

CITY OF SOLVANG ACTIVE TRANSPORTATION PLAN

JUNE 2024

PREPARED FOR:

CITY OF SOLVANG



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INTRODUCTION

The City of Solvang Active Transportation Plan (ATP) is intended to support provision of a connected bicycle and pedestrian network to provide safe, affordable, and accessible transportation choices within the City and its sphere of influence. The plan seeks to inform future active transportation improvements by providing planning-level concepts, which will require further evaluation, including consideration of local, County, and California Department of Transportation standards, further study, design, and funding. By developing this plan, the City of Solvang is promoting a



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more sustainable and equitable community by improving safety, mobility, and access while reducing greenhouse gas emissions, improving air quality, and supporting public health for its residents.

As a dual purpose, this plan demonstrates compliance with Senate Bill (SB) 99 and SB 101, which established the Active Transportation Program guidelines and scoring rubrics. This ATP incorporates a performance-based planning approach to quantify the societal benefits of the plan recommended improvements. It provides the City of Solvang a resource document to inform future funding applications to state and federal competitive grant programs for funding bicycle infrastructure improvements.

The development of this ATP began with the analysis of current conditions coupled with the gathering of input from the community to fully understand existing and future transportation needs in Solvang. This understanding informed the creation of a list of recommended projects and programs. The Solvang ATP presents a strategic plan for implementation of these projects and programs to achieve citywide connectivity for people bicycling and walking, including safe routes to schools and equitable access for disadvantaged community members.

Specifically, the City of Solvang 2023 Active Transportation Plan accomplishes the following:

- updates the City's existing bicycle network;
- updates the City's bicycle facility design guidelines to reflect the latest national/regional guidance;
- determines the efficacy of the current bicycle capital improvement program and revises these recommendations based on input from the public combined with a comprehensive assessment of bicycle connectivity relative to existing and future development patterns;
- establishes a future bicycle network that connects all areas of significance in the city with facilities and routes that are more in line with most potential bicyclists' comfort levels;

- establishes planning level cost opinions to inform bicycle capital improvement cost-effectiveness for funding prioritization; and,
- establishes a one-stop data source to facilitate the development of future state/federal grant funding applications for bicycle improvements by the City of Solvang.

ORGANIZATION OF THIS PLAN

The Solvang ATP is organized in the following chapters:

- **Planning and Design Standards** – Current design standards associated with bicycle infrastructure, state/regional/local plans related to active transportation planning, and Federal/State legislative requirements and guidelines that govern active transportation planning in California are described.
- **Goals, Policies, and Programs** – Bicycle and pedestrian related goals, policies and programs currently included in the City’s draft General Plan Update Mobility Element.
- **Existing Conditions** – Current bicycle and pedestrian facilities, crash history, methodologies, and identified needs related to improving walking and bicycling in Solvang.
- **Community Engagement** – Documentation of recent outreach and community engagement related to walking and bicycling needs in Solvang.
- **Recommended Improvements** – Identified projects, programs, and policies that will improve active transportation in Solvang.
- **Funding and Implementation** – Strategic approach to ensure that recommendations from this Plan are funded and implemented, including project prioritization and upcoming grant opportunities.

PLANNING AND DESIGN STANDARDS

GUIDELINES AND DESIGN STANDARDS

Bikeway planning and design in California rely on the guidelines and design standards established by the California Department of Transportation (Caltrans) and supporting guides as documented in:

- American Association of State Highway and Transportation Officials (AASHTO), Guide for the Development of Bicycle Facilities, 2012, Fourth Edition
- California Manual on Uniform Traffic Control Devices, 2014 Edition, Revision 7
- Caltrans, Design Information Bulletin Number 89, Class IV Bikeway Guidance
- Chapter 1000; Bicycle Transportation Design, contained in the Highway Design Manual, 6th Edition (California Department of Transportation, 2017) with supporting Chapters 200, 300, and 400.
- Federal Highway Administration (FHWA), Separated Bike Lane Planning and Design Guide, 2015
- Massachusetts Department of Transportation (MDOT), Separated Bike Lane Planning and Design Guide, 2015
- National Association of City Transportation Officials (NACTO), Urban Bikeway Design Guide, 2014

Cities may desire to exceed the minimum standards. These guidelines cover basic concepts. The HDM Chapter 1000 contains more detailed standards and guidance and should be followed. Cities may

also reference the AASHTO Guide, and the NACTO Urban Bikeway Design Guide. Caltrans has supported the NACTO from a memorandum dated August 20, 2013 for Bicycle and Pedestrian Facility Design Flexibility. The NACTO addresses more recently developed bicycle design treatments and techniques. It provides options that can help create “complete streets” that better accommodate bicyclists and pedestrians. Many treatments in the NACTO guide are compatible with Caltrans HDM policies and demonstrate new and innovative solutions for the varied urban settings across the country. The vast majority of treatments illustrated in the NACTO guide are either allowed or not precluded from the CA-MUTCD. In addition, non-compliant traffic control devices may be piloted through the CA-MUTCD experimentation process.

Given that they are not currently adopted by the FHWA MUTCD or CA MUTCD, a number of recommended devices currently being implemented in California are considered experimental. Recommended devices that are currently not adopted by the MUTCD or Caltrans appear to be promising improvements in bicycle and pedestrian access and safety as they have been widely used in Europe and experimented within the US. Any jurisdiction wishing to use these treatments should follow the appropriate experimental procedures. Some of the more commonly used devices, such as colored bike lanes, have been given blanket interim approval for use in California. For these, the City only needs to notify Caltrans that it will use these. Bike boxes and colored treatments of shared lane markings are approved for experimentation by the Federal Highway Administration (FHWA). To conduct these experiments, the City would need to follow the guidelines set forth by the FHWA here: <https://mutcd.fhwa.dot.gov/condexper.htm> and to the California Traffic Control Device Committee following their guidelines set forth in Section 1A.10 of the CA MUTCD.

Bicycle facilities are categorized based on the four classifications recognized by Caltrans, along with three subclassifications. These include:

Class I Shared Use Paths: Dedicated paths exclusively for walking and bicycling completely separate from the roadway with cross-flow minimized. Caltrans standards call for Class I bikeways to have a minimum of 8 feet of pavement (10 feet preferred) with 2 foot graded shoulders on either side. These bikeways must also be at least 5 feet from the edge of a paved roadway. City of Solvang bicycle facilities with a Class I classification include SR-246/Mission Drive (north side) between Alamo Pintado Creek Bridge and Refugio Road.



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Trails: Paths for walking and bicycling that may be unpaved or not meet standards for Class I paths.

Class II Bicycle Lanes: Striped lanes for bicyclists. Provides a restricted right-of-way designated for the exclusive or semi-exclusive use of bicycles with through travel by pedestrians and motorists permitted. Caltrans’ standards require a six-inch striped lane with a 4-5-foot paved shoulder for

one-way bike travel on a street or highway. A regional Class II facility within Solvang is Alamo Pintado Road from Solvang to Los Olivos (Dan Henry Bike Route).

Class II Buffered Bicycle Lanes: Bicycle lanes that include a striped buffer area either between the bicycle lane and the travel lane or between the bicycle lane and parked cars.

Class III Bicycle Routes: Signed routes for bicyclists where adequate paved shoulders exist for cyclists or where posted speeds are at or below 25 mph for cyclists to share the travel lane. Provides for shared use with pedestrians and/or motor vehicle traffic within the same right-of-way and is designated with signs only indicating "Bike Route". Class III bike routes are appropriate where restricted right-of-way would make a Class II facility infeasible.

Class III Bicycle Boulevards: Class III bicycle routes that are further enhanced with traffic calming features (e.g., 10-foot or less travel lanes, 25 mph or lower speed limits, speed humps, bulb-outs) or other treatments to prioritize bicyclist comfort.

Class IV Separated Bikeways: On-street bicycle facilities with a physical barrier between the bicycle space and motor vehicle lanes, including bollards, curbs, or parking. Provides a separated bike lane, or "protected bike lane", with a physical barrier between the bike lane and the adjacent travel lanes, parking lanes, and sidewalks. Class IV bike lanes may be one-way or two-way. Separated bike lanes can be separated from motor vehicle traffic by raised medians, concrete curbs, landscaping, on-street parking, bollards, flexible delineator posts, or by a change in elevation between the bike lane and travel lane. No class IV bikeways currently exist in Solvang.

The following facilities or treatments were considered due to the potential for increasing bicyclist visibility, safety, and comfort along bicycle facilities:

- **Buffered Bike Lanes (Without On-Street Parking):** Provides additional protection and can provide comfort levels and function similarly as a Class IV facility. Providing pavement treatments and/or painted buffers at least 2-feet in width can be used to narrow travel lanes, which slows traffic, and are most appropriate on wide, busy streets, where physically separating the bike lanes with protected vertical separation is undesirable for cost, operations, or maintenance reasons. Buffered bike lanes are useful in providing additional separation between cyclists and motor vehicles where traditional Class IV facilities are not feasible, and where Class II facilities are not adequate.
- **Buffered Bike Lanes (With On-Street Parking):** Provides a painted divider between the bike lane and the adjacent travel lane. Buffers at least 3-feet in width can be used to narrow travel lanes, which slows traffic, and are most appropriate on wide, busy streets, where physically separating the bike lanes with protected vertical separation is undesirable for cost, operations, or maintenance reasons. Double buffered bike lanes provide a painted divider on both the travel lane and the parking lane.
- **Colored Bike Lanes:** Provides increased visibility for cyclists through the use of green paint on the width of the bike lane. Colored bike lanes can be implemented at intersections to enhanced bicycle visibility at points of conflict with vehicles or can be used as a continuous treatment spanning the extended length of a bike lane corridor.

The following bicycles facilities were also considered due to the potential for increasing bicyclist visibility, safety, and comfort at intersections.

- **Bikeway Markings:** Continuing marked bicycle facilities at intersections (up to the crosswalk) ensures that separation, guidance on proper positioning, and awareness by motorists are maintained through these potential conflict areas. Colored bike lanes can be implemented at intersections to enhanced bicycle visibility at points of conflict with vehicles.
- **Bike Pockets and Boxes:** Provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase.

Appendix 1 provides Design Elements Toolkit that provides examples of each of these bicycle facility types.

LEGISLATIVE FRAMEWORK

Active transportation planning, funding and implementation is governed by Federal/State laws. This includes compliance with the California Complete Streets Act (Assembly Bill [AB] 1358), Caltrans Director's Policy 37, the Americans with Disabilities Act (ADA), and Caltrans Climate Action Plan for Transportation Infrastructure (CAPTI) as well as environmental justice and social equity initiatives to provide healthier mobility choices to disadvantaged communities. Specific to the development of this plan, adherence to SB 99 and SB 101 was followed as these bills establish the Active Transportation Program guidelines and scoring rubrics (for active transportation projects submitted for competitive grant funding). A complete listing and description of the various Federal/State laws governing active transportation planning including the many State Assembly (AB) and Senate (SB) bills and Executive Orders (EO) are provided in **Appendix 2**.

COMMUNITY PARTICIPATION

A key requirement of ATPs is that it must be informed through community engagement. Community participation is a vital component of this plan for obtaining input on existing bicycling facilities, potential roadways for improvement to accommodate bicycles, and the type of support facilities or programs needed to improve bicycling within the City of Solvang. The public outreach approach of this plan includes the following:

- To avoid "meeting fatigue" the ATP public engagement was integrated with the City's comprehensive General Plan community engagement process. As part of the Circulation Element update, six public workshops were held for the General Plan update by the City of Solvang (February 2021, April 2021, January 2022, March 2022, May 2022 and July 2022). Numerous noticed public hearings for Planning Commission and City Council meetings were also performed and will continue to be performed as part of the plan's approval process. Community participation is discussed in more detail in a following "Community Participation" section.
- Direct input from the City staff about what development is planned for the future and what will be needed to accommodate that growth.
- Public presentations and workshops to incorporate citizen and community input.
- A refinement process that takes into account the following bikeway planning criteria:
 - **Safety** – The system should provide the highest level of safety feasible.
 - **Coverage** – The system should provide balanced access from the City's activity centers for commuting and recreation purposes.

- **Connectivity** – The system should provide “low-stress” bikeway connections to major points of interest in and outside the city (i.e., activity centers, commercial centers, recreational activities, transit stops, regional attractions).
- **Use** – The proposed system should reflect use levels that are commensurate with the intended level of investment.
- **Standards** – The system should reflect the appropriate Class of bicycle facility consistent with Caltrans’ design standards (described previously).



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CONSISTENCY WITH OTHER PLANS

This Plan ensures consistency with the following state/regional/local planning documents:

- California Transportation Plan 2050 (2021)
- Climate Action Plan for Transportation Infrastructure (2021)
- Caltrans District 5 ATP (2021)
- SBCAG Regional ATP (2015)
- Santa Ynez Valley Traffic Circulation & Safety Study (SBCAG, 2020)
- City of Solvang Local Roadway Safety Plan (2021)
- City of Solvang Sidewalk Master Plan (2016)
- Caltrans 2020-2024 Strategic Plan (2020)
- Caltrans Director's Policy 37
- SBCAG RTP & SCS: Connected 2050 (2022)
- Santa Ynez Bicycle Master Plan (SBCAG, 2019)
- Mission Drive Corridor Study (2014)
- City of Solvang General Plan – Circulation Element

A complete list and description of relevant planning documents is provided in **Appendix 3**.

GOALS, POLICIES AND PROGRAMS

For the City’s General Plan Update, the City of Solvang formed the General Plan Advisory Committee (GPAC). The GPAC’s role is to guide and facilitate development of the plan and serve as a sounding board for the discussion of issues and opportunities affecting the community. As part of the update process, the GPAC adopted Guiding Principles for elements of the update. For mobility and access, the adopted guiding principal is as follows:

"Safe and accessible streets, multi-purpose trails, and sustainable multimodal transportation options conveniently connect people and places throughout town and to surrounding destinations in the broader Santa Ynez Valley while reducing the impacts of traffic on the community."



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The following select Goals, Policies and Programs apply to provision of active transportation are currently included in the draft Mobility Element.

Goal MOBILITY-2:

Promote safe alternatives to motorized transportation that meets the needs of all city residents. (Source: Existing General Plan, Goal 3)

Policies

- MOB-2.1** **Support Local and Regional Bicycle Planning.** The City shall coordinate with SBCAG and participating local jurisdictions to update the Santa Ynez Bicycle Master Bikeway Plan every 5 years to maintain an adequate system for the safe and efficient movement of cyclists.
- MOB-2.2** **Improve Bicycle Access.** The City shall adopt a master plan of bikeways on public property and shall develop trails as needed and feasible. (Source: Existing General Plan, Action 3.1.A)
- MOB-2.3** **Improve Bicycle and Pedestrian Routes.** The City shall incorporate bicycle routes or trails into the design of new or expanded roadways when feasible. (Source: Existing General Plan, Action 3.1.B)
- MOB-2.4** **Bicycle Network Maintenance.** The City shall allocate resources to maintain a safe bikeway system by ensuring pavement is of good quality, mode separation is implemented where feasible, and signs and markings are maintained. (Source: Existing General Plan, Action 3.1.C)
- MOB-2.5** **Bicycle Route Prioritization.** The City may consider removal of on-street parking to facilitate bikeways as increased bike use decreases the need for parking. (Source: Existing General Plan, Action 3.1.D)
- MOB-2.6** **Pedestrian Infrastructure.** The City shall provide a system of sidewalks or pathways that provides a safe environment for pedestrians. (Source: Existing General Plan, Policy 3.2)
- MOB-2.7** **New Development Pedestrian Infrastructure Provision.** The City shall require the provision of adequate pedestrian access for new development projects through its Standards and its site plan review process. (Source: Existing General Plan, Action 3.2.A)
- MOB-2.8** **New Development Wheelchair Access.** The City shall require the installation of wheelchair ramps on all new sidewalks. (Source: Existing General Plan, Action 3.2.B)
- MOB-2.9** **Wheelchair Access Expansion.** The City shall encourage the installation of sidewalks and wheelchair ramps in existing neighborhoods, where appropriate. (Source: Existing General Plan, Action 3.2.C)
- MOB-2.10** **Pedestrian Network Improvement.** The City shall support the installation of improved pedestrian paths and connections throughout the community. (Source: Existing General Plan, Action 3.2.D)

Goal MOBILITY-3

To provide an adequate supply of public parking to meet the needs of residents and visitors to the city. (Source: Existing General Plan, Goal 4)

- MOB-3.7 Accommodate Increased Bicycle Use.** The City may consider removal of on-street parking to facilitate bikeways as increased bike use decreases the need for parking. (Source: Existing General Plan, Action 4.2.A)
- MOB-3.9 Creation of Micro-Mobility Infrastructure.** The City shall encourage the use of alternative transportation modes by providing adequate parking for small vehicles such as zero emission vehicles, scooters, “segways” and bicycles. (Source: Existing General Plan, Action 4.3.A, modified)

Goal MOBILITY-4

Provide a safe network of streets that reduced automobile dependence without sacrificing mobility by providing context-sensitive streets that feel safe for all users (Source: TBD)

- MOB-4.1 Complete Streets.** The City shall create context-sensitive guidelines to facilitate the installation of non-automobile serving infrastructure along its streets.
- MOB-4.2 Street Inclusion Assessment.** The City shall examine streets to be closed to vehicular traffic or otherwise modified to improve the network of routes available to other modes.
- MOB-4.3 Safe Streets.** The City shall pursue and enact traffic calming measures as appropriate to meet the policy objectives, as conditions warrant. (Source: Existing General Plan, Action 1.2.E)
- MOB-4.4 Safe Systems Approach.** The City shall regularly assess its outreach programs, roadway design guidelines, and accessibility of nearby medical facilities to facilitate the Safe Road Users, Safe Roads, Post-Crash Care sections of the Safe System Approach. (Source: New Policy)
- MOB-4.5 Safe Vehicles.** The City shall support regional efforts to examine the safety of new vehicle technologies to reduce the rate of collisions and fatalities within Solvang. (Source: New Policy)
- MOB-4.6 Safe Speeds.** The City shall coordinate with Caltrans and neighborhood stakeholders to revise speed limits on roadways serving residential and commercial areas pursuant to AB 43. (Source: New Policy)
- MOB-4.7 Pedestrian Only Streets.** The City shall reserve the right to close or restrict streets to automobile traffic and allow access only to non-auto modes. (Source: New Policy)
- MOB-4.8 Curbside Management.** The City shall assess access to high-use curb space to facilitate curbside pick-up and drop-off for transportation network and delivery companies without unduly limiting clear path and access for pedestrians and bicycles.
- MOB-4.9 Non-prioritization of Scooters.** The City shall not support the implementation of scooters unless community concerns, including those about sidewalk obstruction and vandalism, are addressed.

Goal MOBILITY-5

To reduce traffic congestion and vehicle trips through more efficient infrastructure and support for trip reduction programs. (Source: Existing General Plan, Goal 5.3)

- MOB-5.1 Vehicle Miles Traveled (VMT) Management.** The City shall work with SBCAG and the Santa Barbara County Air Pollution District to identify trip and VMT reduction opportunities. (Source: Existing General Plan, Action 5.2.C)
- MOB-5.2 Promotion of Automobile Alternatives.** The City shall work with employers and developers to provide employees and residents with attractive, affordable transportation alternatives. (Source: Existing General Plan, Action 5.3.A)
- MOB-5.3 TDM.** The City shall encourage employers to promote carpooling, public transportation, active transportation, and allow telecommuting. (Source: Existing General Plan, Action 5.1.C)

Programs

	Implements Which	Responsible
Mobility Element Programs	Mobility Policy(ies)	Supporting Department(s)
A Capital Improvements and Network Management. The City shall establish and maintain through regular updates a prioritized capital improvement program (CIP) that prioritizes projects that improve safety, maintain network efficiency and quality of life, minimize the impact of the transportation network on the natural environment, and facilitates alternatives to Mission Drive. As part of regular reviews of the existing network under this program, the future-readiness of the transportation system will be addressed. (Source: Existing General Plan, Policy 1.3 & 1.3A)	MOB-1.1 MOB-1.2 MOB-1.3 MOB-1.5 MOB-1.6 MOB-1.7 MOB-1.8 MOB-1.9 MOB-1.0 MOB-1.11 MOB-1.12 MOB-1.13 MOB-1.14 MOB-1.15 MOB-1.16 MOB-1.20	Planning Public Works

B Local and Regional Active Transportation Network The City of Solvang shall work to improve bicycle connectivity and access, pursuant to City goals and the Santa Ynez Valley Bicycle Master Plan. This bicycle network will, in conjunction with safe and complete sidewalk networks, allow accessible mobility throughout Solvang. (Source: New Program)	MOB-2.1 MOB-2.2 MOB-2.3 MOB-2.4 MOB-2.5 MOB-2.6 MOB-2.7 MOB-2.8 MOB-2.9 MOB-2.10 MOB-3.7	Public Works
D Complete Streets. The City shall create guidelines to assist with the improvement of the non-automobile transportation network that integrates the FHWA Safe System Approach. Possible solutions can range from traffic calming to closing streets to automotive traffic. (Source: New Program)	MOB-4	Planning Public Works
I Transit Provision and Travel Demand/System Management The City shall provide alternatives to automobile use, including public transportation, that offer equitable access to mobility and access, while supporting infrastructure to reduce VMT and increase system efficiency, such as broadband to support working from home and traveller information systems.	MOB-5 MOB-6	Planning

EXISTING CONDITIONS

This chapter summarizes the existing conditions related to active transportation in the City of Solvang, including an inventory of existing pedestrian and bicycle infrastructure, collision history, a level of traffic stress analysis of existing bicycle facilities, and an origins-destinations analysis to identify existing gaps in the active transportation network.

INVENTORY OF EXISTING BICYCLE FACILITIES

An infrastructure inventory was conducted of bicycle facilities, shared use paths and trails, curb ramps, and crosswalks within the City of Solvang. Facilities data was obtained from City staff and online resources. The facilities presented in this data were verified using Google Earth aerial imagery. Verification of all bicycle facilities and marked crosswalks in the city was performed. Existing bicycle facilities are summarized by type in **Table 1** and shown in **Figure 1**. Existing pedestrian facilities (i.e., sidewalks) are shown in **Figure 2**.

TABLE 1: EXISTING BICYCLE FACILITIES

BIKEWAY CLASS	EXISTING MILES
CLASS I SHARED USE PATHS	1.64
TRAILS	Not inventoried
CLASS II BICYCLE LANES	5.8
CLASS II BUFFERED BIKE LANES	0
CLASS III BICYCLE ROUTES	1.7
CLASS III BICYCLE BOULEVARDS	0
CLASS IV SEPARATED BIKEWAYS	0
TOTAL	9.14

Source: City of Solvang, DKS Associates 2023

There are currently 9.14 centerline miles of bike paths in Solvang. Excluding Class I shared use paths, which are typically separate from roadways, there are a total of 7.5 miles of on-street bicycle facilities in Solvang.

TRANSIT ACCESS

Local transit service in Solvang is provided by Santa Ynez Valley Transit, with Fixed-Route services that transport riders to, from, and around Solvang, Buellton, Santa Ynez, and Los Olivos. Dial-A-Ride service for seniors (60+ years) and ADA-certified patrons (regardless of age) is also offered within $\frac{3}{4}$ of a mile of fixed routes. Solvang is served by two routes: the Express Route, which provides buses every 30 minutes and connects to Buellton and Santa Ynez, and the Los Olivos Loop, which provides buses every 60 minutes and connects to Santa Ynez and Los Olivos.

Regional services such as the COLT Wine Country Express (a cooperative service provided by the Cities of Lompoc, Buellton, and Solvang, as well as Santa Barbara County), the Santa Maria Regional Transit and Santa Ynez Valley Transit (SYVT) all stop at the Solvang Park Transit Center.

There are 16 transit stops across both routes within the City of Solvang, most stops are located along Mission Drive (SR 246), with three stops serving the Los Olivos Loop located along Alamo Pintado Road. Many bicyclists and pedestrians use transit for a portion of their trip, making access to transit stops and stations vital to a safe and connected active transportation network.



PHOTO CREDIT: DKS, 2023

COLLISION ANALYSIS

Collision data was pulled from the Statewide Integrated Traffic Records System (SWITRS) and Transportation Injury Mapping System (TIMS). The crash data analyzed for this project included all crashes recorded in SWITRS and/or TIMS during the five-year period between January 1, 2017, and December 31, 2021. During this five-year period, 11 pedestrian and one bicycle injury crashes were reported¹.

COLLISION SEVERITY

Of the total pedestrian collisions reported, 18 percent resulted in severe injuries and 82 percent resulted in non-severe injuries. There were no pedestrian-involved fatal collisions reported. The one bicycle collision reported did not result in severe injuries.

LOCATION

Pedestrian and bicycle related collisions are shown in **Figure 3**. As shown, all but two of the crashes involving pedestrians or bicycles occurred on Mission Boulevard (SR 246) between 4th Place and Alisal Road and 75% of the crashes occurred at intersections. Among all the crashes, 82% of the pedestrian-involved crashes were attributed to a driver failing to yield when the pedestrian had the right of way, with the remaining two crashes resulting from an improper turning and a DUI. Based on this data, treatments that improve pedestrian visibility within crosswalks and increase driver yielding may be recommended. The single bicycle crash had no primary factor identified.

¹ Bicycle and pedestrian collisions are likely under-reported due to a misconception that they are not “real” collisions, minimal injuries or damage, lack of insurance involvement, or concerns about interacting with law enforcement. Data in this section is based on reported collisions; the actual number of collisions is likely higher.

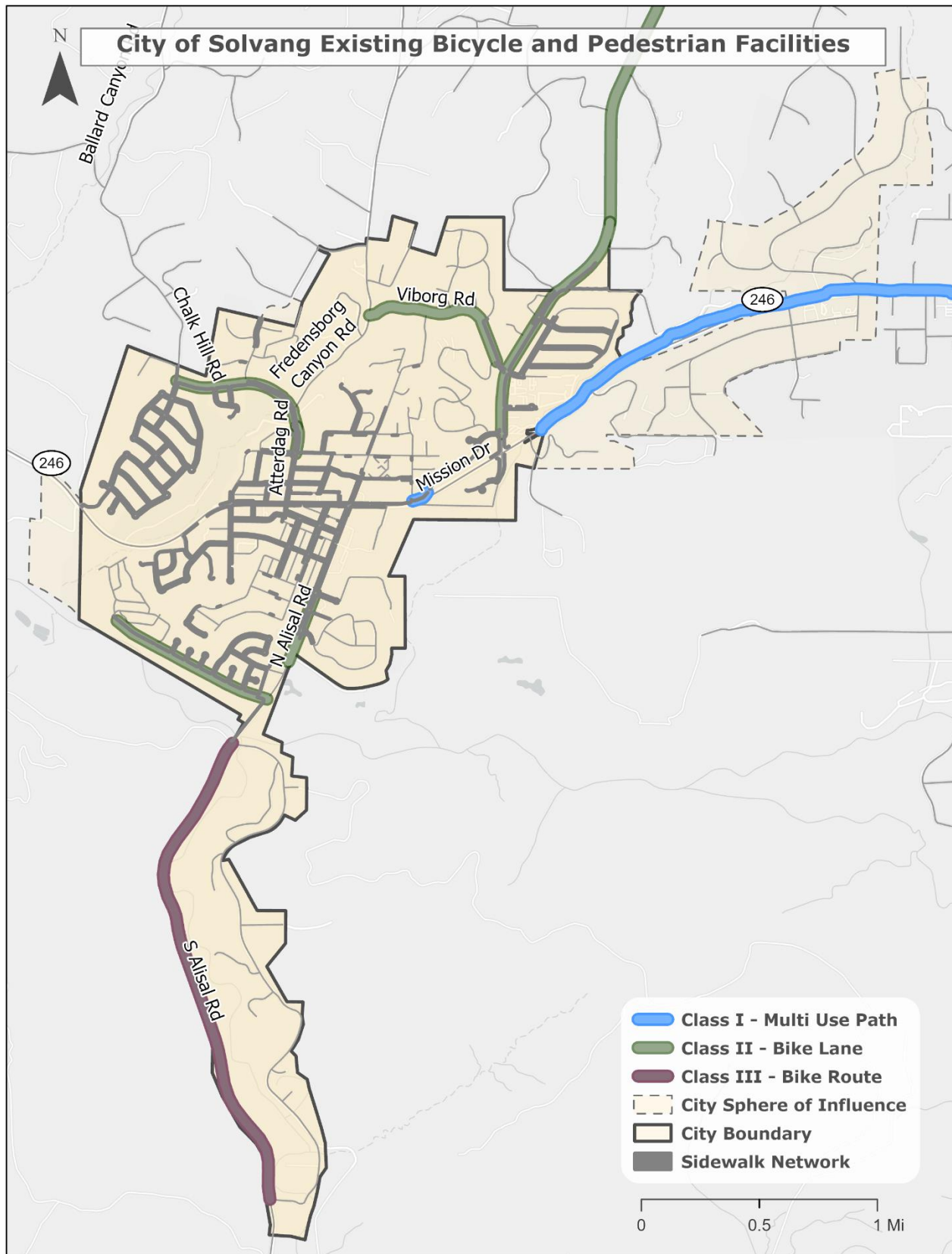


FIGURE 1: EXISTING BICYCLE FACILITIES

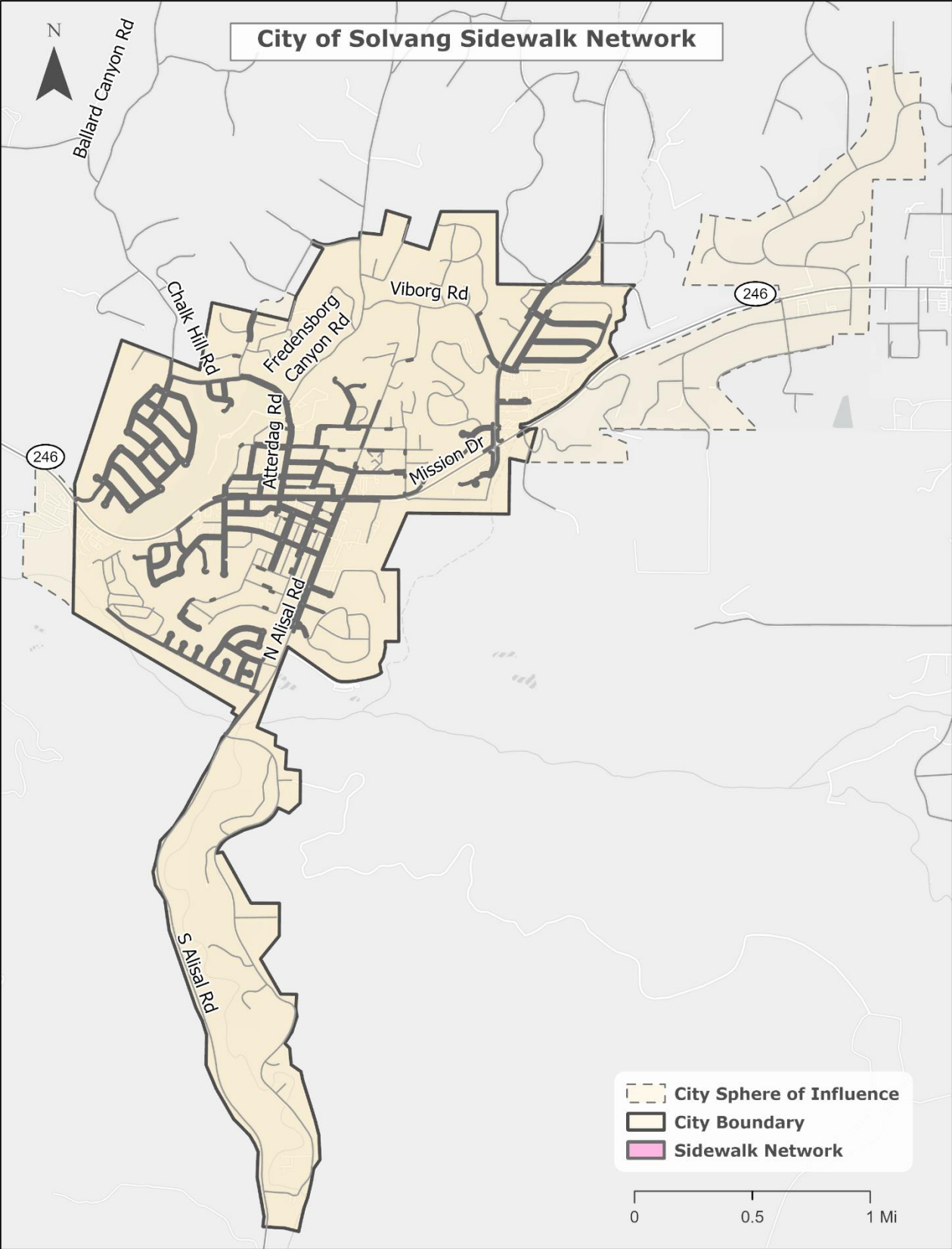


FIGURE 2 EXISTING PEDESTRIAN FACILITIES

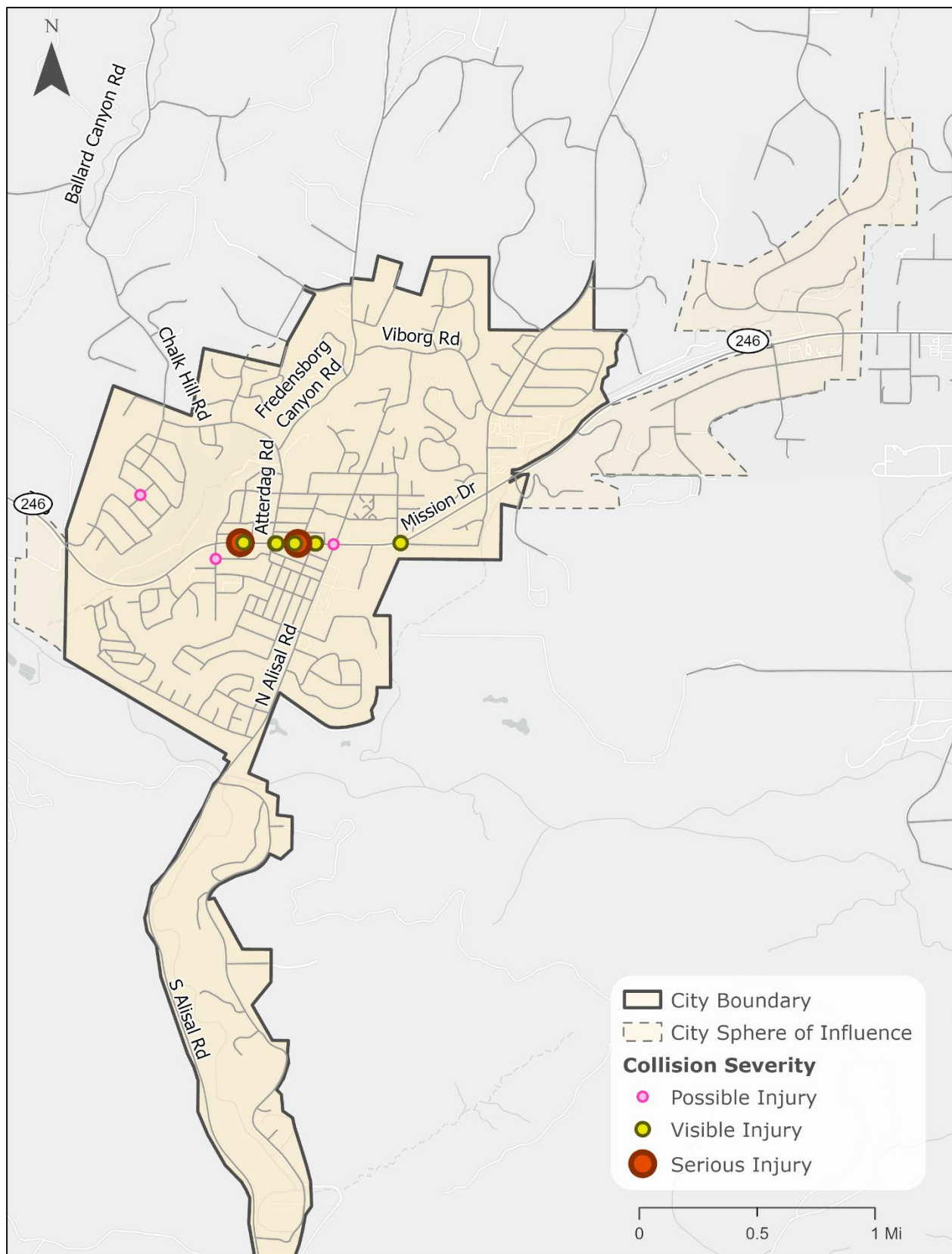
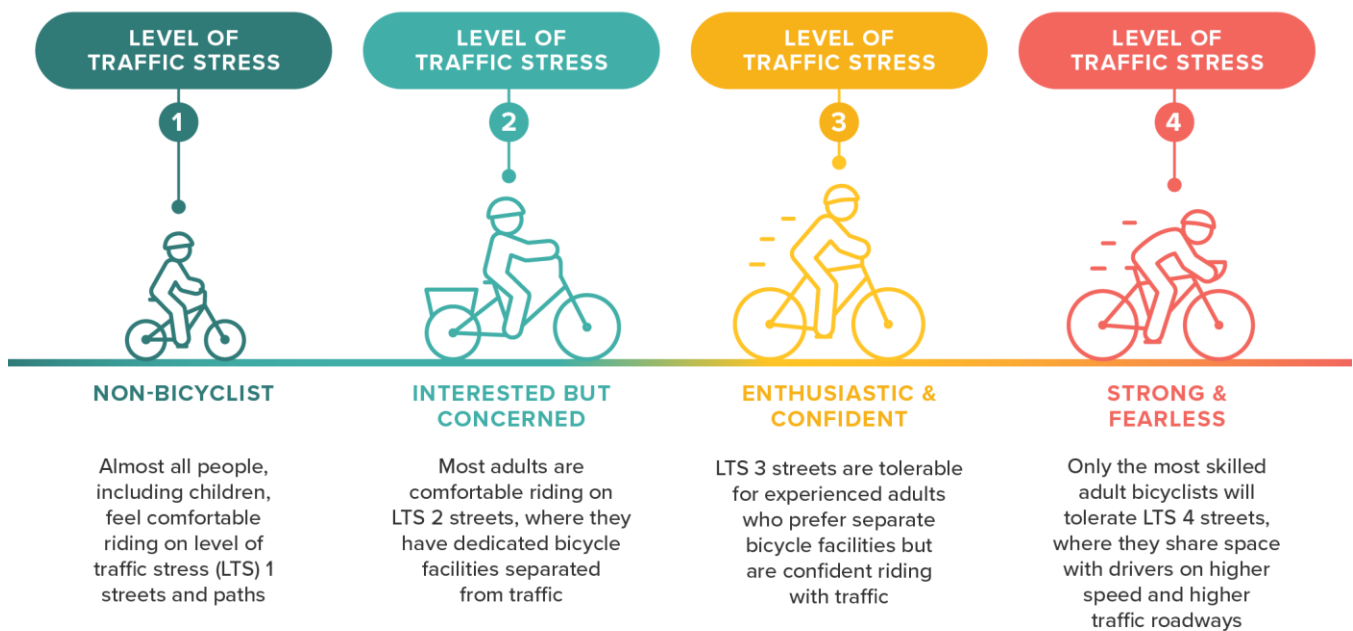


FIGURE 3: BICYCLE AND PEDESTRIAN INVOLVED CRASH LOCATIONS (2017-2021)

LEVEL OF TRAFFIC STRESS

Based on the methodologies described in the Mineta Transportation Institute's Report 11-19 Low-stress Bicycling and Network Connectivity (2012), Bicycle Level of Traffic Stress (LTS) quantifies the stress level of a given roadway segment by considering a variety of criteria. These criteria include street width (number of lanes), speed limit or prevailing speed, presence and width of bike lanes, and the presence and width of parking lanes. Mineta suggests using street width as a surrogate for traffic volume when volume data is not available for the study area. In Solvang, potential traffic volume data was incorporated into LTS scoring using the number of vehicle lanes on each road segment analyzed as an accepted proxy.

LTS is designated with a score of 1 through 4, with 1 providing the most comfort and 4 providing the least comfort. Generally, an LTS score of 1 indicates that the roadway provides a stress level tolerable by small children, and an LTS score of 4 indicates a stress level tolerable only to strong and fearless bicyclists.



For purposes of this analysis, LTS scores of 1-2 denote a low-stress experience while LTS scores of 3-4 denote a high-stress experience. As such, it is desirable to achieve connectivity of the low-stress network among all points of interest within the city. By maximizing connectivity of the low-stress network, a greater proportion of the population who are willing and open to biking (estimated to be approximately 60% of people) may consider using a bike for a given trip rather than driving.

The Bicycle LTS methodology is broken into three categories: segments (bike paths, lanes, or routes), intersection approaches (turn lanes), and intersection crossings (unsignalized intersections). Criteria are applied separately for each category using the "worst case principle," meaning the worst (or highest) score among the criteria considered governs the overall LTS score for that facility.

Depending on the community context and the detail level desired, the overall methodology may be simplified based on the general consistency of facility types, as certain elements (e.g., turn lanes, bike lanes, speed limits, etc.) may not exist in a particular community. If there are no turn lanes on an approach, then this portion of the methodology is skipped. Signalized intersections do not receive an LTS score. Signalized crossings usually do not create a barrier, as the signal provides a protected crossing, and are therefore not considered in the methodology.

The Mineta Transportation Institute's LTS methodology is described in greater detail in **Appendix 4**.

RESULTS

The existing roadway network in the City of Solvang consists of 25.34 centerline miles of local roadway infrastructure, and approximately 2.15 centerline miles of state-owned facilities that traverse the city (i.e., SR 246). Of the city's existing roadway network, 21% provides Class II bike lanes (5.8/27.49). There is a 1.64 centerline miles of Class I bike path that is owned and maintained by Santa Barbara County. This path is within the City's sphere of influence but outside the city limits. These facilities provide alternatives paths of travel for cyclists and pedestrians throughout the city.

The City of Solvang's existing roadway network level of traffic stress is presented for crossings and segments in **Figure 4** and **Figure 5** respectively. Stress level is coded by color: blue being low-stress (LTS 1-2) and red denoting high-stress (LTS 3-4). There is a large proportion of low-stress facilities within the city given that the majority of the city's road-miles are residential streets with speed limits of 25 miles per hour or less. While these streets generally do not have bicycle facilities, they are considered low-stress routes due to the low vehicular speed and low volumes.

Figure isolates just those segments and crossings that based on the Mineta methodology are considered high-stress facilities for bicyclists (LTS 3-4). These facilities act as barriers to low-stress bicycle connectivity within the city. Note that for a bicyclist to have a low-stress experience, he or she must not traverse a high-stress segment or crossing for any portion of the route. In other words, for any two locations to be considered connected via the low-stress network no portion of the route between the two can traverse a high-stress segment or crossing. If it does, it is considered a high-stress route and not viable for a majority of people who would consider riding a bike. The low-stress network identified in the LTS analysis of existing infrastructure was used in the connectivity analysis described in the following section.

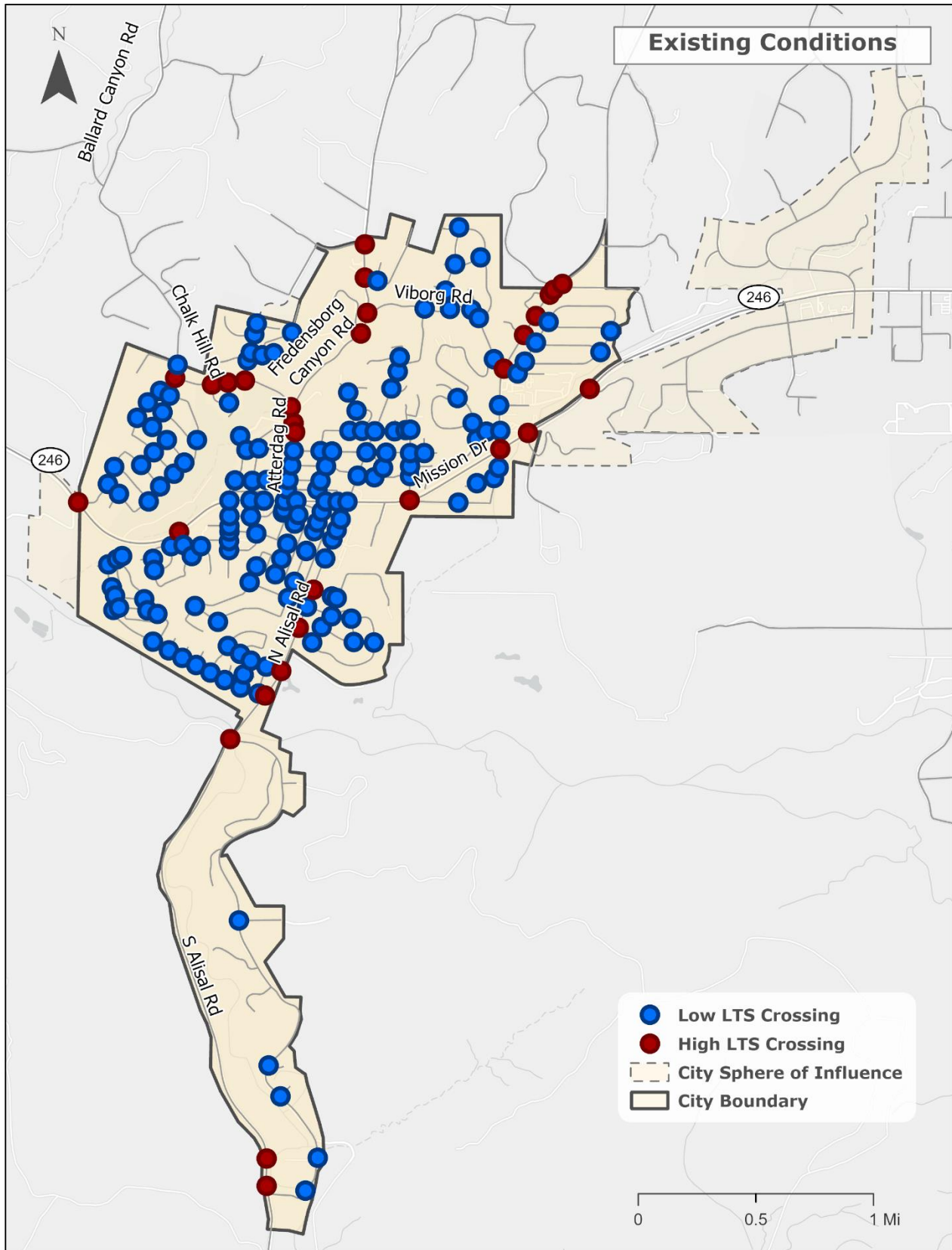


FIGURE 4: EXISTING CROSSINGS BY LTS SCORE

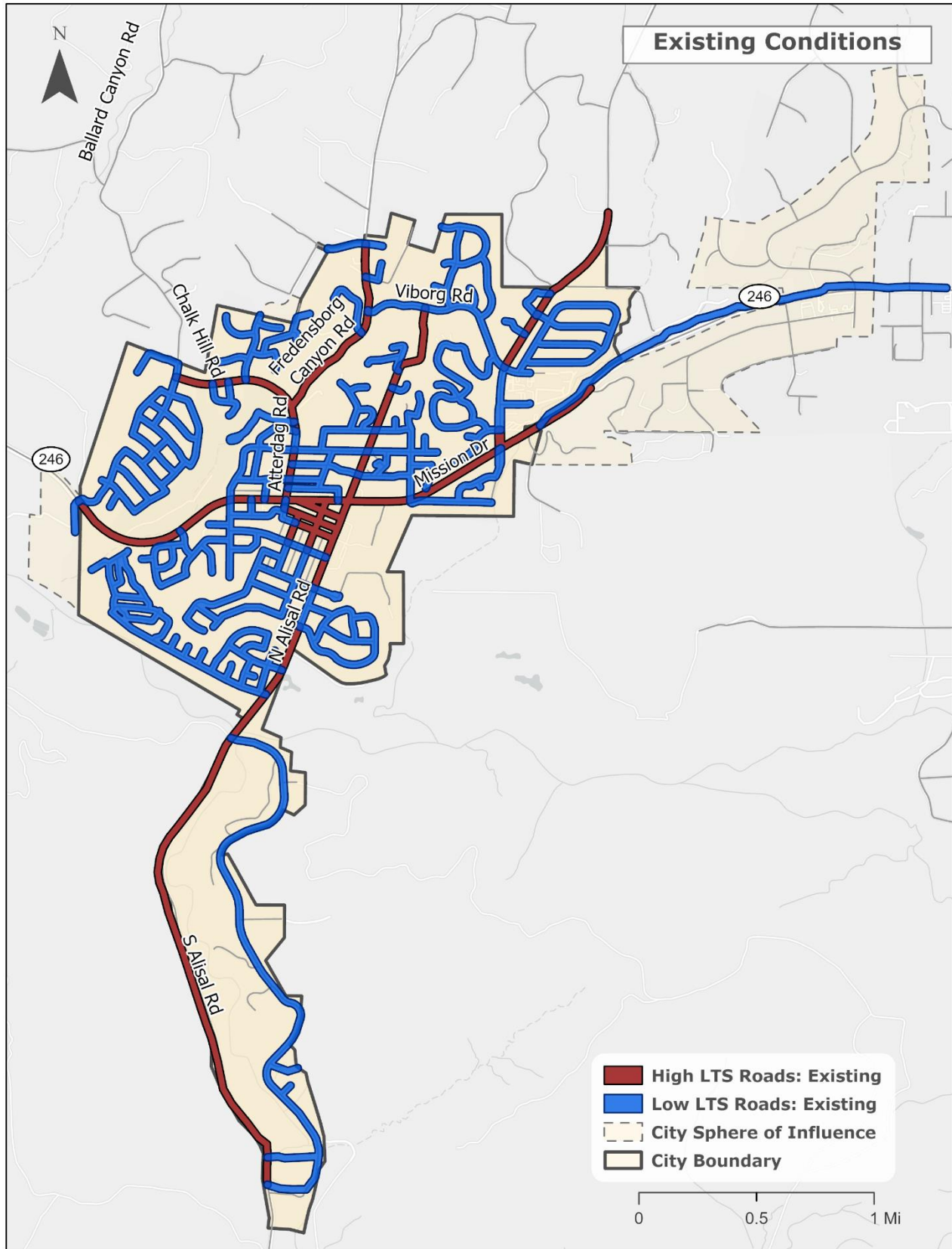


FIGURE 5: EXISTING SEGMENTS BY LTS SCORE

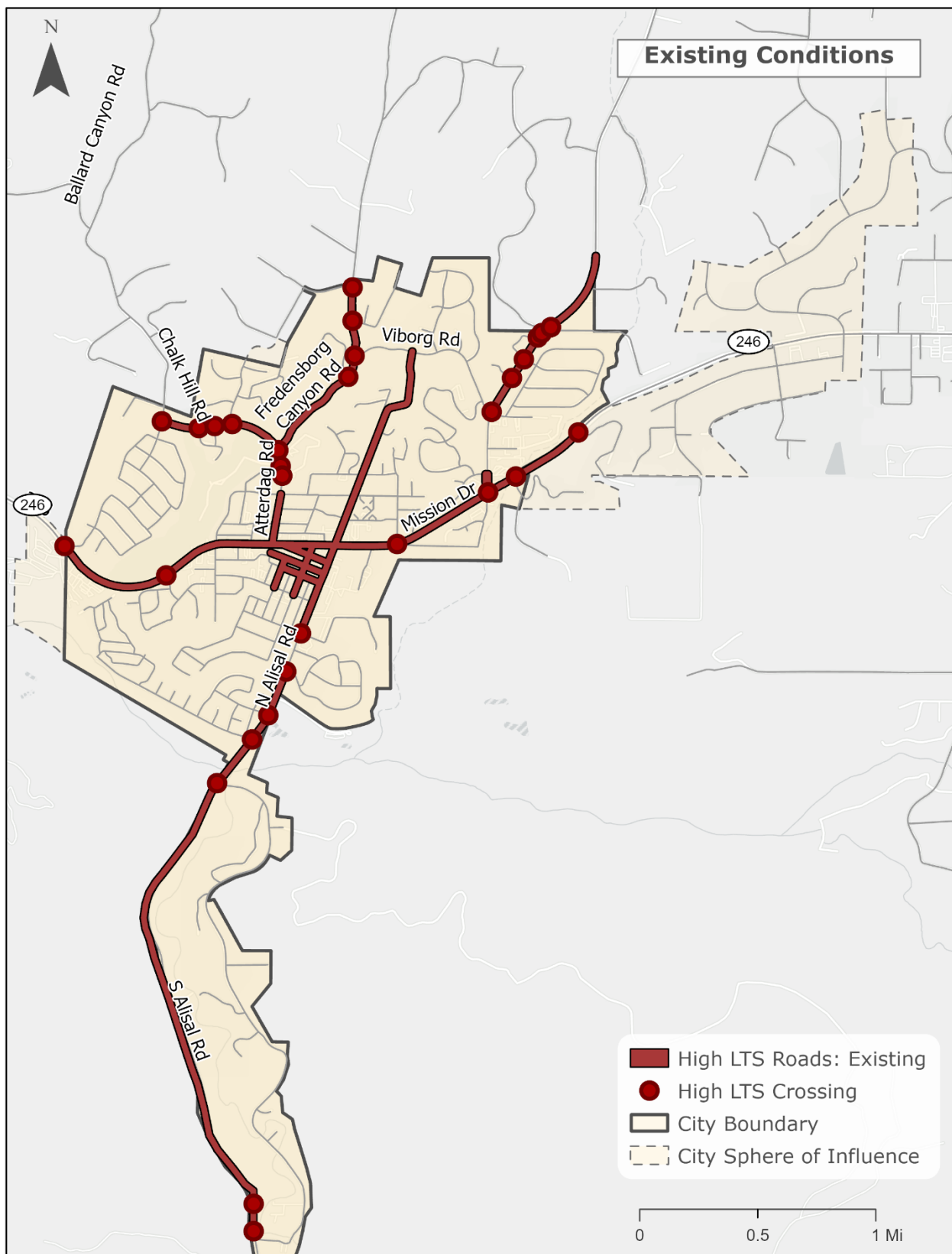


FIGURE 6: HIGH LEVEL OF TRAFFIC STRESS - SEGMENTS AND CROSSINGS

POINTS-OF-INTEREST NETWORK

To identify origins and destinations that are likely to generate bicycle and pedestrian trips, a network analysis was performed. The analysis included identifying key residential and non-residential points of interest within the community.

IDENTIFICATION OF POINTS OF INTEREST (POI)

A point of interest (POI) is a point representing the geographic center of a polygon shape or cluster of points of interest. POIs were classified as residential or non-residential and then used to analyze the level of connectivity between points of interest within the city.

RESIDENTIAL KEY NODES

Land use data from SBCAG's Travel Demand Model was used as the basis for identifying residential POIs to complete the network. All model Traffic Analysis Zones (TAZs) are represented by a centroid or node. The geospatial location of the centroid within each TAZ is influenced by the actual distribution of development within the zone. TAZs that contain no residential units were removed from consideration. TAZs that include residential units (single-family dwelling units, apartment units, condominiums) are shown in **Table 2**. For reference, a prominent residential development located within a given model TAZ is listed but should not be construed as the only residential development within the TAZ.

TABLE 2: KEY RESIDENTIAL NODES

RESIDENTIAL COMMUNITY	SBCAG TAZ
RANCHO SANTA YNEZ ESTATES	101001
VILLAGE COLLECTION RESIDENTIAL DEVELOPMENT	103101
SKYTT MESA RESIDENTIAL DEVELOPMENT	100702
WINDMILL LN/OLD MILL RD RESIDENTIAL DEVELOPMENT	101203, 100801
3RD STREET/WILLOW DR RESIDENTIAL DEVELOPMENT	103102
NYBORG ESTATES RESIDENTIAL DEVELOPMENT	101002
ALISAL GLEN RESIDENTIAL DEVELOPMENT	103102
VIKING HILLS RESIDENTIAL DEVELOPMENT	100701
MISSION OAKS RESIDENTIAL DEVELOPMENT	101204

RESIDENTIAL COMMUNITY	SBCAG TAZ
ALISAL HEIGHTS / ALISAL RD RESIDENTIAL	100903, 101204
NYBORG ESTATES RESIDENTIAL DEVELOPMENT	101205, 101202
CREEKSIDE PLACE RESIDENTIAL DEVELOPMENT	101201
ALISAL RANCH ESTATES RESIDENTIAL DEVELOPMENT	103103
5TH STREET RESIDENTIAL, OAK PARK APARTMENTS	100805, 101003, 100803

Source: DKS Associates, 2023

NON-RESIDENTIAL POINTS OF INTEREST (POI)

Non-residential POIs were selected based on a review of land use and key locations in Solvang. Given the spatial clustering of similar POIs, some points were aggregated to reduce the number of nodes to a more manageable number without losing information. Non-residential POIs incorporated in this analysis include:

- Transit Stops
- Schools
- Parks
- Trail Access Points
- Health-related Facilities
- Shopping Destinations
- Hotels
- Grocery Stores
- Community/Recreation Centers
- Places of Worship
- Sports Facilities
- Municipal Facilities (such as government buildings serving as job centers)
- City Hall
- Libraries
- Police Stations
- Fire Stations



PHOTO CREDIT: DKS, 2021

NETWORK CONNECTIVITY AND UNDUE DETOUR ANALYSIS

To estimate the effect that the presence of moderate to high-stress routes have on bicycle connectivity, network connectivity analysis was conducted to calculate the shortest bicycle trip distance between the identified POIs.

Measuring bicycle trip length is critical to determining network connectivity for the following reasons:

- While POIs may be physically connected by the network, barriers and gaps within the network can substantially increase bicycle trip distances, resulting in significant detour.
- Based on research by the Mineta Institute, circuitous routing of greater than 25% of the baseline distance is considered “undue detour”.
- Additionally, barriers and gaps can completely separate POIs from the surrounding network, making it difficult and unsafe to travel by bicycle.

Initial network analysis was conducted using the full roadway and bicycle network (LTS-1 – LTS-4). The resulting bicycle trip distances between these locations provided the baseline for the City of Solvang’s bicycle connectivity (in terms of trip lengths between POIs) assuming the full existing roadway and bicycle network, regardless of level of traffic stress. This represents the ideal condition for the City of Solvang in which the entire roadway network is considered low-stress. Subsequent network analysis was conducted to calculate the shortest path between these locations using only the low-stress roadway network (LTS-1 – LTS-2). In effect, all moderate to high-stress routes were considered barriers to bicycle travel and not considered as viable bicycle routes for a large percentage of the population.

Figure 7 provides a visual of the degree of low-stress connectivity within the city. POI pairs that are connected via the low-stress network are shown with a blue connector (as the crow flies). These connections are performed for all POI pairs. The resulting pattern delineates areas that are well connected via the low-stress network and areas that are isolated (i.e., cut off by the high-stress facilities). As shown, total connectivity via the low-stress network is 36 percent. Hence, the presence of high-stress routes results in an approximately 64% reduction in overall connectivity between POIs (i.e., approximately 64% of trips between POIs are no longer possible unless high-stress routes are utilized).

Given that bicycle travel using only the low-stress network results in an average increase in bicycle trip lengths of approximately 60% (i.e., bicycle trip distances between POIs increase by almost two times from baseline conditions), consideration of “undue detour” on the viability of some low-stress connections is warranted. Based on the Mineta methodology, detours resulting in a baseline trip increase of 25% or more in length (i.e., shortest distance between POIs) are considered “undue detour”. This represents trips not likely taken by bike if avoiding high-stress routes results in a trip length 25% greater than the most direct and shortest route. **Figure 8** visually shows connections between POIs after removing those connections associated with “undue detour”. As shown, this reduces the overall connectivity from 36% to 19%. Due to the scale of the study area undue detours should not be generally viewed as a significant barrier for many bicycle trips within the city. The longest trip contained in the routing analysis for the final proposed network is 3.5 miles which would take a person riding 15-20 minutes to traverse depending on the terrain.

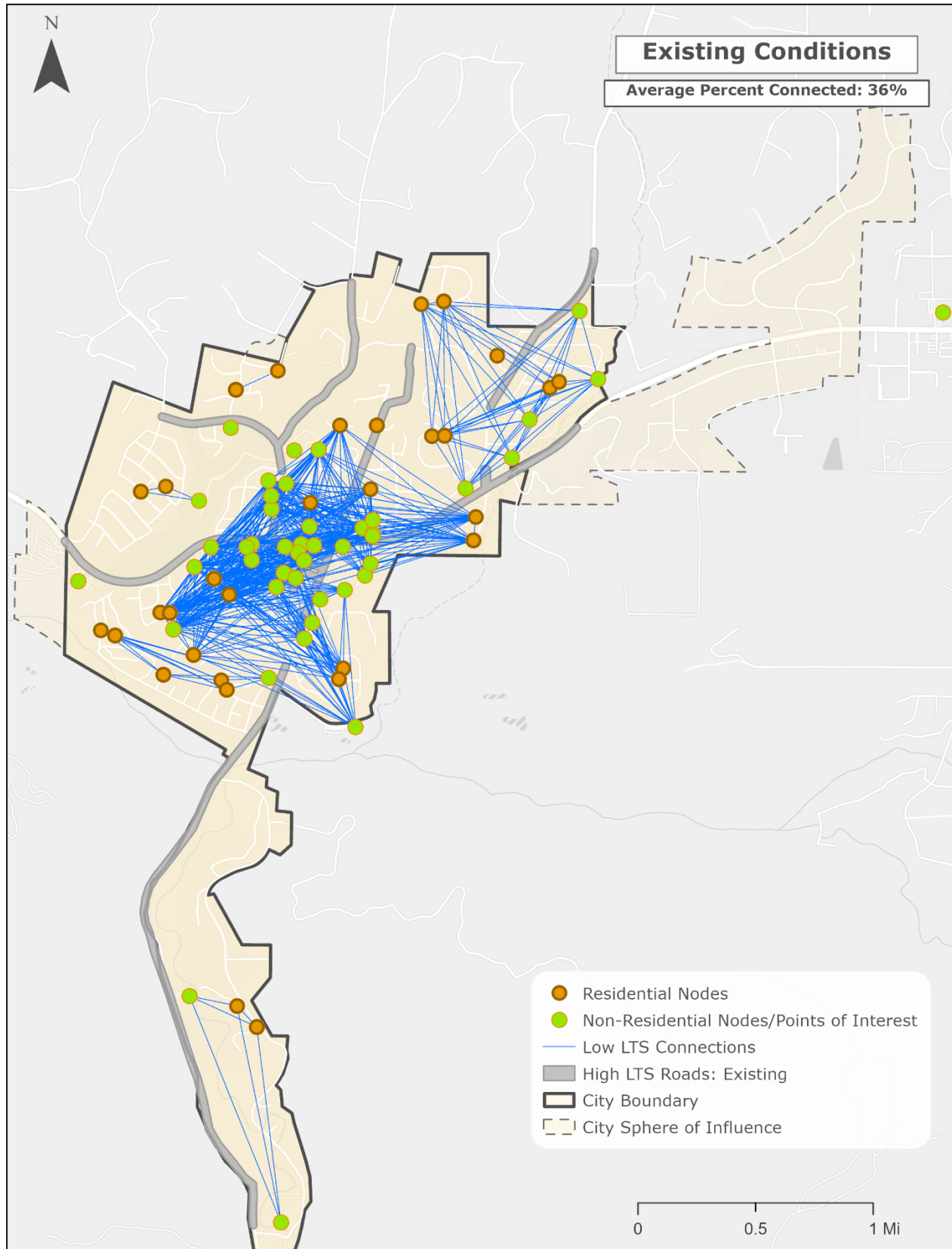


FIGURE 7: EXISTING NETWORK CONNECTIVITY RESULTS

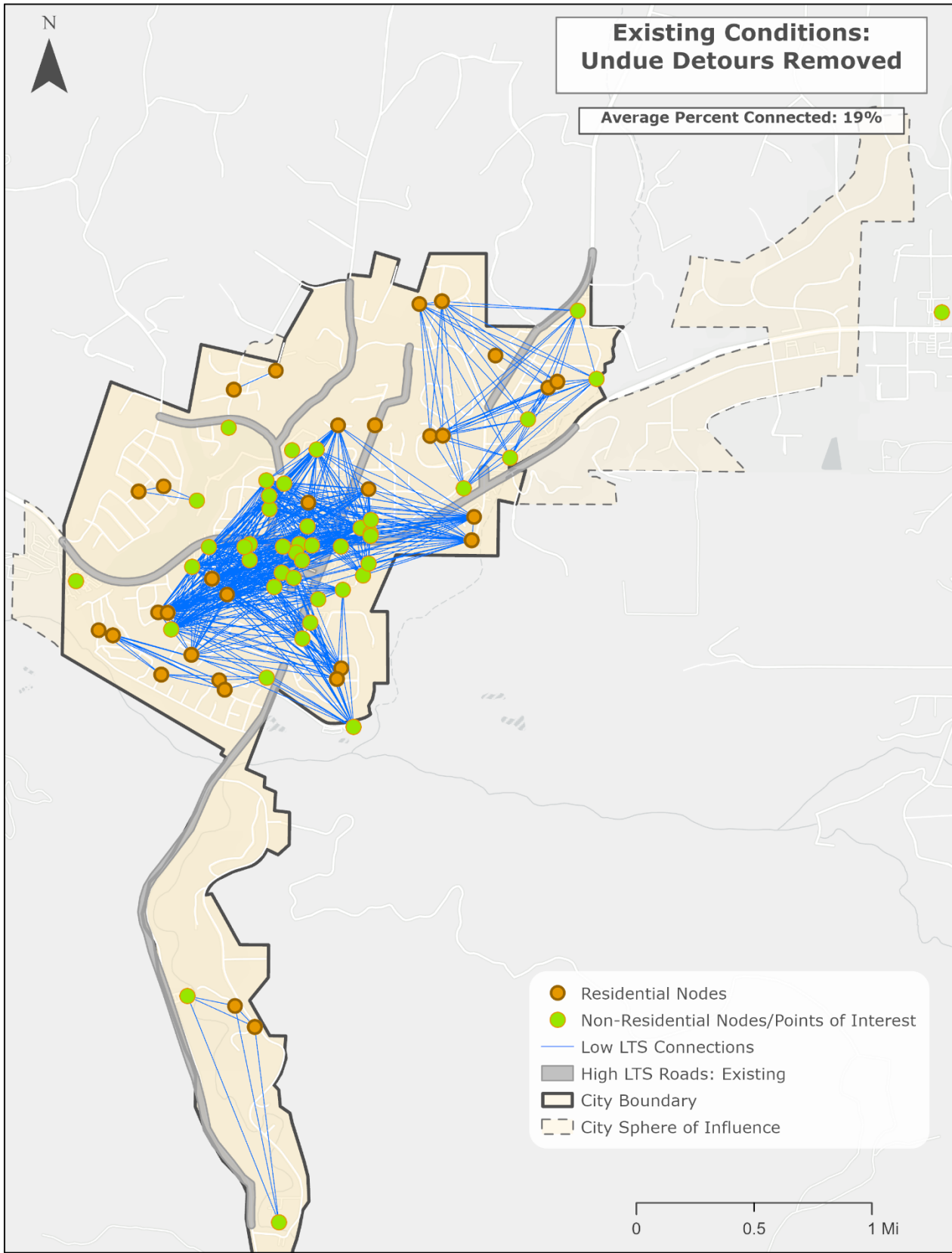


FIGURE 8: EXISTING NETWORK CONNECTIVITY RESULTS WITH UNDUE DETOURS REMOVED

COMMUNITY ENGAGEMENT

The lived experiences of the residents of Solvang are critical to understanding transportation issues, needs, and opportunities in the town. There is a level of intimacy developed through interacting with a place one lives that cannot be captured through quantitative data. The community outreach consisted of stakeholder interviews, workshops, and online engagement. This section presents a summary of the transportation related feedback gathered from these activities.

ACTIVE TRANSPORTATION

The main interests of residents in relation to active transportation were the bike-ability and walkability of the town. There were 31 comments that addressed walking or pedestrian infrastructure and 11 comments mentioned biking (**Figure 9**) consisting of 16.9% of the total comments (**Figure 10**).

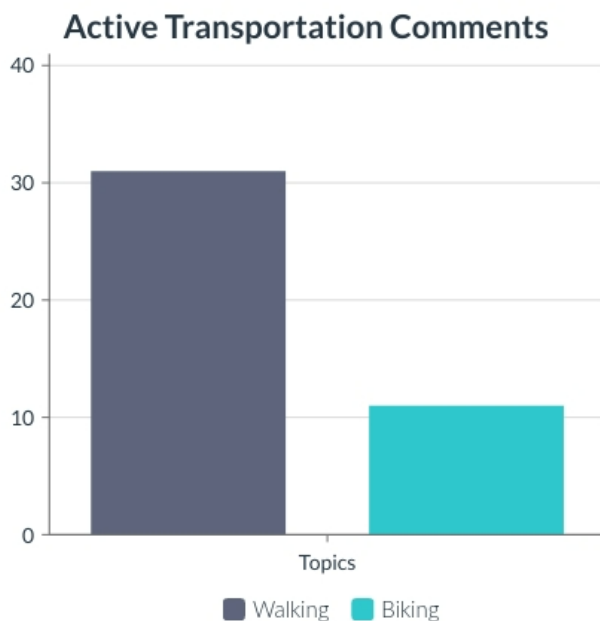


FIGURE 9. ACTIVE TRANSPORTATION COMMENTS

"I love Solvang because... Of its vibrant, quaint downtown, walkability, access to excellent cycling possibilities and the diversity of groups that seem to want to visit that make it a cool place to hang out."

Solvang Transportation Comments

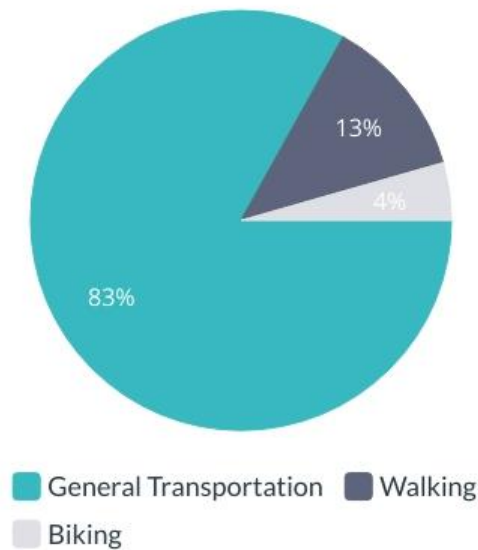


FIGURE 10. TRANSPORTATION COMMENT DISTRIBUTION

WALKING

Residents enjoyed the closure of streets such as Copenhagen Drive in the commercial area of Solvang, but were concerned with how business access, parking, traffic, and tourism would be affected. Of the 20 times the closure of Copenhagen Drive was mentioned three comments advocated for conversion back to vehicle right of way while the rest welcomed continued pedestrian space.

"Keep Copenhagen car free please!"

The connectivity of the pedestrian network was brought up in several comments citing a desire to make Solvang more pedestrian accessible and build sidewalks where they are currently missing.

"It is not easy to walk from some areas due to missing sidewalks or sidewalks not being well maintained."

Overall, the outreach feedback indicated a desire to make Solvang a more walkable and pedestrian friendly community.

BIKING

Residents of Solvang voiced a desire to enhance the bike-ability of Solvang through improvements to the current bike network. The two main actions addressed in the comments are to add more bike lanes and enhance the safety of current infrastructure.

"There is a need to enhance bike lanes in the community."

Current hindrances to biking in the town include unsafe traffic levels and the connectivity of the existing network.

GENERAL TRANSPORTATION

Much of the feedback gathered focused on the parking and traffic effects from continued development of Solvang through programmatic and land use changes. Residents expressed concern and interest in how their mobility has been and will be affected by commercial developments, increased active transportation, changing right of way, and higher residential density. These themes are reflected in the most prominent words from the outreach comments which are summarized in the world cloud below (**Figure 11**).



FIGURE 11. COMMUNITY COMMENT WORLD CLOUD

Through analysis of the other transportation comments three major topics emerged: parking, traffic, development and infrastructure (**Figure 12**).

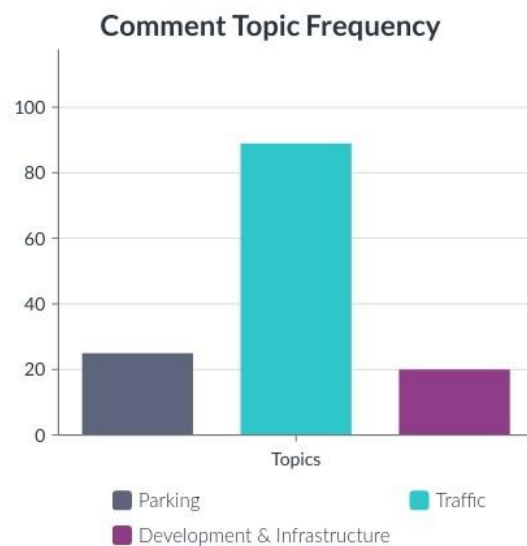


FIGURE 12. TOPIC FREQUENCY FROM COMMUNITY COMMENTS

TRAFFIC

Traffic had the highest frequency of mentions within the outreach comments with 93 instances of the word. Most of the comments related to traffic on Mission Drive (State Route 246) and circulation of traffic volume within the town with some addressing effects on traffic from increasing focus on active transportation. Residents expressed concern over the volume of traffic along Mission Drive citing safety issues and congestion. Traffic leaving Mission Drive to avoid congestion and access amenities have caused issues in other parts of Solvang. In particular, the intersection at Old Mission Drive and Alamo Pintado Road was mentioned 19 times and is a safety concern due to the confluence of truck and vehicle traffic accessing the shopping center and other commercial businesses. The traffic volumes are a concern for both pedestrian and bike traffic traveling through the corridor. A traffic mitigation plan that considers the quiet residential nature of Solvang



PHOTO CREDIT: DKS, 2023

was highlighted over concerns of the Fjord Drive Extension improvement concept was mentioned several times. Regarding active transportation, the closure of streets such as Copenhagen Drive was both praised and criticized. In response, the City commissioned an independent standalone community outreach effort to gauge the level of interest in a permanent downtown street closure including several alternatives and the potential implications on traffic circulation and loss of on-street parking. Ultimately, the City chose not to include this concept as part of its General Plan update. Nonetheless, residents appreciated increasing the walkability of Solvang and expanded pedestrian right of way but were concerned with how changes could negatively affect traffic in the town.

PARKING

Parking was highlighted 50 times throughout the comments and focused on the current constraints in the commercial areas and how they related to mobility and overflow into residential zones. Many of the comments on parking were divided. The closure of Copenhagen Drive to cars received mixed reviews with some residents advocating for its continued closure and others requesting vehicle right of way for parking. The increased walkability and freedom from traffic noise and pollution was a highlight for many. However, there is concern that parking around the commercial areas along Mission Drive is inadequate and that businesses could be negatively affected. Some residents requested more free parking in the area and others advocated for less parking and metering. The overflow of tourist parking into residential areas was cited as an issue making it difficult for residents to navigate the town during peak times.

DEVELOPMENT AND INFRASTRUCTURE

Development and infrastructure were often mentioned together as many residents expressed concern over residential density, parking minimums, commercial development, and induced demand. There were concerns over the suitability of the current transportation infrastructure in handling increased traffic from planned residential development. Some residents saw the current transit and active transportation network as inadequate to serve new buildings with parking minimums that are less than 1 car per unit. Further, there was uncertainty on whether the current circulation network could handle more commercial development and the associated truck and vehicle volumes. Throughout the comments related to this theme residents expressed a desire to maintain a balance between Solvang's bucolic small-town character and increasing tourism to the area. Creating a more walkable and bikeable town was seen as one way to do this as increasing vehicle traffic volumes have been mentioned as a barrier to walking and biking in the town.

RECOMMENDED IMPROVEMENTS

Built on the needs and opportunities identified through the technical analysis and community engagement, as well as bicycle and pedestrian improvements identified through previous planning efforts, this chapter presents recommended infrastructure improvements and programmatic efforts to improve active transportation in Solvang. The network, crossing, and other improvements are intended to provide Solvang residents with convenient, safe, and healthy transportation choices. All recommendations have been developed within the framework of a planning-level analysis and will

require further analysis prior to implementation. Typically, the process to advance recommendations such as those in this Plan would include an engineering study to understand any relevant site-specific issues and develop a design in compliance with the California Manual on Uniform Traffic Control Devices (CAMUTCD) and local design standards (if applicable), public review if required by local process, and securing funding.

INFRASTRUCTURE RECOMMENDATIONS

Recommended improvements are summarized in this section. The term “project” is used to represent a recommendation or set of recommendations that could be pursued for future development by the City and any applicable partners, including development of any required studies, designs, securing funding, and other steps required by the agency prior to implementation. Network projects are described separately for bicyclists and pedestrians, with the exception of Class I shared use paths which are included for both users. Crossing improvements for people bicycling and walking are mapped in combination with network improvements. Some crossing improvements address both bicycle and pedestrian needs and are included in both sections. Others address only one mode of transportation and are only included in the appropriate section.

IMPROVEMENT PROJECTS

As described previously, bicycle network projects are categorized based on the four classifications recognized by Caltrans and described in the Highway Design Manual, along with three sub-classifications. A summation of existing and proposed bicycle and pedestrian centerline miles is provided in **Table 3**. The recommended improvements are provided in **Table 4** and mapped in **Figure 13**. Sources of the recommended improvements include the City’s current Capital Improvement Program (CIP) list of bicycle facility improvements, additional projects identified by the City from previously completed local and regional studies, and lastly, improvements identified to improve low-stress connectivity.

TABLE 3: EXISTING AND CURRENT CAPITAL IMPROVEMENT PROGRAM BICYCLE FACILITIES

BIKEWAY CLASS	EXISTING CENTERLINE MILES	CITY CIP PROJECTS	TOTAL EXISTING + PROPOSED CENTERLINE MILES
		CENTERLINE MILES	
CLASS I SHARED USE PATHS	1.64 ¹	6.99	8.63
CLASS II BICYCLE LANES	3.19	2.03	4.53
CLASS II BUFFERED BIKE LANES	0	0	0
CLASS III BICYCLE ROUTES	1.7	0	1.7
CLASS III BICYCLE BOULEVARDS	0	0	0
CLASS IV SEPARATED BIKEWAYS	0	0	0
TRAILS	-	-	-
TOTAL	6.54	9.02	14.86

¹ This path is in the City's sphere of influence, but outside the City limits. The path is maintained by the County.

TABLE 4: PROPOSED PROJECTS

PROPOSED PROJECTS	DESCRIPTION
ALISAL RD. CLASS II BIKE LANES	Painted bike lanes from Mission Dr. to Fjord Dr.
HANS CHRISTIAN ANDERSEN (HCA) PARK CLASS I PATH	Formalized path connecting Skytt Mesa Dr. to Chalkhill Rd. via HCA Park
MISSION DR. CLASS II BIKE LANES & PARKING MANAGEMENT	Class II bike lanes from Nykobing to Pine St. Removal of parking along Mission Dr.
ALAMO PINTADO RD. CLASS II BIKE LANES	Class II bike lanes North of Alamo Pintado Rd. to Old Mission Dr. (Coyote Creek Rd. to Viborg Rd, Mission Dr. to Old Mission Dr., and Windmill Ln. to Mission Dr.)
FREDENSBORG CYN RD CLASS II BIKE LANE	Class II Bike Lane from Chalk Hill Rd. to Viborg Rd.
S/E SOLVANG CLASS I PATH	Class I Path from Mission Dr. to Alamo Pintado Rd via Old Mill Rd. and Windmill Ln.
ALAMO PINTADO BIKE/PEDESTRIAN BRIDGE	Multi-Use Facility where Mission Dr. crosses Alamo Pintado Creek
COYOTE CREEK RD. CLASS I PATH	Class I Path connecting Alamo Pintado Rd. to existing Santa Barbara County Class I Path north of SR 246.
CHALK HILL RD. SPEED REDUCTION	Reduction of speed limit from 35 mph to 30 mph from Eucalyptus Dr to Solvang Mesa Dr.
CHALK HILL RD. CLASS II BIKE LANES	6 ft. wide Class II Bike Lanes from Eucalyptus Dr to Solvang Mesa Dr.
CHALK HILL RD. VEHICLE LANE REDUCTION	Reduce vehicle through lane widths to 11 ft. to accommodate 6 ft. wide bike lanes both directions.
ALAMO PINTADO RD. SPEED REDUCTION	Reduction of the speed limit from 35 mph to 30 mph from Viborg Rd. to Coyote Creek Rd.
ALISAL RD. SPEED REDUCTION	Reduction of the speed limit from 35 mph to 30 mph from Valhalla Dr. to Fjord Dr.
ALISAL RD. SIGNALIZED CROSSING	Installation of a beacon crossing at Fjord Dr. and Alisal Rd.
CLASS I MULTI-USE PATH ON VIBORG RD.	Class I Path starting on Viborg Rd. & Alamo Pintado Rd. to Fredensborg Canyon Rd. to complete the Multi-Use loop around the City and make it consistent with the potential "River Trail".
CLASS I MULTI-USE PATH ON FJORD RD.	Class I Path starting on West end of Fjord Rd. to Alisal Rd. to complete the Multi-Use loop around the City and make it consistent with the potential "River Trail".

PROPOSED PROJECTS	DESCRIPTION
CLASS I MULTI-USE PATH ON ALISAL RD.	Class I Path starting on Fjord Rd. & Alisal Rd. to Alisa Mesa Rd. to complete the Multi-Use loop around the City and make it consistent with the potential "River Trail".
CLASS I MULTI-USE PATH ON ALAMO PINTADO RD.	Class I Path starting on Alamo Pintado Rd & Mission Dr. to Viborg Rd. to complete the Multi-Use loop around the City and make it consistent with the potential "River Trail".
CLASS I PATH CONNECTION TO HCA CLASS I PATH	Creation of a Class I Path connecting Pistache Ave to the proposed to Hans Christian Andersen Class I Path
ALISAL MESA RD. TO OLD MILL RD CLASS I PATH	Class I Path loop connecting Alisal Mesa Rd. to Alamo Pintado Dr.
MISSION BLVD TO FJORD DR CLASS I PATH	Class I Path connecting SR 246 to Fjord Dr at Skytt Mesa Dr. south of Mission Blvd.

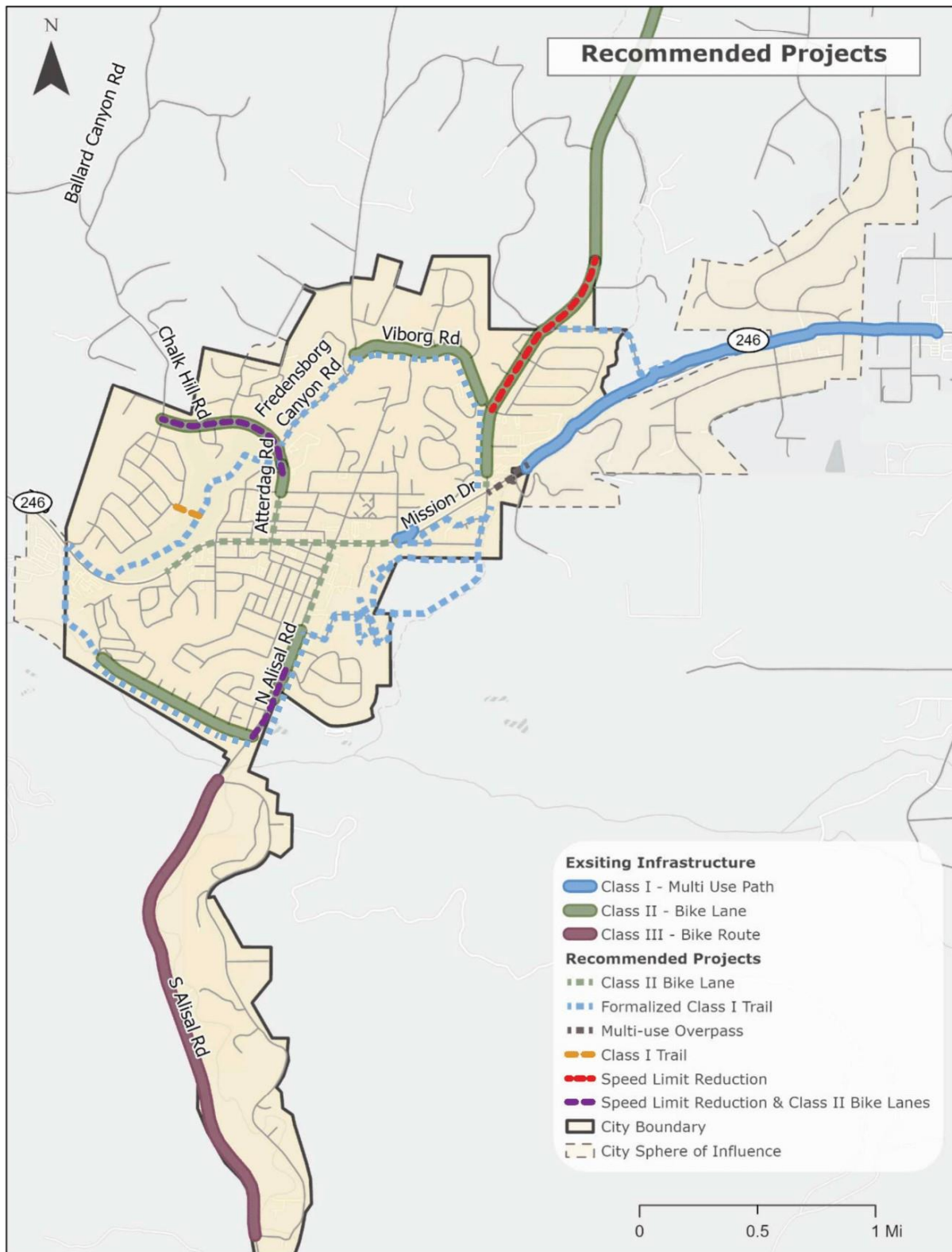


FIGURE 13. PROPOSED PROJECTS TO PRIORITIZE INCREASED LOW LTS NETWORK CONNECTIVITY

LOW-STRESS CONNECTIVITY RESULTS

The resulting roadway network level of traffic stress is presented for crossings and segments in **Figure 14** and **Figure 15** respectively. As shown in **Figure 16**, implementation of the recommended improvements will significantly reduce the amount of high-stress network in the City of Solvang relative to the existing condition. Although high-stress facilities will remain, the proposed improvements would connect 84.9% of the POIs (**Figure 17**). Adjusting for “undue detours” the POI percent connected remains high at 74% (**Figure 18**). These results represent a significant improvement in low-stress connectivity relative to existing conditions. As shown prior, the existing network resulted in a POI percent connected of 36% and just 19% connected when adjusting for “undue detour”. The proposed network allows nearly every identified POI in Solvang to the low-stress network to comfortably access residential and non-residential POIs.

PROGRAMMATIC RECOMMENDATIONS

This section describes recommended bicycle and pedestrian related programs for the City of Solvang. The recommendations are organized in three Es:

- **Education** programs are designed to improve safety and awareness. They can include programs that teach students how to safely cross the street, drivers where to anticipate bicyclists, and how to share the road safely.
- **Encouragement** programs provide incentives and support to help people leave their car at home and try walking or bicycling instead.
- **Evaluation** programs are an important component of any investment. They help measure success of the implementation of the recommendations in the Solvang ATP and identify any adjustments that may be necessary.

The final “E” commonly included in discussions of active transportation is **Engineering**, which is reflected by the infrastructure recommendations listed in this chapter.

The City’s upcoming General Plan update includes goals and objectives that support active transportation and complete streets, as well as land use policies, development regulations, and design guidelines that promote walkable and accessible neighborhoods. Given limited staff time and resources available, programs should be implemented or continued as funding and resources allow. Partnering with local organizations and other agencies is a key strategy for maintaining sustainable program activities.

EVALUATION

An annual report card assesses the City’s progress toward implementation of the projects and programs in the Solvang ATP and success in increasing active transportation trips in the community. Annual report cards can also incorporate a review of effectiveness to evaluate costs and benefits of various efforts and adjust investments to maximize results. It is recommended that the City develop an annual report card that tracks progress toward implementing the Solvang ATP and incorporates annual collision data, Safe Routes to School Program participation, and other relevant information to highlight successes and challenges each year. Specific performance measures identified by the City and community should be included in the card on an annual basis to track key metrics over time to better understand successes and shortcomings.

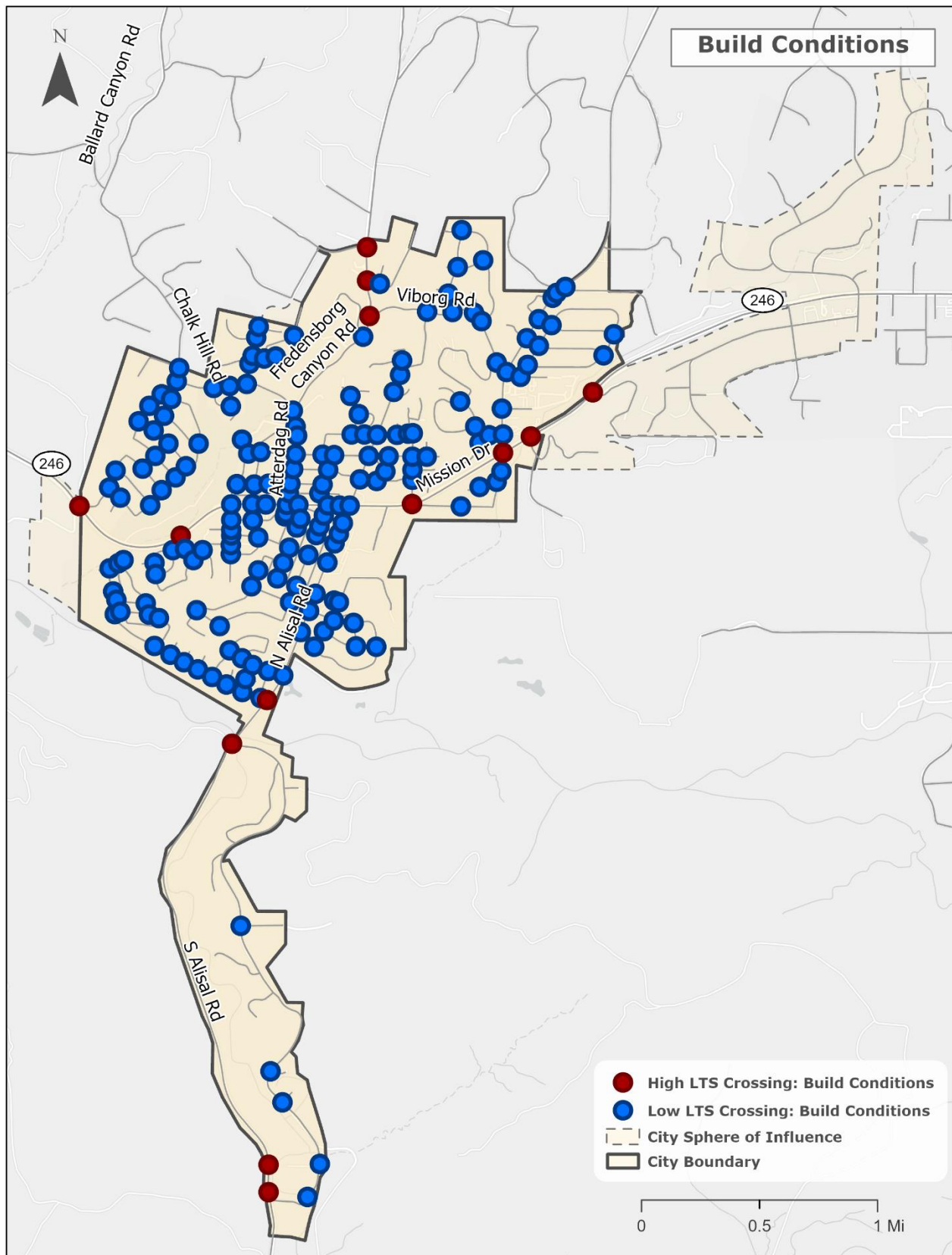


FIGURE 14: BUILD CONDITION CROSSINGS BY LTS SCORE

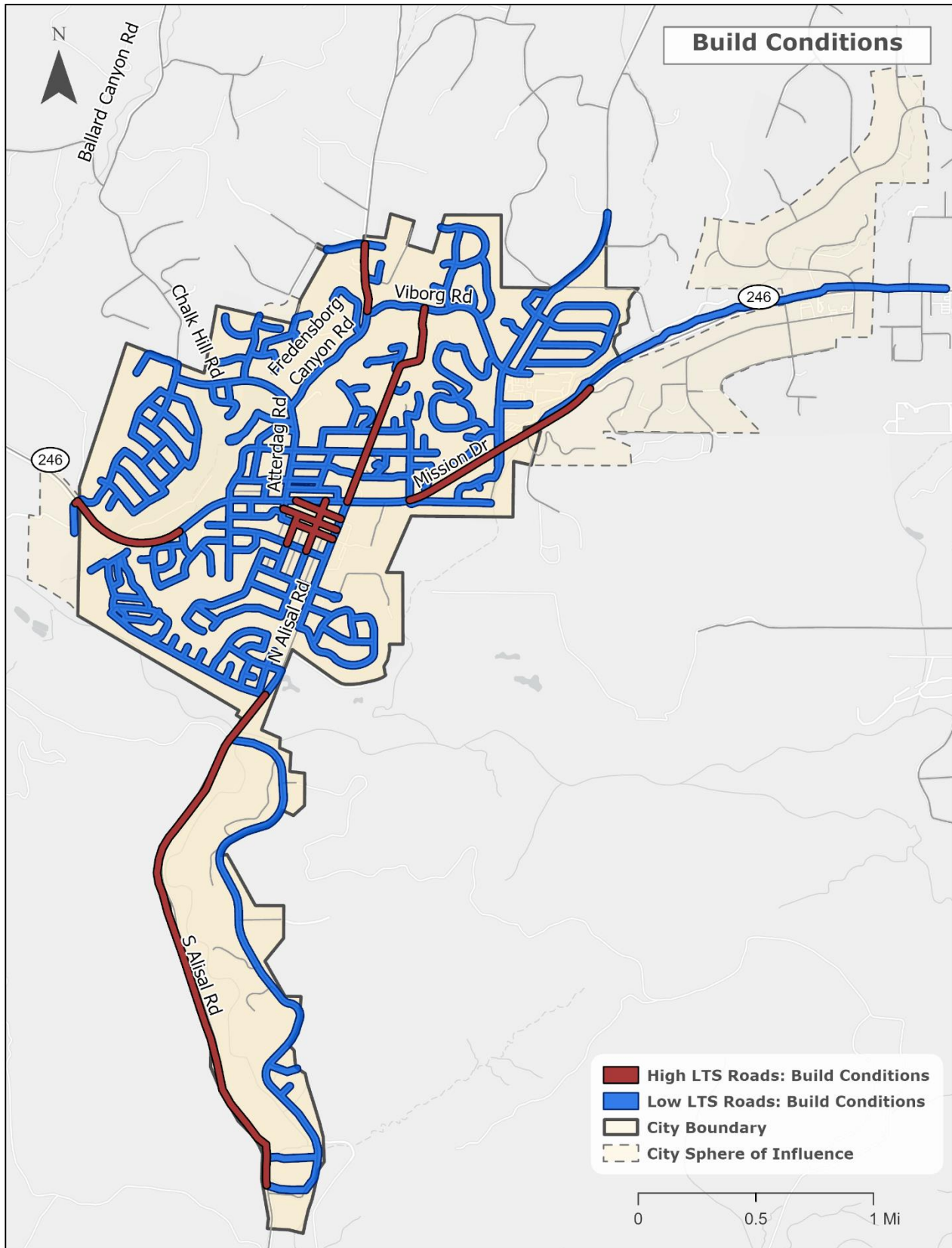


FIGURE 15: BUILD CONDITION SEGMENTS BY LTS SCORE

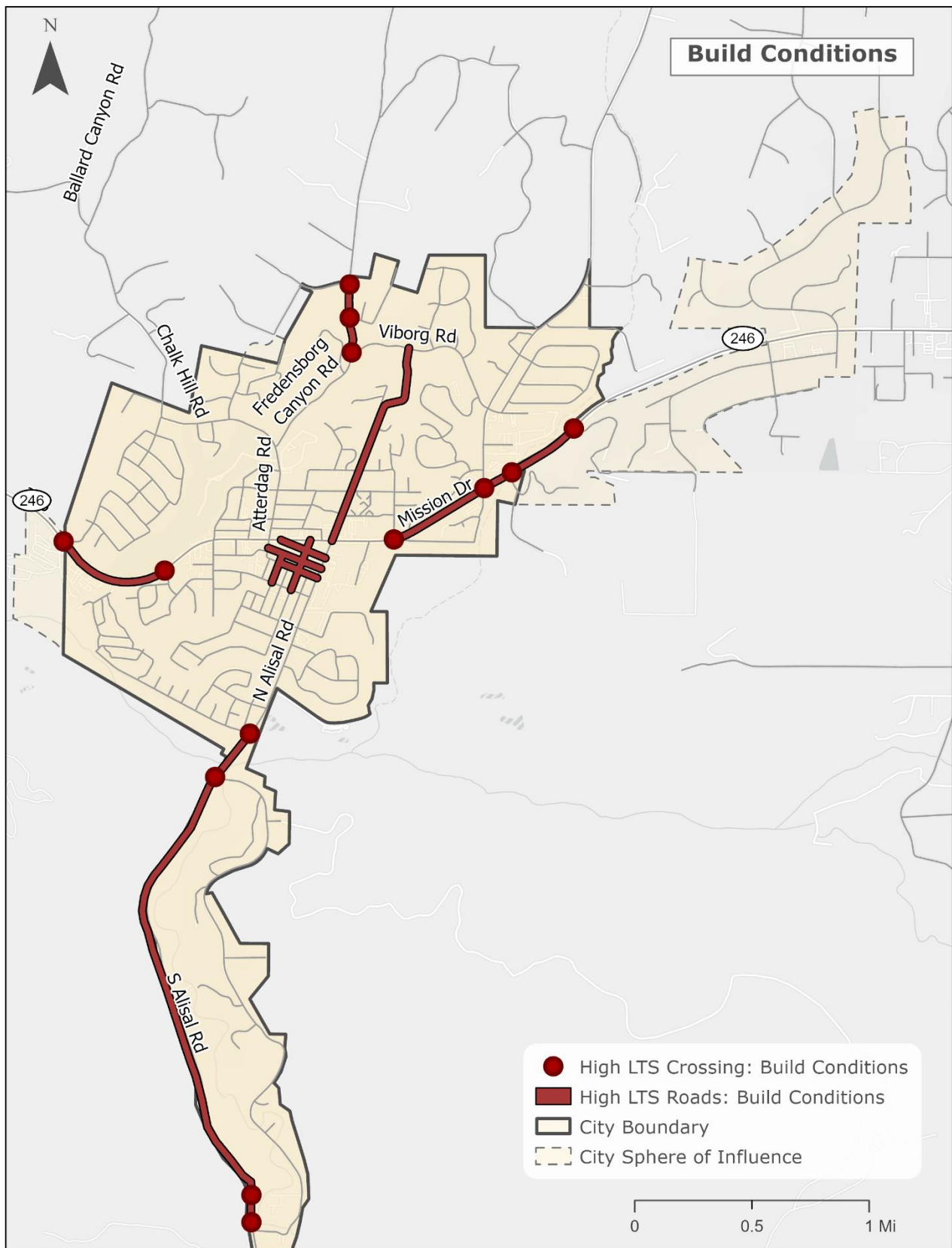


FIGURE 16: BUILD CONDITION: HIGH LEVEL OF TRAFFIC STRESS NETWORK

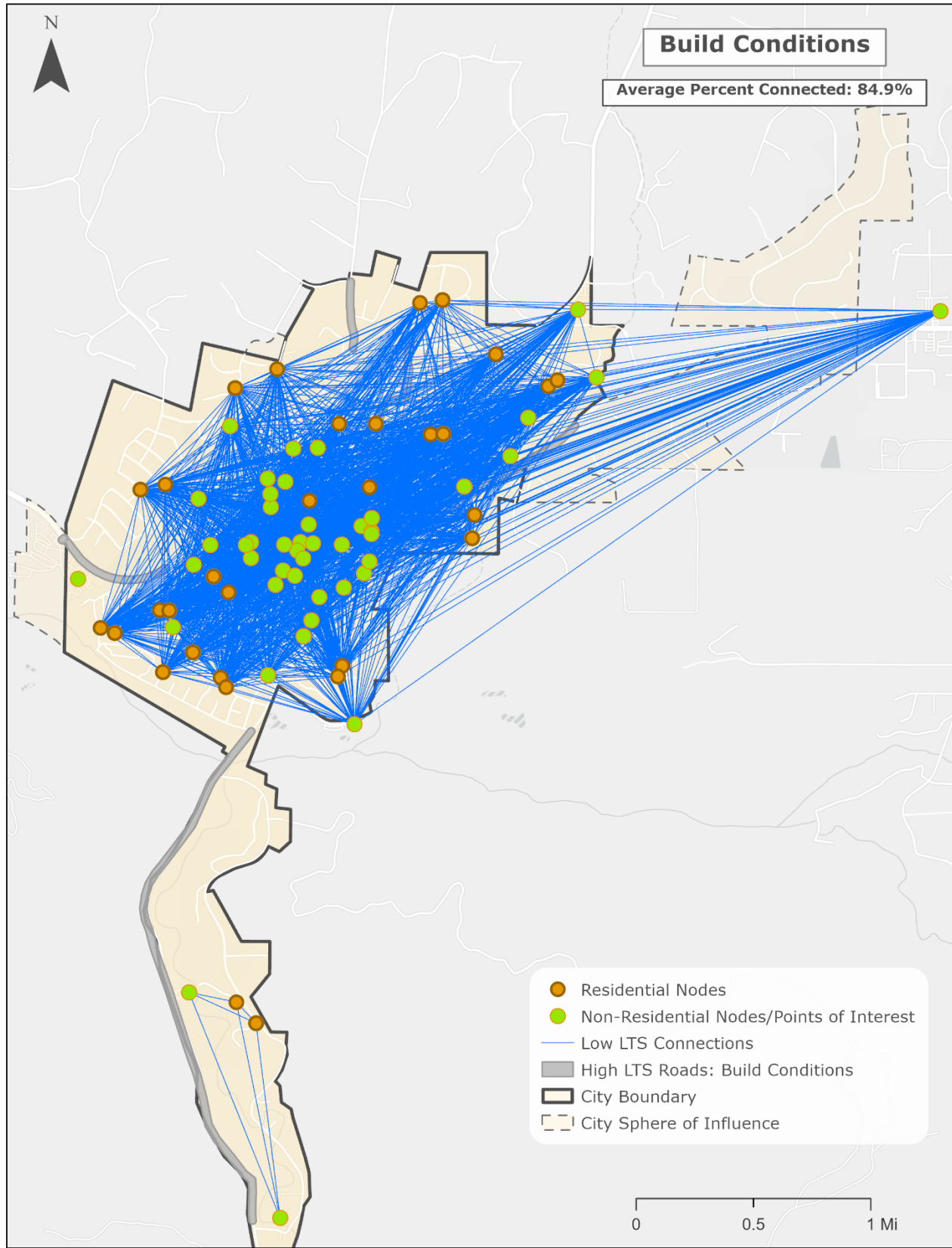


FIGURE 17. BUILD CONDITION: NETWORK CONNECTIVITY

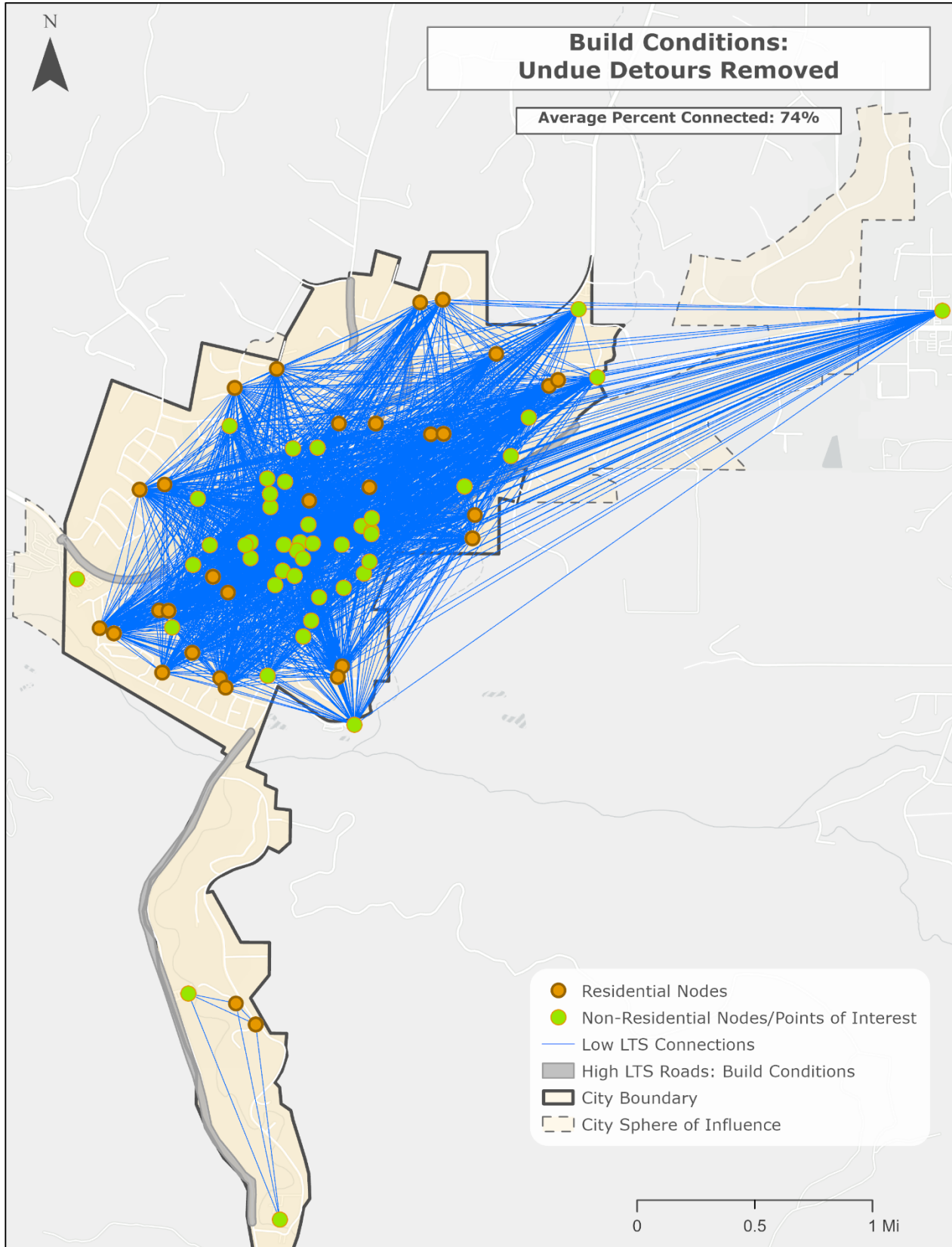


FIGURE 18. BUILD CONDITION: NETWORK CONNECTIVITY (UNDUE DETOURS REMOVED)

FUNDING AND IMPLEMENTATION

COST ESTIMATES

UNIT COST ASSUMPTIONS

Table 5 presents planning level unit cost assumptions used to develop project construction cost estimates. For linear projects, the unit cost method uses a single functional unit (mile or linear foot) that serves as a multiplier. The appropriate unit cost is multiplied by the length of the improvement to develop a planning-level project cost estimate.

Cost estimates were developed based on recent local project costs. Estimates include assumed costs for mobilization, traffic control, earthwork, utility coordination, and grading. In addition, estimates include 30 percent soft costs including engineering design, administration, and construction management, as well as a 20 percent contingency. Cost estimates in this plan are in 2022 dollars which do not include cost escalation and have been rounded to the nearest \$100.

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 or road widening. For some projects, actual costs may differ significantly from the planning-level estimates. Signal timing/phase adjustments are assumed to be staff time only. If additional infrastructure or equipment is needed, that would be an additional cost.

TABLE 5: UNIT COST ASSUMPTIONS

IMPROVEMENT	UNIT	ESTIMATED UNIT COST	NOTES
CLASS I SHARED USE PATH	MI	\$1,000,000	Assumes 12' wide path and minor grading
CLASS II BICYCLE LANES	MI	\$75,000	Both sides of street
CLASS II BUFFERED BICYCLE LANES	MI	\$175,000	Both sides of street
CLASS III BICYCLE ROUTE	MI	\$10,000	
CLASS III BICYCLE BOULEVARD	MI	\$75,000	Assumes speed tables, sharrows and curb extensions
CLASS IV SEPARATED BIKEWAY	MI	\$750,000	One- or two-way facility with small curb separation
SIDEWALK	LF	\$130	Assumes 6' wide sidewalk with curb and gutter
TRANSVERSE MARKED CROSSWALK	EA	\$450	White or yellow
HIGH VISIBILITY MARKED CROSSWALK	EA	\$1,800	White or yellow
ADVANCED STOP OR YIELD LINE	EA	\$750	Includes sign and pavement marking
CURB STRIPING	LF	\$7.50	Red curb
CURB RAMP	EA	\$7,500	ADA Compliant
CURB EXTENSION	EA	\$4,500	Includes two
PEDESTRIAN REFUGE ISLAND	EA	\$3,000	Assume two 6' by 4' islands

IMPLEMENTATION PLAN

This section presents a phased implementation approach for infrastructure projects recommended in the Solvang ATP. Improvements are divided into a short-term list of grant-ready projects to be prioritized, and a longer-term list to be implemented as opportunities arise or once the short-term list is completed. The total dollar cost of the recommended improvements amounts to approximately \$8.5 million. For the recommendations provided in the following pages, further study will be required to advance the improvements from the planning concepts presented to implementable projects. Study required may include engineering study, traffic volume analysis, and study required by City standards as well as Caltrans standards for Caltrans roadways.

PARTNERSHIPS

Some recommended improvements described below involve right-of-way maintained by entities other than the City of Solvang. For example, SR 246 (Mission Drive) is maintained by Caltrans; any projects involving those facilities would be pursued in partnership with Caltrans. Improvements may also involve additional outreach and engagement with stakeholders, such as transit providers, regional agencies such as SBCAG, school communities, neighborhood associations, non-profits, and other stakeholders. As the recommended improvements in this Plan advance from planning to design and implementation, the City of Solvang will undertake partnerships necessary to advance implementation.

RECOMMENDED CAPITAL IMPROVEMENT PROJECTS

The recommended capital improvement projects listed previously in **Table 4** are now shown in **Table 6** with each project's length (expressed in centerline miles) and planning level cost estimates. Active transportation related improvements currently listed in the City's Capital Improvement Program (CIP) that have been completed are listed in **Table 7**. Those that were reflected in the LTS connectivity assessment are indicated. Renderings and additional information of the proposed Class I Path alignments are provided in **Appendix 5**.

MULTIJURISDICTIONAL PROJECTS

Whereas this ATP focusses on local projects within the City of Solvang and its sphere of influence, the Santa Ynez Valley Bicycle Master Plan (SBCAG, 2019) identifies three multijurisdictional projects that in part involves the City of Solvang. The Santa Ynez River Trail extends from Buellton to Solvang and includes the two cities and the County. It remains to be determined where exactly this trail would connect within Solvang. A second multijurisdictional project is to formalize the shoulders of SR 246 as bike lanes. This project would begin at the eastern Buellton city limits and continue to SR 154, involving the County and Solvang. The project primarily entails formalizing the highway's shoulders as bike lanes outside of the downtown area. Finally, a third project would require coordination with Caltrans in the extension of the existing Class I path to reach Alamo Pintado Road. A map of these aspirational regional bike projects is provided in **Appendix 6**.

TABLE 6: RECOMMENDED PROJECT COST ESTIMATES

PROJECT NAME	DESCRIPTION	CENTER LINE LENGTH (MILES)	ESTIMATED COST
ALISAL RD. CLASS II BIKE LANES	Painted bike lanes from Mission Dr. to Fjord Dr.	0.59	\$45,000
HANS CHRISTIAN ANDERSEN (HCA) PARK CLASS I PATH	Formalized path connecting Skytt Mesa Dr. to Chalkhill Rd. via HCA Park	1.0	\$1,034,500
MISSION DR. CLASS II BIKE LANES & PARKING MANAGEMENT	Class II bike lanes from Nykobing to Pine St. Removal of parking along Mission Dr.	0.84	\$65,200
ALAMO PINTADO RD. CLASS II BIKE LANES	Class II bike lanes North of Alamo Pintado Rd. to Old Mission Dr. (Coyote Creek Rd. to Viborg Rd, Mission Dr. to Old Mission Dr., and Windmill Ln. to Mission Dr.)	0.065	\$5,100
FREDENSBORG CYN RD CLASS II BIKE PATH	Class II bike Path from Chalk Hill Rd. to Viborg Rd.	0.41	\$32,000
S/E SOLVANG CLASS I PATH	Class I Path from Mission Dr. to Alamo Pintado Rd via Old Mill Rd. and Windmill Ln.	0.39	\$403,500
ALAMO PINTADO BIKE/PEDESTRIAN BRIDGE	Multi-Use Facility where Mission Dr. crosses Alamo Pintado Creek	0.026	TBD
COYOTE CREEK RD. CLASS I PATH	Class I Path connecting Alamo Pintado Rd. to existing SB Co Class I Path north of SR 246. Includes a new pedestrian bridge over Alamo Pintado Creek would be required plus access easements from property owners.	0.55	\$2,069,000
CHALK HILL RD. SPEED REDUCTION	Reduction of speed limit from 35 mph to 30 mph from Eucalyptus Dr to Solvang Mesa Dr.	N/A	
CHALK HILL RD. CLASS II BIKE LANES	6 ft. wide Class II Bike Lanes from Eucalyptus Dr to Solvang Mesa Dr.	0.53	\$41,110
CHALK HILL RD. VEHICLE LANE REDUCTION	Reduce vehicle through lane widths to 11 ft. to accommodate 6 ft. wide bike lanes	0.53	\$40,900
ALAMO PINTADO RD. SPEED REDUCTION	Reduction of the speed limit from 35 mph to 30 mph from Viborg Rd. to Coyote Creek Rd.	N/A	
ALISAL RD. SPEED REDUCTION	Reduction of the speed limit from 35 mph to 30 mph from Valhalla Dr. to Fjord Dr.	N/A	
ALISAL RD. SIGNALIZED CROSSING	Installation of a beacon crossing at Fjord Dr. and Alisal Rd.	N/A	
CLASS I PATH CONNECTION TO HCA CLASS I PATH	Creation of a Class I Path connecting Pistache Ave to the proposed to Hans Christian	0.088	\$91,040

PROJECT NAME	DESCRIPTION	CENTER LINE LENGTH (MILES)	ESTIMATED COST
ALISAL MESA RD. TO OLD MILL RD CLASS I PATH	Class I Path loop connecting Alisal Mesa Rd. to Alamo Pintado Dr.	2.22	\$2,297,000
MISSION BLVD TO FJORD DR CLASS I PATH	Class I Path connecting SR 246 to Fjord Dr at Skytt Mesa Dr. south of Mission Blvd.	0.42	\$434,500
CLASS I MULTI-USE PATH ON VIBORG RD.	Class I Path starting on Viborg Rd. & Alamo Pintado Rd. to Fredensborg Canyon Rd. to complete the Multi-Use loop around the City and make it consistent with the potential "River Trail".	0.62	\$620,000
CLASS I MULTI-USE PATH ON FJORD RD.	Class I Path starting on West end of Fjord Rd. to Alisal Rd. to complete the Multi-Use loop around the City and make it consistent with the potential "River Trail".	0.61	\$610,000
CLASS I MULTI-USE PATH ON ALISAL RD.	Class I Path starting on Fjord Rd. & Alisal Rd. to Alisa Mesa Rd. to complete the Multi-Use loop around the City and make it consistent with the potential "River Trail".	0.41	\$410,000
CLASS I MULTI-USE PATH ON ALAMO PINTADO RD.	Class I Path starting on Alamo Pintado Rd & Mission Dr. to Viborg Rd. to complete the Multi-Use loop around the City and make it consistent with the potential "River Trail".	0.27	\$270,000

TABLE 7: COMPLETED ACTIVE TRANSPORTATION RELATED IMPROVEMENTS IN THE CIP

PROJECT ID	DESCRIPTION	ATP CONNECTIVITY ANALYSIS	NOTES
PW 010 PTMISEA	Transit Stop Upgrades Project (Various Locations)	No	Transit Improvement
PW 020	Old Mission 4-Way Stop Project	Yes	Circulation
PW 034	Mission Drive Corridor Traffic Circ. Study	No	Plan
PW 046	Traffic Signal Preemption Device Study	No	Emergency/Transit Vehicles
PW 047	Santa Ynez Valley Transit Security Lighting & Bus Stop Imps-Upgrades (Phase 2)	No	Study Transit Improvement

PROJECT ID	DESCRIPTION	ATP CONNECTIVITY ANALYSIS	NOTES
PW 053	Solvang School Sidewalk Project	No	Pedestrian Improvement
PW 061	Fifth Street Sidewalk Project	No	Pedestrian Improvement
PW 062	Mission Drive Priority Project Planning	No	Pedestrian Improvement
PW 087	Mission Drive Intersection and Crosswalk Improvements	Yes	Pedestrian Improvement
PW 088	Alisal Road Sidewalk Improvements	No	Pedestrian Improvement
PW 136	Mission Drive Bus Stop 8 Improvements	No	Transit Improvement
PW 153	Local Road Safety Plan	No	Plan
PW 172	Laurel Speed Humps	No	Traffic Calming

FUNDING OPPORTUNITIES

A variety of bicycle and pedestrian funding sources exist. Many are limited to new construction, though some may also offer funds for maintenance of existing facilities. Funding sources are described on the following section.

LOCAL AND REGIONAL PROGRAMS

City General Funds

Per Government Code Section 16300, the General Fund is used to budget for revenues not specifically designated to be accounted for by any other fund. The primary sources of revenues are personal income tax, sales and use tax, and corporation tax.

Local Gas Tax Subvention Funds

Revenues from the gas tax deposited into the Highway Users Tax Account in the Transportation Tax Fund are apportioned by the California State Controller to cities and counties (Streets and Highways Code Sections 2104 to 2122). The City of Solvang receives its apportionment of local gas tax subvention funds which may be spent on capital improvement projects including pedestrian and bikeway improvements.

Developer Mitigation Funds

Pursuant to the California Mitigation Fee Act (California Government Code, Sections 66000-66025), the City of Solvang collects developer fees for funding capital improvements. The intent of the fee program is to provide an equitable means of ensuring that future development contributes their fair share of transportation improvements so that the City's quality of life can be maintained.

Measure A

Measure A was approved by Santa Barbara County voters in 2008, authorizing a half-cent sales tax in the County. It is anticipated to provide more than \$1 billion for transportation projects over 30 years. Funds are administered by the Santa Barbara County Association of Governments (SBCAG) and will support improvements to Highway 101 as well as eligible transportation projects in local communities. Bicycle and pedestrian improvements are eligible for Measure A funding, as are improvements to transit access.

STATE AND FEDERAL PROGRAMS

Active Transportation Program (ATP)

The ATP was created by SB 99 to encourage increased use of active modes of transportation, such as walking and biking. ATP consolidated various transportation programs into a single program and was originally funded at about \$123 million a year from a combination of state and federal funds. SB 1 directed an additional \$100 million annually to the ATP (see SB 1 Road Repair and Accountability Act, below). The goals of the ATP include, but are not limited to, increasing the proportion of trips accomplished by walking and biking, increasing the safety and mobility of non-motorized users, advancing efforts of regional agencies to achieve greenhouse gas (GHG) reduction goals, enhancing public health, and providing a broad spectrum of projects to benefit many types of users including disadvantaged communities. Application cycles occur approximately every two years, typically in late spring or summer.

Affordable Housing and Sustainable Communities Program (AHSC)

The Affordable Housing Sustainable Communities (AHSC) Program funds land-use, housing, transportation, and land preservation projects to support infill and compact development that reduce GHG emissions. The program assists project areas by providing grants and/or loans, or any combination thereof, that will achieve GHG emissions reductions and benefit Disadvantaged Communities through increasing accessibility of affordable housing, employment centers, and key destinations via low-carbon transportation resulting in fewer vehicle miles traveled through shortened or reduced trip length or mode shift from single occupancy vehicle use to transit, bicycling, or walking. The three Project Area types include:

- Transit Oriented Development (TOD) Project Areas
- Integrated Connectivity Project (ICP) Project Areas
- Rural Innovation Project Areas (RIPA)

SB 1 – Road Repair and Accountability Act

The “Road Repair and Accountability Act” of 2017 (SB 1) invests \$54 billion over a decade to repair roads, improve traffic safety, and expand public transit systems across California, with funds split equally between state and local investments. SB 1 directs \$100 million annually to the ATP to fund infrastructure projects, program implementation, and plan development to increase bicycling and walking.

Surface Transportation Block Grant Program

The Surface Transportation Block Grant program (STBG) provides flexible funding that may be used by states and localities for projects to preserve and improve the conditions and performance on any federal-aid highway, bridge, and tunnel projects on any public road; pedestrian and bicycle infrastructure; and transit capital projects including intercity bus terminals.

Highway Safety Improvement Program (HSIP)

The Highway Safety Improvement Program (HSIP) is a core Federal-aid program with the purpose to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-State-owned roads and roads on tribal land. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads with a focus on performance.

Local Highway Bridge Program (HBP)

The Local Highway Bridge Program (HBP) replaces or rehabilitates public highway bridges over waterways, other topographical barriers, other highways, or railroads when the State and the Federal Highway Administration (FHWA) determine that a bridge is significantly important and qualifies under the HBP program guidelines. Reimbursable scopes of work include replacement, rehabilitation, painting, scour countermeasures, and preventative maintenance activities.

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 improving pilot projects. Communities are typically required to provide an 11.47 percent local match, with staff time or in-kind donations eligible to be used towards the match.

Office of Traffic Safety Grants

Office of Traffic Safety (OTS) Grants are supported by federal funding. They can be used to establish new traffic safety programs, expand ongoing programs, or address deficiencies in current programs. Eligible grantees include government agencies, state colleges and universities, local agencies, school districts, fire departments, and public emergency services providers. Grant funding cannot replace existing program expenditures, nor can traffic safety funds be used for program maintenance, research, rehabilitation, or construction. Grants are awarded on a competitive basis, and priority is given to agencies with the greatest need. Evaluation criteria to assess need include potential traffic safety impact, collision statistics and rankings, seriousness of problems, and performance on past OTS grants.

APPENDIX



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APPENDIX 1: SOLVANG ATP DESIGN TOOLKIT

SOLVANG ATP PLAN DESIGN TOOLKIT

INTRODUCTION

The Solvang Active Transportation Plan Design Toolkit includes safety treatments that may be incorporated into future roadway safety projects to improve active transportation within the City of Solvang.

This Toolkit is organized into the following categories:

- Signal Modifications
- Intersection Treatments
- Bicycle Facility Treatments

Some of the tools may overlap categories. For example, Signal Modifications may also be considered Intersection Treatments.

Relevant design resources and guides referenced include:

- Caltrans Complete Streets Elements Toolbox v2.0
- National Cooperative Highway Research Program (NCHRP) Guidance to Improve Pedestrian & Bicyclist Safety at Intersections
- NACTO Urban Street Design Guide and Urban Bikeway Design Guide
- FHWA Guide for Improving Safety at Uncontrolled Intersection

Each tool includes a brief description of the safety treatment, including:

- **Design Contexts** – Applicable location and additional factors to consider for implementing.
- **Rating** – A Crash Modification Factor (CMF) is a measure or rating of effectiveness of a design element. A CMF of less than 1.0 indicates that a treatment has the potential to reduce crashes. A Crash Reduction Factor (CRF) is the percentage crash reduction that might be expected after implementing a given countermeasure at a specific site. The Caltrans Local Roadway Safety Manual Version 1.4 provides CRF for projects that are HSIP funded. The CRF/CMF listed for each tool will cite the research authors when applicable.
- **Estimated Cost** – A cost range is provided for each tool as of the time of writing. Estimated costs will vary according to several factors.

SIGNAL MODIFICATIONS

EXCLUSIVE PEDESTRIAN PHASE

An exclusive pedestrian phase, also known as a “Barnes Dance,” pedestrian scramble, or all-walk phase, is a phase at signalized intersections that allows pedestrians to cross in any direction. Vehicles at all approaches to the intersection are stopped while pedestrians are given the “WALK” signal. This low-cost treatment can increase pedestrian safety by separating pedestrians in time from vehicles and may improve the efficiency of intersections with heavy pedestrian volumes. It is particularly advantageous in situations where other intersection treatments are cost prohibitive or unable to be implemented due to insufficient right of way.



SOURCE: [HTTPS://NACTO.ORG](https://nacto.org), LA DOT

DESIGN CONTEXTS

- Densely populated urban areas, often in downtowns.
- Signalized intersections with high instances of turning vehicle-pedestrian conflicts.
- High pedestrian volumes and either: 1) low to moderate vehicle volumes, or 2) high turning vehicle volumes.

CMF RATING

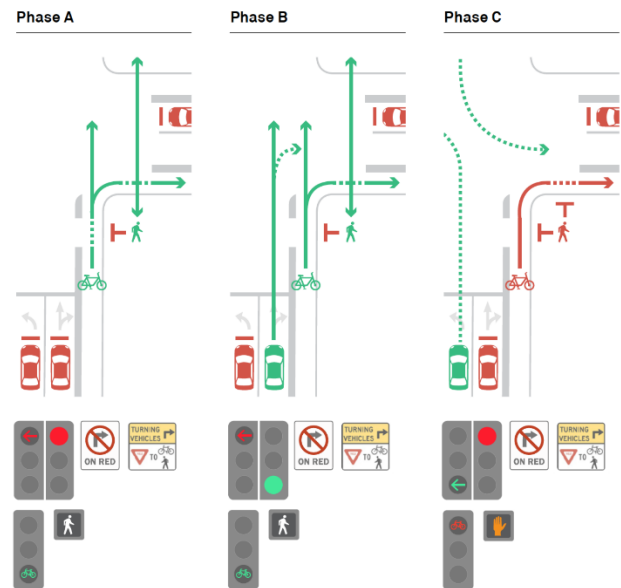
0.66 for vehicle-pedestrian crashes (ITE 2004).

ESTIMATED COST

<\$3,000

LEADING BICYCLE INTERVAL

Leading Bicycle Intervals (LBIs) provide bicyclists an opportunity to enter an intersection before vehicles are given a green indication. LBIs can be easily programmed into existing signals to give bicyclists an advanced green signal a minimum of three to seven seconds before motorists can proceed through the intersection. This extra time provides through-bicyclists with an opportunity to establish their presence in, or to clear an intersection before motorists start turning. This “head start” increases the percentage of motorists who yield the right of way to bicyclists and can minimize conflicts between bicyclists crossing a roadway and turning motorists. If this treatment is used with a bicycle signal, an agency should request permission to experiment from FHWA. Leading bicycle intervals can be provided automatically with each phase or provided only when actuated (actively or passively). Active detection requires bicyclists to use a pushbutton. Pushbuttons should be placed in such a way that bicyclists do not have to dismount or leave the roadway to activate the signal. Passive bicycle detection is the preferred option (see passive bicycle signal detection).



SOURCE: [HTTPS://NACTO.ORG/](https://nacto.org/)

DESIGN CONTEXTS

- Intersections with high bicycle volumes and high turning vehicle volumes.
- Locations where a highly- used bicycle route (including shared-use path) must cross a major, signalized intersection.
- Intersections connecting users to the rest of the route.
- Intersections with contraflow bike lanes or separated bike lanes.
- Intersections where a bicycle facility transitions from a protected bike lane (cycle track) to an unprotected bicycle lane.

CMF RATING

A CMF rating has not yet been determined; initial research indicates this treatment is promising (Kading 2016).

ESTIMATED COST

\$3,000—\$50,000

LEADING PEDESTRIAN INTERVAL

Leading pedestrian intervals (LPIs) provide pedestrians an opportunity to enter an intersection before vehicles are given a green indication. LPIs can be easily programmed into existing signals to give pedestrians the WALK signal a minimum of three to seven seconds before motorists are allowed to proceed through the intersection. This extra time provides pedestrians with an opportunity to establish their presence in the crosswalk before motorists start turning and provides additional crossing time for those who need it. This head start increases the percentage of motorists who yield the right of way to pedestrians and can minimize conflicts between pedestrians crossing a roadway and turning vehicles. Leading pedestrian intervals can be provided automatically with each phase (i.e., set to “recall”) or provided only when actuated (actively or passively).



SOURCE: FHWA PROVEN SAFETY COUNTERMEASURES

DESIGN CONTEXTS

- Signalized intersections
- Medium to high turning vehicle volumes and pedestrian volumes

CMF RATING

0.41 for vehicle-pedestrian crashes (Fayish and Gross 2010). A leading pedestrian interval is recognized by FHWA as a Proven Safety Countermeasure.

ESTIMATED COST

< \$3,000

NO RIGHT TURN ON RED

In most communities, right-turn-on-red is a default condition of existing laws. To restrict it, a sign must be posted at the signalized intersection for each approach where the restriction is desired. The purpose of this treatment is to eliminate conflicts between turning vehicles and pedestrians and/or bicyclists during a concurrent walk (or bike signal) phase. Motorists are advised of this restriction with the posting of “No Turn on Red” signs (MUTCD R10-11 series) which may be static or dynamic. Dynamic signs can be used to restrict turns during certain times of day or during certain signal phases; for example, vehicle right turns may be restricted during a bike signal phase. Preliminary research indicates that dynamic signs may be more effective than static ones at inducing motorists to stop before turning right on red (Thomas et al. 2016).



SOURCE: CA MUTCD, R10-11

DESIGN CONTEXTS

- Signalized intersections
- High volumes of right-turning vehicles and high volumes of bicyclists and/or pedestrians

CMF RATING

0.97 for all crashes (Harkey et al. 2008). This treatment is not well-studied; it is possible that it would result in safety improvements for pedestrians and bicyclists.

ESTIMATED COST

< \$3,000

PEDESTRIAN COUNTDOWN SIGNALS

Pedestrian signals and countdown signals provide guidance to pedestrians regarding the permitted signal interval to cross a street and prohibit pedestrian crossings when conflicting traffic may impact pedestrian safety. Ideally, every signalized intersection should have a pedestrian signal head. Countdown signals are indications designed to begin counting down at the beginning of the clearance interval (flashing "DON'T WALK") and can be set to fixed-time, push button operation, or passive pedestrian detection. They indicate to the pedestrian how much time is left in the crossing phase. The MUTCD requires countdown pedestrian indications for all newly installed traffic signals where pedestrian signals are installed.



SOURCE: FHWA, ITE PEDESTRIAN BIKE COUNCIL

DESIGN CONTEXTS

- Any time a new pedestrian signal is installed.
- Crossings with exclusive pedestrian phases.
- Signalized intersections spanning wide streets.
- Crossings with medium to high volumes of pedestrians.

CMF RATING

0.30 (Van Houten et al. 2012)–0.75 (Markowitz et al. 2006) for vehicle pedestrian crashes; some research has shown no effect or a slightly negative effect (Camden et al. 2012).

ESTIMATED COST

\$3,000–\$50,000

PROTECTED SIGNAL PHASES

Protected signal phases at intersections provide a way to separate vehicular traffic from pedestrian and/or bicyclist movements in time and space, particularly for left turns when concurrent phasing would result in a conflict with crossing pedestrians and left-turning vehicles, and right-turns when concurrent phasing would result in a conflict with through bicyclists and right-turning vehicles.

DESIGN CONTEXTS

- Urban areas, particularly in downtown locations.
- Intersections with high volumes of pedestrians or bicyclists and turning vehicles.
- Intersections with low to medium vehicle volumes.

CMF RATING

0.64 for exclusive pedestrian phase for vehicle-pedestrian crashes (ITE 2004).

ESTIMATED COST

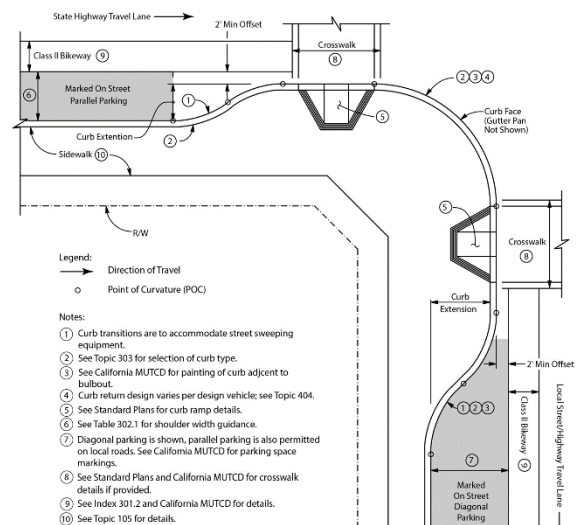
\$3,000–\$50,000

INTERSECTION TREATMENTS

CURB EXTENSIONS /BULB OUTS

Curb extensions (also known as “bulb-outs” or “neck downs”) decrease the width of a roadway through the physical extension of a curb line or sidewalk. Curb extensions may enhance pedestrian safety in several ways: by making pedestrians, bicyclists and motorists more visible to each other; by keeping motor vehicles from parking too close to crossings and blocking sight lines; by reducing crossing distance and thereby exposure; and by narrowing radii at intersections, which may slow right-turning traffic. Curb extensions also tend to allow for better placement of curb ramps and prevent ramps from being blocked by vehicles that park at the corner (Thomas et al. 2016). At signalized locations, it is possible that curb extensions may reduce motorist delay by reducing the amount of signal time that must

be devoted to the pedestrian phase due to the shorter crossing distance. Consideration for concrete curb extensions include the presence of storm water inlets and adequate drainage around the curb extension. Detached concrete curb extensions can also be applied which leave existing drainage in place. Detached curb extensions should consider the installation of grates to prevent tripping hazards within the gutter pan gap. Temporary curb extensions



SOURCE: CALTRANS HIGHWAY DESIGN MANUAL

can also be installed using low-cost materials (paint, bollards, or even rubberized platforms) for demonstration and evaluation purposes.

DESIGN CONTEXTS

- Locations with permanent on-street parking.

CMF RATING

A CMF has not yet been determined; initial research indicates this treatment may be effective at increasing driver yielding and improving pedestrian safety (Johnson et al. 2005).

ESTIMATED COST

\$3,000–\$50,000

CONTINUOUS RAISED MEDIANS OR HARDENED CENTERLINES

Continuous raised medians or hardened centerlines (vertical elements) are roadway design treatments designed to provide access management and to separate opposing directions of motor vehicle travel at intersections and midblock locations. They can be extended across an intersection or a driveway, creating a continuous median to provide access management restricting motorists' turning or crossing movements. Where crosswalks are provided, they must be at least 6 feet in width to provide a pedestrian refuge (see crossing islands) or 8 feet to provide a bicycle refuge. Where used as an access management strategy, they can simplify and improve safety for pedestrians and bicyclists by eliminating motorist left turns. When used at intersections and the hardened centerline or median extends up to or beyond crosswalks, they reduce left turning motorist speeds.



SOURCE:

[HTTPS://ACCESSPLANNING.CA/IDEASBLOG/2023/3/28/BARRIERS-TO-ACTIVE-TRANSPORTATION-HIGHWAY-CROSSINGS](https://accessplanning.ca/ideasblog/2023/3/28/barriers-to-active-transportation-highway-crossings)

DESIGN CONTEXTS

- Locations with permanent on-street parking.

CMF RATING

0.54 for all crashes (Bahar et al. 2007); 0.69 for vehicle-pedestrian crashes for raised medians (Zegeer et al. 2017). A raised median is recognized by FHWA as a proven Safety Countermeasure.

ESTIMATED COST

\$3,000–\$50,000

HIGH-VISIBILITY CROSSWALK MARKINGS

High-visibility crosswalk markings, such as continental or ladder-style, are preferred over parallel line markings to improve visibility to approaching motorists. High-visibility crosswalk markings reinforce legal crosswalks at intersections and create legal crossings at non-intersection locations. These crosswalk markings warn motorists to expect pedestrian crossings and clarify that motorists are expected to yield right-of-way to crossing pedestrians. At uncontrolled locations, high-visibility crosswalk markings identify a preferred crossing location for pedestrians.

DESIGN CONTEXTS

- Uncontrolled locations that meet the requirements listed in MUTCD Section 3B.18 (2009)



SOURCE: FHWA PROVEN SAFETY COUNTERMEASURES

CMF RATING

0.52 for vehicle-pedestrian crashes (Chen et al. 2012).

ESTIMATED COST

< \$3,000

IN-STREET PEDESTRIAN CROSSING SIGNS

This treatment involves placing Yield to Pedestrian signs (MUTCD R1-6) in the roadway at the centerline of an uncontrolled crosswalk.

DESIGN CONTEXTS

Uncontrolled crossings of multi-lane roadways.

CMF RATING

A CMF has not yet been determined; however initial evidence indicates this treatment is promising. This treatment is associated with increased driver yielding and slight reductions in vehicle travel speeds when placed at marked crosswalks (Zegeer et al. 2017).

ESTIMATED COST

< \$3,000



SOURCE: CA MUTCD

MINI TRAFFIC CIRCLES

Mini traffic circles are a traffic-calming device that can take the place of, or supplement, an all-way stop controlled intersection. They may also be installed at intersections with no control or with all-way or 2-way stop or yield control. Mini-circles are raised circular islands constructed in the center of residential street intersections which require motorists to slow down to maneuver around them. They can eliminate left turns by requiring traffic to exit to the right of the circles. Due to the low-volume nature of the intersections where these are installed, mini traffic circles may be



SOURCE: [HTTPS://NACTO.ORG/](https://nacto.org/)

designed to allow larger vehicles to turn left in front of the circle to allow the circle to remain larger in size to provide the desired traffic calming benefits. Mini traffic circles are commonly landscaped, most often at locations where the neighborhood has agreed to maintain the plants. The islands in the center of the circle may be completely mountable for emergency vehicles to better navigate through the intersection.

DESIGN CONTEXTS

- Roadways with 30 mph or lower posted speeds.
- Residential streets.
- Neighborhood bikeways.
- Stop-controlled intersections with high delay.
- Intersections with one lane in each direction.

CMF RATING

A CMF has not yet been developed; however, existing studies indicate that mini-traffic circles can reduce vehicle speeds (Ewing 1999) and crashes (Thomas et al. 2015), improving safety for all road users.

ESTIMATED COST

\$3,000–\$50,000

PEDESTRIAN HYBRID BEACON

Pedestrian Hybrid Beacons (PHBs), also called HAWKs (high intensity activated crosswalk), are signals installed at unsignalized major street crossing locations to help pedestrians cross the street safely. PHBs may be used in locations where side-street volumes do not warrant a conventional traffic signal, or in situations where there are concerns that a conventional signal may encourage additional motor vehicle traffic on the minor street. PHBs may be effective at reducing multiple threat crashes. PHBs typically include the following elements:



SOURCE: FHWA PROVEN SAFETY COUNTERMEASURES

- Overhead beacons with three sections (circular yellow signal indication centered below two horizontally aligned circular red signals) facing both directions on the major street.
- Overhead signs labeled "CROSSWALK STOP ON RED" to indicate that the location is associated with a pedestrian crosswalk.
- A marked crosswalk on the major street.
- Countdown pedestrian signal heads to control pedestrian crossings at the crosswalk.

DESIGN CONTEXTS

- Urban or suburban multi-lane roadways
- Higher speed roadways (particularly at or above 35 mph)
- Locations with high volumes of pedestrians and vehicles (AADT > 9,000); if higher volumes, 30 mph locations may be appropriate. (Blackburn et al. 2017)

CMF RATING

0.70 for total crashes (Fitzpatrick et al. 2010); 0.31–0.45 for vehicle–pedestrian crashes (Zegeer et al. 2017). A pedestrian hybrid beacon is recognized by FHWA as a Proven Safety Countermeasure.

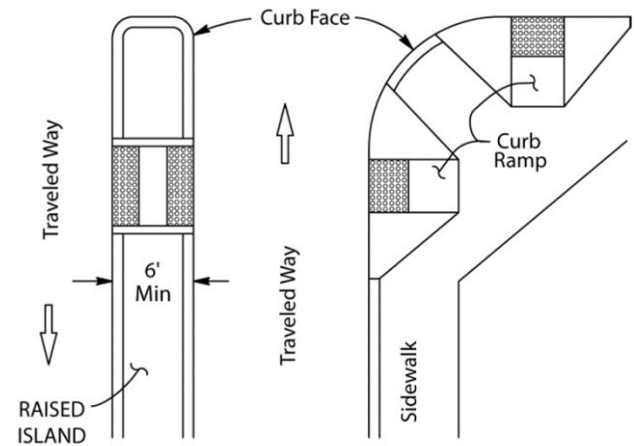
ESTIMATED COST

\$50,000–\$175,000

PEDESTRIAN REFUGE ISLANDS

Pedestrian Refuge Islands (also known as Crossing Islands) are roadway treatments designed to provide refuge for pedestrians and bicyclists between motor vehicle travel lanes at intersections and midblock locations. To provide pedestrian refuge, they must be a minimum width of 6 feet to meet pedestrian accessibility requirements. To provide bicyclists refuge and to accommodate larger groups of pedestrians, the minimum should be increased to 8 feet.

They can improve safety for pedestrians and bicyclists by reducing crossing distances and creating a place of refuge to allow multiple-stage crossings. They are particularly beneficial at uncontrolled crossings, large signalized crossings, or complex intersections where people may have difficulty completing crossings, and they may be especially helpful for pedestrians who are unable to judge gaps in traffic accurately or who travel slower than the design pedestrian (typically walking at least 3.5 ft/s). Crossing islands can be designed with a Z-crossing to require people to face oncoming traffic which may increase visibility and eye contact. Crossing islands that extend up to or beyond crosswalks can also slow left turning motorists, providing the same benefit as hardened centerlines or medians. Temporary pedestrian refuge islands can be installed using low-cost materials (paint, bollards, or even rubberized platforms) for demonstration and evaluation purposes.



SOURCE: CALTRANS HIGHWAY DESIGN MANUAL

DESIGN CONTEXTS

- Midblock or intersection crossing locations.
- Preferable on all roadways with 2 or more lanes of through traffic in each direction and operating speeds over 30 mph.
- Should be considered on all roadways where space is available to provide refuge, and particularly on roadways with medium to high speeds and medium to high vehicle volumes.

CMF RATING

0.54 for all crashes (Bahar et al. 2007); 0.69 for vehicle-pedestrian crashes for raised medians (Zegeer et al. 2017). A crossing island is recognized by FHWA as a Proven Safety Countermeasure.

ESTIMATED COST

\$3,000–\$50,000

RECTANGULAR RAPID FLASH BEACON

Rectangular Rapid Flashing Beacons (RRFBs) are placed on both sides of an uncontrolled crosswalk and are paired with a pedestrian crossing sign as well as an arrow pointing at the crosswalk. The beacons differ from standard flashing beacons by using a rapid flash frequency (approximately 190 times per minute), brighter light intensity, and ability to aim the LED flash. RRFBs can be actuated or pedestrian actuated, and feature an irregular, eye-catching flash pattern to call attention to the presence of pedestrians.



SOURCE: CALTRANS MAIN STREET, CALIFORNIA, 2013

Rectangular rapid flash beacons have been shown to significantly increase motorist yielding behavior at uncontrolled crosswalks, with motorist yield rates ranging from 34 percent to over 90 percent. Studies have also demonstrated reduced pedestrian- vehicle conflicts, increased stopping distance, and reductions in pedestrians trapped in the roadway while crossing (Thomas et al. 2016). These safety benefits likely extend to bicyclists crossing at RRFB locations as well.

DESIGN CONTEXTS

- Roadways with low to medium vehicle volumes.
- Roadways with posted speeds less than 40 mph.

CMF RATING

0.53 for vehicle-pedestrian crashes (Zegeer et al. 2017).

ESTIMATED COST

\$3,000–\$50,000

ROUNDBOUT

Roundabouts are circular intersections designed to eliminate left turns by requiring traffic to circulate around a central island. Roundabouts are typically installed in place of traffic signals to reduce vehicular speeds, improve safety at intersections by eliminating angle and higher-speed collisions, to allow more efficient traffic operations, and to reduce operation costs associated with signalized intersections. Further detail on potential



SOURCE: FHWA PROVEN SAFETY COUNTERMEASURES

applications are discussed in NCHRP Report 672, Roundabouts: An Informational Guide, Second Edition (Rodegerdts et al. 2010). NCHRP Report 834, Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Disabilities: A Guidebook, provides vital information on roundabout design for all pedestrians, including those with vision impairment (Schroeder et al. 2017).

DESIGN CONTEXTS

- Intersections where signals are not warranted or are unable to be installed.
- Intersections of local, collector, or arterial roadways.
- Intersections with high left- turning vehicle volumes.
- Intersections that are part of a corridor treatment that.
- includes access management and motor vehicle travel lane reductions.
- Along corridors characterized by high vehicular speeds that are out of context with the area type.

CMF RATING

A CMF for vehicle-pedestrian crashes based on U.S. data has not been developed due to low incidence of reported pedestrian crashes (Ferguson et al. 2019). Roundabouts reduce motor vehicle speeds, which can create a safer environment for all road users (Rodegerdts et al. 2010, Ariniello 2005). The benefit of this tool is calculated using Caltrans procedure. The crash reduction factor is dependent on the ADT, project location (Rural/ Urban) and the roundabout type (1 lane or 2 lanes). The benefit comes from both the reduction in the number and the severity of the crashes.

ESTIMATED COST

> \$175,000

ADVANCED YIELD LINES

Advanced yield lines are pavement markings placed 20 to 50 feet in advance of an uncontrolled and unsignalized pedestrian or bicycle crossing. This treatment increases the distance between where drivers have stopped or yielded and the crosswalk or bicycle crossing, which improves the visibility of crossing pedestrians and bicyclists to motorists and helps to reduce multiple-threat crashes. Advanced yield lines also discourage drivers from encroaching into the crosswalk.



SOURCE: [HTTP://WWW.PEDBIKESAFE.ORG](http://www.pedbikesafe.org)

DESIGN CONTEXTS

- Uncontrolled multi-lane crossings (at least two lanes in one direction) (Blackburn et al. 2017).

CMF RATING

0.75 for vehicle-pedestrian crashes (Zegeer et al., 2017). The safety benefits of advance stop/yield lines at unsignalized bicycle crossings have not yet been studied.

ESTIMATED COST

< \$3,000

BICYCLE FACILITY TREATMENTS

BICYCLE LANE EXTENSION THROUGH INTERSECTION

Bicycle lane extension pavement markings through intersections are intended to provide bicyclists with a clear, highly visible pathway through an intersection. They also help to alert motorists to the presence of bicycle through-traffic and encourage turning motorists to yield to through moving bicyclists. The pavement within the bicycle lane extension can include green color. The color may be applied with paint, Durable Liquid Pavement Markings (DLPM), thermoplastic, or colored asphalt.



SOURCE:

[HTTPS://WWW.MIKEONTRAFFIC.COM/BIKE-LANE-CONFLICT-ZONE-MARKINGS/](https://www.mikeontraffic.com/bike-lane-conflict-zone-markings/)

DESIGN CONTEXTS

- Locations with bicycle lanes or separated bike lanes where it is desired to delineate the bicycle crossing through an intersection.
- Locations where right- or left- turning vehicles cross through moving bicyclists, especially at intersections along major bike routes.
- At wide or complex intersections where the bicyclist path is unclear (NACTO 2012).

CMF RATING

CMFs for this treatment have not been developed for the US context. Existing studies indicate that when used to highlight key conflict points this treatment may improve bicyclist safety via increased motorist yielding, reduced conflicts with turning vehicles, and increased predictability of bicyclist location (Hunter et al. 2000; Brady et al. 2010; Jensen 2008).

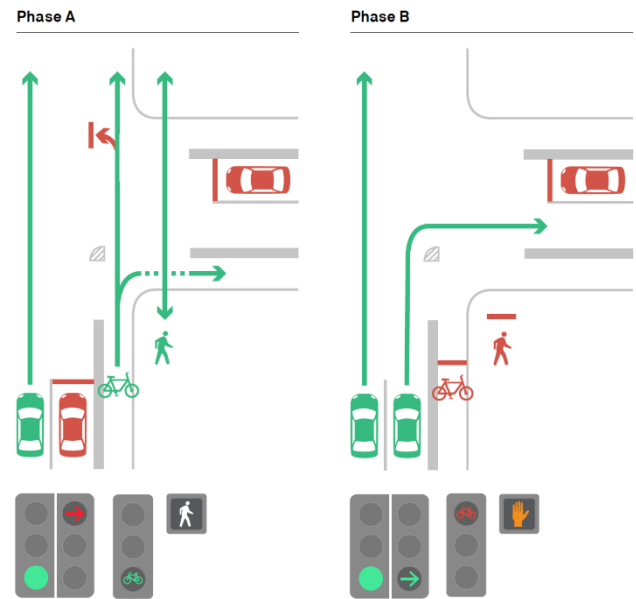
ESTIMATED COST

< \$3,000

BICYCLE SIGNAL

A bicycle signal is a traffic signal with a green, yellow, and red display intended to control bicycle movements. The display may include arrows or a bicycle symbol shape. Bicycle signals are necessary to indicate a leading or protected phase for bicycle movements. This may sometimes require an additional phase be added to the traffic signal cycle. Initial studies of bicycle signals indicate that their presence may increase signal compliance and improve safety. This treatment has been given interim approval to use by FHWA if used for protected bicycle phases but is not included in the 2009 MUTCD. FHWA requires an agency to request permission to experiment if using a bicycle signal to apply a leading phase.

Bicycle signals can be activated actively or passively. Active detection requires bicyclists to use a pushbutton. Pushbuttons should be placed in such a way that bicyclists do not have to leave the roadway to activate the signal.



SOURCE: [HTTPS://NACTO.ORG/](https://nacto.org/)

DESIGN CONTEXTS

- Signalized intersections with high bicycle volumes and high turning vehicle volumes.
- Locations where a highly- used bicycle route (including shared-use path) must cross a major, signalized intersection to connect users to the rest of the route (sometimes requiring bicyclists to cross diagonally).
- Intersections with contraflow bike lanes or separated bike lanes.
- Intersections where a bicycle facility transitions from a cycle track to a bicycle lane.
- Complex intersections that may otherwise be difficult for bicyclists to navigate.

CMF RATING

0.75 for vehicle-pedestrian crashes (Zegeer et al., 2017). The safety benefits of advance stop/yield lines at unsignalized bicycle crossings have not yet been studied.

ESTIMATED COST

\$3,000–\$50,000

BIKE BOXES

Bike boxes provide space for bicyclists to position themselves in front of vehicles while stopped at a signalized intersection. This treatment provides a predictable place for bicyclists to stop and wait at a signal, allowing them to get out ahead of traffic at the onset of a green signal. Bike boxes are intended to reduce the likelihood of a right- or left-hook collision at the on-set of a green signal. In addition to increasing the visibility and predictability of bicyclists, bike boxes provide priority for bicyclists by allowing them to come to the front of the queue. A "No Right Turn on Red" sign can be installed to prevent vehicles from entering the bike box. Bike boxes can also be helpful for bicyclists making left turns who are uncomfortable or unable to merge to a left turn lane. This treatment has been given interim approval to use by FHWA but is not included in the 2009 MUTCD.



SOURCE: [HTTPS://NACTO.ORG/](https://nacto.org/)

DESIGN CONTEXTS

- Signalized intersections with medium to high volumes of bicyclists and motor vehicles.
- Intersections where large vehicles are common.
- Intersections with high volumes of queuing bicyclists.
- Intersections with high volumes of turning vehicles and bicyclists going straight.

CMF RATING

A CMF has not yet been determined; initial evidence indicates this treatment can improve bicyclist safety through improved visibility of bicyclists, increased awareness of bicyclists by motorists, increased motorist yielding, and a reduction in right-hook conflicts (Allen et al. 2005; Brady et al. 2010; Dill et al. 2012).

ESTIMATED COST

\$3,000–\$50,000

CLASS I BICYCLE FACILITIES

Class I bikeways (also known as bike paths or shared-use paths) are facilities with exclusive right of way for bicyclists and pedestrians, away from the roadway and with minimized cross flows by vehicle traffic. These facilities support both recreational and commuting opportunities, especially along rivers, shorelines, canals, utility rights-of-way, railroad rights-of-way, within school campuses, or within and between parks.



*SOURCE: FHWA SEPARATED BIKE LANE
PLANNING AND DESIGN GUIDE*

DESIGN CONTEXTS

- Rural settings to provide access to users of all ages and abilities.
- Along active and/or abandoned rail easements.

CMF RATING

A CMF has not yet been determined.

ESTIMATED COST

The cost per mile depends on several factors including facility width, materials used, etc.

CLASS II BICYCLE FACILITIES

Also known as bike lanes, Class II Bicycle Facilities are established along streets, defined by pavement striping and signage to delineate a portion of a roadway for bicycle travel. Bike lanes are one-way facilities, typically striped adjacent to vehicle traffic traveling in the same direction. Buffered bike lanes provide greater separation from an adjacent traffic lane or on-street parking by using painted chevrons or diagonal markings. Buffered bike lanes may be desirable on streets with higher vehicle speeds or volumes.

DESIGN CONTEXTS

- Bike lanes are most helpful on streets with $\geq 3,000$ motor vehicle average daily traffic.
- Bike lanes are most helpful on streets with a posted speed ≥ 25 mph.
- On streets with high transit vehicle volume.
- On streets with high traffic volume, regular truck traffic, high parking turnover, or a speed limit > 35 mph, consider treatments that provide greater separation between bicycles and motor traffic such as:
 - Left-side bike lanes on one-way streets.
 - Buffered bike lanes.
 - Separated bikeways.

CMF RATING

A CMF has not yet been determined.

ESTIMATED COST

\$3,000–\$50,000



SOURCE: FHWA SEPARATED BIKE LANE
PLANNING AND DESIGN GUIDE

CLASS III BICYCLE FACILITIES

Class III Bicycle Facilities, also known as bike routes, are designated routes shared with vehicles but not served by dedicated bikeways. Bike routes are established by placing signage and/or shared lane (sharrow) markings along roadways, and are therefore generally not appropriate for roadways with high vehicle speeds or volumes. A Bicycle Boulevard or a Neighborhood Greenway is a type of bike route where bicycle travel is prioritized. These facilities are typically placed on residential streets where biking or walking is the primary mode of transportation. Traffic speed and non-local vehicle access is reduced for the safety of bicyclists and pedestrians.



SOURCE: FHWA SEPARATED BIKE LANE PLANNING AND DESIGN GUIDE

DESIGN CONTEXTS

- Streets with speeds at 25 mph or less.
- Streets with traffic volumes less than 3,000 vehicles per day.
- Streets with lower vehicle volumes and speeds that are parallel and near major streets, which have a similar level of connectivity and travel demand function.
- Streets where a continuous route for bicyclists exists and where people are already bicycling.
- Streets where bicyclists have right-of-way at intersections or where right-of-way can be established.

CMF RATING

A CMF has not yet been determined.

ESTIMATED COST

\$3,000–\$50,000

CLASS IV BICYCLE FACILITIES

Class IV Bicycle Facilities (also known as separated bikeways, protected bikeways, or cycle tracks) are for the exclusive use of bicycles and are physically separated from vehicle traffic, parking lanes, and sidewalks with a vertical and/or horizontal feature. These features include flexible posts, inflexible physical barriers, planters, parked vehicles, and curbs. Separated bikeways may be one-way or two-way and may be at street level or sidewalk level. The separation width can vary for these facilities according to roadway geometry. Near transit stops, separated facilities can be incorporated with the use of transit boarding islands.



SOURCE: FHWA SEPARATED BIKE LANE PLANNING AND DESIGN GUIDE, PEOPLEFORBIKES

DESIGN CONTEXTS

- Streets with high demand for double parking, and high parking turnover.
- Streets with multiple lanes.
- Streets with conflicts at intersections.
- Streets with high bicycle volumes.
- Streets with high motor vehicle volumes.
- Streets with high vehicle speeds.

CMF RATING

A CMF has not yet been determined.

ESTIMATED COST

The cost per mile depends on several factors including facility width, vertical elements used, etc.

PASSIVE BICYCLE SIGNAL DETECTION

Properly designed detection can deter unsafe behaviors, such as disregarding red signal indications, by reducing delay at signalized intersections. Bicycle signal detection also increases the convenience of bicycling. Passive detection (i.e., when the signal system automatically detects the presence of the user), is considered best practice where feasible. Loop detectors, commonly used for motor vehicle detection, can also be used to detect bicyclists. Other passive detection devices include video and microwave detection. Bicycle detection devices can be used to call a phase or to prolong the phase to allow a bicyclist to clear an intersection. This is particularly important at locations where the minimum green has been established to serve motorists and may not be long enough to serve bicyclists, especially older bicyclists, children, or those towing bicycle trailers. Pavement markings and/or signs should be used to notify bicyclists of the proper bicycle detection location. Combining passive bicycle detection with detection confirmation lights or active detection (push buttons) may improve compliance by assuring bicyclists that they have been detected.



SOURCE: [HTTP://PEDBIKESAFE.ORG/](http://pedbikesafe.org/)

DESIGN CONTEXTS

- Signalized intersections that require users to be detected to actuate a signal for one or more movement.
- Intersections with bicycle signals and/or bicycle- specific phasing.
- Bike lanes approaching intersections with bicycle signals.
- Left turn lanes with left-turn signals where bicyclists also turn left (NACTO 2012).

CMF RATING

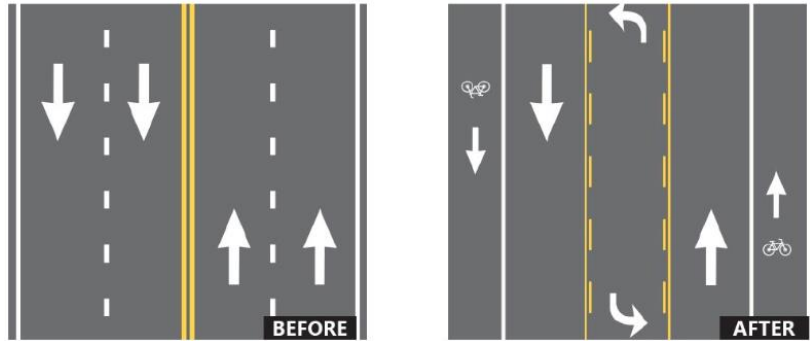
A CMF has not yet been determined; initial use of this treatment indicate that it is promising.

ESTIMATED COST

\$3,000–\$50,000

ROAD DIET / ROAD RECONFIGURATION

The number of lanes on a roadway determines how far pedestrians or bicyclists must cross at an intersection and how many conflict points might exist between turning traffic and bicyclists or pedestrians. Efforts have been made to reduce the number and width of lanes through 'road diets' that not only reduce the number of lanes but provide space to implement additional pedestrian and bicyclist safety treatments such as adding bike



FSOURCE: FHWA PROVEN SAFETY COUNTERMEASURES

lanes, median crossing islands, and reducing travel speed. Road diets are often completed to improve access management, increase bicycle and pedestrian access, and to enhance roadway safety. The most common road diet configuration involves converting a four-lane roadway into three lanes, with one travel lane in each direction, a center two-way left-turn lane, and bike lanes in each direction, often supplemented with painted or raised center islands.

DESIGN CONTEXTS

- Priority bicycle and pedestrian routes.
- Urban and rural areas.
- Multi-lane roads.

CMF RATING

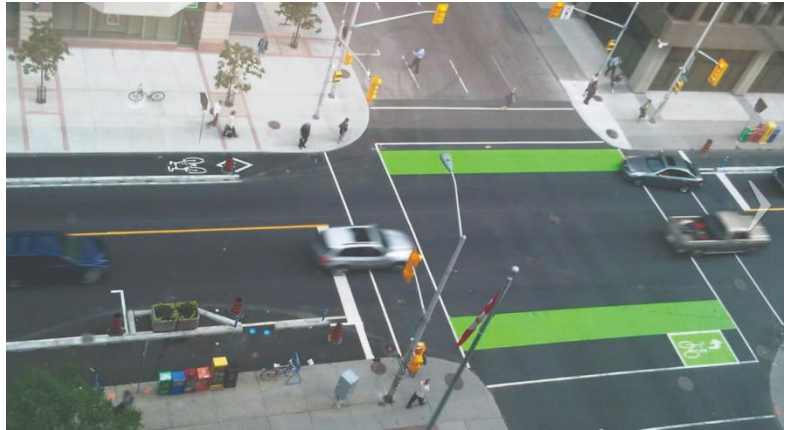
0.71 for total crashes (Harkey et al. 2008). Safety benefits may vary depending on the type of treatments implemented, however studies suggest that road diets are associated with increased pedestrian safety and reduced vehicle speeds (Thomas et al. 2016).

ESTIMATED COST

\$3,000–\$50,000

TWO-STAGE BICYCLE TURN QUEUE BOXES

A two-stage left turn queue box (also known as a Copenhagen-Left or jug-handle turn) designates an area outside of vehicle conflicts for bicyclists to wait for traffic to clear before proceeding in a different direction of travel. It may be used for left or right turns. They may be useful at locations where bicyclists would have to merge across multiple lanes of traffic, would have to wait in a shared travel lane with motorists to turn, or at locations with separated bike lanes or side paths where it is not



SOURCE: [HTTPS://NACTO.ORG/](https://nacto.org/)

possible for bicyclists to merge into motor vehicle lanes in advance of the intersection. This can be advantageous on roadways with higher volumes of traffic or operating speeds to reduce conflicts between motorists and turning bicyclists. Bicycle symbol and turn arrow pavement markings indicating the appropriate direction for bicyclists to turn and wait within the box are recommended, as well as the prohibition of right turns on red if turning vehicles would travel through the area of the two-stage bicycle turn box.

An agency should request permission to experiment from FHWA to use this treatment as it is not currently approved for use.

DESIGN CONTEXTS

- Signalized intersections that require users to be detected to actuate a signal for one or more movement.
- Multi-lane intersections where bicyclists frequently turn left from a facility on the right side of the roadway.
- Cycle tracks or bike lanes with multiple adjacent motor vehicle travel lanes with high traffic speeds and/or traffic volumes (NACTO 2012).

CMF RATING

A CMF has not yet been determined; initial evidence indicates the safety benefits of this treatment are promising (Xiaomin and Shao 2014).

ESTIMATED COST

< \$3,000

APPENDIX 2: LEGISLATIVE FRAMEWORK

LIST OF LAWS AND REGULATIONS

LEGISLATIVE FRAMEWORK

FEDERAL LAWS

AMERICANS WITH DISABILITIES ACT

The Federal Americans with Disabilities Act (ADA) of 1990 guarantees people with disabilities equal opportunities, serving as the basis of enforceable regulations for accessible design. In 2010, the US Department of Justice adopted (revised) enforceable standards, implementing Titles II and III of the ADA, for the design of government facilities, public accommodations, and commercial facilities to enable them to be accessible for people with disabilities. The ADA Standards mandate accessibility for some parts of the public realm, such as curb ramps and bus stops. The US Access Board has proposed guidelines -- the Public Right-of-Way Accessibility Guidelines (PROWAG) -- that more comprehensively address accessibility in the public realm, including dimensional specifications for sidewalk width and slope, curb ramps and driveways, tactile warning surfaces at roadway edges, and other accessibility features. While the PROWAG have yet to be adopted as enforceable standards, many state and local agencies reference them as guidelines or best practices for transportation projects. See the section below on Caltrans DIB 82-06.

ADA STANDARDS

Title II, Section 35.151- New Construction and Alterations

The ADA requires the installation of curb ramps or other modifications when a project alters a roadway. The reconstruction of a roadway, the upgrading of a sidewalk, or the installation of other elements are considered when they affect usability, temporarily or permanently, for pedestrians or vehicles. For ADA purposes, the resurfacing of a roadway is an alteration with respect to the special Title II obligation and therefore requires the installation of curb ramps.

STATE LAWS

CALIFORNIA VEHICLE CODE: SUMMARY OF SELECTED LAWS REGARDING BICYCLING

The California Vehicle Code (CVC) contains the state laws that specify where and how bicycles riders must operate. For the most part, bicyclists have the same rights and responsibilities as motor vehicle drivers, but the CVC provides specific language for the following:

- **Use of the bicycle lane-** On a roadway with a bike lane, bicyclists traveling slower than traffic must use the bike lane except when making a left turn, passing, avoiding hazardous conditions, or approaching a place where a right turn is authorized.
- **Riding on the right hand side of the roadway-** Bicyclists riding slower than traffic moving in the same direction must travel as close as practicable to the right-hand curb or edge of the roadway, except when passing, preparing for and making a legal left turn, approaching a place where a right turn is authorized, riding on a one-way street, riding on a road that is too

narrow, avoiding hazardous conditions, or when the right side of the road is closed due to road construction.

- **Mopeds and high-speed electric bikes-** Gas-powered bicycles and type 3 electric bicycles (with top assisted speeds of 28 mph) may not be used on trails or bike paths or lanes unless allowed by local authorities. They may be used in bike lanes or separated bikeways adjacent to the roadway. They require helmets and may not be operated by people under age 16.
- **Low-speed electric bicycles-** Type 1 and 2 electric bicycles (with top assisted speeds of 20 mph) are allowed wherever regular bikes are allowed unless a sign specifically prohibits electric bicycles.
- **Bike path obstructions-** No one may stop on or park a bicycle on a bicycle path.
- **Sidewalks-** Individual cities and counties control whether bicyclists may ride on sidewalks.
- **Freeways-** Bicycles (including motorized bicycles) may not be ridden on freeways and expressways where doing so is prohibited by Caltrans and local authorities.

CALIFORNIA VEHICLE CODE: SUMMARY OF SELECTED LAWS REGARDING PEDESTRIANS

- **Crosswalks-** Drivers are required to yield to pedestrians in crosswalks, including a marked crosswalk or an unmarked crosswalk at an intersection. Unmarked crosswalks are defined by the prolongation of the (imaginary) boundary lines of sidewalks at right-angle or near-right angle intersections. Marked crosswalks are defined by distinct crosswalk lines or other markings on the road. It is unlawful for a driver to pass another vehicle stopped to permit a pedestrian to cross at a crosswalk. Pedestrians must cross the roadway at a crosswalk when between adjacent intersections are controlled by traffic signal devices or police officers.
- **Sidewalks-** Drivers are required to yield to pedestrians when crossing over sidewalks, e.g. at a driveway.
- **Blind pedestrians-** Drivers must yield the right-of-way to blind pedestrians using a cane or guide dog and must take all reasonably necessary precautions to avoid injury to these pedestrians. Drivers who do not are guilty of a misdemeanor punishable by a prison sentence and fine.

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

As described by the California Natural Resources Agency, the California Environmental Quality Act (CEQA) "is a statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. For the purposes of CEQA, the "environment" is defined as "the physical conditions that exist within the area which will be affected by a proposed project, including land, air, water, minerals, flora, fauna, noise, or objects of historic or aesthetic significance. Transportation is a typical impact category in CEQA analyses, which have narrowly defined transportation as "traffic". In 2018, Senate Bill 743 directed the Office of

Public Research (OPR) to revise the CEQA guidelines to phase out Level of Service (LOS) and instead consider vehicle miles traveled (VMT) when evaluating impacts of a transportation project. In 2021, Senate Bill 288 exempts pedestrian and bicycle projects from the environmental review requirements of CEQA.

STATE ASSEMBLY BILLS

AB 32 – GLOBAL WARMING SOLUTIONS ACT (2006)

The Global Warming Solutions Act (AB 32) established a mandate for the state to reduce its greenhouse gas (GHG) emissions to 1990 levels by 2020. Scoping plans prepared by the California Air Resources Board (ARB) to meet the mandate have included strategies for reducing transportation related GHG emissions from motor vehicles, recommendations to encourage walking and bicycling, and recommended GHG emission reduction targets for local government.

AB 1358 – COMPLETE STREETS (2008)

Under this law, all California cities and counties must include policies for safe accommodations for all street users (pedestrians, bicyclists, transit riders, motorists, children, persons with disabilities, and elderly persons) in circulation element updates.

AB 1371 - VEHICLES: BICYCLES: PASSING DISTANCE (2013)

AB 1371 requires that motor vehicles leave three feet of space between a bicycle and motor vehicle, when the driver of the motor vehicle is overtaking a bicyclist traveling in the same direction.

AB 1193 – PROTECTED BIKEWAYS (2014)

AB 1193 adds a fourth classification of bikeway to the Caltrans bikeway classifications. The new designation, Class IV bikeways, applies to cycle tracks or separated bikeways.

AB 2245 – ENVIRONMENTAL QUALITY: CEQA: EXEMPTION: BICYCLE LANES (2015)

This bill exempts the restriping of roadways for bicycle lanes, provided the roadways are within an urban area and the restriping is consistent with a prepared bicycle transportation plan. A lead agency would be required to conduct a traffic assessment and safety impact study, as well as conduct hearings, before determining if a project is exempt.

AB 43 TRAFFIC SAFETY (2021)

This bill aims to improve traffic safety by authorizing local authorities to consider the safety of vulnerable road user groups when setting speed limits. The bill establishes a prima facie speed limit of 25 miles per hour on state highways located in any business or residence district and authorizes Caltrans to change the speed limit on any such highway. AB 43 authorizes a lowered speed limit on a section of highway contiguous to a business activity district and extends the period that a speed limit remains valid for speed enforcement from 7 to 14 years if evaluated by a registered engineer. Additionally, Caltrans and local authorities are authorized to declare a speed limit of 20 or 15 miles per hour on certain highways. The bill allows local agencies greater flexibility in adjusting roadway speeds through minimizing the role of speed surveys in establishing speed limits.

AB 1909 BICYCLE LANE CHANGE LAW (2023)

This bill took effect on January 1, 2023, across all of California requiring drivers to change into another available lane, when possible, to pass cyclists, building on the current requirement for drivers

to give cyclists at least three feet of space when passing. The law also permits Class 3 e-bike riders to use approved bicycle paths and trails, bikeways, and bicycle lanes.

SENATE BILLS

SB 375 (2008)

SB 375 requires metropolitan planning organizations (MPOs) to plan for meeting GHG reduction targets set by the California Air Resources Board (ARB). An MPO's Regional Transportation Plan and Sustainable Communities Strategy (RTP-SCS) must show how the region will meet the target through land use planning strategies and transportation system recommendations.

SB 391 (2010)

SB 391 requires the California Transportation Plan to support a statewide reduction of GHG emissions to 1990 levels by 2020 and 80 percent below 1990 levels by 2050.

SB 535 - DISADVANTAGED COMMUNITIES (2012)

SB 535 requires that 25 percent of the proceeds from the AB 32 GHG Reduction Fund go to projects that provide a benefit to disadvantaged communities.

SB 743 (2013)

SB 743 requires changes to the CEQA Guidelines pertaining to transportation impact analysis. OPR subsequently proposed, and the California Natural Resources Agency certified and adopted, revisions to the guidelines to phase out automobile LOS as a metric for evaluating the transportation impacts of a project. VMT is now recognized as the most appropriate metric.

SB 99 - ACTIVE TRANSPORTATION PROGRAM ACT (2013)

The Active Transportation Program (ATP) distributes federal and state funds for local and regional efforts to increase walking and bicycling. The funding is intended to increase the number of walking and bicycling trips, increase safety for those modes, and provide support for disadvantaged communities to achieve transportation equity.

SB 32 (2016)

SB 32 updates the targets in AB 32 by mandating a statewide GHG reduction of 40 percent from 1990 levels by 2030.

SB 1 – ROAD REPAIR AND ACCOUNTABILITY ACT (2017)

The "Road Repair and Accountability Act" of 2017 (SB 1) invests \$54 billion over a decade to repair roads, improve traffic safety, and expand public transit systems across California, with funds split equally between state and local investments.

SB 288 - CEQA: EXEMPTIONS: TRANSPORTATION-RELATED PROJECTS (2020)

Expands the list of transit and transportation projects statutorily exempt from the California Environmental Quality Act (CEQA). The expanded exemption list includes pedestrian and bicycle facilities.

SB 932 - TRAFFIC CALMING AND ACTIVE TRANSPORTATION PLANS (2022)

Requires cities to incorporate the Safe System – aka Vision Zero – principles within their general plans.

EXECUTIVE ORDERS

EXECUTIVE ORDER S-3-05 (2005)

Sets a target for reducing GHG emissions by 80 percent from 1990 levels by 2050.

EXECUTIVE ORDER B-16-12 (2012)

Sets a target for reducing GHG emissions in the transportation sector to 80 percent below 1990 levels by 2050.

EXECUTIVE ORDER B-30-15 (2015)

Sets a target for reducing GHG emissions by 40 percent from 1990 levels by 2030.

EXECUTIVE ORDER B-55-18 (2018)

Sets a goal of achieving statewide carbon neutrality by 2045.

EXECUTIVE ORDER N-19-19 (2019)

Redoubled the state's efforts to reduce greenhouse gas emissions and mitigate the impacts of climate change while building a sustainable, inclusive economy. Caltrans was directed to leverage over \$5 billion toward transportation construction, operations, and maintenance to lower fuel consumption and greenhouse gas emissions from transportation. This includes strategies for lowering vehicle miles traveled, such as supporting housing development near available jobs, and supporting active modes of transportation such as biking and walking that also benefit public health.

EXECUTIVE ORDER N-79-20 (2020)

Sets a goal of ending the sale of internal combustion passenger vehicles by 2035. The executive order called for Caltrans to identify near term actions and investment strategies to improve clean transportation, sustainable freight, and transit options. This included supporting bicycle, pedestrian, and micro-mobility options, particularly in low-income and disadvantaged communities in the State, by incorporating safe and accessible infrastructure into projects where appropriate.

APPENDIX 3: PLAN CONSISTENCY

LIST OF PLANS

POLICY FRAMEWORK

The following is a review of state, regional, and local policies/plans that are applicable to the advancement of the City of Solvang's Active Transportation Plan.

STATE PLANS AND POLICIES

Main Street, California (2013)

This document is a guide, produced by Caltrans for communities that consolidates recent updates for improving multimodal access, livability, and sustainability. It summarizes standards, procedures, and guidelines from the Caltrans Highway Design Manual (HDM), the California Manual on Uniform Traffic Control Devices (CA MUTCD), and the Project Development Procedures Manual (PDPM). A section titled, "Design for Bicyclists", describes a suite of state-approved bicycle facilities, such as shared traffic lanes, sharrows, bike lanes, colored pavement, etc., and offers examples of where it is appropriate to use such infrastructure as well as the guidance from which they are drawn.

Caltrans 2020-2024 Strategic Plan (2020)

This plan provides a strategic direction for Caltrans that integrates sustainability principles across all agency goals. The plan calls for reducing user fatalities and injuries, promoting community health through active transportation, and improving the quality of life for all Californians by increasing accessibility to all modes of transportation.

California Transportation Plan 2050 (2021)

The California Transportation Plan's Vision Statement calls for California's transportation system to "be high-tech, high-quality, and more efficient at moving people and goods. The transportation system will be resilient to natural hazards including flooding, earthquakes, pandemics, and other disruptions, and ensure protection of our invaluable natural and cultural resources. It will power the expansion and diversification of California's world-class economy, with a modernized and sustainable freight system that supports local economic growth. Our future transportation system will be carbon-neutral, enhancing public health and quality of life for all Californians, regardless of race, ethnicity, income, age, gender, sexual orientation, or ability. Our future system will advance quality of life and economic opportunity for disadvantaged and low-income communities, who have long endured the greatest burdens of the transportation system, building economic opportunity and mobility for those who need it most." The plan aims to have zero transportation-related fatalities and serious injuries by 2050 and plans to expand access to safe and convenient transit, shared mobility, and active transportation options.

California Air Resources Board Mobile Source Strategy (2020)

The California Air Resources Board (ARB) released a Mobile Source Strategy that demonstrates how the State can simultaneously meet air quality standards, achieve GHG emission reduction targets, decrease health risk from transportation emissions, and reduce petroleum consumption over the next thirty years. The Mobile Source Strategy focuses on the widespread use of cleaner vehicle

technologies, cleaner fuels, and efficiency improvements to the freight transport system to make communities more sustainable and enhance the benefits of investments in cleaner technologies by reducing growth in vehicle miles traveled (VMT).

ARB Climate Change Plan Scoping Update (2022)

The 2022 Scoping Plan for Achieving Carbon Neutrality (2022 Scoping Plan) lays out a path to achieve targets for carbon neutrality and reduce anthropogenic greenhouse gas (GHG) emissions by 85 percent below 1990 levels no later than 2045, as directed by Assembly Bill 1279. The actions and outcomes in the plan will achieve: significant reductions in fossil fuel combustion by deploying clean technologies and fuels, further reductions in short-lived climate pollutants, support for sustainable development, increased action on natural and working lands to reduce emissions and sequester carbon, and the capture and storage of carbon.

The plan recognizes the multiple benefits of promoting active transportation public health benefits of reduced criteria pollutants due to VMT reduction and increased physical activity. To expand and complete networks of high-quality active transportation infrastructure, the plan sets out to require complete street enhancements, including minimum space allocations for bicycle and pedestrian infrastructure, in all State-funded transportation investments.

Toward an Active California: State Bicycle and Pedestrian Plan (2017)

The California State Bicycle and Pedestrian Plan is a visionary and comprehensive policy to support active modes of transportation. Policies that stem from this plan will guide decisions about future bicycle and pedestrian investments and support local governments in creating a safe active transportation network.

The plan's vision states that "by 2040, people in California of all ages, abilities, and incomes can safely, conveniently, and comfortably walk and bicycle for their transportation needs." The plan identifies policies and strategies that will get Caltrans to this goal focusing on safety, mobility, preservation of the transportation system, and social equity.

Caltrans District 5 Active Transportation Plan (2021)

The Caltrans District 5 Active Transportation Plan (Plan) advances the vision statement and goals in Toward an Active California, the statewide bicycle and pedestrian plan, and is part of a comprehensive planning process to identify locations with walking and bicycling needs in each Caltrans district across California. Caltrans staff and regional and agency partners will use the Plan to address high priority needs on, along, and across the State Highway System (SHS).

A key action of Toward an Active California is the development of Active Transportation Plans for each of the twelve local Caltrans districts. Part of this effort includes developing an overarching statewide framework and methodology for collecting, storing, and using active transportation data. The statewide framework and methodology will inform each District Plan and will be flexible enough that each District can customize its study process to meet local contexts and needs. Each plan will be data-driven and will focus on developing context-appropriate recommendations within and adjacent to the Caltrans SHS right of way.

This plan places a high priority on meeting needs for people in communities that face significant and disproportionate environmental, public health, and economic disadvantages. The SHS may sometimes act as a barrier to walking and biking in the communities it passes through, compounding challenges those communities already face. The plan uses disadvantaged community definitions from CalEnviroScreen and from local and regional planning agencies. The maps shown here use only the local and regional data.

Smart Mobility Framework

The California Smart Mobility Call to Action provides new approaches to implementation and lays the groundwork for an expanded State Transportation Planning Program. It enhances the scope of the existing California Transportation Plan by analyzing the benefits of multi-modal, interregional transportation projects. The Smart Mobility Framework emphasizes travel choices and safety for all users, supporting the goals of social equity, climate change intervention, energy security, and a sustainable economy.

CalEPA Environmental Justice Program / CalEnviroScreen

The principles of environmental justice call for fairness, regardless of race, color, national origin, or income, in the development of laws and regulations that affect every community's natural surroundings, and the places people live, work, play and learn.

California was one of the first states in the nation to codify environmental justice in statute. Beyond the fair treatment called for in code, leaders in the environmental justice movement work to include those individuals disproportionately impacted by pollution in decision making processes. The aim is to lift the unfair burden of pollution from those most vulnerable to its effects.

CalEnviroScreen is a screening methodology and mapping tool that helps identify California communities that are disproportionately burdened by multiple sources of pollution and is an important tool in meeting the California Environmental Protection Agency's (CalEPA) commitment to environmental justice for all.

Climate Action Plan for Transportation Infrastructure (2021)

The Climate Action Plan for Transportation Infrastructure (CAPTI), produced by the California State Transportation Agency (CalSTA), details how the state recommends investing billions of discretionary transportation dollars annually to aggressively combat and adapt to climate change while supporting public health, safety and equity. CAPTI builds on executive orders signed by Governor Gavin Newsom in 2019 and 2020 targeted at reducing greenhouse gas (GHG) emissions in transportation, which account for more than 40 percent of all emissions, to reach the state's ambitious climate goals. CalSTA developed the draft CAPTI through collaboration with many different state agencies, along with extensive outreach and engagement with hundreds of stakeholders.

CAPTI supports improving multimodal connectivity in local street networks (including overcrossing opportunities of Caltrans facilities) in order to enable more direct routing and efficient access to destinations for short trips, thereby removing trips from the state highway system. Additionally,

adding and improving connected facilities for walking and bicycling in the corridor and for first/last-mile connections to local, interregional, and regional transit routes is also supported.

Caltrans System Investment Strategy (CSIS)

Caltrans is in a significant leadership role to carry out meaningful measures that advance state's goals and priorities through the development and implementation of the Caltrans System Investment Strategy (CSIS). The CSIS, which implements one of CAPTI's key actions, is envisioned to be an investment framework through a data and performance-driven approach that guides transportation investments and decisions. This framework includes methodologies and processes for how Caltrans should invest billions of dollars of highly competitive fund programs that will address transportation deficiencies while also achieving the CAPTI Guiding Principles.

Caltrans Director's Policy 37

The California Department of Transportation (Caltrans) recognizes that walking, biking, transit, and passenger rail are integral to their vision of delivering a brighter future for all through a world-class transportation network. Additionally, Caltrans recognizes that streets are not only used for transportation but are also valuable community spaces. Accordingly, in locations with current and/or future pedestrian, bicycle, or transit needs, all transportation projects funded or overseen by Caltrans will provide comfortable, convenient, and connected complete streets facilities for people walking, biking, and taking transit or passenger rail unless an exception is documented and approved. When decisions are made not to include complete streets elements in capital and maintenance projects, the justification will be documented with final approval by the responsible District Director.

REGIONAL PLANS AND POLICIES

SBCAG Regional Transportation Plan & Sustainable Communities Plan (2022)

The Santa Barbara County Association of Governments' (SBCAG) Regional Transportation Plan and Sustainable Communities' Strategy (RTP-SCS) "Connected 2050," explores the region's land use and travel patterns, accounts for the demographic growth that will force new demands on both and presents a vision for how they can work together to satisfy the goals important to the region while also meeting the State's GHG reduction targets.

The RTP-SCS regional objectives include reducing GHG and criteria pollutant emissions, promoting transit and alternative transportation, reducing VMT and congestion, reducing the frequency and severity of crashes, and increasing the bike, walk, and transit mode share.

SBCAG Regional Active Transportation Plan (2015)

The SBCAG Regional Active Transportation Plan was prepared to meet the requirements of the California Transportation Commission's (CTC) 2014 ATP Guidelines. It provides an overview of the existing conditions as related to the bicycle and pedestrian modes in the region and highlights current and future needs and improvements. The purpose of this plan is to create a regional vision for improving the bicycle and pedestrian network by integrating the bicycle and pedestrian planning of the region's nine-member governments. The plan is also intended to establish a base level of

eligibility for funding through ATP grants for specific projects in the plan area. Four goals were developed for the plan to guide its development, as well as to shape the future of the bicycle and pedestrian environments in the region:

- Enhance Mobility
- Increase Connectivity
- Promote Equity for all Users in all Communities
- Improve Safety and Public Health

Santa Ynez Bicycle Master Plan (SBCAG, 2019)

The purpose of this plan is to create a cohesive vision for recreational and utilitarian bicycle travel in the Santa Ynez Valley. The Santa Ynez Valley is governed by four jurisdictions: The County of Santa Barbara, the City of Buellton, the City of Solvang, and the Chumash Nation. In addition, the California Department of Transportation (Caltrans) is the owner/operator of State Routes 154 and 246, as well as US 101 in the study area. Each of these jurisdictions has their own goals and vision for bicycling, yet a cohesive vision is lacking. Travel by bicycle frequently involves crossing a political boundary and without a consistent vision, a disjointed and uncoordinated bicycle network can be expected. This plan is intended to fill the sub-regional gap in bicycle planning. This plan has been prepared in a manner to allow for adoption by the cities of Buellton and Solvang, and the County of Santa Barbara. The final product of this plan is a project list pertaining to each jurisdiction that has been prioritized by the public. Identifying priority projects informs jurisdictions of the projects most wanted by the community.

Santa Ynez Valley Traffic Circulation & Safety Study (SBCAG, 2020)

The Santa Ynez Valley Traffic Circulation & Safety Study was conducted by SBCAG, in partnership with the Santa Ynez Band of Chumash Indians. The Study aims to comprehensively assess and identify needed current and forecasted future circulation and safety improvements for the multimodal transportation of the Santa Ynez Valley. The Study offers both a quantitative and qualitative assessment of current travel conditions on the network, as well as potential short and long-term improvements to support growing travel demand, improved safety, increased connectivity, and increased quality of life and sustainability for residents.

SBCAG Measure A Program

SBCAG administers The Road Repair, Traffic Relief and Transportation Safety Measure, referred to by its ballot designation "Measure A" to implement needed transportation improvement projects and programs in Santa Barbara County from 2010 to 2040. It will generate approximately \$1.050 billion over its life and will help leverage and match an estimated \$0.5 billion in state and federal funds. Funds will be spent on high priority transportation projects and programs that advisory committees in the North County and South Coast regions of the county have selected to address the current and future needs of each region. The measure calls for North County and the South Coast of the county to each receive 43.4 percent of revenues, or an estimated \$455 million, generated over the 30 years. The measure is in effect for high priority transportation projects and programs.

As part the Measure A Program, SBCAG implements the Measure A North County Regional Bicycle and Pedestrian Program and Safe Routes to School Program with the goal of improving safety at school crossings and providing safe routes to schools, and increasing senior and disabled accessibility to public transit. SBCAG administers a call for active transportation project applications every five years that the North County jurisdictions to compete for. The first and second cycles occurred in 2015 and 2021 respectively. The third cycle is anticipated to occur in the 2024-25 timeframe.

LOCAL PLANS AND POLICIES

Mission Drive Corridor Study (2014)

The Mission Drive Corridor Study analyzes traffic data, evaluates infrastructure, and provides recommendations for improvements to Mission Drive. The study analyzes intersections along Mission Drive, from Skytt Mesa Drive to Alamo Pintado Road. Collision data was utilized as well as community input via a public workshop in 2013. The study also explores street lighting, through traffic impacts, and transit, bicycle, and pedestrian activity. The study makes several recommendations for improvements to Mission Drive, including intersection improvements, curb extensions, high-visibility crosswalks, pedestrian traffic signal equipment, etc. The analysis and recommendations in this study were used as guidance in addressing emphasis areas on Mission Drive, such as Mission Drive at Fifth Street, Mission Drive at Atterdag Road, Mission Drive at First Street, Mission Drive at Alisal Road, and Mission Drive at Alamo Pintado.

City of Solvang Local Roadway Safety Plan (2021)

The City of Solvang is committed to improving transportation safety. The Local Roadway Safety Plan (LRSP) addresses traffic safety needs and strategies, laying the groundwork to improve the health and safety of all residents and visitors. The City of Solvang aims to advance roadway safety through implementing a Vision Zero strategy and reducing the number of fatal and severe traffic incidents to zero by 2030. The installation and/or upgrade of bike and pedestrian infrastructure was included in the list of systemic countermeasures needed for East Mission Dr and Chalk Hill Rd.

General Plan – Circulation Element

The Circulation Element is the guide for the City to provide a balanced circulation system that addresses existing deficiencies and provides adequate capacity to support the travel demands of future development. To achieve this, the Circulation Element establishes acceptable roadway service levels and identifies improvements required to maintain the service levels. The Circulation Element promotes alternative modes of transportation, such as transit, walking, and bicycling to reduce the demand for transportation system improvements and to improve air quality. The Circulation Element contains policies to facilitate the development of more detailed circulation system implementation programs for the future.

City of Solvang Municipal Code

The City of Solvang's municipal code contains local ordinances and regulations specifically pertaining to bicyclists and pedestrians.

APPENDIX 4: LEVEL OF TRAFFIC STRESS METHODOLOGY

MINETA INSTITUTE

METHODOLOGY

The Bicycle LTS methodology is broken into three categories: segments (bike paths, lanes, or routes), intersection approaches (turn lanes), and intersection crossings (unsignalized intersections). Table-based criteria are applied separately for each category using the “worst case principle,” meaning the worst (or highest) score among the criteria considered governs the overall LTS score for that facility.

Depending on the community context and the detail level desired, the overall methodology may be simplified based on the general consistency of facility types, as certain elements (e.g., turn lanes, bike lanes, speed limits, etc.) may not exist in a particular community. If there are no turn lanes on an approach, then this portion of the methodology is skipped. Signalized intersections do not receive an LTS score. Signalized crossings usually do not create a barrier, as the signal provides a protected crossing, and are not considered in the methodology.

SEGMENTS

Table 4.1 through **Table 4.3** display the LTS scoring criteria utilized for analyzing the level of traffic stress for the various types of roadway segments, including segments within mixed traffic, segments with bicycle lanes alongside a parking lane, and segments with bicycle lanes not alongside a parking lane. Class I shared-use paths and Class IV separated bikeways, not shown in these tables, automatically receive an LTS score of 1, because of the increased level of comfort a facility separated from vehicular traffic provides a bicyclist. These table were adapted from the criteria tables presented in the Mineta methodology, incorporating vehicle lanes as a surrogate for street width.

Bicycle LTS for roadway segments accounts for traffic volumes, speed, presence and width of a bicycle lane, presence, width of a parking lane, and bicycle lane blockage, which denotes the frequency at which a bicycle lane is blocked. However, in the Solvang LTS analysis, there was no known data available suggesting frequent blockage of bicycle lanes in the city. As such, bicycle lane blockage was assumed rare, which is consistent with the Mineta methodological approach.

Bicycle LTS criteria for analyzing segments in mixed traffic are shown in **Table 4.2**. Mixed traffic segments are roadway segments that do not have Class II bicycle lanes. Roadway segments with Class III bicycle routes are analyzed as mixed traffic segments.

ERROR! REFERENCE SOURCE NOT FOUND.**Table 4.3** presents the LTS analysis criteria for segments with bicycle lanes. As shown, some criteria result in “no effect.” No effect denotes that when other variables are accounted for there is no impact, or no effect, on the LTS score at that traffic stress level. For example, **Table 4.3** shows “no effect” for two of the four criteria considered at LTS 4—the combined width of the adjacent bicycle and parking lanes and bicycle lane blockage. In this example, this means that a roadway segment featuring a bicycle lane alongside a parking lane, two or more through lanes per direction, and/or speeds at or higher than 40 mph, the width of the bicycle and parking lane will have no impact on the LTS score. If the sum of the bicycle and parking lane width is below 14 feet, considering only these criteria would result in LTS 3 score. When through lanes per direction and speeds are also considered and surpass two or more lanes and 40 mph speed thresholds shown in **Table 4.3**, the overall traffic stress of the segment would result in LTS 4. In this case, the

combined bicycle/parking lane width and bicycle lane blockage would have no bearing on the overall score.

TABLE 4.1: BICYCLE LTS CRITERIA FOR SEGMENTS WITHIN MIXED TRAFFIC

BIKEWAY CLASS	EXISTING MILES		
	2-3 lanes	4-5 lanes	6+
UP TO 25 MPH	LTS 1 or 2	LTS 3	LTS 4
30 MPH	LTS 2 or 3	LTS 4	LTS 4
35 MPH OR MORE	LTS 4	LTS 4	LTS 4

TABLE 4.2: BICYCLE LTS CRITERIA: SEGMENTS (BIKE LANES ALONGSIDE A PARKING LANE)

	LTS 1	LTS 2	LTS 3	LTS 4
THROUGH LANES PER DIRECTION	1	No effect	2 or more	No effect
SUM OF BICYCLE LANE WIDTH AND PARKING LANE WIDTH ¹	15 feet or more	14 to 15 feet	Less than 14 feet	No effect
SPEED LIMIT OR PREVAILING SPEED	Up to 25 mph	30 mph	35 mph	40 mph or more
BICYCLE LANE BLOCKAGE	Rare	No Effect	Frequent	No Effect

TABLE 4.3: BICYCLE LTS CRITERIA: SEGMENTS (BIKE LANES NOT ALONGSIDE A PARKING LANE)

	LTS 1	LTS 2	LTS 3	LTS 4
THROUGH LANES PER DIRECTION	1	No effect	2 or more	No effect
SUM OF BICYCLE LANE WIDTH AND PARKING LANE WIDTH ¹	6 feet or more	Less than 6 feet	No effect	No effect
SPEED LIMIT OR PREVAILING SPEED	Up to 30 mph	No effect	35 mph	40 mph or more
BICYCLE LANE BLOCKAGE	Rare	No Effect	Frequent	No Effect

APPROACHES

Based on the Mineta methodology, only approaches with right turn markings were included in the LTS analysis. Right turn lanes at intersection approaches can “challenge a cyclist’s normal position and create a weaving conflict” (Mineta 2012). Intersection approach scoring criteria for approaches are displayed in **Table 4.4** and **Table 4.5**.

Table 4.4 presents the scoring criteria for right-turn approaches to an intersection that are adjacent to a bicycle lane, and **Table 4.5** presents the scoring criteria for approaches adjacent to mixed traffic segments (i.e., travel lanes that include Class III or Sharrows). These criteria include length of the right turn lane, configuration of the bicycle lane in relation to the right turn lane, and the estimated speed associated with the curb radius at the intersection turn.

The length of the turn lane accounts for the time a bicyclist is exposed to right-turning vehicles—longer turn lanes result in greater exposure and increased traffic stress. The curb radius accounts for the speed of a turning vehicle. A smaller curb radius will result in a tighter turn and slower turning speeds, while a larger curb radius will allow a vehicle to make a turn at greater speeds and result in higher traffic stress.

The bicycle lane configuration at an intersection approach also greatly influences traffic stress. At approaches where bicycle lanes exist along the adjacent roadway segment and a right turn lane is introduced, bicycle lanes are often configured to shift to the left so the bicycle lane is configured to the left of the right turn pocket. In these cases, either the bicycle lane abruptly veers to the left, or the bicycle lane disappears for roughly 100 feet then reappears closer to the intersection at the left of the right turn lane. Both of these scenarios require a bicyclist to merge to the left against vehicles entering the right turn lane. This increases traffic stress given that bicyclists must look over their shoulder to navigate the potential conflict with right-turning vehicles potentially traveling at high speeds and increases user priority ambiguity.

An approach featuring a free right movement, more than one turn lane, a trapped bicycle lane or a through-right lane will also result in increased traffic stress. According to the Mineta methodology, an approach configuration where the bicycle lane continues straight will result in the lowest traffic stress, because this type of configuration will result in an unambiguous priority placed on the bicyclist and cars merge across the bicycle lane rather than vice versa.



PHOTO CREDIT: DKS, 2021

TABLE 4.4: BICYCLE LTS CRITERIA FOR APPROACHES ALONGSIDE BICYCLE LANES

CONFIGURATION	LTS
SINGLE RIGHT-TURN LANE UP TO 150 FT LONG STARTING ABRUPTLY WHILE BICYCLE LANE CONTINUES STRAIGHT AND INTERSECTION ANGLE/CURB RADIUS SUCH THAT TURNING SPEED IS ≤ 15 MPH	LTS ≥ 2
SINGLE RIGHT-TURN LANE LONGER THAN 150 FT STARTING ABRUPTLY WHILE BICYCLE LANE CONTINUES STRAIGHT AND INTERSECTION ANGLE/CURB RADIUS SUCH THAT TURNING SPEED IS ≤ 15 MPH	LTS ≥ 3
SINGLE RIGHT-TURN LANE WITH BICYCLE LANE THAT SHIFTS TO THE LEFT AND INTERSECTION ANGLE/CURB RADIUS SUCH THAT TURNING SPEED IS ≤ 15 MPH	LTS ≥ 3
SINGLE RIGHT-TURN LANE WITH ANY OTHER CONFIGURATION OR DUAL RIGHT-TURN LANES OR RIGHT-TURN LANE ALONG WITH A COMBINED THROUGH/RIGHT LANE	LTS ≥ 4

TABLE 4.5: BICYCLE LTS CRITERIA FOR APPROACHES ALONG MIXED TRAFFIC SEGMENTS

CONFIGURATION	LTS
SINGLE RIGHT-TURN LANE UP TO 75 FT LONG AND INTERSECTION ANGLE/CURB RADIUS SUCH THAT TURNING SPEED IS ≤ 15 MPH	No effect
SINGLE RIGHT-TURN LANE BETWEEN 75 FT AND 150 FT LONG AND INTERSECTION ANGLE/CURB RADIUS SUCH THAT TURNING SPEED IS ≤ 15 MPH	LTS ≥ 3
ANY OTHER CONFIGURATION	LTS ≥ 4

CROSSINGS

Only crossings at unsignalized intersections were considered in the LTS analysis. Unsignalized intersections with median refuges of at least six feet and those without a median refuge are analyzed separately, as shown in **Table 4.6** and **Table 4.7**.

According to the Mineta methodology, signalized crossings are generally not analyzed as these crossing control types generally do not create a barrier to connectivity. In most cases, signalization provides adequate protection when crossing an intersection. An exception to this scoring criteria is roadways that are exceptionally wide (i.e., more than eight travel lanes), or where data exists to suggest that signal timings do not provide adequate crossing time for cyclists.

Crossings at intersections between two roadways classified as local/residential that received LTS 1 (low-stress) scores, were also assumed to be low-stress due to low volumes and speed.

TABLE 4.6: BICYCLE LTS CRITERIA FOR CROSSINGS WITH A MEDIAN REFUGE OF AT LEAST 6 FEET

SPEED LIMIT OF STREET BEING CROSSED	EXISTING MILES		
	Up to 3 Lanes	4-5 Lanes	6+ Lanes
UP TO 25 MPH	LTS 1	LTS 1	LTS 2
30 MPH	LTS 1	LTS 2	LTS 3
35 MPH	LTS 2	LTS 3	LTS 4
40 MPH OR MORE	LTS 3	LTS 4	LTS 4

TABLE 4.7: BICYCLE LTS CRITERIA FOR CROSSINGS WITHOUT A MEDIAN

SPEED LIMIT OF STREET BEING CROSSED	EXISTING MILES		
	Up to 3 Lanes	4-5 Lanes	6+ Lanes
UP TO 25 MPH	LTS 1	LTS 1	LTS 2
30 MPH	LTS 1	LTS 2	LTS 3
35 MPH	LTS 2	LTS 3	LTS 4
40 MPH OR MORE	LTS 3	LTS 4	LTS 4

APPENDIX 5: CLASS I PATH RENDERINGS

APPENDIX 6: MULTIJURISDICTIONAL ASPIRATIONAL BIKEWAY NETWORK
