LIVERMORE
CALIFORNIA

Bicycle, Pedestrian, & Trails Active Transportation Plan

JUNE 11, 2018

Prepared by Alta Planning + Design

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TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

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01
Introduction

CHAPTER 1 INTRODUCTION

The City of Livermore envisions a vibrant community where people can comfortably walk, bicycle, and access trails for transportation and recreation. The Livermore Bicycle, Pedestrian, and Trails Active Transportation Plan (Plan) carries this vision forward with a strategy to realize a safer, more comfortable active transportation environment with a thriving walking and bicycling culture.

The Plan identifies challenges and recommends implementation strategies to improve walking, biking, and trails in Livermore. The Plan analyzes existing conditions, incorporates community objectives, implements current policies, and recommends network improvements and programs that address limitations and challenges to active transportation. The Plan proposes enhancements to the existing network to close gaps and increase safety, comfort, connectivity. The Plan prioritizes network and programmatic improvements, explores options for project phasing, and identifies funding opportunities.

WHAT IS ACTIVE TRANSPORTATION?

Active Transportation refers to all human-powered modes of transportation, from walking and bicycling to scootering, skateboarding, or rollerblading. These active modes of transportation are not only fun, affordable, and environmentally friendly, they support public health by incorporating physical activity into daily life.

In this document, “pedestrian” and “walking” are intended to include people walking as well as those using wheelchairs (whether manual or motorized), skateboards, scooters, or any other human-powered transportation other than a bicycle. These modes of transportation all primarily use sidewalks and are considered “pedestrians” by the vehicle code, which dictates the rules and traffic signals or signs that each mode must abide by.

PLANNING AREA

The Active Transportation Planning Area for this Plan (Planning Area) is aligned with the City’s Planning Area as described in the General Plan, and encompasses land in Alameda County. The Planning Area extends beyond Livermore City limits to the north, east, and south to allow for bicycle, pedestrian, and trail access within the City to connect to regional and local open space and parks, schools, job centers, and other recreation opportunities. See Figure 3-1 in Chapter 3 for a map of the planning area.

PLANNING PROCESS

WHAT WE LEARNED

Using a data-driven approach, multiple analyses highlighted areas of strong demand for walking and bicycling facilities near downtown, schools, and parks; gaps in the existing network; and community partners who support walking and bicycling related programs in the city. They also showed areas where improvements to safety or comfort of people walking and bicycling are needed, and where freeways and other features create barriers to connectivity.

WHAT WE HEARD

A significant amount of community input provided throughout the planning process at key milestones contributed to the development of this Plan. The Plan is the result of a contiguous feedback loop with the community throughout the entire process, which took on many forms including workshops, online engagement tools, surveys, pop up events, and Advisory Committee meetings.

More than 250 people attended events to share their thoughts, and over 500 people provided input with the online tools. In responses to the community survey, 75 percent of people said they would like to walk or bicycle more for daily transportation, but concerns prevent them from feeling comfortable on the current networks. Bicycling and walking facilities that increase comfort by providing additional separation from vehicle traffic would encourage this group of residents to use active transportation more often.

Across all feedback opportunities, community members expressed a strong appreciation for the walking and bicycling trails in Livermore, and identified a need for improvements. When input from all outreach events was reviewed, five overarching themes coalesced into focus areas that guided development of the project and program lists in this Plan:

- Improved school access
- Improved access to and throughout the downtown area
- Crosstown routes that improve connectivity on longer corridors
- Increased connections within the existing trail network, as well as between the trail network and on-street bicycle and pedestrian networks
- I-580 crossing improvements to reduce the impact of this barrier

THE ACTION PLAN

The programs, policies, and projects in this Plan are informed by the extensive community outreach, current best practices in bicycle and pedestrian planning, and key findings from the assessment of existing conditions and needs.

The project list was then reviewed and prioritized to create a strategic plan for implementation based on the cost, complexity, and anticipated benefit of each project.

PURPOSE OF THE PLAN

This Plan replaces the City's 2001 Bikeways and Trails Master Plan. It adds a pedestrian emphasis and has been updated to reflect the current physical environment and public policy conditions. Based on this updated assessment of conditions, this Plan establishes a long-term vision to improve the active transportation network and enhance connections to transit facilities, employment, retail and commercial centers, and public facilities.

This document is a comprehensive framework to guide decisions to implement network improvements, which will result in quality bicycle and pedestrian facilities to improve mobility, connectivity, public health, physical activity, and recreational opportunities. Using this Plan, the City aims to increase transportation options, reduce environmental impacts of the transportation system, and enhance the overall quality of life for the Livermore community. Overall, the Plan will create a system that enables people to use a variety of modes to achieve daily needs.

Development of the Plan ultimately resulted in a programmed system of improvements consistent with State, regional, and local planning policies. This Plan complies with the State of California Active Transportation Program (ATP) guidelines, making Livermore more competitive for the ATP and other sources of grant funding.

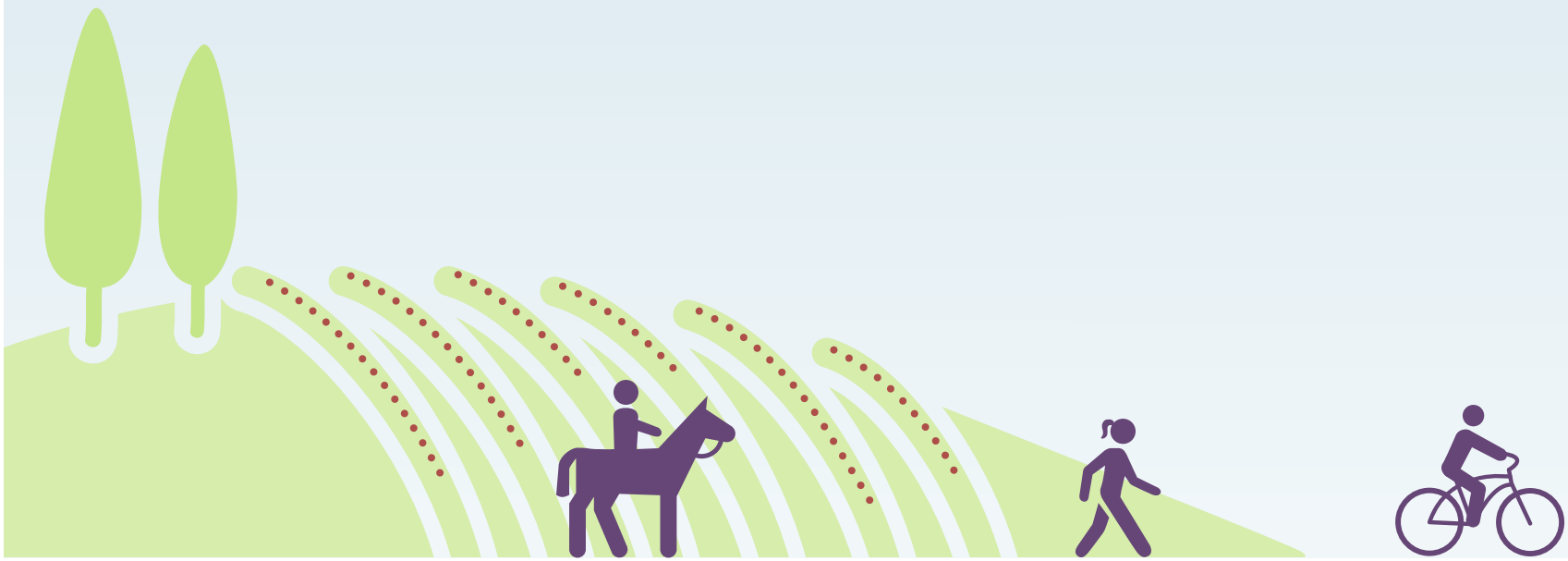
In addition, the Plan is consistent with or provides further guidance for regional plans and policies including the Livermore Area Recreation and Park District Master Plan, the East Bay Regional Park District Master Plan, Alameda Countywide Bike Plan and Pedestrian Plan, and Unincorporated Alameda County's Bike Plan and Pedestrian Plan. It also complies with the "Alameda County Transportation Commission Bicycle Master Plan Guidelines" and the "Toolkit for Improving Walkability in Alameda County." See Appendix A for a review of relevant plans and policy documents.

Further, this Plan implements the City's Complete Street Policies set forth in the Livermore General Plan, and is consistent with or provides further guidance for the City's Climate Action Plan, South Livermore Valley Specific Plan, El Charro Specific Plan, Downtown Specific Plan, Iron Horse Trail Feasibility Study, Arroyo Vista Neighborhood Plan, Development Code, Municipal Code, Design Guidelines, and Standard Details.

ORGANIZATION OF THE PLAN

The Plan is organized into seven chapters. In addition, appendices include more detailed background data and analyses used to support the project recommendations, and an attachment provides documentation of public input and events.

02
Vision & Goals



CHAPTER 2 VISION & GOALS

The vision, goals, and policies of the Plan will guide City decisions to prioritize and implement recommended active transportation network improvement projects and programs.

In this Plan, Goals and Policies are defined as follows:

Goals are broad statements of what the City hopes to achieve for the bicycle, pedestrian, and trail network. These represent the most important priorities and attitudes of the community.

Policies address City priorities, direct the way that public improvements are made, where resources are allocated, and how programs are operated. These include actions with measurable outcomes to be evaluated regularly.

VISION

The City of Livermore envisions a city where people of all ages and abilities can comfortably access jobs, schools, recreation, shopping, and transit on foot or by bicycle as part of daily life in a healthy and active community.

GOALS

GOAL 1: SAFE & COMPREHENSIVE NETWORK

Provide a safe, efficient, and connected bicycle, pedestrian, and trail network that accommodates all users and abilities.

POLICIES

- 1.1 Develop and implement projects and improvements to address bicycle and pedestrian safety
- 1.2 Connect neighborhoods, schools, work places, transit facilities, and other destinations with on-street facilities and/or separated trails
- 1.3 Build cross town connections for the bicycle, pedestrian, and trail network
- 1.4 Improve the pedestrian and bicycle network to and through Downtown Livermore to increase access, safety, and mobility
- 1.5 Establish safe crossings of barriers including high-volume roadways, freeway interchanges, railroads, arroyos, and other barriers
- 1.6 Coordinate with other agencies, adjacent jurisdictions, and regional partners to plan and implement projects that improve Livermore's network and connections to the region

GOAL 2: DESIGN FOR ALL USERS

Build a well-designed and comfortable bicycle, pedestrian, and trail network with support services and facilities to serve users of all ages and abilities.

POLICIES

- 2.1 Incorporate best practices for the design of pedestrian facilities, bikeways, and trails that emphasize user safety and comfort
- 2.2 Incorporate sustainable and environmentally sensitive design for all facilities and amenities
- 2.3 Provide support facilities on public properties as appropriate, such as bicycle parking, rest areas, water fountains, and other facilities
- 2.4 Require private development to provide appropriate support facilities, such as shower/locker facilities and bicycle parking
- 2.5 Connect new development and public spaces to the active transportation network
- 2.6 Consider maintenance needs in the design of all new facilities

GOAL 3: ENGAGE & GROW THE ACTIVE TRANSPORTATION COMMUNITY

Increase bicycling and walking for transportation and recreation with education, awareness, and enforcement.

POLICIES

- 3.1 Educate the public on the benefits of bicycling and walking, the available bicycle and trail facilities, and their rights and responsibilities
- 3.2 Provide up-to-date information about the bicycle and trail network, bicycle parking, and program resources
- 3.3 Develop and implement strategies to encourage bicycling and walking to and through community events, including bicycle and pedestrian support facilities
- 3.4 Support and participate in Federal, State, Regional, and Local programs, such as countywide Safe Routes to School efforts
- 3.5 Coordinate with other agencies to promote, encourage, and implement active transportation programs
- 3.6 Continue and expand bicycle, pedestrian, and traffic enforcement programs to encourage proper use of facilities, increase safety, and improve the user experience

GOAL 4: MAINTAIN THE ACTIVE TRANSPORTATION NETWORK

Maintain roadways, sidewalks, and multi-use trails to provide safe and comfortable active transportation conditions for all users and abilities.

POLICIES

- 4.1 Develop and provide a maintenance program for pedestrian facilities, bikeways, and trails to provide continued safe and comfortable use of the network
- 4.2 Provide new facilities only where sufficient maintenance funding can be identified
- 4.3 Work with Federal, State, and Regional agencies to expand maintenance funding opportunities

03
Existing Conditions

CHAPTER 3 EXISTING CONDITIONS

This chapter describes the existing transportation environment in Livermore, with a focus on conditions that affect the bikeway, pedestrian, and trail networks. Conditions were evaluated under six broad categories, including:

- Community Setting and Context
- Existing Networks
- Existing Programs
- Activity Generators
- Demographics
- Travel Patterns

These existing conditions serve as the basis for the needs analysis in Chapter 4.

COMMUNITY SETTING AND CONTEXT

Livermore is in eastern Alameda County, in the Tri-valley region of the San Francisco Bay Area which includes Pleasanton, Dublin, San Ramon, and Danville. The Livermore Valley, oriented east to west, is formed by the Diablo Range of the coastal mountains, and joins the Amador and Sunol Valleys on its west side. The City of Livermore is predominantly flat on the valley floor, while the northern, eastern, and southern valley edges are composed of rolling hills, vineyards, and ridge lines.

Interstate 580 (I-580) aligns east to west through the Valley and bisects the Planning Area. Similarly, the Union Pacific Railroad parallels I-580 to the south through the downtown core. Livermore's historic downtown is located in the geographic center of Livermore, in an area roughly bounded by the railway to the north, Fourth Street to the south and east, and Murrieta Boulevard to the west.

Livermore is crossed by several arroyos, including Arroyo Seco, Arroyo Mocho, Arroyo Las Positas, and Arroyo del Valle, which form the natural drainage for the area. These watercourses support vegetation and wildlife habitat; provide opportunities for human and wildlife connectivity, and recreation; and add visual interest to the community. The diverse open spaces and trails provide a suitable environment for outdoor activity and opportunity to increase bicycling, walking, and horseback riding.

EXISTING NETWORKS

ROADWAY NETWORK & MAJOR BARRIERS

Streets in downtown Livermore generally follow a traditional grid network. The majority of the City is comprised of suburban streets with cul-de-sacs and limited connections between neighborhoods. As a result, the few corridors that provide cross-town connectivity face enormous pressure to accommodate all modes of transportation.

Major east-west arterials include:

- First Street
- Jack London Boulevard
- Stanley Boulevard
- Concannon Boulevard
- East Avenue

Major north-south arterials include:

- Livermore Avenue
- Mines Road
- Vasco Road
- L Street/Arroyo Road
- Isabel Avenue

The Union Pacific Railroad tracks that bisect the city create a barrier to north-south travel for motor vehicles, bicycle traffic, and trail users since many streets do not cross the railroad tracks and there are few grade-separated crossings. Existing at-grade crossings include:

- L Street
- Junction Avenue
- Vasco Road

Grade separated crossings include:

- Murrieta Boulevard
- Livermore Avenue
- First Street
- P Street
- Mines Road
- Vasco Road
- Greenville Road

In addition, I-580 separates the Northwest and Northeast neighborhoods from the rest of the City due to limited crossing options. There are eight existing crossings of I-580 in Livermore. All allow bicycle and pedestrian crossings, but most are not ideal because they lack pedestrian and bicycle facilities that provide a comfortable experience.

Finally, several arroyos weave through Livermore, creating both opportunities and constraints. Many of these arroyos are under the jurisdiction of the Zone 7 Flood Control District and have service roads, which have been or could be converted to multi-use trails. However, the arroyos can also act as barriers with limited crossing opportunities.

TRANSIT NETWORK

The Altamont Corridor Express (ACE) rail service runs from San Jose to Stockton and has two stops in Livermore, one in downtown and one at Vasco Road. ACE service provides pedestrian and bicycle commuters and visitors who live outside of Livermore with an alternative mode of transportation into the City.

The Livermore Amador Valley Transit Authority (LAVTA) operates a fleet of its Wheels buses within Livermore and provides connecting access to and from San Ramon, Dublin, and Pleasanton. The Livermore Transit Center in downtown Livermore serves as a major hub for LAVTA bus service as well as the downtown Livermore ACE station.

BICYCLE NETWORK

The California Department of Transportation (Caltrans) classifies and defines bicycle facilities. Caltrans designates four classes of bicycle facilities: Classes I, II, III, and IV. In addition, the Alameda County Transportation Commission (Alameda CTC) has adopted a set of sub-classifications for each Caltrans classification. These sub-classifications were designed to harmonize previously existing local classification systems within Alameda County and to incorporate emerging bikeway typologies.

The following sections describe the classes of bikeways that currently exist in Livermore, followed by a description of the additional bikeway classes identified by Caltrans and Alameda CTC.

EXISTING BIKEWAYS IN LIVERMORE

Table 3-1 summarizes existing bikeway mileage in Livermore in 2001 and today, and Figure 3-1 shows existing and previously proposed bikeways and trails.

Table 3-1: Existing Bikeway Miles

BIKEWAY CLASS	2001 MILES	2018 MILES
Class I Shared Use Paths	22	40
Class II Bicycle Lanes	46	66
Total	**68**	**106**

An existing shared use path in Livermore

Class I Shared Use Paths are completely separated, exclusive rights-of-way for two-way bicycling, walking, and other non-motorized uses.

- Class IA for paved paths
- Class IB for unpaved paths

Equestrians are permitted to use all paths in Livermore.

An existing Class II bicycle lane in Livermore

Class II Bicycle Lanes are striped, preferential lanes on roadways for one-way bicycle travel. All existing bicycle lanes in Livermore are Class IIA conventional bicycle lanes, consisting of a single stripe to delineate the lane, stenciled pavement markings, and signs to identify it as a bicycle lane. Where a bicycle lane is adjacent to on-street parking, the lane may be striped on both sides.

ADDITIONAL BICYCLE FACILITIES

In addition to Class I shared use paths and Class IIA conventional bicycle lanes, there are several additional classes of bikeways designated by Caltrans and Alameda CTC and intersection treatments that do not yet exist in Livermore but were considered in development of this Plan and recommended where appropriate.

A typical buffered bicycle lane

Class II bicycle lanes can be upgraded from conventional striping to include striped buffers that add a few feet of separation between the bicycle lane and traffic lane or parking aisle, or other features that improve bicyclist comfort. The additional Alameda CTC designations for bicycle lanes are:

- Class IIB for upgraded bicycle lanes, either with a striped buffer between the bicycle lane and traffic lane, or with green conflict markings in the bicycle lane
- Class IIC for climbing bicycle lanes, which have a dedicated bicycle lane in the uphill direction and a Class III bicycle route in the downhill direction
- Class IID for contraflow bicycle lanes, which allow for bicycling in the opposite direction of motor vehicle traffic (typically used to support two-way bicycle travel on one-way streets)

Typical bicycle boulevard features, clockwise from top left: sharrows, wayfinding, speed hump, and traffic circle

Class III Bicycle Routes are signed routes where people riding bicycles share a travel lane with people driving motor vehicles.

- Class IIIA for signage-only routes
- Class IIIB for wide curb or shoulder lanes, that may or may not include signage
- Class IIIC for routes with shared lane markings ("sharrows") or other pavement stenciling, and may also include signage
- Class IIID for routes with green-backed sharrows, also called "super sharrows"
- Class IIIE for bicycle boulevards, which are signed, shared travelways with low motor vehicle volumes and speeds that prioritize convenient and safe bicycle travel through traffic calming, wayfinding signs, and traffic control adjustments

Because they are mixed-traffic facilities, Class III bicycle routes are only appropriate for very low-volume streets with slow travel speeds. Designating Class III bicycle routes can support bicycling beyond the actual facility provided. Signed bicycle routes can help people riding bicycles navigate quiet streets and identify which streets connect. The City may also choose to adopt related policies or practices to maintain designated streets at a level that is comfortable for people bicycling, which may include sweeping more frequently or maintaining a higher quality pavement surface than non-designated streets.

Typical separated bikeway with bollards

Class IV Separated Bikeways are on-street bicycle lanes that are physically separated from motor vehicle traffic by a vertical element or barrier such as a curb, bollards, or parking aisle. They may allow for one- or two-way traffic.

- Class IVA for one-way separated bikeways
- Class IVB for two-way separated bikeways

Bike boxes at signalized intersections provide a designated space for bicyclists to queue ahead of vehicle traffic, increasing visibility, reducing signal delay for bicyclists, and helping to prevent right-hook conflicts with turning vehicles. Bike boxes also benefit pedestrians as they reduce vehicles encroaching into the crosswalk.

Typical bicycle box

Two-stage turn boxes help bicyclists make left turns at signalized intersections with multiple travel lanes from a bicycle lane or separated bikeway. They may also be used at unsignalized locations to facilitate turns from one facility type to another, such as the transition from a bike lane to a bike boulevard. The turn boxes separate turning bicyclists from those continuing through, reduce turning conflicts between vehicles and bikes, and provide a formal queuing space in the intersection.

Two-stage turn box

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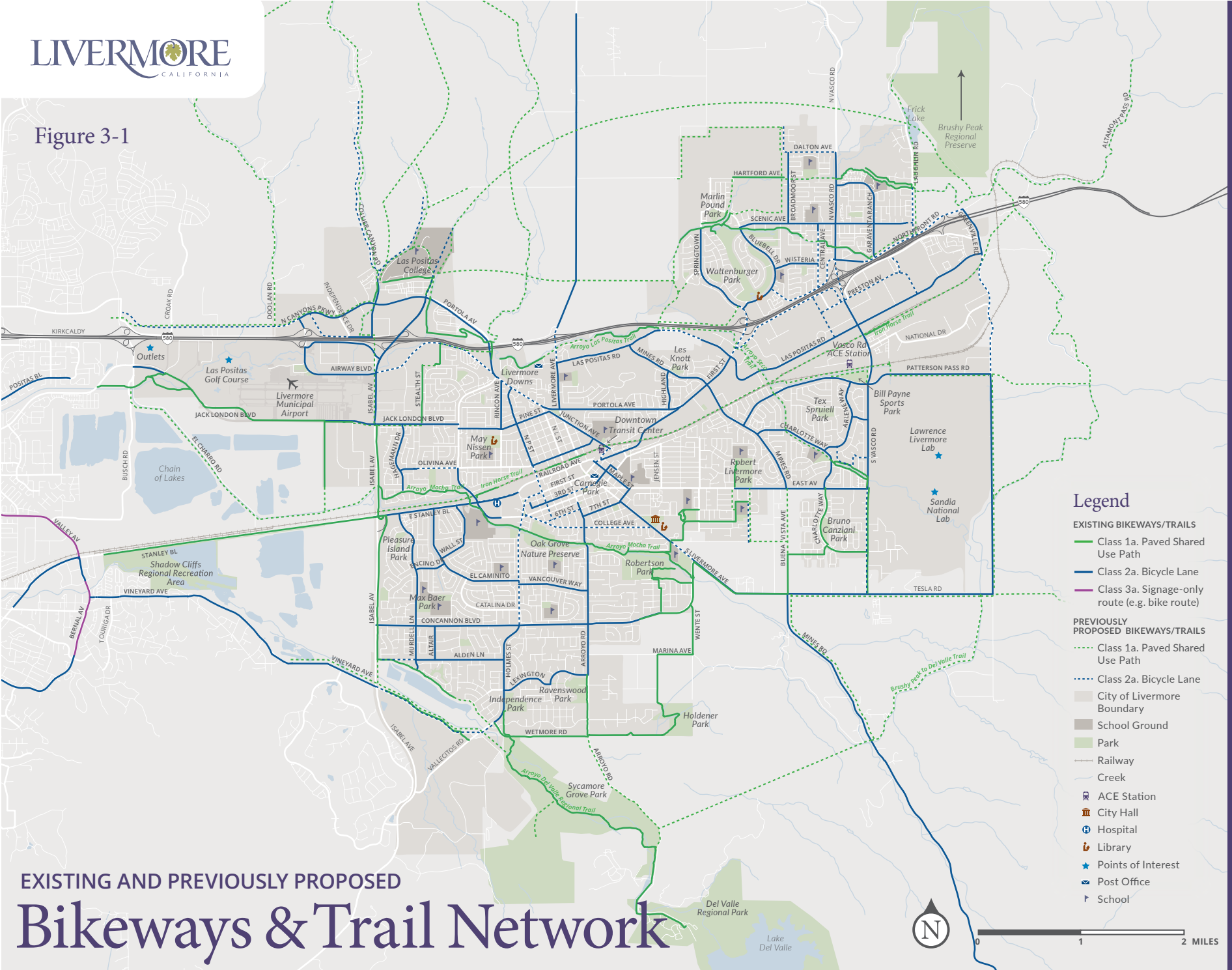
Figure 3-1



EXISTING AND PREVIOUSLY PROPOSED

Bikeways & Trail Network

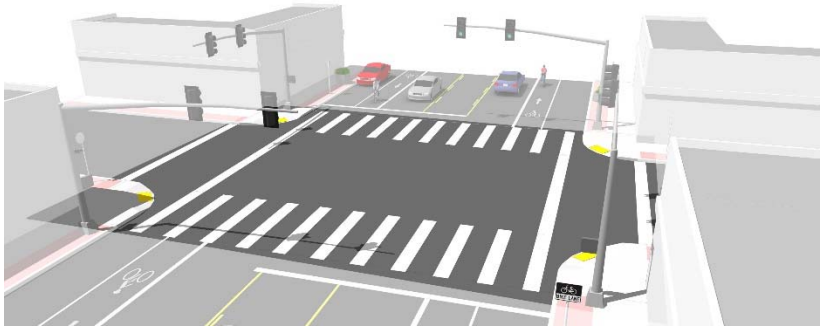
PEDESTRIAN NETWORK

The pedestrian network is composed of sidewalks, pathways, crosswalks, curb ramps, crossing enhancements, and amenities like benches and lighting.

EXISTING PEDESTRIAN NETWORK IN LIVERMORE

A typical sidewalk

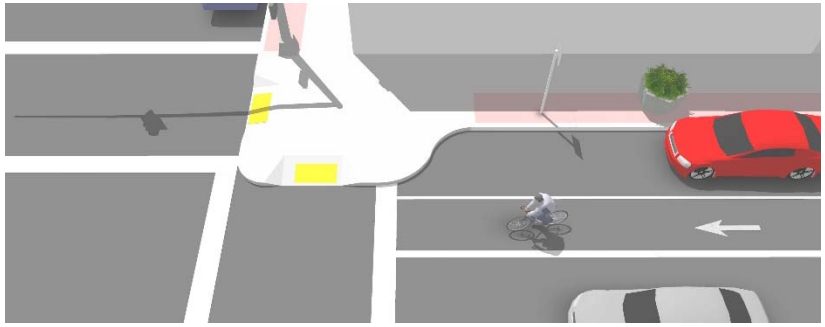
Sidewalks are smooth, even surfaces for pedestrian use that are separated from vehicle travel lanes. Some sidewalks are buffered from the roadway by landscaped areas or other features. Sidewalks throughout Livermore vary in width from five to ten feet wide, depending on the adjacent land use. Livermore currently has approximately 566 miles of sidewalks, covering 93 percent of the street network. There are 44 miles of roadways that have sidewalk on only one side, and 32 miles that lack sidewalks entirely. Small sidewalk gaps that exist sporadically throughout the planning area impede or discourage pedestrian activity.



Transverse and high visibility crosswalk markings

Marked crosswalks guide pedestrians to a preferred path of travel across a street, and alert motorists that pedestrians are likely to be crossing at that location. Standard or “transverse” crosswalks consist of two parallel lines, while high visibility crosswalks add horizontal stripes or other markings. Crosswalks near schools may be marked in yellow.

Marked crossings should always include advance warning signage and advance yield lines, and can be enhanced with curb extensions to shorten the crossing distance and increase visibility. On streets with one lane in each direction and moderate traffic volumes, the addition of a median refuge may be necessary to improve safety and comfort of people crossing.



Curb ramps

Curb ramps help pedestrians with mobility impairments, those using assistive devices, and children transition from the sidewalk to a crosswalk. They also support pedestrians with strollers and children riding scooters or skateboards on the sidewalk. At corners with two crosswalks, two perpendicular curb ramps should be installed to lead directly into the crosswalk on a straight path. While a single diagonal ramp is acceptable under certain constrained conditions, two perpendicular ramps are the preferred design option because of the benefits they offer to people with disabilities. People with vision impairments are aligned from a ramp directly into the crosswalk, and people using wheelchairs or other assistive devices do not travel diagonally into the street before turning back into one of the crosswalks.

The City has an estimated 8,000 curb ramps. Based on an inventory and condition assessment of a sample of the City's curb ramps, it is estimated that 28 percent of ramps comply with current ADA standards, 59 percent require updates, and 13 percent are locations where a curb ramp would traditionally be located but has not been installed.

A typical median refuge

Median refuges, also known as pedestrian refuge islands, provide a safe waiting area for pedestrians in the median of wide, busy streets. Median refuges also allow pedestrians to focus on one direction of vehicle traffic, stop and wait in the median, and then focus on the other direction of vehicle traffic to finish crossing.

The median refuge should have a physical barrier on either side, which can be curbs or plantings, to separate pedestrians from vehicle traffic. Median refuges should be combined with other crossing treatments, such as Rectangular Rapid Flashing Beacons (RRFBs) or other beacons.

A typical RRFB

Rectangular Rapid Flashing Beacons (RRFBs) are user-actuated amber LEDs that supplement warning signs at uncontrolled intersections and mid-block crosswalks. They can be activated by people bicycling and walking by manually pushing a button or passively by remote detection.

For crossings of roadways with one lane in each direction and higher traffic volumes, or on four-lane streets with medium volumes, both a median refuge island and RRFB are typically provided to improve safety and comfort.

ADDITIONAL PEDESTRIAN FACILITIES

In addition to the previously described pedestrian facilities and amenities that exist in Livermore today, one additional type of pedestrian beacon was considered in development of this Plan and may be recommended for intersection improvements as appropriate.

Pedestrian Hybrid Beacons, also known as high-intensity activated crosswalk (HAWK) beacons, are traffic control devices used to stop roadway traffic and allow people to walk or bike across an intersection. People walking and bicycling activate the beacon by manually pushing a button or passively by video detection or a detector loop system. A PHB creates the lowest level of stress (LTS 1) for people crossing major streets as it functions as a traffic signal, requiring vehicles to stop at a red light when activated. It is designed for intersections that may not meet requirements for a traffic signal, but have volumes high enough that a beacon is needed to provide adequate breaks in traffic for pedestrians and bicyclists to get through the intersection.

A typical pedestrian hybrid beacon

TRAIL NETWORK

Livermore currently has approximately 40 miles of Class I paved shared use paths designed for bicycling, walking, and horseback riding. While equestrians are allowed on all existing trails, trails constructed in South Livermore Valley generally provide a separate unpaved path for horses.

The existing trail network is partially developed throughout portions of the City. The previous Bikeways and Trails Master Plan proposed a network of trails throughout Livermore, along the railroad tracks, linkages to cross I-580, and along the arroyos. Figure 3-2 shows existing and previously proposed trails in Livermore.

The existing and proposed trail network is intended to provide separated and comfortable access to community facilities, schools, and transit. The trail network also provides recreational opportunity and connection to neighborhood and regional parks.

TRAILHEADS

There are several existing trailheads that serve the network and provide access for equestrians, including:

- Robertson Park (Robertson Park Rd)
- Sycamore Grove Park (Wetmore Rd access from Sycamore Grove Park Parking Lot)
- Del Valle Regional Park (Arroyo Rd Del Valle Arroyo Rd Staging Area (EBRPD))
- Brushy Peak (Laughlin Rd – Laughlin Ranch Staging Area)

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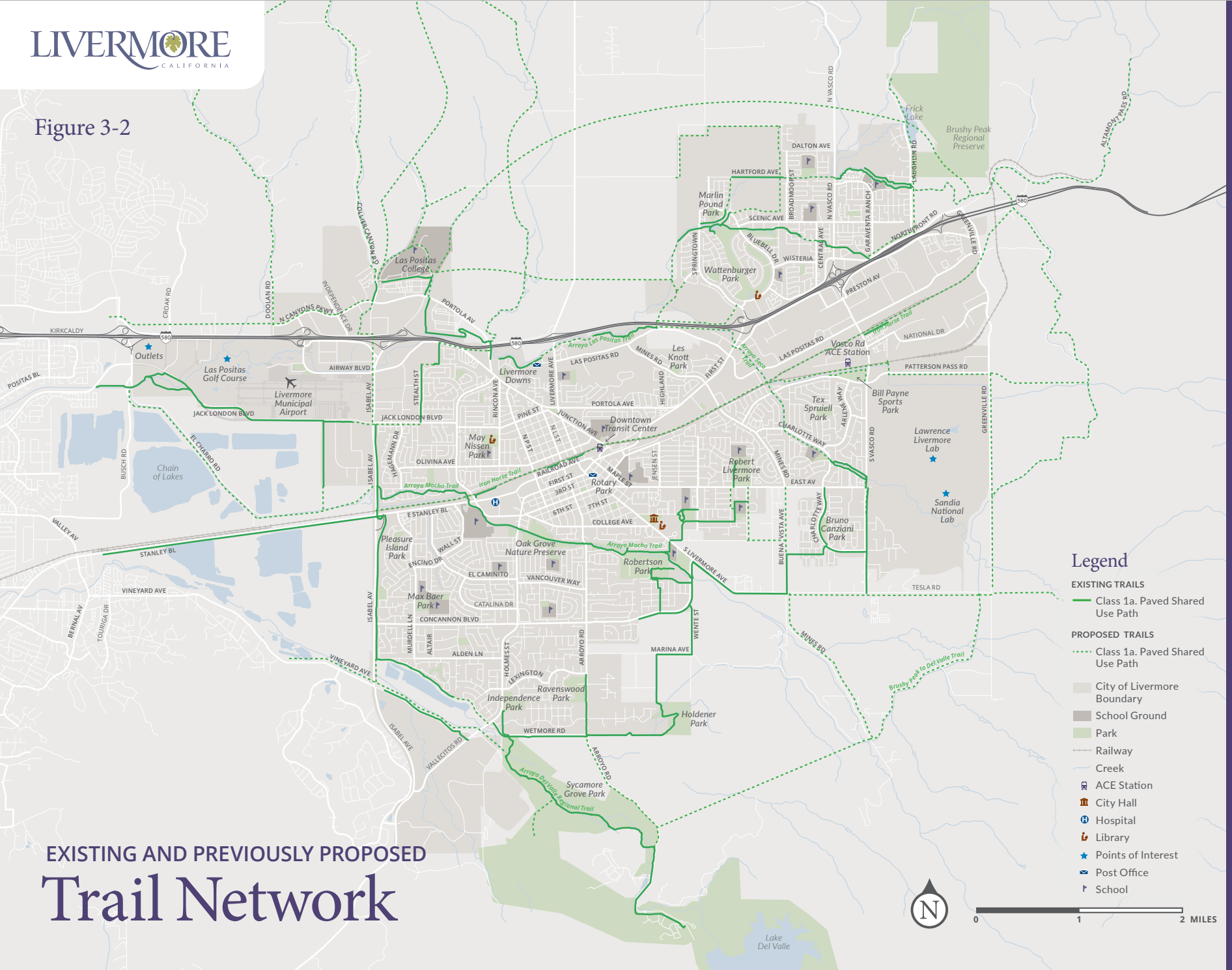
Figure 3-2



EXISTING AND PREVIOUSLY PROPOSED

Trail Network

EXISTING PROGRAMS

Bicycle and pedestrian education, encouragement, enforcement, and evaluation programs are an integral part of supporting active transportation and increasing users.

Programs are generally described by four E's: education, encouragement, enforcement, and evaluation. Livermore has a strong history of supporting and participating in active transportation programs, which are listed briefly below. These programs are described in greater detail, along with recommendations for new and expanded program efforts, in Chapter 5 and Appendix K.

EDUCATION

- **Bicycle Safety Education Classes** for youth are offered by Livermore police to students in Kindergarten through 8th grade, and through the Alameda County Safe Routes to School (SR2S) program to elementary, middle, and high school students
- **Adult Bicycle Safety Education** is offered by Bike East Bay, and teaches riders the rules of the road and how to safely bicycle in a variety of scenarios, including both classroom lessons and on-bike practice
- **Youth Pedestrian Safety Education** provided to Kindergarten through second graders by the Alameda County SR2S program includes practicing safe walking and crossing behaviors
- **Bike Maps** provide information about the City's existing bikeways and trails in addition to information on key destinations, routes, and distances between points

ENCOURAGEMENT

- **Safe Routes to School (SR2S) Program** operated by Alameda County Transportation Commission includes numerous activities to promote walking and bicycling to school, including school site audits, evaluation activities, education efforts, and fun encouragement events
- **Bike to Work Day** activities in Livermore, which include energizer stations, giveaways for commuters, and an outreach campaign, are led by the City in partnership with the Metropolitan Transportation Commission and Bike East Bay
- **Bicycle and Pedestrian Coordination** for the City is currently incorporated into the responsibilities of two staff members in the Planning department who manage bicycling and walking plans and projects for the City, including coordinating with partner agencies to implement programs and events

ENFORCEMENT

- **Ticket Diversion Classes for Bicyclists** operated by the Livermore Police Department and Bike East Bay allow youth bicyclists to attend a bicycle safety course instead of paying a fine for a citation
- **Crossing Guards** hired by the Livermore Police Department are stationed at key locations near schools to assist students and enforce safe driving behavior at crosswalks
- **Speed Feedback Trailers** deployed by the Livermore Police Department are used for short-term enforcement to target areas where speeding is a concern

- **Bicycle Patrol** officers and volunteers with the Livermore Police Department patrol trails in addition to streets and other areas of the community, and may notice challenges or hazards specific to bicyclists during their shifts
- **Traffic Calming** consists of engineering treatments designed and implemented to reduce traffic speeds and improve safety and comfort along key corridors, often coupled with enforcement campaigns to educate the community on the new features

EVALUATION

The City currently does not formally evaluate bicycling and walking programs or projects on an annual or routine basis.

ACTIVITY GENERATORS

Existing activity generators are destinations that are likely to attract walking or bicycling trips, including:

- Parks and community facilities
- Commercial retail centers
- Schools
- Major employers

A map of activity generators can be seen in Figure 3-3.

PARKS & COMMUNITY FACILITIES

Three libraries and one community center in Livermore provide space for recreational activities, classes, and community gatherings. These include the Civic Center, Rincon Branch, and Springtown Branch libraries and the Robert Livermore Community Center.

Parks are distributed throughout the community and vary in size, intensity and design. The Livermore Area Recreation and Park District (LARPD) is an independent special district that owns and/or manages parks in and around Livermore. LARPD provides:

- 29 neighborhood parks
- Three community parks
- Seven dog parks
- Four open space areas totaling 1,360 acres
- 10 special-use parks

East Bay Regional Park District (EBRPD) owns or manages approximately 6,500 acres of regional park land in the Livermore area, offering a variety of recreational opportunities. In addition, EBRPD owns or manages several miles of regional trails in Livermore including the Iron Horse Regional Trail and the Shadow Cliffs to Del Valle Regional Trail. There is high demand for improved access to these regional park amenities.

Zone 7 Water Agency serves the Livermore-Amador Valley, and controls several arroyos and access roads within Livermore. Some maintenance roads on levees are currently open for bicycle and pedestrian use, and the Agency has expressed a willingness to discuss opening additional levee trails for transportation and recreation.

COMMERCIAL RETAIL CENTERS

Commercial uses in Livermore are concentrated downtown and in neighborhood shopping centers along arterials in the community. Providing improved bicycle and pedestrian access to shops, restaurants, services, and other businesses will support residents who want to socialize or run errands without using a car.

Wineries are also a major commercial activity and destination in Livermore. Many vineyards and tasting rooms are clustered just southeast of the City, and form a transition between the developed area and the surrounding open space. Some wineries are served by existing shared use paths, and opportunities exist to connect additional wineries and promote the area as a wine trail.

SCHOOLS

Livermore schools are distributed throughout the city's neighborhoods. They include:

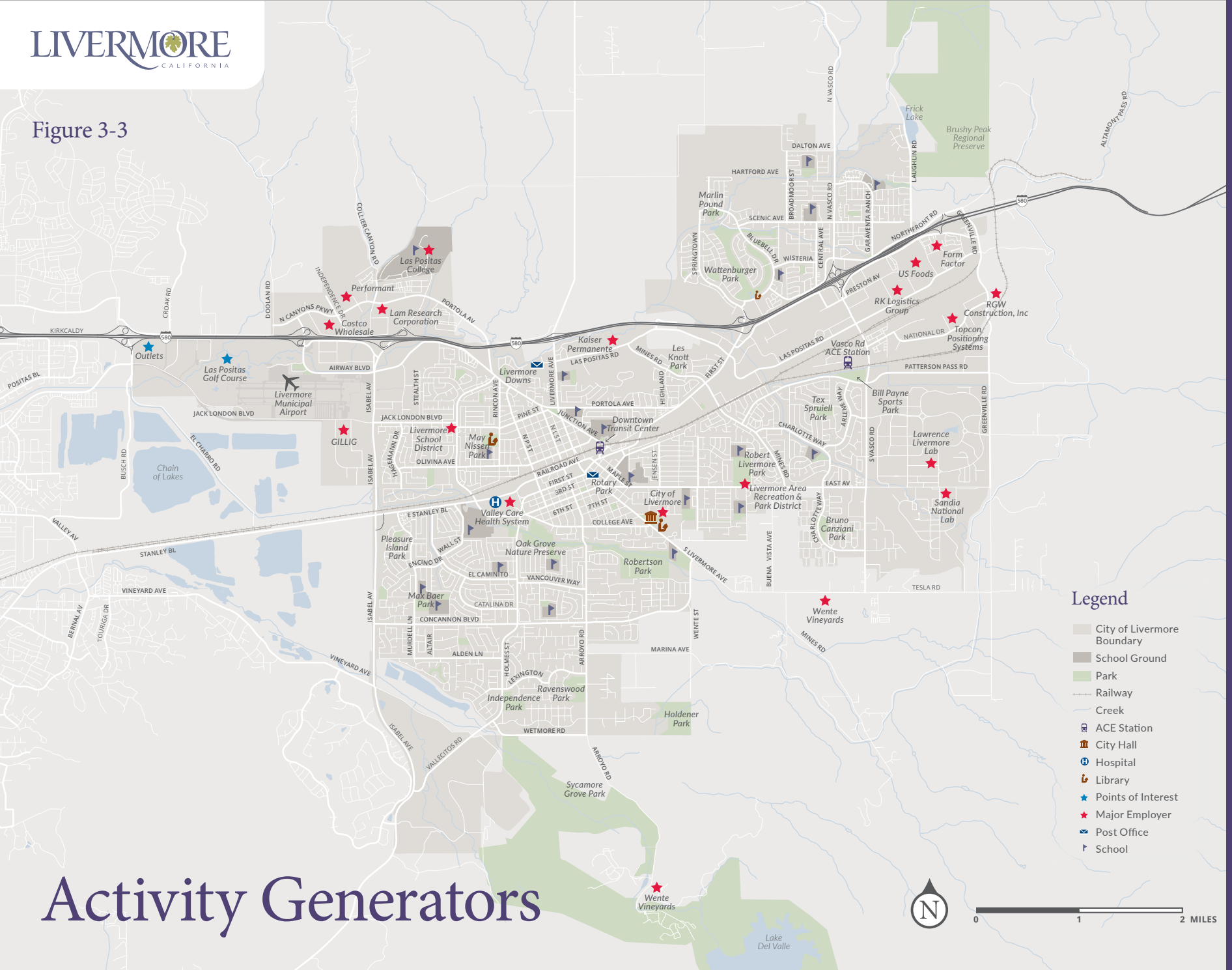
- Livermore Valley Unified School District: nine elementary schools, two K-8 schools, three middle schools, and three high schools
- Las Positas Community College
- Private schools and pre-schools

MAJOR EMPLOYERS

According to the Livermore Office of Innovation and Economic Development, the largest employers in Livermore are the Lawrence Livermore National Laboratory, Valley Care Health Systems, Sandia National Lab, Livermore Valley Joint Unified School District, Kaiser Permanente, GILLIG, Lam Research, Form Factor, Wente Vineyards, US Foods, the RK Logistics Group, Livermore Area Recreation and Parks District, the City of Livermore, Las Positas College, Topcon Positioning Systems, Costco, and Performant.

LIVERMORE
CALIFORNIA

Figure 3-3



Activity Generators

DEMOGRAPHICS

Understanding the demographics of the Livermore community not only informed the projects, programs, and priorities reflected in this Plan, but also informed a strategic outreach and community engagement plan to reach the diverse residents. All demographic data reflects 2014 5-year estimates from the American Community Survey.

POPULATION

Livermore is home to 89,301 residents, and has grown by 22 percent since 2000. It is the sixth-largest city in Alameda County.

AGE

There are many young people in Livermore, with just over 24 percent of residents under 18 years of age compared to 22 percent in Alameda County. This 24 percent are likely to be unable to drive, which increases their dependence on walking, bicycling, and taking transit to reach their destinations.

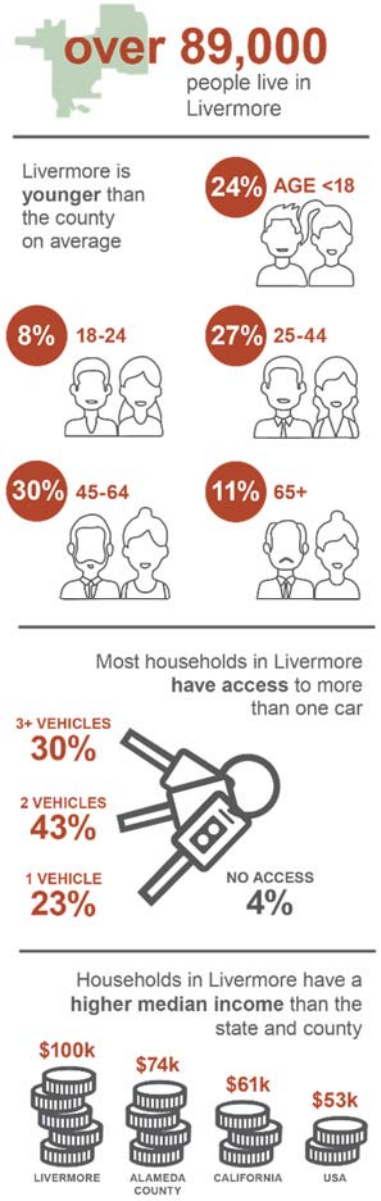
ACCESS TO CARS

More than 95 percent of Livermore households have access to a car. Just four percent do not have access to a car, suggesting they rely on walking, bicycling, or transit. Based on Livermore's average household size, this represents nearly 3,500 residents who may not have access to a car for transportation.

An additional 23 percent of households have access to only one vehicle. If these households have two workers, one or more of them may rely on other modes of transportation for their commute.

INCOME

Median household income in Livermore is $99,683 in 2014 dollars, representing a 32 percent increase from the 2000 median of $75,322. On average, Livermore residents earn more than Alameda County overall, which has a median income of $73,775.



American Community Survey 2014 5-year estimates

TRAVEL PATTERNS

COMMUTE TRAVEL

Almost 80 percent of Livermore residents drive alone to work. Bicycling and walking together make up just two percent of all commute trips, based on 2014 5-year estimates from the American Community Survey. Bicycling and walking is likely higher than this overall, as the American Community Survey does not count recreational trips or trips where commuters use more than one mode, such as taking a bus and then bicycling to their final destination. Thirty-nine percent of the Livermore residents also work in Livermore, which provides an opportunity to shift commute trips within the city from driving to other modes. Compared to communities listed in Table 3-2, Livermore has a higher bicycling commute mode share and a lower walking commute mode share than some Bay Area peers.

Table 3-2: Commute Modes in Peer Communities

CITY	BIKE COMMUTE SHARE	WALK COMMUTE SHARE
Livermore	1.4%	0.9%
Dublin	0.4%	2.0%
Pleasanton	0.9%	2.4%
Rancho Cordova	1.4%	2.3%
Berkeley	9.7%	19.6%
Davis	23.2%	5.1%
Copenhagen	37.0%	6.0%

SCHOOL TRAVEL

The Alameda County Safe Routes to School program collects data on trips to school, including several schools in Livermore. From 2013 to 2015, 6.6 percent of Livermore students bicycled and 17.4 percent of students walked to school. Bicycling to school in Livermore is higher than the national average of 2.2 percent, which suggests the bicycle network in Livermore currently supports some trips to school. If the bicycling network along routes to school is improved, bicycling to school rates are likely to increase.

Alameda County Safe Routes to Schools Program counts taken between 2013 and 2015

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04
Needs Analysis

CHAPTER 4 NEEDS ANALYSIS

The walking and bicycling needs of the Livermore community are diverse, influenced by the quality of the networks—both the physical condition of the infrastructure and the perceived comfort of people walking and bicycling—community demographics, trip purposes, and many other factors.

This chapter includes an overview of active transportation needs identified through the following analyses:

- Public Input
- Health
- Safety
- Data-driven Analysis

PUBLIC INPUT

Throughout the planning process, the City held multiple workshops, tours, and other events to gather input for this Plan. Opportunities to inform existing conditions and help identify and prioritize needed improvements were offered throughout development of the Plan, with a priority on reaching a broad cross section of Livermore residents. This continuous feedback loop resulted in a project list, evaluation strategy, and programs suite that truly reflects community values and priorities. Opportunities for public input included:

- Two public workshops
- Survey and interactive map
- 14 pop-up events
- Walking and bicycling tours
- Advisory committee meetings
- Planning Commission and City Council meetings

Activities and key outcomes are summarized in the following sections. For detailed information, see Appendix C.

WORKSHOPS

COMMUNITY WORKSHOP 1

The first public open house, held in April 2016, was attended by 76 people. Participants reviewed and provided comments on the existing conditions information, including suggesting Plan goals and desired improvements. Hard copies of the community survey were also distributed for participants to complete.

COMMUNITY WORKSHOP 2

A second workshop was held in January 2017 to gather feedback from the community on draft network, crossing, and program recommendations, and provide an opportunity for input on project prioritization criteria. The workshop, which included Spanish and Vietnamese interpretation, was attended by 110 people. Feedback themes included:

- Support for green bicycle lanes or boxes at key conflict points
- Need for additional bicycle parking
- Improved bicycle detection at signalized intersections
- Improved lighting citywide
- Additional amenities along trails
- Improved connectivity between bikeways
- Preference for accommodating on-street bikeways through travel lane narrowing or removal rather than on-street parking removal

SURVEY AND INTERACTIVE MAP

A community survey gathered input on active transportation challenges and opportunities throughout Livermore. The survey was available online in English and Spanish from March 28 through May 30, 2016, and collected 524 responses.

An interactive mapping tool was also included online, which allowed residents and stakeholders to draw routes and make comments to help identify locations that need improvements, routes they are currently using, and barriers to walking and bicycling.

Survey respondents expressed an appreciation for the walking and bicycling paths in Livermore, and a desire for a more connected network and improved safety and comfort. Mapped input is shown in Figure 4-1. The majority of survey respondents also reported a desire to walk (76 percent) or bicycle (81 percent) more often for their daily commute, errands, and other trips. In addition, 34 percent of respondents reported they are interested in bicycling but have concerns, representing an opportunity for mode shift and behavior change if improvements to bicyclist safety and comfort are implemented.

Additional themes from the feedback received include:

WALKING NEEDS

- Close sidewalk gaps
- Improve street lighting
- Improve crossings and curb ramps
- Traffic calming

Key locations identified as needing improvements include:

- Downtown Livermore
- Livermore Avenue
- Vasco Road/I-580 crossing

BICYCLING NEEDS

- Improve safety for on-street bikeways
- Create dedicated space for bicycling
- Design ramps and bollards to accommodate bicycles with trailers
- Improve crossings

Key locations identified as needing improvements include:

- Arroyo Mocho Trail
- East Avenue
- Vasco Road/I-580 crossing

Additional bicycle parking was also identified as a need, including along First Street in the downtown, and near parks, grocery stores, and other destinations.

TRAIL NEEDS

- Improve connectivity of separated trails
- Address personal safety concerns
- Complete trail gaps

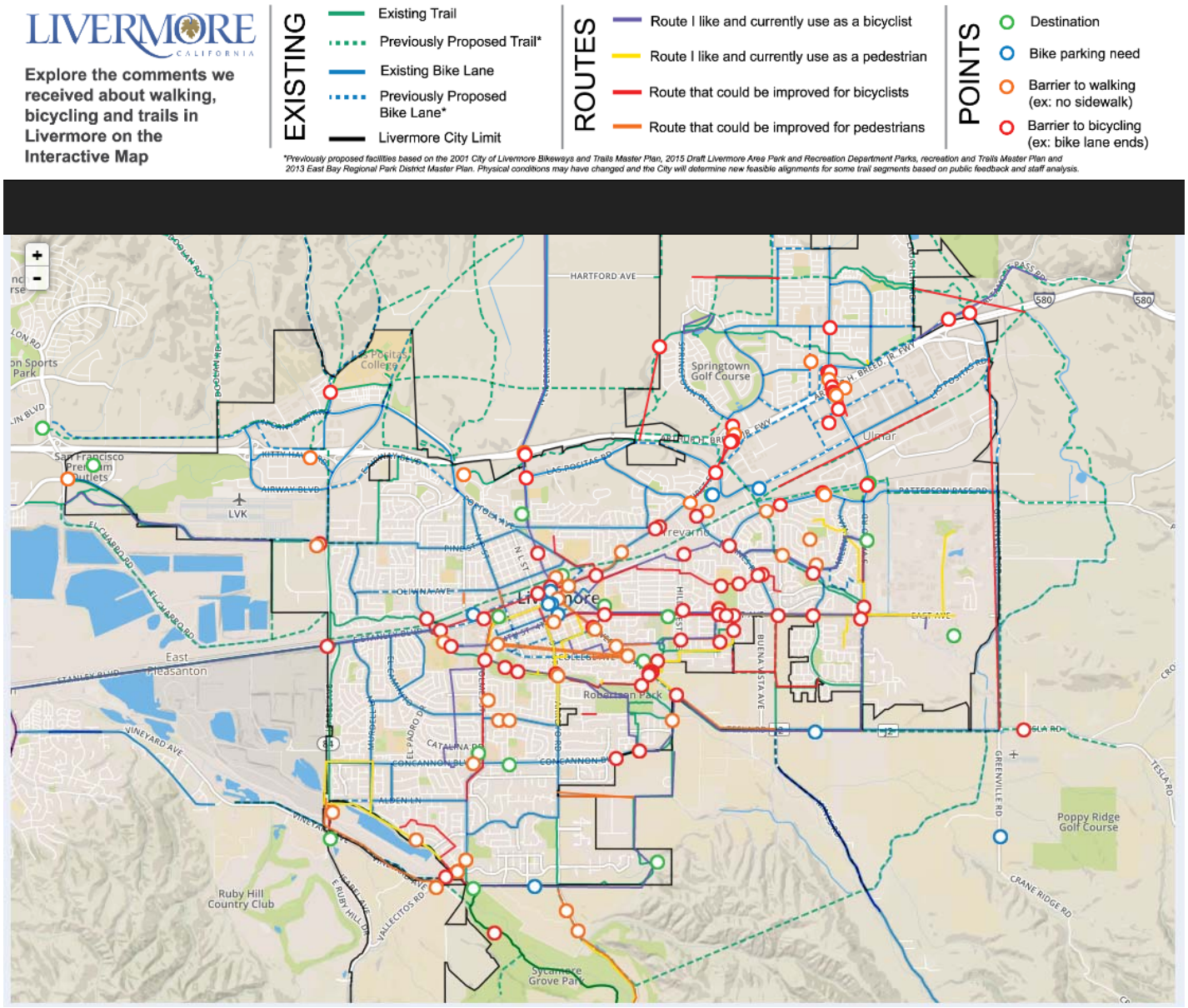


Figure 4-1: Public Mapping Input

POP-UP EVENTS

To gather input from residents who may not have attended a traditional workshop, the City of Livermore planned and facilitated 14 diverse community events to share information and talk with attendees about the project. These pop up events were conducted at:

- Parent Club Information Council – April 26, 2016
- Senior Services – Living with Purpose – May 2, 2016
- Youth Advisory Commission – May 2, 2016
- Las Positas Junior College – May 4, 2016
- Livermore Farmer's Market – May 19, 2016
- WHEELS Disabled Advisory Committee – January 4, 2017
- Marylin Elementary – English Learner Advisory Committee – March 29, 2017
- Livermore Wine Country Downtown Street Fest – May 2016 and May 2017
- Bike to Work Day Energizer Stations at Sandia and Lawrence Livermore Labs and at My Buddy's Bike Shop – May 2016 and May 2017
- Hook and Ladder Run – June 4, 2017
- Equestrian Focus Group – June 25, 2017
- Livermore Trailblazers Focus Group – July 10, 2017

WALKING AND BICYCLING TOUR

A walking and bicycling tour of Livermore was attended by four people walking and five people bicycling in March 2017. The groups were led by project staff and visited locations to discuss proposed projects and document challenges.

ADVISORY COMMITTEES

ACTIVE TRANSPORTATION PLAN CITIZEN ADVISORY COMMITTEE

Development of this Plan was guided by an Active Transportation Plan Citizen Advisory Committee composed of six members appointed by the City Council. The group met seven times throughout the planning process to set project goals, review key deliverables, and inform community outreach processes.

TECHNICAL ADVISORY COMMITTEE

A technical advisory committee of thirteen subject area experts met four times throughout the process to provide in-depth input into project development and prioritization. Member agencies included:

- Alameda County Public Works
- Alameda CTC
- Bike East Bay
- City of Dublin
- City of Livermore Police Department
- City of Livermore Public Works Department
- City of Pleasanton
- East Bay Regional Parks District
- Las Positas Community College
- Livermore Amador Valley Transit Authority/Wheels
- Livermore Area Recreation and Parks District
- Livermore Valley Joint Unified School District
- Zone 7 Water Agency

PLANNING COMMISSION & CITY COUNCIL MEETINGS

Two rounds of presentations were made to the Planning Commission and City Council at key project milestones. The first round of meetings, held in Fall of 2016, presented information on the existing conditions, needs analysis, and goals chapters of the Plan.

The second round of meetings, held in Summer of 2018, presented the completed draft Plan for review and comments before adoption.

HEALTH

Bicycling and walking are closely tied to health, and a review of physical activity and air quality can illuminate the need for active transportation improvements in a community. A growing number of studies show how communities and transportation systems have a profound impact on health and quality of life issues. Fostering conditions where bicycling and walking are accepted and encouraged can increase the health and livability of a city through increased physical activity and improved air quality. For detailed data on health in Livermore, see Appendix D.

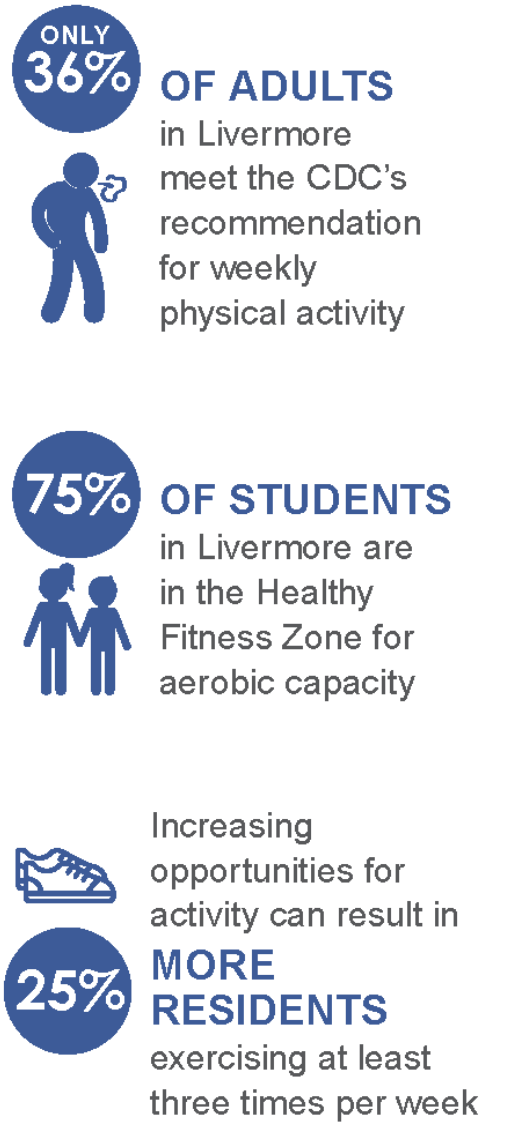
PHYSICAL ACTIVITY

The Centers for Disease Control and Prevention (CDC) recommends adults get 150 minutes of physical activity each week. According to the California Health Interview Survey Neighborhood Edition, only 36 percent of adults in Livermore meet this recommendation. While this is a small sample of the population, the rate is consistent with county and statewide rates at 37 and 33 percent respectively.

The Department of Education, which collects physical fitness data for students, reports approximately 75 percent of students in the Livermore Valley Joint Unified School District are in the Healthy Fitness Zone for aerobic capacity. Similar to adult activity rates, this is on par with county and state levels.

The Department of Education also reports slightly lower rates of obese or overweight youth in Livermore compared to state and county data, while California Health Interview Survey Neighborhood Edition data shows Livermore adults are slightly more likely to be obese or overweight than their peers in Alameda County or California.

Improving walking and bicycling networks can improve physical activity and reduce obesity in both children and adults. The CDC has found increasing opportunities for activity can result in 25 percent more residents exercising at least three times per week.

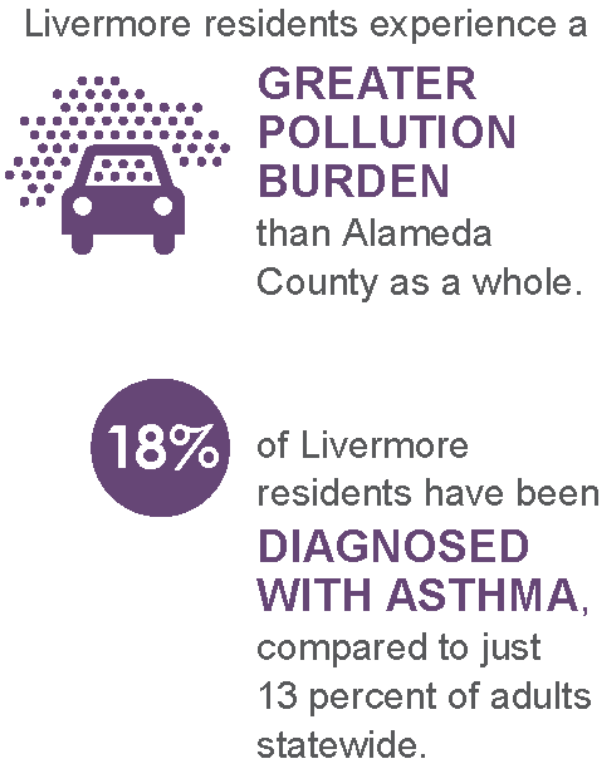


California Health Interview Survey Neighborhood Edition; California Department of Education; and Centers for Disease Control and Prevention

AIR QUALITY

CalEnviroScreen 2.0 is a tool developed by the Office of Environmental Health Hazard Assessment team that measures pollution and population factors to identify census tracts where adverse health effects are disproportionately distributed. According to CalEnviroScreen 2.0, Livermore residents experience a greater pollution burden than Alameda County as a whole. Livermore ranks in the 51st percentile, while Alameda County ranks in the 34th percentile. With regards to traffic related pollution, Livermore census tracts rank in the 36th percentile on average for exposure to PM2.5 and in the 45th percentile for diesel emissions. Exposure to traffic pollution can have adverse health effects, such as respiratory issues, heart and lung disease, and asthma.

Livermore residents also disproportionately suffer from asthma compared to the rest of California, which may be related to increased air pollution exposure in the City. The California Health Interview Survey Neighborhood Edition reports 18 percent of Livermore residents have been diagnosed with asthma, compared to 15 percent of youth and 13 percent of adults statewide.



CalEnviroScreen 2.0; California Health Interview Survey Neighborhood Edition

SAFETY

Safety and comfort play a significant role in the decision to walk or bicycle instead of some other mode of transportation. While these two factors are closely related, safety refers to the real risk of injury or fatality due to a collision, while comfort refers to a person's perception of the bicycle or pedestrian facility provided on a particular street. This section discusses safety in Livermore; comfort is addressed in the following data-driven analysis section.

Identification of locations and behaviors involved in bicycle and pedestrian related crashes informed this Plan's recommendations. A summary is presented in this section, and Appendix E contains a detailed analysis. Collisions are mapped in Figure 4-2.

Bicycle and pedestrian related collisions in Livermore were analyzed using the most recent five years of available data, from 2010 to 2014, accessed through the Statewide Integrated Traffic Records System (SWITRS). SWITRS is likely an underestimate of crashes, as not all incidents are reported to law enforcement—especially those that do not result in property damage.

BICYCLE-INVOLVED COLLISIONS

There were a total of 122 bicycle-related collisions during the study period, representing 2.3 percent of all collisions in Livermore. No bicyclist fatalities were recorded, but four bicyclists were severely injured.

The most commonly reported factors that contributed to these collisions included:

- Traveling on the wrong side of the road
- Improper turning
- Failure to yield to a motor vehicle

PEDESTRIAN-INVOLVED COLLISIONS

There were 72 pedestrian-related collisions during the study period, representing 1.4 percent of all collisions in Livermore. Three collisions resulted in pedestrian fatalities, and nine pedestrians were severely injured.

The most commonly reported contributing factors included:

- Motorist failing to yield to a pedestrian
- Pedestrian failing to yield to a motor vehicle
- Unsafe starting or backing up by a motorist

COMPARISON TO SURROUNDING AREA

Compared to nearby cities and Alameda County, Livermore has a lower rate of bicycle collisions and a higher rate of pedestrian collisions, as shown in Table 4-1. This table uses commute to work modes as reported in American Community Survey 2014 5-year estimates.

Table 4-1: Crashes Compared to Surrounding Area

DATA	LIVERMORE	PLEASANTON	DUBLIN	ALAMEDA COUNTY
Bicycle collisions	122	155	35	3,305
Bicycle commuters	580	293	99	13,812
Collisions/100 bicyclists	21	53	35	24
Pedestrian collisions	72	63	35	3283
Pedestrian commuters	371	821	483	25,802
Collisions/100 pedestrians	19	8	7	13

This table shows the risk of a bicyclist or pedestrian being exposed to a collision while accounting for walking and bicycling rates in the community. For example, Livermore has nearly four times as many bicycle collision than Dublin, but it has nearly six times as many bicycle commuters. Therefore the exposure rate is lower in Livermore than Dublin.

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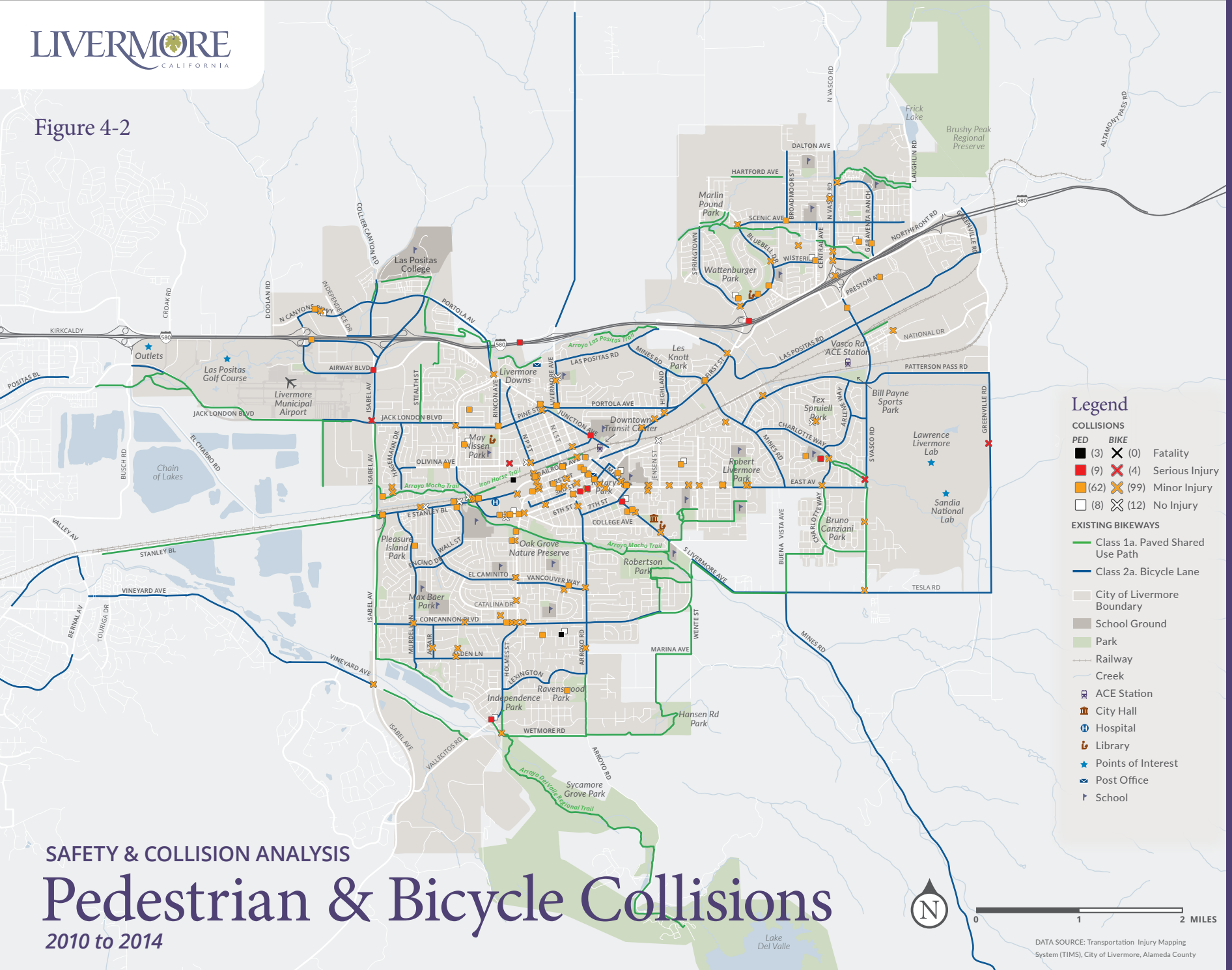
Figure 4-2



SAFETY & COLLISION ANALYSIS

Pedestrian & Bicycle Collisions

2010 to 2014

DATA-DRIVEN ANALYSIS

Data-driven analyses help document current conditions, projected demand, and opportunities to improve the bicycling and walking environment in Livermore. Four analyses were completed during development of this Plan, described at right.

DEMAND ANALYSIS

The first data-driven analysis used is the Bicycle and Pedestrian Composite Demand Model. This process identifies dense activity areas most likely to have high demand for walking and biking by quantifying factors such as where people live, work, learn, play, shop, and access transit—many of the activity generators identified in Chapter 3. This analysis does not reflect current levels of walking and bicycling activity, but instead captures latent demand—the potential for walking and bicycling.

Results of the composite demand model are used to identify areas of higher demand within Livermore and prioritize locations for improvements. The model results, illustrated in Figure 4-3, show high demand areas in orange. Areas that yielded highest demand include the confluence of schools, retail, transit, and higher density residential areas. Areas with potential high walking and bicycling demand include:

- Downtown Livermore, including the Transit Station
- Schools, especially Mendenhall Middle School and Livermore High School
- Parks
- Las Positas College

See Appendix F for a detailed description of the Demand Model process.

DEMAND ANALYSIS
Identifies dense activity areas where there is likely to be high demand for walking and bicycling facilities

BICYCLE LEVEL OF TRAFFIC STRESS
Identifies street segments where people are unlikely to be comfortable bicycling due to stressful factors like speeding cars, high traffic volumes, or bicycle facilities that do not provide enough separation from moving cars

PEDESTRIAN LEVEL OF SERVICE
Identifies street segments where people are unlikely to be comfortable walking due to sidewalk gaps, challenging crossings, or speed of traffic

NETWORK CONNECTIVITY
Identifies gaps and barriers in the current bicycling and walking environments

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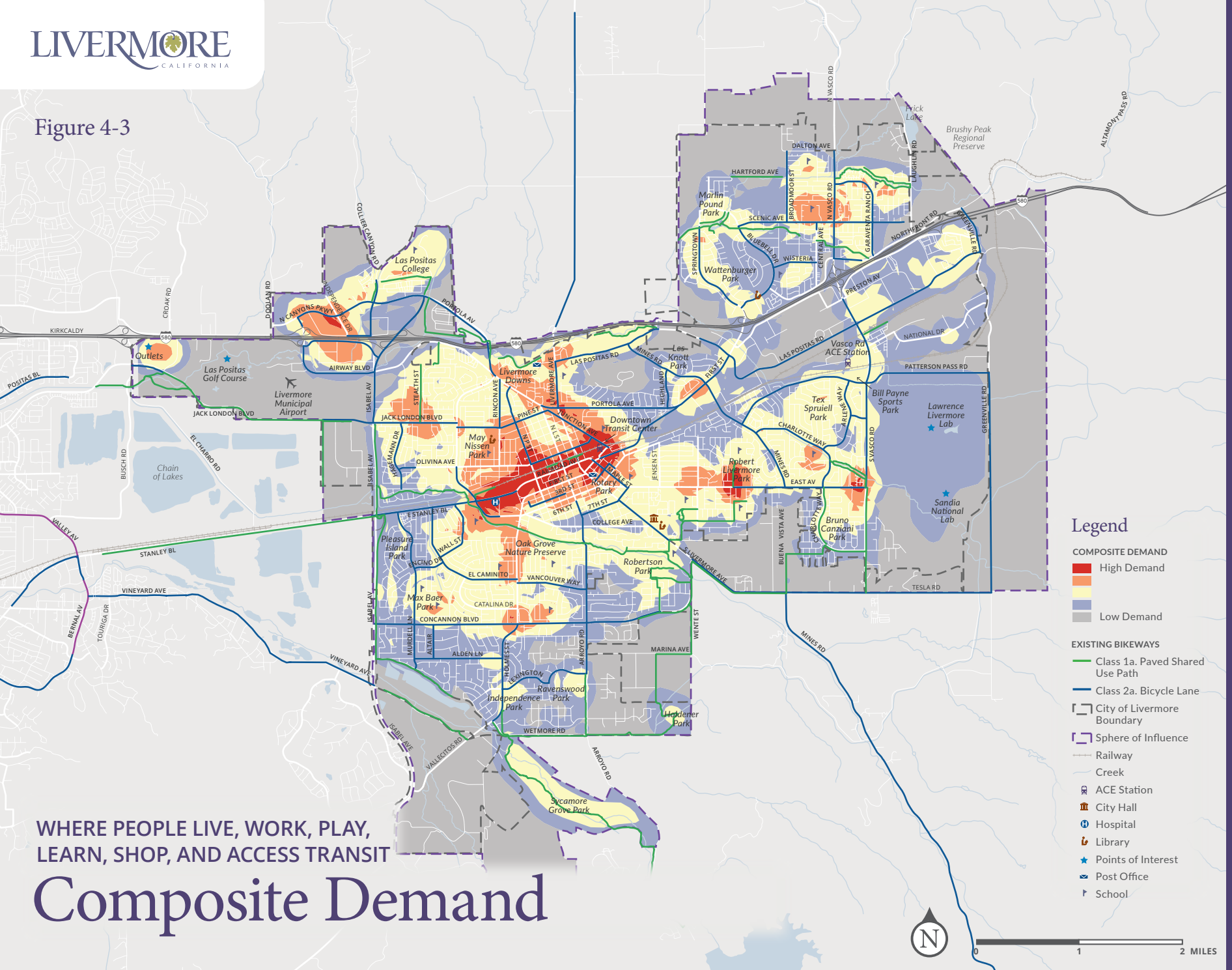
Figure 4-3



WHERE PEOPLE LIVE, WORK, PLAY, LEARN, SHOP, AND ACCESS TRANSIT

Composite Demand

Legend

COMPOSITE DEMAND

- High Demand
- Low Demand

EXISTING BIKEWAYS

- Class 1a. Paved Shared Use Path
- Class 2a. Bicycle Lane
- City of Livermore Boundary
- Sphere of Influence
- Railway
- Creek
- ACE Station
- City Hall
- Hospital
- Library
- Points of Interest
- Post Office
- School

N

0 1 2 MILES

BICYCLE LEVEL OF TRAFFIC STRESS

The second analysis completed for this Plan was the Bicycle Level of Traffic Stress (BLTS) model. BLTS models score street segments and intersections based on characteristics of the roadway and the bicycle facility provided. The analysis is based on a number of factors, including:

- Posted speed limit
- Roadway width and number of travel lanes
- Intersection conditions
- Presence and character of bicycle facilities
- Land use context

BLTS models measure the perceived discomfort associated with bicycling in or adjacent to motor vehicle traffic. Higher-stress facilities provide little comfort for bicyclists, and are likely to be used only by the most confident and fearless riders. Low-stress facilities offer higher comfort, and are likely to be attractive to a broad group of riders. This analysis classifies road segments and intersections into four categories, with BLTS 1 being the least stressful and BLTS 4 being the most stressful.

For a bicycle network to attract the broadest segment of the population, it must provide a continuous and comfortable experience for users. A continuous and comfortable network will allow citizens of all ages and abilities to better consider bicycling as a viable and safe form of transportation.

Results of the BLTS model are shown in Figure 4-4. Just over 60 percent of the roadway network in Livermore was rated BLTS 1 or 2, meaning they are relatively low-stress environments for bicycling. The remaining segments, rated BLTS 3 or 4, are primarily higher speed arterials and other streets comfortable only for the most experienced bicyclists.

For additional detail on the BLTS model, see Appendix G.

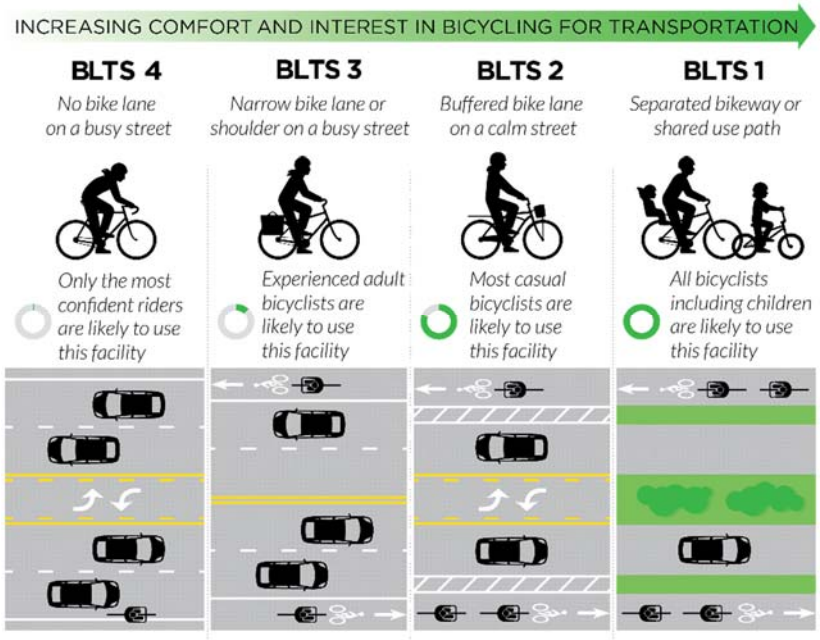


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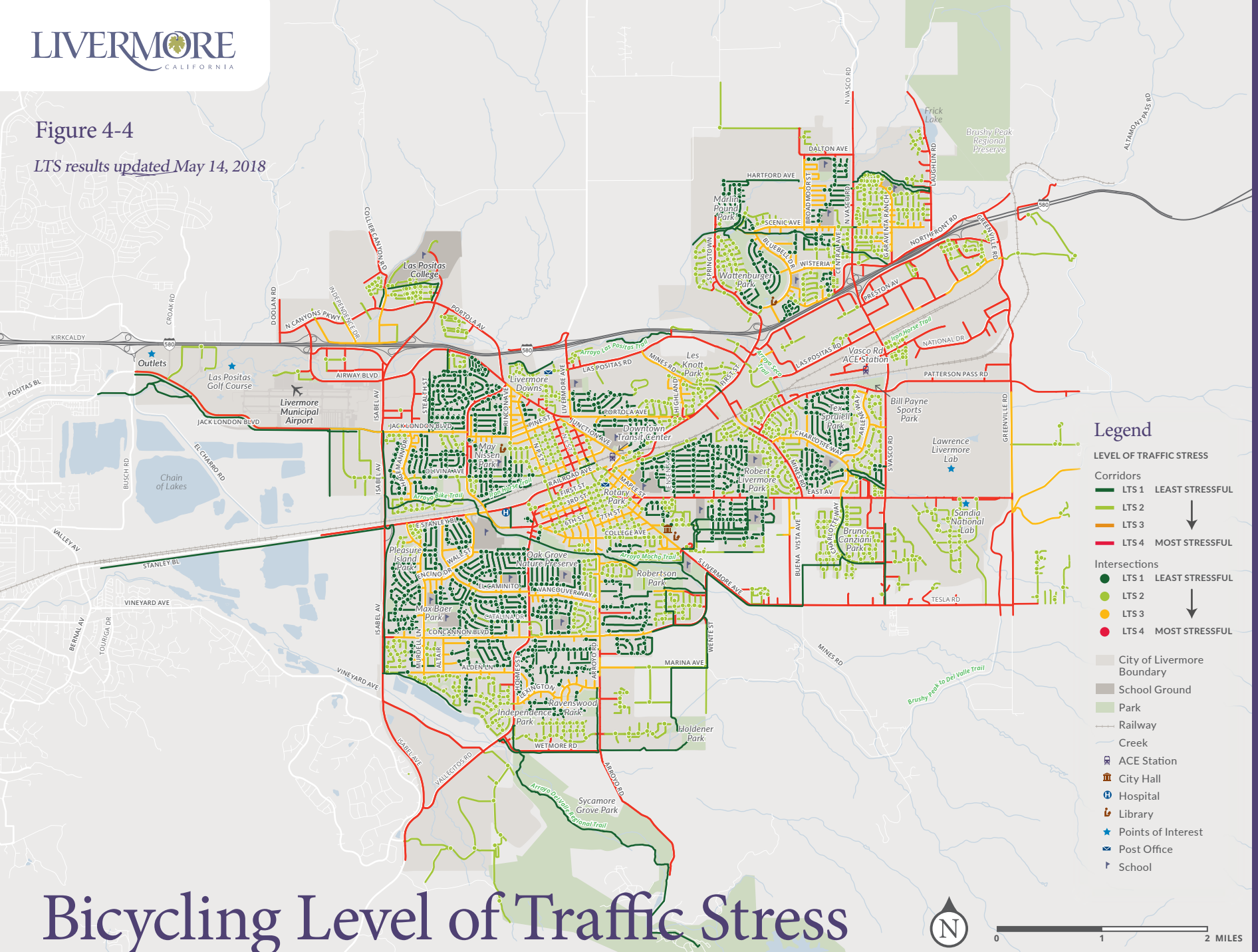
Figure 4-4

LTS results updated May 14, 2018



Bicycling Level of Traffic Stress

PEDESTRIAN LEVEL OF SERVICE

The third data-driven analysis completed was a Pedestrian Level of Service (PLOS) model. Similar to the BLTS process, a PLOS model helps identify where pedestrian improvements could improve comfort, and where they may have the greatest impact given the existing conditions and the anticipated demand.

The model scores street segments and intersections based on characteristics that impact pedestrian safety, comfort, and ease of movement. The PLOS analysis is based on four factors:

- Presence of sidewalks
- Posted speed limit
- Roadway width (number of travel lanes)
- Pedestrian buffers (sidewalk is separated from travel lanes by bicycle lanes, on-street parking, and/or landscaping)

Results of the PLOS model are shown in Figure 4-5. Key outcomes of the analysis include:

- High levels of pedestrian comfort were found on roughly 90 percent of roadways in Livermore, generally on low-speed residential streets and in the downtown core
- Low levels of pedestrian comfort were found on the remaining 10 percent of roadways, primarily on higher-speed arterials, collectors, and state routes, which generally lack sidewalks

While the overwhelming majority of roadways are relatively comfortable for walking, these roadways tend to be islands isolated by arterials or other barriers that make it challenging to reach meaningful destinations. Improving access along and across these key roadways will be vital to creating an inviting walking environment.

For additional detail on the PLOS model, see Appendix H.

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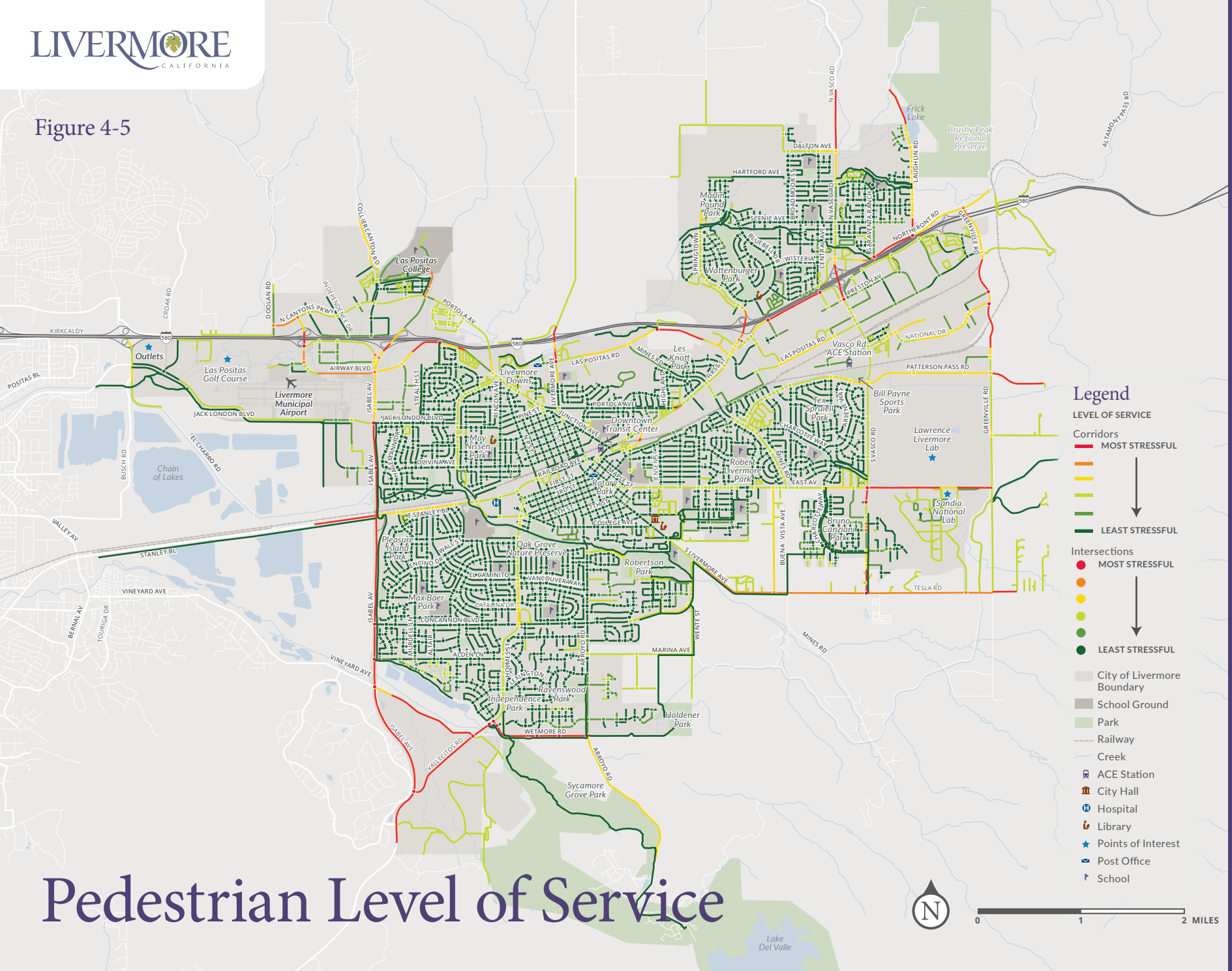
Figure 4-5



Pedestrian Level of Service

NETWORK CONNECTIVITY ANALYSIS

This fourth data-driven analysis evaluates connectivity of the low-stress bicycling and walking networks in Livermore. On an effective bicycle and pedestrian network, people must be able to travel to their destinations without encountering barriers that discourage them from choosing active transportation. These barriers, including high speed or wide streets, railroads, waterways, or other features that do not have comfortable and convenient crossings or parallel paths.

Figure 4-6 and Figure 4-7 show the low-stress network islands for bicycling and walking in Livermore, illustrating how these isolated pockets are separated by high stress segments or crossings that make it challenging for people to reach their destinations.

The bicycling network analysis shows relatively small islands of high comfort suggesting most bicyclists would be uncomfortable riding beyond their neighborhood due to stressful crossings or route segments. Downtown Livermore is surrounded by high-stress network segments, which makes it challenging to access.

The pedestrian network analysis shows fewer barriers, by comparison. With the exception of a few key routes and crossings, walking is likely to be a comfortable option for many residents. This analysis does not take lighting into account, which can affect both visibility and personal security for pedestrians, so walking at night may be more challenging.

COMBINED ANALYSIS RESULTS

The synthesis of the Demand Analysis, the Bicycle Level of Traffic Stress (BLTS), Pedestrian Level of Service (PLOS), and the Network Connectivity Analysis informed the Plan's recommended infrastructure and programmatic improvements. Each of these analyses are strong and useful tools for understanding both current conditions and projected demand for bicycle and pedestrian facilities in Livermore.

By overlaying the analysis results, locations where high demand coincides with high-stress or disconnected networks are identified and can be prioritized for improvements. These are locations where projects are likely to have the greatest benefit for walking and bicycling comfort and connectivity.

Figure 4-8 illustrates the LTS network results over the composite demand analysis. The downtown core and surrounding areas, which have high composite demand, are intersected by high stress roadways for bicyclists. These roadways may be significant barriers for the bicyclists who wishes to travel in and around the downtown area.

Figure 4-9 illustrates the PLOS network results over the composite demand analysis. As shown on the map, high demand areas throughout the city are complemented by high supply pedestrian roadways. In fact, there are very few low supply pedestrian roadways in high demand areas of the city. Key connecting streets in high demand areas like E Stanley Blvd, Las Positas Road, East Ave, and Holmes St could benefit from network and crossing improvements so that pedestrians can more easily traverse the high supply pedestrian network.

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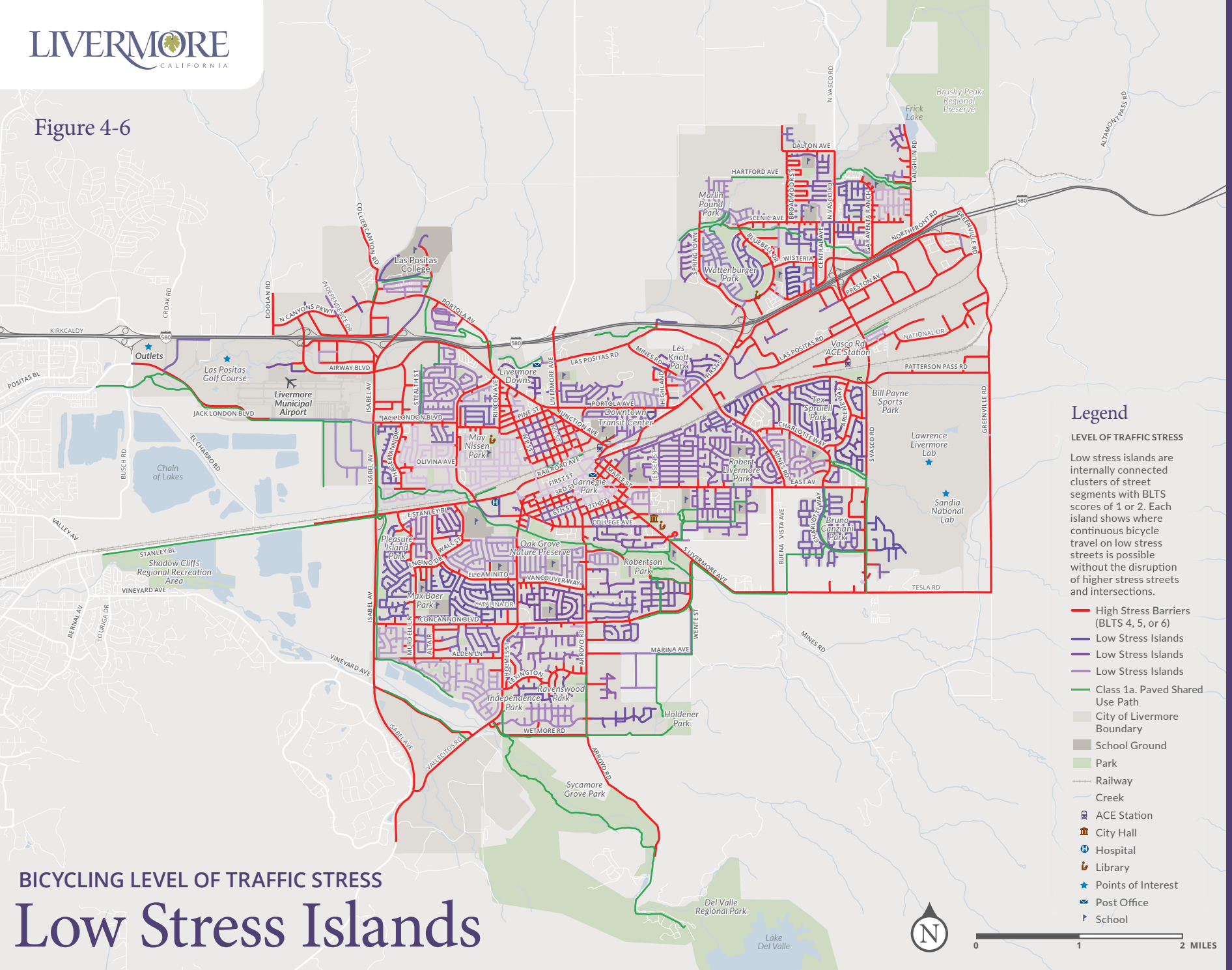
Figure 4-6



BICYCLING LEVEL OF TRAFFIC STRESS

Low Stress Islands

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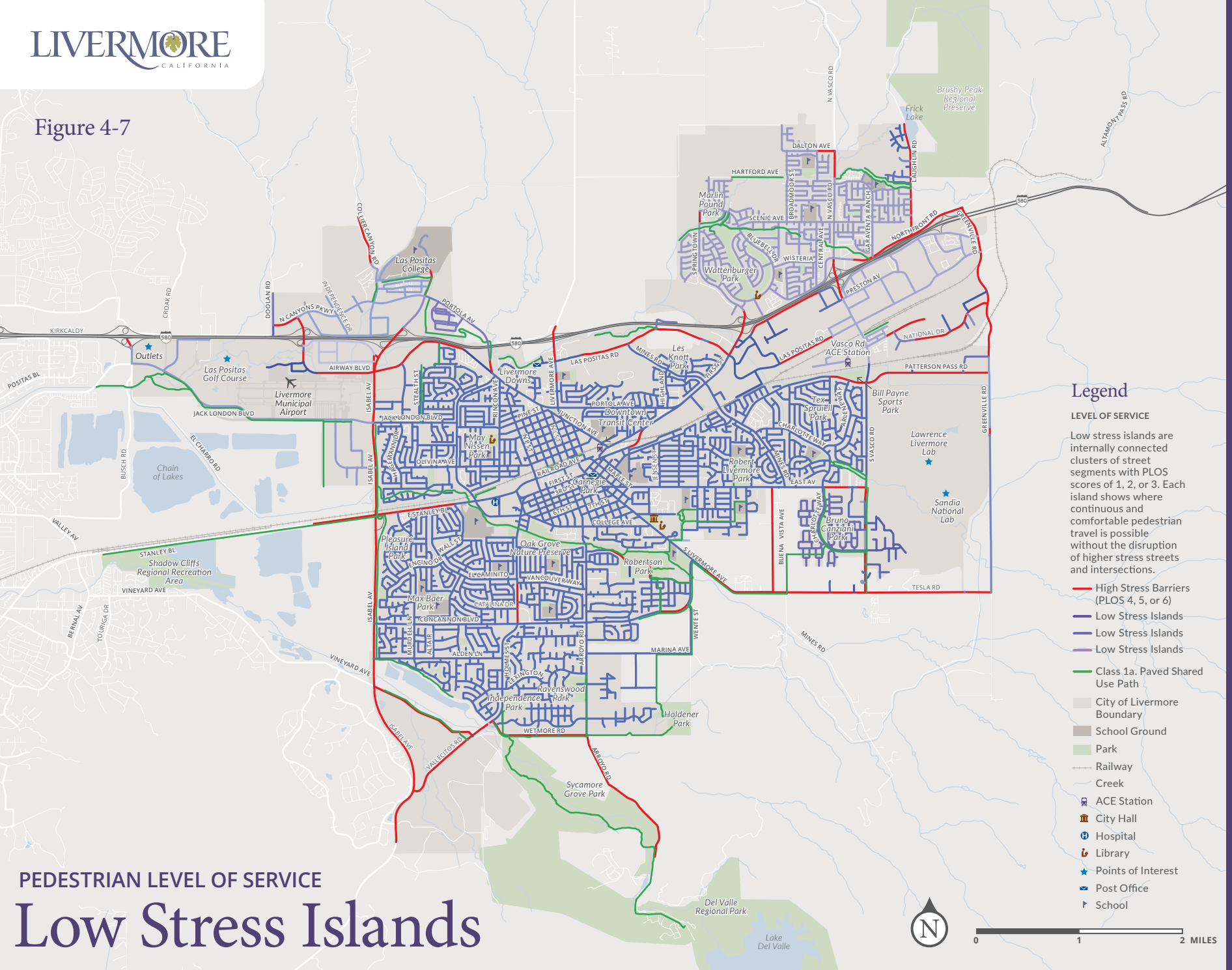
Figure 4-7



PEDESTRIAN LEVEL OF SERVICE

Low Stress Islands

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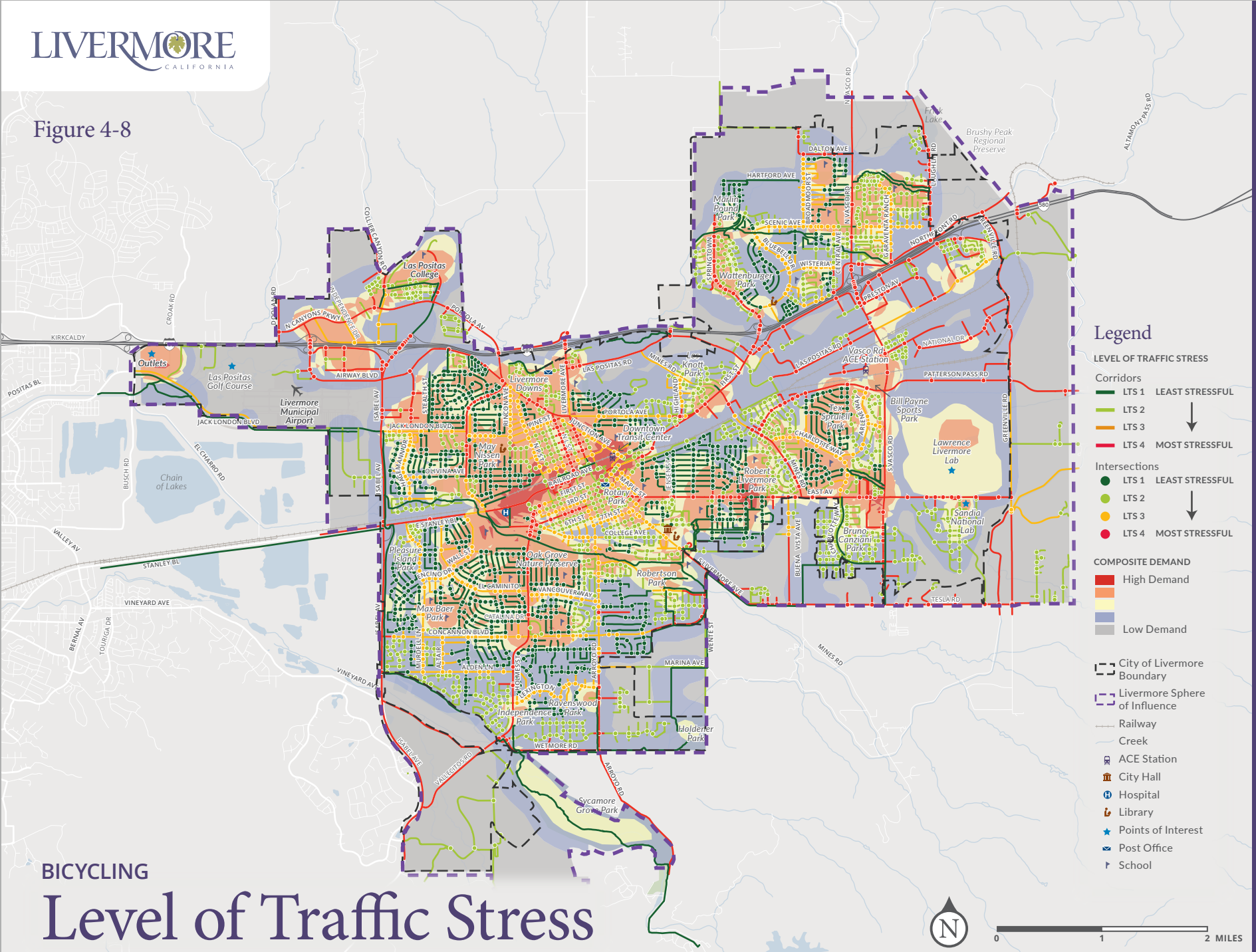
Figure 4-8



BICYCLING

Level of Traffic Stress

over Composite Demand

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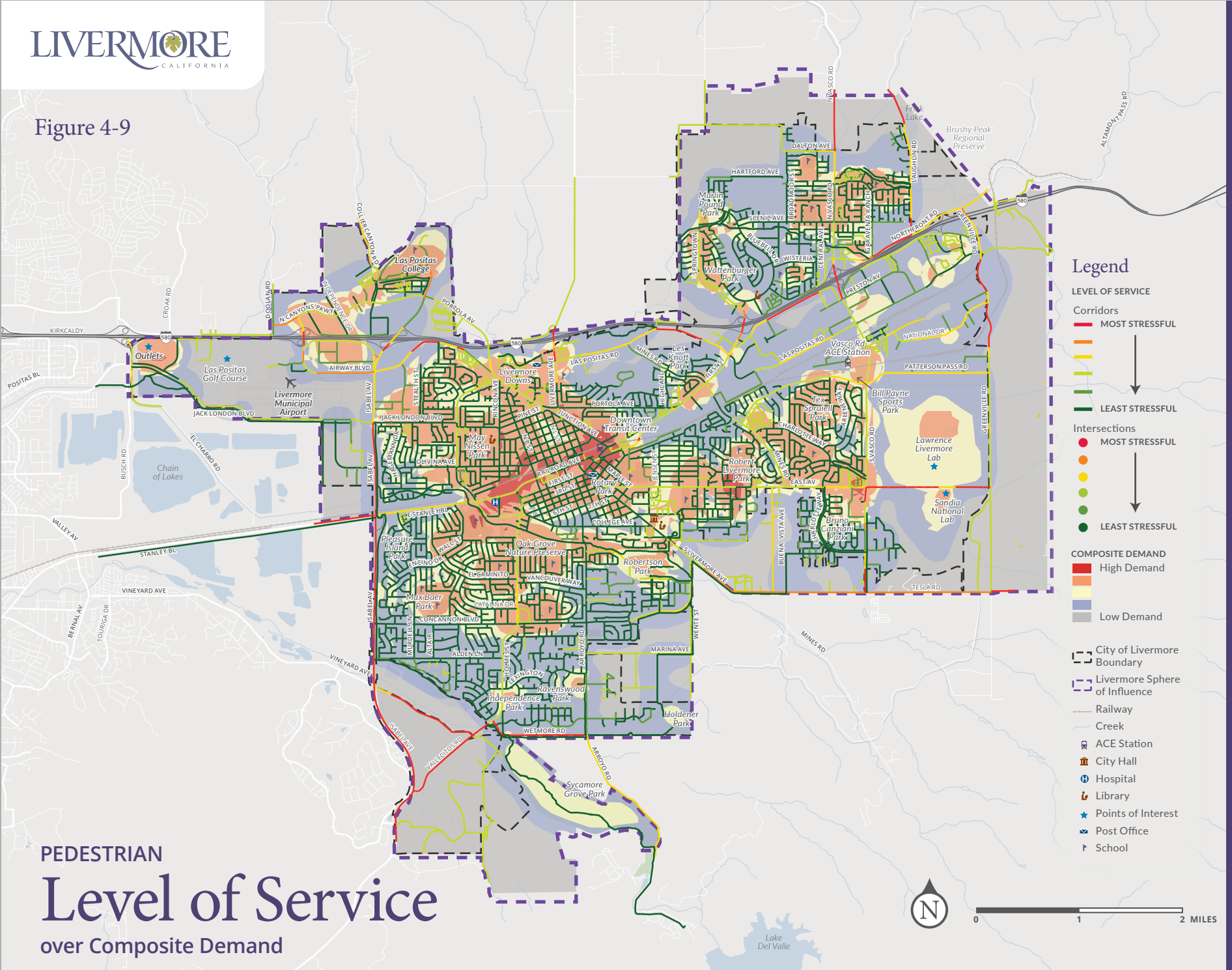
Figure 4-9



PEDESTRIAN

Level of Service

over Composite Demand

FOCUS AREAS

After reviewing existing conditions, listening to community needs and completing the data-driven analyses described in this chapter, five overarching themes for needs and opportunities emerged. To achieve the Plan's vision and goals, the recommended improvements are structured to provide or enhance access to these focus areas.

SCHOOL ACCESS

Many students must cross major arterial roadways to get to school. This Plan includes recommendations to increase the safety and comfort of students accessing their schools.

DOWNTOWN ACCESS

High stress streets surround the downtown area, making it difficult to comfortably access downtown on foot or by bike. Improving routes and intersections into and throughout the downtown area will encourage more active transportation in the community.

CROSSTOWN ROUTES

The city's major arterial streets carry multiple lanes of high speed vehicle traffic, creating high stress corridors and crossings for bicyclists and pedestrians. This Plan recommends increasing safety and comfort for active transportation users along and across these corridors, enabling more people to reach their destinations on foot or by bicycle.

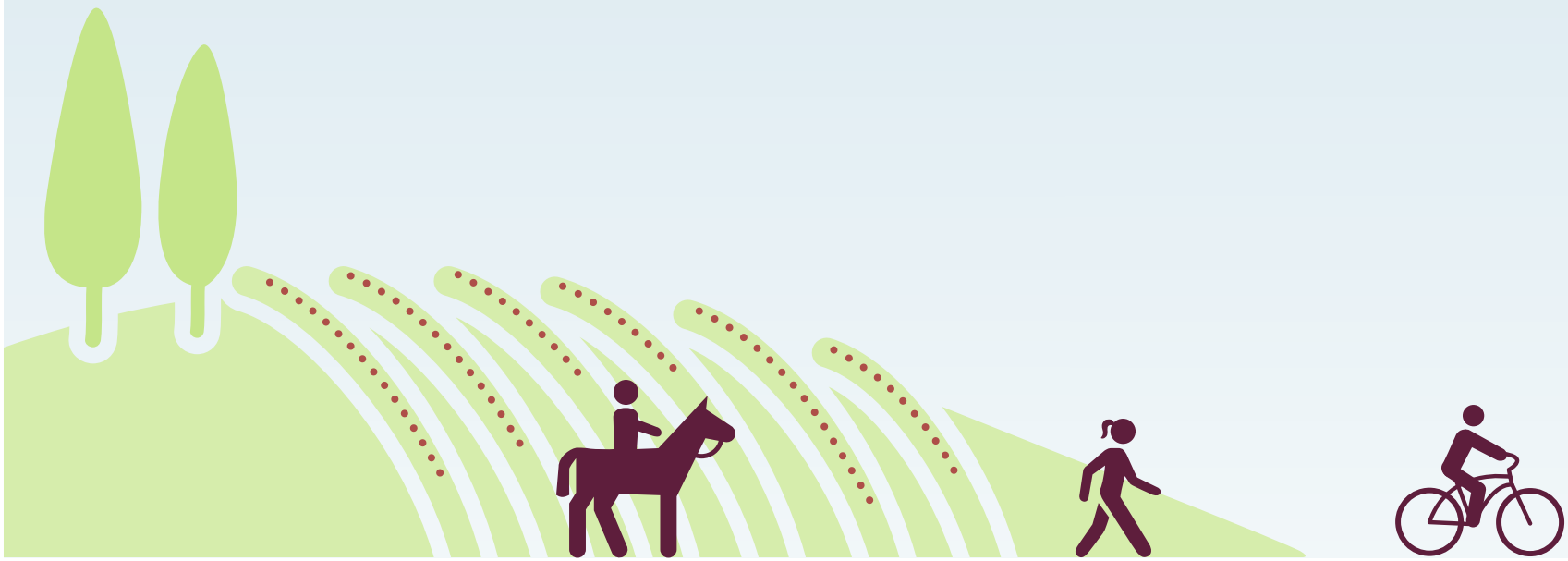
TRAIL CONNECTIONS

Livermore's extensive trail network is a community asset cherished by residents and visitors alike, but gaps between the trail system and the street network create connectivity challenges. This Plan emphasizes closing key gaps to provide a seamless active transportation network, while also improving trail access to regional parks, downtown Livermore, transit, and other destinations.

I-580 CROSSINGS

Residents expressed a strong desire for improved access across I-580, including connections to Las Positas College, Northeast Livermore neighborhoods, and downtown. This Plan identifies opportunities to improve existing I-580 crossings as well as provide new crossings.

05
Projects & Programs



CHAPTER 5 PROJECTS & PROGRAMS

This Plan's proposed active transportation network seeks to provide the Livermore community with safe, convenient, and healthy transportation choices. The network also enhances regional connectivity to adjacent communities, regional parks, and other destinations through an extensive trail network and connected bicycling and walking facilities.

Building on the needs and opportunities identified through the evaluation of existing conditions, community input, health, safety, and data-driven analyses, this chapter summarizes the projects, programs, and citywide efforts. These improvements address network gaps informed by the needs analysis, goals identified through community input, and best practices in active transportation planning. For a detailed list of projects, see Appendix I. Detailed trail improvements are described in Appendix J. Proposed and continuing programs are described in Appendix B.

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

This chapter is divided into sections that describe the proposed walking, bicycling, and trail improvements. Proposed infrastructure projects are separated into two categories: network improvements and crossing improvements. Additionally, proposed citywide projects include policies or standards for bicycle and pedestrian amenities that should be implemented as development occurs or opportunities arise. Finally, programs include current and proposed new activities to support active transportation, organized into four groups: education, encouragement, enforcement, and evaluation.

NETWORK IMPROVEMENTS

Proposed network improvements are intended to make walking and bicycling more comfortable, enjoyable, and safer when traveling along Livermore corridors. Network projects include a variety of bikeway facilities and sidewalk projects. Bikeways are categorized based on the four classes recognized by Caltrans, with subdivisions unique to Alameda County. These classes are described in detail in Chapter 3. A summary of existing and proposed network improvements is provided in Table 5-1, and mapped in Figure 5-1. Network project maps by facility type are included in Appendix I.

Table 5-1: Summary of Proposed Network Improvements (Mileage)

FACILITY TYPE	EXISTING	PROPOSED	TOTAL
Class 1A Shared Use Path	40	80.8	120.8
Class 2A Bicycle Lanes	66	16.3	82.3
Class 2B Buffered Bicycle Lanes	0	16.8	16.8
Class 3A Bicycle Route	0	1.2	1.2
Class 3E Bicycle Boulevard	0	19.2	19.2
Class 4A Separated Bikeway	0	13.4	13.4
Sidewalk	566	6.0	572.0
TOTAL MILES	**672**	**153.7**	**825.7**

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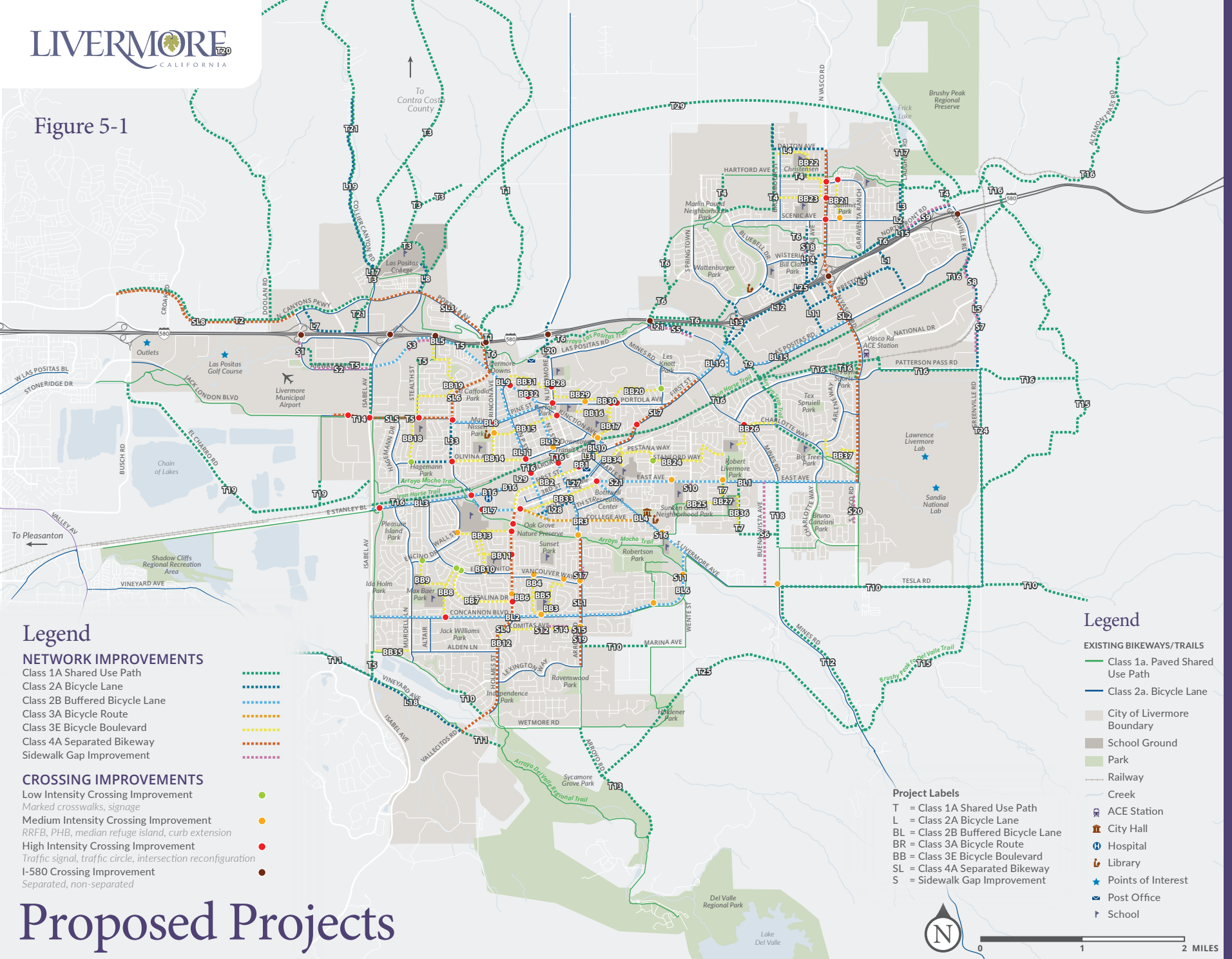
Figure 5-1



Proposed Projects

CROSSING IMPROVEMENTS

Crossing improvements are an essential complement to the network improvements, as they connect routes at intersections. For Livermore, crossing improvements are classified as low, medium, or high intensity based on the complexity of facilities required. High intensity crossings are further divided into low and high cost categories. Typical improvements in each category are described in the following sections, and summarized in Table 5-2. Crossing improvements are mapped in Figure 5-2.

Table 5-2: Summary of Crossing Improvements

CROSSING INTENSITY	NUMBER
Low	6
Medium	25
High/Low	24
High/High	11
I-580 Crossings	10
TOTAL	**76**

Crossing projects were classified based on five factors:

- Existing conditions at the intersection to categorize each location as affecting bikes and/or pedestrians
- Number of travel lanes at the intersection
- Average daily traffic volumes (ADT)
- Bicycle Level of Traffic Stress (BLTS) scores, ranging from 1 (low stress) to 4 (high stress); see Chapter 4 and Appendix G
- Pedestrian Level of Service (PLOS) scores, ranging from 1 (low stress) to 6 (high stress); see Chapter 4 and Appendix H

LOW INTENSITY CROSSINGS

The intersections receiving low-intensity crossing improvements primarily provide access to schools and are local on small, local streets. These crossing improvements primarily affect pedestrians.

Existing conditions for bicyclists at these crossing locations generally already have low BLTS scores and do not require additional bicycle-specific treatments.

Treatments for pedestrians at these crossings could include installing marked crosswalks, signage warning vehicles of an upcoming pedestrian crossing location, curb ramps, and minor sidewalk repairs. These locations typically have low enough volumes that pedestrians can find a break in traffic to cross with the presence of a marked crosswalk.

MEDIUM INTENSITY CROSSINGS

Intersections that have medium traffic volumes, generally defined as less than 12,000 ADT, and two to four travel lanes need a more intensive treatment in order to become a low-stress crossing for bicyclists and pedestrians because the higher traffic volumes make it more difficult to find a break in traffic to cross. With higher traffic volumes, these intersections are typically on larger streets, such as Holmes Street and Mines Road.

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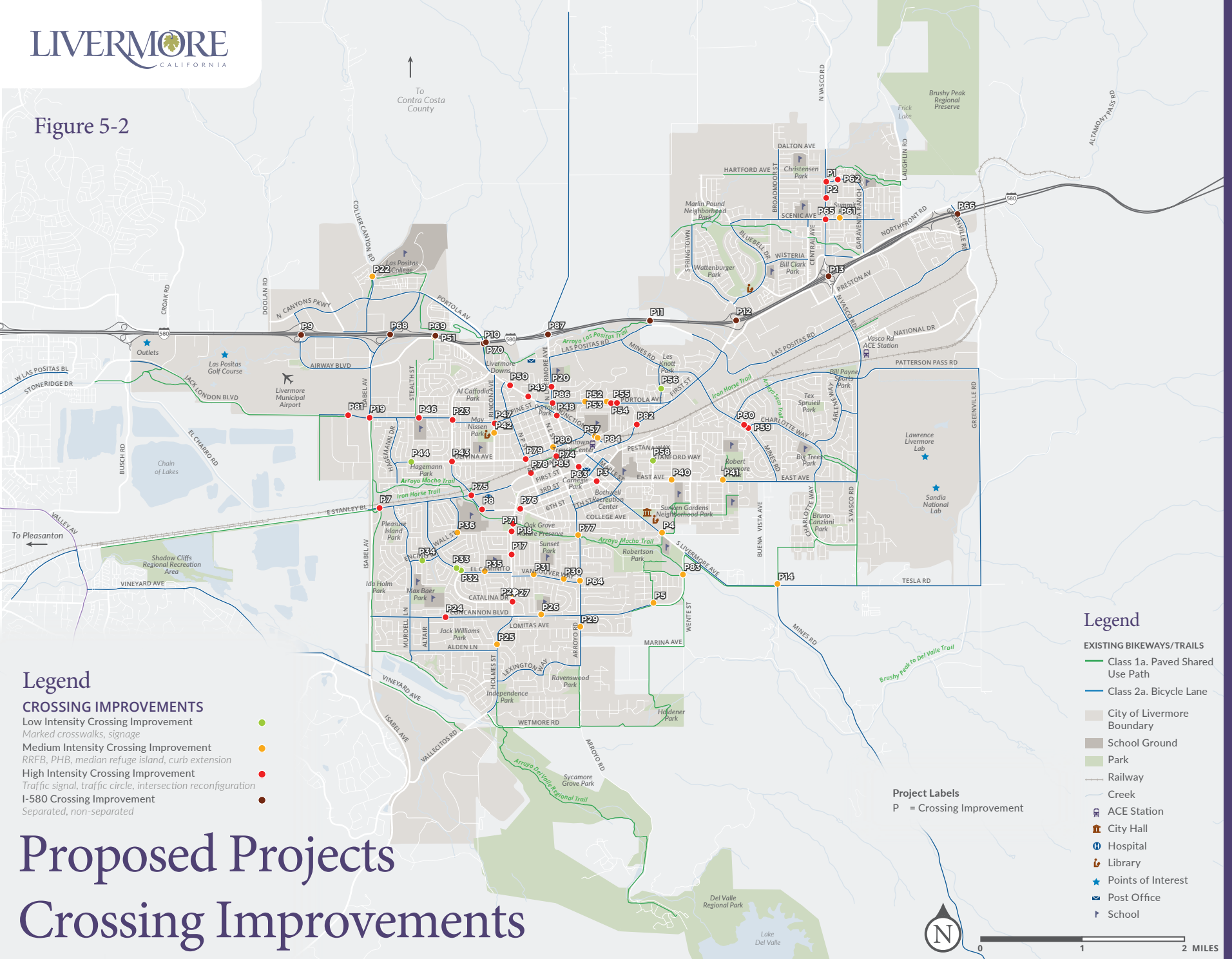
Figure 5-2



Legend

CROSSING IMPROVEMENTS

- Low Intensity Crossing Improvement
  Marked crosswalks, signage
- Medium Intensity Crossing Improvement
  RRFB, PHB, median refuge island, curb extension
- High Intensity Crossing Improvement
  Traffic signal, traffic circle, intersection reconfiguration
- I-580 Crossing Improvement
  Separated, non-separated

Proposed Projects
Crossing Improvements

Project Labels
P = Crossing Improvement

Legend

EXISTING BIKEWAYS/TRAILS

- Class 1a. Paved Shared Use Path
- Class 2a. Bicycle Lane
- City of Livermore Boundary
- School Ground
- Park
- Railway
- Creek
- ACE Station
- City Hall
- Hospital
- Library
- Points of Interest
- Post Office
- School

N

0 1 2 MILES

Medium intensity crossings may also include more moderate improvements such as curb extensions, refuge islands, and pedestrian beacons or rectangular rapid-flashing beacons (RRFBs). Where traffic signals already exist, bicycle-specific intersection treatments may include bike boxes or two-stage turn boxes. Where traffic signals do not exist, bicycle-specific intersection treatments may include signage, improved intersection crossing markings, and/or two-stage turn boxes.

HIGH INTENSITY CROSSINGS

Intersections in the high-intensity crossing treatment group affect either bicyclists, primarily at signalized locations, or both bicyclists and pedestrians, primarily at unsignalized locations. The intersections in this group have high traffic volumes (12,000+) and scored LTS 3 or 4 for bicyclists, indicating high intensity treatments are needed to increase safety and comfort.

High intensity crossings include more complex improvements, including new traffic signal configurations, relocating curbs, adding pedestrian actuation buttons, intersection crossing markings, stop control, signalization, intersection reconfiguration, median refuge islands, two-stage turn boxes, bike boxes, or bicycle signal heads. High intensity crossings are further divided into high and low cost efforts, indicating whether traffic signals require major pole relocation and signal modification work (high intensity, high cost), or whether only minor adjustments are required (high intensity, low cost).

I-580 CROSSINGS

In addition to crossings of local streets, ten crossings of I-580 were identified. Because these grade-separated crossings will require significant investment and coordination between the City and Caltrans, these projects were not included in the prioritization process in this Plan. Rather, this Plan recommends studying interchanges for possible short-term improvements. Additionally, the projects will be moved forward with Caltrans as funding and opportunities become available. In the interim, the City may apply for funding to study the existing crossings and develop design concepts to improve walking and bicycling access across the highway.

PROJECT GROUPS

Community input received throughout development of this Plan highlighted five focus areas for infrastructure: school access, downtown access, crosstown routes, trail connections, and I-580 crossings. Sidewalk gap closures, while they support many of these focus areas, have been presented as a separate group due to the process for implementation.

Therefore, the network and crossing projects recommended in this plan are organized into six project groups to reflect local priorities.

School Access projects improve safety and comfort for students walking and bicycling to school, considering safe access points for each school to maintain a separation between students walking and bicycling and vehicles picking up and dropping off.

Downtown Access projects create a more welcoming bicycling and walking environment to and throughout the Downtown area.

Crosstown Routes seek to provide meaningful access to destinations by creating longer-distance corridors that increase

safety and comfort for active transportation along major arterial streets with multiple lanes of high speed vehicle traffic.

Trail Connections provide recreation, access to jobs, housing, regional parks, transit, shopping, and other major destinations, as well as integrate Livermore's off-street network with on-street bikeways and pedestrian facilities.

Sidewalk Gap Improvements fill in the pedestrian network to provide uninterrupted connectivity to destinations.

I-580 Crossing Improvements provide improved access across I-580, including connections to Las Positas College, Northwest and Northeast Livermore neighborhoods, and downtown. As noted previously, these improvements will be advanced through separate efforts with Caltrans and are not included in the implementation strategy for this Plan.

Projects by group are summarized in Table 5-3 and mapped in Figure 5-3.

Table 5-3: Proposed Projects by Group

PROJECT GROUP AND FACILITY	SEGMENTS	MILES
School Access	**73**	**18.2**
Class 3E Bicycle Boulevard	34	18.2
Low Intensity Crossing	6	--
Medium Intensity Crossing	15	--
High/Low Intensity Crossing	10	--
High/High Intensity Crossing	8	--
Downtown Access	**22**	**7.8**
Class 2A Bicycle Lane	6	2.0
Class 2B Buffered Bicycle Lane	3	2.9
Class 3A Bicycle Route	1	1.2
Class 3E Bicycle Boulevard	2	1.0
Class 4A Separated Bikeway	1	0.7
Medium Intensity Crossing	2	--
High/Low Intensity Crossing	6	--
High/High Intensity Crossing	1	--
Crosstown Routes	**54**	**40.9**
Class 2A Bicycle Lane	22	14.7
Class 2B Buffered Bicycle Lane	12	13.4
Class 4A Separated Bicycle Lane	9	12.7
Medium Intensity Crossing	4	--
High/Low Intensity Crossing	6	--
High/High Intensity Crossing	1	--
Trail Connections	**75**	**80.8**
Class 1A Paved Shared Use Path	68	80.8
Medium Intensity Crossing	4	--
High/Low Intensity Crossing	2	--
High/High Intensity Crossing	1	--
Sidewalk Gap Closure	**19**	**6.0**
Sidewalk	19	6.0
I-580 Crossing Improvements	**10**	**--**
I-580 Crossing Improvements	10	--

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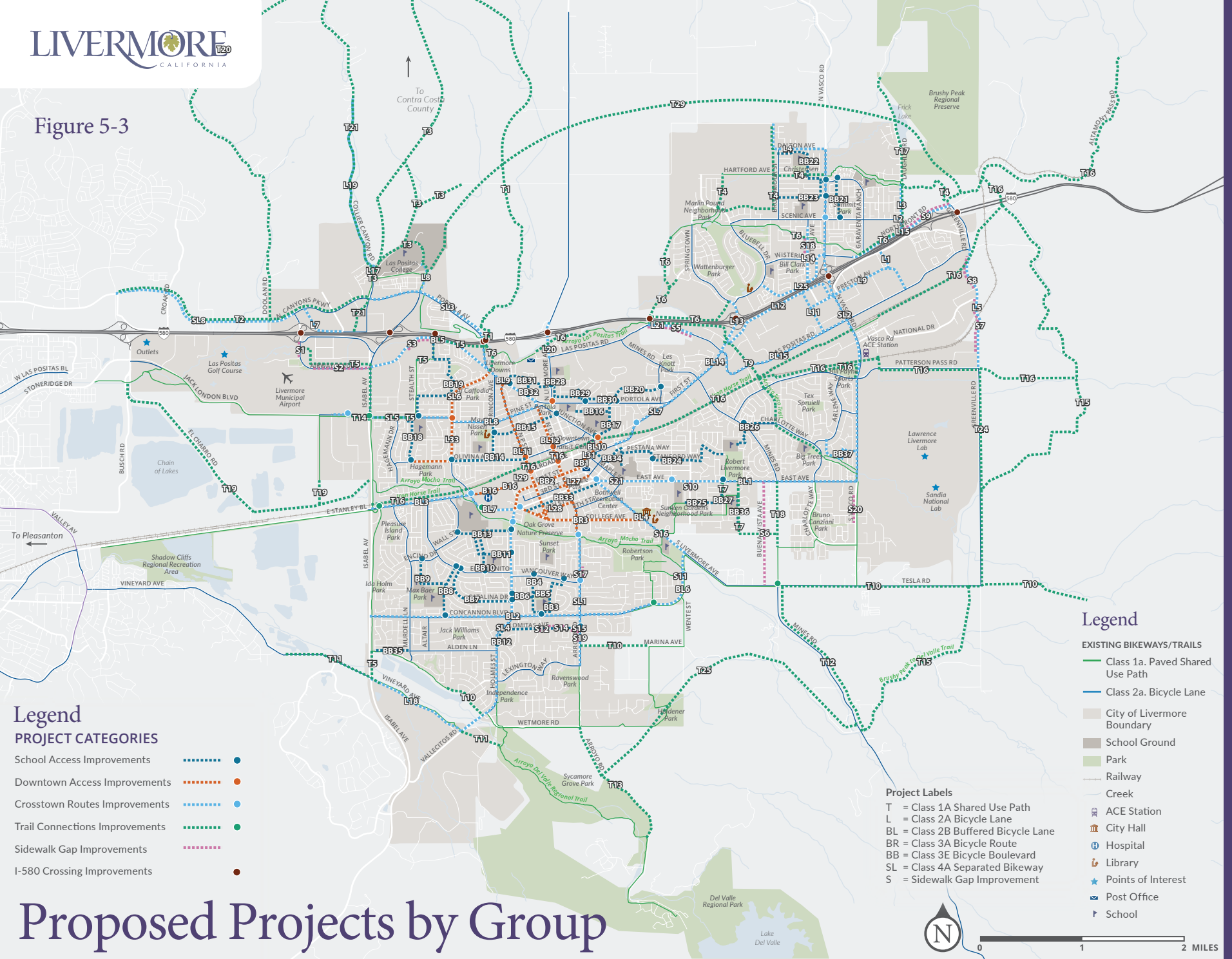
Figure 5-3



Proposed Projects by Group

CITYWIDE PROJECTS

In addition to specific infrastructure projects and related programmatic efforts, key amenities are needed citywide to complete the active transportation network. These amenities should be installed as a matter of policy in conjunction with any City project as opportunities arise, or in conjunction with development. The citywide amenities recommended in this Plan include:

- Pedestrian-scale lighting
- Development review
- Bicycle parking
- New bicycle technologies
- Streetscape amenities
- Wayfinding
- Bike share
- Traffic control zones
- Waste management
- Green bike facilities

The following sections describe these citywide projects in further detail.

PEDESTRIAN-SCALE LIGHTING

Pedestrian-scale lighting provides illumination of walking areas by installing frequent lampposts at a low height, typically around 12-15 feet tall. Pedestrian-scale lighting increases pedestrian visibility to drivers, increases pedestrian comfort and perceived sense of safety, and helps to create an inviting and vibrant streetscape for those walking. Some major arterials and trails in Livermore do not currently have pedestrian-scale lighting, deterring walking in the early morning hours and at night.

RECOMMENDATION

This Plan recommends the City develop a method to evaluate and install pedestrian-scale lighting to enhance the pedestrian environment and improve visibility in and around activity generators in key locations such as schools, downtown, transit stops, and community facilities.

DEVELOPMENT REVIEW

As new development is proposed in Livermore, the City reviews projects for compliance with the Municipal Code, Development Code, Design Standards and Guidelines, and existing plans.

RECOMMENDATION

This Plan recommends that as the City reviews new development proposals for compliance with this Plan, it seeks opportunities to implement project and program recommendations in partnership with developers.

BICYCLE PARKING

Bicycle parking needs vary by land use and demand, and whether bikes will be stored for short trips or long-term. Depending on the need, bicycle parking can take many forms, from a simple bicycle rack to storage in a locker or secure area. Livermore currently has bicycle parking at key locations in the city, including some downtown businesses and public buildings.

Bicycle parking can be categorized into short-term and long-term parking. Bicycle racks are the preferred device for short-term bike parking. These racks serve people who leave their bicycles for relatively short periods of time, typically for shopping, errands, or recreational trips. Bicycle racks provide a high level of convenience and moderate level of security.

Long-term bike parking includes bike lockers and secure parking areas (SPAs) and serve people who leave their bicycles for longer periods of time. Long-term bike parking is typically needed at destinations such as transit stations, multifamily residential buildings, and commercial buildings. These facilities provide a higher level of security than racks.

RECOMMENDATIONS

This Plan includes recommendations for installing bicycle parking in locations within the public right-of-way, identified through public input, and locations likely to have high demand. Bike parking should be provided at the following locations on public property or in the public right-of-way, at minimum:

- All city-related buildings, such as city hall, community centers, and libraries
- Downtown, in front of local businesses
- Transit stations, including ACE Stations and bus stops

This Plan also recommends evaluating existing bicycle parking standards in light of best practices recommended by the Association for Pedestrian and Bicycle Professionals (APBP), including bicycle parking ratios tied to land uses rather than automobile parking rates, and differentiation between the provision of short-term and long-term bicycle parking. Updates to the City's standards could include providing additional details regarding requirements for land uses such as transit centers, retail, and office space, among others. Additionally, this Plan recommends removing bicycle parking maximums from the Livermore Development Code.

NEW TECHNOLOGIES

New legislation in California has provided new guidance for the operation of electric bicycles, while still providing flexibility for local jurisdictions to regulate their operations as needed. As electric bicycle use grows, it will be important to craft regulations meeting the needs of Livermore's residents. As electric bicycles become more prevalent, charging locations and parking that accommodates e-bikes should be considered.

In addition, electrified modes of transportation including electric scooters, Segways, and others are becoming increasingly popular. While these electric vehicles provide improved mobility for some people, care should be taken that they do not create challenges or decrease comfort for people walking or bicycling due to their comparatively higher operating speeds.

RECOMMENDATION

This Plan recommends the City of Livermore work with the Livermore Police Department and Alameda County to adopt e-bike regulations for their use in Livermore, and consider regulations for additional types of electric vehicles.

STREETSCAPE AMENITIES

Sidewalk furnishings like benches, shade structures, restrooms, water fountains and pedestrian signals can contribute to a safer, cleaner, and more pedestrian-oriented public realm. These elements encourage the activation of Livermore's sidewalk and trail system.

Litter and debris removal is a concern on all walking and bicycling facilities, including the trail network and on paths through private developments. Providing waste receptacles for trash and recycling can reduce litter, support the environment, and make walking and bicycling more convenient and attractive. Receptacles should be placed near the travelway without impeding the path of a person bicycling or walking, and without requiring a bicyclist to dismount or a person to detour significantly from their path.

RECOMMENDATION

This Plan recommends streetscape amenities in the downtown core, along major corridors, and near transit stops to encourage multimodal transportation within Livermore.

WAYFINDING

Wayfinding signs direct bicyclists or pedestrians along the existing network and to key community destinations. Signs typically include distance and direction (using an arrow) to key destinations. In Livermore, there is no consistent wayfinding signage program implemented throughout the City.

The California Manual on Uniform Traffic Control Devices (CA MUTCD) includes standard bicycle wayfinding signage, but it is the also the Class 3A Bicycle Route sign, which may cause confusion. Cities have modified the standard sign to change bike route to bikeway, and others have developed and installed non-standard enhanced wayfinding signs. The non-standard option provides flexibility for wayfinding to reflect community character.

RECOMMENDATION

This Plan recommends the City of Livermore develops wayfinding signs that reflect the character of the community. These can be used by pedestrians walking downtown and while accessing trails, and by bicyclists along the bicycle network throughout the city and to access trails. Wayfinding signage should be provided directing bicyclists and pedestrians to trailheads, downtown, community centers, libraries, and other key community destinations.

BIKE SHARE

Bike share programs are becoming increasingly popular in North America, and allow people to rent bicycles for short periods of time. Several different models of bike share programs exist, including programs with kiosks at fixed locations; programs that allow bicycles to be locked at any public bicycle rack; programs that allow bicycles to be reserved, located, or paid for using mobile apps; and programs that offer electric-assist bicycles.

RECOMMENDATION

This Plan recommends the City research bike share program options and develop a proposal for a bike share system in Livermore.

TRAFFIC CONTROL ZONES

When bicycling or walking facilities are affected by construction activities, people walking or bicycling must often travel a significant distance to detour around the interrupted segment. More often than not, these detours are not marked or signed the way motor vehicle detours are identified. This lack of consideration discourages walking and bicycling, and can impact safety when a reasonable alternative path is not clearly provided.

RECOMMENDATION

This Plan recommends the City review its standards for consideration of bicyclists and pedestrians during construction or maintenance activities to ensure they require adequate temporary traffic control. These standards should require a reasonable detour for walking and/or bicycling be maintained throughout the duration of the project, including for long-term capital projects, short-term maintenance activities, and emergency repairs. In addition, enforcement schedules and practices should be reviewed to encourage compliance with the City's policy.

WASTE MANAGEMENT

On-street collection of trash and recycling totes can create challenges for people bicycling and walking when totes are placed in the bicycle lane or on the sidewalk. The City currently requires residential and commercial customers to place totes in the street with their wheels against the curb. In areas with on-street parking, however, totes are often incorrectly placed outside of parked cars where they may obstruct the bicycle lane.

RECOMMENDATION

This Plan recommends the City require future development to provide convenient locations for trash and recycling tote collection that does not conflict with parking or with active transportation facilities.

In existing neighborhoods where on-street parking constrains available space for curbside tote placement, the City should consider implementing parking restrictions to allow for waste collection without blocking bicycle lanes. These parking restrictions may be permanent (red painted curbs where parking is never allowed) or time-limited (parking is prohibited only on trash collection days).

Citywide, the City should consider adding reflective markings to totes to increase their visibility at night and reduce the risk of a bicyclist colliding with a misplaced tote, or stenciling "Do not place in bicycle lane" on totes to remind residents of proper placement.

Educational campaigns or other programmatic efforts, including incorporating messaging into SRTS efforts, should be paired with other improvements to encourage and enforce good behavior.

GREEN BICYCLE FACILITIES

Green pavement within bike facilities increases visibility of the facility, identifies potential conflict zones, and reinforces space for bicyclists. The colored pavement can be used along a corridor, such as a bike lane, or as a spot improvement, such as a bike box at an intersection. The City of Livermore has not installed any colored pavement for bike facilities.

The National Association of City Transportation Officials' Urban Bikeway Design Guide provides design guidance for colored bike facilities, including required, recommended, and optional treatment specifications.

RECOMMENDATION

This Plan recommends the City of Livermore develop a method to evaluate and install green pavement within bike facilities in a consistent manner at key locations to address potential conflict areas and promote common understanding among all road users. The practice of installing green pavement in Livermore may be to install it under the following conditions:

- Portions of Class 2A Bicycle Lanes on arterial roads without additional enhancement, such as a buffer from vehicle traffic
- Driveway conflict zones in high-volume, auto-oriented locations, such as major shopping centers
- Intersections with conflicts on a designated school route

Green pavement design specifications can be found in the companion Design Guidelines.

PROGRAMS

Bicycle and pedestrian education, encouragement, enforcement, and evaluation programs are an integral part of supporting active transportation and increasing users. The physical network should be supplemented by programs and policies focused on increasing walking and bicycling in the City while improving safety and addressing maintenance needs of the network.

Programs are organized into four E's: education, encouragement, enforcement, and evaluation.

Education programs are designed to increase safety by raising awareness and teaching pedestrian and bicycle skills to youth and adults.

Encouragement programs promote walking and bicycling through a variety of mechanisms, such as user friendly maps, incentives for walking or bicycling, and social gatherings.

Enforcement programs are designed to increase safety by increasing compliance with traffic laws by pedestrians, bicyclists, and motorists.

Evaluation programs help the City track progress toward achieving the goals outlined in this Plan and inform any necessary adjustments.

This Plan recommends the City continues its existing programs listed in Chapter 3 and refine or expand those programs as resources become available. The City should also pursue strong partnerships with stakeholder organizations and relevant agencies to effectively implement programs, and identify opportunities for community organizations to take the lead on program implementation as appropriate.

Along with the continued implementation of existing programming, this Plan identifies the following programs, based on national best practices. Implementation of these programs will depend on available funding, resources, and community support. New and continuing programs are listed in Table 5-4, and explained in detail in Appendix K.

New programs are listed as low, medium, or high effort based on the amount of staff and volunteer time typically required to implement the program.

Table 5-4: Existing and Proposed Programs

PROGRAM	STATUS	LEVEL OF RESOURCES	AUDIENCE
Education			
Youth Bicycle Safety Education	Existing		Youth
Adult Bicycle Safety Education	Existing		Adults
Pedestrian Safety Education	Existing		Youth
Website	New	Low	All
Share-the-Path Campaign	New	Low	All
New Facility & Low Stress Route Rides	New	Low	All
Bicycling & Walking Maps & Guides	Existing/ New	Low	All
Encouragement			
Safe Routes to School	Existing		Youth
Bike to Work Day	Existing		Adults
City Bicycle & Pedestrian Coordination	Existing		All
Employer-Based Campaigns	New	Low	Adults
Bicycle Friendly Business Program	New	Low	All
Bicycle Friendly Community Award	New	Low	All
Walking & Bicycling Ambassadors	New	Medium	All
Open Streets Events	New	High	All
Bicycle Tourism	New	Low	All
Group Social Rides	New	Low	All
Enforcement			
Traffic Citation Diversion Program	Existing		All
Targeted Enforcement & Speed Trailer	Existing		All
Bicycle Patrol	Existing		All
Crossing Guard Program	Existing		Youth
Traffic Calming	Existing		All
Evaluation			
Community Survey	New	Medium	All
Expanded Bicycle & Pedestrian Counts	New	Low	All
Expanded Collision Data Review	New	Low	All
Annual Report Card	New	Medium	All
Pre/Post Studies of New Infrastructure	New	Medium	All

Resource levels for existing programs are not provided because they are already included in City budgeting efforts

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06
Implementation Strategy

CHAPTER 6 IMPLEMENTATION STRATEGY

This Plan includes projects and programs intended to create an active, vibrant, safer, and connected Livermore community. The network and crossing improvements seek to increase comfort and safety and improve bicycle and pedestrian connections to transit facilities, major employers, commercial centers, schools, regional parks, and other public facilities.

The Implementation Strategy described in this chapter reflects a systematic approach to determine each project's community benefit and connection to key destinations in a manner that is feasible, fundable, and sustainable. Many linear projects are broken into smaller segments based on the realities of implementation, allowing each segment to be evaluated independently.

The strategy used a set of geographic and community based criteria to rank bicycle, pedestrian, and trail improvements, considered limited City resources, and evaluated tradeoffs. The result is a list of projects that the City will work to implement in the near-term, and a framework for reevaluating and recalibrating projects in the future to address changes.

This chapter outlines the strategy used to evaluate the proposed network, including:

- Planning level cost estimates for implementation and maintenance
- Funding opportunities and assumptions
- Benefit and feasibility evaluation
- First phase of projects identified for implementation
- Guiding principles for implementation of the entire project list

This logical approach starts with an understanding of the cost of implementing and maintaining each project, paired with a realistic snapshot of the funding that is likely to be available. This cost and feasibility information was then reviewed in conjunction with the anticipated benefits of each project, which informed the list of projects to be implemented in a first phase. This first phase project list includes some interim treatments as a first phase for more complex improvements, such as buffered bicycle lanes that will later be converted to separated bikeways, as well as pilot projects or corridor studies where more information is needed before final design can be completed.

Finally, a set of guiding principles is based on this strategy and all the community input and analyses completed in this Plan. These principles will assist in prioritizing the remaining projects over time as the City implements some projects, or as opportunities for implementation arise.

PLANNING LEVEL COST ESTIMATES

CONSTRUCTION COST ASSUMPTIONS

Table 6-1 presents the planning level unit cost assumptions used to develop project construction cost estimates. For linear projects, the unit cost method uses a single functional unit (per mile) that serves as a multiplier. Each unit cost is multiplied for each improvement to calculate a project cost estimate.

Cost estimates were developed based on recent local project costs. The cost estimates include assumed costs for mobilization, traffic control, earthwork, utility coordination, and grading. In addition, the cost estimates include 30 percent soft costs including engineering design, administration, and construction management, as well as a 15 percent contingency.

At the planning level, cost assumptions do not consider project-specific or location specific factors that may affect actual costs, including acquisition of right-of-way. For some projects, actual costs may differ significantly from the planning level estimates.

Cost estimates for projects in this plan have been rounded to the nearest $100, are in 2017 dollars, and do not include cost escalation.

For a detailed breakdown of unit cost assumptions, see Appendix K.

Table 6-1: Unit Cost Assumptions

FACILITY	UNIT	UNIT COST
Class 1A Shared Use Path	MI	$1,579,500
Class 1A Shared Use Path (Unpaved)	MI	$1,133,400
Class 2A Bicycle Lane	MI	$75,100
Class 2B Buffered Bicycle Lane	MI	$137,800
Class 3A Bicycle Route	MI	$54,100
Class 3E Bicycle Boulevard	MI	$539,700
Class 4A Separated Bicycle Lane	MI	$1,751,600
Sidewalk (one side of street)	MI	$794,100
Sidewalk (both sides of street)	MI	$1,588,200
Pilot Project	EA	$75,000
Corridor Study	MI	$175,500
Low-Intensity Intersection Crossing	EA	$35,600
Medium-Intensity Intersection Crossing	EA	$172,300
High-Intensity Intersection Crossing (Low)	EA	$312,300
High-Intensity Intersection Crossing (High)	EA	$447,900

Unit costs include assumed costs for mobilization, traffic control, earthwork, utility coordination, and grading; 30 percent soft cost for engineering design, administration, and construction management; and 15 percent contingency. Costs are 2017 dollars rounded to the nearest $100 and do not include cost escalation.

PROJECT COST ESTIMATES

Table 6-2 presents the total estimated costs by project group. The total cost estimate to realize the envisioned network for all projects presented in this Plan is approximately $183 million. A significant amount of project costs are shared use paths, bicycle boulevards, and separated bikeways. Projects are mapped by project group in Figure 6-1. For a complete list of all projects, see Appendix I.

Table 6-2: Estimated Costs by Project Group

PROJECT	NO.	MI	EST. COST
School Access Network	**73**	**18.2**	**$19,330,100**
Class 3E Bicycle Boulevards	34	18.2	$9,827,000
Low Intensity Crossings	6		$213,000
Medium Intensity Crossings	15		$2,584,500
High Intensity Low Cost Crossings	10		$3,123,000
High Intensity High Cost Crossings	8		$3,582,400
Downtown Access Network	**22**	**7.8**	**$4,791,300**
Class 2A Bicycle Lanes	6	2.0	$151,600
Class 2B Buffered Bicycle Lanes	3	2.9	$404,000
Class 3A Bicycle Routes	1	1.2	$66,400
Class 3E Bicycle Boulevards	2	1.0	$518,100
Class 4A Separated Bikeways	1	0.7	$985,000
Pilot Projects	1		$75,000
Corridor Studies	1	1.4	$237,400
Medium Intensity Crossings	2		$344,600
High Intensity Low Cost Crossings	6		$1,873,800
High Intensity High Cost Crossings	1		$447,800
Crosstown Routes Network	**54**	**40.9**	**$25,058,800**
Class 2A Bicycle Lanes	22	14.7	$1,105,700
Class 2B Buffered Bicycle Lanes	12	13.4	$1,852,300
Class 4A Separated Bikeways	9	12.7	$19,090,000
Pilot Projects	1		$75,000
Corridor Studies	3	6.8	$1,197,200
Medium Intensity Crossings	4		$689,200
High Intensity Low Cost Crossings	6		$1,873,800
High Intensity High Cost Crossings	1		$447,800
Trail Connections	**75**	**80.8**	**$129,450,600**
Class 1A Shared Use Paths	68	80.8	$127,689,000
Medium Intensity Crossings	4		$689,200
High Intensity Low Cost Crossings	2		$624,600
High Intensity High Cost Crossings	1		$447,800
Sidewalk Gap Closure	**19**	**5.0**	**$4,812,300**
Sidewalk	19	5.0	$4,812,300
TOTAL	**253**	**152.8**	**$183,443,100**

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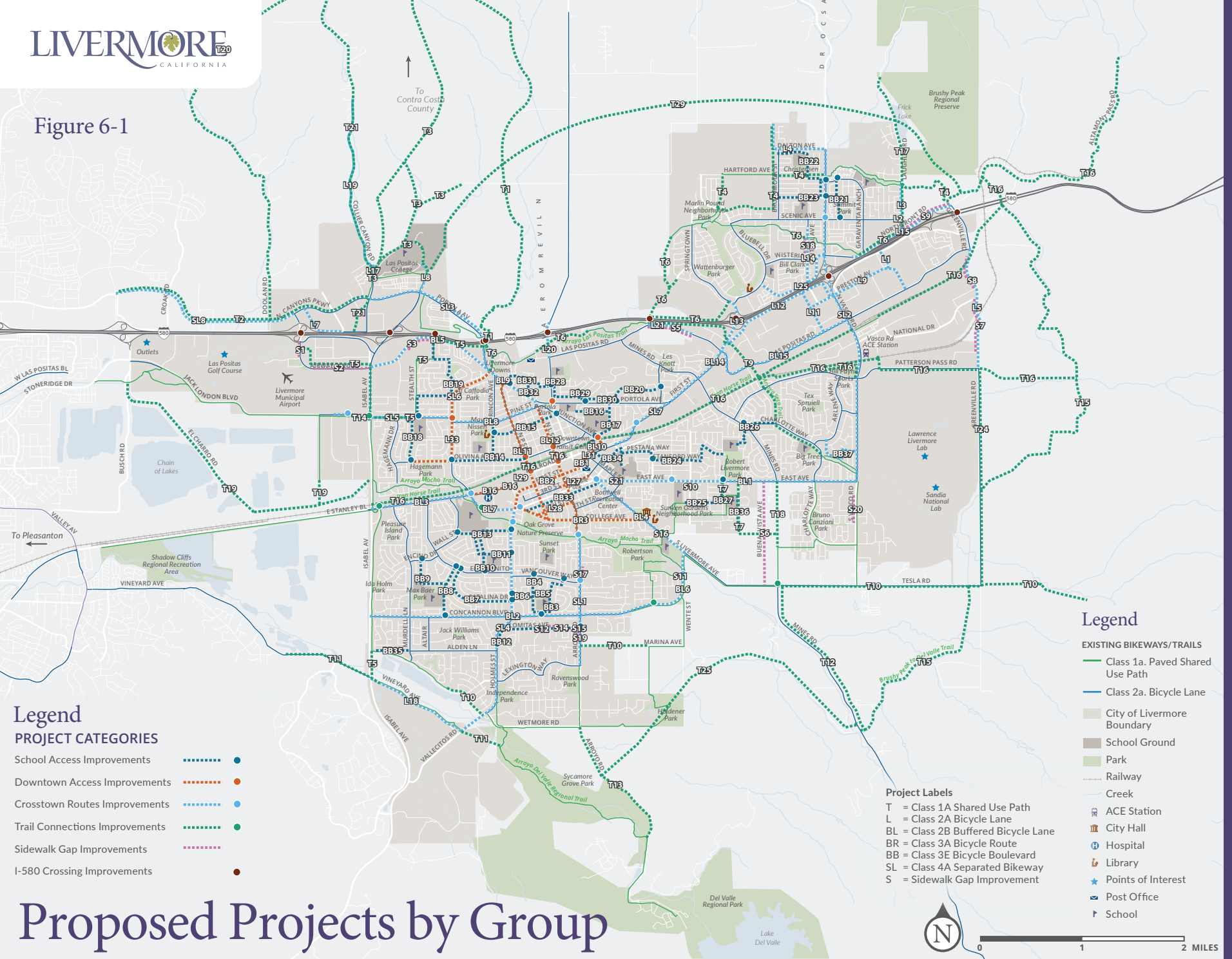
Figure 6-1



Legend

PROJECT CATEGORIES

- School Access Improvements
- Downtown Access Improvements
- Crosstown Routes Improvements
- Trail Connections Improvements
- Sidewalk Gap Improvements
- I-580 Crossing Improvements

Legend

EXISTING BIKEWAYS/TRAILS

- Class 1a. Paved Shared Use Path
- Class 2a. Bicycle Lane
- City of Livermore Boundary
- School Ground
- Park
- Railway
- Creek
- ACE Station
- City Hall
- Hospital
- Library
- Points of Interest
- Post Office
- School

Project Labels

T = Class 1A Shared Use Path
L = Class 2A Bicycle Lane
BL = Class 2B Buffered Bicycle Lane
BR = Class 3A Bicycle Route
BB = Class 3E Bicycle Boulevard
SL = Class 4A Separated Bikeway
S = Sidewalk Gap Improvement

N

0 1 2 MILES

Proposed Projects by Group

MAINTENANCE COST ASSUMPTIONS

Maintaining the walking and bicycling network protects the public's investment, ensures adequate safety levels, and supports a high quality of life for the Livermore community. Maintenance generally refers to the operations, repair, and eventual replacement of a facility. Due to limited resources and high level of service standards, maintenance costs are a concern for most cities, including Livermore. Most grant programs offer funds to construct projects but not to maintain them.

Maintenance activities are typically funded through the City's General Fund. The cost of maintaining the City's assets, including bicycle and pedestrian facilities, is higher than the current budget allocated. Livermore must continually evaluate tradeoffs and make decisions whether to spend limited funds on new construction and/or maintain existing assets.

The Plan assumes that on-street bikeways would be maintained as part of the normal roadway maintenance program, while separated facilities will require additional maintenance considerations. Emphasis should be placed on keeping bicycle and pedestrian facilities clear of debris and obstruction, clearly delineated, and ensuring adequate visibility. Crossing, sidewalk, and trail maintenance should be conducted according to current City policy.

Table 6-3 lists typical annual maintenance costs for bikeways based on City Public Work's Department staff evaluations and actual operations experience. All costs are rounded to the nearest $100, in 2017 dollars, and do not include cost escalation. For a breakdown of maintenance cost assumptions, see Appendix K.

Table 6-3: Maintenance Cost Assumptions

FACILITY	UNIT	ANNUAL COST
Class 1A Shared Use Path	MI	$26,400
Class 2A Bicycle Lane	MI	$2,700
Class 2B Buffered Bicycle Lane	MI	$3,600
Class 3A Bicycle Route	MI	$1,300
Class 3E Bicycle Boulevard	MI	$2,900
Class 4A Separated Bicycle Lane	MI	$20,800
Sidewalk (one side)	MI	$8,100
Low Intensity Crossing	EA	$500
Medium Intensity Crossing	EA	$3,900
High Intensity Low Cost Crossing	EA	$7,600
High Intensity High Cost Crossing	EA	$10,300

All costs are rounded to the nearest $100 in 2017 dollars, and do not include cost escalation

FUNDING OPPORTUNITIES

A variety of bicycle and pedestrian funding sources exist. As stated previously, some bicycle and pedestrian funding sources are eligible for maintenance of existing facilities. Others are limited to new construction. The Plan assumes that any funds eligible for maintenance, the City will use for maintenance.

Local and Regional funding sources that can be used for construction or maintenance of bicycle and pedestrian improvements, along with competitive grant programs, are described below.

LOCAL & REGIONAL FUNDING SOURCES

MEASURE B/BB

Measure B and Measure BB are Alameda County one-cent sales tax measures for transportation projects. The total revenue is anticipated to be nearly $8 billion over 30 years, from 2014 to 2045. Livermore receives $420,000 annually for bicycle and pedestrian projects, and an additional $1.74 million annually for local streets and roads projects. These funds will be used by the City for maintenance.

TRANSPORTATION FUNDS FOR CLEAN AIR

The Transportation Funds for Clean Air program, established by AB 434, are generated by a $4 surcharge on vehicle registration 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 local match for state or federal grant programs.

TRANSPORTATION DEVELOPMENT ACT

Transportation Development Act Article III funds are generated by a sales tax on gasoline, and are returned to the source county to be used on transportation projects—including a two percent set-aside for bicycle and pedestrian projects. Alameda County allocates these funds to cities based on population. Eligible uses for the funds include projects in an adopted plan approved by a local Bicycle Advisory Committee, such as this Plan, or as a local match for state or federal grant programs.

PARK FACILITY FEES

All new residential and commercial development in Livermore must pay a Park Facility Fee to the City. This fee is used for the design and construction of parks and trails, including purchasing land and constructing shared use paths.

COMPETITIVE GRANT PROGRAMS

CALIFORNIA ACTIVE TRANSPORTATION PROGRAM

California's Active Transportation Program (ATP) funds infrastructure and program 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. Eligible projects include 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 points are awarded to communities who do identify matching funds.

TRANSPORTATION PLANNING GRANTS

Caltrans Transportation Planning Grants are available to communities for planning, study, and 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.

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. The program focuses on projects that address safety through proven countermeasures, and are implementation-ready, and demonstrate cost-effectiveness.

BENEFIT AND FEASIBILITY EVALUATION

All network and crossing improvements were reviewed based on a two-faceted benefit evaluation:

- **Benefit Criteria:** Projects were evaluated based on a set of ten benefit criteria.
- **Project Feasibility and Readiness**: Projects were evaluated based on feasibility and complexity of implementation.

First, each project was evaluated based on the following 10 benefit criteria:

- Whether the improvement location is within one-quarter mile of five types of activity generator:
  - Transit
  - School
  - Employment
  - Retail
  - Public Facilities
- Safety data
- Whether the improvement closed a gap
- Whether the project was identified by the community
- Whether the project increases comfort
- Whether the project is consistent with existing planning documents.

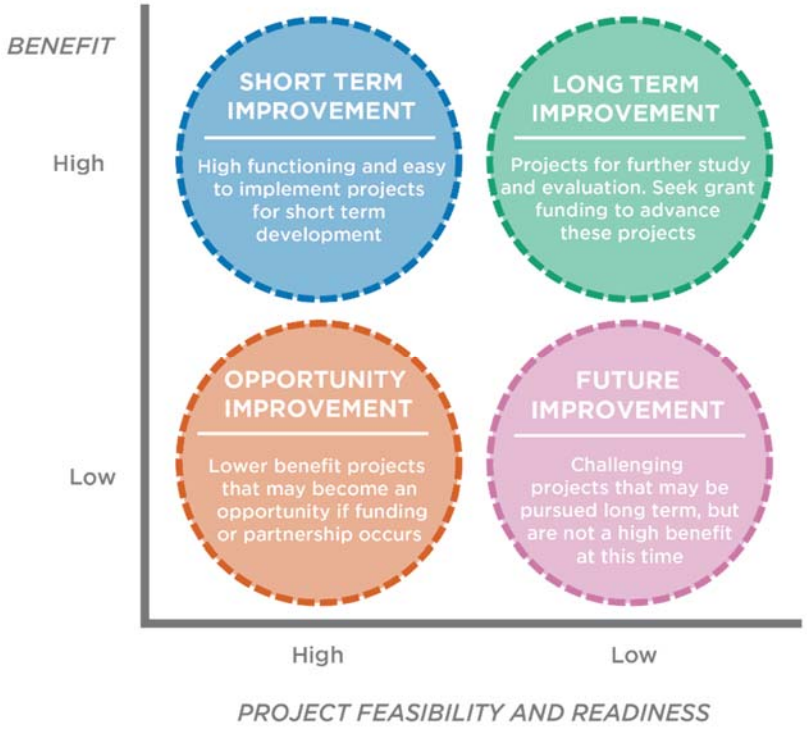
The evaluation process weighted the criteria evenly and designated projects as higher or lower benefit.

Following the benefit evaluation, projects were evaluated for implementation readiness based on feasibility and construction complexity. Feasibility was evaluated based on right-of-way ownership, the facility type, and the significance of any required roadway modifications. For example, significant modifications to the roadway such as removal of parking or traffic lanes received a low readiness. Similarly, trail segments that require right-of-way acquisition received a low readiness. Less significant alterations, such as reduction of travel lane widths within acceptable standards received a high feasibility rating.

The feasibility evaluation considered existing conditions, travel speeds, and average daily trips. Because all intersections (except for the I-580 Crossings) are located within the City right-of-way, the Implementation Strategy primarily ranked them by their intensity. Based on two factors, the Implementation Strategy assigns a high or a low designation for improvement readiness.

Together, the results from the benefit and readiness evaluations created groups of projects categorized by their implementation potential, illustrated in Figure 6-2, and explained in detail in Appendix K.

Figure 6-2: Implementation Strategy



Short Term Improvements are those projects that provide a high benefit and are ready to be implemented. In contrast, Future Projects have a lower benefit and lower readiness.

Improvements that receive a high benefit and high readiness ranking are those that the City could choose to implement in the near term. In addition to these viable improvements, there are several longer term improvements that the Plan recommends pursuing either as a project phase to provide some level of enhancement, a corridor or feasibility study to identify and resolve any potential issues, or a temporary pilot to sample the facility type and gain further public input.

For a map of projects by implementation strategy, see Figure 6-3.

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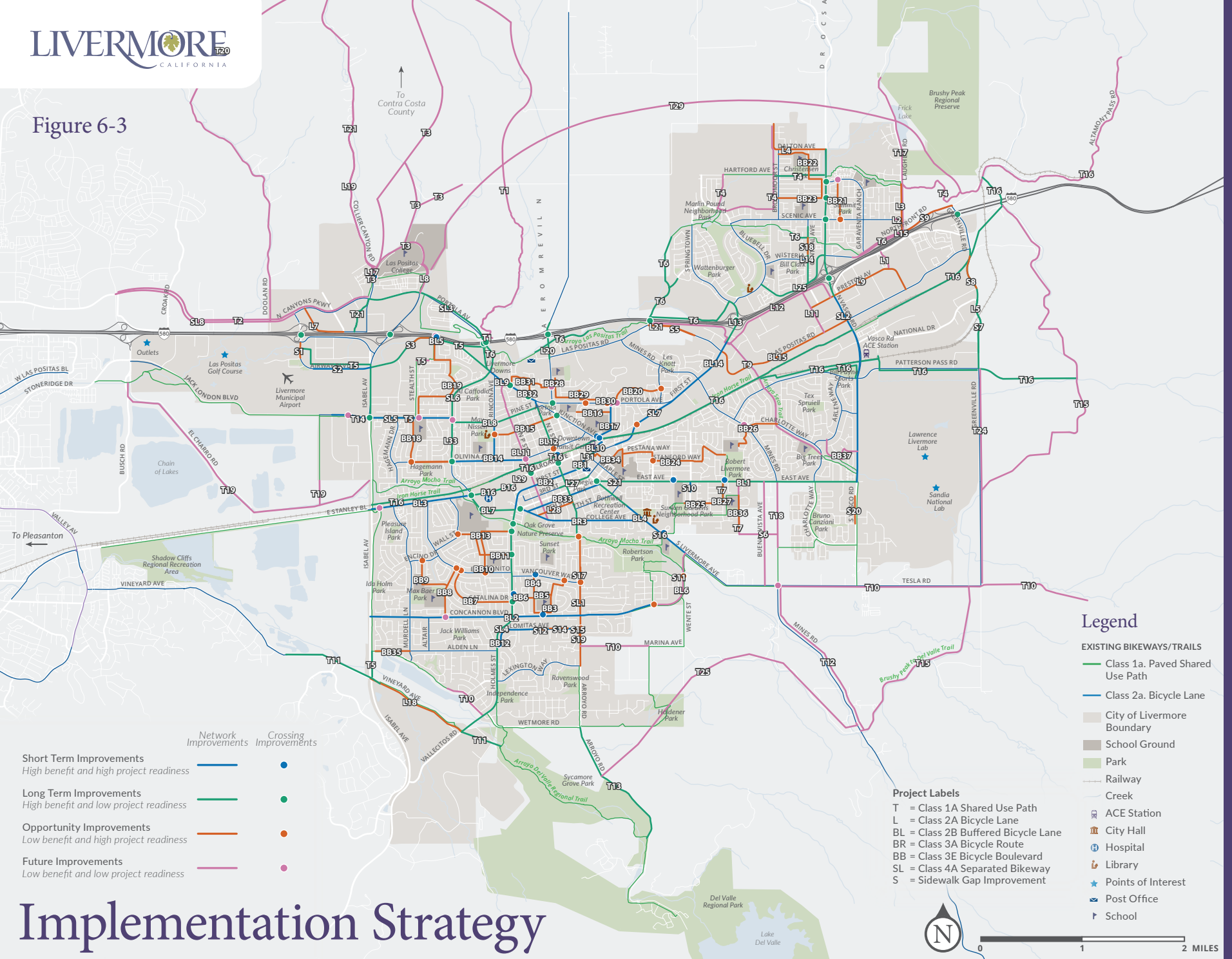
Figure 6-3



Implementation Strategy

FIRST PHASE

The Plan compared project costs against the project benefits to develop an implementation strategy that is effective and efficient. The Implementation Strategy refined the total project list to focus on the 50 highest benefit network and intersection improvements and applicable programs. This list included short-term projects, projects determined by the Advisory Committee to have significant importance, and those evaluated by the City, for overall connectivity and improvement to the existing system. The total project costs on this list is approximately $35 million. See Table I-1 in Appendix I.

Even at that level of cost, the Implementation Strategy required further refinement based on available funding. A short list of first phase projects was then developed for the City to pursue over the next five years, totaling approximately $5.8 million. This is the approximate funding anticipated to accrue within five years from the City's previously identified funding sources.

The Plan establishes a long-term, aspirational vision for a robust bicycle and pedestrian network. However, given limited resources and volume of improvements, the City will focus efforts towards the highest benefit improvements and those that provide the greatest connectivity as listed in Table 6-4.

These projects are those that the City may be able to implement in a five-year window. Some of the projects will be constructed to full build out, while others will be phased due to cost, limited right of way, or to introduce a facility type, and determine community support. First phase projects are mapped in Figure 6-4.

In addition, the Implementation Strategy proposes allocating funds towards programs to direct cyclists and pedestrians to the existing network, such as mapping and wayfinding, and conduct education, enforcement, and encouragement efforts.

Table 6-4: First Phase Implementation Projects

ID	PROJECT NAME	CONSTRUCTION	ONGOING ANNUAL MAINTENANCE
L28	Sixth Street Bicycle Lane	$27,800	$1,000
S10	Hillcrest Sidewalk at East Avenue	$68,900	$700
BL3	Stanley Boulevard Buffered Bicycle Lane (Isabel to Murrieta)	$134,900	$3,500
BB37, BB26, BB24	Bicycle Route from Lawrence Livermore National Lab to Livermore High*	$140,100	$3,400
SL5	Jack London Boulevard Buffered Bicycle Lane (Discovery to Murrieta)*	$162,300	$1,600
P83	Crossing: Robertson Park and Concannon	$172,300	$3,900
P26	Crossing: Concannon and Epson	$172,300	$3,900
SL7, BL14	First Street Buffered Bicycle Lane (Inman to Southfront)	$209,300	$5,500
SL2	Vasco Road Buffered Bicycle Lane (East to Preston)*	$259,100	$5,500
P75	Crossing: Murrieta and Stanley	$312,000	$7,600
P82	Crossing: First and Scott Street	$312,000	$7,600
BL2	Concannon Boulevard Buffered Bicycle Lane (Isabel to San Vincente)	$383,900	$10,100
L34, BB14	Olivina Bicycle Lane/Bicycle Boulevard (Hagemann to Rincon)	$716,000	$4,100
T13	Arroyo Road Trail (Wetmore to Veterans Park)	$2,160,700	$36,100
BL1	East Avenue Corridor Study*	$175,000	-
	I-580 Crossings Study*	$175,000	-
	Programs (education, encouragement, and enforcement)	$250,000	-
T6 segment E1	Las Colinas Trail – Support to LARPD	$25,000	-
	TOTAL	**$5,856,600**	**$94,500**

**Phased improvement is an interim treatment to be implemented in the near-term while a more complex facility is pursued as a long-term solution. Estimated cost reflects phased interim treatment.*

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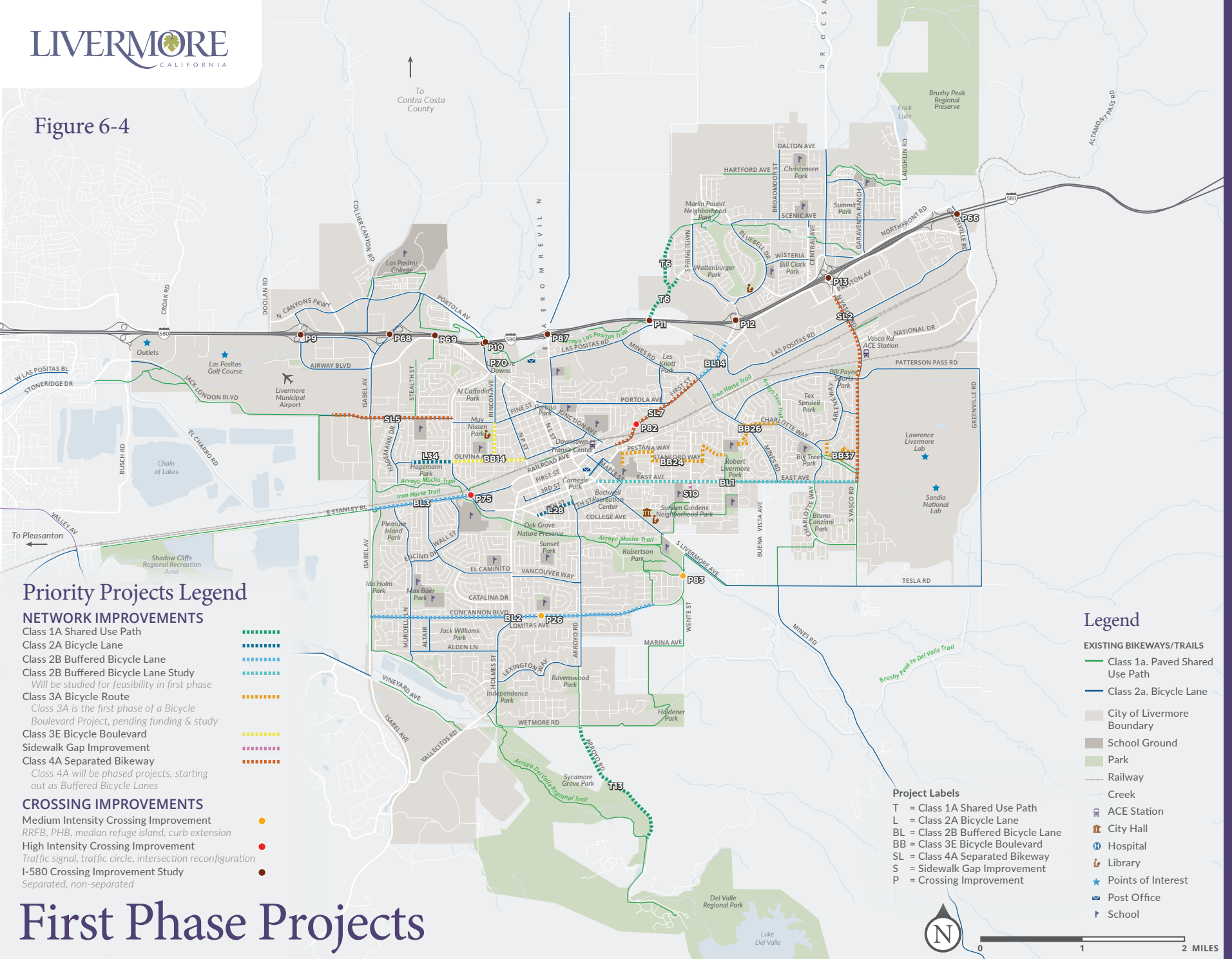
Figure 6-4



Priority Projects Legend

NETWORK IMPROVEMENTS

- Class 1A Shared Use Path
- Class 2A Bicycle Lane
- Class 2B Buffered Bicycle Lane
- Class 2B Buffered Bicycle Lane Study
  Will be studied for feasibility in first phase
- Class 3A Bicycle Route
  Class 3A is the first phase of a Bicycle Boulevard Project, pending funding & study
- Class 3E Bicycle Boulevard
- Sidewalk Gap Improvement
- Class 4A Separated Bikeway
  Class 4A will be phased projects, starting out as Buffered Bicycle Lanes

CROSSING IMPROVEMENTS

- Medium Intensity Crossing Improvement
  RRFB, PHB, median refuge island, curb extension
- High Intensity Crossing Improvement
  Traffic signal, traffic circle, intersection reconfiguration
- I-580 Crossing Improvement Study
  Separated, non-separated

First Phase Projects

Project Labels

T = Class 1A Shared Use Path
L = Class 2A Bicycle Lane
BL = Class 2B Buffered Bicycle Lane
BB = Class 3E Bicycle Boulevard
SL = Class 4A Separated Bikeway
S = Sidewalk Gap Improvement
P = Crossing Improvement

Legend

EXISTING BIKEWAYS/TRAILS

- Class 1a. Paved Shared Use Path
- Class 2a. Bicycle Lane
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- Hospital
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- Points of Interest
- Post Office
- School

N

0 1 2 MILES

GUIDING PRINCIPLES

Due to the large number of network and intersection improvements and the limited financial resources available, the Implementation Strategy employs a set of principles to address challenges and realize the network vision. These guiding principles can be used to review and prioritize implementation of the broader project list beyond the first phase project list. These principles are not mutually exclusive, and should be applied by the City to achieve the desired improvement.

MAINTENANCE

All new network projects must secure maintenance funding prior to construction. These can include maintenance districts, agency partnerships, developer paid maintenance mechanism, or other means. Maintenance funding is vital to ensuring long-term sustainability of the facility.

OPPORTUNITIES AND EFFICIENCIES

The City should capitalize on opportunities and use resources efficiently to implement the network. The City should proactively seek grants, develop agency partnerships, share resources, and facilitate development of bicycle and pedestrian improvements owned and operated by other agencies. The City should also consider consolidating duplicative facilities.

Private developers should be required to build new facility types or upgrade existing facilities as part of development projects and consider active transportation through every stage of the project. The City should coordinate new bicycle and pedestrian facilities with other City sponsored projects to take advantage of economy of scale, including staging, traffic control, materials, and mobilization costs.

SUSTAINABLITY

Active transportation improvements should proactively seek materials and implement practices that extend useful life of the facility and reduce ongoing and long-term maintenance costs.

PROJECT PHASING

Project phasing includes installing an easier-to-implement project as an interim treatment before a more complex or costly improvement. For example, a separated facility could be implemented as a buffered bicycle lane or a bicycle boulevard could be implemented as a signed route. This approach would allow the City to provide additional comfort while continuing to study and evaluate the facility type, measure performance, secure funding, and track changes in travel patterns.

Phasing also refers to transitions between facility types in conflict zones or areas with limited right of way. Projects in this Plan are planning-level, and as more detailed engineering designs are completed some segments may not be feasible for the pedestrian or bikeway improvement identified. For example, a separated bikeway may need to transition to a buffered bicycle lane if a short segment has constrained right of way.

REGULAR REVIEW OF PRIORITIES

To be successful, the Implementation Strategy must adapt to evolving City Policies, changing Plan Goals, fluctuating Network Objectives. In addition, City will need to be strategic and flexible in terms of funding availability. The City should periodically review the project list and implementation principles, and may wish to seek additional input from the community and City Council on emerging priorities to identify a new five-year list of projects for implementation.