Granada Ave	0.29
Forbes Ave at Kiely Blvd	Bike Detection	Update bicycle detection on west leg of intersection. Spot Improvement #30	Forbes Ave	Kiely Blvd	-
Forest Ave	Class III Bicycle Boulevard		Parkway Park	City limit	0.48
Fremont Park	Bicycle Parking		-	-	-
Fuller Street Park	Bicycle Parking		-	-	-
Future	Class I Shared-Use Path	To be finalized as part of the City Place project			0.44
Future	Class II Bicycle Lane	To be finalized as part of the City Place project			0.79
Future	Class II Bicycle Lane	To be finalized as part of the City Place project			0.40
Future	Class I Shared-Use Path	To be finalized as part of the City Place project			0.47
Future	Class II Bicycle Lane	To be finalized as part of the City Place project			0.45

Name	Project	Notes	Start	End	Mileage
Future	Class II Bicycle Lane	To be finalized as part of the City Place project			0.85
Garrity Way	Class III Bicycle Boulevard		Agnew Rd	Lick Mill Blvd	0.34
Granada Ave	Class III Bicycle Boulevard		Flora Vista Ave	Pomeroy Ave	0.36
Great America Pkwy at Mission College Blvd	Install intersection crossing markings	Spot Improvement #6	Great America Pkwy	Mission College Blvd	-
Haman Elementary School	Bicycle Parking		-	-	-
Henry Schmidt Park	Bicycle Parking		-	-	-
Hetch Hetchy Trail	Class I Shared-Use Path	Project being analyzed separately under the Creek Trail Master Plan project	Calabazas Creek	Guadalupe River	1.76
Hetch-Hetchy Trail and Calabazas Creek Trail	Connect future Hetch-Hetchy Trail over the creek to the other side	Project being analyzed separately under the Creek Trail Master Plan project. Spot Improvement #5	Calabazas Creek Trail	Future Hetch-Hetchy Trail	-
Home Depot	Bicycle Parking		-	-	-
Homestead Road at San Tomas Expy	Intersection Improvements	Long Term: Protected Intersection. Spot Improvement #28	Homestead Rd	San Tomas Expy	-
Hope St	Class IV Separated Bikeway		Lafayette St	Lick Mill Blvd	0.52
Jefferson St	Class III Bicycle Boulevard		Homestead Rd	Bellomy St	0.29
Juliette Lane and Mission College Blvd	Protected Intersection	Spot Improvement #8	Juliette Lane	Mission College Blvd	-
Julliette Lane	Class II Bicycle Lane	Install buffered lanes where space is available	Mission College Blvd	Montague Expy	0.45

Name	Project	Notes	Start	End	Mileage
Kathryn Hughes Elementary School	Bicycle Parking		-	-	-
Kiely Blvd	Class IIB Buffered Bicycle Lane		Pruneridge Ave	Stevens Creek Blvd	0.48
Kona Kai Swim and Raquet Club	Bicycle Parking		-	-	-
Lafayette St	Class I Shared-Use Path		Warburton Ave	Reed St	0.13
Lafayette St at Fairway Glen Dr	Intersection Improvements	On west side, square up area surrounding manholes and add ramps on either end to allow bikes to ride over covers and keep bike facility continuous. Spot Improvement #4	Lafayette St	Fairway Glen Dr	-
Laurelwood Elementary School	Bicycle Parking		-	-	-
Lehigh Dr	Class III Bicycle Route		Lawerence Expy	Harvard Ave	0.07
Lick Mill Park	Bicycle Parking		-	-	-
Live Oak Park	Bicycle Parking		-	-	-
Los Padres Blvd at El Camino Real	Intersection Improvements	Install detection marker, install intersection crossing markings, consider bicycle-adaptive timing across El Camino Real. Spot Improvement #20	Los Padres Blvd	El Camino Real	-
Market St	Class III Bicycle Route		Monroe St	Park Ave	0.46
Market St at Winchester Blvd	Bike Detection	Spot Improvement #25	Market St	Winchester Blvd	-
Marsalli Park	Bicycle Parking		-	-	-
Martin Ave	Class IIB Buffered Bicycle Lane		De La Cruz	Brokaw Rd	0.74
Martin Ave	Class IV Separated Bikeway		Lafayette St	De La Cruz Blvd	0.48

Name	Project	Notes	Start	End	Mileage
Mary Gomez Park	Bicycle Parking		-	-	-
Mauricia Ave, Keystone Ave, Buckingham Dr	Class III Bicycle Boulevard		Cronin Dr	Saratoga Ave	1.11
Maywood Park	Bicycle Parking	More Bicycle Parking	-	-	-
Mercado Center	Bicycle Parking		-	-	-
Millikin Basics Elementary School	Bicycle Parking		-	-	-
Mission City Center for the Performing Arts	Bicycle Parking		-	-	-
Mission College Blvd	Class IV Separated Bikeway		Mission College Blvd	Great America Pkwy	0.95
Mission Library	Bicycle Parking		-	-	-
Montague Elementary School	Bicycle Parking		-	-	-
Montague Park	Bicycle Parking		-	-	-
Moreland Way at Lick Mill Blvd	Bike Detection	Update bicycle detection on west leg of intersection. Spot Improvement #9	Moreland Way	Lick Mill Blvd	-
Off the Wall Soccer	Bicycle Parking		-	-	-
Parkway Park	Bicycle Parking		-	-	-
Poinciana Dr	Class III Bicycle Route		City limit	White Oak Ln/ Klamath Ave	0.26
Pomeroy Ave at Homestead Rd	Intersection Improvements	Short-term: bike lane markings through intersection. Spot Improvement #27	Homestead Rd	Pomeroy Ave	-
Pomeroy Ave at Homestead Rd	Intersection Improvements	Long-term: study protected intersection. Spot Improvement #27	Homestead Rd	Pomeroy Ave	-
Pomeroy Elementary School	Bicycle Parking		-	-	-

Name	Project	Notes	Start	End	Mileage
Pruneridge Ave at Kiely Blvd	Intersection Improvements	Bike detection, red curbs/no parking signage near corners. Spot Improvement #31	Pruneridge Ave	Kiely Blvd	-
San Tomas Aquino Creek Trail	Class I Shared-Use Path		Homestead Rd	Stevens Creek Blvd	1.26
San Tomas Expy and Saratoga Ave	Improve access to overcrossing	Spot Improvement #32	San Tomas Expressway	Saratoga Ave	-
Santa Clara High School	Bicycle Parking		-	-	-
Santa Clara Skate Park	Bicycle Parking		-	-	-
Santa Clara St	Class III Bicycle Boulevard		Winchester Blvd	Lafayette St	0.62
Saratoga Ave/ Market St	Class II Bicycle Lane		Bellomy St	Winchester Blvd	0.27
Scott Lane Elementary School	Bicycle Parking		-	-	-
Tasman Dr at Great America Pkwy	Bike Detection	All legs. Spot Improvement #3	Tasman Dr	Great America Pkwy	-
Tasman Drive and Old Ironsides Drive	Intersection Improvements	Tighten turning radii on northeast corner. Spot Improvement #2	Tasman Drive	Old Ironsides Drive	-
Thamien Park	Bicycle Parking		-	-	-
The Alameda	Class III Bicycle Route		Benton St	Franklin St	0.07
Thomas Rd	Class II Bicycle Lane		Montague Expy	Laurelwood Rd	0.46
Triton Museum	Bicycle Parking		-	-	-
Ulistac Natural Area 1	Bicycle Parking		-	-	-
Ulistac Natural Area 2	Bicycle Parking		-	-	-

Name	Project	Notes	Start	End	Mileage
US 101 and Great America Parkway	Improve bike access through interchange	Work with Caltrans to improve bike access through interchange as part of Great America Parkway Class IV project. Spot Improvement #10	US 101	Great America Parkway	-
Warburton Ave	Class II Bicycle Lane		Scott Blvd	130 ft west of Fillmore St	0.34
Warburton Ave	Class III Bicycle Boulevard		Graham Ln	Scott Blvd	0.47
Warburton Swim Center	Bicycle Parking		-	-	-
Warbuton Ave	Class III Bicycle Boulevard		130 ft west of Fillmore St	Warburton Ave	0.38
Washington Elementary School	Bicycle Parking		-	-	-
Washington Park	Bicycle Parking		-	-	-
Washington St at Manchester Dr/ Camino Dr	Upgrade crossing for bicycle boulevard	Spot Improvement #24	Lafayette St	Manchester Dr/ Camino Dr	-
Washington St at Market St	Bike Detection	Spot Improvement #23	Lafayette St	Market St	-
Westwood Oaks Park	Bicycle Parking		-	-	-
Wilcox High School	Bicycle Parking		-	-	-
Wilson High School	Bicycle Parking		-	-	-

Appendices

Table of Contents

APPENDIX A

Plan & Policy Review

This appendix provides a high-level summary of relevant local, regional, and statewide plans. The Bicycle Master Plan Update 2018 will be compliant with each of these plans and policies.

Local Plans

City of Santa Clara Bicycle Plan Update (2009)

The 2009 Bicycle Plan Update was developed to help create an expanded bicycle network that promotes alternative modes of transportation and to position the City for future funding opportunities for design and implementation. This plan places a heavy emphasis on safety and educational programming. There were 21 bikeway recommendations (all Class II or Class III bikeways) made, representing 18.6 miles of proposed bikeways.

City of Santa Clara Climate Action Plan (2013)

The City of Santa Clara is striving to reduce GHG emissions to 15% below 2008 levels by 2020. Sustainability efforts relating to transportation and planning include: Priority Development Areas and transit investments, TDM programs, bicycle and pedestrian infrastructure, full service streets, and bus rapid transit. Based on 2008 data, transportation accounts for 26% (523,000 MTCO2e) of Santa Clara's emissions, the second largest emissions sector. The plan recommends establishing land uses and using TDM programs to minimize single-occupant vehicle use.

City of Santa Clara Design Criteria (2015)

The Design Criteria provides the specifics required for various utilities and roadway designs. The Criteria provides information on minimal roadway width and other technical/engineering aspects. Bicycle and pedestrian infrastructure specifics are not included in this document.

City of Santa Clara General Plan 2010-2035 (2010)

Santa Clara's most recent General Plan Update was adopted in 2010 and has an overall mobility and transportation vision to create a balanced transportation system with connected networks that facilities pedestrian, bicycle, and vehicular movements throughout the City and to support increased densities and mixed uses. Other relevant major strategies of the General Plan include: preserve and cultivate neighborhoods, promote sustainability, support focus areas and community vitality, and maximize health and safety benefits. The plan identifies existing bikeways and corridors where future bikeway studies should be considered. In addition to improving pedestrian and bicycle conditions within the City of Santa Clara, the plan also emphasizes the importance of enhancing regional connections.

City of Santa Clara Creek Trail Network Expansion Feasibility Study (2013)

This report examines the feasibility of three creek corridors to expand the City's off-street trail system: Calabazas Creek, Saratoga Creek, and the Hetch Hetchy corridor. A trail is feasible on two-of-three segments of the Calabazas Creek corridor, all of the Hetch Hetchy corridor (although it has crossing and land ownership complications), and all but half a mile of the Saratoga Creek Corridor.

City of Santa Clara Creek Trail Network Expansion Master Plan (2017)

This Master Plan process includes engineering evaluation, stakeholder coordination, and public outreach to identify alignments and environmentally evaluate the alignments for the three previously studied creek corridors.

Regional Plans

Lawrence Station Area Plan (2016)

The Station Area Plan plans for a 72-acre site (65 acres are developable), located in close proximity to the Lawrence Caltrain Station. This could accommodate up to 3,500 residential units, 100,000 square feet of neighborhood-oriented retail, and park space. "Lawrence Station will become a livable urban community and a model for encouraging walking, biking, and transit usage." The plan strives to change the area into a transit hub and create active, multi-modal streets that benefit bicyclists and pedestrians. Figure A-1 shows the proposed active transportation circulation for the station area within Santa Clara.

Tasman East Focus Area Plan (2016)

The Tasman East area is envisioned to become a vibrant, high density neighborhood that provides convenient access to nearby communities, transit, and trails. The plan recommends extending Lick Mill Boulevard and Calle del Sol and widening Calle De Luna. Bicycle facilities were recommended for most streets within the project area.

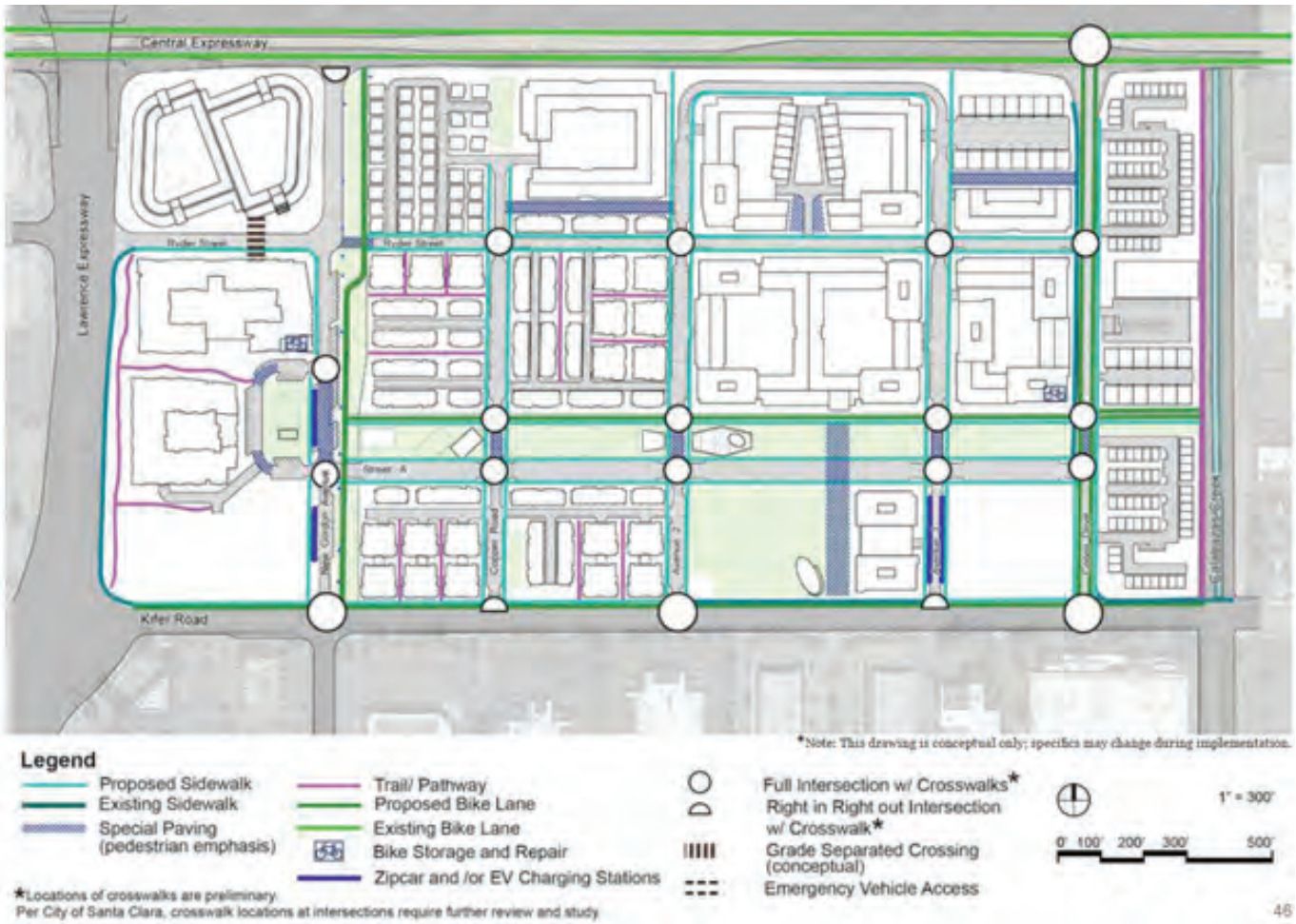
Countywide Bicycle Plan (2018)

The Countywide Bicycle Plan, developed by Santa Clara Valley Transportation Authority, envisions Santa Clara County being served by a countywide bicycle network that is safe, convenient, and connected, enabling people of all ages and abilities to easily bike to work, school, shopping, transit, and elsewhere. The plan supports increased bicycle parking availability at transit stations. The plan also identifies and prioritizes multiple cross-county bicycle corridors, addresses crossing major barriers, and other bicycle related infrastructure, programming, and analysis. The cross county bicycle corridors identified in this plan are listed below. See the plan for more information and a map of these projects.

- US 101 Corridor
- Alma Street/Caltrain Corridor
- Dumbarton East-West Connector
- El Camino Real/Grand Boulevard Corridor
- Shoreline/Miramonte/ San Antonio/El Monte Corridor
- Tasman/Alum Rock Light Rail Corridor/River Oaks Spur
- Mary/Old Highway 9 Corridor
- Winchester/Hedding /Berryessa/Penitencia Creek Corridor
- Wolfe/SunnyvaleSaratoga/Borregas Corridor
- North I-280/Stevens Creek-San Carlos Street Corridor
- Calabazas Creek/ Winchester/Los Gatos Boulevard Corridor
- South of I-280/Williams/ Moorpark/Alma Corridor
- Bowers/Kiely/Saratoga Avenue Corridor
- Prospect/Campbell/ Curtner/Tully Corridor
- Gilroy to Valley Fair/Santa Teresa Corridor
- Blossom Hill/Branham to Saratoga Corridor
- Oakland Road/Abel/ Milpitas Boulevard Corridor
- San Martin East-West Corridor
- Dixon Landing/Zanker/ Monterey Road Corridor
- Coyote Valley/Uvas Road Corridor
- I-680/ Silver Creek Corridor
- Hwy 152 Corridor
- Eastern South Valley Corridor
- Blaney/Sunnyvale East Channel Corridor

- South County Caltrain to Coyote Creek Corridor
- Race/Lincoln/Cherry Corridor
- McLaughlin/24th Street Corridor
- Milpitas Boulevard/Lundy/ King/ Silver Creek Road Corridor
- Julian/McKee Corridor
- N 1st Street Corridor
- Calderon/Phyllis/Grant Corridor
- Channing/Homer Corridor
- Fremont/Benton/Homeste ad Corridor
- Story/Ruby/Aborn Corridor
- Loma Verde Avenue/Charleston/ Arastradero Corridor
- Trade Zone/Cropley Corridor
- SR 237 Bike Path
- San Tomas Aquino Creek Trail-Saratoga Creek Trail

Figure A-1: Bicycle and Pedestrian Circulation in Lawrence Station Area



- SR 87 Bike Path
- Uvas Creek Trail
- Thompson Creek Trail-Silver Creek Trail
- Three Creeks Trail/Five Wounds Trail
- Llagas Trail-Little Llagas Trail to Coyote Lake
- Hetch-Hetchy Trail
- San Francisco Bay Trail
- UPRR Trail
- Coyote Creek Trail
- Stevens Creek Trail
- Guadalupe River/Creek Trail-Los Alamitos Trail
- Los Gatos Creek Trail
- Expressway Connector
- Capitol Expressway
- Lawrence Expressway
- Page Mill-Oregon Expressway
- San Tomas/Montague Expressway
- Foothill Expressway
- Central Expressway
- Almaden Expressway
- Local Connector

Plan Bay Area 2040 (2017)

Plan Bay Area 2040 is the long range transportation plan (RTP) for the nine-county Bay Area and discusses how the Bay Area will grow over the next two decades and identifies transportation and land use strategies to enable a more sustainable, equitable, and economically vibrant future. Plan Bay Area sets many transportation-related targets including: reducing per-capita CO2 emissions, reduce adverse health impacts, decrease lower-income households' budget spent on housing and transportation, increase the share of jobs accessible in congested conditions, and increase non-auto mode share.

State Plans

There are several state-level plans and policies that guide the development of and provide requirements for the Bike Master Plan. Plans include the California Transportation Plan 2040 and the California State Bicycle and Pedestrian Plan. Policies include the California Complete Streets Policy and the 2014 Design Flexibility in Multimodal Design Memorandum.

- **The California Transportation Plan (CTP) 2040** is the statewide, long-range transportation plan to meet future mobility needs and reduce greenhouse gas (GHG) emissions. It guides multimodal transportation investments and decisions by all levels of government, the private sector, and stakeholders.
- **California State Bicycle + Pedestrian Plan, Toward an Active California** – bicycle and pedestrian plan for the state. Mainly a policy document, it aims to align Caltrans policies and programs to create a framework to increase safe bicycling and walking in California.
- **Caltrans Strategic Management Plan (SMP)** – provides the strategic direction for Caltrans as an organization. The 2015-2020 SMP identified targets for doubling walking and tripling bicycling in California by 2020.

- **California Complete Streets Policy** is the foundation of active transportation policy framework, requiring integration of Complete Streets principles in all agency activities since 2008. Caltrans monitors Complete Streets progress through the original Complete Streets Implementation Action Plan released in 2010 and the Complete Streets Implementation Action Plan 2.0, released in 2014.
- **Smart Mobility 2010: A Call to Action for the New Decade (Smart Mobility Framework)** – provides tools and resources to help state and local agencies create a more sustainable transportation system, with policies centered on public health and safety.
- **Caltrans Highway Design Manual (HDM)** – The Highway Design Manual is a living document, allowing addition of new infrastructure concepts, such as the December 2015 Design Information Bulletin that set design standards for Class IV Separated Bikeways. While the manual only explicitly applies to the state highway system, many local agencies refer to it as they design their own roads, bicycle facilities, and sidewalks. The complete streets version of the HDM released in 2012 was intended, in part, to make designers aware of bicycle treatments as they were investigating needs for motorized users.
- **California Manual on Uniform Traffic Control Devices (CA MUTCD)** – provides uniform standards and specifications for all official traffic control devices in California, including the types of signs allowed. Another pertinent guide includes AB 819 (Bikeway Research, Experimentation, Testing, Evaluation, or Verification Related to Design Criteria), which outlines the procedures for when a bicycle project is planned on a State highway system or used federal funding.
- **Main Street, California: A Guide for Improving Community and Transportation Vitality** – This 2013 document is focused on the design of California State Highways that also serve as the "main street" of a community. The guide provides information from existing Caltrans manuals and policies, as well as national resources, to help communities improve multimodal access, livability and sustainability, while meeting appropriate engineering standards. The guide helps readers find information about standards and procedures described in the Caltrans HDM, the California MUTCD, and the Project Development Procedures Manual.
- **Complete Intersections: A Guide to Reconstructing Intersections and Interchanges for Bicyclists and Pedestrians** – The Complete Intersections Guide provides direction on implementing an important aspect of Caltrans' Complete Streets policy, by identifying "actions that will improve safety and mobility for bicyclists and pedestrians at intersections and interchanges." The Guide is intended primarily for Caltrans planners, engineers, and other highway designers working as generalists or specialists in advising, engineering, or designing for safe travel for all highway users at intersections and interchanges. The reference guide includes a disclaimer that it, "Does not constitute a standard, specification, or regulation. It is not intended to replace the existing [Caltrans] mandatory or advisory standards, nor the exercise of engineering judgment by licensed professionals."

APPENDIX B

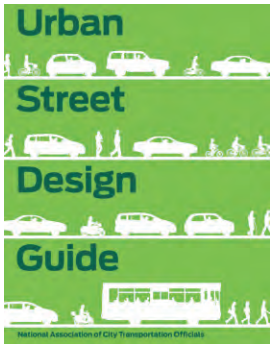
Bicycle Facility Design Guidelines

This Design Guide has been developed to complement the City's Bicycle Plan update and other nationally recognized efforts to promote bicycle ridership through increased comfort. The chapter will present a toolbox of current engineering standards and design approaches to implement bicycle enhancements.

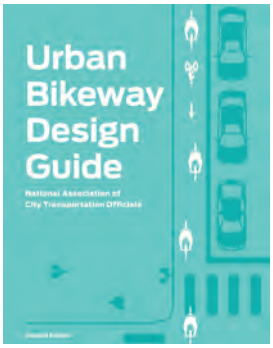
Guidance Basis

The sections that follow serve as an inventory of pedestrian and bicycle design treatments and provide guidelines for their development. These treatments and design guidelines are important because they represent the tools for creating a bicycle-friendly, safe, accessible community. The guidelines are not, however, a substitute for a more thorough evaluation by a professional upon implementation of facility improvements. The following standards and guidelines are referred to in this guide:

NATIONAL GUIDANCE



A blueprint for designing 21st century streets, the NACTO **Urban Street Design Guide (2013)** *unveils the toolbox and tactics cities use to make streets safer, more livable, and more economically vibrant. The Guide outlines both a clear vision for complete streets and a basic road map for how to bring them to fruition. The document charts the principles and practices of the nation's foremost engineers, planners, and designers working in cities today.*



The National Association of City Transportation Officials' (NACTO) **Urban Bikeway Design Guide (2012)** *provides cities with state-of-the-practice solutions that can help create complete streets that are safe and enjoyable for bicyclists. The designs were developed by cities for cities, since unique urban streets require innovative solutions. In August 2013, the Federal Highway Administration issued a memorandum officially supporting use of the document.*

Separated Bike Lane Planning and Design Guide (2015) *provides national guidance on the planning and design of separated bike lane facilities. Released by the Federal Highway Administration (FHWA), this guide documents best practices as demonstrated around the U.S., and offers ideas on future areas of research, evaluation, and design flexibility.*

NCHRP's Improving Pedestrian Safety at Unsignalized Crossings Report *recommends engineering treatments to improve pedestrian safety at unsignalized locations with high speeds and traffic volumes.*

CALIFORNIA GUIDANCE

The **California Manual on Uniform Traffic Control Devices (CAMUTCD) (2014)** *is an amended version of the FHWA MUTCD 2009 edition modified for use in California. While standards presented in the CA MUTCD substantially conform to the FHWA MUTCD, the state of California follows local practices, laws and requirements with regards to signing, striping and other traffic control devices.*

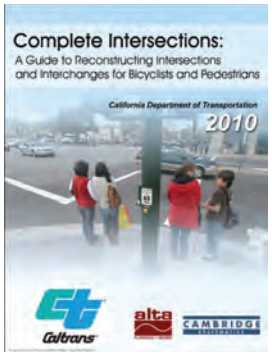
Design Guidelines


FOREWORD

The **California Highway Design Manual (HDM) (Updated 2015)** *establishes uniform policies and procedures to carry out highway design functions for the California Department of Transportation.*


Memorandum

The Caltrans Memo: **Design Flexibility in Multimodal Design (2014)** *encourages flexibility in highway design. The memo stated that "Publications such as the NACTO "Urban Street Design Guide" and "Urban Bikeway Design Guide," ... are resources that Caltrans and local entities can reference when making planning and design decisions on the State highway system and local streets and roads."*



Complete Intersections: A Guide to Reconstructing Intersections and Interchanges for Bicyclists and Pedestrians (2010) *is a reference guide that presents information and concepts related to improving conditions for bicyclists and pedestrians at major intersections and interchanges. The guide can be used to inform minor signage and striping changes to intersections, as well as major changes and designs for new intersections.*


Memorandum

The Caltrans resource **Class IV Bikeway Guidance (2018)** *provides enhanced guidance for two-way separated bikeways, with added information on transit stops and separated bikeways adjacent to street parking. It also provides a discussion of maintenance using Caltrans equipment.*

LOCAL GUIDANCE

Main Street, California: A Guide for Improving Community and Transportation Vitality (2013) *reflects California's current manuals and policies that improve multi-modal access, livability and sustainability within the transportation system. The guide recognizes the overlapping and sometimes competing needs of main streets.*

Santa Clara Valley Transportation Authority's (VTA) **Bicycle Technical Guidelines (2012)** *provides general and technical guidance on the design of on-street and off-street bicycle infrastructure for local jurisdictions within Santa Clara County based on FHWA and CalTrans standards, as well as local, national, and international case studies. Buffered bike lanes and separated bikeways are not covered in this guide.*

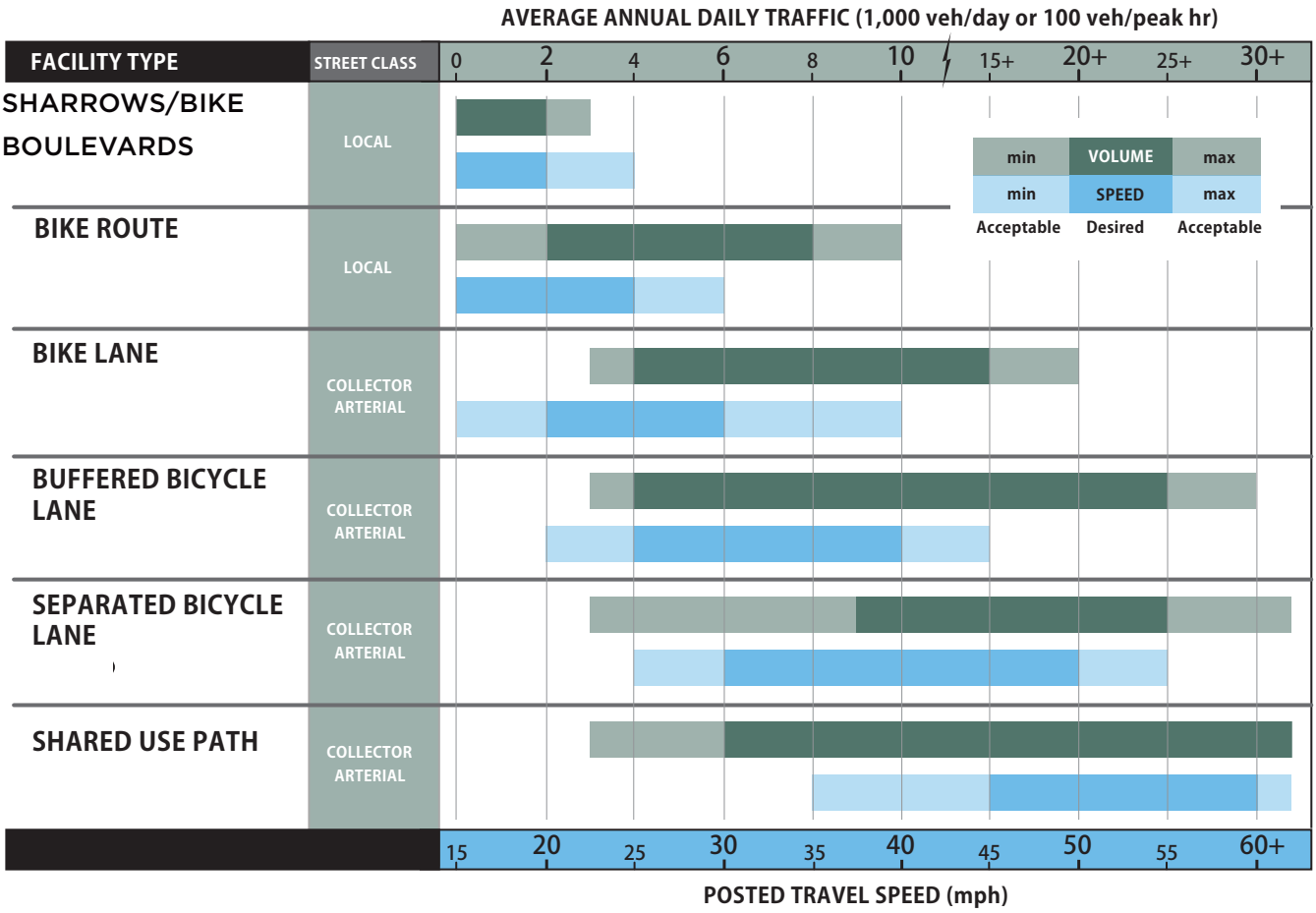
Facility Selection

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

FACILITY SELECTION TABLE

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

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



Facility Classification

Consistent with bicycle facility classifications throughout the nation, these Bicycle Facility Design Guidelines identify the following classes of facilities by degree of separation from motor vehicle traffic.

Shared roadways are bikeways where bicyclists and cars operate within the same travel lane, either side by side or in single file depending on roadway configuration. The most basic type of bikeway is a signed shared roadway. This facility provides continuity with other bicycle facilities (usually bike lanes), or designates preferred routes through high-demand corridors.

Shared roadways may also be designated by pavement markings, signage and other treatments including directional signage, traffic diverters, chicanes, chokers and /or other traffic calming devices to reduce vehicle speeds or volumes. Such treatments often are associated with **Bicycle Boulevards**.

On-Street Bikeways, such as conventional or buffered bike lanes, use signage and striping to delineate the right-of-way assigned to bicyclists and motorists. Bike lanes encourage predictable movements by both bicyclists and motorists.

Another variant of on-street bikeway is **Separated Bike Lanes** which are exclusive bike facilities that combine the user experience of a separated path with the on-street infrastructure of conventional bike lanes.

Shared Use Paths are facilities separated from roadways for use by bicyclists and pedestrians.

Design Needs of Bicyclists

The facility designer must have an understanding of how bicyclists operate and how their bicycle influences that operation. Bicyclists, by nature, are much more affected by poor facility design, construction and maintenance practices than motor vehicle drivers.

By understanding the unique characteristics and needs of bicyclists, a facility designer can provide quality facilities and minimize user risk.

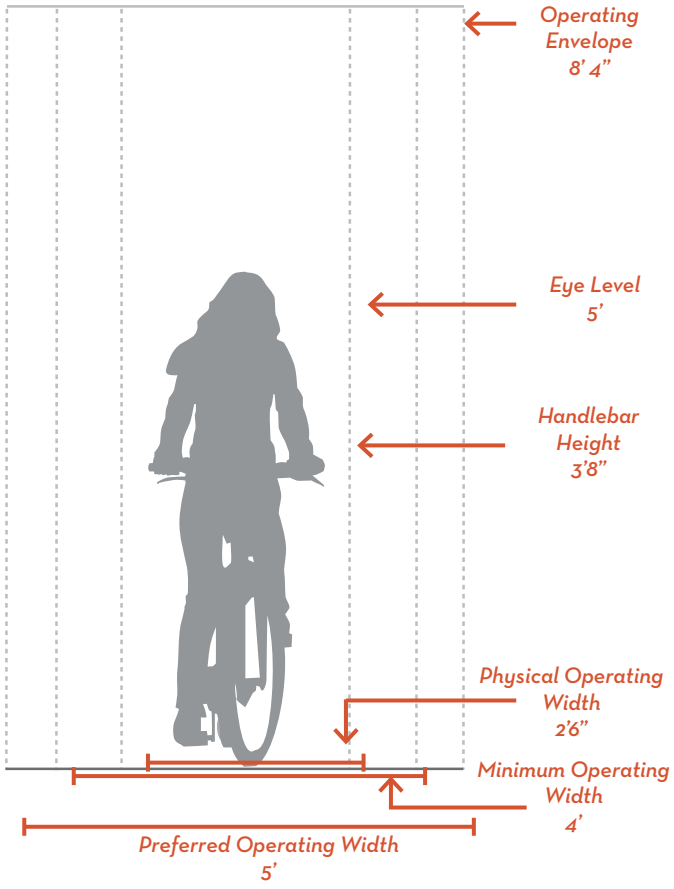
BICYCLE AS A DESIGN VEHICLE

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

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

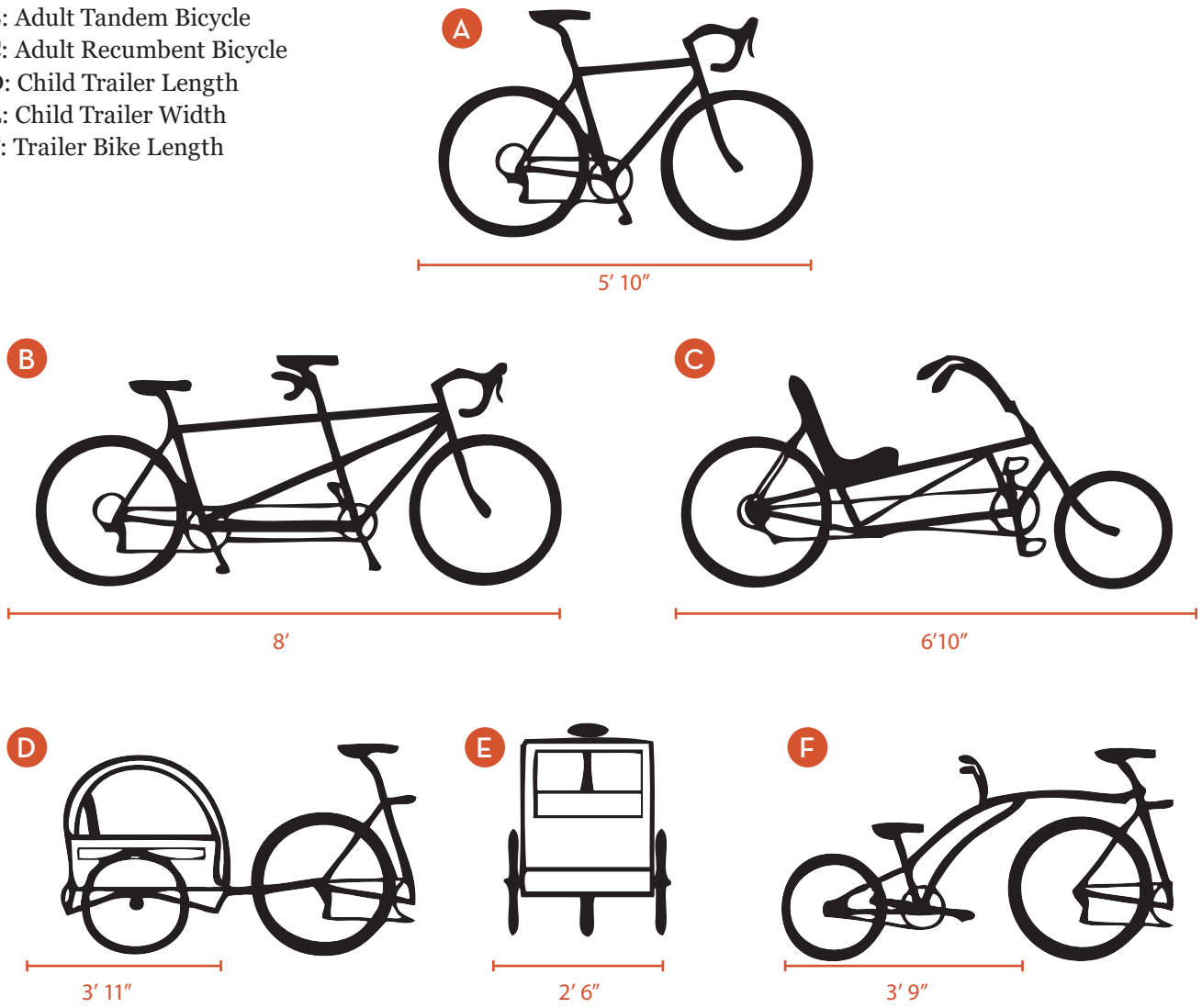
In addition to the design dimensions of a typical bicycle, there are many other commonly used pedal-driven cycles and accessories to consider when planning and designing bicycle facilities. The most common types include tandem bicycles, recumbent bicycles, and trailer accessories. The figure on the following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

Bicycle Rider – Typical Dimensions



Bicycle Design Vehicle – Typical Dimensions

A: Adult Typical Bicycle
B: Adult Tandem Bicycle
C: Adult Recumbent Bicycle
D: Child Trailer Length
E: Child Trailer Width
F: Trailer Bike Length



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

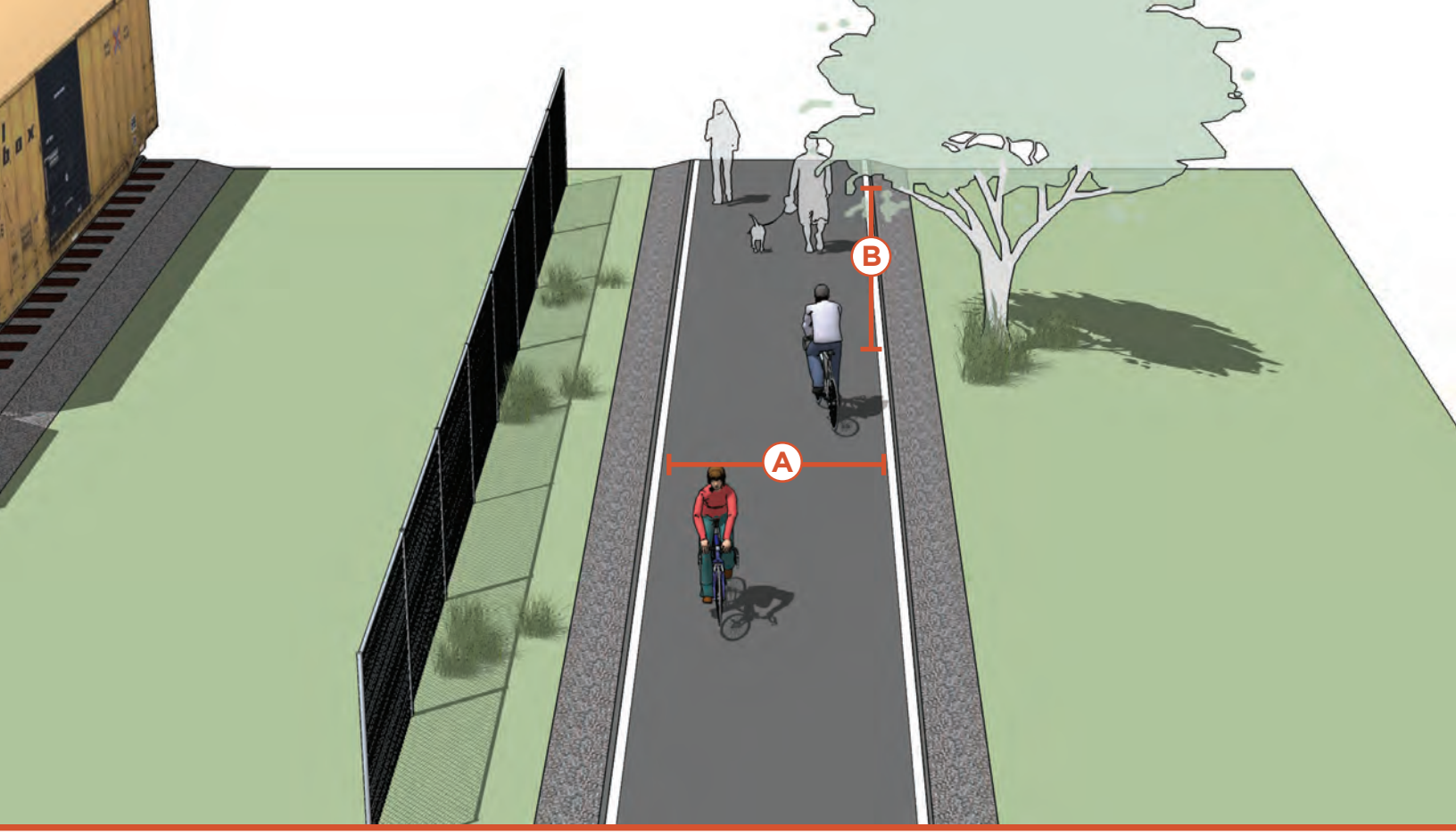
Bicycle as Design Vehicle – Design Speed Expectations

BICYCLE TYPE	FEATURE	TYPICAL SPEED
Upright Adult Bicyclist	Paved level surfacing	8-12 mph*
	Crossing Intersections	10 mph
	Downhill	30 mph
	Uphill	5 -12 mph
Recumbent Bicyclist	Paved level surfacing	18 mph

* Typical speed for casual riders per AASHTO 2013.

CLASS I BIKEWAYS

Shared Use Paths



Shared Use Path

Shared use paths (Class I Bikeways) are off-street facilities that can provide a desirable transportation and recreation connection for users of all skill levels who prefer separation from traffic. They often provide low-stress connections to local and regional attractions that may be difficult, or may not be possible, with on the street network.

TYPICAL USE

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

DESIGN FEATURES

(A) 8 ft is the minimum width (with 2' ft shoulders) allowed for a two-way bicycle path and is only recommended for low traffic situations (Caltrans Design Manual; VTA).

- 10 ft is recommended in most situations and will be adequate for moderate to heavy use.
- 12 ft is recommended for heavy use situations with high concentrations of multiple users. A separate track (5 ft minimum) can be provided for pedestrian use.

Lateral Clearance

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

Overhead Clearance

B Clearance to overhead obstructions should be 8 ft minimum, with 10 ft recommended.

Striping

- When striping is required, use a 4" dashed yellow centerline stripe with 4" solid white edge lines.
- Solid 4" wide centerlines can be provided on tight or blind corners, and on the approaches to roadway crossings.

Prince Memorial Greenway connects users to downtown Santa Rosa, CA

Source: Peter Stetson.

FURTHER CONSIDERATIONS

- The provision of a shared use path adjacent to a road is not a substitute for the provision of on-road accommodations such as paved shoulders or bike lanes, but may be considered in some locations in addition to on-road bicycle facilities.
- To reduce potential conflicts in some situations, it may be better to place one-way sidepaths on both sides of the street.
- The design of the trail should conform to Crime Prevention Through Environmental Design (CPTED) principles. CPTED is a framework that encourages intuitive visual cues to guide path users and increase the visibility of the corridor. Careful design indicates active use and upkeep and manages conflicting uses. Regular maintenance is needed to prevent improper or illegal uses.
- Lighting should be considered during standard commute hours. However, lighting may not be allowed within sensitive wildlife habitat areas (VTA Bicycle Technical Guidelines 9-2).

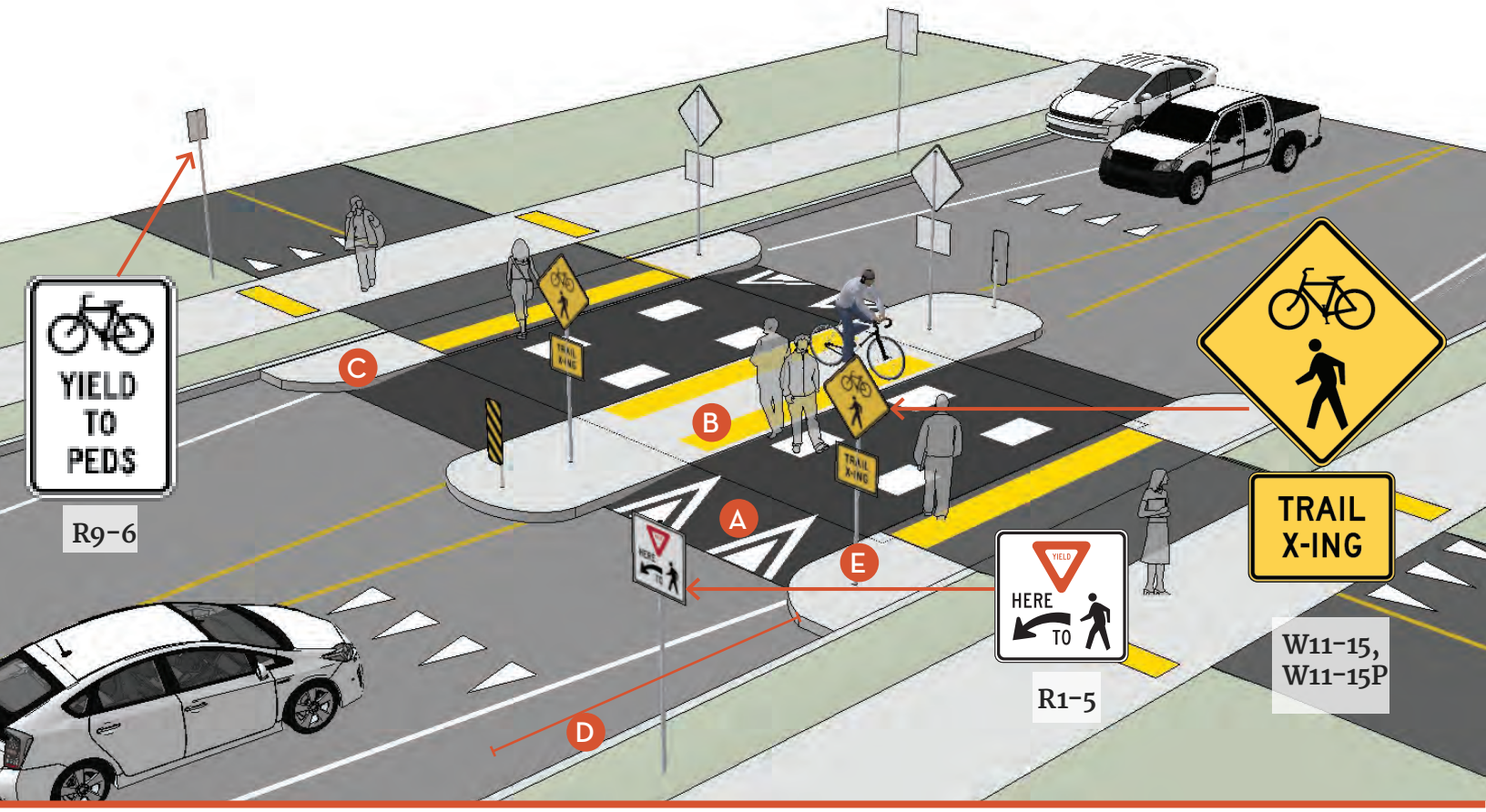
MATERIALS AND MAINTENANCE

Shared use paths must be regularly maintained to address potholes, cracks, root lift, and debris. Signage and lighting should also be regularly maintained to ensure shared use path users feel comfortable, especially where visibility is limited.

Adjacent landscaping should be regularly pruned, to allow adequate sightlines and keep a clear path of travel.

APPROXIMATE COST

The cost of a shared use path can vary, but typical costs are between $700,000 per mile to $1 million per mile (in 2018 dollars). These costs vary with materials, such as asphalt, concrete, boardwalk and other paving materials, lighting, and ROW acquisition.



Raised Path Crossings

The California Vehicle Code requires that motorists yield right-of-way to pedestrians within crosswalks. This requirement for motorists to yield is not explicitly extended to bicyclists, and the rights and responsibilities for bicyclists within crosswalks is ambiguous. Where shared-use paths intersect with minor streets, design solutions such as raised crossings help resolve this ambiguity by giving people on bicycles priority within the crossing.

TYPICAL APPLICATION

- Where highly utilized shared-use paths cross minor streets.
- Where safety and comfort of path users at crossings is prioritized over vehicular traffic.

DESIGN FEATURES

A Raised crossings create vertical deflection that slows drivers and prepares them to yield to path users, while high-visibility crosswalk markings establish a legal crosswalk away from intersections.

B Median refuge islands create horizontal deflection to draw driver attention to changed conditions at the crossing.

C Curb extensions shorten crossing distance and position users in a visible location.

D Parking should be prohibited 20 feet in advance of the crosswalk.

E Path priority signing (MUTCD R1-5) and stop or yield markings are placed 20 feet in advance of the crossing and function best when path user volumes are high.

Raised Path Crossings

Raised path crossings increase the visibility of pedestrians and bicyclists in a crosswalk.

FURTHER CONSIDERATIONS

- Geometric design should promote a high degree of yielding to path users through raised crossings, horizontal deflection, signing, and striping.
- The approach to designing path crossings of streets depends on an evaluation of vehicular traffic, line of sight, pathway traffic, use patterns, vehicle speed, road type, road width, and other safety issues such as proximity to major attractions.
- Raised crossings should raise 4" above the roadway with a steep 1:6 (16%) ramp. The raise should use a sinusoidal profile to facilitate street sweeping operations. Advisory speed signs may be used to indicate the required slow crossing speed.
- A median safety island should allow path users to cross one lane of traffic at a time. The bicycle waiting area should be 8 ft wide or wider to allow for a variety of bicycle types.
- Rectangular Rapid Flashing Beacons (RRFBs) or Pedestrian Hybrid Beacons (sometimes called HAWK signals) may be used in conjunction with raised path crossings to further alert drivers to the presence of crossing cyclists and pedestrians.

MATERIALS AND MAINTENANCE

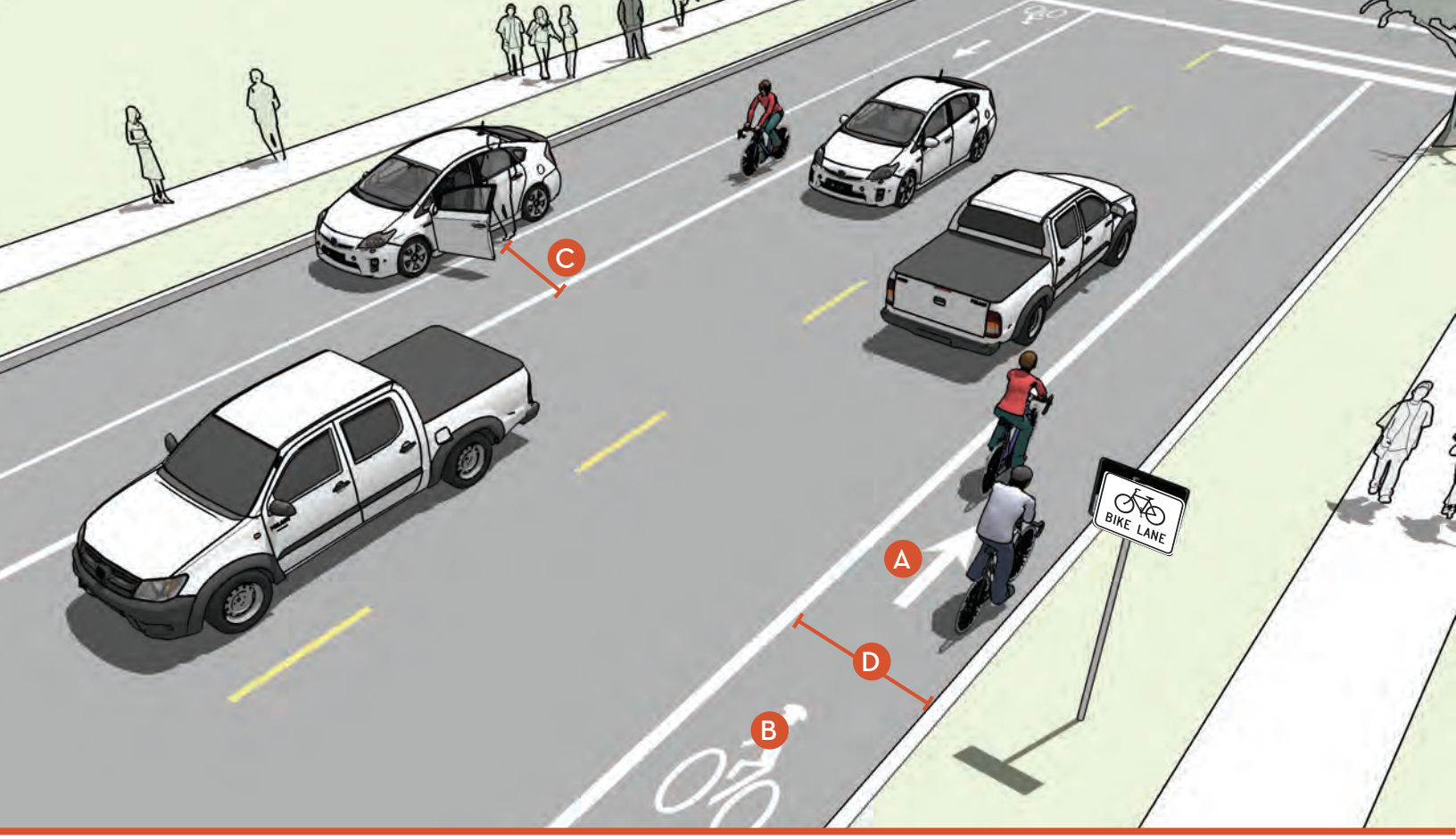
Because the effectiveness of marked crossings depends entirely on their visibility, maintaining path crossings should be a high priority. Ensure drainage pipes used to channel stormwater past the raised intersection are kept free of debris, to prevent stormwater from backing up and pooling.

APPROXIMATE COST

- Striped crosswalks costs range from approximately $100 to $2,100 each.
- Curb extension costs can range from $35,000 to $150,000, depending on the design and site condition.
- Median refuge islands costs range from $3,500 to $40,000, depending on the design, site conditions, and landscaping.
- RRFBs cost $10,000-15,000 for materials and installation. HAWK systems cost between $75,000 and $150,000, depending on whether signals are suspended from a wire or a mast arm.

CLASS II BIKEWAYS

Bike Lanes



Bicycle Lanes

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

TYPICAL APPLICATION

- Bike lanes may be used on any street with adequate space, but are most effective on streets with moderate traffic volumes ≥ 6,000 ADT (≥ 3,000 preferred).
- Bike lanes are most appropriate on streets with moderate speeds ≥ 25 mph.
- Appropriate for skilled adult riders on most streets.
- May be appropriate for children when configured as 6+ ft wide lanes on lower-speed, lower-volume streets with one lane in each direction.

DESIGN FEATURES

A. Include a bicycle lane marking at the beginning of blocks and at 500 ft intervals along the route.

B. In-lane cyclist icon should be depicted wearing a helmet.

C. 6 ft width preferred adjacent to on-street parking (5 ft minimum) (HDM).

D. 6 ft preferred adjacent to curb and gutter (VTA) or 4 ft more than the gutter pan width.

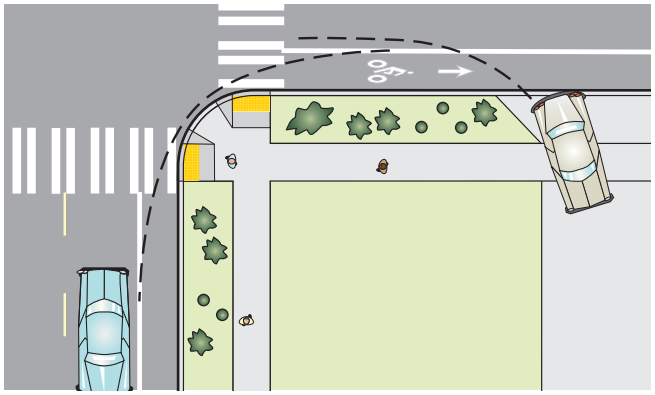
FURTHER CONSIDERATIONS

- On high speed streets (≥ 40 mph) the minimum bike lane should be 6 ft (HDM 301.2).
- An 8 ft bike lane for 45mph+ street is recommended by VTA, however, a separated bikeway will provide a safer and more comfortable facility for bicyclists.
- On streets where bicyclists passing each other is expected, where high volumes of bicyclists are present, or where added comfort is desired, consider providing extra wide bike lanes up to 7 ft wide, or configure as a buffered bicycle lane.
- It may be desirable to reduce the width of general purpose travel lanes in order to add or widen bicycle lanes (HDM 301.2 3).
- On multi-lane streets, the most appropriate bicycle facility to provide for user comfort may be buffered bicycle lanes or physically separated bicycle lanes.
- Mark parking lane with 6" wide lane line or "Ts" marking. Consider marking the curbside line with 6" wide stripe, although not required.
- Manholes, drainage grates, or other obstacles should be set flush with the paved roadway and should be bicycle friendly designs. Roadway surface inconsistencies pose a threat to safe riding conditions for bicyclists. Construction of manholes, access panels or other drainage elements should be constructed with no variation in the surface. The maximum allowable tolerance in vertical roadway surface will be 1/4".

Bicycle Lane

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

Place Bike Lane Symbols to Reduce Wear



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

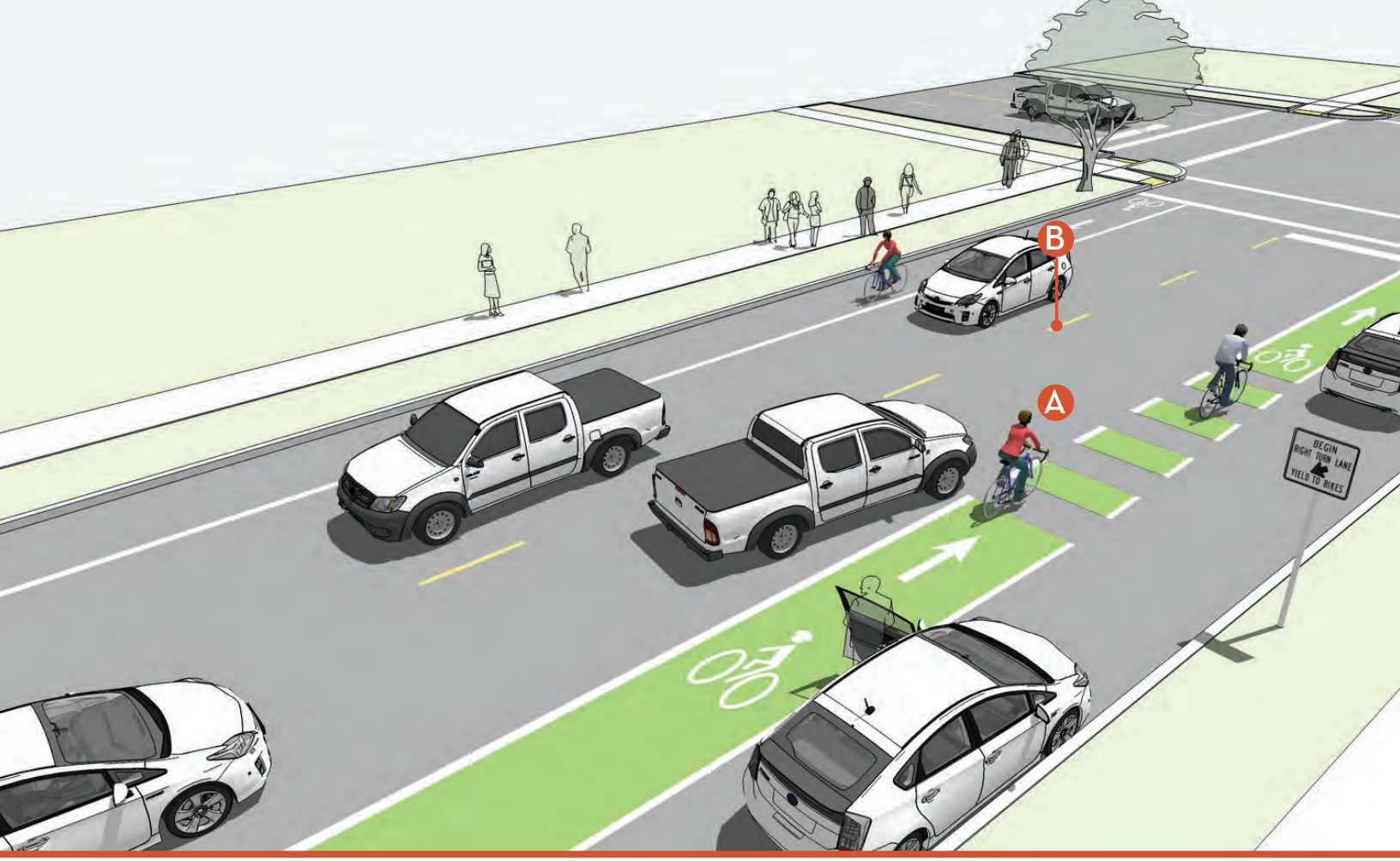
MATERIALS AND MAINTENANCE

Bike lane striping and markings will require higher maintenance where vehicles frequently traverse over them at intersections, driveways, parking lanes, and along curved or constrained segments of roadway.

Bike lanes should also be maintained so that there are no pot holes, cracks, uneven surfaces or debris.

APPROXIMATE COST

The cost for installing bicycle lanes will depend on the implementation approach. Typical costs are $80,000 per mile for both sides of the street.



Colored Bicycle Lanes

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

TYPICAL APPLICATION

- Within a weaving or conflict area to identify the potential for bicyclist and motorist interactions and assert bicyclist priority.
- Where increased visibility of the bike lane is needed near free rights turns with modal conflict issues.

DESIGN FEATURES

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

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

- The colored surface should be skid resistant and retro-reflective (CAMUTCD 9C.02.02).
- In exclusive use areas, such as bike boxes, color application should be solid green.
- If colored pavement is used, then at an intersection approach where the bike lane is dashed, the green pavement should be similarly dashed (VTA).

Colored Bicycle Lane

A colored bicycle lane in Portland, Oregon alerts users to potential merging in advance of a minor street intersection.

FURTHER CONSIDERATIONS

- Green colored pavement shall be used in compliance with FHWA Interim Approval (CAMUTCD 1A.10) (FHWA IA-14.10)[1].
- While other colors have been used (red, blue, yellow), green is the recommended color in the U.S.
- The application of green colored pavement within bicycle lanes is an emerging practice. The guidance recommended here is based on best practices in cities around the country.

MATERIALS AND MAINTENANCE

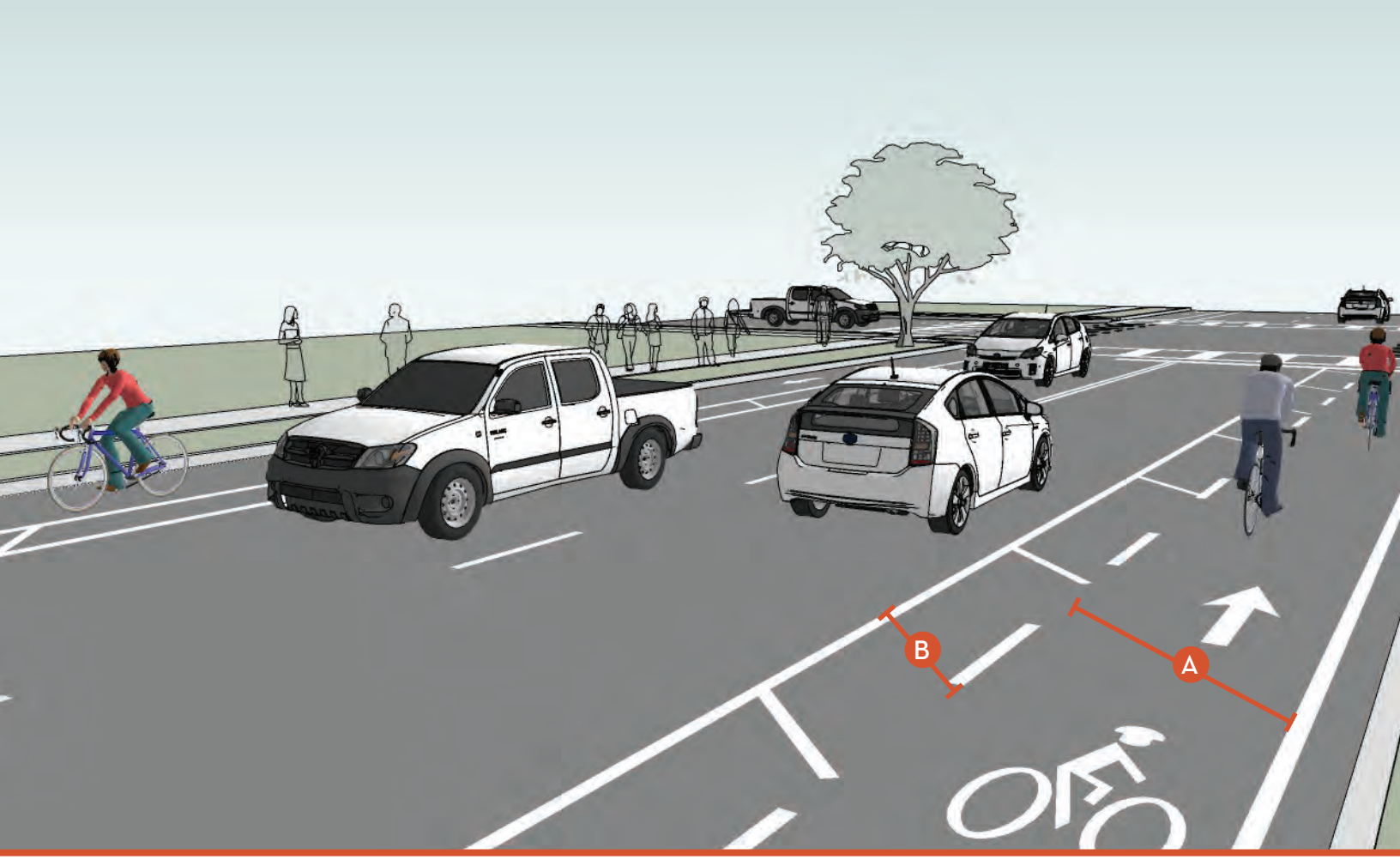
As intended, paint or thermoplastic are placed in locations that are trafficked by vehicles, and are subject to high vehicle wear. Colored pavement treatments will experience higher rates of wear at locations with higher turning vehicles, buses, and heavy trucks. At these locations, green coloring will require more frequent replacement over time.

The life of the green coloring will depend on vehicle volumes and turning movements, but thermoplastic is generally a more durable material than paint.

APPROXIMATE COST

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

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



Buffered Bicycle Lanes

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

TYPICAL APPLICATION

- Anywhere a conventional bike lane is being considered.
- While conventional bike lanes are most appropriate on streets with lower to moderate speeds (≥ 25 mph), buffered bike lanes are appropriate on streets with higher speeds (+25mph) and high volumes or high truck volumes (up to 6,000 ADT).
- On streets with extra lanes or lane width.
- Appropriate for skilled adult riders on most streets.

DESIGN FEATURES

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

B Buffers should be at least 2 ft wide. If buffer area is 3 ft or wider, 8" diagonal markings should be used (CAMUTCD 9C-104).

- For clarity at driveways or minor street crossings, consider dashing bicycle lane pavement markings.
- Dashing the inside buffer line nearest to the curb can alert drivers that a bicyclist may enter into the buffer zone.
- There is no standard for whether the buffer is configured on the parking side, the travel side, or a combination of both.
- If used and where there is parking on the right side of the buffered bicycle lane, the right most line should be broken. Where vehicles are expected to cross the buffer area at driveways, both lines should be broken. Where neither condition exists, both lines should be solid (CAMUTCD 9C.04).

Buffered Bicycle Lanes

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

FURTHER CONSIDERATIONS

- Color may be used within the lane to discourage motorists from entering the buffered lane.
- On multi-lane streets with high vehicle speeds, the most appropriate bicycle facility to provide for user comfort may be physically separated bike lanes.
- NCHRP Report #766 recommends, when space in limited, installing a buffer space between the parking lane and bicycle lane where on-street parking is permitted, rather than between the bicycle lane and vehicle travel lane.[1]

MATERIALS AND MAINTENANCE

Bike lane striping and markings will require higher maintenance where vehicles frequently traverse over them at intersections, driveways, parking lanes, and along curved or constrained segments of roadway.

Bike lanes should be maintained so that there are no pot holes, cracks, uneven surfaces or debris.

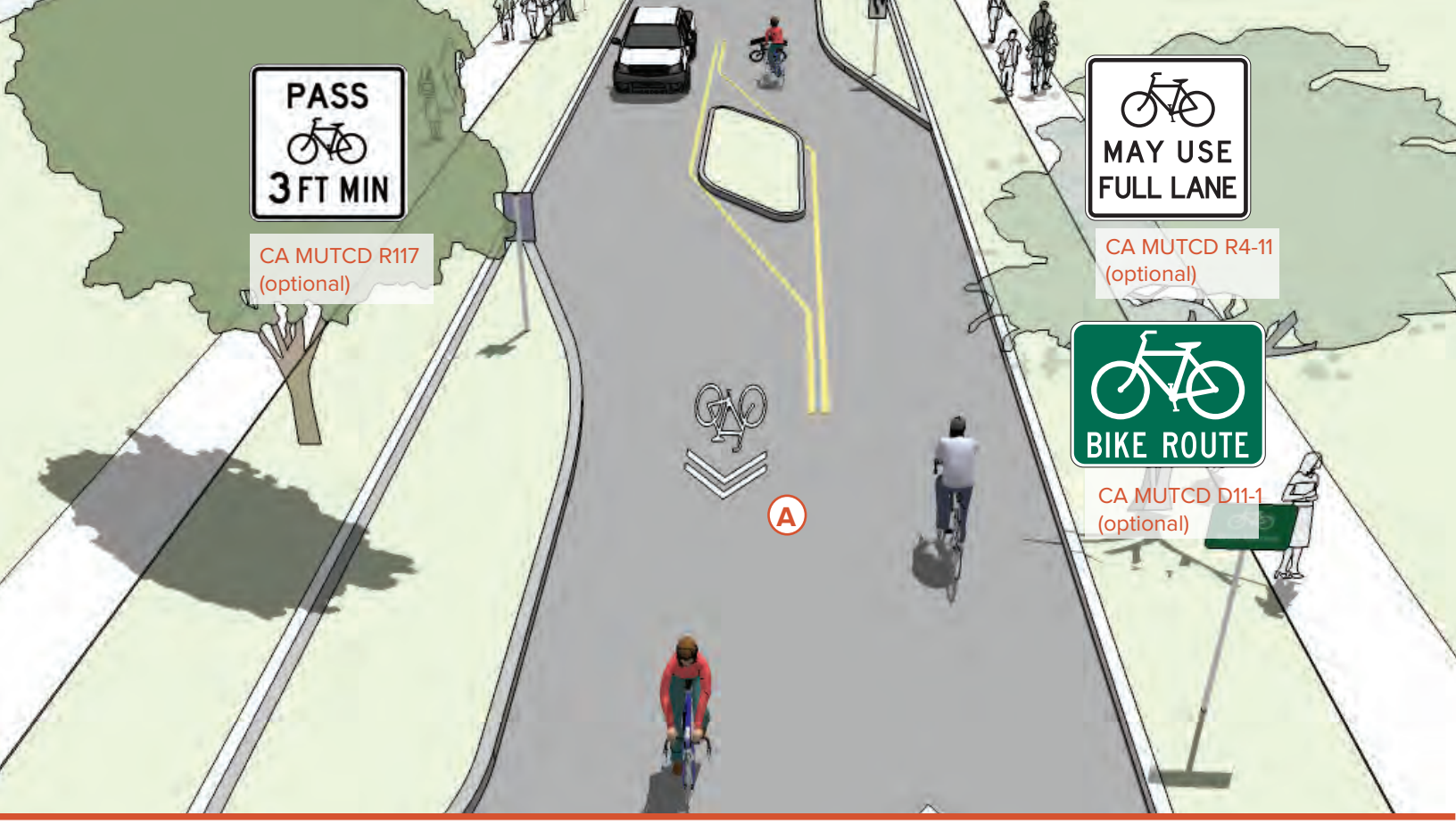
APPROXIMATE COST

The cost for installing buffered bicycle lanes will depend on the implementation approach. Typical costs are $130,000 per mile for both sides of a street. However, the cost of large-scale bicycle treatments will vary greatly due to differences in project specifications and the scale and length of the treatment.

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

CLASS III BIKEWAYS

Shared Roadways



Standard Bike Routes

Shared Lane Marking or “Sharrow” stencils are used in California as an additional treatment for Bike Route facilities and are currently approved in conjunction with on-street parking. The CA MUTCD-approved pavement marking can serve a number of purposes, such as making motorists aware of the need to share the road with bicyclists, showing bicyclists the direction of travel, and, with proper placement, reminding bicyclists to bike further from parked cars to prevent collisions with drivers opening car doors.

TYPICAL USE

- Shared Lane Markings are not appropriate on paved shoulders or in bike lanes, and should not be used on roadways that have a posted speed greater than 35 mph.
- Shared Lane Markings should be implemented in conjunction with BIKES MAY USE FULL LANE signs.

DESIGN FEATURES

(A) Placement in the center of the travel lane is preferred in constrained conditions.

- Markings should be placed immediately after intersections and spaced at 250 ft intervals thereafter.
- When placed adjacent to parking, markings should be outside of the “door zone”. Minimum placement is 11 ft from the curb face.

Sharrows also serve as positional guidance and raise bicycle awareness where there isn't space to accommodate a full-width bike lane. Center lane markings may or may not be necessary depending on travel lane widths. Narrower two way residential streets (less than 22 ft between parked cars) have a natural traffic calming effect without center turn lanes. Pictured right: sharrows on Sonoma Ave.

FURTHER CONSIDERATIONS

- Consider modifications to signal timing to induce a bicycle-friendly travel speed for all users.
- Though not always possible, placing the markings outside of vehicle tire tracks will increase the life of the markings and the long-term cost of the treatment.
- A green thermoplastic background can be applied to further increase the visibility of the shared lane marking.
- A "Pass Bicycle 3 FT MIN" sign (R117(CA)) can be installed to indicate to drivers the required passing distance per California Vehicle Code section 21760.

MATERIALS AND MAINTENANCE

Shared lane markings should be inspected annually and maintained accordingly, especially if located on roadways that feature high vehicle turning movements, or bus or truck traffic.

APPROXIMATE COST

Sharrows typically cost $200 per each marker for a lane-mile cost of $4,200, assuming the CA MUTCD guidance of sharrow placement every 250 ft.

Bicycle Boulevards

A bicycle boulevard (Class III Bikeway) is a low-speed, low-volume roadway that has been modified, as needed, to enhance comfort and convenience for people bicycling. It provides better conditions for bicycling while maintaining the neighborhood character and neighborhood and emergency vehicle access. Bicycle boulevards are intended to serve as the primary low-stress bikeway network, providing direct and convenient routes. Key elements of bicycle boulevards are unique signage and pavement markings, traffic calming and diversion features to maintain low vehicle volumes, and convenient major street crossings.

TYPICAL APPLICATION

- Parallel with and in close proximity to major thoroughfares (1/4 mile or less).
- Follow a desire line for bicycle travel that is ideally long and relatively continuous (2-5 miles).
- Avoid alignments with excessive zigzag or circuitous routing. The bikeway should have less than 10% out of direction travel compared to shortest path of primary corridor.
- Local streets with traffic volumes of fewer than 1,500 vehicles per day. Utilize traffic calming to maintain or establish low volumes and discourage vehicle cut through / speeding.

DESIGN FEATURES

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

Bicycle Boulevards

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

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

- Implement volume control treatments based on the context of the bicycle boulevard, using engineering judgment. Motor vehicle volumes should not exceed 1,500 vehicles per day.
- Intersection crossings should be designed to enhance safety and minimize delay for bicyclists.

FURTHER CONSIDERATIONS

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

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

MATERIALS AND MAINTENANCE

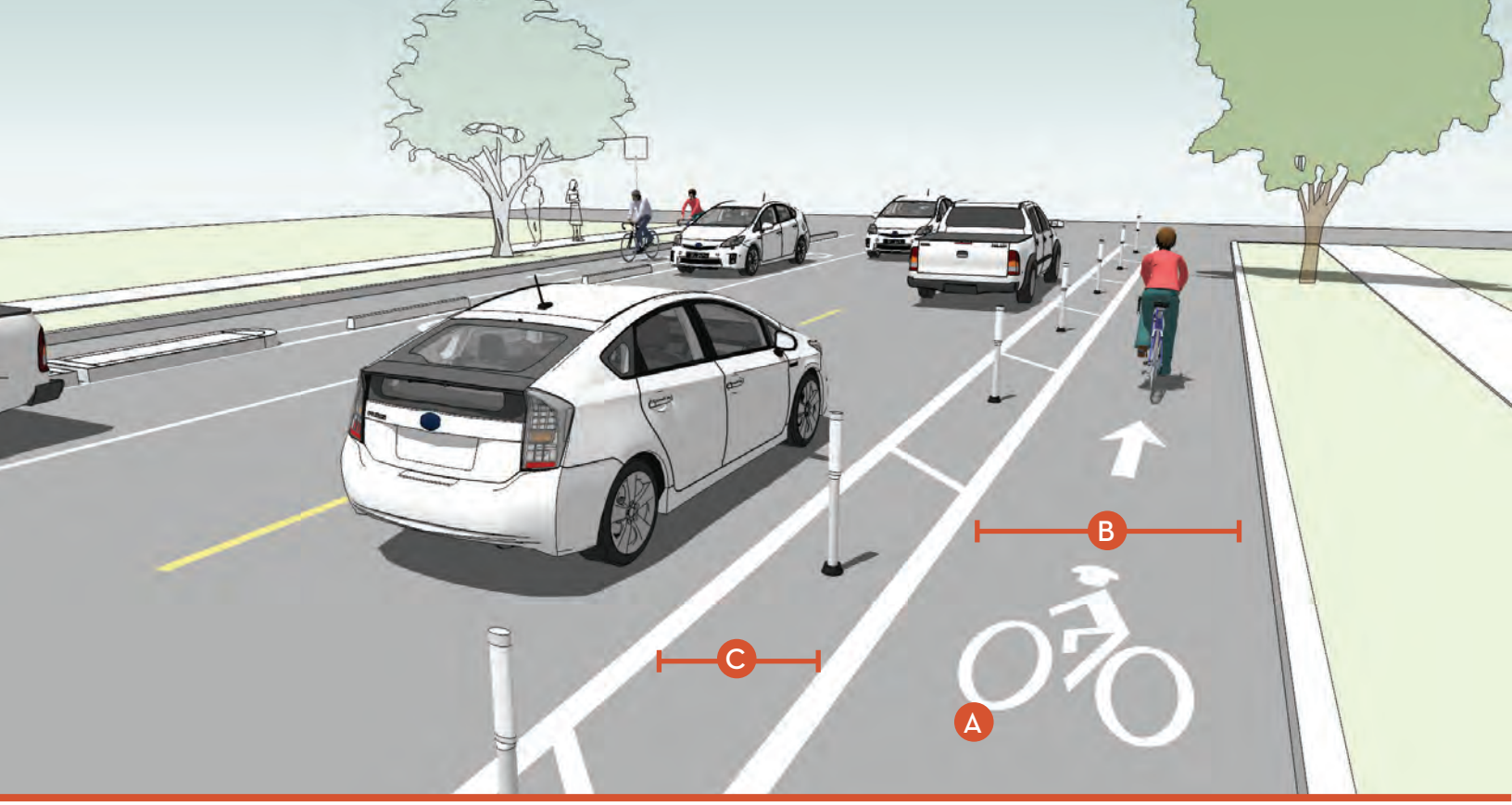
Bicycle boulevards require few additional maintenance requirements to local roadways. Signage, signals, and other traffic calming elements should be inspected and maintained according to local standards.

APPROXIMATE COST

Costs vary depending on the type of treatments proposed for the corridor. Bi-directional bicycle boulevards can cost between $75,000-$140,000. Simple treatments such as wayfinding signage and markings are most cost-effective, but more intensive treatments will have greater impact at lowering speeds and volumes, at higher cost.

CLASS IV BIKEWAYS

Separated Bikeways



One-Way Separated Bikeways

One-way separated bikeways are on-street bikeway facilities that are separated from vehicle traffic. Separation for separated bikeways is provided through physical barriers between the bike lane and the vehicular travel lane. These barriers can include bollards, planter strips, extruded curbs, or on-street parking. Separated bikeways using these barrier elements typically share the same elevation as adjacent travel lanes; however, the bikeway may also be raised above street level, either below or equivalent to sidewalk level.

TYPICAL APPLICATION

- Along streets on which conventional bicycle lanes would cause many bicyclists to feel stress because of factors such as multiple lanes, high bicycle volumes, high motor traffic volumes (9,000-30,000 ADT), higher traffic speeds (25+ mph), high incidence of double parking, higher truck traffic (10% of total ADT) and high parking turnover.
- Along streets for which conflicts at intersections can be effectively mitigated using parking lane setbacks, bicycle markings through the intersection, and other signalized intersection treatments.

DESIGN FEATURES

A Pavement markings, symbols and/or arrow markings must be placed at the beginning of the separated bikeway and at 500' intervals along the facility to define the bike direction (CAMUTCD 9C.04).

B 7 ft width preferred in areas with high bicycle volumes or uphill sections to facilitate safe passing behavior (5 ft minimum) (HDM 1003.1(1)).

C 3 ft minimum buffer width adjacent to parking lanes (2 ft minimum adjacent to travel lanes), marked with 2 solid white lines (NACTO, 2012).

Street Level Separated Bikeways

Street-level separated bikeways can be separated from the street with parking, planters, bollards or other design elements.

FURTHER CONSIDERATIONS

- Separated bikeway buffers and barriers are covered in the CAMUTCD as preferential lane markings (section 3D.01) and channelizing devices (section 3H.01). If buffer area is 4 ft or wider, diagonal markings should be used (section 9C.04). Curbs may be used as a channeling device, see the section on islands (section 3I.01). Grade-separation provides an enhanced level of separation in addition to buffers and other barrier types.
- Where possible, physical barriers such as tubular markings or removable curbs should be oriented towards the inside edge of the buffer to provide as much extra width as possible for bicycle use.
- A retrofit separated bike lane has a relatively low implementation cost compared to road reconstruction by making use of existing pavement and drainage and using a parking lane as a barrier.
- Gutters, drainage outlets, and utility covers should be designed and configured so as not to impact bicycle travel.
- For clarity at driveways or minor street crossings, consider a dotted line for the buffer boundary where cars are expected to cross.
- Bike box intersection treatments may be used in conjunction with one-way separated bike facilities in suitable locations to accommodate left turn movements for cyclists.
- Special consideration should be given at transit stops to manage bicycle and pedestrian interactions.

MATERIALS AND MAINTENANCE

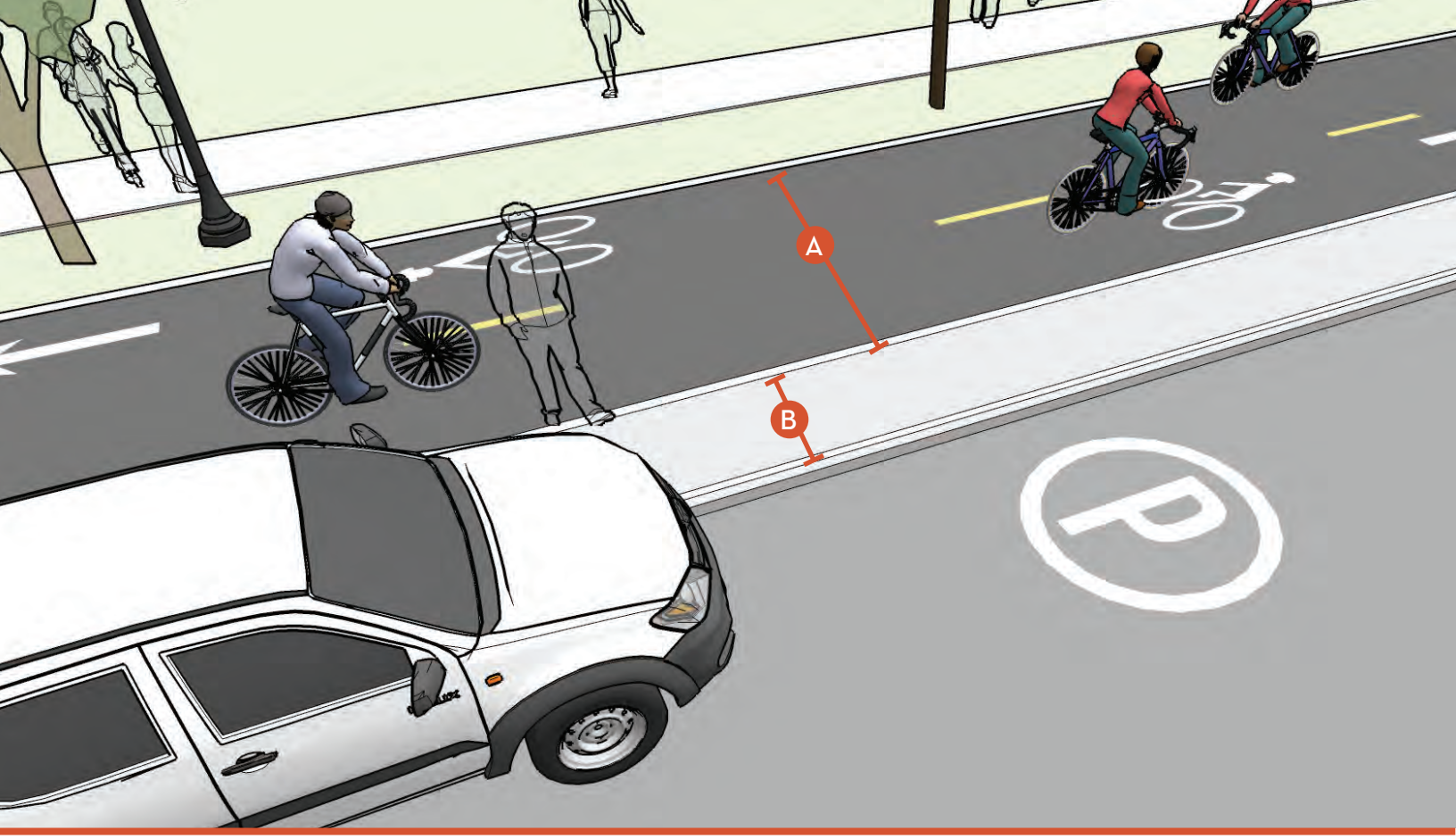
Bikeway striping and markings will require higher maintenance where vehicles frequently traverse over them at intersections, driveways, parking lanes, and along curved or constrained segments of roadway. Green conflict striping (if used) will also generally require higher maintenance due to vehicle wear.

Bikeways should be maintained so that there are no pot holes, cracks, uneven surfaces or debris.

Access points along the facility should be provided for street sweeper vehicles to enter/exit the separated bikeway.

APPROXIMATE COST

Separated bikeway construction costs can vary drastically depending on the type of separation used, the amount of new curb and gutter, stormwater mitigation, and crossing treatments. Construction of a separated bikeway starts at approximately $250,000 per mile.



Two-Way Separated Bikeway

Two-way separated bikeways are bicycle facilities that allow bicycle travel in both directions on one side of the road. Two-way separated bikeways share some of the same design characteristics as one-way separated bicycle lanes, but may require additional considerations at driveway and side-street crossings.

TYPICAL APPLICATION

- Streets with high motor vehicle volumes and/or speeds.
- Streets with high bicycle volumes.
- Streets with a high incidence of wrong-way bicycle riding.
- Streets with few conflicts such as driveways or cross-streets on one side of the street.
- Streets that connect to shared use paths.

DESIGN FEATURES

A 12 ft operating width preferred (10 ft minimum) width for two-way facility.

- In constrained situations an 8 ft minimum operating width may be considered (HDM 1003.1(1)).

B Adjacent to on-street parking a 3 ft minimum width channelized buffer or island shall be provided to accommodate opening doors (NACTO, 2012) (CAMUTCD 3H.01, 3I.01).

- A separation narrower than 3 ft may be permitted if a physical barrier is present, otherwise paint is sufficient (AASHTO, 2013).
- Additional signalization and signs may be necessary to manage conflicts in the absence of physical barriers.

Two-Way Separated Bikeway

A two-way facility can accommodate cyclists in two directions of travel.

FURTHER CONSIDERATIONS

- On-street bike lane buffers and barriers are covered in the CAMUTCD as preferential lane markings (section 3D.01) and channelizing devices, including flexible delineators (section 3H.01). Curbs may be used as a channeling device, see the section on islands (section 3I.01).
- A two-way separated bikeway may be configured at street level or as a raised separated bikeway with vertical separation from the adjacent travel lane.
- Two-way separated bikeways should ideally be placed along streets with long blocks and few driveways or mid-block access points for motor vehicles.
- Bike box intersection treatments may be used in conjunction with two-way separated bike facilities in suitable locations to accommodate turn movements for cyclists.

MATERIALS AND MAINTENANCE

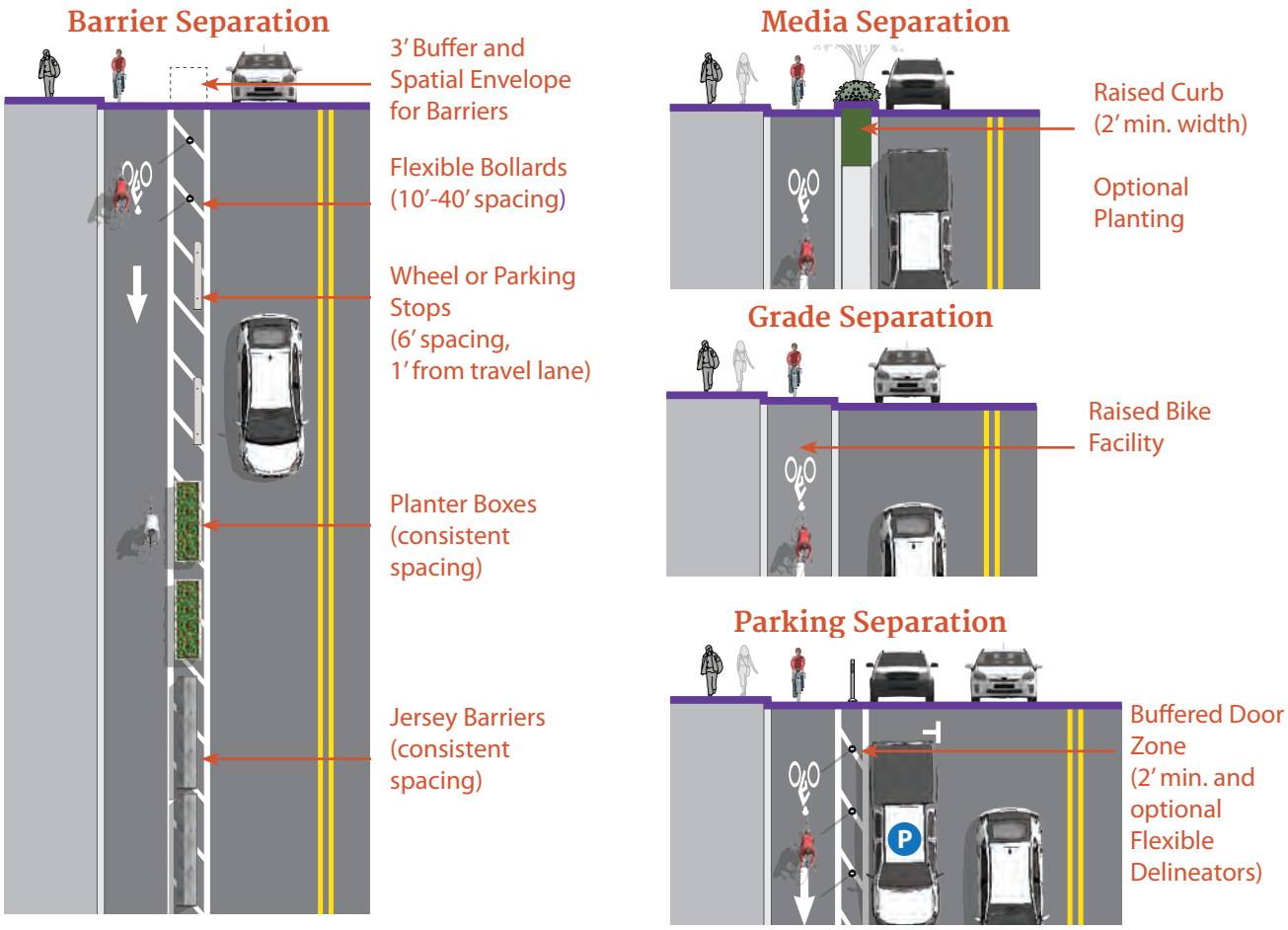
Bikeway striping and markings will require higher maintenance where vehicles frequently traverse over them at intersections, driveways, parking lanes, and along curved or constrained segments of roadway. Green conflict striping (if used) will also generally require higher maintenance due to vehicle wear.

Bikeways should be maintained so that there are no pot holes, cracks, uneven surfaces or debris.

Access points along the facility should be provided for street sweeper vehicles to enter/exit the separated bikeway.

APPROXIMATE COST

Separated bikeway construction costs can vary drastically depending on the type of separation used, the amount of new curb and gutter, stormwater mitigation, and crossing treatments. Construction of a separated bikeway starts at approximately $250,000 per mile.



Separated Bikeway Barriers

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

TYPICAL APPLICATION

Appropriate barriers for retrofit projects:

- Parked Cars
- Flexible delineators
- Bollards
- Planter boxes; K-Rail/Jersey barrier
- Wheel or Parking stops

Appropriate barriers for reconstruction projects:

- Curb separation
- Medians
- Landscaped medians
- Raised or protected bikeway with vertical or mountable curb
- Pedestrian safety islands

Bikeway Separation Methods

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

DESIGN FEATURES

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

FURTHER CONSIDERATIONS

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

MATERIALS AND MAINTENANCE

Separated bikeways protected by concrete islands or other permanent physical separation, can be swept by smaller street sweeper vehicles.

Access points along the facility should be provided for street sweeper vehicles to enter/exit the separated bikeway.

APPROXIMATE COST

Separated bikeway barrier material costs can vary greatly, depending on the type of material, the scale, and whether it is part of a broader construction project. Construction of a separated bikeway starts at approximately $250,000 per mile.


EXCEPT
BICYCLES
30
km/h
ARBUTUS
CHEVROLET

BIKEWAY

Intersection Treatments

Intersection Crossing Markings

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

TYPICAL APPLICATION

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

DESIGN FEATURES

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

A Dotted lines should be a minimum of 6” wide and 4 ft long, spaced every 12 ft (CAMUTCD Figure 39A).

- All markings should be white, skid resistant and retroreflective (CAMUTCD 9C.02.02).

B Green pavement markings may also be used.

- Bike lanes approaching intersections should dash the solid bike lane line for the last 100 to 200 feet in advance of the intersection. This encourages the right-turn vehicle to enter the bike lane prior to the turn per CVC 21717 (VTA).

Intersection Crossing Markings

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

FURTHER CONSIDERATIONS

The National Committee on Uniform Traffic Control Devices has submitted a request to include additional options bicycle lanes extensions through intersections as a part of future MUTCD updates[1]. Their proposal includes the following options for striping elements within the crossing:

- Bicycle lane markings.
- Double chevron markings, indicating the direction of travel.
- Green colored pavement.

MATERIALS AND MAINTENANCE

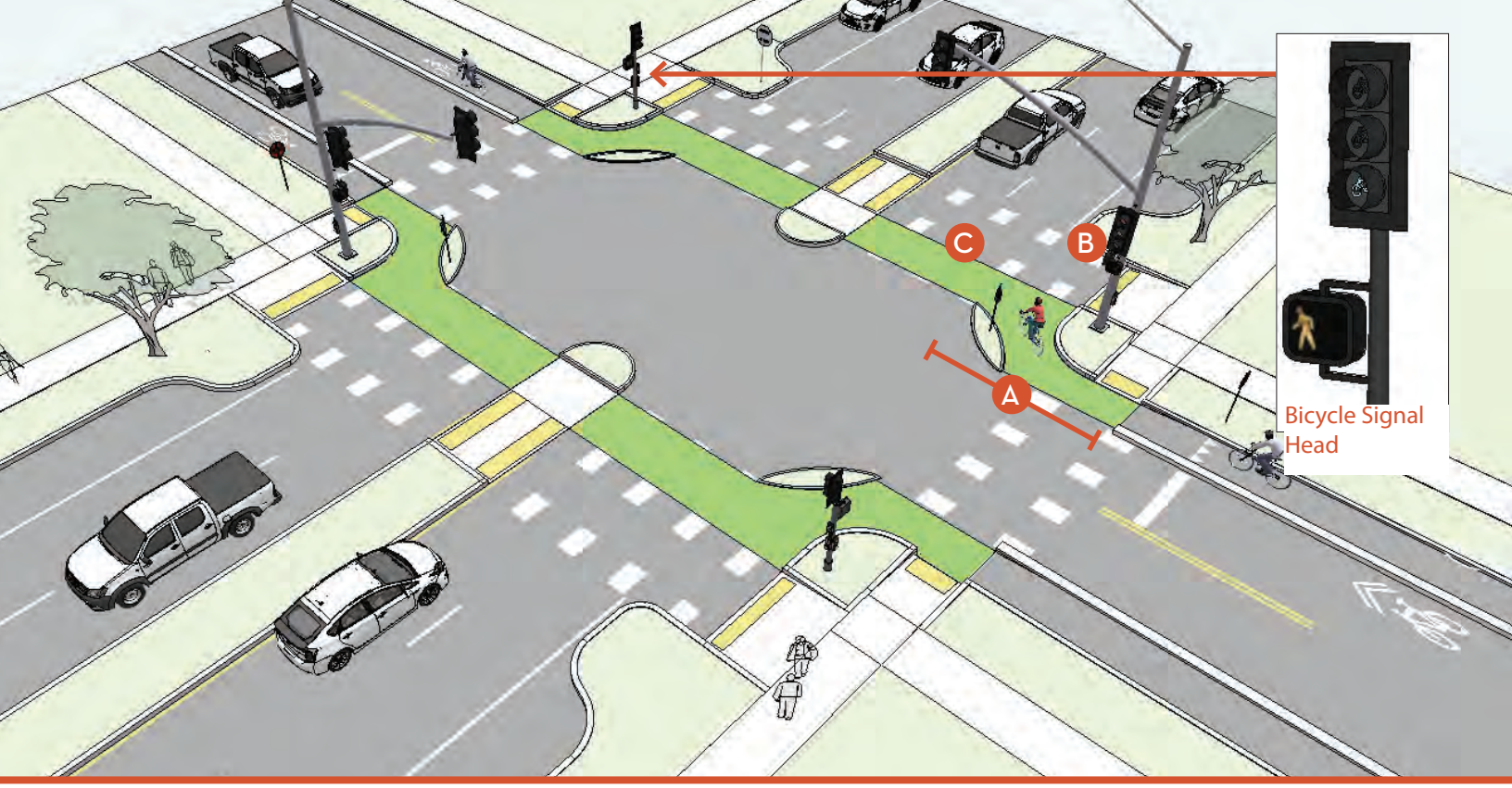
Because the effectiveness of crossing markings depends entirely on their visibility, maintaining markings should be a high priority. Thermoplastic markings offer increased durability than conventional paint.

APPROXIMATE COST

The cost for installing intersection crossing markings will depend on the implementation approach. On roadways with adequate width for reconfiguration or restriping, costs may be negligible when provided as part of routine overlay or repaving projects. Stand alone intersection improvements of this nature typically cost around $5,000 per location.

Maintenance of markings should also be considered.

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



Protected Intersection

A protected intersection uses a collection of intersection design elements to maximize user comfort within the intersection and promote a high rate of motorists yielding to people bicycling. Protected intersections may be physically protected and/or protected using signal timing. The design maintains a physical separation within the intersection to define the turning paths of motor vehicles, slow vehicle turning speed, and offer a comfortable place for people bicycling to wait at a red signal. Time-based separation applications (e.g., bicycle-only signal phases) may also be used to reduce bicycle/motor vehicle conflicts.

TYPICAL APPLICATION

- Streets with separated bikeways protected by wide buffer or on-street parking.
- Where two separated bikeways intersect and two-stage left-turn movements can be provided for bicycle riders.
- Helps reduce conflicts between right-turning motorists and bicycle riders by reducing turning speeds and providing a forward stop bar for bicycles.
- Where it is desirable to create a curb extension at intersections to reduce pedestrian crossing distance.

DESIGN FEATURES

A Setback bicycle crossing of 16.5 ft allows for one passenger car to queue while yielding. Smaller setback distance is possible in slow-speed, space constrained conditions.

B Corner safety island with a 15-20 ft corner radius slows motor vehicle speeds. Larger radius designs may be possible when paired with a deeper setback or a protected signal phase, or small mountable aprons. Two-stage turning boxes are provided for queuing bicyclists adjacent to corner islands.

C Use intersection crossing markings.

Protected Intersection

Protected intersections feature a corner safety island and intersection crossing markings.

Protected intersections incorporate queuing areas for two-stage left turns.

FURTHER CONSIDERATIONS

- Pedestrian crosswalks may need to be further set back from intersections in order to make room for two-stage turning queue boxes.
- Wayfinding and directional signage should be provided to help bicycle riders navigate through the intersection.
- Colored pavement may be used within the corner refuge area to clarify use by people bicycling and discourage use by people walking or driving.
- Intersection approaches with high volumes of right turning vehicles should provide a dedicated right turn only lane paired with a protected signal phase. Protected signal phasing may allow different design dimensions than are described here.
- At signalized intersections, time-based separation may take the form of bicycle-only signal phases or a "leading bicycle interval." These applications typically necessitate additional features including bicycle-specific signals (with bicycle signal heads) and supplemental signage aimed at bicyclists (e.g, "Bike Signal") and motorists (e.g., "No Turn on Red").
- Educational signage or campaigns may also inform roadway users of correct usage.

MATERIALS AND MAINTENANCE

- Green conflict striping (if used) will also generally require higher maintenance due to vehicle wear.
- Bikeways should be maintained so that there are no pot holes, cracks, uneven surfaces or debris.
- Bikeways protected by concrete islands or other permanent physical separation, can be swept by street sweeper vehicles with narrow widths.

APPROXIMATE COST

The cost of protected intersection elements vary between $750,000 and $1.5 million depending on materials used and degree of implementation desired.

- Complete reconstruction costs comparable to a full intersection.
- Retrofit implementation may be possible at lower costs if existing curbs and drainage are maintained. Inexpensive materials can used, such as paint, concrete planters, and bollards.

Bicycle Detection and Actuation

At fully signalized intersections, bicycle crossings are typically accomplished through the use of a standard green signal indication for Class II and III bikeways. A number of traffic signal enhancements can be made to improve detection and actuation and to better accommodate bicyclists. An exclusive bicycle phase provided by bicycle signals offers the highest level of service and protection, especially for Class I and IV bikeways, but feature the same detection and actuation devices used at intersections with standard traffic signals. For more information on bicycle signals, see Protected Bicycle Signal Phase.

TYPICAL APPLICATION

- Bicycle detection and actuation is used to alert the signal controller of bicycle crossing demand on a particular approach. Proper bicycle detection should meet at least two primary criteria: 1) accurately detect bicyclists, and 2) provide clear guidance to bicyclists on how to actuate detection (e.g. what button to push or where to stand). Additionally, new technologies are being developed to provide feedback to bicyclists once they have been detected to increase the likelihood of stop compliance.
- Detection mechanisms can also provide bicyclists with an extended green time before the signal turns yellow so that bicyclists of all abilities can reach the far side of the intersection.
- All new or modified traffic signals in California must be equipped for bicyclist detection, or be placed on permanent recall or fixed time operation. (CalTrans Traffic Operations Policy Directive (TOPD) 09-06.
- Detection shall be place where bicyclists are intended to travel and/or wait.
- On bicycle priority corridors with on-street bike lanes or separated bikeways, consider the use of advance detection placed 100-200 ft upstream of the intersection to provide an early trigger to the signal system and reduce bicyclist delay.

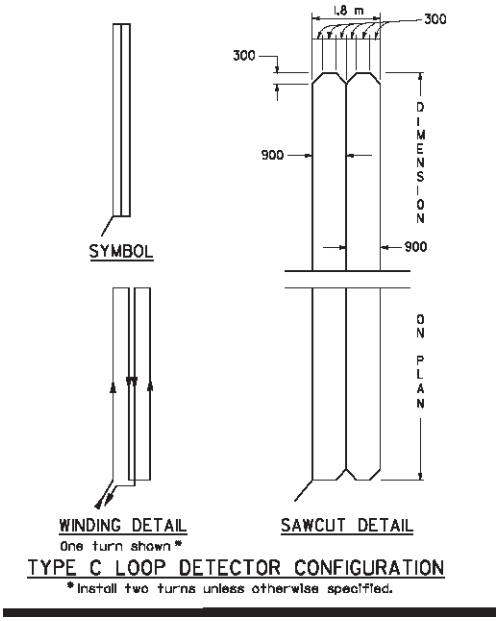
DESIGN FEATURES

- Bicycle detection and actuation systems include user-activated buttons mounted on a pole facing the street, in-pavement loop detectors that trigger a change in the traffic signal when a bicycle is detected, video detection cameras that use digital image processing to detect a change in the image at a location, and/or Remote Traffic Microwave Sensor Detection (RTMS) which uses frequency modulated continuous wave radio signals to detect objects in the roadway.
- 6’ x 6’ Type C loop conductors should be used.
- A linear pavement marking should be used to indicate where cyclists should stand to acuate the signal.
- Signal heads should depict green, yellow, and red cyclist icons to communicate when the exclusive bicycle phase is in progress.

Push Button Actuation

Bicycle push button actuators are positioned to allow bicycle riders in roadway to stop traffic on busy cross-streets.

Type C Loop Detector



Type C loop detector have been shown to most reliably detect bicyclists at all points over their surface.

FURTHER CONSIDERATIONS

- The location of pushbuttons should not require bicyclists to dismount or be rerouted out of the way or onto the sidewalk to activate the phase. Signage should supplement the signal to alert bicyclists of the required activation to prompt the green phase.
- In-pavement Type C Loop detectors are induction circuits installed within the roadway surface to detect bicyclists as they wait for the signal. This allows the bicyclists to stay within the lane of travel. Loop detectors should be sufficiently sensitive to detect bicyclists and be marked with pavement markings instructing bicyclists on where to stand. CAMUTCD provides guidance on stencil markings and signage related to loop detectors.
- Remote Traffic Microwave Sensor Detection (RTMS) is unaffected by temperature and lighting which can affect standard video detection.
- Bicyclists typically need more time to travel through an intersection than motor vehicles. Green light times should be determined using the bicycle crossing time for standing bicycles.

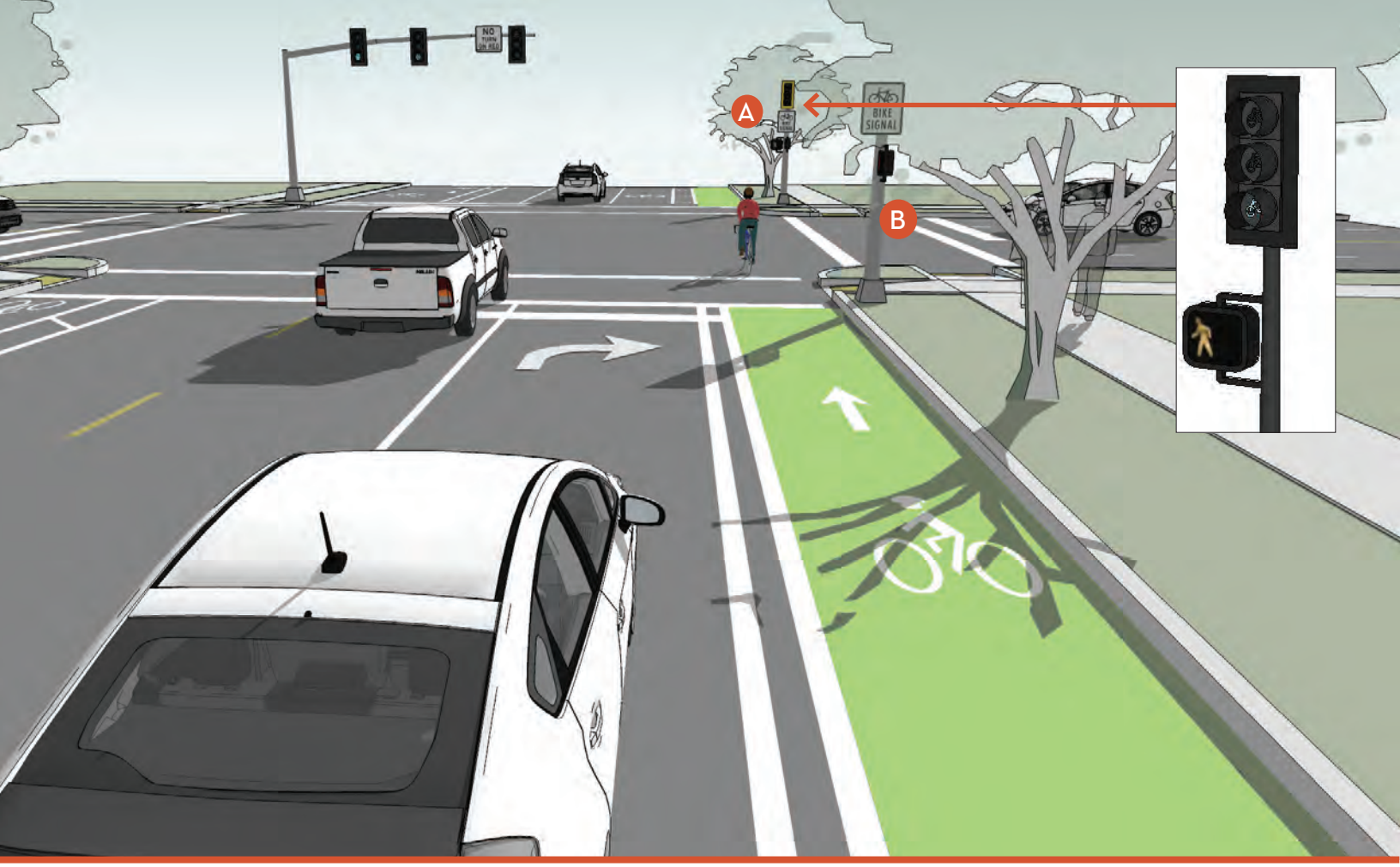
MATERIALS AND MAINTENANCE

Bicycle signal detection equipment should be inspected and maintained regularly, especially if detection relies on manual actuation. Pushbuttons and loop detectors will tend to have higher maintenance needs than other passive detection equipment.

APPROXIMATE COST

Costs vary depending on the type of technology used, but bicycle loop detectors embedded in the pavement typically cost from $1,000-$2,000. Video detection camera systems typically range from $20,000 to $30,000 per intersection.

Other traffic signal programming enhancements can be made to existing traffic signal hardware with relatively little to no additional hardware costs.



Protected Bicycle Signal Phase

Separated bikeway crossings of signalized intersections can be accomplished through the use of a bicycle signal phase which reduces conflicts with motor vehicles by separating bicycle movements from conflicting motor vehicle movements. Bicycle signals are traditional three-lens signal heads with green, yellow, and red bicycle-stenciled lenses.

TYPICAL APPLICATION

- One-way separated bikeways with high levels of bicycle traffic and motor vehicle traffic.
- Two-way separated bikeways where contraflow bicycle movement or increased conflict points warrant protected operation.
- Bicyclists moving on a green or yellow signal indication in a bicycle signal shall not be in conflict with any simultaneous motor vehicle movement at the signalized location.
- High volume bicycle crossings on major roadways.

DESIGN FEATURES

A. An additional “Bicycle Signal” sign should be installed below the bicycle signal head.

B. Designs for bicycles at signalized crossings should allow bicyclists to trigger signals and safely maneuver the crossing.

- On bikeways, signal timing and actuation shall be reviewed and adjusted to consider the needs of bicyclists (CAMUTCD 9D.02).

Protected Bicycle Signal Phase

A bicycle detection system triggers a change in the traffic signal when a bicycle is detected.

FURTHER CONSIDERATIONS

- A bicycle signal should be considered for use only when the volume/collision or volume/geometric warrants have been met (CAMUTCD 4C.102).
- Right (or left) turns on red should be prohibited in locations where such operation would conflict with a green bicycle signal indication.
- FHWA has approved bicycle signals for use, if they comply with requirements from Interim Approval 16 (I.A. 16). Bicycle Signals are not approved for use in conjunction with Pedestrian Hybrid Beacons.
- Bicyclists typically need more time to travel through an intersection than motor vehicles. Green light times should be determined using the bicycle crossing time for standing bicycles.
- Bicycle detection and actuation systems include user-activated buttons mounted on a pole, loop detectors that trigger a change in the traffic signal when a bicycle is detected and video detection cameras, that use digital image processing to detect a change in the image at a location.

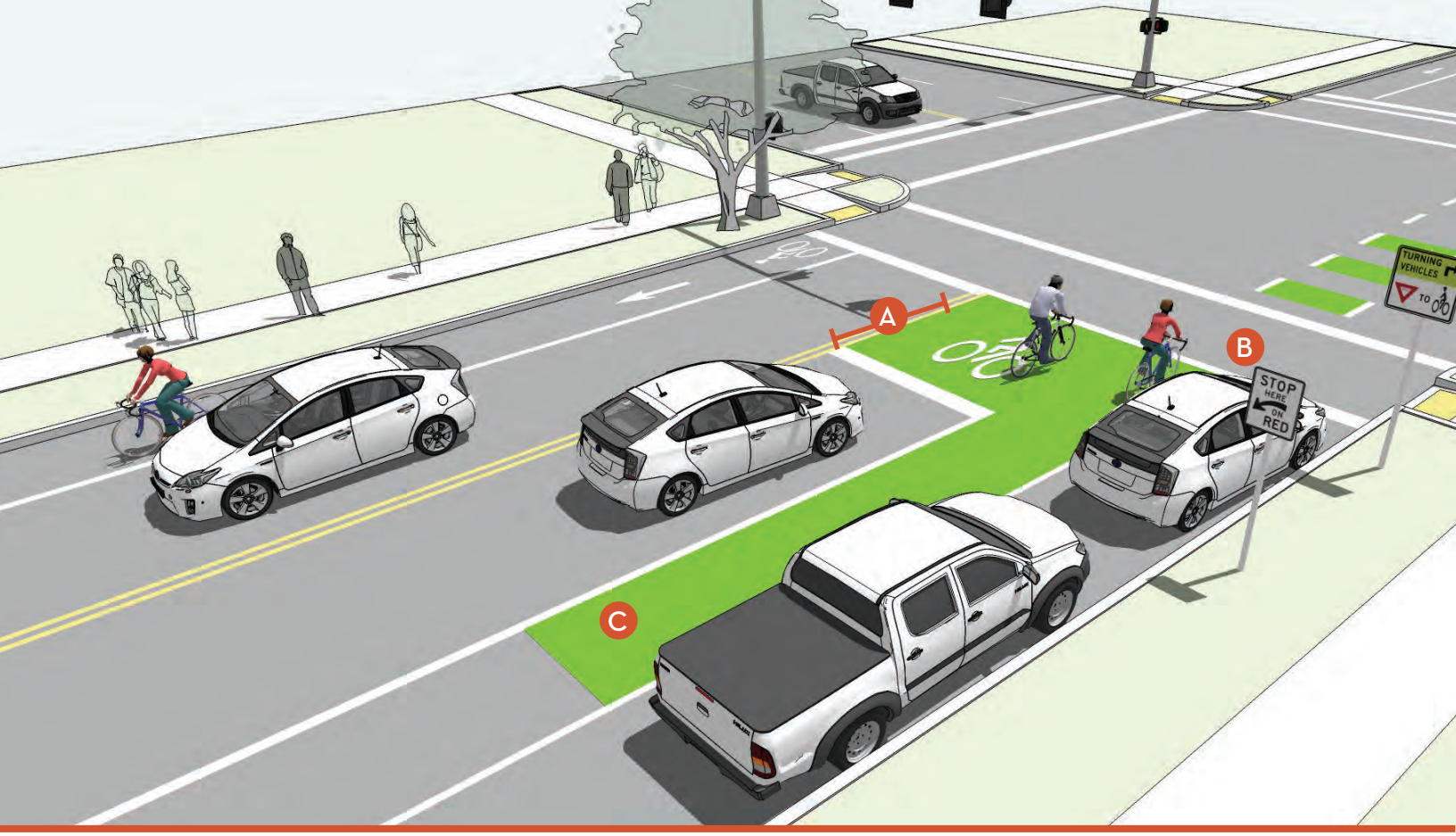
MATERIALS AND MAINTENANCE

Bicycle signal detection equipment should be inspected and maintained regularly, especially if detection relies on manual actuation. Pushbuttons and loop detectors will tend to have higher maintenance needs than other passive detection equipment.

APPROXIMATE COST

Bicycle signal heads have an average cost of $12,800.

Video detection camera system costs range from $20,000 to $30,000 per intersection.



Bike Box

A bike box is an experimental treatment, designed to provide bicyclists with a safe and visible space to get in front of queuing traffic during the red signal phase. Motor vehicles must queue behind the white stop line at the rear of the bike box. On a green signal, all bicyclists can quickly clear the intersection.

TYPICAL APPLICATION

- At potential areas of conflict between bicyclists and turning vehicles, such as a right or left turn locations.
- At signalized intersections with high bicycle volumes.
- At signalized intersections with high vehicle volumes.
- Not to be used on downhill approaches to minimize the right hook threat potential during the green signal phase.
- May be used on roadways with 1 or 2 vehicle travel lanes in each direction.

DESIGN FEATURES

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

B A "No Turn on Red" (CAMUTCD R10-11) or "No Right Turn on Red" (CAMUTCD R13A) sign shall be installed overhead to prevent vehicles from entering the Bike Box. (Refer to CVC 22101 for the signage) A "Stop Here on Red" (CAMUTCD R10-6) sign should be post mounted at the stop line to reinforce observance of the stop line.

C A 50 ft ingress lane should be used to provide access to the box.

- Use of green colored pavement is optional.

Bike Box

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

FURTHER CONSIDERATIONS

- This treatment positions bicycles together and on a green signal, all bicyclists can quickly clear the intersection, minimizing conflict and delay to transit or other traffic.
- Pedestrians also benefit from bike boxes, as they experience reduced vehicle encroachment into the crosswalk.
- Bike boxes are currently under experiment in California. Projects will be required to go through an official Request to Experiment process. This process is outlined in Section 1A.10 in the CAMUTCD, and jurisdictions must receive approval prior to implementation.
- Education may be needed to ensure bike boxes are understood and correctly utilized by all roadway users.

MATERIALS AND MAINTENANCE

Bike boxes are subject to high vehicle wear, especially turning passenger vehicles, buses, and heavy trucks. As a result, bike boxes with green coloring will require more frequent replacement over time. The life of the green coloring will depend on vehicle volumes and turning movements, but Thermoplastic is generally a more durable material than paint.

APPROXIMATE COST

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

The typical cost for painting a bike box is $11.50 per square foot. Detection costs range from $1,500 to $30,000 depending on the system used.

Two-Stage Turn Boxes

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

TYPICAL APPLICATION

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

DESIGN FEATURES

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

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

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

Two-stage Turn Box

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

FURTHER CONSIDERATIONS

- Consider providing a "No Turn on Red" (CAMUTCD R10-11) on the cross street to prevent motor vehicles from entering the turn box.
- This design formalizes a maneuver called a "box turn" or "pedestrian style turn".
- Some two-stage turn box designs are considered experimental by FHWA and are not currently under experiment in California.
- Design guidance for two-stage turns apply to both bike lanes and separated bikeways.
- Two-stage turn boxes reduce conflicts in multiple ways: keeping bicyclists from queuing in a bike lane or crosswalk and separating turning bicyclists from through bicyclists.
- Bicyclist capacity of a two-stage turn box is influenced by physical dimension (how many bicyclists it can contain) and signal phasing (how frequently the box clears).
- Education may be needed to ensure turn boxes are understood and correctly utilized by all roadway users.
- Turn boxes are currently under experiment in California. Projects will be required to go through an official Request to Experiment process. This process is outlined in Section 1A.10 in the CAMUTCD, and jurisdictions must receive approval prior to implementation.

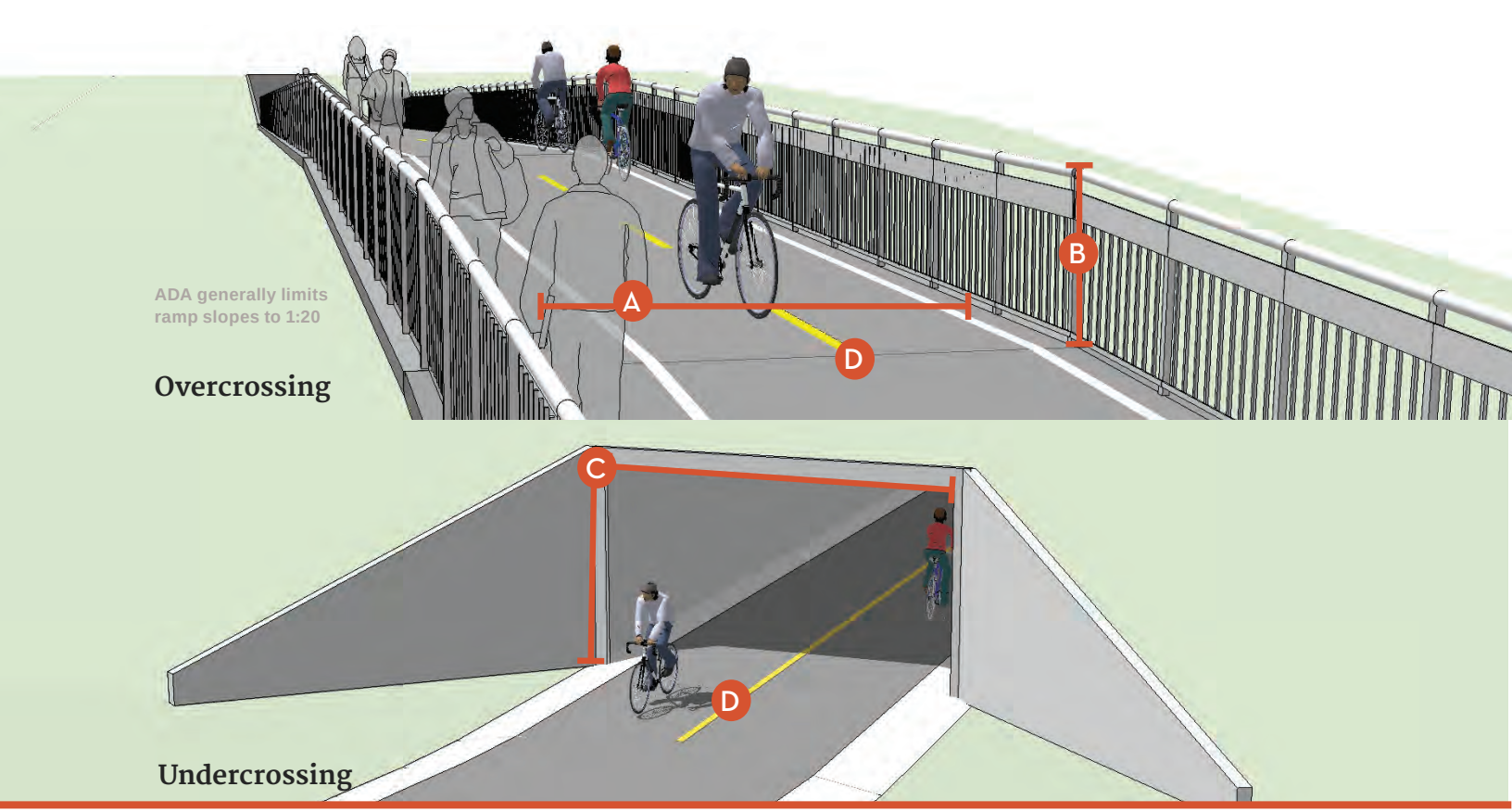
MATERIALS AND MAINTENANCE

Thermoplastic should be used to offer increased durability than conventional paint. Maintain turn boxes to ensure they are kept free of debris.

APPROXIMATE COST

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

The typical cost for painting a two-stage turn box is $11.50 per square foot. Detection costs range from $1,500 to $30,000 depending on the system used.



Grade Separated Crossings

Grade-separated crossings provide critical non-motorized system links by joining areas separated by barriers such as railroads, waterways, and highway corridors. In most cases, these structures are built in response to user demand for safe crossings where they previously did not exist. There are no minimum roadway characteristics for considering grade separation. Depending on the type of facility or the desired user group, grade separation may be considered in many types of projects.

TYPICAL APPLICATION

- Where shared-use paths cross high-speed and high-volume roadways where an at-grade signalized crossing is not feasible or desired, or where crossing railways or waterways.

DESIGN FEATURES

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

B Railing height must be a minimum of 42-54" for overcrossings. Railroad overcrossing typically requiring a minimum 8 ft fence.

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

D Centerline stripe is recommended for grade-separated facility.

Overcrossings

Undercrossings

Grade-separated crossings help people walking or biking cross barriers such as freeways, railroads, and rivers.

FURTHER CONSIDERATIONS

- Overcrossings require a minimum of 17 ft of vertical clearance to the roadway below. Minimal vertical clearance over railways is typically 24 ft, but depends on the railroad operators specifications.
- Overcrossings for bicycles and pedestrians typically fall under the Americans with Disabilities Act (ADA), which strictly limits ramp slopes to 5% (1:20) with landings at 400 ft intervals, or 8.33% (1:12) with landings every 30 ft.
- Overcrossings pose potential concerns about visual impact and functional appeal, as well as space requirements necessary to meet ADA guidelines for slope.
- To mitigate safety concerns, an undercrossing should be designed to be spacious, well-lit, equipped with emergency cell phones at each end and completely visible for its entire length from end to end.

MATERIALS AND MAINTENANCE

Overcrossings and undercrossings should be kept clean and free of debris and trash. Lighting, railings, and pavements markings should all be routinely maintained to ensure user safety.

APPROXIMATE COST

Costs will vary greatly based on site conditions, materials, etc. Overpasses have a range from $150 to $250/sq ft or $1,073,000 to $5,366,000 per complete installation, depending on site conditions. Underpasses range from slightly less than $1,609,000 to $10,733,000 in total or around $120/sq ft (PBIC).

BIKE PARKING

Bike Parking

Bicyclists expect a safe, convenient place to secure their bicycle when they reach their destination. This may be short-term parking of 2 hours or less, or long-term parking for employees, students, residents, and commuters.

TYPICAL APPLICATION

- Bike racks provide short-term bicycle parking and are meant to accommodate visitors, customers, and others expected to depart within two hours. Bike racks should be an approved standard rack, with appropriate location/placement and weather protection.
- On-street bike corrals (also known as on-street bicycle parking) consist of bicycle racks grouped together in a common area within the street traditionally used for automobile parking. Bicycle corrals are reserved exclusively for bicycle parking and provide a relatively inexpensive solution to providing high-volume bicycle parking. Bicycle corrals can be implemented by converting one or two on-street motor vehicle parking spaces into on-street bicycle parking. Each motor vehicle parking space can be replaced with approximately 6-10 bicycle parking spaces.
- Bicycle lockers are intended to provide long-term bicycle storage for employees, students, residents, and others expected to park more than two hours. Long-term facilities protect the entire bicycle, its components, and accessories against theft and against inclement weather, including snow and wind-driven rain.
- A secure parking area for bicycles is a dedicated long-term bike parking facility, also referred to as Bike & Ride (when located at transit stations) and is a semi-enclosed space that offers a higher level of security than ordinary bike racks. Accessible via key-card, combination locks, or keys, these facilities provide high-capacity parking for 10 to 100 or more bicycles. Increased security measures create an additional transportation option for those whose biggest concern is theft and vulnerability.

DESIGN FEATURES

Bike Racks

A 2 ft minimum from the curb face to avoid 'dooring'.

B 3 ft between racks to provide maneuvering room (VTA Bicycle Technical Guidelines 10-9).

- Locate close to destinations; 50 ft maximum distance from main building entrance.
- Minimum clear distance of 6 ft should be provided between the bicycle rack and the property line.

Bike Corrals

C Bicyclists should have an entrance width from the roadway of 5-6 ft.

- Can be used with parallel or angled parking.
- Parking stalls adjacent to curb extensions are good candidates for bicycle corrals since the concrete extension serves as delimitation on one side.

Bike Lockers

D Minimum dimensions: width (opening) 2.5 ft; height 4 ft; depth 6 ft.

- 4 ft side clearance and 6 ft end clearance.
- 7 ft minimum distance between facing lockers.

Secure Parking Area

- Closed-circuit television monitoring with secure access for users.

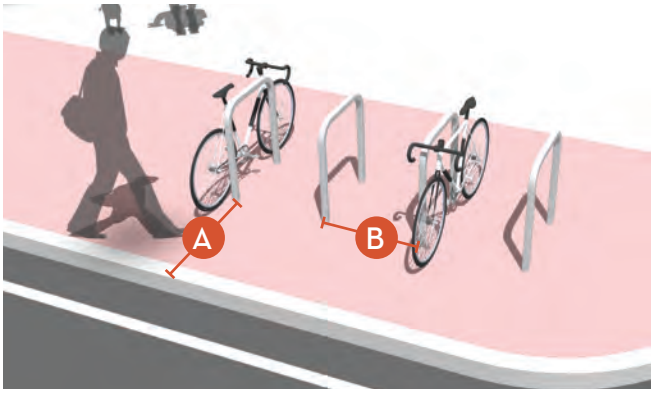
E Double high racks and cargo bike spaces.

- Bike repair station with bench and bike tube and maintenance item vending machine.
- Bike lock "hitching post" – allows people to leave bike locks.

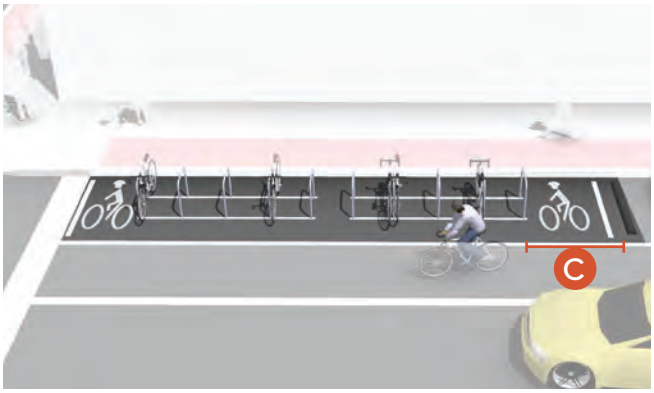
Additional Information

- Additional information on bike parking can be found in the Association of Pedestrian and Bicycle Professionals' (APBP) *Essentials of Bike Parking* (2015) or Valley Transportation Authority's *Bicycle Technical Guidelines*.

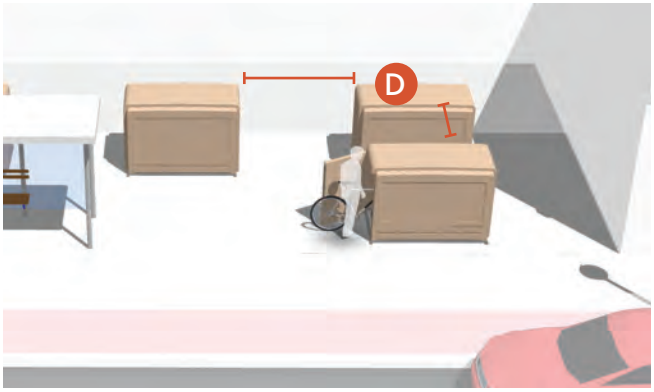
Perpendicular Bike Racks



Bike Corral



Bike Locker



Secure Parking Area

APPENDIX C

Recommendations Tables

This appendix shows the full list of project recommendations for the Santa Clara Bicycle Plan Update 2018 in alphabetical order. Where possible, cost estimates are included.

Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High	Priority Project
Agate Dr	Class III Bicycle Boulevard		City Limit	Bowers Ave	1.11	$83,000	$155,000	-
Agate Dr at Calabazas Creek Trail	Intersection Improvements	Project being analyzed separately under the Creek Trail Master Plan project. Spot Improvement #14	Agate Dr	Calabazas Creek Trail	-			
Agnew Park	Bicycle Parking		-	-	-	$800	-	-
Agnew Rd	Class IIB Buffered Bicycle Lane		San Tomas Aquino Creek Trail	Lafayette St	0.65	$84,000	$274,000	-
Alvarez Jr Park	Bicycle Parking		-	-	-	$800	-	-
Amethyst Dr	Class III Bicycle Boulevard		Glade Dr	Bowers Ave	0.90	$68,000	$126,000	Yes
Bassett St	Class II Bicycle Lane		Chestnut St	Laurelwood Rd	0.97	$78,000	$411,000	-
Bassett St	Class III Bicycle Boulevard		Kingsbury Cir	Chestnut St	0.52	$39,000	$73,000	-
Bellomy St	Class II Bicycle Lane		Lafayette St	Park Ave	0.17	$14,000	$72,000	-
Benton St	Class II Bicycle Lane		Lincoln St	El Camino Real	0.83	$66,000	$350,000	Yes
Benton St	Class IIB Buffered Bicycle Lane		Dunford Way	Maryann Dr	1.68	$219,000	$712,000	Yes
Benton St	Class III Bicycle Boulevard		Maryann Dr	Lincoln St	0.88	$66,000	$123,000	Yes
Bowers Ave at Central Expy	Install intersection crossing markings	Spot Improvement #12	Bowers Ave	Central Expy	-	$5,000	-	-
Bowers Ave/Great America Parkway	Class IV Separated Bikeway		Bay Trail	Chromite Dr	3.45	$863,000	$1,208,000	Yes
Bowers Ave	Class IIB Buffered Bicycle Lane		Chromite Dr	El Camino Real	1.06	$138,000	$450,000	Yes

Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High	Priority Project
Bowers Elementary School	Bicycle Parking		-	-	-	$800	-	-
Bowers Park	Bicycle Parking		-	-	-	$800	-	-
Bracher Elementary	Bicycle Parking		-	-	-	$800	-	-
Bracher Park	Bicycle Parking		-	-	-	$800	-	-
Brokaw Rd	Class IIB Buffered Bicycle Lane		Costco access road	Martin Ave	0.29	$37,000	$122,000	-
Buschser Middle School	Bicycle Parking		-	-	-	$800	-	-
Cabrillo Ave at Lawrence Expy	Intersection Improvements	Short term: Intersection crossing markings. Spot Improvement #18	Cabrillo Ave	Lawrence Expy	-	$5,000		
Cabrillo Ave at Lawrence Expy	Intersection Improvements	Long Term: Protected intersection. Spot Improvement #18	Cabrillo Ave	Lawrence Expy	-	$750,000	$1,500,000	
Cabrillo Ave at Scott Blvd	Bike Detection	Spot Improvement #19	Cabrillo Ave	Scott Blvd	-	$1,500	$30,000	-
Cabrillo Middle School	Bicycle Parking		-	-	-	$800	-	-
Calabazas Creek Trail	Class I Shared-Use Path	Project being analyzed separately under the Creek Trail Master Plan project	Calabazas Creek Trail	Benton St	3.72	$2,604,000	$3,720,000	Yes
Calabazas Creek Trail at Caltrain rail lines	Connect Calabazas Creek Trail accross Caltrain rail lines (over or under)	Project being analyzed separately under the Creek Trail Master Plan project. Spot Improvement #13	Calabazas Creek Trail	Caltrain Rail Lines	-			-
Calabazas Creek Trail at Central Expressway	Connect the Calabaza Creek Trail across Central Expressway (over or under)	Project being analyzed separately under the Creek Trail Master Plan project. Spot Improvement #11	Calabazas Creek Trail	Central Expressway	-			-

Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High	Priority Project
Calabazas Creek Trail at SR 237	Connect Calabazas Creek Trail to Bay Trail	Project being analyzed separately under the Creek Trail Master Plan project. Spot Improvement #1	Calabazas Creek Trail	SR 237	-			-
Calabazas Creek Trail Extension - North	Class I Shared-Use Path	Project being analyzed separately under the Creek Trail Master Plan project	Bay Trail	Old Mountain View-Alviso Rd	0.12	$84,000	$120,000	Yes
Calle del Mundo	Class II Bicycle Lane		Lafayette St	Street End	0.35	$28,000	$149,000	-
Caltrain Station	Bicycle Parking	Bike lockers	-	-	-	$2,000	-	-
Camino Dr	Class III Bicycle Boulevard		Washington St	Park Ave	0.29	$22,000	$41,000	Yes
Carli Park	Bicycle Parking		-	-	-	$800	-	-
Carmichael Park	Bicycle Parking		-	-	-	$800	-	-
Central Park Library	Bicycle Parking	Bike lockers	-	-	-	$2,000	-	-
Chromite Dr	Class III Bicycle Route		Monroe St	Bowers Ave	0.33	$25,000	$46,000	-
City Hall	Bicycle Parking	Bike racks and lockers	-	-	-	$2,000	-	-
Civic Center Park	Bicycle Parking		-	-	-	$800	-	-
Coleman Ave	Class II Bicycle Lane		Reed St	Aviation Ave	0.84	$67,000	$355,000	-
Cronin Dr	Class III Bicycle Boulevard		Pruneridge Ave	Stevens Creek Blvd	0.51	$38,000	$71,000	-
Cypress Ave	Class III Bicycle Boulevard		Saratoga Ave	Stevens Creek Blvd	0.69	$52,000	$97,000	-
De La Cruz Blvd	Class IV Separated Bikeway		Montague Park	Trimble Rd	0.63	$158,000	$222,000	Yes
De La Cruz Blvd	Class IV Separated Bikeway		Central Expy	Reed St	0.89	$223,000	$690,000	Yes
De La Cruz Blvd	Class II Bicycle Lane		Montague Expy	Montague Park	0.38	$30,000	$161,000	-
Dolores Ave	Class III Bicycle Boulevard		Los Padres Blvd	Winchester Blvd	0.29	$22,000	$41,000	-
East River Pkwy	Class III Bicycle Route		Garrity Way	Lick Mill Blvd	0.23	$6,000	-	-

Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High	Priority Project
El Camino Real	Class IV Separated Bikeway		City limit	City limit	4.29	$1,071,000	$1,500,000	Yes
El Camino Real at Benton St	Intersection Improvements	Signal detection, tighten turning radii. Spot Improvement #22	El Camino Real	Benton St	-	$6,500	$180,000	Yes
El Camino Real at Monroe St	Intersection Improvements	Bicycle detection, Install bike lane markings across intersection, tighten turning radii. Spot Improvement #21	El Camino Real	Monroe St	-	$6,500	$180,000	Yes
Flora Vista Ave	Class III Bicycle Boulevard		Benton St	Granada Ave	0.29	$21,000	$40,000	-
Forbes Ave	Class III Bicycle Boulevard		Harvard Ave	Los Padres Blvd	1.84	$138,000	$258,000	Yes
Forbes Ave at Kiely Blvd	Bike Detection	Update bicycle detection on west leg of intersection. Spot Improvement #30	Forbes Ave	Kiely Blvd	-	1500	$30,000	-
Forest Ave	Class III Bicycle Boulevard		Parkway Park	City limit	0.48	$36,000	$68,000	-
Fremont Park	Bicycle Parking		-	-	-	$800	-	-
Fuller Street Park	Bicycle Parking		-	-	-	$800	-	-
Future	Class I Shared-Use Path	To be finalized as part of the City Place project			0.44	$305,000	$436,000	-
Future	Class II Bicycle Lane	To be finalized as part of the City Place project			0.79	$63,000	$335,000	-
Future	Class II Bicycle Lane	To be finalized as part of the City Place project			0.40	$32,000	$170,000	-
Future	Class I Shared-Use Path	To be finalized as part of the City Place project			0.47	$326,000	$466,000	-
Future	Class II Bicycle Lane	To be finalized as part of the City Place project			0.45	$36,000	$189,000	-
Future	Class II Bicycle Lane	To be finalized as part of the City Place project			0.85	$68,000	$359,000	-
Garrity Way	Class III Bicycle Boulevard		Agnew Rd	Lick Mill Blvd	0.34	$26,000	$48,000	-
Granada Ave	Class III Bicycle Boulevard		Flora Vista Ave	Pomeroy Ave	0.36	$27,000	$51,000	-

Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High	Priority Project
Great America Pkwy at Mission College Blvd	Install intersection crossing markings	Spot Improvement #6	Great America Pkwy	Mission College Blvd	-	$5,000	-	-
Haman Elementary School	Bicycle Parking		-	-	-	$800	-	-
Harvard Ave, Bing Dr/ Princeton Way	Class III Bicycle Boulevard		Homestead Rd	Pruneridge Ave	0.55	$41,000	$77,000	Yes
Henry Schmidt Park	Bicycle Parking		-	-	-	$800	-	-
Hetch Hetchy Trail	Class I Shared-Use Path	Project being analyzed separately under the Creek Trail Master Plan project	Calabazas Creek	Guadalupe River	1.76	$1,229,000	$1,755,000	-
Hetch-Hetchy Trail and Calabazas Creek Trail	Connect future Hetch-Hetchy Trail over the creek to the other side	Project being analyzed separately under the Creek Trail Master Plan project. Spot Improvement #5	Calabazas Creek Trail	Future Hetch-Hetchy Trail	-			-
Home Depot	Bicycle Parking		-	-	-	$800	-	-
Homestead Rd	Class II Bicycle Lane		Scott Blvd	Viader Ct	0.23	$18,000	$98,000	Yes
Homestead Rd at Lawrence Expy	Intersection Improvements	Short Term: bike lane markings through intersection. Coordinate with VTA. Spot Improvement #28	Homestead Rd	Lawrence Expy	-	$1,500	$30,000	Yes
Homestead Rd at Lawrence Expy	Intersection Improvements	Long Term: Protected Intersection. Coordinate with VTA. Spot Improvement #28	Homestead Rd	Lawrence Expy	-	$750,000	$1,500,000	Yes
Homestead Road at San Tomas Expy	Intersection Improvements	Short Term: bike lane markings through intersection. Spot Improvement #26	Homestead Rd	San Tomas Expy	-	$5,000	$1,500,000	Yes
Homestead Road at San Tomas Expy	Intersection Improvements	Long Term: Protected Intersection. Spot Improvement #28	Homestead Rd	San Tomas Expy	-			

Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High	Priority Project
Hope St	Class IV Separated Bikeway		Lafayette St	Lick Mill Blvd	0.52	$130,000	$182,000	-
Jefferson St	Class III Bicycle Boulevard		Homestead Rd	Bellomy St	0.29	$22,000	$40,000	-
Juliette Lane and Mission College Blvd	Protected Intersection	Spot Improvement #8	Juliette Lane	Mission College Blvd	-	$750,000	$1,500,000	-
Julliette Lane	Class II Bicycle Lane	Install buffered lanes where space is available	Mission College Blvd	Montague Expy	0.45	$36,000	$192,000	-
Kathryn Hughes Elementary School	Bicycle Parking		-	-	-	$800	-	-
Kiely Blvd	Class IIB Buffered Bicycle Lane		Pruneridge Ave	Stevens Creek Blvd	0.48	$63,000	$204,000	-
Kifer Rd/ Walsh Ave	Class IV Separated Bikeway		City Limit	Lafayette St	2.66	$665,000	$931,000	Yes
Kona Kai Swim and Raquet Club	Bicycle Parking		-	-	-	$800	-	-
Lafayette St	Class IV Separated Bikeway		Laurelwood Rd	Reed St	1.42	$355,000	$497,000	Yes
Lafayette St	Class IV Separated Bikeway		SR 237	Agnew Rd	1.73	$431,000	$604,000	Yes
Lafayette St	Class I Shared-Use Path		Warburton Ave	Reed St	0.13	$90,000	$129,000	-
Lafayette St at Fairway Glen Dr	Intersection Improvements	On west side, square up area surrounding manholes and add ramps on either end to allow bikes to ride over covers and keep bike facility continuous. Spot Improvement #4	Lafayette St	Fairway Glen Dr	-			-
Laurelwood Elementary School	Bicycle Parking		-	-	-	$800	-	-
Laurelwood Rd	Class II Bicycle Lane		Thomas Rd	Bassett St	0.51	$41,000	$217,000	Yes
Lehigh Dr	Class III Bicycle Route		Lawerence Expy	Harvard Ave	0.07	$2,000	-	-

Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High	Priority Project
Lick Mill Blvd	Class IV Separated Bikeway		Tasman Dr	Montague Expy	1.43	$358,000	$501,000	Yes
Lick Mill Park	Bicycle Parking		-	-	-	$800	-	-
Lincoln St	Class II Bicycle Lane		Warburton Ave	El Camino Real	0.25	$20,000	$104,000	Yes
Lincoln St	Class III Bicycle Boulevard		El Camino Real	Homestead Rd	0.44	$33,000	$61,000	Yes
Live Oak Park	Bicycle Parking		-	-	-	$800	-	-
Los Padres Blvd at El Camino Real	Intersection Improvements	Install detection marker, install intersection crossing markings, consider bicycle-adaptive timing across El Camino Real. Spot Improvement #20	Los Padres Blvd	El Camino Real	-	$6,500	$180,000	-
Manchester Dr	Class III Bicycle Boulevard		Monroe St	Washington St	0.21	$16,000	$29,000	Yes
Market St	Class III Bicycle Route		Monroe St	Park Ave	0.46	$12,000	-	-
Market St at Winchester Blvd	Bike Detection	Spot Improvement #25	Market St	Winchester Blvd	-	1500	$30,000	-
Marsalli Park	Bicycle Parking		-	-	-	$800	-	-
Martin Ave	Class IIB Buffered Bicycle Lane		De La Cruz	Brokaw Rd	0.74	$96,000	$312,000	-
Martin Ave	Class IV Separated Bikeway		Lafayette St	De La Cruz Blvd	0.48	$120,000	$168,000	-
Mary Gomez Park	Bicycle Parking		-	-	-	$800	-	-
Mauricia Ave, Keystone Ave, Buckingham Dr	Class III Bicycle Boulevard		Cronin Dr	Saratoga Ave	1.11	$83,000	$155,000	-
Maywood Park	Bicycle Parking	More Bicycle Parking	-	-	-	$800	-	-
Mercado Center	Bicycle Parking		-	-	-	$800	-	-
Millikin Basics Elementary School	Bicycle Parking		-	-	-	$800	-	-

Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High	Priority Project
Mission City Center for the Performing Arts	Bicycle Parking		-	-	-	$800	-	-
Mission College Blvd	Class II Bicycle Lane		Great America Pkwy	Marriott Entrance	0.15	$12,000	$64,000	Yes
Mission College Blvd	Class IV Separated Bikeway		Bowers Ave	Montague Expy	0.87	$218,000	$306,000	Yes
Mission College Blvd	Class IV Separated Bikeway		Mission College Blvd	Great America Pkwy	0.95	$237,000	$332,000	-
Mission Library	Bicycle Parking		-	-	-	$800	-	-
Monroe St	Class IIB Buffered Bicycle Lane		Lawrence Expy	San Tomas Aquino Creek Trail	1.62	$211,000	$685,000	Yes
Monroe St	Class II Bicycle Lane		Civic Center Dr	Lewis St	0.14	$11,000	$58,000	Yes
Monroe St at San Tomas Aquino Creek Trail	Intersection Improvements	Redesign striping across Monroe St to better signal to drivers where to stop at red light. Spot Improvement #16	Monroe St	San Tomas Aquino Creek Trail	-	$6,500	$35,000	Yes
Montague Elementary School	Bicycle Parking		-	-	-	$800	-	-
Montague Park	Bicycle Parking		-	-	-	$800	-	-
Moreland Way at Lick Mill Blvd	Bike Detection	Update bicycle detection on west leg of intersection. Spot Improvement #9	Moreland Way	Lick Mill Blvd	-	1500	$30,000	-
Off the Wall Soccer	Bicycle Parking		-	-	-	$800	-	-
Parkway Park	Bicycle Parking		-	-	-	$800	-	-
Patrick Henry Dr/Old Ironsides Dr	Class IV Separated Bikeway		Tasman Dr	Tasman Dr	1.30	$324,000	$454,000	Yes
Poinciana Dr	Class III Bicycle Route		City limit	White Oak Ln/Klamath Ave	0.26	$6,000	-	-

Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High	Priority Project
Pomeroy Ave at Homestead Rd	Intersection Improvements	Short-term: bike lane markings through intersection. Spot Improvement #27	Homestead Rd	Pomeroy Ave	-	$6,500	$35,000	-
Pomeroy Ave at Homestead Rd	Intersection Improvements	Long-term: study protected intersection. Spot Improvement #27	Homestead Rd	Pomeroy Ave	-	$750,000	$1,500,000	
Pomeroy Elementary School	Bicycle Parking		-	-	-	$800	-	-
Pruneridge Ave	Class IIB Buffered Bicycle Lane		Winchester Blvd	City Limit/ Meadow Ave	3.03	$393,000	$1,280,000	Yes
Pruneridge Ave at Kiely Blvd	Intersection Improvements	Bike detection, red curbs/no parking signage near corners. Spot Improvement #31	Pruneridge Ave	Kiely Blvd	-	$6,500	$35,000	-
Pruneridge Ave at Lawrence Expy	Protected Intersection	Coordinate with VTA. Spot Improvement #29	Pruneridge Ave	Lawrence Expy	-	$750,000	$1,500,000	Yes
San Tomas Aquino Creek Trail	Class I Shared-Use Path		Homestead Rd	Stevens Creek Blvd	1.26	$880,000	$1,257,000	-
San Tomas Aquino Creek Trail at Agnew Rd	Intersection Improvements	Reconfigure intersection. Spot Improvement #7	San Tomas Aquino Creek Trail	Agnew Rd	-			Yes
San Tomas Expy and Saratoga Ave	Improve access to overcrossing	Spot Improvement #32	San Tomas Expressway	Saratoga Ave	-			-
San Tomas Expy at Monroe St	Intersection Improvements	Consistent with VTA Bike Plan. Spot Improvement #17	San Tomas Expy	Monroe St	-	$6,500	$35,000	Yes
San Tomas Expy at Walsh Ave	Protected Intersection	Consistent with VTA Bike Plan. Spot Improvement #15	San Tomas Expy	Walsh Ave	-	$750,000	$1,500,000	Yes
Santa Clara High School	Bicycle Parking		-	-	-	$800	-	-
Santa Clara Skate Park	Bicycle Parking		-	-	-	$800	-	-
Santa Clara St	Class III Bicycle Boulevard		Winchester Blvd	Lafayette St	0.62	$47,000	$87,000	-

Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High	Priority Project
Saratoga Ave	Class IIB Buffered Bicycle Lane		Stevens Creek Blvd	Market St/ Bellomy St	1.42	$185,000	$600,000	Yes
Saratoga Ave/Market St	Class II Bicycle Lane		Bellomy St	Winchester Blvd	0.27	$21,000	$113,000	-
Saratoga Creek Trail	Class I Shared-Use Path	Project being analyzed separately under the Creek Trail Master Plan project	Central Park	Forbes Ave	0.58	$407,000	$581,000	Yes
Saratoga Creek Trail	Class I Shared-Use Path	Project being analyzed separately under the Creek Trail Master Plan project	Central Park/ Benton St	Cabrillo Ave	1.41	$988,000	$1,411,000	Yes
Scott Blvd	Class II Bicycle Lane		Monroe St	Saratoga Ave	1.55	$124,000	$658,000	Yes
Scott Blvd	Class IIB Buffered Bicycle Lane		City Limit	Monroe St	2.59	$336,000	$1,094,000	Yes
Scott Lane Elementary School	Bicycle Parking		-	-	-	$800	-	-
Tasman Dr at Great America Pkwy	Bike Detection	All legs. Spot Improvement #3	Tasman Dr	Great America Pkwy	-	1500	$30,000	-
Tasman Drive and Old Ironsides Drive	Intersection Improvements	Tighten turning radii on northeast corner. Spot Improvement #2	Tasman Drive	Old Ironsides Drive	-	$35,000	$150,000	-
Thamien Park	Bicycle Parking		-	-	-	$800	-	-
The Alameda	Class III Bicycle Route		Benton St	Franklin St	0.07	$2,000	-	-
Thomas Rd	Class II Bicycle Lane		Montague Expy	Laurelwood Rd	0.46	$37,000	$193,000	-
Triton Museum	Bicycle Parking		-	-	-	$800	-	-
Ulistac Natural Area 1	Bicycle Parking		-	-	-	$800	-	-
Ulistac Natural Area 2	Bicycle Parking		-	-	-	$800	-	-

Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High	Priority Project
US 101 and Great America Parkway	Improve bike access through interchange	Work with Caltrans to improve bike access through interchange as part of Great America Parkway Class IV project. Spot Improvement #10	US 101	Great America Parkway	-			-
Warburton Ave	Class III Bicycle Boulevard		Lawrence Rd	Laine Ave	1.48	$111,000	$207,000	Yes
Warburton Ave	Class II Bicycle Lane		Scott Blvd	130 ft west of Fillmore St	0.34	$27,000	$144,000	-
Warburton Ave	Class III Bicycle Boulevard		Graham Ln	Scott Blvd	0.47	$35,000	$65,000	-
Warburton Swim Center	Bicycle Parking		-	-	-	$800	-	-
Warbuton Ave	Class III Bicycle Boulevard		130 ft west of Fillmore St	Warburton Ave	0.38	$29,000	$53,000	-
Washington Elementary School	Bicycle Parking		-	-	-	$800	-	-
Washington Park	Bicycle Parking		-	-	-	$800	-	-
Washington St at Manchester Dr/Camino Dr	Upgrade crossing for bicycle boulevard	Spot Improvement #24	Lafayette St	Manchester Dr/Camino Dr	-			-
Washington St at Market St	Bike Detection	Spot Improvement #23	Lafayette St	Market St	-	1500	$30,000	-
Westwood Oaks Park	Bicycle Parking		-	-	-	$800	-	-
Wilcox High School	Bicycle Parking		-	-	-	$800	-	-
Wilson High School	Bicycle Parking		-	-	-	$800	-	-
Tasman Dr at Great America Pkwy	Bike Detection	All legs. Spot Improvement #3	Tasman Dr	Great America Pkwy	-	1500	$30,000	-
Tasman Drive and Old Ironsides Drive	Intersection Improvements	Tighten turning radii on northeast corner. Spot Improvement #2	Tasman Drive	Old Ironsides Drive	-	$35,000	$150,000	-
Thamien Park	Bicycle Parking		-	-	-	$800	-	-

Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High	Priority Project
The Alameda	Class III Bicycle Route		Benton St	Franklin St	0.07	$2,000	-	-
Thomas Rd	Class II Bicycle Lane		Montague Expy	Laurelwood Rd	0.46	$37,000	$193,000	-
Triton Museum	Bicycle Parking		-	-	-	$800	-	-
Ulistac Natural Area 1	Bicycle Parking		-	-	-	$800	-	-
Ulistac Natural Area 2	Bicycle Parking		-	-	-	$800	-	-
US 101 and Great America Parkway	Improve bike access through interchange	Work with Caltrans to improve bike access through interchange as part of Great America Parkway Class IV project. Spot Improvement #10	US 101	Great America Parkway	-			-
Warburton Ave	Class III Bicycle Boulevard		Lawrence Rd	Laine Ave	1.48	$111,000	$207,000	Yes
Warburton Ave	Class II Bicycle Lane		Scott Blvd	130 ft west of Fillmore St	0.34	$27,000	$144,000	-
Warburton Ave	Class III Bicycle Boulevard		Graham Ln	Scott Blvd	0.47	$35,000	$65,000	-
Warburton Swim Center	Bicycle Parking		-	-	-	$800	-	-
Warbuton Ave	Class III Bicycle Boulevard		130 ft west of Fillmore St	Warburton Ave	0.38	$29,000	$53,000	-
Washington Elementary School	Bicycle Parking		-	-	-	$800	-	-
Washington Park	Bicycle Parking		-	-	-	$800	-	-
Washington St at Manchester Dr/Camino Dr	Upgrade crossing for bicycle boulevard	Spot Improvement #24	Lafayette St	Manchester Dr/Camino Dr	-			-
Washington St at Market St	Bike Detection	Spot Improvement #23	Lafayette St	Market St	-	1500	$30,000	-

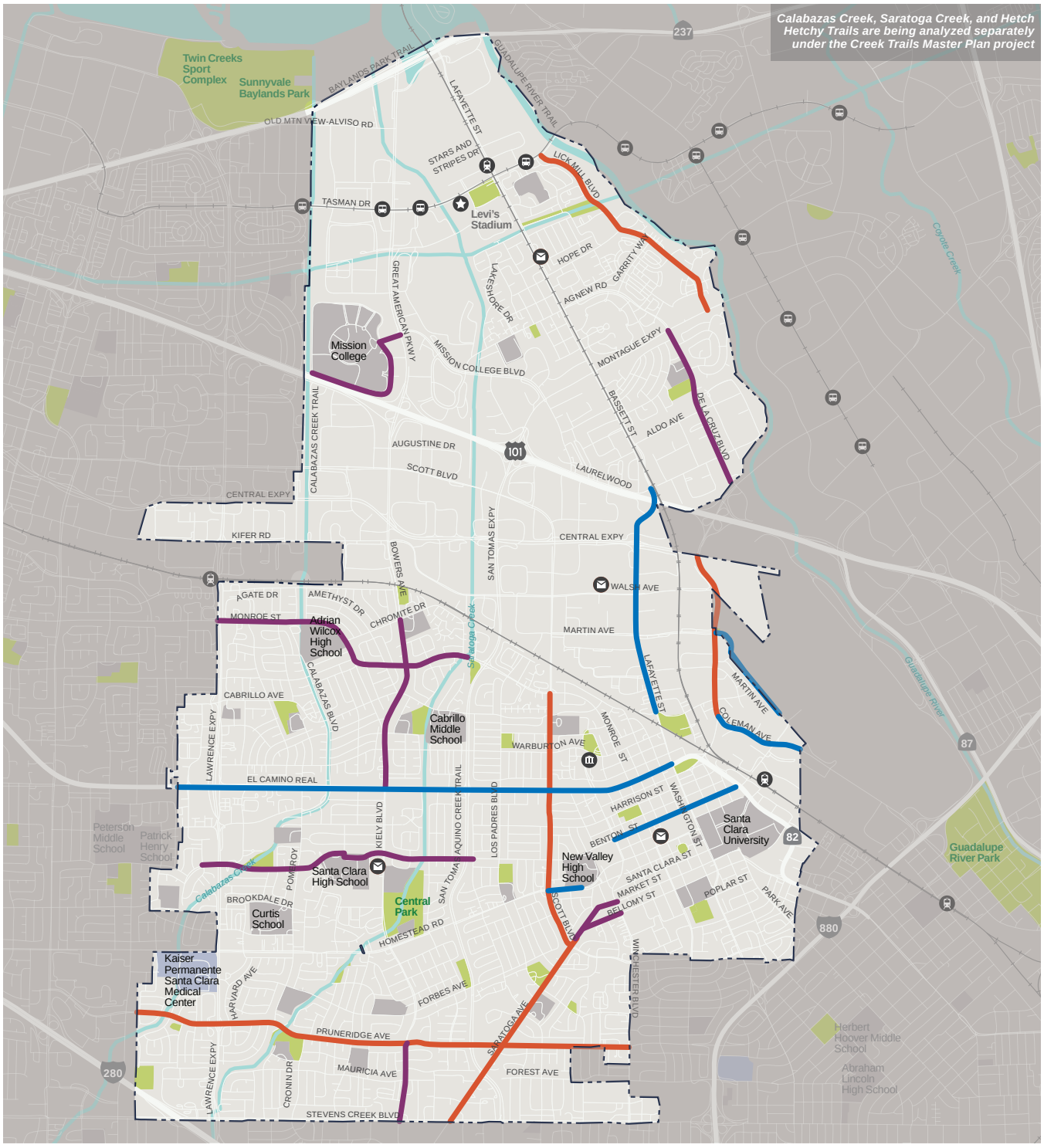
Name	Project	Notes	Start	End	Mileage	Cost Estimate - Low	Cost Estimate - High	Priority Project
Westwood Oaks Park	Bicycle Parking		-	-	-	$800	-	-
Wilcox High School	Bicycle Parking		-	-	-	$800	-	-
Wilson High School	Bicycle Parking		-	-	-	$800	-	-

APPENDIX D

Future Design Considerations

This appendix shows the roadways that may require parking removal, roadway reconfiguration, or further study to accommodate the project recommendation.

Figure D-1



Source: City of Santa Clara, Caltrans, US Census, ESRI, VTA. Map produced March 2018

Future Design Considerations

Santa Clara Bicycle Plan Update 2018

N

0 0.5 1 MILES

Roadway Needs for Bicycle Recommendations

- Remove Parking
- Road Reconfiguration
- Study (Remove Parking or Road Reconfiguration)

***Further study is required to determine final options for bicycle facility accommodation

Destinations + Boundaries

- City Hall
- Train Station
- Light Rail Station
- USPS Office
- Sport Stadium
- School
- Hospital
- Park

APPENDIX E

Completed Projects

This appendix lists the projects that have been completed since the 2009 City of Santa Clara Bicycle Plan Update was adopted.

Added Bike Facility	Length (miles)	Extents
Lafayette Street Bike lanes	0.8	Calle De Luna - Highway 237
Tasman Drive Buffered Bike Lanes	1.5	Calabazas Creek - Guadalupe River
Stars & Stripes Drive Bike Lanes	0.5	Centential Boulevard - Southern end of VTA parking lot
Lakeside Drive Bike Lanes	0.1	Augustine Drive - Scott Boulevard
Scott Boulevard Bike Lanes	0.9	Central Expressway - Monroe Street
Monroe Street Bike lanes	0.5	San Tomas Aquino Creek Trail - Scott Boulevard
San Tomas Aquino Creek Trail - Spur Trail (adjacent to San Tomas Expressway)	1.3	Cabrillo Avenue - Homestead Road
Pruneridge Avenue Bike lanes	0.9	Tantau Avenue - Pomeroy Avenue
Chromite Drive Bike Route	0.3	Monroe Street - Bowers Avenue
Homestead Road Bike Lanes	0.1	White Drive - San Tomas Expressway
Park Avenue Bike Lanes	0.5	The Alameda - San Jose City Limits
Santa Clara Caltrain Station Railroad Underpass	0.1	Railroad Avenue - Brokaw Road

APPENDIX F

Bicycle-Related Collisions

This appendix lists the bicycle-related collisions in Santa Clara used as part of the analysis for this Plan.

Table begins on next page.

Bicycle-Related Collisions

Report #	Date	Time	Location	Dist.	Dir.	Type of Collision	Dir. Of Travel 1
13341	1/10/13	15:21	Monroe St & Lawrence Expy	133’	East	Other	East
13509	1/15/13	11:02	El Camino Real & Lafayette St	0’	In Int.	Broadside	
131633	2/15/13	8:23	Lafayette St & El Camino Real	0’	In Int.	Sideswipe	North
132010	2/26/13	7:33	Lafayette St & Agnew Rd	0’	In Int.	Broadside	West
132033	2/26/13	18:10	Benton St & Pomeroy Ave	123’	East	Broadside	East
132117	2/28/13	18:57	Winchester Blvd & Stevens Creek Blvd	120’	North	Other	North
132204	3/3/13	11:05	El Camino Real & Bowers Ave	30’	East	Vehicle - Pedestrian	West
132471	3/11/13	15:22	Brookdale Dr & Curtis Ave	0’	In Int.	Broadside	East
132536	3/13/13	9:20	Benton St & Blackfield Ct	0’	In Int.	Broadside	North
132846	3/21/13	18:10	Agnew Rd & Davis St (W)	0’	In Int.	Broadside	West
133426	4/6/13	13:14	Townsend Ave & Victoria Ave	0’	In Int.	Broadside	East
133710	4/14/13	15:37	Monroe St & Newhall St	200’	North	Sideswipe	North
134111	4/25/13	20:44	Central Expy & Bowers Ave	0’	In Int.	Broadside	East
134358	5/2/13	16:11	Monroe St & Scott Blvd	100’	East	Sideswipe	South
134428	5/4/13	13:05	El Camino Real & Buchanan Dr	3’	North	Other	North
134818	5/15/13	10:55	Scott Blvd & Cabrillo Ave	141’	South	Sideswipe	North
135127	5/23/13	10:09	The Alameda & Franklin St	100’	North	Broadside	North
135633	6/5/13	20:01	Homestead Rd & Las Palmas Dr	0’	In Int.	Other	West
135710	6/7/13	18:32	El Camino Real & Halford Ave	0’	In Int.	Broadside	West
136305	6/24/13	17:04	Warburton Ave & Shamrock Ave	0’	In Int.	Broadside	South
137008	7/13/13	9:22	Homestead Rd & Las Palmas Dr	144’	West	Broadside	West
137456	7/26/13	9:06	El Camino Real & Buchanan Dr	0’	In Int.	Broadside	West
137722	8/2/13	22:11	Lafayette St & Hogan Dr	0’	In Int.	Rear-End	South
137739	8/3/13	11:56	Civic Center Dr & Lincoln St	50’	East	Rear-End	East
138299	8/19/13	12:24	Highland Ave & Washington St	142’	West	Sideswipe	
138343	8/20/13	15:52	Pruneridge Ave & Saratoga Ave	179’	West	Rear-End	South
138448	8/23/13	20:49	Lafayette St & El Camino Real	0’	In Int.	Broadside	North
138516	8/26/13	7:34	Francis Ave & Machado	0’	In Int.	Broadside	North
138797	9/3/13	1:18	El Camino Real & Los Padres Blvd	219’	East	Broadside	West
139032	9/10/13	7:30	El Camino Real & Las Palmas Dr	0’	In Int.	Broadside	West
139144	9/13/13	12:43	El Camino Real & The Alameda	250’	North	Broadside	South
139862	10/2/13	7:53	Monroe St & Deborah Dr	0’	In Int.	Sideswipe	West
139887	10/2/13	17:42	Saratoga Ave & Keystone Ave	0’	In Int.	Broadside	South
1310001	10/5/13	12:30	Scott Blvd & El Camino Real	136’	North	Broadside	North
1310127	10/8/13	17:25	Homestead Rd & Layton St	0’	In Int.	Broadside	West
1310129	10/8/13	17:59	Homestead Rd & Layton St	151’	West	Broadside	West
1310423	10/16/13	11:57	Monroe St & Los Padres Blvd	0’	In Int.	Rear-End	West
1311064	11/1/13	21:56	El Camino Real & San Tomas Expy	218’	West	Broadside	East

Movement Prec. Coll. 1	Dir. Of Travel 2	Movement Prec. Coll. 2	Primary Cause	Inj.	Kill
Making Right Turn	East	Proceeding Straight	Improper Turning	1	0
Proceeding Straight	East	Proceeding Straight	Traffic Signals and Signs	0	0
Proceeding Straight	North	Proceeding Straight	Improper Turning	1	0
Proceeding Straight	West	Proceeding Straight	Auto R/W Violation	1	0
Backing	East	Proceeding Straight	Unknown	1	0
Making Right Turn	North	Proceeding Straight	Ped R/W Violation	1	0
Proceeding Straight	North	Proceeding Straight	Other Hazardous Movement	1	0
Passing Other Vehicle	East	Making Left Turn	Improper Passing	1	0
Making Right Turn			Unknown	0	0
Making Left Turn	West	Proceeding Straight	Improper Turning	0	0
Making Right Turn	South	Proceeding Straight	Traffic Signals and Signs	1	0
Parked	North	Proceeding Straight	Other Hazardous Movement	1	0
Proceeding Straight	South	Proceeding Straight	Other Hazardous Movement	1	0
Other Unsafe Turning	West	Slowing/Stopping	Auto R/W Violation	1	0
Making Right Turn	East	Proceeding Straight	Improper Turning	1	0
Changing Lanes	North	Proceeding Straight	Improper Turning	1	0
Making Left Turn	North	Proceeding Straight	Improper Turning	1	0
Making Left Turn	South	Proceeding Straight	Other Hazardous Movement	1	0
Proceeding Straight	South	Making Left Turn	Traffic Signals and Signs	1	0
Proceeding Straight	West	Proceeding Straight	Traffic Signals and Signs	1	0
Making Left Turn	East	Proceeding Straight	Auto R/W Violation	1	0
Proceeding Straight	North	Proceeding Straight	Unsafe Speed	1	0
Changing Lanes	South	Proceeding Straight	Unsafe Lane Change	1	0
Proceeding Straight	East	Proceeding Straight	Following Too Closely	1	0
Proceeding Straight	East	Parked	Unknown	0	0
Crossed Into Opposing Lane - Unplanned	East	Proceeding Straight	Auto R/W Violation	1	0
Entering Traffic	East	Proceeding Straight	Wrong Side of Road	0	0
Proceeding Straight	East	Proceeding Straight	Other Hazardous Movement	0	0
Traveling Wrong Way	North	Entering Traffic	Unknown	0	0
Proceeding Straight	North	Making Right Turn	Other Hazardous Movement	1	0
Proceeding Straight	West	Proceeding Straight	Unknown	1	0
Making Right Turn	West	Proceeding Straight	Improper Turning	1	0
Making Left Turn	East	Proceeding Straight	Unknown	1	0
Making Right Turn	North	Proceeding Straight	Improper Turning	1	0
Making Left Turn	East	Proceeding Straight	Unknown	1	0
Making Right Turn	North	Proceeding Straight	Unknown	1	0
Making Right Turn	West	Proceeding Straight	Unsafe Speed	1	0
Proceeding Straight	South	Stopped In Road	Wrong Side of Road	1	0

Bicycle-Related Collisions

Report #	Date	Time	Location	Dist.	Dir.	Type of Collision	Dir. Of Travel 1
1311091	11/2/13	11:50	Kiely Blvd & Malabar Ave	150’	South	Vehicle - Pedestrian	North
1311104	11/2/13	22:26	El Camino Real & Bowe Ave	593’	West	Broadside	East
1312505	12/14/13	17:14	El Camino Real & Halford Ave	80’	East	Broadside	East
1312701	12/19/13	17:20	Pruneridge Ave & Cronin Dr	42’	South	Broadside	North
1312909	12/26/13	18:40	Forbes Ave & Los Padres Blvd	0’	In Int.	Broadside	North
14591	1/16/14	8:15	Lick Mill Blvd & Tasman Dr	265’	South	Rear-End	South
14593	1/16/14	8:52	Stanley Ave & Newhall St	0’	In Int.	Broadside	South
141186	1/21/14	17:58	Central Expy Ramp & Bowers Ave	234’	West	Rear-End	West
14887	1/23/14	18:36	Aldo Ave & Woodward Ave	1200’	West	Broadside	East
141467	2/8/14	20:01	El Camino Real & Lawrence Expy	78’	West	Vehicle - Pedestrian	South
141599	2/12/14	8:58	Kifer Rd & Bowers Ave	138’	West	Broadside	South
141913	2/19/14	22:35	Homestead Rd & Quince Ave	55’	East	Sideswipe	East
142869	3/17/14	0:55	Mission College Blvd & Great America Pkwy	0’	In Int.	Head-On	North
143010	3/20/14	9:06	Benton St & San Tomas Expy	0’	In Int.	Broadside	West
143367	3/28/14	14:30	Monroe St & Pacific Dr	0’	In Int.	Broadside	West
143810	4/8/14	18:14	Walsh Ave & San Tomas Expy	295’	West	Sideswipe	West
143987	4/12/14	14:10	Homestead Rd & Las Palmas Dr	16’	West	Vehicle - Pedestrian	East
144327	4/21/14	7:31	Cabrillo Ave & Cabrillo Ct	0’	In Int.	Broadside	West
14-4715	4/30/14	5:47	Space Park Dr & Alfred St	0’	In Int.	Broadside	South
14-4719	4/30/14	9:24	Stevens Creek Blvd & Cabot Ave	361’	West	Sideswipe	West
144748	4/30/14	17:00	Monroe St & Market St	0’	In Int.	Broadside	West
135156	5/10/14	15:20	Cornell Dr & Homestead Rd	0’	In Int.	Broadside	West
14-5255	5/13/14	14:39	Lawrence Expy & Monroe St	0’	In Int.	Broadside	West
14-5788	5/27/14	7:57	Lewis St & Monroe St	0’	In Int.	Broadside	West
14-6608	6/17/14	12:00	Scott Blvd & Warburton Ave	0’	In Int.	Other	West
14-6657	6/18/14	13:18	El Camino Real & Flora Vista Ave	0’	In Int.	Broadside	West
14-7064	6/30/14	18:45	Tasman Dr & Calle Del Sol	20’	East	Broadside	East
147064	6/30/14	18:45	Tasman Dr & Calle Del Sol	20’	East	Broadside	East
147484	7/10/14	17:26	Agnew Rd & Lake Santa Clara Dr	576’	West	Broadside	East
147818	7/19/14	18:01	El Camino Real & Mccormick Dr	114’	West	Broadside	East
147982	7/23/14	18:56	El Camino Real & Buchanan Dr	0’	In Int.	Broadside	East
14-8289	7/31/14	13:19	1050 Kiely Blvd & Kiely Blvd	7’	West	Broadside	East
148420	8/4/14	15:28	El Camino Real & Morse Ln	0’	In Int.	Broadside	East
14-8523	8/6/14	18:05	Halford Ave. & Miramar Way	0’	In Int.	Broadside	North
148576	8/7/14	20:02	Alviso St & Harrison St	0’	In Int.	Broadside	East
14-10155	9/19/14	6:41	Monroe St & Machado Ave	0’	In Int.	Head-On	North

Movement Prec. Coll. 1	Dir. Of Travel 2	Movement Prec. Coll. 2	Primary Cause	Inj.	Kill
Proceeding Straight	South	Proceeding Straight	Other Hazardous Movement	1	0
Traveling Wrong Way	West	Entering Traffic	Other Hazardous Movement	1	0
Making Right Turn	East	Proceeding Straight	Improper Turning	1	0
Entering Traffic	East	Proceeding Straight	Auto R/W Violation	1	0
Proceeding Straight	West	Proceeding Straight	Unknown	1	0
Making Right Turn	West	Proceeding Straight	Improper Turning	1	0
Proceeding Straight	South	Slowing/Stopping	Unknown	0	0
Proceeding Straight	West	Merging	Unsafe Lane Change	1	0
Making Left Turn	West	Proceeding Straight	Driving Under Influence	1	0
Other	East	Proceeding Straight	Pedestrian Violation	2	0
Making Left Turn	East	Proceeding Straight	Auto R/W Violation	1	0
Traveling Wrong Way	West	Proceeding Straight	Other Hazardous Movement	1	0
Proceeding Straight	West	Proceeding Straight	Unknown	1	0
Proceeding Straight	East	Making Right Turn	Wrong Side of Road	1	0
Proceeding Straight	East	Making Right Turn	Wrong Side of Road	1	0
Proceeding Straight	North	Entering Traffic	Wrong Side of Road	1	0
Proceeding Straight	South	Proceeding Straight	Traffic Signals and Signs	1	0
Proceeding Straight	North	Making Right Turn	Other Hazardous Movement	1	0
Making Left Turn	N/E	Making Left Turn	Auto R/W Violation	1	0
Making Right Turn	West	Proceeding Straight	Improper Turning	1	0
Making Left Turn	South	Proceeding Straight	Auto R/W Violation	1	0
Traveling Wrong Way	North	Proceeding Straight	Unknown	1	0
Proceeding Straight	North	Making Right Turn	Wrong Side of Road	1	0
Proceeding Straight	North	Proceeding Straight	Traffic Signals and Signs	1	0
Making Right Turn	South	Traveling Wrong Way	Improper Turning	1	0
Making Left Turn	West	Proceeding Straight	Improper Turning	1	0
Proceeding Straight	South	Stopped In Road	Traffic Signals and Signs	1	0
Proceeding Straight	South	Stopped In Road	Traffic Signals and Signs	1	0
Proceeding Straight	North	Proceeding Straight	Traffic Signals and Signs	1	0
Proceeding Straight	South	Proceeding Straight	Other Hazardous Movement	1	0
Proceeding Straight	North	Proceeding Straight	Ped R/W Violation	1	0
Proceeding Straight	North	Proceeding Straight	Unknown	1	0
Proceeding Straight	South	Proceeding Straight	Ped R/W Violation	1	0
Making Left Turn	South	Proceeding Straight	Auto R/W Violation	1	0
Proceeding Straight	North	Proceeding Straight	Traffic Signals and Signs	1	0
Proceeding Straight	South	Proceeding Straight	Wrong Side of Road	1	0

Report #	Date	Time	Location	Dist.	Dir.	Type of Collision	Dir. Of Travel 1
1411559	10/21/14	14:14	Stevens Creek Blvd & San Tomas Expy	0’	In Int.	Broadside	East
1411572	10/21/14	19:20	El Camino Real & Alpine Ave	0’	In Int.	Not Stated	West
14-12187	11/4/14	16:43	Tasman Dr & Calle Del Sol	435’	West	Rear-End	West
1412524	11/13/14	17:24	Halford Ave & El Camino Real	0’	In Int.	Broadside	South
14-12711	11/18/14	17:42	Winchester Blvd & Stevens Creek Blvd	100’	North	Broadside	
14-13042	11/26/14	11:38	Los Padres Blvd & Bray Ave	0’	In Int.	Broadside	East
1413559	12/9/14	17:28	Benton Ct & Live Oak Dr	0’	In Int.	Broadside	North
14-13823	12/17/14	12:30	Pomeroy Ave & Homestead Rd	0’	In Int.	Broadside	West
14-13834	12/17/14	17:40	Central Expy & San Tomas Expy	486’	West	Rear-End	
14-13998	12/20/14	23:54	Monroe St & Scott Blvd	120’	East	Broadside	South
151024	1/25/15	11:24	Los Padres Blvd & El Camino Real	0’	In Int.	Not Stated	West
15-1204	1/29/15	8:10	Great America Pkwy & Tasman Dr	0’	In Int.	Broadside	South
151293	1/30/15	22:24	Homestead Rd & Woodhams Rd	350’	West	Sideswipe	
15-1564	2/6/15	12:00	Scott Blvd & Cabrillo Ave	0’	In Int.	Broadside	West
15-2253	2/23/15	7:15	Maryann Dr & Benton St	15’	South	Broadside	West
15-2335	2/24/15	16:53	El Camino Real & San Tomas Expy	0’	In Int.	Head-On	North
15-2616	3/3/15	16:52	3305 El Camino Real & Pomeroy Av	100’	West	Broadside	East
15-2877	3/9/15	17:06	In The Parking Lot Of 4701 Great America Parkway &	0’	In Int.	Broadside	South
15-3891	4/3/15	17:44	Monroe St & Warburton Ave	0’	In Int.	Broadside	South
15-4316	4/13/15	15:30	Lafayette St & Mathew St	43’	North	Broadside	West
15-4317	4/13/15	16:34	Lafayette St & Central Expy	462’	South	Broadside	South
15-4368	4/14/15	18:02	Homestead Rd & Kiely Blvd	100’	West	Broadside	South
15-4399	4/15/15	17:37	2760 Homestead Rd & Kiely Bl	100’	East	Broadside	West
15-5082	4/30/15	16:41	Stevens Creek Blvd & Rosewood Ave	0’	In Int.	Sideswipe	West
15-5907	5/20/15	15:31	Pomeroy Ave & El Camino Real	225’	South	Broadside	West
15-6177	5/27/15	13:36	Benton St & Pomeroy Ave	0’	In Int.	Broadside	East
15-6380	6/1/15	9:07	El Camino Real Sr-82 & Lafayette	100’	West	Broadside	East
15-6381	6/1/15	9:10	Homestead Rd & Lawrence Expy	233’	East	Sideswipe	West
15-6897	6/12/15	17:14	Harrison St & Main St	0’	In Int.	Broadside	South
157185	6/20/15	7:05	Lafayette St & Montague Expy Ne To Lafayette Ramp	0’	In Int.	Sideswipe	North
15-7309	6/23/15	19:08	Hope Dr & Lick Mill Blvd	330’	West	Hit Object	East
15-7322	6/24/15	8:07	Market St & Alviso St	0’	In Int.		East
15-7355	6/24/15	19:25	4450 Bassett St & South Curbline Of 3rd St	195’	South		North
15-9100	8/4/15	9:05	Tasman Dr & Lick Mill Blvd	0’	In Int.	Broadside	West
15-9387	8/11/15	17:35	Market St & Main St	83’	West	Sideswipe	West
15-9391	8/11/15	18:50	Bowers Ave & Cabrillo Ave	0’	In Int.	Broadside	West

Movement Prec. Coll. 1	Dir. Of Travel 2	Movement Prec. Coll. 2	Primary Cause	Inj.	Kill
Proceeding Straight	South	Making Left Turn	Wrong Side of Road	0	0
Making Left Turn		Proceeding Straight	Auto R/W Violation	1	0
Proceeding Straight	West	Proceeding Straight	Unsafe Speed	1	0
Proceeding Straight	East	Proceeding Straight	Traffic Signals and Signs	0	0
Entering Traffic	South	Proceeding Straight	Unknown	0	0
Proceeding Straight	North	Proceeding Straight	Auto R/W Violation	1	0
Making Left Turn	East	Proceeding Straight	Unknown	0	0
Making Left Turn	South	Proceeding Straight	Auto R/W Violation	1	0
Proceeding Straight	West	Proceeding Straight	Unknown	1	0
Making Left Turn	East	Proceeding Straight	Auto R/W Violation	1	0
Traveling Wrong Way	South	Proceeding Straight	Pedestrian Violation	1	0
Proceeding Straight	East	Proceeding Straight	Wrong Side of Road	1	0
Proceeding Straight	West	Parked	Improper Turning	0	0
Making Left Turn	South	Proceeding Straight	Auto R/W Violation	1	0
Proceeding Straight	South	Making Left Turn	Improper Turning	1	0
Proceeding Straight	South	Proceeding Straight	Unknown	1	0
Traveling Wrong Way	South	Entering Traffic	Unknown	1	0
Proceeding Straight	West	Proceeding Straight	Unknown	1	0
Making Right Turn	South	Proceeding Straight	Improper Turning	1	0
Making Left Turn	North	Proceeding Straight	Improper Turning	1	0
Proceeding Straight	West	Entering Traffic	Other Hazardous Movement	1	0
Making Left Turn	East	Proceeding Straight	Auto R/W Violation	1	0
Proceeding Straight	South	Entering Traffic	Other Hazardous Movement	1	0
Parked	West	Proceeding Straight	Other Hazardous Movement	1	0
Making Left Turn	North	Proceeding Straight	Improper Turning	1	0
Making Right Turn	East	Proceeding Straight	Improper Turning	1	0
Proceeding Straight	South	Making Right Turn	Wrong Side of Road	1	0
Making Right Turn	West	Proceeding Straight	Auto R/W Violation	1	0
Proceeding Straight	East	Proceeding Straight	Traffic Signals and Signs	1	0
Making Right Turn	North	Proceeding Straight	Improper Turning	1	0
Parked	East	Proceeding Straight	Other Hazardous Movement	1	0
Entering Traffic	East	Proceeding Straight	Unsafe Starting or Backing	1	0
Making Left Turn	South	Proceeding Straight	Auto R/W Violation	1	0
Proceeding Straight	South	Proceeding Straight	Traffic Signals and Signs	1	0
Parked	West	Proceeding Straight	Other Hazardous Movement	1	0
Making Left Turn	East	Proceeding Straight	Unknown	1	0

Report #	Date	Time	Location	Dist.	Dir.	Type of Collision	Dir. Of Travel 1
159776	8/21/15	13:50	Cabrillo Ave & Fordham Dr	200’	West	Other	
15-9962	8/25/15	17:11	Poinciana Dr & White Oak Ln	83’	West	Broadside	East
15-10198	8/31/15	14:27	Bowers Ave & El Camino Real	157’	North	Hit Object	South
15-10230	9/1/15	12:02	Brookdale Dr & Curtis Ave	0’	In Int.	Broadside	NORTH
15-10568	9/9/15	17:10	Calabazas Blvd & Warburton Ave	0’	In Int.	Broadside	West
15-10566	9/10/15	15:31	Kiely Blvd & Homestead Rd	150’	North	Sideswipe	East
15-10572	9/10/15	18:04	Kiely Blvd & Fresno St	0’	In Int.	Broadside	North
15-10574	9/10/15	18:58	Benton St & Carmel Way	0’	In Int.	Sideswipe	East
15-10592	9/11/15	7:52	Cabrillo Ave & Larsen Pl	0’	In Int.	Broadside	South
15-10650	9/12/15	12:21	2655 Homestead Rd & Kiely Blvd	200’	East	Broadside	East
15-10708	9/14/15	9:08	Aldo Ave & Lafayette St	10’	East	Broadside	West
15-10992	9/21/15	8:06	Cabrillo Ave & Townsend Ave	0’	In Int.	Broadside	West
15-11034	9/22/15	7:45	Lafayette St & Laurie Ave	0’	In Int.	Broadside	East
15-11141	9/24/15	17:49	Monroe St & Meadowbrook Dr	5’	West	Broadside	South
1511314	9/28/15	18:16	Princeton Way & Purdue Ct	0’	In Int.	Broadside	South
15-11330	9/29/15	7:07	Lafayette St & Duane Ave	0’	In Int.	Head-On	South
1511616	10/6/15	11:42	Homestead Rd & Las Palmas Dr	0’	In Int.	Broadside	East
15-11910	10/13/15	17:30	Kifer Rd & Uranium Rd	0’	In Int.	Broadside	SOUTH
15-12149	10/19/15	16:48	Locust St & Park Ave	0’	In Int.	Broadside	East
15-12206	10/21/15	10:04	Scott Blvd & Garrett Dr	450’	East	Broadside	West
15-12312	10/23/15	17:41	Lafayette St & Laurelwood Rd	0’	In Int.	Broadside	North
15-12426	10/26/15	19:14	Scott Blvd & De La Pena Ave	0’	In Int.	Broadside	East
15-12450	10/27/15	18:45	Lochinvar Ave & Pomeroy Ave	400’	West	Broadside	North
15-12550	10/30/15	15:32	El Camino Real & Scott Blvd	0’	In Int.	Broadside	West
15-12791	11/6/15	10:25	Carriage Dr & Newhall St	4’	South	Broadside	West
15-13074	11/13/15	19:04	Homestead Rd & Jackson St	0’	In Int.	Broadside	East
15-013074	11/13/15	19:04	Homestead Rd & Jackson St	0’	In Int.	Broadside	East
15-13208	11/17/15	17:22	El Camino Real & Flora Vista Ave	0’	In Int.	Broadside	East
15-13268	11/19/15	17:58	Tasman Dr & Great America Pkwy	0’	In Int.	Broadside	South
15-13409	11/23/15	18:38	Mission College Blvd & Freedom Cir (W)	177’	East	Broadside	North
15-13466	11/25/15	12:40	Market St & Alviso St	0’	In Int.	Broadside	East
15-13906	12/8/15	7:05	El Camino Real & Lincoln St	0’	In Int.	Broadside	North
15-13958	12/9/15	15:00	Tasman Dr & Convention Center	0’	In Int.	Broadside	West
15-14180	12/16/15	7:54	Monroe St & Chromite Dr	0’	In Int.	Broadside	South
15-007842	12/16/15	13:00	Charleston Rd & Alta Ave	0’	In Int.	Broadside	South
16-975	1/28/16	6:47	Agnew Rd & Lakeshore Dr	512’	West	Broadside	South
16-1266	2/5/16	8:04	Scott Bl & Hillebrandt Pl	0’	In Int.	Other	South
16-001057	2/19/16	19:10	El Camino Real & Escuela Avenue	24’	West	Broadside	West
16-1853	2/22/16	15:25	Market St & Washington St	0’	In Int.	Broadside	South

Bicycle-Related Collisions

Movement Prec. Coll. 1	Dir. Of Travel 2	Movement Prec. Coll. 2	Primary Cause	Inj.	Kill
Parked	East	Proceeding Straight	Other Hazardous Movement	0	0
Making Left Turn	East	Proceeding Straight	Improper Turning	1	0
Proceeding Straight	West	Entering Traffic	Wrong Side of Road	1	0
Making Left Turn	EAST	Making Left Turn	Auto R/W Violation	1	0
Making Left Turn	South	Proceeding Straight	Auto R/W Violation	1	0
Traveling Wrong Way	South	Proceeding Straight	Wrong Side of Road	1	0
Proceeding Straight	East	Making Right Turn	Unknown	1	0
Making Right Turn	East	Passing Other Vehicle	Improper Turning	1	0
Making Left Turn	East	Proceeding Straight	Auto R/W Violation	1	0
Other	North	Making Right Turn	Wrong Side of Road	1	0
Making Right Turn	West	Stopped In Road	Improper Turning	0	0
Proceeding Straight	North	Making Right Turn	Wrong Side of Road	1	0
Proceeding Straight	South	Proceeding Straight	Unknown	1	0
Proceeding Straight	East	Proceeding Straight	Other Hazardous Movement	1	0
Making Left Turn	East	Proceeding Straight	Auto R/W Violation	0	0
Proceeding Straight	North	Making Right Turn	Other Hazardous Movement	1	0
Traveling Wrong Way	South	Making Right Turn	Wrong Side of Road	1	0
Making Left Turn	EAST	Proceeding Straight	Auto R/W Violation	1	0
Making Left Turn	South	Proceeding Straight	Auto R/W Violation	1	0
Making Right Turn	West	Proceeding Straight	Improper Turning	1	0
Stopped In Road	East	Proceeding Straight	Traffic Signals and Signs	1	0
Entering Traffic	South	Proceeding Straight	Auto R/W Violation	0	0
Making Left Turn	East	Proceeding Straight	Auto R/W Violation	1	0
Proceeding Straight	North	Proceeding Straight	Unknown	1	0
Proceeding Straight	North	Making Right Turn	Unknown	1	0
Making Left Turn	West	Proceeding Straight	Improper Turning	1	0
Making Left Turn	West	Proceeding Straight	Improper Turning	1	0
Making Left Turn	South	Making Left Turn	Improper Turning	1	0
Making Left Turn	East	Proceeding Straight	Impeding Traffic	1	0
Entering Traffic	East	Proceeding Straight	Auto R/W Violation	1	0
Proceeding Straight	South	Making Right Turn	Unsafe Speed	1	0
Making Right Turn	East	Proceeding Straight	Traffic Signals and Signs	1	0
Proceeding Straight	North	Proceeding Straight	Unknown	1	0
Making Left Turn	North	Proceeding Straight	Auto R/W Violation	1	0
Proceeding Straight	East	Proceeding Straight	Traffic Signals and Signs	1	0
Proceeding Straight	West	Proceeding Straight	Auto R/W Violation	1	0
Traveling Wrong Way	West	Slowing / Stopping	Wrong Side of Road	1	0
Proceeding Straight	North	Making Left Turn	Wrong Side of Road	0	0
Making Right Turn	East	Proceeding Straight	Improper Turning	1	0

Bicycle-Related Collisions

Report #	Date	Time	Location	Dist.	Dir.	Type of Collision	Dir. Of Travel 1
16-2100	3/1/16	9:16	Barkley Ave & Larsen Pl	0’	In Int.	Broadside	East
16-2190	3/3/16	15:02	El Camino Real & Monroe St	0’	In Int.	Broadside	North
16-001434	3/8/16	0:00	Showers Dr & San Antonio Cir	0’	In Int.	Sideswipe	West
16-2323	3/8/16	7:17	Calabazas Blvd & Georgetown Pl	82’	North	Broadside	East
16-2532	3/14/16	8:09	Lincoln St & Benton St	0’	In Int.	Rear-End	East
16-3178	4/1/16	9:46	San Tomas Aquino Creek Trail & Tasman Dr	985’	South	Broadside	East
16-3181	4/1/16	12:03	El Camino Real & San Tomas Expy	0’	In Int.	Other	East
16-3315	4/5/16	7:03	Don Ave & Don Ct	275’	West	Other	West
16-4332	5/5/16	9:49	Stevens Creek Blvd & Breech Ave	60’	West	Sideswipe	West
16-4759	5/17/16	17:56	Los Padres Blvd & Saratoga Ave	608’	North	Broadside	North
16-5391	5/18/16	7:40	San Tomas Aquino Creek Trail & Scott Blvd	0’	In Int.	Head-On	South
16-4935	5/23/16	13:38	Lafayette St & Laurelwood Rd	10’	North	Broadside	South
16-4967	5/24/16	9:24	Homestead Rd & Lawrence Expy	400’	East	Broadside	North
16-5333	6/4/16	8:52	Granada Ave & Bergin Pl	0’	In Int.	Sideswipe	East
16-5402	6/6/16	19:34	Market St & Lafayette St	0’	In Int.	Sideswipe	East
16-5412	6/6/16	19:38	Winchester Blvd & Forest Ave (N)	0’	In Int.	Vehicle - Pedestrian	North
16-5922	6/21/16	8:45	Homestead Rd & East Curbline Of Driveway To 3433 Homestead Road	0’	In Int.	Broadside	West
16-7015	7/28/16	9:18	Scott Blvd & Martin Ave	50’	South	Broadside	North
16-7370	8/9/16	10:13	Homestead Rd & Los Padres Blvd	0’	In Int.	Broadside	East
16-11193	11/21/16	12:00	Great America Pkwy & Old Mountain View Alviso Rd	180’	South	Sideswipe	West
16-11613	12/3/16	12:59	Lafayette St & Franklin St	0’	In Int.	Broadside	South
17-3395	4/19/17	10:27	Bowers Ave & Scott Blvd	0’	In Int.	Sideswipe	North
17-4463	5/21/17	13:25	Victoria Ave & Nobili Ave	255’	West	Vehicle - Pedestrian	West
17-4497	5/23/17	13:21	Quince Ave & Homestead Rd	0’	In Int.	Vehicle - Pedestrian	East
17-4573	5/26/17	8:45	Market St & Jefferson St	0’	In Int.	Other	East
17-6059	7/17/17	18:01	Cabrillo Ave & Larsen Pl	95’	East	Sideswipe	East
17-7237	8/22/17	15:50	Benton St & Live Oak Dr	0’	In Int.	Broadside	West
17-7675	9/5/17	8:06	Homestead Rd & Scott Blvd	300’	East	Broadside	Not Stated
17-7776	9/8/17	12:40	Warburton Ave & Nobili Ave	0’	In Int.	Other	West
17-8199	9/21/17	12:48	Monroe Street &	0’	In Int.	Sideswipe	East
17-8646	10/4/17	19:16	Monroe St & Homestead Rd	29’	South	Sideswipe	North
17-8847	10/10/17	19:38	Homestead Rd & Monroe St	0’	In Int.	Broadside	South

Movement Prec. Coll. 1	Dir. Of Travel 2	Movement Prec. Coll. 2	Primary Cause	Inj.	Kill
Proceeding Straight	South	Stopped In Road	Not Stated	1	0
Proceeding Straight	East	Proceeding Straight	Traffic Signals and Signs	1	0
Making Left Turn	West	Entering Traffic	Unknown	1	0
Proceeding Straight	North	Proceeding Straight	Auto R/W Violation	1	0
Making Right Turn	South	Proceeding Straight	Traffic Signals and Signs	1	0
Proceeding Straight	South	Proceeding Straight	Auto R/W Violation	1	0
Other Unsafe Turning	East	Proceeding Straight	Improper Turning	1	0
Backing	East	Proceeding Straight	Unsafe Starting or Backing	1	0
Passing Other Vehicle	West	Proceeding Straight	Not Stated	1	0
Stopped In Road	North	Proceeding Straight	Other Hazardous Movement	1	0
Proceeding Straight	North	Proceeding Straight	Wrong Side of Road	1	0
Proceeding Straight	West	Proceeding Straight	Not Stated	1	0
Making Left Turn	West	Proceeding Straight	Auto R/W Violation	1	0
Proceeding Straight	East	Proceeding Straight	Improper Turning	1	0
Proceeding Straight	West	Making Left Turn	Unsafe Speed	1	0
Proceeding Straight	East	Proceeding Straight	Auto R/W Violation	1	0
Making Left Turn	West	Proceeding Straight	Auto R/W Violation	1	0
Changing Lanes	North	Proceeding Straight	Unsafe Lane Change	1	0
Proceeding Straight	South	Making Right Turn	Other Hazardous Movement	1	0
Making Right Turn	South	Proceeding Straight	Improper Turning	0	0
Making Left Turn	East	Proceeding Straight	Improper Turning	1	0
Making Left Turn	North	Making Left Turn		1	0
Proceeding Straight	East	Making Right Turn	Unknown	1	0
Proceeding Straight	South	Slowing / Stopping	Wrong Side of Road	0	0
Proceeding Straight	North	Making Left Turn	Wrong Side of Road	1	0
Proceeding Straight	East	Proceeding Straight	Improper Turning	1	0
Traveling Wrong Way	North	Proceeding Straight	Wrong Side of Road	1	0
Proceeding Straight	North	Entering Traffic	Auto R/W Violation	0	0
Proceeding Straight	North	Proceeding Straight	Traffic Signals and Signs	1	0
Traveling Wrong Way	East	Proceeding Straight	Improper Passing	1	0
Proceeding Straight	North	Proceeding Straight	Improper Turning	1	0
Proceeding Straight	East	Proceeding Straight	Traffic Signals and Signs	1	0