13.B.11 BICYCLE MASTER PLAN UPDATE

TOGETHER WE PLAN NATIONAL CITY

City of National City

BICYCLE MASTER PLAN

Draft February 2023

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Chapter 1
Executive Summary

Goals and Policies

The goals of the Plan are:

- A city where bicycling is a viable and comfortable travel choice for users of all abilities and backgrounds,
- A safe and comprehensive locally, regionally, and multi-modally connected bikeway network,
- Environmental quality, public health, recreation, and mobility benefits through increased bicycling.

These goals are supported by the National City General Plan policies that will help bicycling become a more viable transportation mode for localized trips, connection to transit, commuting, and recreation. This document is a focused Bicycle Master Plan update that aligns with changes identified in the National City Focused General Plan Update, Downtown Specific Plan, and Westside Specific Plan, as well as the 24th Street Transit Oriented Development Overlay (TODO) Study and the INTRAConnect study.

Relationship to Existing Plans

This Bicycle Master Plan includes a summary of legislation and other Planning or policy documents from the State of California, San Diego Association of Governments (SANDAG), and the City of National City that are most pertinent to bicycling in National City. This includes a brief synopsis of important state legislation such as California Government Code §65302 and California Senate Bill (SB) 375 as well as bicycle plans from neighboring jurisdictions. As an update to align with the National City Focused General Plan Update, this document carries forward information from the 2011 adopted Bicycle Master Plan where no significant changes are being made. The Bicycle Master Plan Update will support National City's implementation of SB 743 and its Climate Action Plan (CAP) by reducing reliance on vehicles and positioning bicycling as a viable, safe, and enjoyable form of intra-city transportation.

Public Engagement

Public engagement for the Bicycle Master Plan Update was conducted in conjunction with engagement for the Focused General Plan Update so as to align common efforts, capture a more robust understanding of community priorities and desires, and minimize engagement fatigue by ensuring all engagement is strategic, efficient, and unique. A total of six virtual webinars were held in August and September 2020 as well as March 2021 to collect feedback from National City residents on bicycling opportunities and constraints. Participants reviewed presentations and information pertaining to bicycle facilities, programs and related amenities, and provided feedback to help identify opportunities and constraints for consideration in updating the Bicycle Master Plan. A survey was conducted prior to the webinars in August and September 2020 to gather additional information. Suggestions and recommendations were considered throughout the overall development stages.

Existing Conditions

Understanding existing bicycling conditions is critical to identifying appropriate recommendations. The Bicycle Master Plan contains a thorough review of existing land uses, topography, the roadway network, multimodal connections, programs, and policies that affect bicycling in National City.

The Bicycle Master Plan includes an assessment of current bicycling demand and barriers in National City and estimates future demand and benefits that could be realized through implementation of this Plan. Assessing needs and potential benefits is instrumental to planning a system that will serve the needs of all user groups.

The needs analysis relies on spatial modeling techniques, points of origin and attractions, public input, bicycle collision data, and bicycle commuting statistics to gauge current demand and to establish a baseline against which progress can be measured. The analysis will assist in quantifying future demand and benefits to allow the city to prioritize

projects, compete for grant funding, and justify expenditures.

Bicycle Facility Recommendations

The National City Bicycle Master Plan recommends various improvements based on public input, best practices, and analysis of existing conditions and future opportunities. The recommended improvements include bikeway network facilities, treatments at intersections and other spot locations, and bicycle support facilities. National City's temperate climate and gentle topography make it a great place to bicycle. The improved facilities outlined in this plan will help make bicycling an effective transportation option throughout National City. Table 1-1 summarizes the current and recommended network.

TABLE 1-1: Current and Recommended Network with Classifications

Facility	Current Mileage	Recommended Currently Funded Mileage	Recommended Unfunded Mileage
Class I (Bicycle Paths)	3.6	2.4	0.0
Class II (Bicycle Lanes)	12.7	0.5	3.5
Class III (Bicycle Routes)	4.7	3.1	4.9
Class III (Bicycle Boulevards)	0.0	0.0	3.4
Class IV (Cycle Tracks)	0.4	2.2	3.4
Total	**21.5**	**8.2**	**15.2**

Design Guidelines

As the City of National City works to encourage bicycling, enhance safety and accessibility, and expand its bikeway network, it faces the challenge of implementing improvements within a dense, urban environment. When National City retrofits existing streets, there is an opportunity to incorporate bicycle facilities along with other improvements. The design guidelines discussed in this Plan provide the city a range of design options based on a comprehensive review of federal, state, and regional best management practices.

Bicycle Program Recommendations

The Bicycle Master Plan recommends several education, encouragement, monitoring, enforcement, and evaluation efforts, as well as programs the city currently provides and should continue. Recommended education programs include developing a bicycle map and website, safety awareness & media campaigns, youth safety training, and adult skills education. Encouragement programs include National Bike-to-Work Day/Week/Month, car-free events, bicycle commute incentives, and coordination with large employers such as Naval Base San Diego. Evaluation and monitoring programs include convening a Bicycle Advisory Committee, collecting bicycle and pedestrian counts, and preparing annual progress reports.

These programs were originally developed in National City's 2011 Bicycle Master Plan; as their implementation is still critical for the City today, they have been reviewed for inclusion in the 2023 Bicycle Master Plan Update.

Funding

There are a variety of federal, state, and regional funding sources available for bicycle projects and programs. Information is provided to assist city staff in identifying appropriate sources of funding for the projects recommended in this Bicycle Master Plan. By maintaining a Bicycle Master Plan, the city is eligible for a variety of funding opportunities such as the Bicycle Transportation Account, which is one of many competitive grant programs.

Chapter 2
Introduction

2.1 Purpose of the Plan

This Bicycle Master Plan provides a vision, strategies, and actions for improving the bicycling experience in National City. This document is a focused Bicycle Master Plan update that aligns with changes identified in the National City Focused General Plan Update, Downtown Specific Plan, and Westside Specific Plan, as well as the TODO Study and the INTRAConnect study. As such, this document carries forward information from the 2011 adopted Bicycle Master Plan where no significant changes are being made.

The Bicycle Master Plan describes a variety of recommendations to improve public awareness and support for bicycling, increase the number of frequent bicycle users and the frequency of bicycle trips, and improve bicyclist safety conditions. The Plan provides guidance for expanding and improving National City's existing bikeway network, connecting network gaps, and fostering greater regional and local connectivity. Additionally, the Plan presents recommended bikeway and support facility design guidelines. In order to attain higher bicycle ridership and improved bicycle conditions, the Plan provides recommendations for education, encouragement, enforcement, and evaluation programs.

2.2 Setting

National City lies in San Diego County's southwestern corner. It is bordered by the City of San Diego on the north and northeast, the San Diego County community of Bonita on the southeast, Chula Vista on the south, and the San Diego bay on the west. Figure 2-1 shows where National City lies in the greater San Diego region. The city boundary encompasses Lincoln Acres, an unincorporated area of San Diego County, in the southeast. In total, National City spans approximately 7.4 square miles of land and 1.9 square miles of water. National City is the second oldest city in San Diego County, preceded by the City of San Diego as the oldest. It is the tenth most populous city in San Diego County, with an estimated population of 62,307 according to The San Diego Association of Governments' (SANDAG) 2019 Demographic and Socioeconomic Estimates report. The city is predominantly Hispanic, with 58% of residents identifying as Hispanic or Latino, and is relatively young, with a median age of 29.7 years old. The topography is relatively level throughout most of the city, with some undulating hills east of Interstate 805. National City's gridded street network throughout most of the city, as well as its general topographic uniformity, provide excellent opportunities to enhance and further develop a well-connected and robust bicycle network.

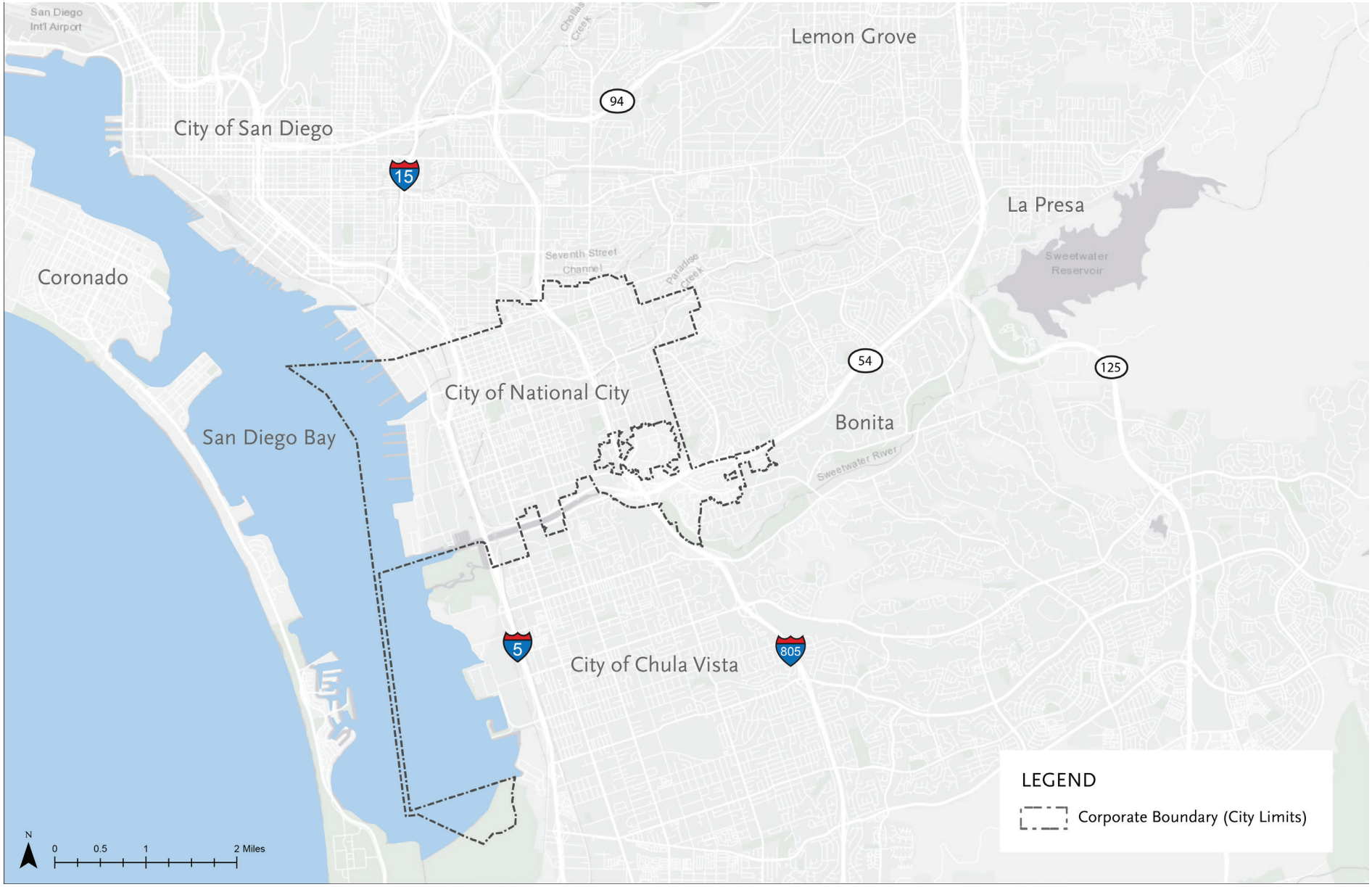

FIGURE 2-1: Regional Map

2.3 Why Bicycling?

Bicycles are low-cost and effective transportation modes. They are healthy, fun, non-polluting, energy efficient, and quiet. Bicycling is not simply a recreation activity. Recently, bicycling as a means of transportation has continued to gain traction and become more popular. Many communities are now actively working to create more balanced, safe, dynamic, and active transportation systems by improving conditions for bicyclists on roadway networks and integrating bicycling into local transportation systems. Studies have shown that better and safer bicycle facilities encourage people to cycle more frequently.[1] [2] Bicycling as a means of transportation is also particularly beneficial for low-income communities with higher proportions of residents who do not own cars. Active transportation modes, especially bicycles, provide financially accessible alternatives to owning a private vehicle, allow for longer-range trips than walking, and provide more flexibility than fixed-route and fixed-schedule public transportation.

Bicycling has numerous benefits, including enhanced quality of life, improved air quality, reduced greenhouse gas emissions, and better public health. Replacing automobile trips with bicycling can help reduce vehicle miles traveled (VMT) and traffic congestion, thereby reducing pollutants and greenhouse gas emissions associated with automobiles. Bicycling has both physical and mental health benefits. Physical inactivity is a significant contributor to the nation's most common chronic diseases. Active transportation modes like bicycling provide opportunities for exercise and can reduce the risk of common chronic diseases such as cardiovascular disease and cancer.[3] Designing and retrofitting communities to be bicycle-friendly is one of several effective ways to promote and encourage active lifestyles. Physical activity is now known to generally improve mental health, and active lifestyles are understood to be an important element of mental health routines. Research shows an association between regular exercise, particularly bicycling, and improved mental health.[4] Furthermore, bicycle facilities are generally less expensive to implement than other transportation improvements and positively contribute to a strong sense of place and economic development.[5] Cost savings of bicycles are passed down to the user as well: those who regularly commute by bicycle save money by spending less on gasoline for automobiles.

National City is in a unique position to capitalize on its bicycle-friendly features of relatively level terrain, temperate climate, and gridded street network to significantly increase the number of residents and visitors who bicycle. In order to reach National City's full bicycling potential, the bikeway network should be further expanded, end-of-trip facilities should be improved, and safety should be enhanced through education and enforcement programs.

2.4 Relationship to Existing Plans and Policies

This Plan is written to be consistent with other relevant plans and policies including National City's Focused General Plan Update, Westside Specific Plan Update, Downtown Specific Plan Update, state policies and legislation, and other local and regional bicycle plans.

[1] National Association of City Transportation Officials, "Equitable Bike Share Means Building Better Places for People to Ride," July 2016.

[2] PeopleForBikes, "Activating Support for Building Bike Infrastructure," 2018.

[3] Celis-Morales et al, British Medical Journal. "Association Between Active Commuting and Incident Cardiovascular Disease, Cancer, and Mortality: Prospective Cohort Study," March 2017.

[4] Chekroud et al, The Lancet. "Association Between Physical Exercise and Mental Health in 1.2 Million Individuals in the USA Between 2011 and 2015: A Cross-Sectional Study," August 2018.

[5] PeopleForBikes, "Economic Impacts of Bicycle and Pedestrian Street Improvements," 2020.

2.5 Plan Goals

The goals in the Bicycle Master Plan were developed in coordination with the National City Focused General Plan Update, the Westside Specific Plan Update, and the Downtown Specific Plan Update. The Bicycle Master Plan's goals help structure it and strengthen additional policies that provide specific guidance for achieving an ideal bicycling environment in National City. These goals are:

- A city where bicycling is a viable and comfortable travel choice for users of all abilities and backgrounds,
- A safe and comprehensive locally, regionally, and multi-modally connected bikeway network,
- Environmental quality, public health, recreation, and mobility benefits through increased bicycling.

These goals are supported by General Plan goals and policies (detailed below), that will help bicycling become a more widely used transportation mode in National City. The Plan leverages these goals and policies to provide an implementation framework for substantial and tangible improvements for bicyclists in National City.

2.5.1 National City Plans

National City General Plan

National City updated its General Plan concurrently with this Bicycle Master Plan Update. Development of this Bicycle Master Plan was thus done in coordination with the Focused General Plan Update. This Update included several goals and policies that impact bicycling. Implementing the National City Bicycle Master Plan will help the city achieve many of the goals included in the Focused General Plan Update's Transportation Element.

Transportation Element:

- Goal T-2: A safe, comprehensive and integrated bikeway system.
- Policy T-2.1: Create a safe and comfortable network of bicycling facilities to access transit, schools, parks, recreation centers, shopping districts, and other key destinations.
- Policy T-2.2: Require new development and redevelopment to provide safe, secure end of trip bicycle facilities, where appropriate.
- Policy T-2.3: Require new development and redevelopment to provide safe and comfortable bicycle routing to community connections such as transit, schools, parks, recreation centers, shopping districts, and other key destinations, where appropriate.
- Policy T-2.4: Encourage existing businesses and new development or redevelopment projects to promote bicycling and provide personal lockers and shower rooms.
- Policy T-2.5: Encourage bicycling through education and promotion programs in conjunction with local school districts.
- Policy T-2.6: Encourage and facilitate cycling through wayfinding and signage for facilities connecting to transit, schools, parks, recreation centers, shopping districts, and other key destinations.
- Policy T-2.7: Promote the safety of cyclists at intersections and mid-block crossings that are in the bicycle network.
- Policy T-3.3: Provide multi-modal facilities for access to transit stops, including end of trip facilities for bicyclists and pedestrians, including children and youth, seniors, and persons with disabilities.
- Policy T-4.2: Require new development to provide and enhance connectivity to new and existing transportation facilities via the provision of key roadway connections, sidewalks, and bicycle facilities.

- Policy T-4.3: Require new development and redevelopment to provide good internal circulation facilities that meet the needs of walkers, bicyclists, children, seniors, and persons with disabilities.
- Policy T-4.7: Encourage public health by increasing access to nutritious food using the circulation system, including roadways, transit routes, bike lanes, and pedestrian paths with grocery destinations, farmers markets, and social service providers.
- Policy T-5.2: Enhance connectivity by eliminating gaps and barriers in roadway, transit, bikeway, and pedestrian networks.
- Policy T-5.6: Enhance the quality of life in the City's neighborhoods and minimize impacts on schools, hospitals, convalescent homes and other sensitive facilities through the implementation of traffic calming measures in these areas to reduce vehicle speeds and discourage cut-through traffic.
- Policy T-5.15: Consider a Complete Streets approach in the design of all street improvements projects that balance the needs of cyclists, pedestrians, transit and drivers in support of access to community-serving destinations such as schools, housing, jobs, parks and shops.
- Goal T-10: Increased use of alternative modes of travel to reduce peak hour vehicular trips, save energy and improve air quality.
- Policy T-10.2: Encourage employers to offer shared commute programs and/or incentives for employees to use transit, bicycles or other shared and non-motorized mobility options.
- Policy T-10.3: Require new developments to provide adequate bicycle parking and support facilities.
- Policy T-10.5: Encourage the use of alternative transportation modes.
- Policy T-10.8: Create a safe and comfortable network of micromobility (bicycles, scooters, etc) facilities to transit, schools, parks, recreation centers, shopping districts, and other key destinations.
- Policy T-10.9: Encourage and facilitate micromobility through wayfinding and signage.
- Goal T-11: Increase access to multi-modal, non-single occupancy vehicle mobility options for all residents and visitors.

National City Westside Specific Plan

National City updated its Westside Specific Plan concurrently with this Bicycle Master Plan Update. Development of this Bicycle Master Plan was thus done in coordination with the Westside Specific Plan Update. This Update will include several goals and policies that impact bicycling. Implementing the National City Bicycle Master Plan will help the city achieve many of the goals included in the Westside Specific Plan.

- Goal 5.1: Make walking and bicycling safe and enjoyable by reducing sidewalk hazards, installing bicycle lanes, lighting, and landscaping along pedestrian paths and bicycling routes to the downtown, transit station, school, parks, and community facilities.
- Goal 5.2: Improve traffic safety by integrating traffic calming methods that will reduce traffic speeds.
- Goal 5.5: Improve conditions for children and other community members walking and bicycling to Kimball School, Paradise Creek Educational Park, and the Civic Center Drive mixed-use center.
- Strategy 5.1: Implement traffic calming methods to slow driving speeds and improve pedestrian friendliness and safety. Measures may include pedestrian- scaled lighting, curb bulb-outs, angled parking, landscaping, and street furniture.
- Strategy 5.6: Install bike lanes and bike routes with appropriate bikeway signage, including "Share the Road" signs consistent with the plan.
- Strategy 5.13: Pursue grant funds for installation of sidewalks repair, accessibility, traffic calming measures, decorative street lighting, and landscaping.

» Strategy 5.15: Install traffic calming measures to improve pedestrian friendliness, safety and provide visual interest to slow motorist traffic with pedestrian-scaled lighting, curb bulb-outs at unsignalized crosswalks, and roundabouts.

National City Downtown Specific Plan

National City updated its Downtown Specific Plan concurrently with this Bicycle Master Plan Update. Development of this Bicycle Master Plan was thus done in coordination with the Downtown Specific Plan Update. This Update will include several goals and policies that impact bicycling. Implementing the National City Bicycle Master Plan will help the city achieve many of the goals included in the Downtown Specific Plan.

While the Downtown Specific Plan does not have a formal list of goals or policies, it does have relevant guidelines:

» 7.6.7.1 Off-street Parking and Access:

- Q. Provide pedestrian and cyclist access to and from parking areas that is clearly visible, well-lit, convenient, and easily accessible from the public realm street.

» 7.7.2.1 Main Streets Guidelines:

- B. Accommodate bicycle use with in-street markings for Class II bike lanes, Class III bicycle routes, bike boxes, and by providing bike parking.

» 7.7.2.3 Multi-Modal Streets Guidelines:

- A. Prioritize alternative travel methods including transit, cycling, NEV shuttles, and walking over the standard automobile through appropriate facility design and routing.

- B. Delineate bicycle and NEV routes with separate lane systems, curbs, or road markings where possible.

- E. Create easy, clear, and direct pedestrian and cyclist access to the downtown core using appropriate signage, and special paving materials and site furnishings along the route.

» 7.7.3.1 On-Street parking:

- E. Explore opportunities to incorporate reverse angle (i.e., back in) diagonal parking to improve safety for bicyclists, calm traffic, and reduce conflicts with on-coming traffic. This is particularly appropriate in locations with generous street widths (50 feet or greater), where a narrower travel lane can accompany this configuration.

- F. Avoid conflicts between front-in angled parking and marked bicycle lanes by providing a six-foot buffer. Bicycle lanes may be adjacent to the parking area when back-in angled parking is used.

- N. Place bike corrals in the parking lane in retail areas where pedestrian activity is heavy and sidewalk space limited to include bicycle parking.

- O. Use bollards to define bike corrals to protect bicycles and cyclists.

» 7.7.4.1 Reducing Impermeable Surfacing:

- D. Street widths should be decreased where traffic flows allow to decrease impermeable surfacing and provide opportunities for planted areas, bike lanes, and other amenities. Pedestrian extensions, corner planters, bulb-outs, and other pedestrian-friendly features can also be used to reclaim excessively wide streets at crossing points and intersections.

» 7.7.5.1 Bicycle Facilities Guidelines:

- A. Provide low-stress, comfortable bicycle facilities to increase

transportation options for National City residents. National City's Bicycle Master Plan has identified a network of streets within National City that should incorporate different bicycle facilities in the future.

- B. Facilities to be considered include: designated bicycle lanes, sharrows, cycle tracks, and bicycle boulevards. In locations where high-speed and high-volume vehicle traffic make cycling dangerous, traffic calming elements should be implemented. See Chapter 4 Circulation for more information and guidelines relating to the recommended bicycle network and facilities for the Planning Area. See Section 7.7.7 Street Amenities for guidelines concerning type, placement, and spacing of bike amenities.
- C. Roads with heavy traffic or difficult conditions for cyclists should still be improved. However, if this is unfeasible, parallel streets with lower stress factors should be considered.
- D. Consider the need for bike parking facilities in all new projects and developments.

» 7.7.6.1 Pedestrian Walkways:

- L. Minimize points of conflict between pedestrians, cyclists, and motorists such as intersections, parking lot entry/exits, and driveways where possible.
- M. Maintain clear sight triangles and sight distances appropriate to the design speed of the relevant streets where pedestrian, bicycle, and vehicular routes intersect. Avoid obscuring sightlines through proper placement and design of building projections, signs, landscaping, and other elements. Clearly confer the right-of-way to the pedestrian through grade separation, articulated pavement, signage, or other means.

» 7.7.7.6 Bicycle Parking:

- A. Placement of bicycle racks should encourage the convenience and use of biking and transit routes.
- B. Bicycle racks should be placed so the full length of parked bikes remains clear of pedestrian and motorist pathways as well as seating and other use areas.
- C. All bicycle racks should be clearly visible to cyclists from the street and from adjoining buildings and use-areas.
- D. A minimum of 2 bike racks with parking capacity for a minimum of 4 bikes each should be located on both sides of the street on every block. Spacing and number of bike racks per block should be consistent throughout the city.
- E. When new development occurs, a study should be performed to determine whether more than the minimum number of bike racks should be required.
- F. Property owners should be encouraged to replace parking spaces with multiple bike parking spaces or bike corrals where appropriate.
- G. Bike racks should be designed to provide a secure stand that will prevent the theft of bicycles and keep them from tipping over or becoming tangled with other bicycles.

2.5.2 Local and Regional Plans

National City's bicycle network is closely linked to that of neighboring jursdictions of Chula Vista, San Diego, and San Diego County. This Bicycle Master Plan was developed while considering the interplay between it and adjacent area active transportation and bicycle plans in order to ensure that National City has a regionally connected and integrated bicycle network.

San Diego Regional Bike Plan

SANDAG adopted the San Diego Regional Bike Plan in 2010 that focus-

es on setting a region-wide bicycle strategy with a 2050 horizon year. This Bicycle Master Plan supports SANDAG's 2050 Regional Plan and aims to make bicycling a useful mode of transportation for everyday travel in the San Diego region. Additional goals of the Plan are to help the region meet its greenhouse gas reduction goals and improve mobility. The Plan details the Regional Bike Network with facility classifications and alternative alignments, as well as supporting policies and programs, bicycle facility design guidelines, and a best practices manual. Potential funding options are also explored as part of the Plan's implementation strategy.

City of Chula Vista Active Transportation Plan

The City of Chula Vista updated its Active Transportation Plan in 2020 which includes enhancements to existing bicycle facilities as well as propositions for new facilities. Specifically, that Plan focuses on increasing the safety, comfort, and connectivity of the bicycle network. Schools, retail districts, employment centers, and recreational areas are considered key land uses between which the bicycle network will facilitate connections. Proposed bicycle projects are ranked according to implementation priority based on demand and safety. Education, engineering, encouragement, enforcement, and evaluation programs to support active transportation infrastructure are also recommended. Chula Vista's Active Transportation Plan includes several proposed facilities that would connect to proposed facilities in National City on both 2nd Avenue and National City Boulevard. Several existing facilities that connect to existing and recommended facilities in National City are also identified in the Chula Vista Active Transportation Plan.

City Of San Diego Bicycle Master Plan

The City of San Diego's Bicycle Master Plan was updated in 2013 and was developed to be closely in line with relevant goals in the City's 2008 General Plan. This Bicycle Master Plan presents plans and recommendations focused through 2030. Making bicycling a viable mode of transportation for short trips of less than five miles that serve as connections to transit or as a recreation activity is the overarching vision of the Bicycle Master Plan. By proposing to significantly expand the existing network of on-street facilities as well as on-street paths, this Plan phases out freeway shoulder bicycle facilities.

2.5.3 State Policies And Legislation

California Government Code §65302 (Complete Streets) (2008)

California Assembly Bill (AB) 1358, often referred to as the Complete Streets Bill, was passed in 2008 and amended the California Government Code §65302 to require that all major revisions of a city or county's Circulation Element include provisions for the accommodation of all roadway users, including pedestrians and bicyclists. Accommodations include sidewalks, bikeways, crosswalks, and curb extensions. The Government Code §65302 reads:

"(2) (A) Commencing January 1, 2011, upon any substantive revision of the circulation element, the legislative body shall modify the circulation element to plan for a balanced, multimodal transportation network that meets the needs of all users of streets, roads, and highways for safe and convenient travel in a manner that is suitable to the rural, suburban, or urban context of the general plan.

(B)For purposes of this paragraph, "users of streets, roads, and highways" means bicyclists, children, persons with disabilities, motorists, movers of commercial goods, pedestrians, users of public transportation, and seniors."

Deputy Directive 64 (2008; 2014)

The California Department of Transportation (Caltrans) adopted AB 1358, Deputy Directive 64 (DD-64-R1), in 2008. This directive facilitates application of complete streets by requiring Caltrans to address the "safety and mobility needs of bicyclists, pedestrians, and transit users in all projects, regardless of funding." It recognizes that " bicycle, pedestrian, and transit travel is facilitated by creating 'complete

streets'" in all stages of project planning and delivery. The directive was renewed in 2014 as DD-64-R2.

California SB 375 – Sustainable Communities (2008)

Senate Bill (SB) 375 was enacted to compliment Assembly Bill (AB) 32: The Global Warming Solutions Act of 2006. SB 375 encourages local governments to reduce greenhouse gas emissions through improved planning. Under SB 375, the California Air Resources Board (CARB) was required to establish emissions reduction targets for 2020 and 2035 for each region covered by one of the State's 18 metropolitan planning organizations (MPOs). Each MPO was then required to prepare a "Sustainable Communities Strategy (SCS)" that demonstrated how the region would meet its greenhouse gas reduction target through integrated land use, housing and transportation planning. One way to help meet these emissions targets is to substitute bicycle trips for automobile trips, thereby increasing the bicycle mode share. The San Diego Association of Governments (SANDAG) adopted the San Diego MPO's Sustainable Community Strategy in 2011. National City's efforts to encourage bicycling and other alternative transportation modes contribute to San Diego's progress in working towards achieving its emissions reduction targets.

In addition to these policies, the California Highway Design Manual contains bikeway design standards, and the California Manual on Uniform Traffic Control Devices (CAMUTCD) includes specifications for traffic control devices, signs, and pavement markings that California cities must adhere to. The design guidelines in Section 6 adhere to these standards.

Traffic Operations Policy Directive 09-06 (2009)

In 2009, Caltrans adopted the Traffic Operations Policy Directive 09-06. This policy directive serves as an application of complete streets goals by establishing bicycle detection requirements at all approaches to signalized intersections. For example, this directive requires new or modified signal detectors to provide bicyclist detection. Furthermore, the directive states that new or modified bicycle path approaches to signalized intersections must provide bicycle detection or a bicyclist push button if detection is required.

California AB 1193 – Bikeways (2014)

Passed in 2014, AB 1193 amended the codified definition of bikeways to include cycle tracks as Class IV facilities. The bill also requires the Department of Transportation to establish minimum safety design criteria for each bikeway class. These criteria were required to be created specifically with consideration of vulnerable populations' safety and must have been published by January 1, 2016. Furthermore, this bill repealed the granting of exceptions for implementing bikeways that do not conform to minimum safety design criteria.

California SB 672 – Traffic-Actuated Signals: Motorcycles And Bicycles (2017)

Senate Bill 672 was passed in 2017 and granted an indefinite extension to the requirement to install traffic-actuated signals that detect bicyclists and motorcyclists on the roadway.

California AB 1218 – California Environmental Quality Act: Exemption: Bicycle Transportation Plans (2017)

AB 1218 (passed in 2017) extended the exemption of bicycle transportation plans for urbanized areas from California Environmental Quality Act (CEQA) requirements until January 1, 2021. Due to this bill, bicycle transportation plans in urbanized areas are not mandated to involve preparation of environmental impact reports, negative declarations, or mitigated negative declarations for plans involving street and highway restriping, bicycle parking and storage, signal timing, and bicycle, pedestrian, and vehicle signage.

2.6 Public Engagement

In order to ensure the Bicycle Master Plan reflects and meets the needs of the National City community, public input was sought throughout the update process as part of the broader engagement conducted for the Focused General Plan Update. This effort included updating National City's Transportation Element; engagement for the Bicycle Master Plan update was thus combined with that for the Transportation Element and bicycle network-specific feedback was solicited. Multiple rounds of engagement were conducted using diverse methods. Due to the COVID-19 pandemic, which occurred throughout the entirety of the Bicycle Master Plan update and resulted in in-person activities being prohibited, all engagement efforts were shifted to virtual formats. These engagement efforts included an online survey, hosted in August and September 2020, and two rounds of webinars that incorporated opportunities for live audience participation and office hours, hosted in August and September 2020 as well as March 2021. During the first round of engagement, four webinars were held; during the second round, two were held. Over 300 people participated in engagement efforts throughout the project

The engagement was designed to be accessible to all members of the community. National City has a significant population of Spanish speakers; engagement materials and events were thus designed to support language access. All webinars were translated live into Spanish and interpreters were available to translate questions posed in Spanish into English so that English-speaking staff could answer. Furthermore, one "Spanish-only" webinar was held and conducted entirely in Spanish. The summaries of the webinars, as well as the questions and answers, were posted on the city's website in both Spanish and English. The online survey and all engagement materials were produced in both Spanish and English.

In order to further facilitate engagement from diverse members of the community and accommodate different schedules, the webinars were held on both weekdays and weekends, and were scheduled during the day and in the evening. Virtual office hours where community members could call staff and members of the project team were held during different times of different days as well. These office

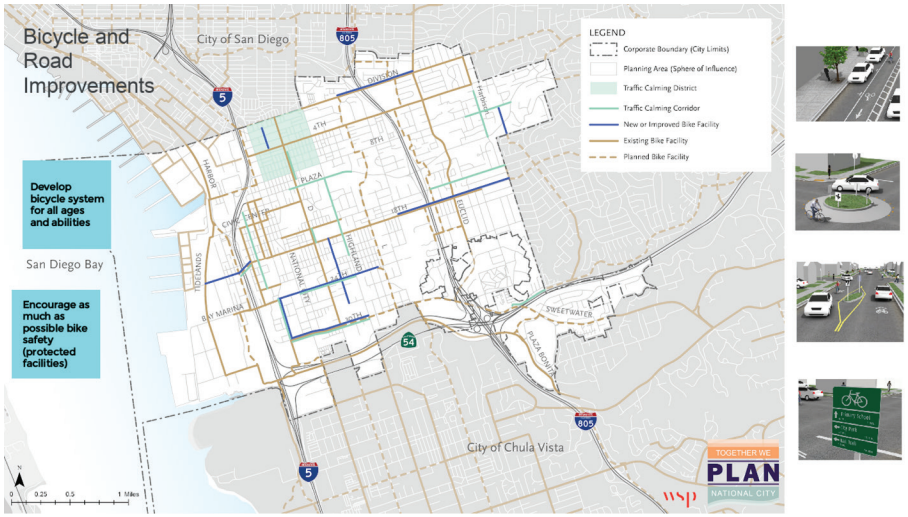

FIGURE 2-2: Bicycle Network Engagement Activity

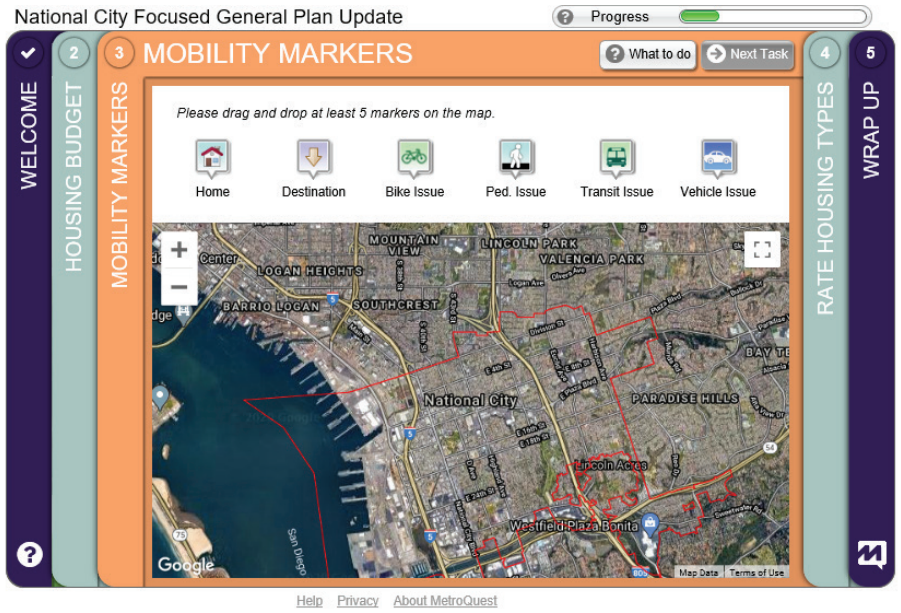

FIGURE 2-3: Interactive Survey Mobility Markers

hours served both as an avenue for community members to engage more thoroughly with staff and as a way to address the digital divide and ensure those without access to the internet or a computer could still actively participate in the engagement process.

Focused efforts were made to encourage all members of the National City community to participate and to ensure everyone who lives in the city was represented in the engagement process. Postcards with information about how to participate in the Focused General Plan Update, in both English and Spanish, were sent to every National City resident and business; these postcards were sent out in two rounds that coincided with each round of webinars. Workshops were also advertised on the National City website, the project website, National City social media accounts, and the National City email distribution list.

During the webinars, bicycle network draft recommendations were presented and participants were asked to comment on draft bicycle network recommendations. Participants voiced support for bicycle improvements and noted strong opportunities for expanded bicycle parking and end of trip facilities at key activity generators such as grocery stores. Bicycle education and incentive programs were also recommended. A sample map from this activity is shown in Figure 2-2.

Recognizing that effective engagement involves a diligent and broad effort to engage the community, the project team conducted an interactive survey. This survey strayed away from the traditional multiple choice and ranking questions, and rather entailed engaging activities and simulations. The survey was open for just over one month and received 200 responses, three of which were provided in Spanish. The Mobility Markers exercise on this survey, shown in Figure 2-3, displayed an interactive map centered on National City, along with six Marker icons that respondents could place on the map: Home, Destination, Bike Issue, Pedestrian Issue, Transit Issue, and Vehicle Issue. When a respondent placed a Mobility Marker, they were asked to choose from a list specifying follow up attributes of the marker and were given the opportunity to write a comment. Respondents were asked to place at least five Mobility Markers. In total, respondents placed 635 Mobili-

ty Markers and provided 370 comments. For the Bike Issue Mobility Marker, 71% (22 responses) of indicated follow up answers were "A bike safety concern," 23% (7 responses) were "Poor lighting," and 6% (2 responses) were "A maintenance need." In comments written for the Mobility Markers, respondents generally suggested adding more bicycle lanes along major roads.

2.6.1 Supporting Engagement

To support and supplement the direct Bicycle Master Plan engagement conducted as part of the Focused General Plan Update, engagement results from several recent planning documents and studies were also considered.

The INTRAConnect Plan examined ways to facilitate connections to healthy and vibrant communities in National City. Engagement was conducted for the INTRAConnect plan between September 2018 and September 2019. The engagement strategy for this plan included surveys, walk audits, and 17 workshops held. Engagement opportunities were advertised on social media. Community comments identified areas of concern and corridors most in need of improvements, as well as gaps in the bicycle network. Bicycle improvements were suggested for corridors along East 18th Street, East Division Street, D Avenue, F Avenue, B Avenue, East 24th Street, Olive Avenue, and South Harbison Avenue.

The TODO Study examined a roughly 1-mile buffer around the 24th Street transit station and provided land use and mobility recommendations for the area. Engagement strategies included two online surveys, four workshops, 15 stakeholder meetings, community presentations, and public hearings. Surveys asked respondents about which areas of National City are uncomfortable for bicycling; respondents indicated that areas close to high-speed traffic and areas where bicyclists must be close to traffic were uncomfortable to ride in. During workshops, community members also voiced support for increasing awareness of key mobility challenges for bicyclists.

The Homefront to Waterfront Project examined how to support existing mobility services and incentivize the development and use of new mobility options. An online survey was conducted and a workshop was held to gather community input.

2.7 Active Transportation Program Guidelines

The National City Bicycle Master Plan will continue to provide opportunities for the city to seek funding via the California Transportation Commission (CTC) Active Transportation Program (ATP), a competitive statewide program created to encourage increased use of active modes of transportation.

Through the ATP, the CTC encourages projects that provide a transformative benefit and significantly expand the active transportation opportunities to a community or a region. Project types eligible for ATP programming are listed below:

- **Infrastructure Projects:** Capital improvements that will further the goals of the ATP. This category typically includes the environmental, design, right-of-way (ROW), and construction phases of a capital (facilities) project.
- **Plans:** The development of a community-wide bicycle, pedestrian, SRTS, or active transportation plan that encompasses or is predominately located in a disadvantaged community.
- **Non-infrastructure (NI) Projects:** Education, encouragement, and enforcement activities that further the goals of the ATP. NI projects can be start-up programs or new and/or expanded components of existing programs.
- **Infrastructure projects with non-infrastructure components:** Capital improvement projects that include an education, encour-

agement, or enforcement component.

» **Quick-Build Project Pilot Program:** Quick-build projects are interim capital improvement projects that further the goals of the ATP. These projects require construction, are built with durable, low to moderate cost materials, and last from one year to five years.

The minimum request for ATP funds is $250,000. This minimum encourages the aggregation of small projects into one larger comprehensive project and does not apply to non-infrastructure projects, SRTS projects, recreational trail projects, plans, and quick-build pilot projects. Per SB 99, at least 25% of funds must benefit disadvantaged communities within each of the program components.

Projects must also demonstrate consistency with an adopted regional transportation plan. Section 2.5 details the relationship of the National City Bicycle Master Plan to existing plans and policies. A description of the ATP evaluation categories is presented in Table 2-1.

TABLE 2-1: Regional Map

Scoring Topic	Description	Relationship to National City Bicycle Master Plan
Benefits to Disadvantaged Communities (DAC)	The score will be impacted by the project location in relation to the DAC, the severity, the direct benefit the project will provide, and if applicable, how anti-displacement policies are being implemented. DAC can be identified using either median household income, CalEnviroScreen criteria, Healthy Places Index data, or the percentage of students receiving free or reduced school lunches.	National City is considered a disadvantaged community according to multiple statewide criteria, and has a lower median household income than the San Diego County average. Implementation of projects that improve mobility and connectivity throughout the city will provide a direct benefit to DACs.
Need	The potential for increased walking and bicycling, especially among students, including the identification of walking and bicycling routes to and from schools, transit facilities, community centers, employment centers, and other destinations; and including increasing and improving connectivity and mobility of non-motorized users.	Section 4 summarizes the need and demand analysis for bicycling throughout the city.
Safety	Potential for reducing the number and/or rate of pedestrian and bicyclist fatalities and injuries, including the identification of safety hazards for pedestrians and bicyclists.	Section 4.3 discusses existing barriers to bicycling, which include safety concerns, as well as the bicycle collision analysis for the city.
Public Participation and Planning	Identification of the community-based public participation process, including the participation of DAC stakeholders, and how this process resulted in the identification and prioritization of the recommended project.	Section 2.6 outlines the public engagement conducted as part of National City's Focused General Plan Update that informed the recommended network and facility improvements.

TABLE 2-1: Regional Map (Cont.)

Scoring Topic	Description	Relationship to National City Bicycle Master Plan
Scope and Plan Layout Consistency and Cost Effectiveness	Evidence that the application, scope, and plan layout are consistent with each other and depict what is being recommended. A project's cost effectiveness is the relative costs of the project in comparison to the project's benefits.	The recommended network and facility improvements in Section 5 reflect a cohesive approach to improvements to the bicycle experience in the city. This section lays the foundation for future projects with clear scopes and plans. Section 8 also outlines the costs of the recommended network.
Context Sensitive Bikeways/Walkways and Innovative Project Elements	Consideration of the "recognized best" solutions appropriate for the local community context and a description of the innovative features of the project.	Section 6 summarizes the design guidelines of the Bicycle Master Plan, including national and state guidelines and current best practices.
Transformative Projects	The potential for the project to support existing and planned housing, especially affordable housing.	This topic is only applicable to large infrastructure/non infrastructure projects. The Bicycle Master Plan addresses the relationship of the bicycle network and bicycle infrastructure to greater connectivity and access, which includes supporting and connecting housing.
Past Performance	Applicant's performance on past ATP projects.	From fiscal years 2019-2023, National City has been awarded nearly $11.7 million in ATP funding. This funding has been awarded for projects such as the Highland Avenue Inter-City Bike Connection, 24th Street Transit Center Connections, Bayshore Bikeway, Central Community Bicycle Corridor, Citywide Bicycle Wayfinding Signage, 30th Street/Sweetwater Road Bicycle Corridor, Division Street Bicycle Corridor, National City Boulevard Inter-City Bicycle Corridor, Citywide Bicycle Parking Enhancements, and more. National City is committed to the successful implementation of all ATP-funded projects.

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Chapter 3
Existing Conditions

3.1 Land Use

National City is a largely developed area with a mix of residential neighborhoods and commercial and industrial uses. The city is comprised of three main communities, identified by major parks: El Toyon, Kimball, and Las Palmas. These communities are further divided into residential neighborhoods and business districts with distinct identities, illustrated in Figure 3-1. Residential areas are organized around the "neighborhood unit concept" where elementary schools act as the focal point of each neighborhood.

The El Toyon community includes the Rancho de la Nacion, Ira Harbison, and Palmer Way neighborhoods. The Kimball community includes Downtown, Old Town, Central, and John Otis neighborhoods. The Kimball community also includes the Mile of Cars and Harbor business districts. The Las Palmas community includes the Olivewood, Las Palmas, and Lincoln Acres neighborhoods. The Las Palmas community also includes the Plaza Bonita business district. These park and school facilities, which are key organizing elements of the City's underlying structure, are illustrated in Figure 3-2.

In general, National City is largely built-out with limited vacant and undeveloped land. Residential uses constitute the largest land use in the city, with single-family detached being the most prominent, followed by single-family attached and multi-family residential. Other residential uses, such as mobile home parks and group quarters, are limited throughout the city.

National City has light and heavy industrial uses which are primarily concentrated within the city's western portion by the harbor front. The city has a substantial amount of automotive land use, such as dealerships and auto repair shops. Commercial and office uses within the city include a wide variety of activities, such as retail and strip commercial, arterial commercial, automobile dealers, neighborhood commercial, service stations, shopping centers, and other retail trade, and office uses. In general, commercial and office uses tend to be concentrated along major roads, such as National City Boulevard, Highland Avenue, and East Plaza Boulevard. The city does not currently have a significant amount of mixed-use land use, which is a combination of street level commercial uses with residential and/or office uses above.

Military uses within the National City include Naval Base San Diego, the Army National Guard (located at 303 Palm Avenue), and the US Government Navy Department (1005 E. Plaza Boulevard). These areas are controlled by the United States military.

National City's recreation, open space, and agriculture land uses include parks and recreational centers with tennis or basketball courts, baseball diamonds, soccer fields, playgrounds, and public and private golf courses. The city has several elementary, middle, and high schools. Public facilities and services include fire/police facilities, community centers, hospital/health care-related uses, and other public services.

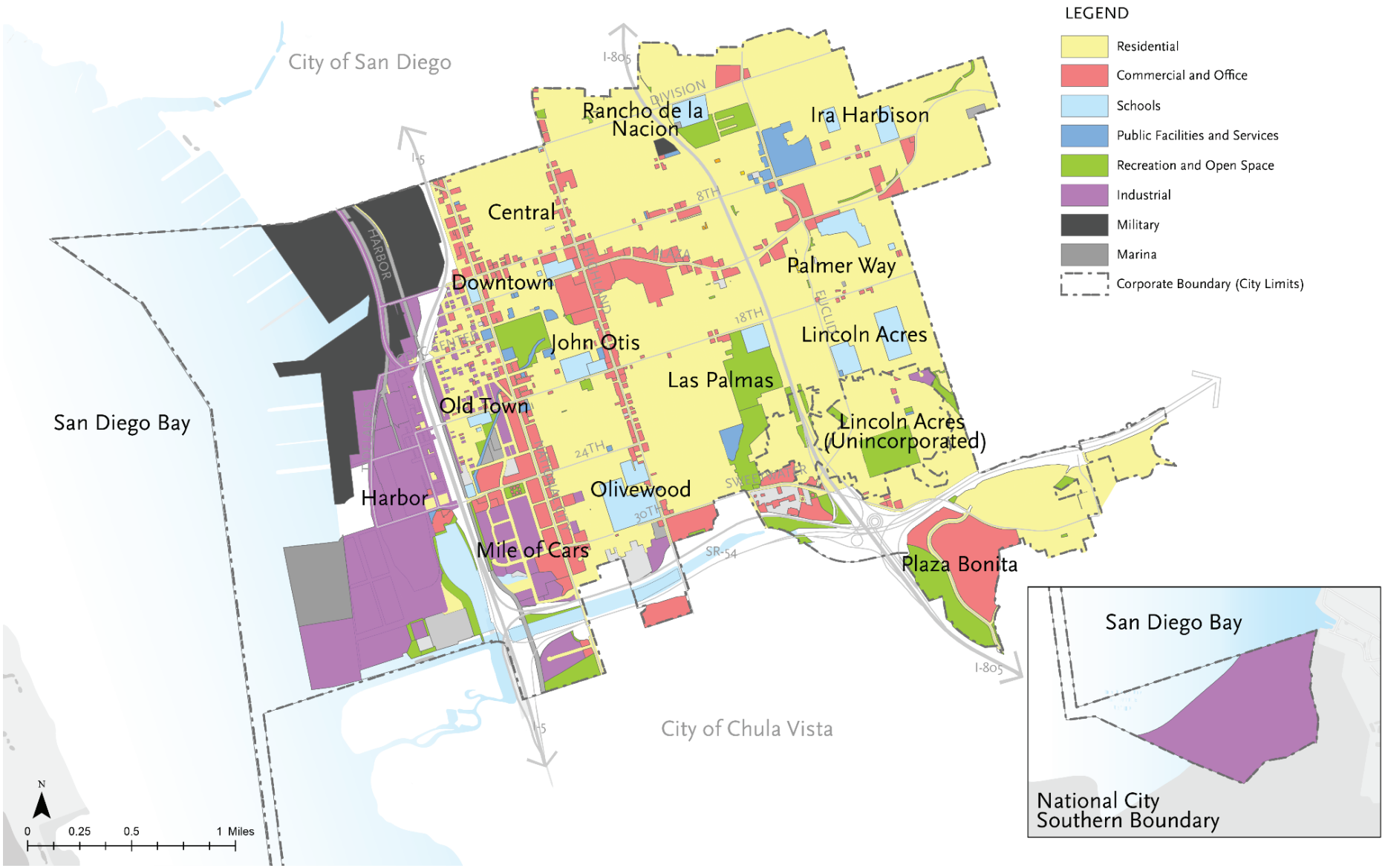


FIGURE 3-1: Existing Land Uses

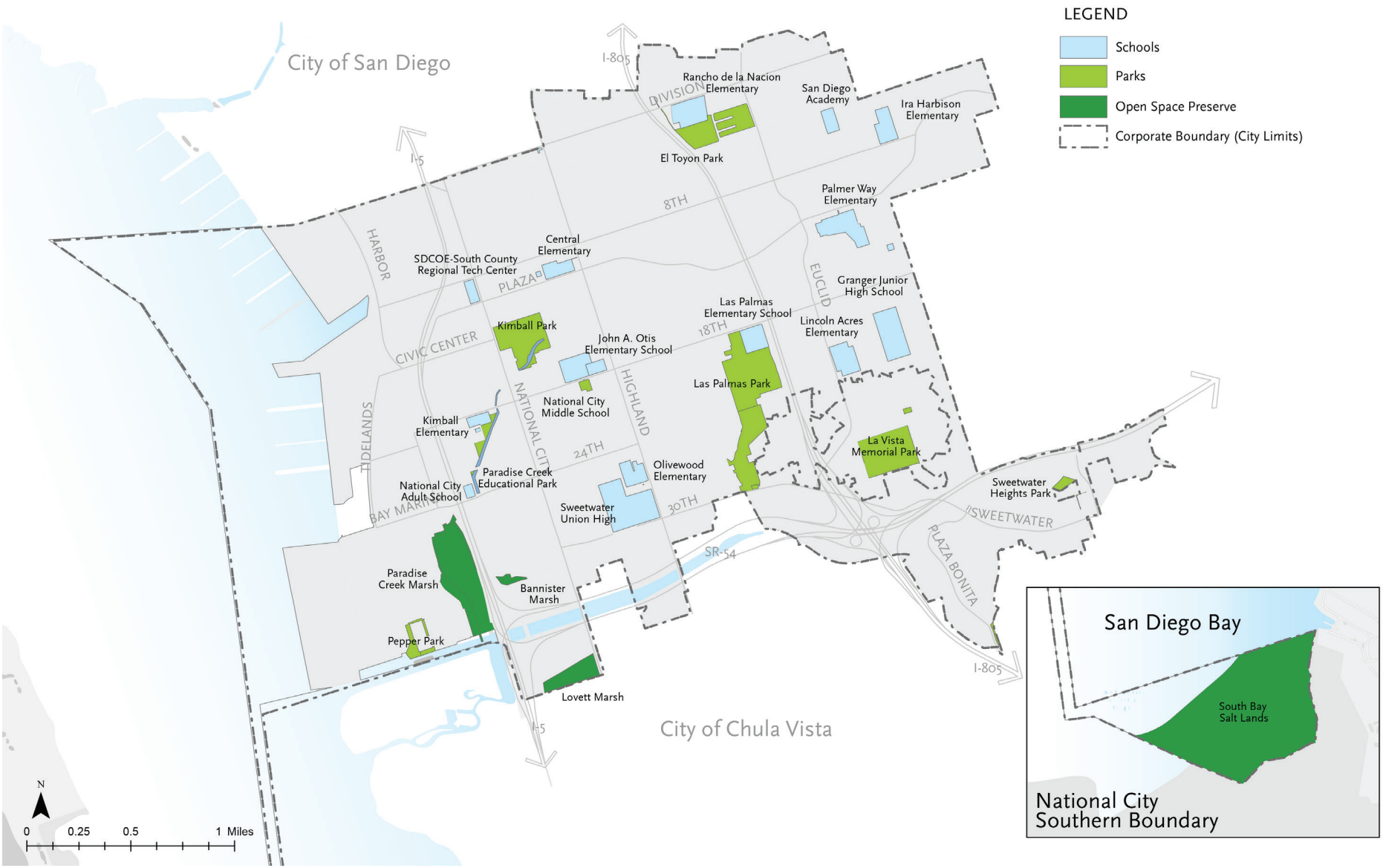


FIGURE 3-2: School and Park Facilities

Source: 2016/17 Citywide Engineering and Traffic Survey

3.2 Transportation Network

National City currently has approximately 110 miles of paved streets and more than 90 signalized intersections. The existing roadway system generally follows a traditional grid pattern. The main regional freeway facilities through the city are I-5, I-805, and SR-54. Both I-5 and I-805 provide north-south movement while SR-54 is an east-west corridor.

Approximately 14 major arterial roadways provide circulation across the city and to major destination points throughout the region. These streets are typically four lanes and are generally spaced at half-mile intervals. The city is also served by approximately 31 collector roadways that operate as local conduits to take users in and out of neighborhoods and business districts and onto the arterial routes. These collectors are generally two-lane roads with signalized intersections. The street system includes major roadways, which are broken down into four classifications: freeways, arterials, collectors, and local roads.

All of the city's arterials and collectors have posted speed limits enforceable per the California Vehicle Code (CVC) and determined by an engineering traffic speed survey. Factors that are used to determine speed limits include 85th percentile speeds, collision data, and roadway conditions not readily apparent to drivers. Engineering and traffic surveys for speed limits are conducted once every five years by governing municipalities in order to comply with Section 40802(a) of the CVC and the national Uniform Vehicle Code. Engineering and traffic surveys may be extended to every seven years or every 10 years if a registered engineer evaluates the section of the highway and determines that no significant changes in roadway or traffic conditions have occurred.

A speed survey was conducted in 2016/2017 that updated posted speed limits throughout the City. The resulting city-wide posted speed limits can be seen in Figure 3-3. While these posted speed limits are current, the City is currently in the process of updating its city-wide speed survey and anticipates having that work completed this year.

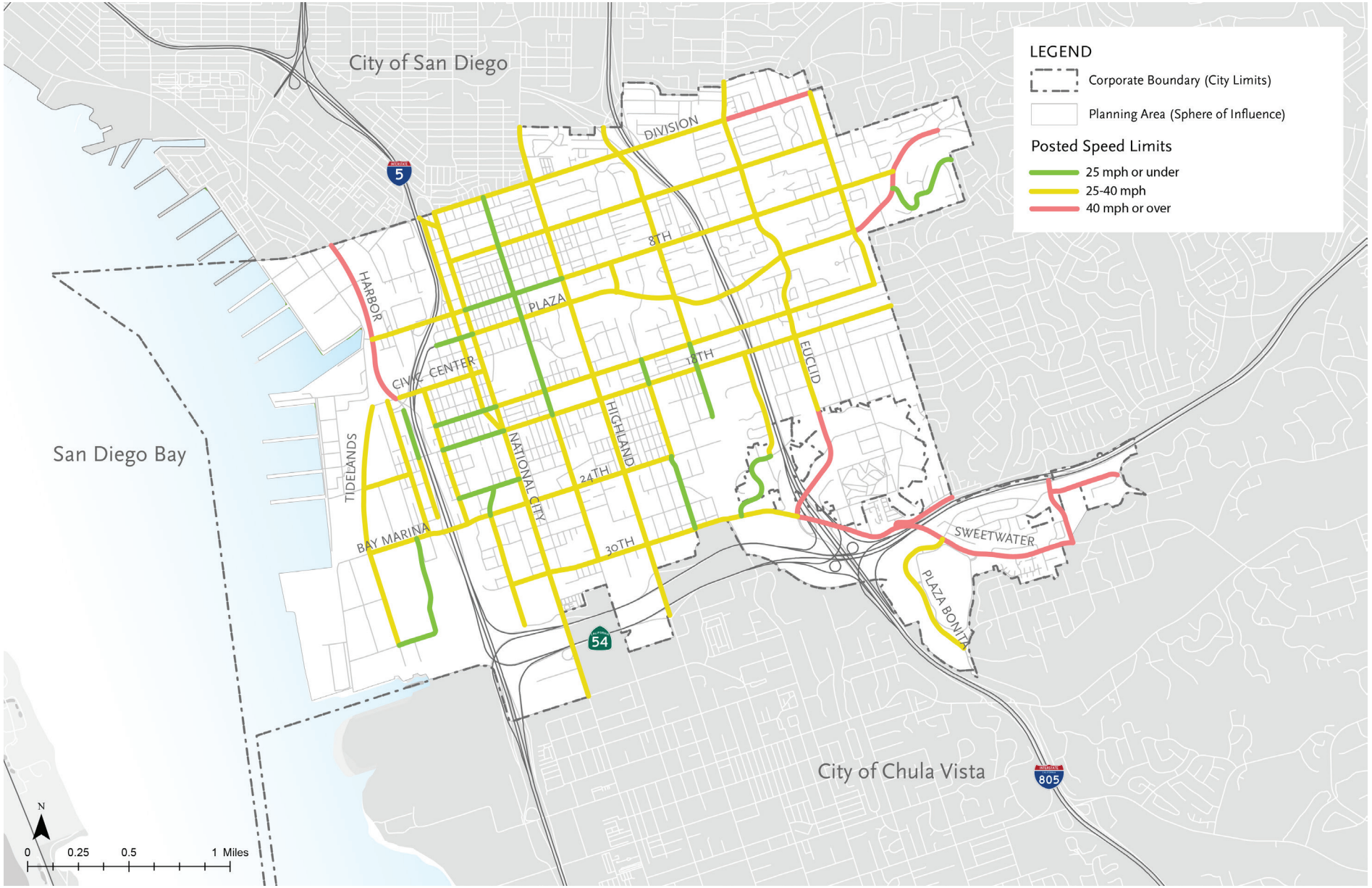


FIGURE 3-3: Posted Speed Limits

3.3 Bicycle Facilities

3.3.1 Bikeways

National City is home to a range of bicycle facilities that create both local and regional bicycle connectivity. Improving these connections supports the city's General Plan goal of creating successful complete "10 minute" neighborhoods, as well as the Climate Action Plan goals to reduce GHG emissions and VMT. National City is committed to enhancing local and regional bicycle connectivity and enhancing bicycle safety. From 2013-2022 the City constructed approximately 2.61 miles of new bicycle facilities.

Bicycle facilities within the planning area can be broken down into four classifications that are summarized below:

Class I Bike Path:	Paved rights-of-way separated from the street
Class II Bike Lane:	On street facilities designed for bicyclists with striping and stencils
Class III Bike Route:	Streets shared with motor vehicles that are designated for bicycle travel with signage
Class IV Cycle Track:	Exclusive bikeway with a physical separation from motor vehicle travel lanes, parking lanes, and sidewalks

In addition to the local serving bikeways, the planning area also contains two regional bikeways: The Bayshore Bikeway and the Sweetwater River Bikeway.

The Bayshore Bikeway is a 26-mile regional bicycle route that encircles San Diego Bay and passes through National City along Harbor Drive and Tidelands Avenue. The Sweetwater River Bikeway is located along the southern border of National City with segments in Chula Vista. It runs parallel with the Sweetwater River Flood Control Channel. This bikeway is approximately 1.7 miles long and varies between eight and ten feet in width. It connects to the Bayshore Bikeway at the Sweetwater Channel near the Gordy Shields Bridge. Figure 3-4 shows a map of the existing local and regional bikeways.

3.3.2 Bicycle Parking and End-of-Trip Amenities

An essential component of a robust bicycle network is parking and end-of-trip amenities. Users must be able to safely store their bicycles when riding to destinations, and amenities such as showers, charging facilities, and repair kits make bicycling more practical and attractive.

National City has limited bicycle parking facilities. Some bicycle parking and end-of-trip amenities such as showers and lockers are available at key employment and educational facilities, such as Southwestern Community College. SANDAG iCommute bicycle lockers are available at both of National City's trolley stations. These lockers provide an enclosed parking space that is accessible by a mechanical or electronic key system for a monthly fee. They are available on a first-come, first-served basis. The 8th Street Trolley Station has four bicycle locker structures containing eight spaces. The 24th Street Trolley Station includes two bicycle lockers with four spaces. Figure 3-5 shows existing bicycle parking facilities.

3.3.3 Opportunities

In general, the grid layout of National City's street network and relatively flat topography support bicycling. This section describes opportunities to improve bicycling in National City.

Roadway Characteristics

Many of National City's roadways appear to have more vehicle capacity than is currently needed. For example, many residential and collector streets have curb-to-curb widths greater than 40 feet, which is wider than is needed to support on-street parking and one travel lane in each direction. These wide roadways present an opportunity to enhance multi-modal transportation options through relatively simple and inexpensive treatments, such as roadway restriping to accommodate bike lanes, bulb-outs to reduce vehicle speeds, bicycle markings and

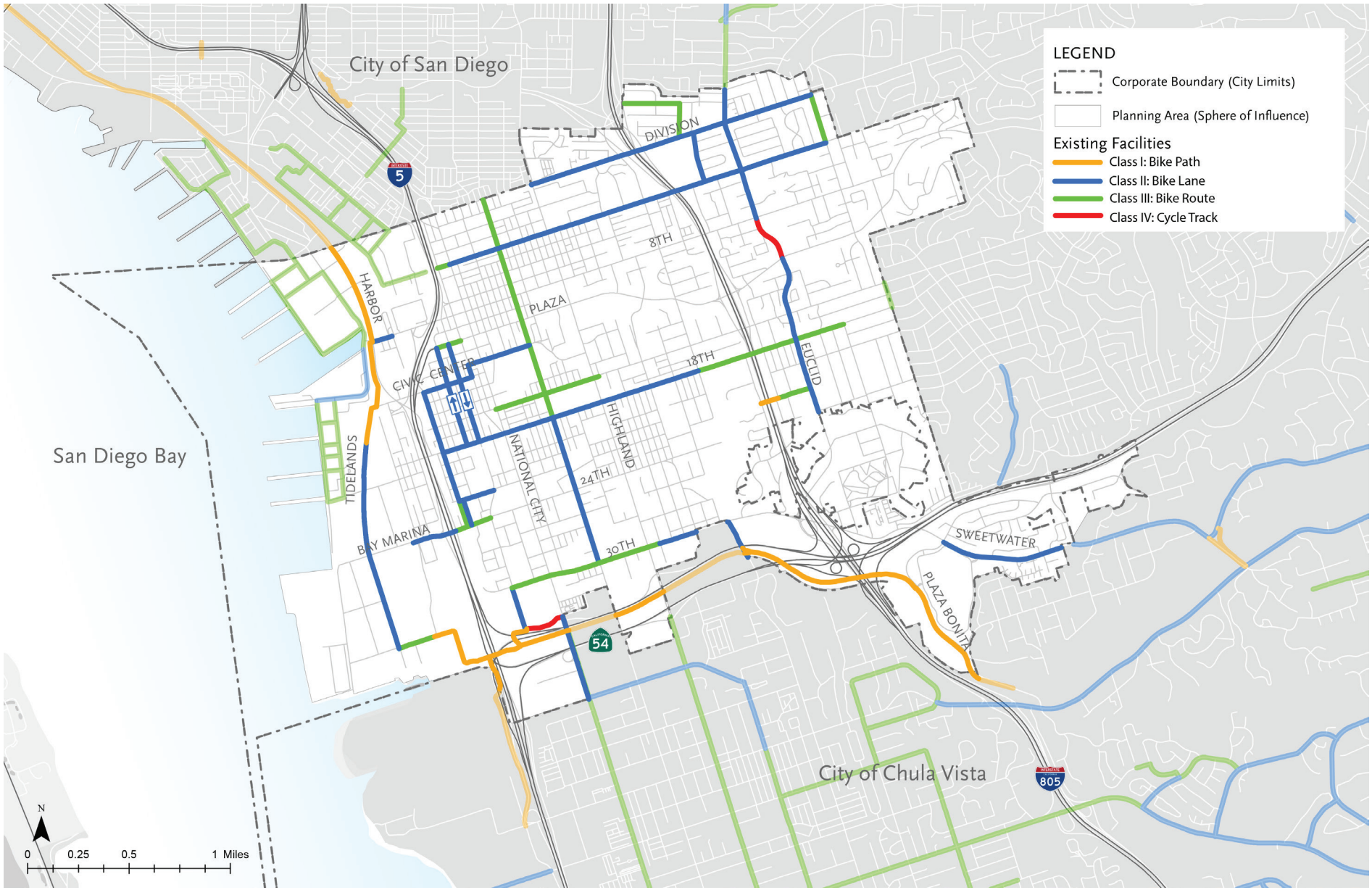


FIGURE 3-4: Existing Bicycle Facilities

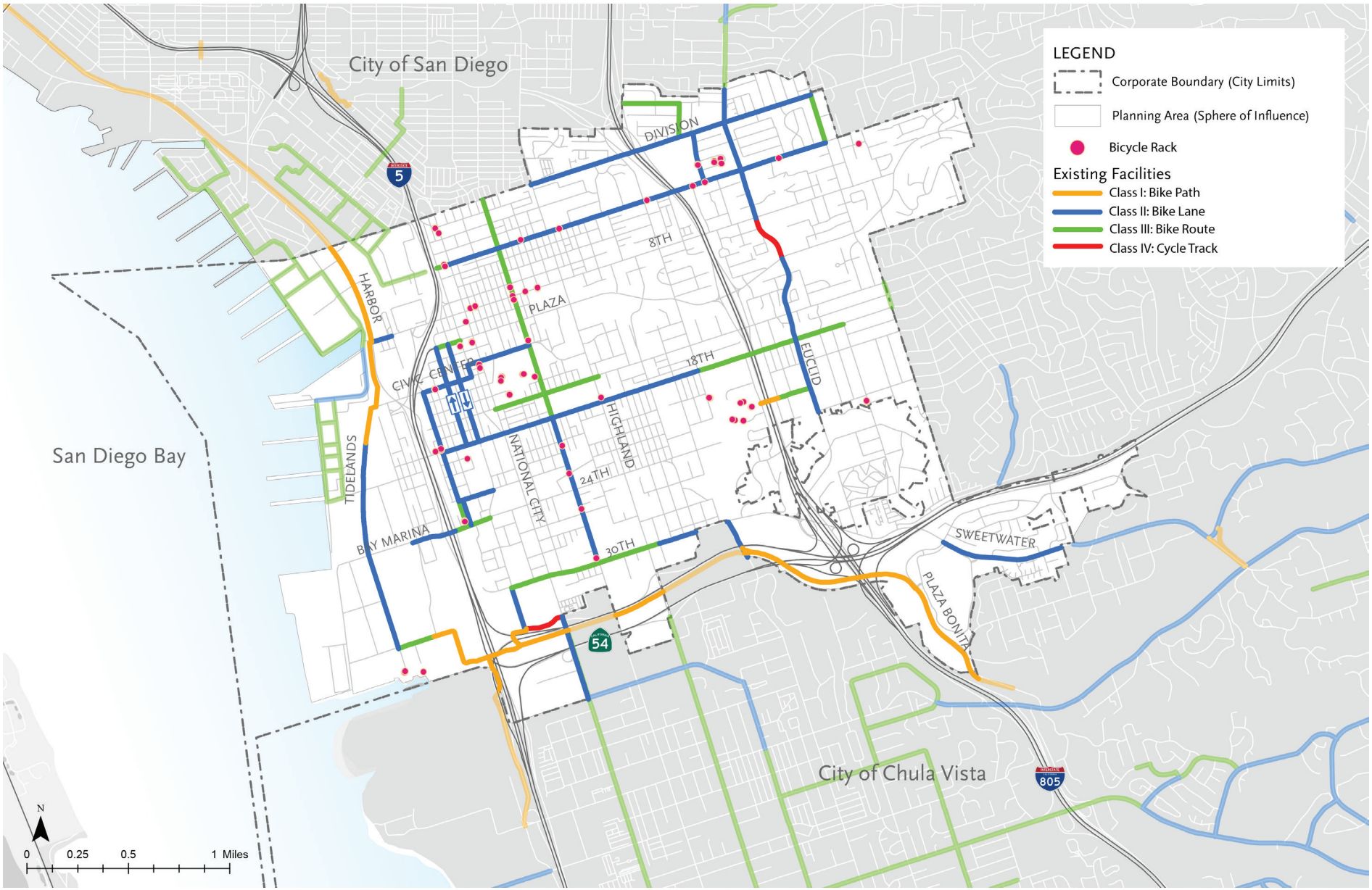


FIGURE 3-5: Existing Bicycle Parking Facilities

signage, and angled vehicle parking for bicycle safety.

Local streets with lower vehicle volumes and speeds create a more friendly environment for active transportation. Improving the roadway characteristics on these streets allows for the creation of low-stress community corridors that encourage active transportation modes. Providing such enhancements will improve the safety and comfort of bicycling throughout the city and is an opportunity to meet the growing needs of residents. During engagement, community members cited vehicle speeds, lighting, and signal timing as safety concerns that create a barrier to bicycling and expressed a desire for additional bicycle facilities on the city's roadways.

Topography

National City's relatively flat topography makes bicycling an accessible mode of transportation for those with a variety of abilities. Steep or frequent hills present a barrier to bicycling because of the increased effort and skill necessary to pedal up and down them. National City has few hills and even fewer steep hills, making most of the city an ideal topography for bicycling. Furthermore, National City has a relatively flatter terrain than much of San Diego County. The few hills that the city does have are concentrated towards the city's eastern border. Figure 3-6 shows the topography of National City in a contour map. Each brown line represents 20 feet of elevation and the numbers show the elevation at that location; the collection of lines shows where hills and valleys are. The closer together the lines are, the steeper the slope. Areas with no contour lines are generally flat.

Regional Connectivity

SANDAG's San Diego Regional Bike Plan establishes a vision for a diverse and interconnected regional bicycle system. In 2013, the City of San Diego completed a Bicycle Master Plan Update to reflect changes in bicycle user needs and make bicycling a more convenient transportation option. The 2020 update to the City of Chula Vista Active Transportation Plan focused on enhancing existing bicycle facilities while implementing new facilities based on demand and safety, which include connections to National City.

The regional corridors identified in these plans, discussed in Section 3.3 and illustrated in Figure 3-4, provide an opportunity to connect National City to neighboring communities and allow for enhancements such as regional wayfinding signage. Identifying local bikeways and treatments to improve local access to these regional facilities provides an opportunity to support inter-community bicycle travel for residents.

The Bayshore Bikeway provides a link to the nearby cities of San Diego, Coronado, Imperial Beach, and Chula Vista. This route also provides an alternative transportation option to many industrial and military job sites. The bikeway connects with the Sweetwater River Bikeway near National City's southern border. The Sweetwater River Bikeway connects National City, unincorporated San Diego County, and Chula Vista.

Transit

National City is served by a regional transit system operated by the San Diego Metropolitan Transit System (MTS). Ten bus routes serve the city with 205 stops. Each bus stop presents an opportunity for multi-modal connections.

In addition, two MTS Trolley Stations, the 8th Street Trolley Station and the 24th Street Trolley Station, present an opportunity to improve bicycle access and support increased connectivity. Both of these transit stations have bicycle lockers available to the public. There is opportunity to improve bicycle access to both stations. Current Class II bicycle facilities on Wilson Avenue and 22nd Street, as well as Class II and III bike facilities along Mile of Cars Way, provide connections to the stations and support multi-modal connectivity. MTS trolleys can accommodate one to two bicycles per car. MTS buses accommodate two bicycles each. Providing more bicycle parking at trolley stations and along transit lines has the potential to increase ridership and enhance bicycle-transit integration.

A future high speed, high frequency transit mode is being planned as part of a SANDAG Comprehensive Multimodal Corridor Plan (CMCP). While final recommendations for future stations and transit mode types are still being assessed, this plan will include bicycle facility recommendations in and around potential locations near Highland Avenue, Plaza Boulevard, and 8th Street.

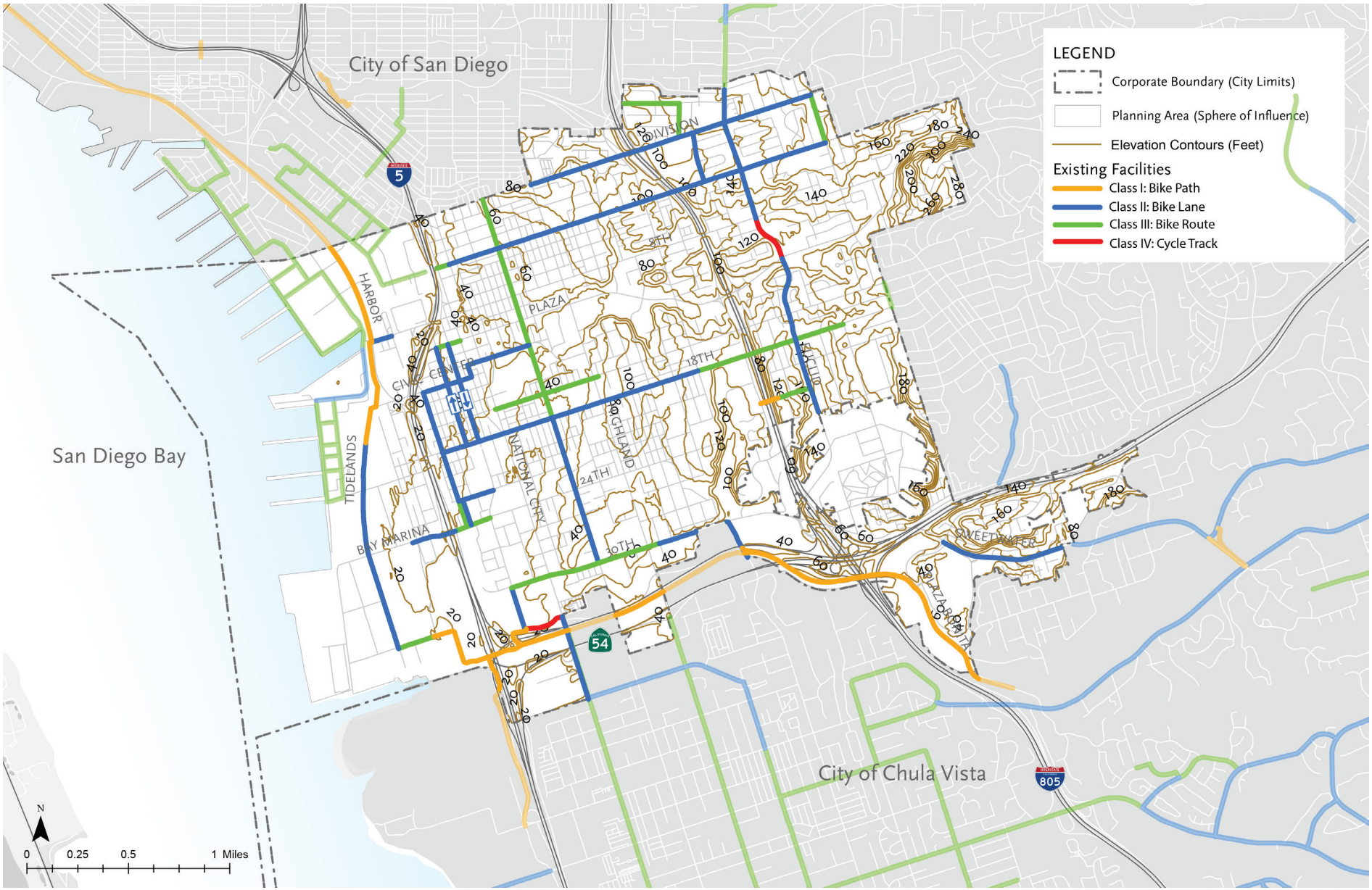


FIGURE 3-6: National City Topography

The existing and future transit stations and connections throughout the city create opportunities to provide first/last mile transportation improvements that encourage multi-modal trips. Such improvements consider a traveler's entire trip, which often begins and ends with walking and/or bicycling. First/last mile transportation improvements, which can include bicycle infrastructure and wayfinding signage, anticipate the need for supporting the journey to and from transit stations in order to enhance the rider experience and encourage transit use.

Community Corridors

The National City street network includes a community corridor street typology in addition to the four roadway classifications. The community corridors classification is focused more on the qualitative characteristics of a roadway rather than the quantitative properties specified in the functional classifications. This street type is applied to arterials, collectors, and local streets and is intended to increase the comfort of walking and/or bicycling on these roads through traffic calming measures such as on-street parking and bulb-outs; streetscape improvements such as landscaping, street trees, and medians; pedestrian enhancements such as wider sidewalks and street furniture; and bicycle improvements such as designated bicycle lanes and bicycle rack facilities. Community corridors reflect the city's commitment to reinvesting in its multi-modal network and adding to a sense of community identity with visible enhancements. Figure 3-7 identifies the location of existing designated community corridors in National City, as well as planned community corridors identified in the Transportation Element. Community corridors are subdivided into four categories (see Figure 3-8 through Figure 3-11):

- "Main Street" Commercial Districts
- "Main Street" Commercial Corridors
- Multi-Modal Streets
- Green Streets/Urban Trails

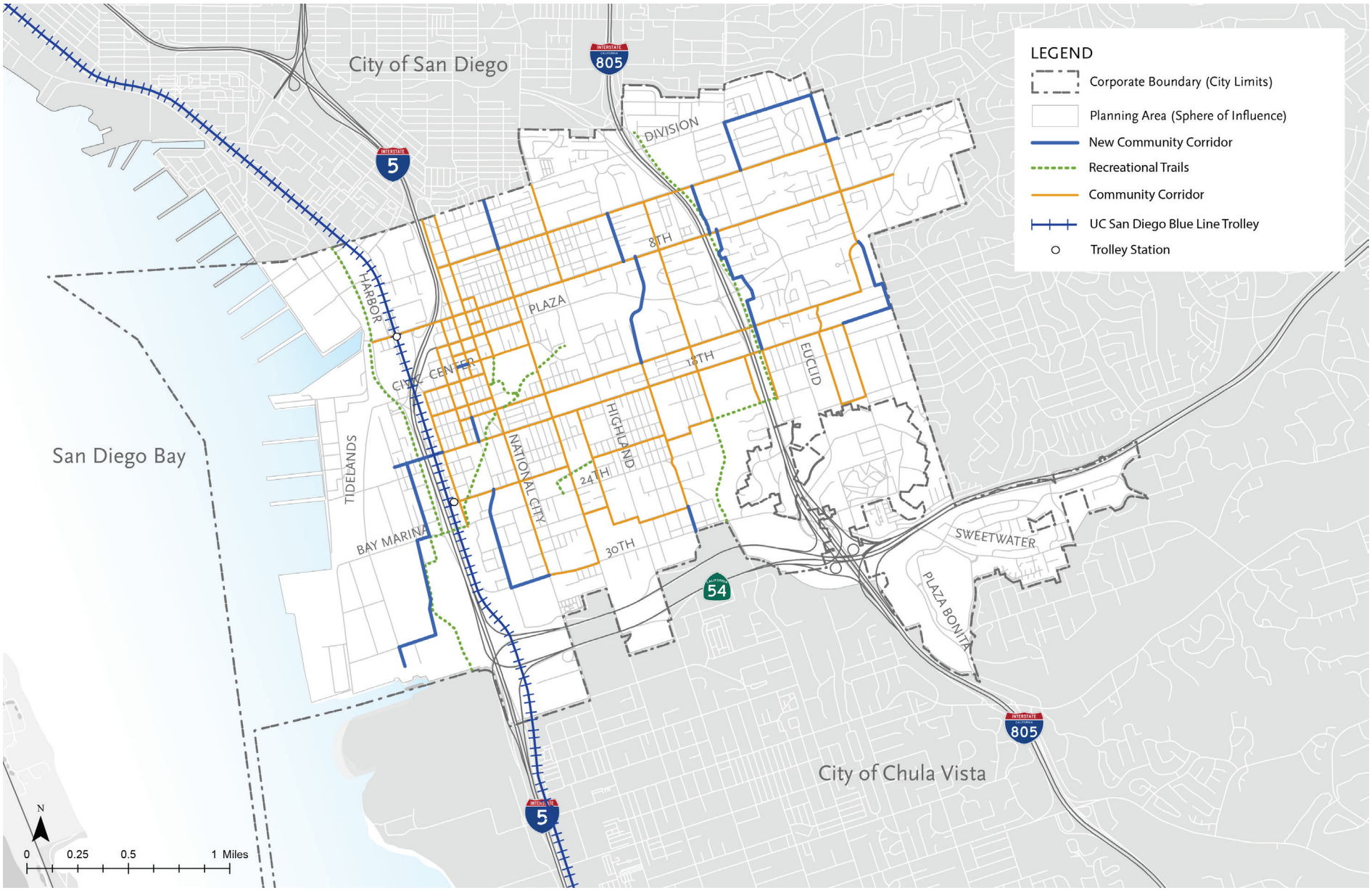


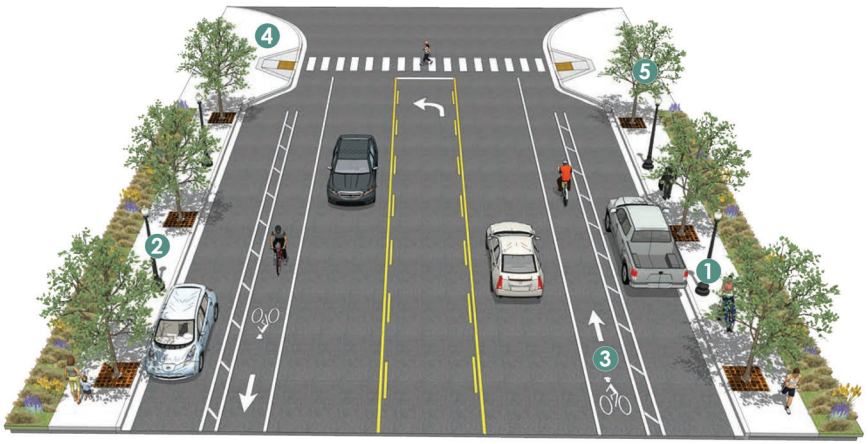
FIGURE 3-7: Community Corridors

1. Banners
2. Themed street furnishings
3. 10 feet wide walkways
4. Angled parking
5. Bulb-outs for shortened pedestrian crossing
6. Highly visible and short pedestrian crossing distances
7. Medians for scale and design treatments

FIGURE 3-8: Main Street Commercial District Community Corridor

1. Lighting
2. Themed street furnishings
3. 10 feet wide walkways
4. On-street Parking
5. Highly visible pedestrian crossing distances
6. Landscaped median

FIGURE 3-9: Main Street Linear Commercial District Community Corridor



1. Widened sidewalks
2. Lighting
3. Buffered bike lanes on each side
4. Bulb-outs
5. Street trees for pedestrian safety and comfort

FIGURE 3-10: "Multi-Modal Community Corridor"

1. Interpretative panels
2. Urban trail markers and art
3. Permeable surfaces for parking
4. Large canopy trees for urban forestry, urban heat island reduction, stormwater runoff reduction, traffic calming, and safety
5. Bioswales

FIGURE 3-11: Green Street or Urban Trail Community Corridor

Development

As new development and redevelopment projects occur, the city has an opportunity to ensure bicycle facilities are included through the plan review process. Smart growth - one of the General Plan's key policy drivers - emphasizes the importance of linking land use and transportation improvements. The TODO Study is an example of the city's efforts to encourage transit-supportive land uses and their connection to improved mobility. Among the goals of the TODO Study are developing housing and parking policies to be more supportive of smart growth, identifying key active transportation improvements, and creating smart growth and complete streets corridors with additional housing choices and improved connections to housing. The Focused General Plan Update identifies areas with strong potential and compatibility for infill, mixed-use, or higher density development sites and proposes rezoning them. These areas are in corridors throughout National City, including the eastern portions of the city where current land uses suggest that there is lower bicycling demand compared to the western portions. These planned zoning changes are anticipated to generate additional bicycling demand which should be addressed in the development of the bicycle network. Figure 3-12 displays the new zoning map from the Focused General Plan Update and existing citywide bicycle facilities.

3.3.4 Constraints

Although National City has many opportunities to improve the bicycle network, there are impediments to bicycle travel that require consideration.

Barriers

Several roadways in National City may present barriers to bicycle travel. These barriers can generally be categorized into three types:

Physical barrier: This type of barrier describes a physical impediment to travel such as where a roadway terminates or where crossings can only occur at freeway interchanges. I-5 and I-805 run north-south through the city while SR-54 runs east-west across the southern border. SR-54 limits local connectivity to the Sweetwater Bikeway. In addition to being a physical barrier, streets that cross I-5 and I-805 pose a safety concern that discourages bicycle use. Future bikeways that intersect I-5 and I-805 will require special attention to the configuration and treatments at interchange crossings. These future improvements will also be within Caltrans ROW and will require coordination.

Facility barrier: This type of barrier occurs where no bicycle facilities exist. This type of barrier restricts bicycle access to key community destinations.

Situational barrier: This type of barrier occurs where roadway widths, travel speeds, or other roadway characteristics make bicycle travel difficult. Plaza Boulevard and Highland Avenue are examples of situational barriers in National City.

On-Street Parking

Along some roadways in National City, existing public ROW widths may not be sufficient to accommodate both dedicated bicycle lanes and on-street parking. This constraint occurs on several streets in the city where bicycle connections are still desirable. If on-street parking is to be maintained, Class III bicycle routes or Class III bicycle boulevards may be used. On-street diagonal parking can also serve as a constraint since drivers' visibility of bicyclists may be obscured when reversing out of a parking space. An additional buffer or back-in diagonal parking can enhance visibility. Diagonal parking exists adjacent to some bicycle-attracting land uses in the city such as National City Middle School on D Avenue.

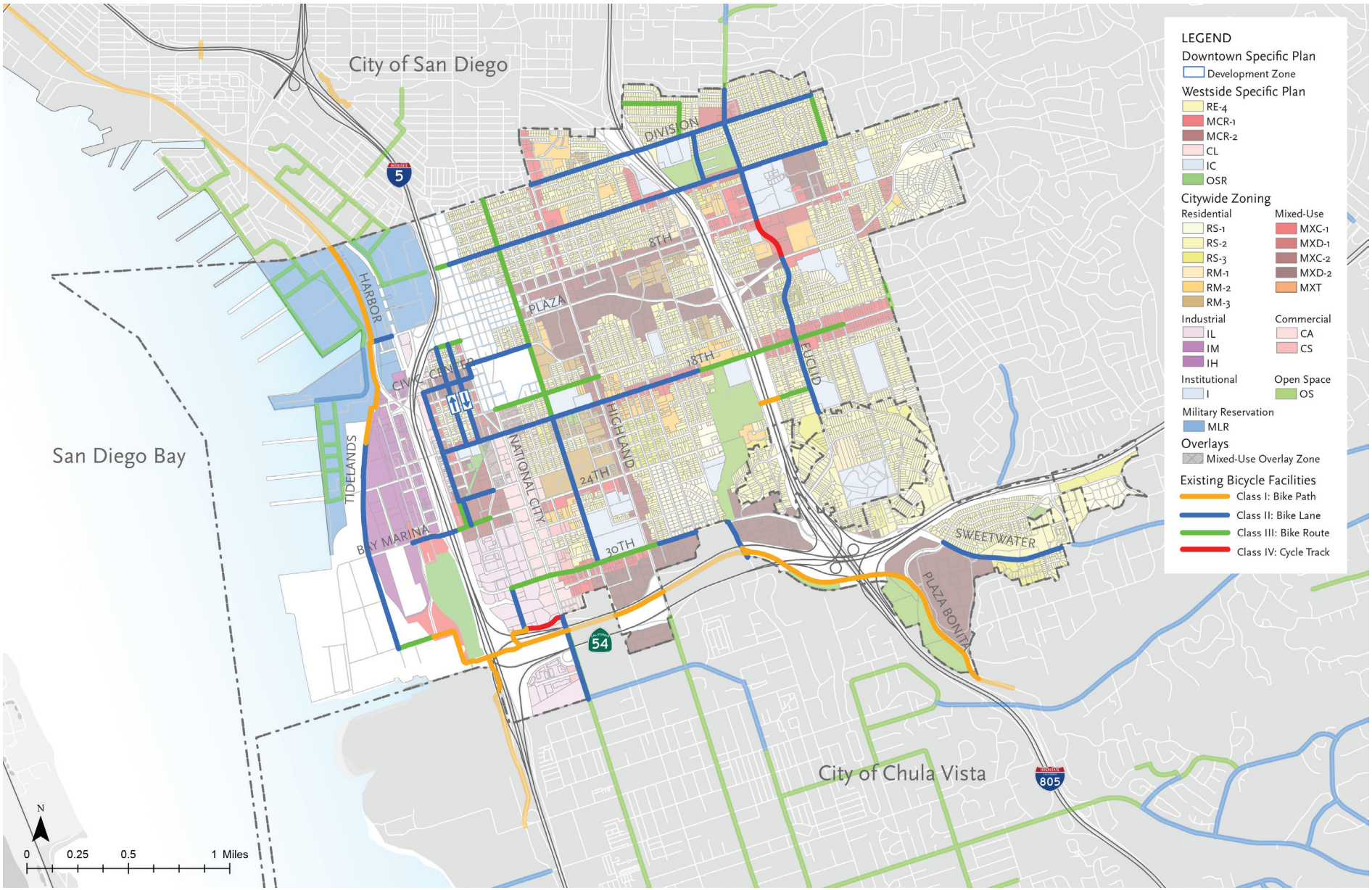


FIGURE 3-12: Focused General Plan Update Zoning and Existing Bicycle Facilities

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Chapter 4
Needs and Demands Analysis

This section presents an estimate of current and potential bicycling demand in National City based on bicycle commute statistics and an assessment of population characteristics and land uses associated with higher rates of bicycling activity. Estimating how many people currently bicycle provides an indication of current system usage and establishes a baseline against which to measure progress. This section also identifies network gaps and roadway characteristics that serve as barriers to bicycling. Assessing demand and deficiencies is critical to identifying where facilities should be constructed or improved.

4.1 Bicycle Commuter Estimates

Given National City's temperate climate and generally flat topography, bicycling is a strong mode to use for commuting to work. Since work commutes tend to be regular, analyzing bicycling as a means of transportation to work can provide reliable information about bicycle usage among working-age individuals.

The current bicycle commute trends in National City indicate the opportunity for increased future usage trends. While bicycle mode share is relatively low locally and nationally, the surveyed data, as seen in Table 4-1, indicates that National City has a higher bicycle commute mode share than both San Diego County and the United States. This data indicates that bicycle commute mode share could continue to outgrow and outpace local rates with targeted facility and amenity improvements.

TABLE 4-1: Means of Transportation to Work Data

Mode	United States	California	San Diego County	National City
Bicycle	0.5%	0.8%	0.6%	0.7%
Drove Alone – Car, Truck, or Van	74.9%	72.1%	73.9%	66.0%
Carpool – Car, Truck, or Van	8.9%	10.0%	8.7%	15.5%
Transit	4.6%	4.6%	2.6%	5.1%
Walked	2.6%	2.5%	2.9%	7.0%
Other Means	1.3%	1.6%	1.7%	1.7%
Worked at Home	7.3%	8.4%	9.6%	4.1%

Source: American Community Survey 2020 5-Year Estimates, Table S0801

To understand where usage trends may be most pronounced, and as part of the Focused General Plan Update, travel demand modeling was conducted with the current bicycle network to forecast commute mode share citywide and by City Master Geographic Reference Area (MGRA) for the year 2050. The modeled commute share citywide in 2050 for bicycles was approximately 0.4%. While this modeled citywide commute share is less than the surveyed commute share, bicycle trip propensity was mapped by MGRA and provides a blueprint for targeted facility and amenity improvements in strategic MGRAs to help citywide bicycle commute mode share grow.

4.2 Demographic Analysis

Understanding the demographic trends of National City residents is critical to planning bicycle facilities that serve community needs and aspirations. It is important to plan bicycle facilities that all community members can and want to use, regardless of their identities or socioeconomic circumstances. The following sections detail income and environmental indicators, which are key factors that are especially impactful on bicycling trends and directly inform the planning and design of bicycle facilities.

4.2.1 Income

People with lower incomes are more likely to face cost-related transportation challenges than those with higher incomes. For example, households with lower incomes may be more burdened by the cost of owning and operating a vehicle and therefore may be more likely to seek out alternative modes of transportation, such as bicycles. These households may also be more dependent on active transportation fa-

cilities than those with higher incomes and may be more impacted by changes to the active transportation network. For the purposes of this analysis, household incomes are grouped into the following categories based on the Area Median Income (AMI) for a metropolitan area:

- Extremely Low: 0-30% of AMI
- Very Low: 31-50% of AMI
- Low: 51-80% of AMI
- Moderate: 81-120% AMI
- Above Moderate: Over 120% AMI

The term "lower income" is generally used to collectively refer to extremely low-, very low-, and low-income households. As shown in Table 4-2, approximately 73.0% of National City households fall into the lower income category while 27.0% fall into the moderate or above moderate category. Compared to the County's overall percentage of lower income households (46.9%), National City has a significantly higher lower income population. Additionally, National City household incomes are typically less than those of the rest of the County. The median household income in National City is $47,119. The median household income for the County, however, is $78,890. National City's median income is approximately 40.3% lower than the that of the County.

4.2.2 Environmental Indicators

Areas disproportionately affected by environmental pollution and other hazards have a strong opportunity to convert to private auto trips to alternative modes of transportation in order to help alleviate local pollution levels. Higher rates of active transportation use can positively impact the local environment and improve climate-related health outcomes for community members. Improving and expanding the local bicycle facility network can thus have positive impacts on local environmental pollution and related hazards and can provide more multi-modal opportunities for residents who live in disadvantaged areas.

CalEnviroScreen aggregates environmental, health, and socioeconomic data to assess the pollution burden of a community relative to other census tracts across the state. As shown in Figure 4-1, all census tracts within National City are within the 45th to 95th percentiles of the CalEnviroScreen 3.0 index, indicating significant pollution burden and vulnerability throughout the city. Compared to the region, National City has generally higher CalEnviroScreenscores: Chula Vista's scores range from the 11th to 90th percentile, San Diego's scores range from the 31st to 100th percentile, and Coronado's scores range from the 1st to 10th percentile. The western portion of National City is among the top 25% of impacted tracts across the State of California identified by CalEnviroScreen 3.0. This area, shown in Figure 4-2, qualifies as both an SB 535 disadvantaged community and AB 1550 low-income community.

TABLE 4-2: Households by Income Category

Income Category	% of AMI	National City (2)		San Diego County (2)	
Extremely Low	30% AMI or less	4,980	29.9%	174,540	15.5%
Very Low	31-50% AMI	3,445	20.7%	149,590	13.3%
Low	51-80% of AMI	3,735	22.4%	203,395	18.1%
Moderate or Above	Over 80% of AMI	4,500	27.0%	597,760	53.1%
Totals		**16,660**	**100.0%**	**1,125,285**	**100.0%**

(1) The AMI for a family of four in the San Diego region is $86,300. At the time of writing, the most recent year for which complete AMI data as shown is available is 2019. Source: San Diego Housing Commission, 2019 Area Median Income Limits.
(2) Source: Department of Housing and Urban Development (HUD) and Comprehensive Housing Affordability Strategy (CHAS) (2015-2019).

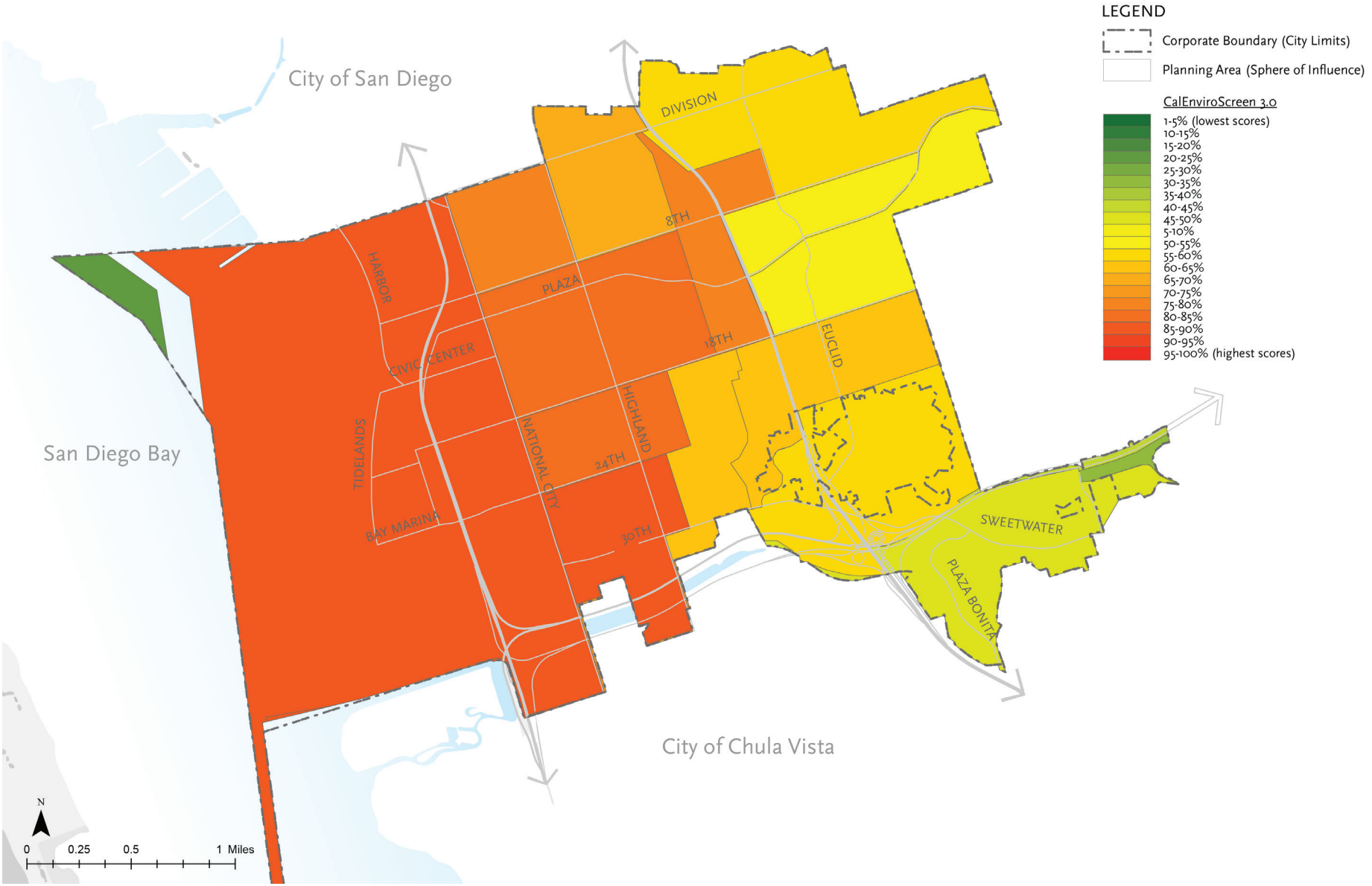


FIGURE 4-1: CalEnviroScreen 3.0 Index

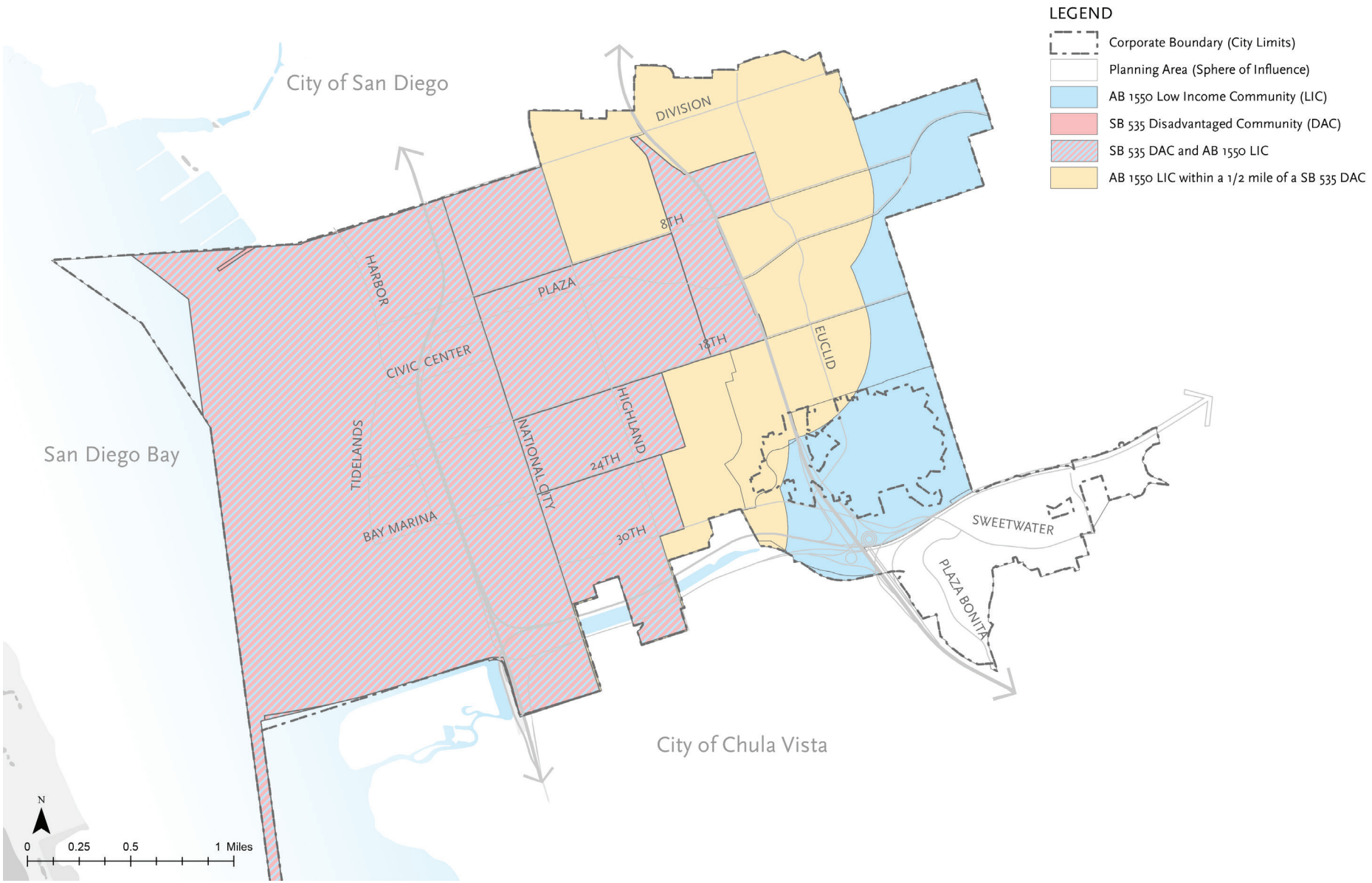


FIGURE 4-2: SB 535 Disadvantaged Communities and AB 1550 Low-Income Communities

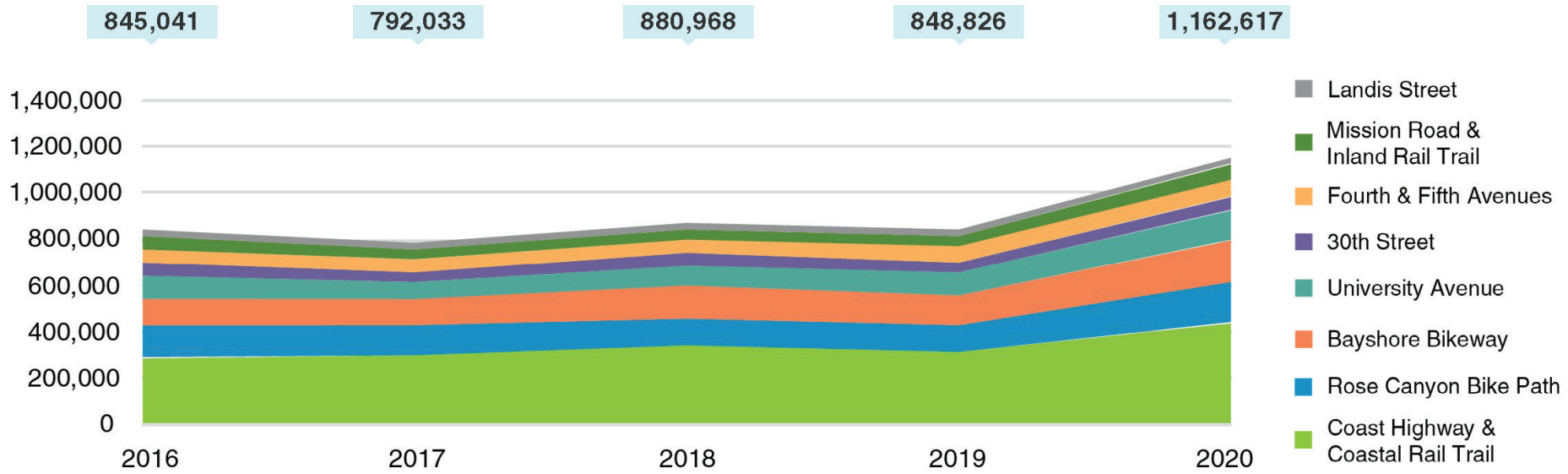
4.3 Bicycle Propensity

Areas with high bicycle propensity are those with high potential for bicycle trips. When planning, designing, and investing in bicycle networks, it is most beneficial to focus facilities in areas with higher bicycle propensity. Factors discussed in Section 3, such as land use, topography, roadway characteristics, and existing facilities all affect bicycle propensity.

Regionally, bicycle use has been increasing recently. The number of regional bicycle trips had been trending upwards prior to the COVID-19 pandemic and further increased markedly in 2020, likely due in part to pandemic-related changing travel patterns. Figure 4-3 shows bicycle counts on regional facilities from 2016 through 2020. All measured regional facilities have seen increases in bicycle counts, with the Bayshore Bikeway, which runs through western National City, experiencing a significant increase in use.

Modeling from the Focused General Plan Update adopted land use scenario forecasts citywide bicycle trips in 2050 by MGRA, which is a geography developed by SANDAG that is between the scale of United States Census block groups and census tracts. Figure 4-4 displays the modeled bicycle trips with the existing bicycle network. This overlay shows that areas with existing bicycle facilities coincide with areas forecasted for higher numbers of bicycle trips. These areas have a higher bicycle propensity and should be further enhanced and expanded. Additionally, areas such as Las Palmas, Downtown, and the Plaza Boulevard Commercial District with higher forecasted bicycle trips have strong bicycle propensity and would benefit from additional facilities. These areas are key activity centers, with destinations such as shops, grocery stores, and schools.

FIGURE 4-3: San Diego Regional Facility Bicycle Counts 2016 – 2020



Source: SANDAG 2020 State of the Commute Report

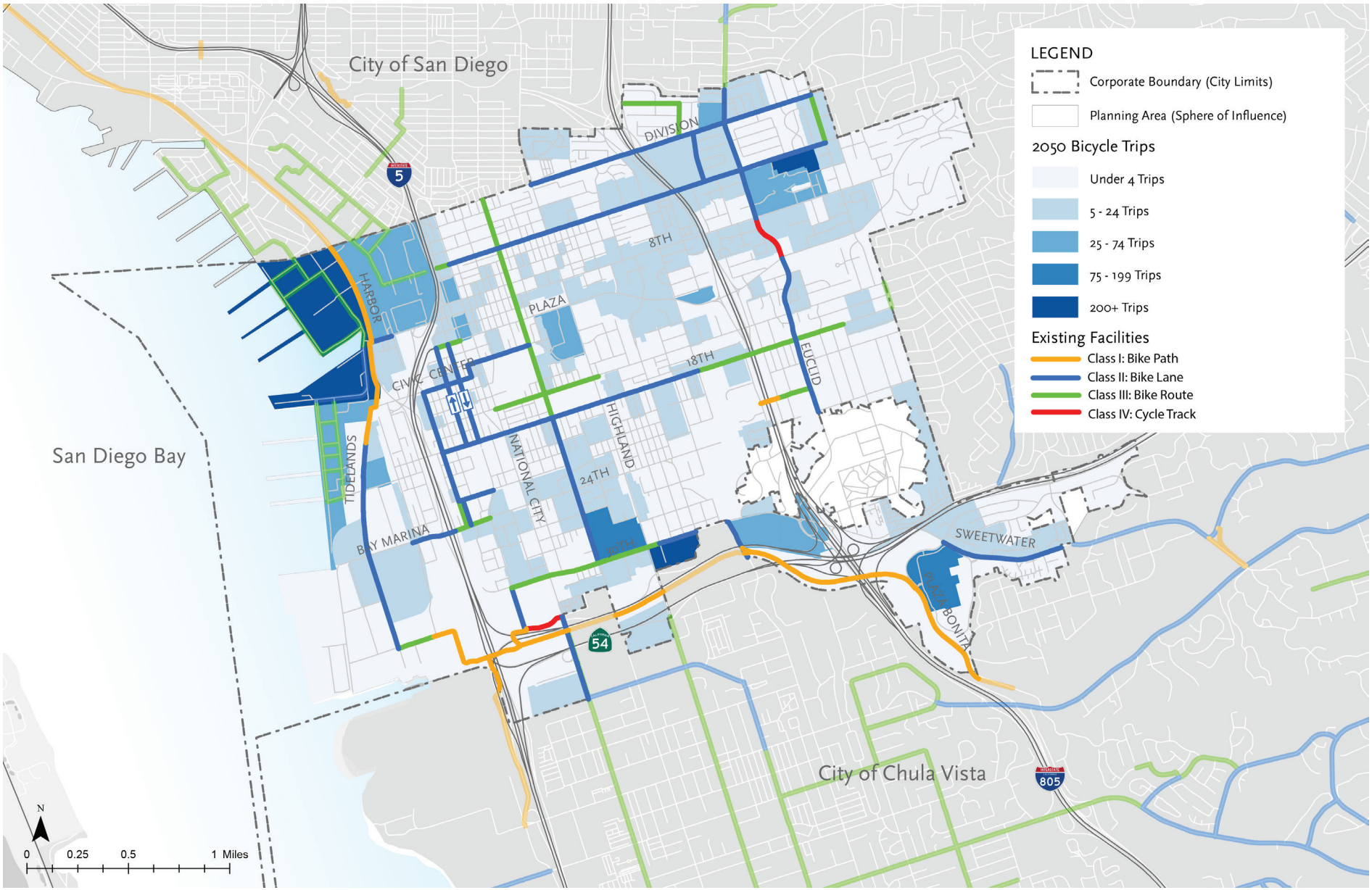


FIGURE 4-4: Existing Bicycle Facilities and 2050 Bicycle Trips to and from National City MGRAs

4.4 Trip Detractors and Collision Analysis

This section describes key indications of bicycling barriers, such as roadways with high vehicular traffic volumes and speeds, freeway on/off ramps, steep terrain, and bicycle collision locations.

4.4.1 Bicycle Trip Detractors

Figures 4-5 and 4-6, as well as Figure 3-6 on page 31, display roadway characteristics that negatively impact the quality of the bicycling environment and may deter people from bicycling in certain locations. Freeways and railroad tracks act as hard infrastructure barriers that inhibit connected bicycle networks and travel. Streets with high average daily traffic (ADT) volumes can be less appealing for bicyclists due to safety and bicycle experience concerns. For the purposes of this study, streets with ADT volumes of greater than 7,500 are considered high volume streets. For similar reasons, high traffic speeds can also detract from bicycle trips. Locations in the eastern portion of the city with steeper terrain are more difficult to bicycle in as well.

4.4.2 Bicycle Collisions

Table 4-3 presents the number of traffic collisions and collisions involving bicyclists in National City for five consecutive years: 2013, 2014, 2015, 2016 and 2017. As the table shows, one fatal bicycle-related collision was reported in National City during the five-year period in 2017. This collision occurred on Grove Street as the vehicle involved was travelling at an unsafe speed. On average, about 9% of collisions resulting in injuries involved bicyclists. In 2013 there was a significantly higher rate of bicycle-involved collisions resulting in injury than in the proceeding four years, which have generally similar rates ranging from 6.5% to 7.8%.

Safety is a major concern for both existing and potential bicyclists. Identifying the locations of bicycle collision sites can assist in developing improvements or determining more appropriate routes for bicyclists to use. Figure 4-7 on page 49 displays bicycle collision locations in National City during the same 2013 to 2017 period as shown in Table 4-3. Bicycle-involved collisions occurred at various intersections throughout the city, with hotspots occurring in the portion of the city to the west of I-805.

TABLE 4-3: National City Bicycle-Involved Collisions 2013 – 2017

Year	Total Collisions		Total Bicycle-Related Collisions		Bicycle-Related Percent of Total Fatal	Bicycle-Related Percent of Total Injury
	Fatal	Injury	Fatal	Injury		
2013	2	187	0	27	0.0%	14.4%
2014	5	184	0	14	0.0%	7.6%
2015	0	186	0	14	0.0%	7.5%
2016	3	199	0	13	0.0%	6.5%
2017	6	205	1	16	16.7%	7.8%
Total	16	961	1	84	3.3%	8.8%

Source: City of National City

FIGURE 4-5: Bicycle Barriers and Steeps Slopes

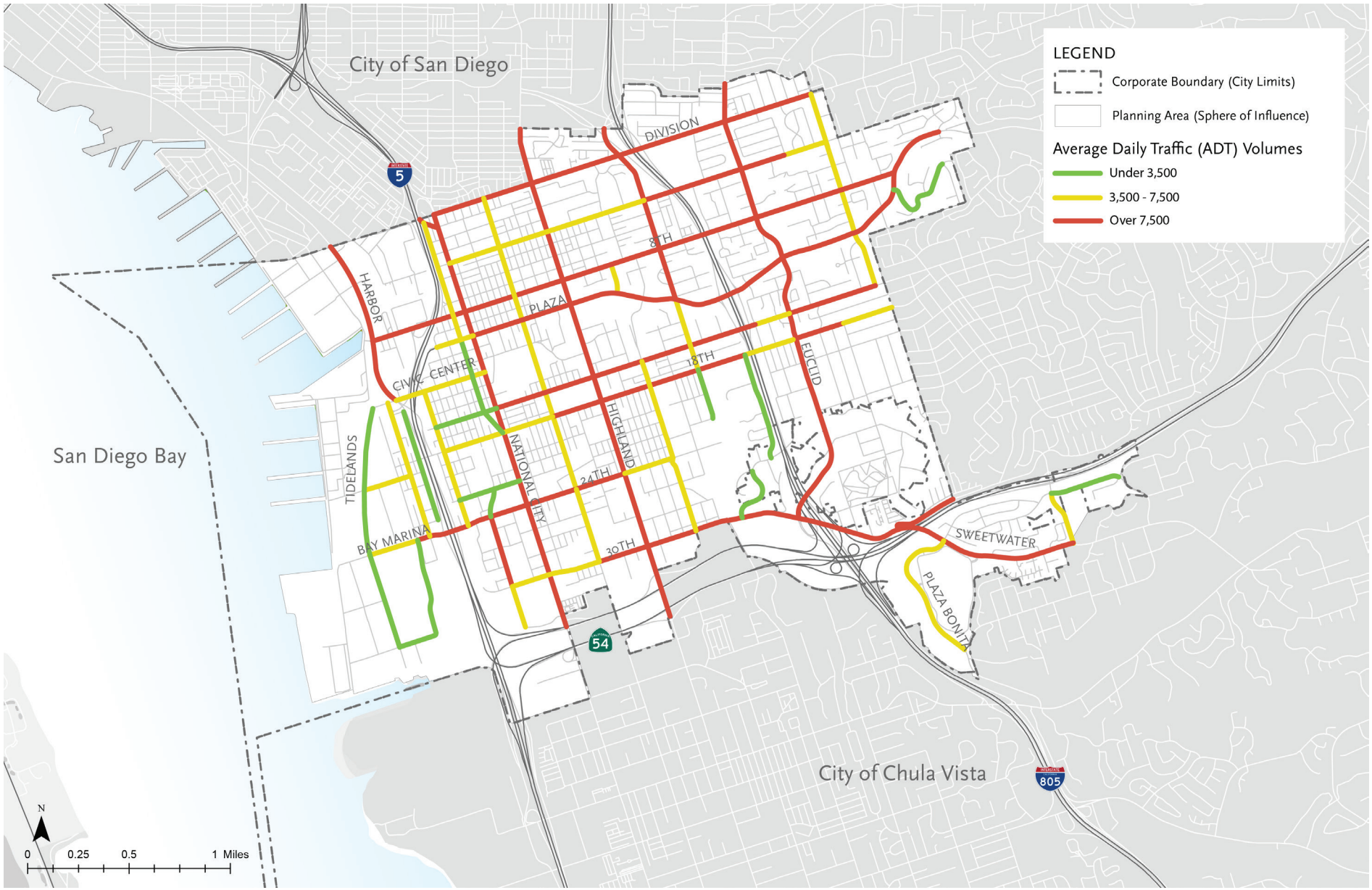


FIGURE 4-6: High ADT Volume Roadways

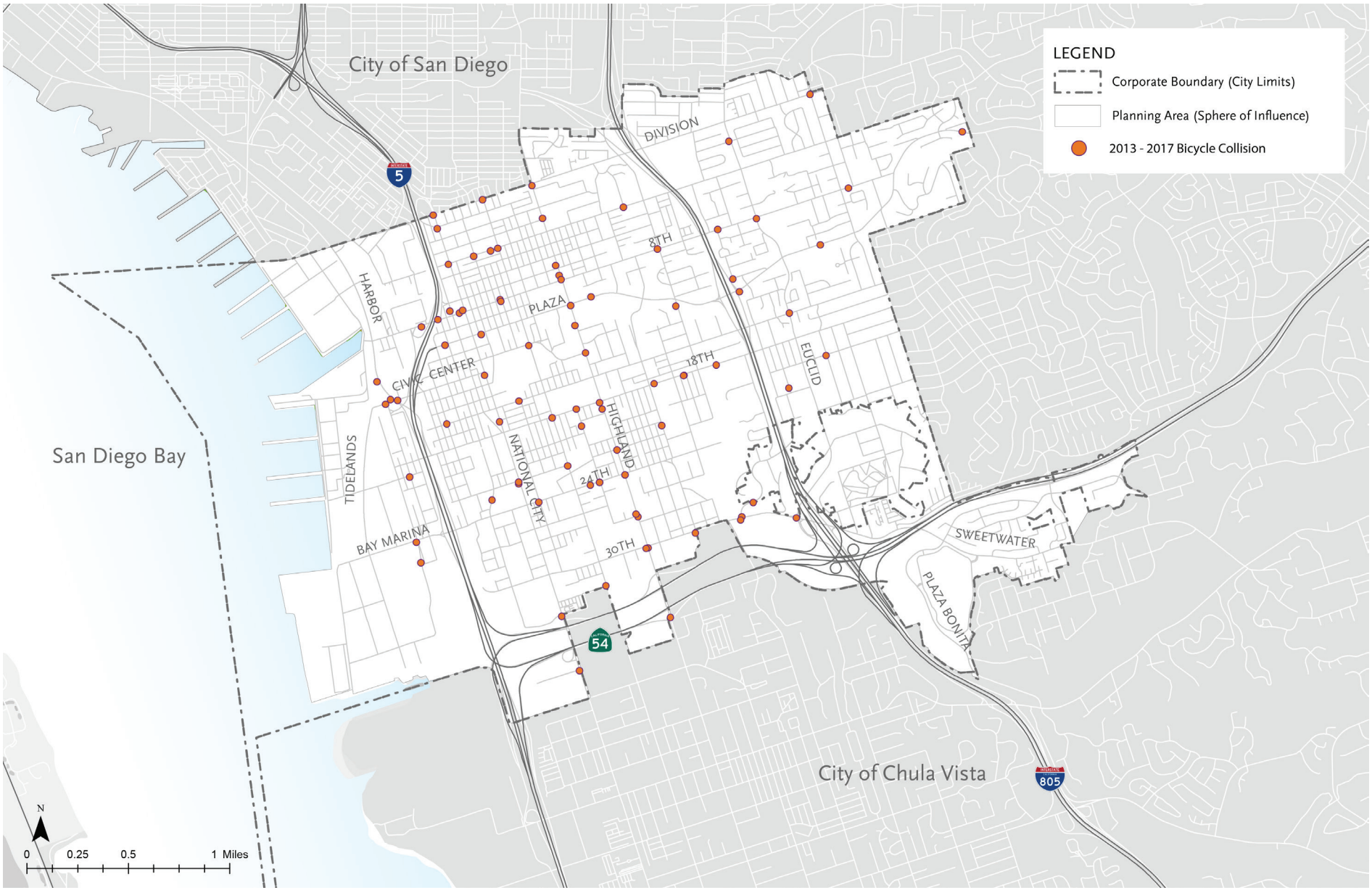


FIGURE 4-7: 2013 – 2017 Bicycle-Involved Collisions

4.5 Bikeway Gaps

This section describes existing bicycle system gaps in National City that warrant consideration for bicycle facilities.

4.5.1 Bikeway Gap Types

Bikeway gaps exist in various forms, ranging from short "missing links" on a specific street or path corridor to larger geographic areas with few or no bicycle facilities. Gaps can be organized based on length and other characteristics. This document classifies bikeway gaps into five main categories:

Spot gaps: Spot gaps refer to point-specific locations lacking dedicated bicycle facilities or other treatments to accommodate safe and comfortable bicycle travel. Spot gaps primarily include intersections and other vehicle/bicycle conflict areas posing challenges for riders. Examples include bike lanes on a major street "dropping" to make way for right turn lanes at intersections, or a lack of intersection crossing treatments for bicyclists on a route or path as they approach a major street.

Connection gaps: Connection gaps are missing segments (1/4 mile long or less) on a clearly defined and otherwise well-connected bikeway. Major barriers standing between bicycle destinations and clearly defined routes also represent connection gaps. Examples include bike lanes on a major street "dropping" for several blocks to make way for on-street parking, a discontinuous off-street path, or a freeway standing between a major bicycle route and a school.

Lineal gaps: Similar to connection gaps, lineal gaps are half- to one mile-long missing link segments on a clearly defined and otherwise well-connected bikeway.

Corridor gaps: Corridor gaps are missing links longer than one mile on a clearly defined and otherwise well-connected bikeway. These gaps will sometimes encompass an entire street corridor where bicycle facilities are desired but do not currently exist.

System gaps: System gaps are larger geographic areas (e.g., a neighborhood or business district) where few or no bikeways exist. System gaps exist in areas where a minimum of two intersecting bikeways would be required to achieve the target network density.

Chapter 5
Recommended Network and Facility Improvements

The recommended improvements in this Bicycle Master Plan include bikeway network facilities, intersection and other spot improvements, and bicycle support facilities. National City's temperate climate and gentle topography make it a great place to bicycle. The improved facilities outlined below will help make bicycling an effective transportation option throughout National City.

5.1 Bikeways

A comprehensive evaluation of existing conditions, including opportunities and constraints, was completed to identify locations for future bikeways and support facilities. The final recommended network provides for a well-connected citywide system. Improvement recommendations are based on best practices and are supplemented by:

» Review of existing planning efforts

» City staff/public input

» Field work and data analysis

» Local and regional network connections

The recommended bicycle network detailed in the following sections includes both facilities that are already planned, funded, and awaiting construction, and facility projects that are unfunded.

5.1.1 Recommended Network

National City's current bikeway network includes 3.6 miles of Class I bikeways (bike paths), 12.7 miles of Class II bikeways (bike lanes), 4.7 miles of Class III bikeways (bike routes), and 0.4 miles of Class IV bikeways (cycle tracks). This plan recommends an additional 2.4 miles of Class I bikeways, 4.0 miles of Class II bikeways, 8.0 miles of Class III bikeways, 3.4 miles of Class IIIB bikeways (bicycle boulevards), and 5.6 miles of Class IV bikeways.

These additional facilities provide north-south and east-west corridors through the city as well as connections to regional facilities such as the Bayshore Bikeway and the Sweetwater River Bikeway. A comprehensive bikeway network improves bicyclists' level of safety, convenience, and access to key destinations. It is important to note that bicyclists are legally entitled to ride on all city streets whether or not the streets are part of a designated bikeway network. Figure 5-1 shows the recommended bicycle network (both funded and unfunded projects) with Classifications for National City. The recommendations were developed based on the following guidelines:

» Needs of various user groups – Facilities addressing the needs of various types of bicyclists such that all people can use the city's bicycle facilities

» Existing bicycling patterns – Preferred bicycling patterns, identified by the community in public workshops and by city staff

» Connectivity – Increased system connectivity by providing bikeway connections to major destinations and to regional bikeways

» Traffic volumes and travel speeds – Traffic volumes and travel speeds were taken into account in determining alignment and types of facilities. Research on the relationship between ADT and appropriate bikeways presented in the Federal Highway Administration's (FHWA) 2019 Bikeway Selection Guide was used as a basis for establishing preferred facility types. Preference for Class III facilities was given to streets with ADT volumes below 3,500, preference for Class II facilities was given to streets with 3,500 – 7,500 ADT volumes, and preference for fully separated bicycle facilities was given to streets with ADT volumes greater than 7,500. While these ADT-based preferences were treated as such, ROW and other constraints on some segments of the recommended network led to some facilities being recommended that do not match this ADT breakdown

» Existing roadway width and ROW – Available ROW determines the type of facility and feasibility

» Public input – Public input on needs and recommendations used to help screen projects

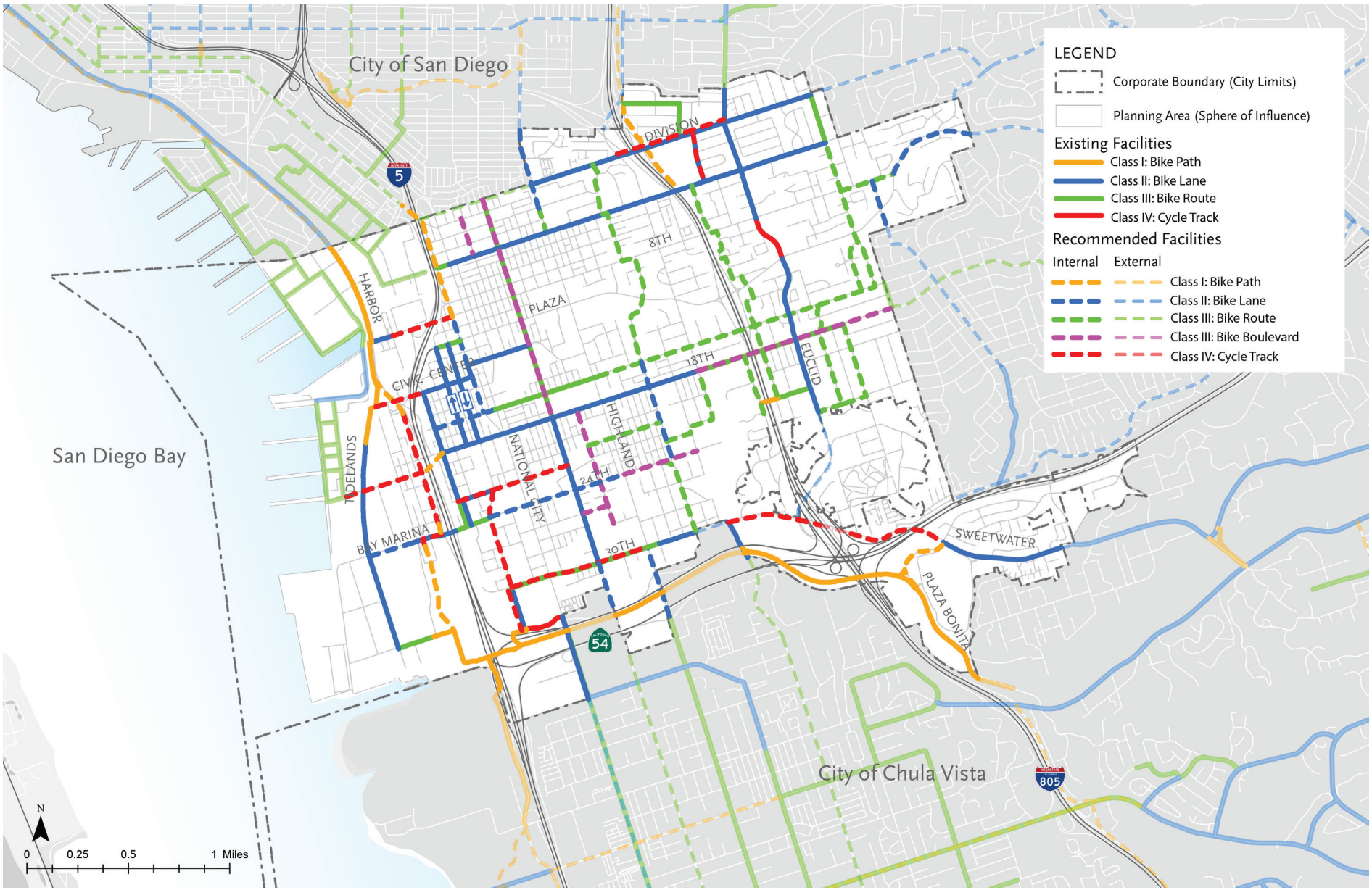


FIGURE 5-1: Recommended Bicycle Network[1]

[1]Includes both funded and unfunded bicycle facility projects

5.1.2 Bicycle Paths

Table 5-1 lists the recommended Class I Bicycle Path projects for National City. A bicycle path provides for bicycle travel on a paved ROW completely separated from streets or highways. These recommended facilities will provide opportunities for recreational bicycling as well as for commuting and travel related to errands. The recommended network includes connections to the Bayshore Bikeway and Sweetwater River Bikeway.

5.1.3 Bicycle Lanes

Table 5-2 outlines the recommended Class II Bicycle Lane projects for National City. Some segments of identified projects are not Class II; in these cases only the Class II portion of the project is shown. Bicycle lanes provide a signed, striped, and stenciled lane for one-way travel on both sides of a street or highway. Class II bikeways are typically recommended where traffic volumes require channelization of motorized and non-motorized users in order to enhance safety.

TABLE 5-1: Recommended Class I Bikeways

Location	From	To	Mileage
Roosevelt Avenue	Yama Street	8th Street	0.61
El Toyon-Las Palmas Bicycle Corridor Multi-Use Path	Beta Street	4th Street	0.52
Marina Way	Recommended Class IV Facility	Sweetwater River Bikeway	0.46
Plaza Bonita Road	Sweetwater Road	Sweetwater River Bikeway	0.31
Harbor Drive	Bayshore Bikeway	14th Street	0.22
19th Street	McKinley Avenue	Wilson Avenue	0.12
Plaza Bonita Road	Recommended Class I Facility	Plaza Bonita Parking Lot Entrance	0.10
McKinley Avenue	23rd Street	Bay Marina Drive	0.07
		Total	**2.42**

TABLE 5-2: Recommended Class II Bikeways

Location	From	To	Mileage
24th Street	Hoover Avenue	Highland Avenue	0.69
L Avenue	16th Street	24th Street	0.50
Paradise Valley Road	8th Street	Eastern city limit	0.47
Highland Avenue	Delta Street	2ns Street	0.40
Highland Avenue	30th Street	SR 54 exit ramp	0.39
16th Street	Wilson Avenue	National City Boulevard	0.31
Olive Avenue	8th Street	Plumas Street	0.28
Bay Marina Drive	Tidelands Avenue	Harbison Avenue	0.25
Roosevelt Avenue	8th Street	12th Street	0.25
D Avenue	30th Street	Southern terminus	0.23
Roosevelt Avenue	Civic Center Drive	16th Street	0.19
		Total	**3.96**

5.1.4 Bicycle Routes

Table 5-3 includes recommended Class III Bicycle Routes for National City. Some segments of identified projects are not Class III; in these cases only the Class III portion of the project is shown. Class III facilities are appropriate where there is limited available ROW for a dedicated lane or shoulder widening but the route is an integral part of the bicycle network. All recommended Class III segments should be signed with Caltrans standard bicycle route signs. Where on-street parallel parking is present, shared-lane markings may be placed. Appendix B provides guidance on bicycle routes and shared lane markings.

5.1.5 Bicycle Boulevards

Table 5-4 includes recommended Class IIIB Bicycle Boulevards for National City. Class IIIB facilities are appropriate where there are low vehicle volumes and speeds. They use signage, traffic calming measures, and pavement markings to give bicycles priority on the road and limit through-usage of the street by vehicles. Measures used to create bicycle boulevards generally benefit other active transportation modes as well.

TABLE 5-3: Recommended Class III Bikeways

Location	From	To	Mileage
16th Street	Highland Avenue	Harbison Avenue	1.46
Grove Street, Paradise Drive, T Avenue	22nd Street	4th Street	1.35
Laurel Avenue, M Avenue, N Avenue	Division Street	16th Street	1.15
Lanoitan Avenue, Granger Avenue, 24th Street	16th Street, 18th Street	Euclid Avenue	1.13
Harbison Avenue, Earle Drive	4th Street	16th Street	1.02
Roselawn Street, 22nd Street, Palm Avenue	L Avenue	18th Street	0.53
Olivewood Drive, L Avenue	24th Street	30th Street	0.40
21st Street	F Avenue	L Avenue	0.38
Newell Street	18th Street	22nd Street	0.30
8th Street	Harbison Avenue	Paradise Valley Road	0.27
Highland Avenue	2nd Street	4th Street	0.13
		Total	**8.04**

TABLE 5-4: Recommended Class IIIB Bikeways

Location	From	To	Mileage
D Avenue	Division Street	18th Street	1.13
18th Street	Palm Avenue	Rachael Avenue	1.00
F Avenue, 26th Street	18th Street	28th Street, D Avenue	0.72
24th Street	Highland Avenue	N Avenue	0.38
B Avenue	1st Street	4th Street	0.19
		Total	**3.41**

5.1.6 Cycle Tracks

Table 5-5 includes recommended Class IV Cycle Tracks for National City. Class IV facilities are a hybrid between Class I separated bicycle paths and Class II on-street bicycle lanes. They are on-street exclusive bicycle facilities that are separated from vehicle traffic by a physical barrier, such as bollards, on-street parking, or raised pavers. They may be one-way or two-way and they may be at the street level, the sidewalk level, or in between. By physically separating bicyclists from vehicles, cycle tracks provide bicyclists increased feelings of comfort and security while not requiring construction outside of the roadway.

TABLE 5-5: Recommended Class IV Bikeways

Location	From	To	Mileage
Sweetwater Rd	2nd Avenue, City Boundary	City Boundary, Plaza Bonita Road	0.95
Hoover Avenue	22nd Street	33rd Street	0.76
30th Street	Hoover Avenue	Highland Avenue	0.70
Division Street	Laurel Avenue	Euclid Avenue	0.68
22nd Street	Wilson Avenue	D Avenue	0.57
McKinley Avenue	14th Street	23rd Street	0.55
19th Street	Kidd Street	McKinley Avenue	0.43
8th Street	Rail tracks	Roosevelt Avenue	0.31
Civic Center Drive	Tidelands Avenue	Wilson Avenue	0.26
U Avenue	Division Street	4th Street	0.25
Bay Marina Drive	Marina Way	McKinley Avenue	0.100
Marina Way	Bay Marina Drive	Recommended Class I Facility	0.03
		Total	**5.58**

5.2 Route Selection and Prioritization

This section outlines the prioritization methodology and the route selection criteria for the unfunded bikeway recommendations in this Bicycle Master Plan, as shown in Table 5-6 and Figure 5-2 on page 58. The intent of the ranking process is to create a prioritized list of projects for funding and implementation. The project list and rankings are flexible concepts that serve as guidelines. The list may change over time because of changing bicycling patterns, implementation opportunities and constraints, and the development of other transportation system facilities. National City should review the project list at regular intervals to ensure it reflects the most current priorities, needs, and opportunities for implementing the bicycle network in a logical and efficient manner.

The recommended unfunded bikeway projects have been ranked using the following evaluation criteria:

» **Previously identified in another plan or city document.** Projects that have been previously identified scored higher

» **Placemaking.** Projects that directly connect to schools and parks scored higher

» **Safety need.** Projects in areas with more 2013 – 2017 collisions involving bicycles scored higher

» **Bicycle propensity.** Projects in areas with high modeled 2050 bicycle usage scored higher

» **Engineering feasibility.** Projects with few high-level engineering-related complications scored higher

» **Regional connectivity.** Projects that directly connect to existing regional bikeways scored higher

TABLE 5-6: Recommended Unfunded Bicycle Projects

Rank	Project Name	Facility Type	Previously Identified	Placemaking	Safety Need	Bicycle Propensity	Engineering Feasibility	Regional Connectivity	Composite Score
1	18th Street Bicycle Boulevard	Class IIIB	●	●	●	◕	◕	●	◕
2	Highland Avenue Bike Lanes	Class II	●	◕	●	●	◑	●	◕
3	F Avenue Bicycle Boulevard	Class IIIB	●	●	●	●	◕	◔	◕
4	8th Street Complete Street Improvements	Class II Class IIIR	●	◕	◕	◑	◕	◕	◑
5	D Avenue Bicycle Boulevard	Class IIIB	◑	●	●	◑	◑	◕	◑
6	Division Street Cycle Track	Class IV	●	◕	◔	●	◑	●	◑
7	30th Street Cycle Track	Class IV	◑	●	◑	●	◕	◑	◑
8	16th Street Bicycle Corridor	Class IIIR	●	◕	◑	◑	●	◑	◑
9	Granger Avenue Bicycle Corridor	Class IIIR	●	◕	◑	◔	●	◕	◑
10	24th Street Complete Street Improvements	Class II Class IIIB	◕	◑	●	◕	◑	◑	◑
11	Las Palmas Bicycle Corridor	Class IIIR	●	◕	◔	◑	●	◑	◑
12	Hoover Avenue Cycle Track	Class IV	●	◑	◔	◕	◑	●	◑
13	22nd Street Cycle Track	Class IV	●	◕	◕	◑	◑	◔	◑
14	Harbison Avenue Bicycle Corridor	Class IIIR	●	◑	◔	◑	●	◑	◑
15	Olive Avenue Bike Lanes	Class II	●	◕	◔	◑	◑	◕	◑
16	D Avenue Bike Lanes	Class II	◑	◔	◑	●	◕	◑	◑
17	Civic Center Drive Cycle Track	Class IV	●	◔	●	◔	◔	◕	◑
18	Highland Avenue Complete Street Improvements	Class II Class IIIR	◕	◔	◕	◑	◑	◕	◑
19	19th Street Cycle Track	Class IV	◑	◔	◑	◕	◑	●	◑
20	B Avenue Bicycle Boulevard/Advisory Bicycle Lanes	Class IIIB	●	◔	◑	◔	●	◑	◑
21	Bay Marina Drive Bike Lanes	Class II	●	◔	◑	◑	◑	◕	◑
22	Roosevelt Avenue North Bike Lanes	Class II	●	◕	◔	◕	◑	◔	◑
23	16th Street Bike Lanes	Class II	●	◕	◔	◔	◕	◑	◑
24	Roosevelt Avenue South Bike Lanes	Class II	◑	◑	◔	◔	◕	◔	◔
25	21st Street Bicycle Corridor	Class IIIR	◑	◔	◔	◑	◕	◔	◔

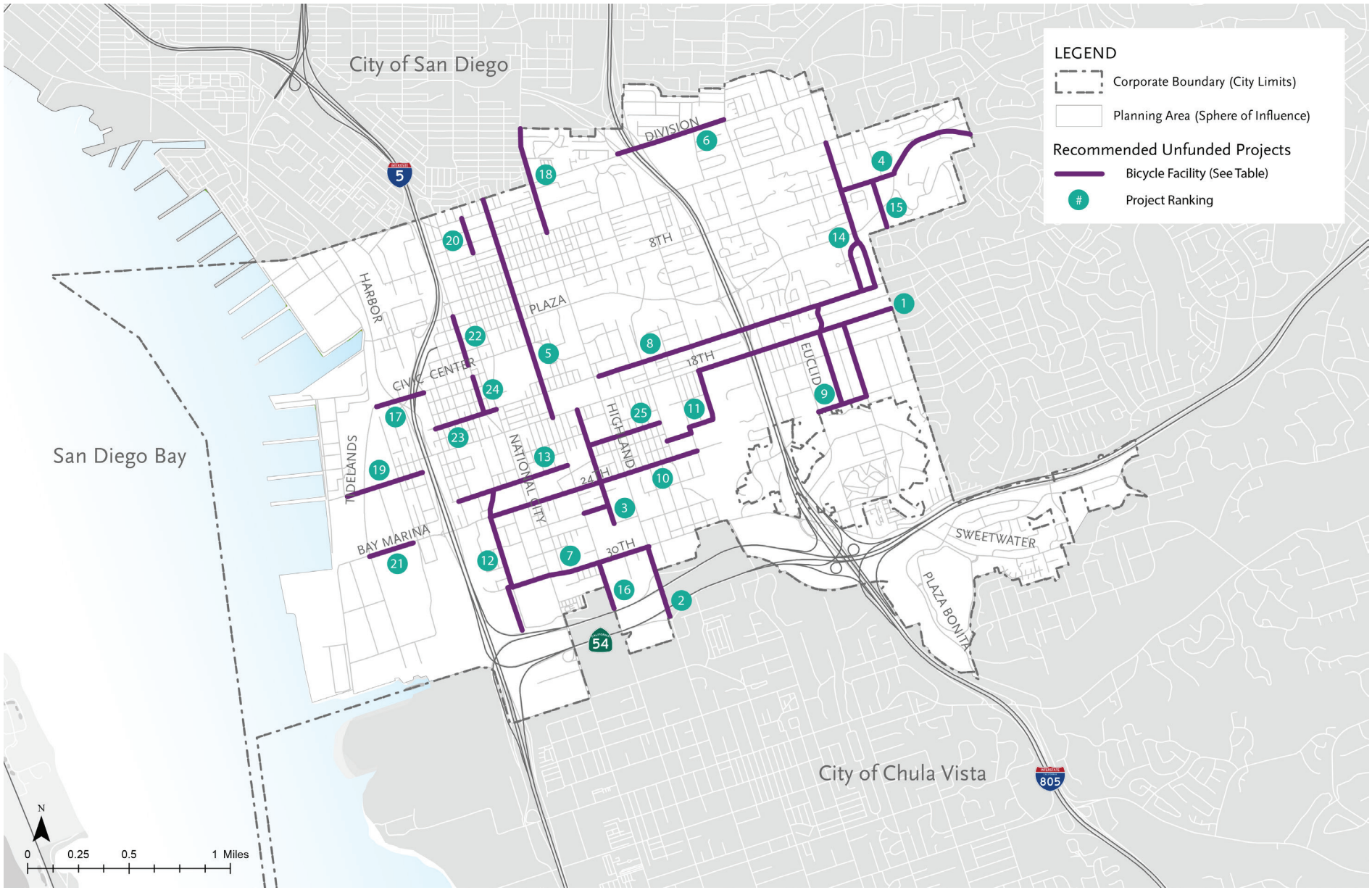


FIGURE 5-2: Recommended Unfunded Bicycle Projects

Scores for each evaluation criterion were compiled using adjustment factors to yield a composite score per project. The score for safety need was weighted the highest, and the scores for placemaking, bicycle propensity, and engineering feasibility were weighted the same. The scores for previously identified in another plan or city document and regional connectivity were both weighted slightly lower, as they are less critical factors in bicycle facility prioritization. The evaluation criteria and detailed adjustment factors are shown in Appendix A.

5.3 End of Trip and Support Facilities

Although the recommended network of routes, lanes, and paths will go a long way towards achieving the goals of making bicycling a viable mode of travel in National City, additional support is required. Support facilities and connections to other modes of transportation are essential components of a bicycle system. Improved bicycle connections with public transit will make it easier for residents to get around the city and the region while reducing the propensity for automobile use. Support facilities, such as bicycle parking racks, showers and lockers for employees, and wayfinding further enhance safety and convenience for bicyclists and encourage bicycle use. With nearly all utilitarian and many recreational bicycle trips, bicyclists need secure, well-located bicycle parking. Recent bicycle enhancement projects throughout the city have implemented new bicycle racks. However, more secure parking in strategic locations is needed to enhance the bicycling environment.

Wayfinding signage enhances the ability to navigate through a region and is an important component of multi-modal connections. Bicycle wayfinding signs can serve as guides for bicyclists to navigate the city's transportation network and to visually cue motorists that they are driving along a bicycle route. The recommended bikeway network interacts with city streets at a number of signalized intersections. Enhancements should be made to ensure that signals will change for bicyclists and give them adequate time to clear the intersection.

5.3.1 Multi-Modal Connections

Improving non-motorized access to transit is an important part of making bicycling a part of daily life in National City. Linking bicycles with public transit overcomes barriers such as trip distance, personal safety and security concerns, and riding at night, in poor weather, or up hills. This link also enables bicyclists to reach more distant locations for both recreation and utilitarian purposes.

The 8th Street and 24th Street Stations of the San Diego Trolley are located greater than one-quarter mile (which is generally considered reasonable walking distance) from key destinations, such as the Plaza Bonita Mall. Both stations also have connecting bus service, underscoring the importance of providing improved bicycling connectivity to greatly increase the potential number of riders with access to bus stops and the trolley stations. The existing network includes links to the 24th Street Station. The recommended network includes additional links to this station, as well as new bicycle enhancements to connect to the 8th Street Station. The recommended network also crosses and connects to several major bus corridors, including Highland Avenue, Plaza Boulevard, and Euclid Avenue.

Through the 2021 Regional Plan, SANDAG has developed a transportation vision that includes a mobility hub recommendation in National City. Mobility hubs are transportation centers located in smart growth areas served by high frequency transit service. They provide an integrated suite of mobility services, amenities, and technologies that bridge the distance between transit and an individual's origin or destination. SANDAG's Regional Mobility Hub Implementation Strategy identified potential mobility hub opportunities at the 8th Street Trolley Station.

As part of the ATP Cycle 6, National City was awarded funding to implement the 24th Street Transit Center Connections project. This project involves the creation of over two miles of Class IV bikeways, curb extensions near Sweetwater High School, new crosswalks with

shortened crossing distances and surface improvements, signal and timing improvements, bicycle signals, road diets, and reconstructed ADA-compliant curb ramps. The integrated components of this project seek to provide safer, easier, and more convenient active transportation access and connection to the 24th Street Transit Center, as well as the Sweetwater River Trail, Paradise Creek Apartments, and Paradise Creek Park. It is expected to be completed in 2028.

Emerging Mobility and Micromobility

National City is committed to leveraging the continued advancements in emerging mobility and micromobility as tools for its smart growth and climate action goals. Emerging mobility and micromobility provide additional access to the bicycle network and opportunities for links with transit. Encouraging the use of micromobility by developing programs, facilities, and connected paths will support the overall bicycle network. Similarly, integrating emerging mobility into the transportation network by investigating new technologies and programs can support alternative and active modes of transportation, such as bicycling.

The city is addressing multi-modal connections in current projects and plans. The Homefront to Waterfront Project addresses the need to support existing mobility services and incentivize the development and use of new mobility options. Some of the recommendations in the plan include the creation of mobility hubs/mini hubs that will connect transit, rideshare, micromobility services, Neighborhood Electric Vehicles (NEVs), and other bicycle facilities. The vision of these hubs is to provide and improve access to transit stops, bicycle parking, and micromobility parking, and to include wayfinding, greening, and other improvements to enhance the experience at these locations and encourage their use. Figure 5-3 illustrates potential intersection and midblock hubs.

5.3.2 Parking

During public engagement, community members consistently stated that parking and end of trip facilities limit their ability to use bicycles for short trips. Most of these short trips involve destinations - such as shops, restaurants, or schools – where people must leave their bicycles outside as they spend time inside at the destination. As indoor locations generally do not allow bicycles, community members may be unable to use their bicycles for trips that are accessible via bikeways but do not have bicycle parking infrastructure. Community members have noted that bicycle parking facilities would be especially beneficial at private land uses, such as supermarkets, apartment complexes, pharmacies, strip malls, and restaurants/fast food locations. This input directly correlates with the Transportation Element's policies T-2.2, T-2.4, T-3.3, and T-10.3 as stated in Section 2.5.

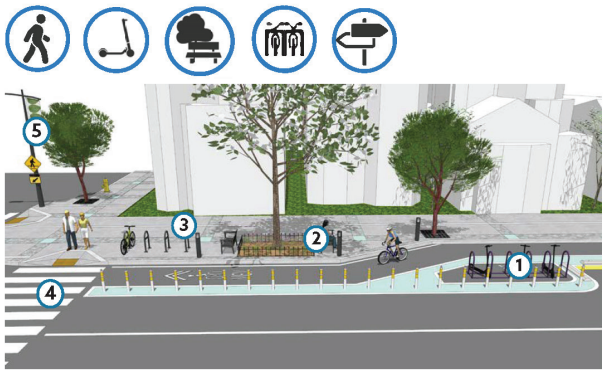
National City currently has 76 bicycle racks, as shown in Figure **3-5**. As more bikeways are implemented, the need for bicycle parking will continue to increase. **To meet current and future demand, the city should increase the number of public bicycle parking facilities by 30% by 2030.**

Bicycle parking location recommendations have been developed based upon proximity to land uses that attract bicycle trips, including transit hubs and activity centers. The following locations would benefit from new or expanded bicycle parking facilities:

- Public transit stations, such as the 8th Street and 24th Street Trolley Stations
- Recreation areas, such as Kimball Park, Las Palmas Park, Pepper Park, and El Toyon Park
- Schools, such as National City Middle School, Sweetwater High School, El Toyon School, and Southwestern Community College

FIGURE 5-3: Homefront to Waterfront Mobility/Mini Hub Typologies

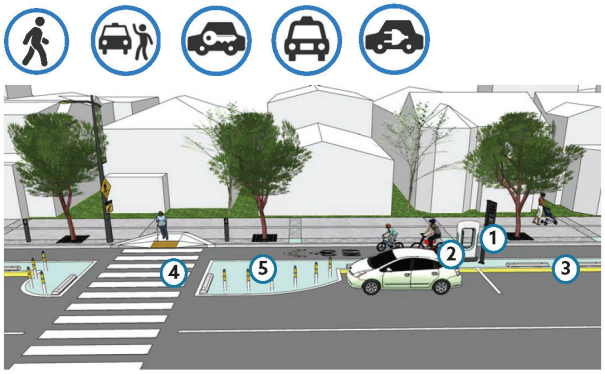
SIMPLE INTERSECTION MOBILITY MINI HUB



1. Shared Micro-mobility Parking Zone
2. Placemaking: Seating with Shade
3. Additional Off-street Bike Parking
4. High-visibility Crosswalk
5. Way-finding/ Community Branding

Downtown San Diego

MID-BLOCK MOBILITY MINI HUB

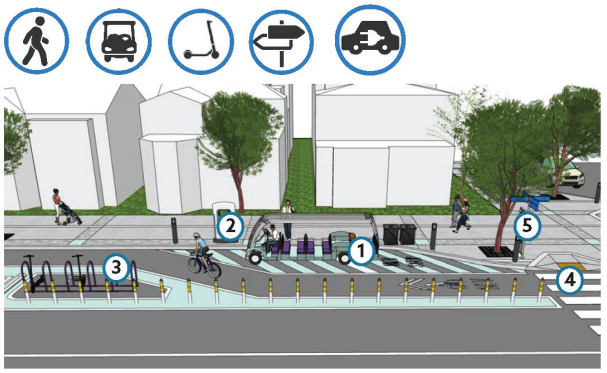


1. Shared Ride Loading/Drop-off Zone
2. Electric Vehicle Charging Station
3. Car-share Parking
4. High-visibility Mid-block Crosswalk
5. Parking Safety Painted Bulbout

Downtown San Diego

Downtown Denver, CO

TRANSIT/NEV MOBILITY MINI HUB AT INTERSECTION



1. NEV *(Neighborhood Electric Vehicle)* Station
2. NEV Charging Station
3. Shared Micro-mobility Parking Zone
4. High-visibility Crosswalk
5. Way-finding/ Community Branding

Downtown Denver, CO

Source: Homefront to Waterfront plan

» Commercial/office areas, such as the shopping centers on Plaza Boulevard and Sweetwater Road and the Plaza Bonita Mall

» The Downtown and Westside Specific Plan areas

It is recommended that more secure bicycle parking options, such as bicycle lockers, be provided at particularly high-activity locations such as transit stations. For guidance on bicycle parking design, installation standards, and types of short- and long-term bicycle parking options, please refer to Appendix B.

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Chapter 6
Design Guidelines

6.1 Design Guidelines

The design guidelines presented hereafter provide an exhaustive range of options for bicycle and trail treatments. Design guidelines are intended to be flexible and should be applied with professional judgment by designers, planners, and engineers. These guidelines do not specify what the city will implement on any given project, but rather provide a framework. Specific national and state guidelines are identified in this document, as well as a compilation of best practices.

The following key principles should be observed:

- The bicycle and trail network should enhance safety. Bicycle routes, pathways, and crossings should be designed, built, and maintained to be free of hazards and to minimize conflicts with external factors such as noise, vehicular traffic, and protruding architectural elements.
- The bicycle and trail network should be accessible. Bicycle routes, pathways, and crossings should ensure the mobility of all users by accommodating the needs of people regardless of age or ability.
- The bicycle and trail network should connect to key destinations. Convenient connections should be established between homes, schools, shopping districts, public services, recreational areas, and transit.
- The bicycle and trail network should be clearly identified and easy to use. Bicycle routes, pathways, and crossings should be signed and striped such that users can easily find a direct route to a destination to minimize delays.
- Bicycle and trail improvements should be economical. Improvements should be designed to achieve the maximum benefit for their cost, including implementation and maintenance costs to reduce reliance on more expensive, less environmentally friendly modes of transportation. Where possible, improvements in the public ROW should stimulate, reinforce, and connect with adjacent private improvements.

6.1.1 National and State Guidelines/Best Practices

Federal Guidelines

- American Association of State Highway and Transportation Officials. (2018). AASHTO Policy on Geometric Design of Highways and Streets, 7th Edition. Washington, DC. https://store.transportation.org/item/collectiondetail/180
- American Association of State Highway and Transportation Officials. (2012). AASHTO Guide for the Development of Bicycle Facilities, 4th Edition. Washington, DC. https://store.transportation.org/Item/CollectionDetail?ID=116
- Federal Highway Administration. (2009). Manual on Uniform Traffic Control Devices (MUTCD). Washington, DC. http://mutcd.fhwa.dot.gov
- United States Access Board. (2013). Public Rights-of-Way Accessibility Guidelines (PROWAG). Washington, D.C. https://www.access-board.gov/files/prowag/PROW-SUP-SNPRM-2013.pdf

State and Local Guidelines

- California Department of Transportation. (2020). Highway Design Manual (HDM), Chapter 1000: Bicycle Transportation Design. https://dot.ca.gov/-/media/dot-media/programs/design/documents/chp1000-a11y.pdf
- California Department of Transportation. (2018). California Manual of Uniform Traffic Control Devices for Streets and Highways, Part 9: Traffic Controls for Bicycle Facilities https://dot.ca.gov/-/media/dot-media/programs/safety-programs/documents/ca-mutcd/rev6/camutcd2014-part9-rev6.pdf
- California Department of Transportation. (2005) Pedestrian and Bicycle Facilities in California: A Technical Reference and Technology Transfer Synthesis for Caltrans Planners and Engineers. https://

dot.ca.gov/-/media/dot-media/programs/safety-programs/documents/ped-bike/f0018152-technical-reference-a11y.pdf

» National City Focused General Plan Update (2022). https://www.nationalcityca.gov/government/community-development/planning/focused-general-plan-update

» San Diego Association of Governments (2010). San Diego Regional Bicycle Plan. https://www.sandag.org/-/media/SANDAG/Documents/PDF/projects-and-programs/bikeways-and-walkways/regional-bike-plan/san-diego-regional-bike-plan-riding-to-2050.pdf

» San Diego Association of Governments. (2015). Wayfinding Design Guidelines. San Diego Regional Bike Network. https://issuu.com/fehrandpeers/docs/sandag_bikewayfinding_dg

Best Practices

» Alta Planning + Design and the Initiative for Bicycle & Pedestrian Innovation (IBPI). (2009). Fundamentals of Bicycle Boulevard Planning & Design. https://nacto.org/wp-content/uploads/2012/06/Alta-and-IBPI.-2009.pdf

» Association of Pedestrian and Bicycle Professionals (APBP). (2010). Bicycle Parking Design Guidelines, 2nd Edition. https://www.apbp.org/Publications

» APBP. (2015). Essentials of Bike Parking: Selecting and Installing Bike Parking that Works. https://www.apbp.org/assets/docs/EssentialsofBikeParking_FINA.pdf

» Caltrans. (2018). Complete Streets Elements Toolbox Version 2.0. https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/f0020348_complete-streets-elements-toolbox-a11y.pdf

» City of Berkeley. (2017). Bicycle Facility Design Toolbox. https://www.cityofberkeley.info/berkeleybikeplan/

» City of Chicago and the Pedestrian and Bicycle Information Center (PBIC). (2002). Bike Lane Design Guide. https://www.chicago.gov/content/dam/city/depts/cdot/bicycling/publications/bike_lane_design_guide.pdf

» City of Oakland. (2017). Design Guidelines for Bicycle Wayfinding Signage. http://www2.oaklandnet.com/oakca1/groups/pwa/documents/report/oak025118.pdf

» City of Portland Bureau of Transportation. (2010). Portland Bicycle Master Plan for 2030. http://www.portlandonline.com/transportation/index.cfm?c=44597

» Federal Highway Administration. (2005). Report HRT-04-100, Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations. https://www.fhwa.dot.gov/publications/research/safety/04100/04100.pdf

» Federal Highway Administration. (2001). Designing Sidewalks and Trails for Access. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalk2/pdf.cfm

» United States Access Board. (2014). Accessibility Standards for Federal Outdoor Developed Areas https://www.access-board.gov/files/aba/guides/outdoor-guide.pdf

» Federal Highway Administration. (2015). Separated Bike Lane Planning and Design Guide. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/separated_bikelane_pdg/page00.cfm

» Institute of Transportation Engineers Pedestrian and Bicycle Task Force. (2002). Innovative Bicycle Treatments. https://trid.trb.org/view/724395

» King, Michael, for the Pedestrian and Bicycle Information Center. (2002). Bicycle Facility Selection: A Comparison of Approaches. Highway Safety Research Center, University of North Carolina – Chapel Hill. https://nacto.org/wp-content/uploads/2011/03/Bicycle-Facility-Selection-A-Comparison-of-Approaches-2002.pdf

- Los Angeles County Metropolitan Transportation Authority (Metro). (2014). First Last Mile Strategic Plan and Planning Guidelines. http://media.metro.net/docs/First_Last_Mile_Strategic_Plan.pdf
- Minnesota Department of Transportation. (2020). Bicycle Facility Design Manual. http://www.dot.state.mn.us/bike/bicycle-facility-design-manual.html
- National Association of City Transportation Officials (NACTO). (2014). Urban Bikeway Design Guide. https://nacto.org/publication/urban-bikeway-design-guide/
- NACTO. (2017). Designing for all Ages and Abilities: Contextual Guidance for High-Comfort Bicycle Facilities. https://nacto.org/wp-content/uploads/2017/12/NACTO_Designing-for-All-Ages-Abilities.pdf
- Rosales, Jennifer. (2006). Road Diet Handbook: Setting Trends for Livable Streets.

- All bikeway facilities are required, at a minimum, to meet the design guidelines outlined in the Caltrans Highway Design Manual and the California MUTCD. When considering design treatments not approved by the California MUTCD or the Highway Design Manual, National City must follow the protocol for testing innovative treatments specified by the State.

6.2 The Bicycle as a Design Vehicle

Similar to motor vehicles, bicyclists and their bicycles come in a variety of sizes and configurations. There are a variety of vehicle types, such as conventional bicycles, tandem bicycles, and recumbent bicycles. The behavioral characteristics and comfort levels of the bicyclists riding the vehicles also varies. When designing a bicycle facility, consideration should be given to vehicle types and skill levels of the bicyclists projected to use the facility.

6.2.1 Physical Dimensions

The operating space and physical dimensions of a typical adult bicyclist are shown in Figure 6-1. Clear space is required for the bicyclist to be able to operate within a facility. This constraint is why the minimum operating width for the facility is greater than the physical dimensions of the bicyclist. Although four feet is the minimum acceptable operating width, five feet or more is recommended. Outside of the design dimensions of a typical bicycle there are many commonly used pedal driven cycles and accessories that should be considered when planning and designing bicycle facilities.

Table 6-1 summarizes the typical dimensions for most commonly used bicycle design vehicles.

The most common types of bicycles, including tandem bicycles, recumbent bicycles, and trailer accessories are depicted in Figure 6-2 on page 68.

FIGURE 6-1: Standard Bicycle Rider Dimensions

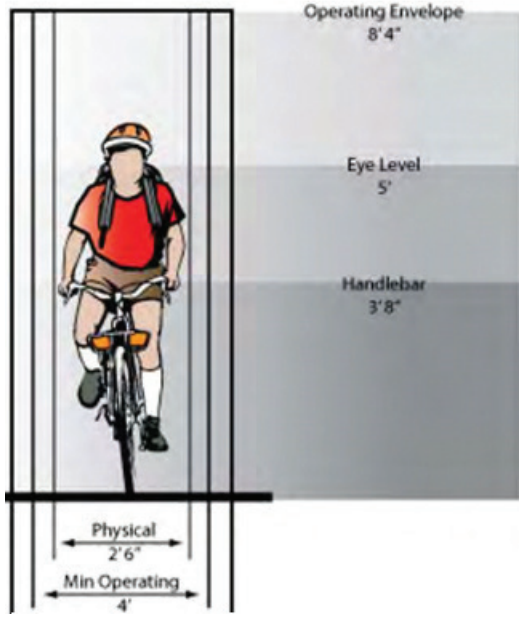
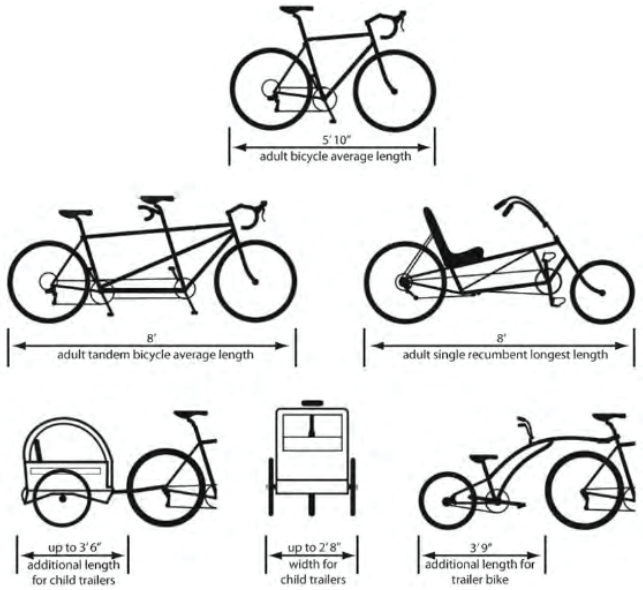


TABLE 6-1: Bicycle as Design Vehicle – Typical Dimensions

Bicycle Type	Feature	Typical Dimensions
Upright Adult Bicyclist	Physical width	2 ft 6 in
	Operating width (Minimum)	4 ft
	Operating width (Preferred)	5 ft
	Physical length	5 ft 10 in
	Physical height of handlebars	3 ft 8 in
	Operating height	8 ft 4 in
	Eye height	5 ft
	Vertical clearance to obstructions (tunnel height, lighting, etc.).	10 ft
	Approximate center of gravity	2 ft 9 in to 3 ft 4 in
Recumbent Bicyclist	Physical length	7 ft
	Eye height	3 ft 10 in
Tandem Bicyclist	Physical length	8 ft
Bicyclist with child trailer	Physical length	10 ft
	Physical width	2 ft 6 in
Hand Bicyclist	Eye height	2 ft 10 in
Inline Skater	Operating width (sweep width)	5 ft

FIGURE 6-2: Various Bicycle Dimensions



6.2.2 Design Speed

The speed that various types of bicyclists can be expected to maintain under various conditions can also have influence over the design of facilities such as shared use paths. Table 6-2 provides typical speeds of various types of bicyclists for a variety of conditions.

TABLE 6-2: Bicycle as Design Vehicle – Design Speed Expectations

Bicycle Type	Feature	Typical Speed
Upright Adult Bicyclist	Paved level surfacing	15 mph
	Crossing Intersections	10 mph
	Downhill	30 mph
	Uphill	5-12 mph
Recumbent Bicyclist	Paved level surfacing	18 mph

6.2.3 Types of Bicyclists

The skill level of the bicyclist also impacts speeds and behavioral characteristics. There are several systems of classification currently in use within the bicycle planning and engineering professions. Classification systems are helpful in understanding the characteristics and infrastructure preferences of different bicyclists. However, it should be noted that classifications may change in type or proportion over time as infrastructure and culture evolve. Often, an instructional course can instantly turn a less confident bicyclist into one that can comfortably and safely share the roadway with vehicular traffic. Bicycle infrastructure should be planned and designed to accommodate as many user types as possible, with particular attention to the least confident users. Separate or parallel facilities should be considered to provide a comfortable experience for the greatest number of bicyclists.

The 2019 FHWA Bikeway Selection Guide identifies the following classification system for bicycle user types:

- Highly Confident Bicyclist (Very low percentage of population) – Characterized by bicyclists who generally choose the most direct route to a destination, even if it means riding in mixed traffic and/or on roadways with higher vehicle speeds and volumes. While these bicyclists often enjoy separated bikeways, they may avoid facilities they perceive to be too crowded with pedestrians or slower bicyclists or those that would involve deviating from a direct route to their destination.
- Somewhat Confident Bicyclist (5-9% of population) – This user group is typically comfortable riding on most types of bicycle facilities, but usually prefer low traffic streets or separated bicycle lanes on higher volume streets when available. These riders may tolerate higher levels of traffic stress for short periods if it saves them from taking a non-direct route.

» Interested But Concerned (51-56% of population) – This user group comprises the majority of the bicycling population and represents bicyclists who have the lowest tolerance for traffic stress. These bicyclists tend to generally avoid bicycling except on separated bikeways or very low-volume streets with safe crossings.

6.3 Routine Accommodation of Bicyclists (Complete Streets)

Bicyclists have legal access to all public streets in National City. While this Bicycle Master Plan identifies a specific subset of streets to be designated as bikeways, many bicyclists will need to use other streets to reach their destinations. Therefore, it is important that all roadways be designed to accommodate bicyclists. The California Complete Streets Act of 2008 (AB 1358) mandates that cities plan for all users of roadways:

Commencing January 1, 2011, upon any substantive revision of the circulation element, the legislative body shall modify the circulation element to plan for a balanced, multimodal transportation network that meets the needs of all users of streets, roads, and highways for safe and convenient travel in a manner that is suitable to the rural, suburban, or urban context of the general plan.…

For purposes of this paragraph, "users of streets, roads, and highways" means bicyclists, children, persons with disabilities, motorists, movers of commercial goods, pedestrians, users of public transportation, and seniors.

FIGURE 6-3: Bicycle Lanes on One Side with Painted Buffer and Parallel Parking (72’ ROW, 60’ Curb to Curb)

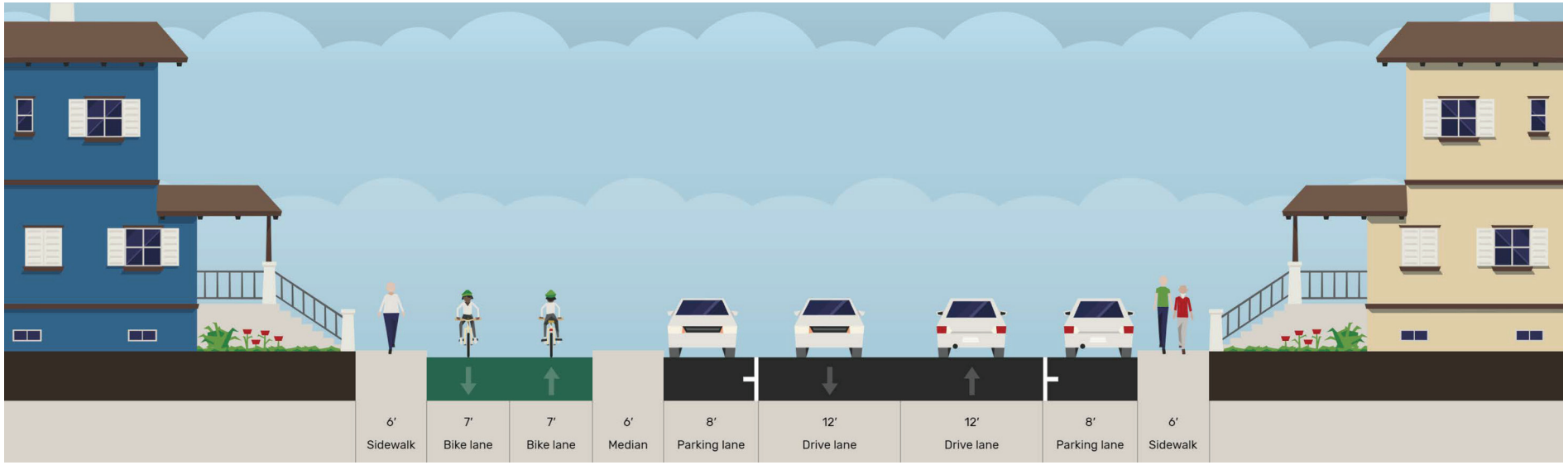


FIGURE 6-4: Bicycle Lanes with Angled and Parallel Parking and Painted Buffers on Both Sides (80’ ROW, 64’ Curb to Curb)

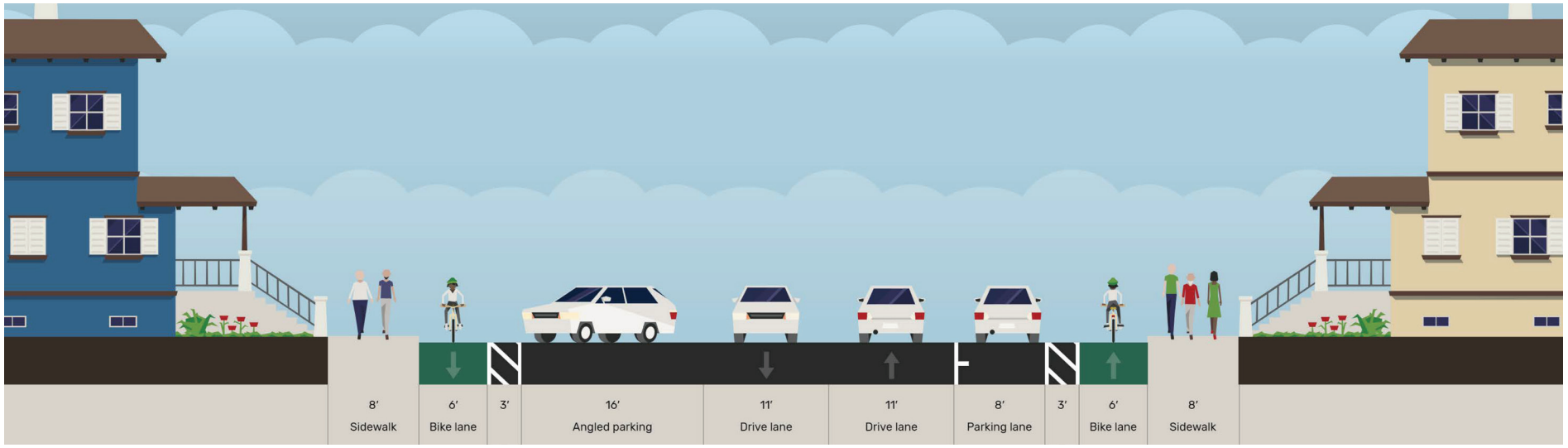


FIGURE 6-5: Bicycle Lanes with Raised Medians on Both Sides (80’ ROW, 64’ Curb to Curb)

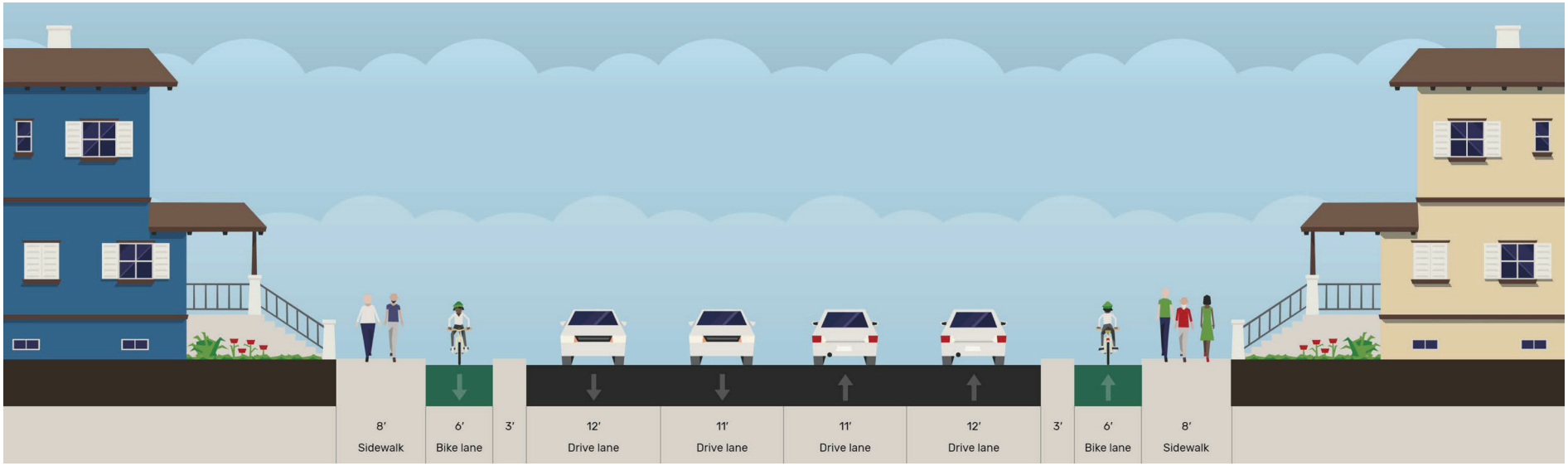


FIGURE 6-6: Bicycle Lanes with Parallel Parking and Painted Buffers on Both Sides (80’ ROW, 64’ Curb to Curb)

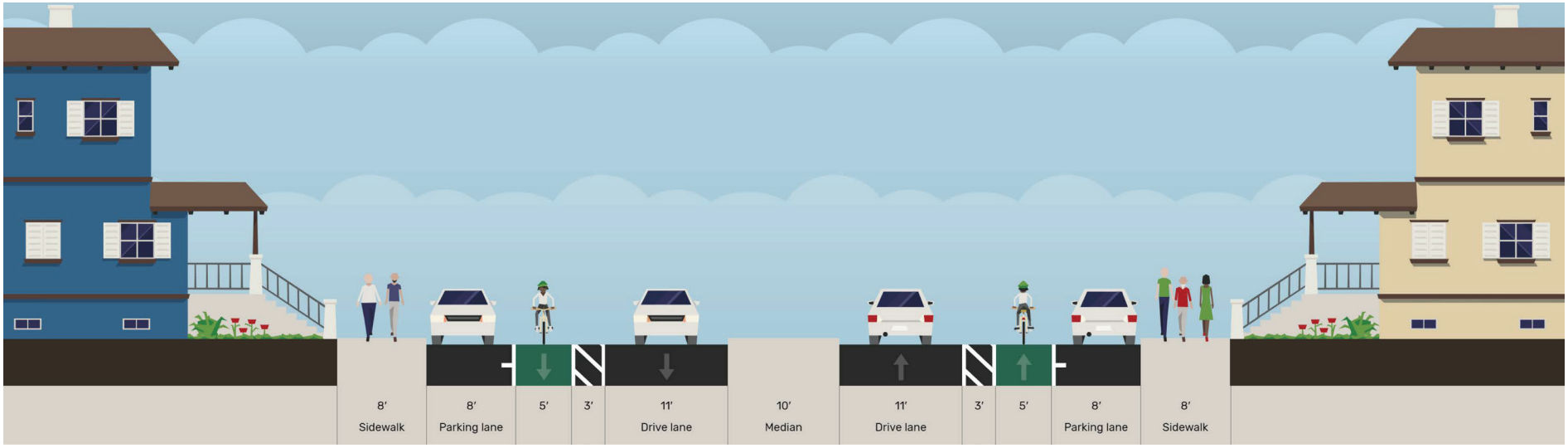


FIGURE 6-7: Bicycle Lanes with Painted Buffers on Both Sides and Median (100’ ROW, 80’ Curb to Curb)

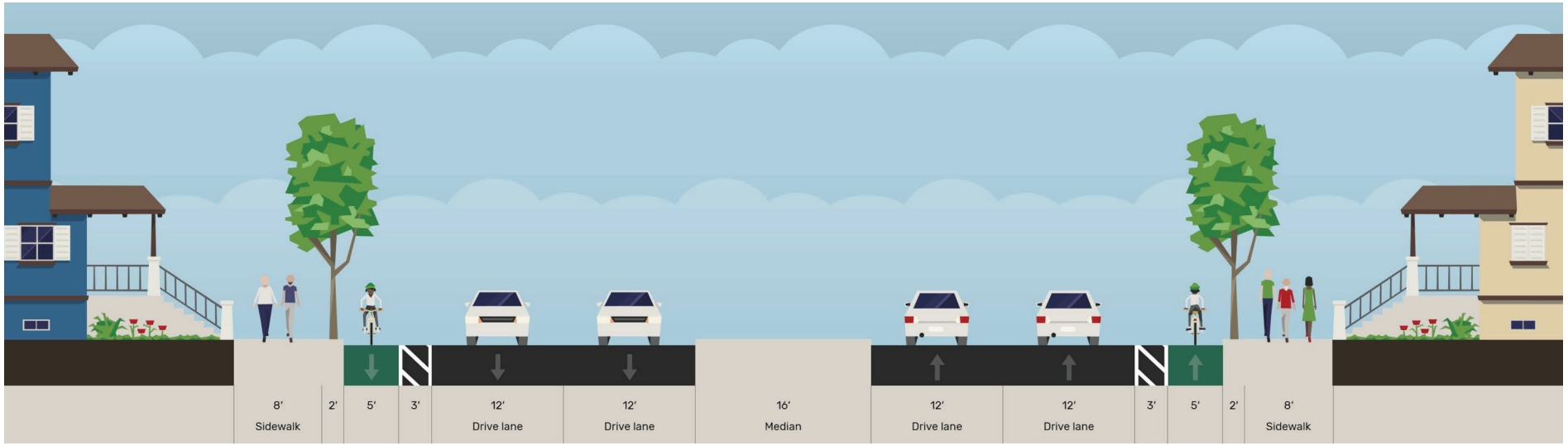


FIGURE 6-8: Bicycle Lanes with Parallel Parking on Both Sides (80’ ROW, 48’ Curb to Curb)

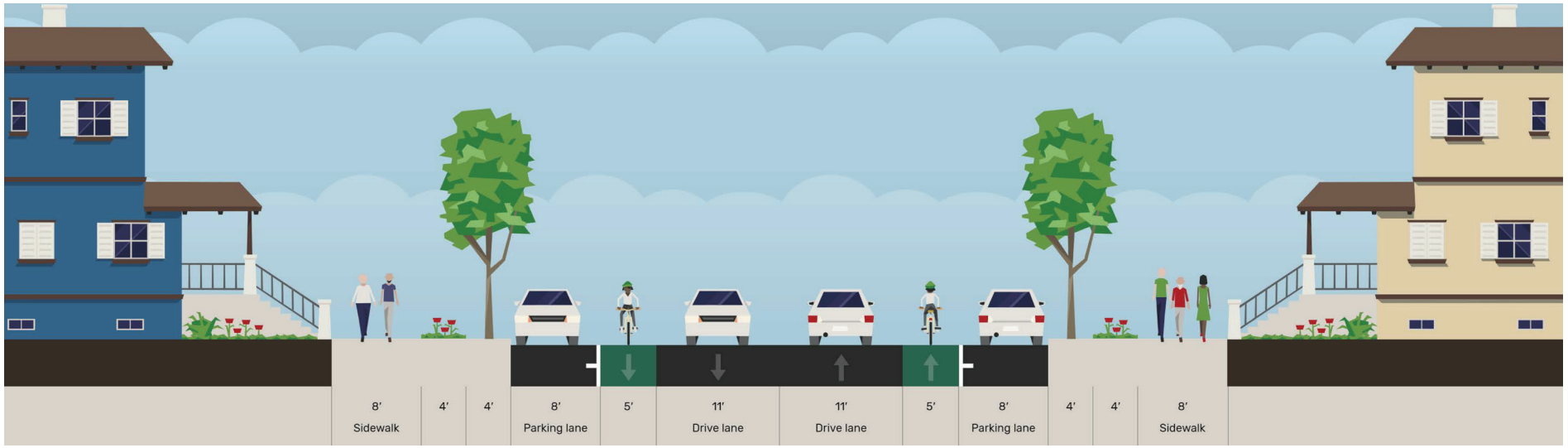


FIGURE 6-9: Bicycle Lanes with Painted Buffers and Parallel Parking on Both Sides (100’ ROW, 64’ Curb to Curb)

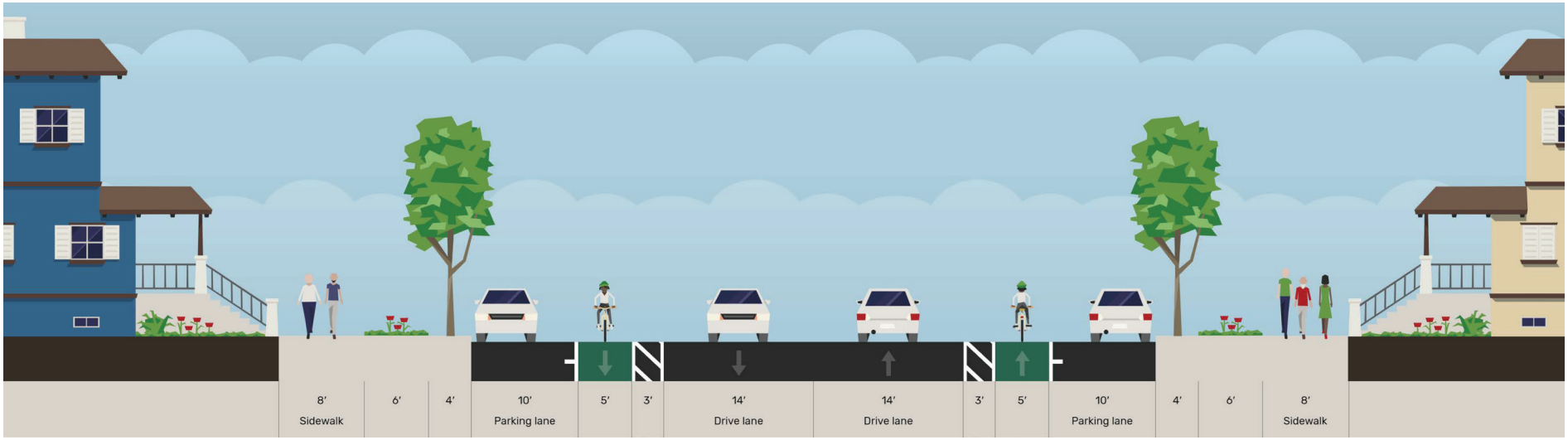


FIGURE 6-10: Bicycle Lanes with Parallel Parking on Both Sides and Median (80’ ROW, 60’ Curb to Curb)

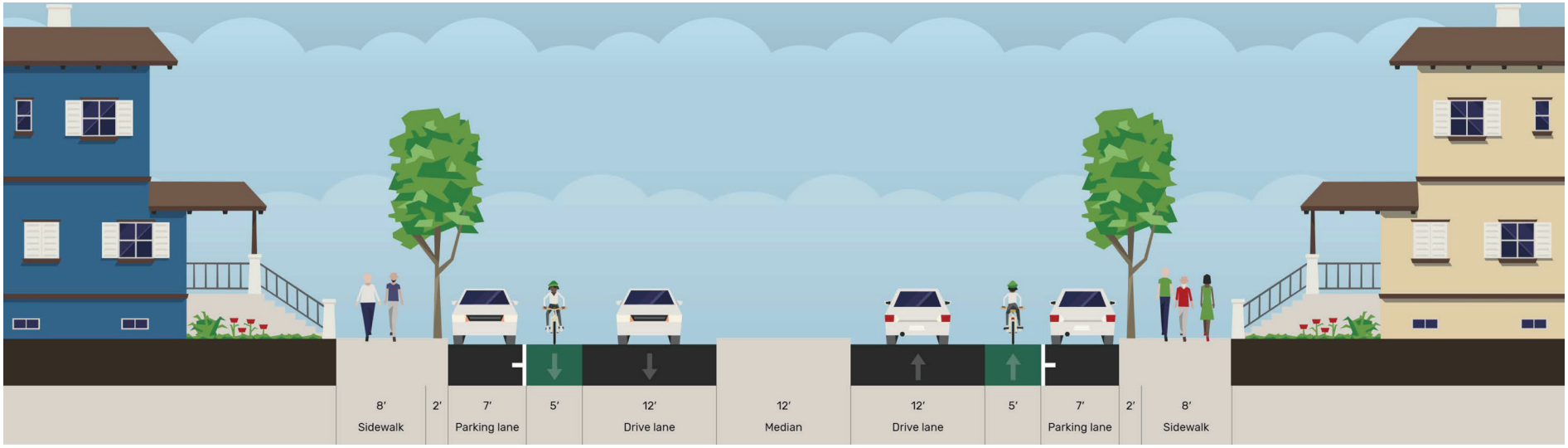


FIGURE 6-11: Bicycle Lanes on One Side with Buffer (80' ROW, 54' Curb to Curb)

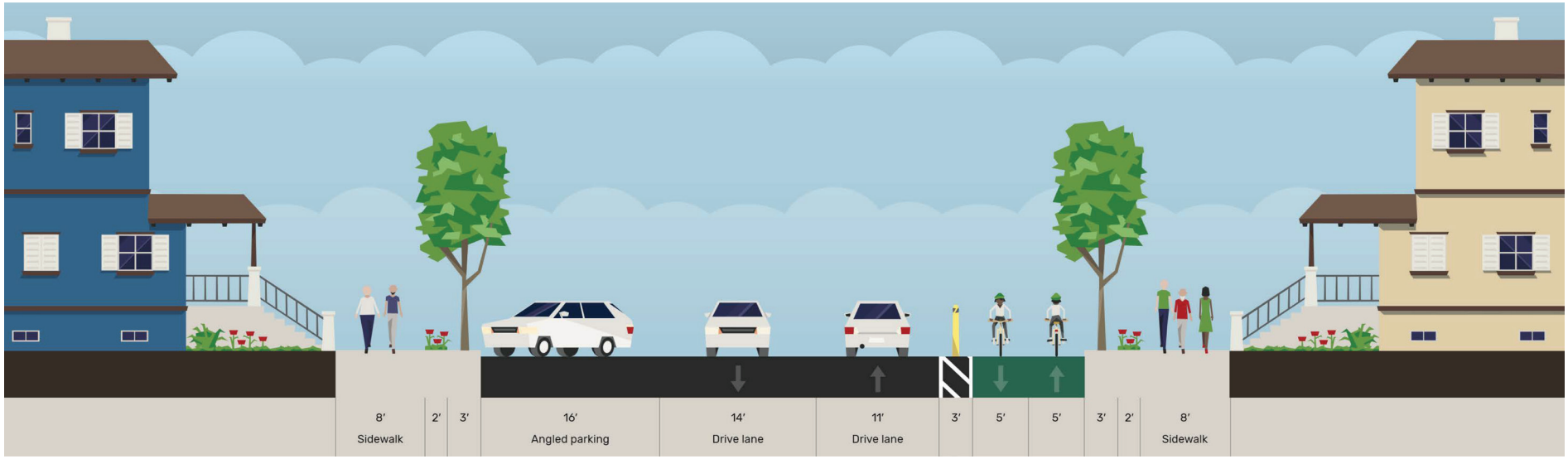


FIGURE 6-12: Bicycle Lanes on One Side with Buffer (80' ROW, 48' Curb to Curb)

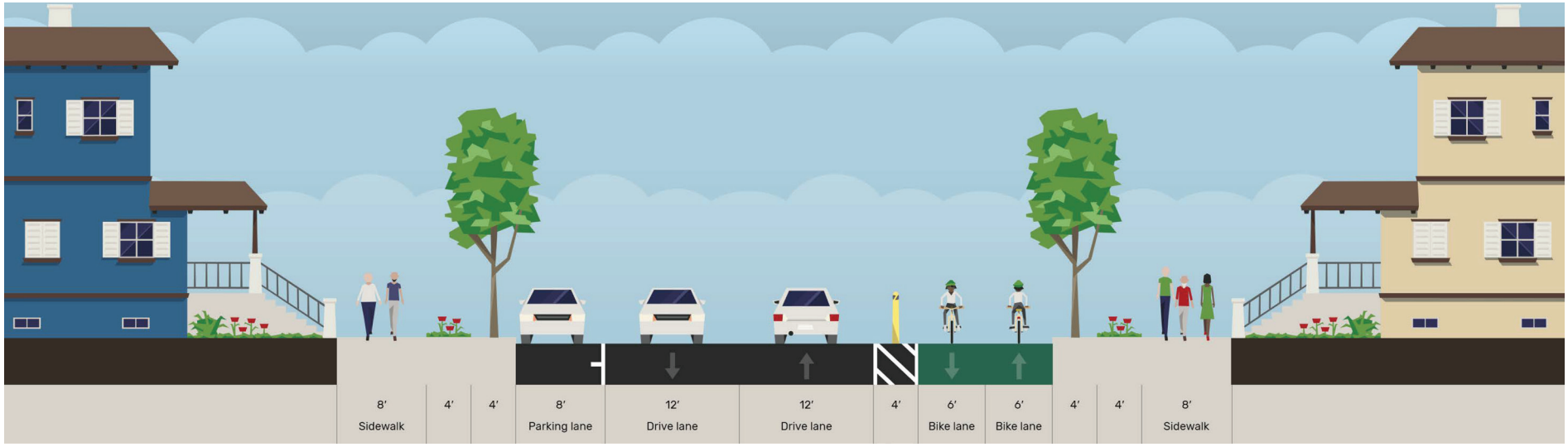


FIGURE 6-13: Multi-Use Path on One Side with Parallel Parking (60’ ROW, 40’ Curb to Curb)

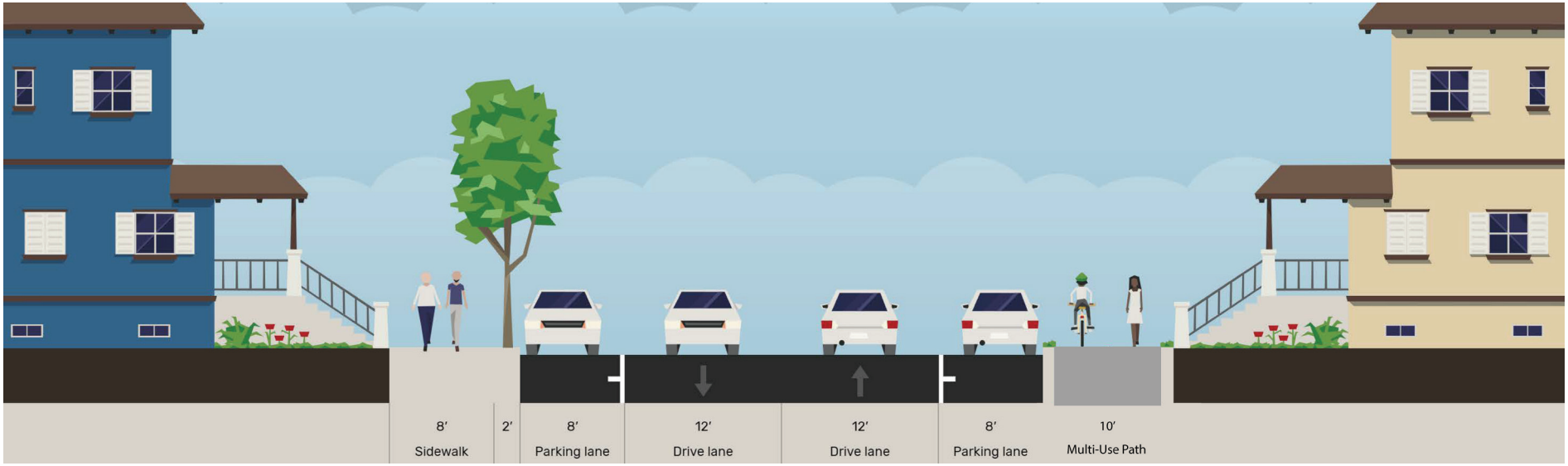


FIGURE 6-14: Bicycle Lanes with Painted Buffers and Parallel Parking on Both Sides, Center Turn Lane (80’ ROW, 64’ Curb to Curb)

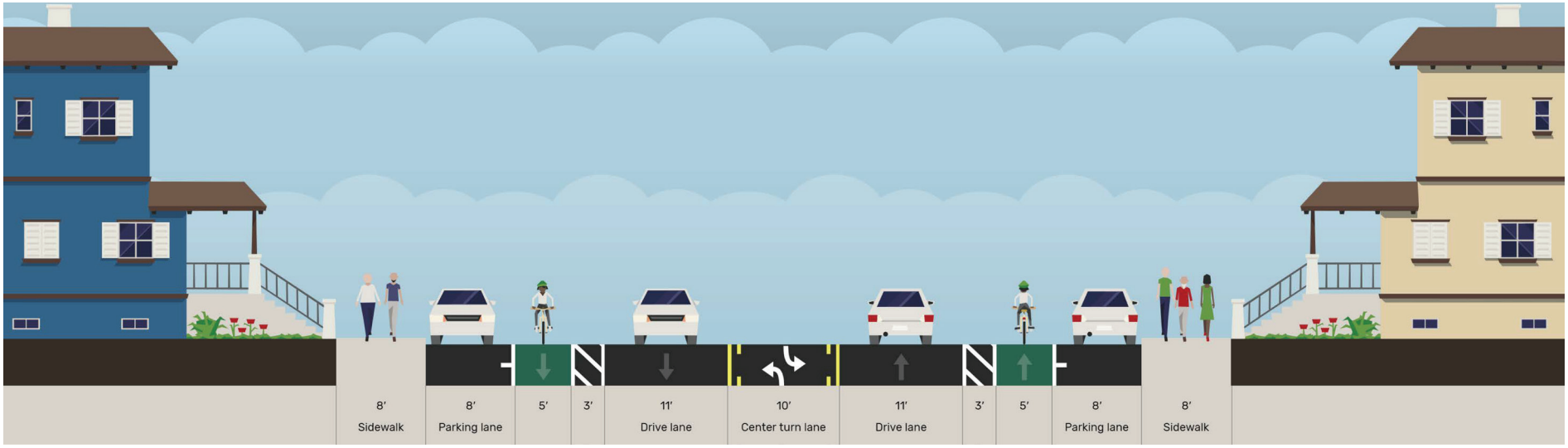


FIGURE 6-15: Bicycle Lanes with Buffers and Parallel Parking on Both Sides, Center Turn Lane (80' ROW, 64' Curb to Curb)

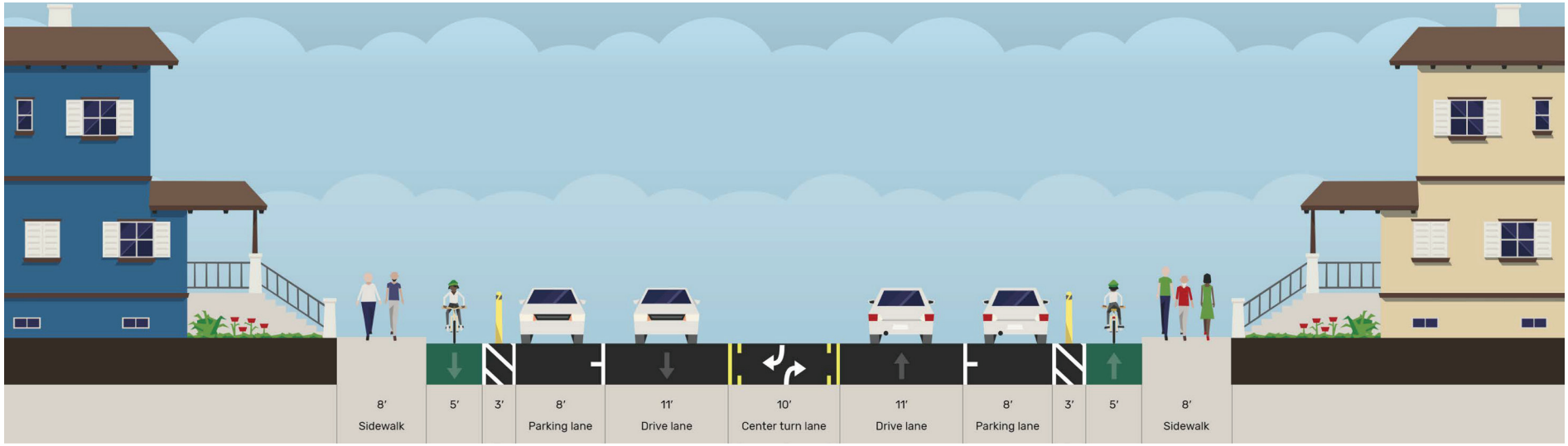
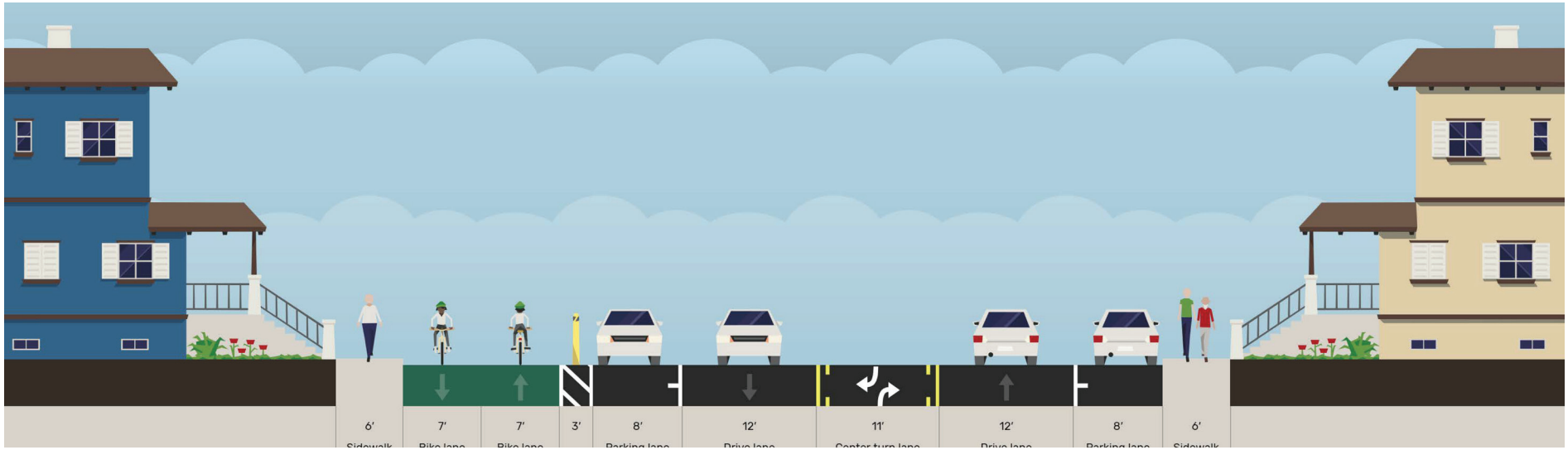


FIGURE 6-16: Bicycle Lanes on One Side with Buffer and Parallel Parking (80' ROW, 68' Curb to Curb)



6.4 Community Corridors

National City's Focused General Plan Update includes a variety of roadway types designed to better accommodate pedestrians and bicyclists. Referred to as "Community Corridors," these roadways represent complete streets with emphasis on traffic calming, streetscape enhancements, and improved walkability/bicycle access. Figure 3-7 on page 33 illustrates the Community Corridor network. Figures 6-3 through 6-16 illustrate options for reconfiguring roadways to enhance bicycle access. In many cases, it may be necessary to use minimum travel and turn lane widths in order to accommodate bike lanes. Whether or not minimum lane widths are acceptable should be determined on a case-by-case basis through sound engineering judgment and analysis of various site-specific factors including traffic speeds, parking demand and turnover, bus and truck volumes, etc.

6.5 On-Street Bicycle Facility Design Guidelines

There are a variety of bicycle facilities and treatments available based on the desired level of protection or separation from automobile traffic. This section summarizes best practices for on-street bicycle facility design.

6.5.1 Facility Selection

There are a variety of techniques for selecting the appropriate type of facility or treatment. Roadway characteristics typically considered include:

- Motor vehicle speeds and volumes
- Presence of heavy vehicles/trucks
- Roadway width
- Parking
- Demand for bicycle facilities/user preference
- Land use - urban or rural context

Figure 6-17 on page 78 provides guidance from the FHWA's 2019 Bikeway Selection Guide for how ADT and auto speed can influence preferred bikeway types for a location or corridor. The guide states that roads with higher speeds and ADT generally work best with more protective bikeways, while shared lanes or bicycle boulevards work best on roads with the lowest speeds and ADT. Bicycle lanes are best for roads with low speeds and low to moderate ADT, and separated bike lanes or shared use paths are best for roads with moderate to high speeds and high ADT. Facilities should be chosen based on anticipated comfort levels of less confident bicyclists so that people of all abilities are able to comfortably use the bicycle facilities; more protective facilities than strictly necessary may thus be recommended.

National City developed Bicycle Design Guidelines as part of the 2011 Bicycle Master Plan . Still relevant and accepted design guidance from those guidelines can be found in Appendix B. Designers should refer to these design guidelines and the latest guidance from the American Association of State Highway and Transportation Officials (AASHTO), California MUTCD, NACTO, and other design guidance documents listed in Section 6.1 and are subject to review by the City Engineer.

FIGURE 6-17: Preferred Bikeway Types Based on ADT and Speed

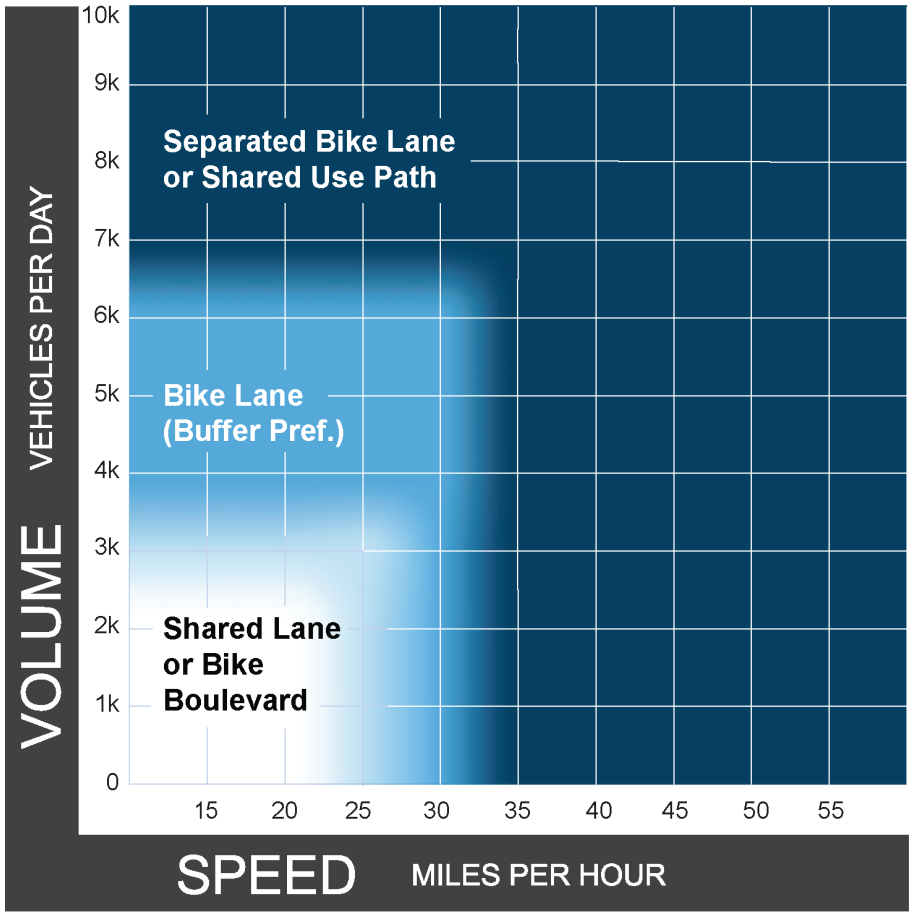


Chart assumes operating speeds are similar to posted speeds. If they differ, use operating speed rather than posted speed. Advisory bike lanes may be an option where traffic volume is <3K ADT.

Source: Bikeway Selection Guide, FHWA, 2019

Chapter 7
Recommended Programs

Improvements to bicycle facilities in National City should be complemented by programs designed to promote and encourage bicycling. The following narrative presents recommendations for education, encouragement, enforcement, and evaluation programs intended to promote bicycling and encourage the use of the infrastructure improvements set forth in the National City Bicycle Master Plan. These programs were originally developed in National City's 2011 Bicycle Master Plan; as their implementation is still critical for the city today, they have been reviewed for inclusion in the 2022 Bicycle Master Plan Update.

7.1 Safe Routes to School Toolkit

SRTS is a program with a simple goal: helping more children get to school safely by walking and bicycling. Envision active kids using safe streets, helped by engaged adults (from teachers to parents to police officers), surrounded by responsible drivers. SRTS programs use a variety of strategies to make it easy, fun, and safe for children to walk and bicycle to school. These strategies are often called the "Six Es:"

Engagement: strategies to listen to students, families, teachers, and school leaders and working with existing community organizations to build engagement opportunities.

Equity: strategies to ensure that SRTS initiatives are benefiting all demographic groups, with particular attention to ensuring safe, healthy, and fair outcomes for low-income students, students of color, students of all genders, students with disabilities, and others.

Education: programs designed to teach children about traffic safety, bicycle and pedestrian skills, and traffic decision-making.

Encouragement: programs that make it fun for kids to walk and bicycle. These programs may be challenges, incentive programs, regular events (e.g., "Walk and Bike Wednesdays"), or classroom activities.

Engineering: physical projects that are built to improve walking and bicycling conditions.

Evaluation: strategies to help understand program effectiveness, identify improvements, and ensure program sustainability.

Who is This Toolkit For?

National City supports and encourages community partners and school districts to use this SRTS Toolkit to implement broader safety initiatives around schools. This Toolkit is for any adult who wants to improve traffic safety and air quality around schools, help children be more physically active and "ready to learn," and improve our neighborhoods. Whether you are a parent, teacher, school administrator, neighbor, public health professional, city staff, or a city official, this Toolkit will provide you with facts and figures, as

Students enjoy the walk to school

A young student gets some exercise on his way home from school

Students learn pedestrian safety lessons

well as ideas, inspiration, and proven techniques. This Toolkit covers the Why, Who and How of SRTS.

History of the Safe Routes to School Movement

Based on the success of programs in New York, California, and Florida, SRTS became a nationwide effort in 2005, when Congress included a national SRTS program in the reauthorization of federal highway legislation. The program distributed $612 million in dedicated SRTS funds around the nation. As a result, every state has a SRTS coordinator and a grant program. The movement developed from a staggering decline over time in the proportion of schoolchildren walking and bicycling to school. In 1969, over 40% of schoolchildren walked or bicycled to school. Today, that number has dropped to almost 11%.[1] As fewer kids bicycled and walked, more were bused and, increasingly, driven to school. Furthermore, children suffer from a variety of problems related to physical inactivity, and over 25% of morning rush-hour traffic is parents driving children to school. Traffic safety and air quality have declined near schools. In the 1970s and 1980s, numerous European and British communities began to notice that children were no longer walking and bicycling to school. The first SRTS programs inspired similar programs in Australia, Canada, and the United States. In the US, the first SRTS programs were implemented in New York City, Florida, Marin County (CA), and Arlington (MA).

Benefits of Walking and Bicycling to School

Active kids are healthy kids, and walking or bicycling to school is an easy way to make sure that children get daily physical activity. Benefits to children include:

- Increased physical fitness and cardiovascular health
- Increased ability to focus on school
- A sense of independence and confidence

SRTS also benefits neighborhoods:

- Improved air quality as fewer children are driven to school
- Decreased crashes and congestion as fewer children are driven to school
- More community involvement as parents, teachers, and neighbors get involved and put "eyes on the street"

Schools also benefit:

- Fewer discipline problems because children arrive "ready to learn"
- Fewer private cars arriving to drop off and pick up children

[1] McDonald, N. (2007). Active Transportation to School: Trends Among U.S. Schoolchildren, 1969–2001. American Journal of Preventative Medicine. 32(6) 509–516; National Household Travel Survey (2017).

» Opportunities to integrate walking, bicycling and transportation topics into curriculum (e.g. "Walk & Bike Across America," mapping lessons, graphs and charts of distance walked or biked)

7.1.1 Overview of National City's Existing Efforts

In the early 2000s, National City partnered with the National School District, Sweetwater Union High School District, school principals, parents, volunteers, and community organizations to create a SRTS Program Task Force. The initial goal of the Task Force was to identify barriers between school zones and feeder neighborhoods that precluded many children from walking to school. These meetings provided direction for city engineers and planners to collect data, perform site evaluations and develop projects to create safe walking corridors. The efforts of the Task Force led to the completion of a number of engineering related improvements near schools to improve walking and bicycling conditions for school children. These improvements include the installation of vehicle speed feedback signs and flashing beacon combination units, vehicle speed feedback sign trailer units, pole-mounted flashing beacons, in-roadway lighted crosswalk systems, pedestrian countdown signal modules at intersections, school zone signing and striping enhancements, traffic calming bulb-outs and pedestrian refuge islands at school crosswalks, and pedestrian ramp and sidewalk improvements for schools citywide.

More recently, National City has also completed the Coolidge Avenue SRTS project and the Paradise Valley Road SRTS project, as well as a project with improvements focused in the western portion of the city. The Coolidge Avenue SRTS project, completed in 2014, implemented enhanced crosswalks with high intensity signing and striping, wider sidewalks and pedestrian curb ramps, new lighting and landscaping, traffic calming measures such as corner bulb-outs, and decorative benches and bike racks. The Paradise Valley Road SRTS project, completed in 2016, implemented a new sidewalk, curb and gutter, and lighting along the west side of Paradise Valley Road between E. 8th Street and E. Plaza Boulevard to provide a gap closure along this key walking route to/from Ira Harbison Elementary School.

Example of a permanent radar speed feedback sign

The most recent SRTS project, completed in 2023, focused on addressing pedestrian barriers. It implemented high visibility continental crosswalks, ADA-accessible ramps with truncated domes, pedestrian crosswalk signs, and sidewalk replacement at locations near several elementary schools and Granger Junior High School.

Remaining planned infrastructure improvements include traffic calming and streetscape enhancements along various corridors near schools throughout the city. In order for the SRTS efforts in National City to be well-rounded and as robust as possible, infrastructure improvements should be complemented with school, local agency, and/or parent-led efforts in the other five "Es:" engagement, equity, education, encouragement, and evaluation. The following Toolkit provides ideas and resources for implementing programs that will give parents and schoolchildren the information, confidence, and encouragement they need to make walking and bicycling to school a reality.

7.1.2 Engagement

At its core, engagement is a relationship building exercise that begins with listening. Engagement takes a longer-term approach to provid-

ing opportunities for all viewpoints to be heard, and factors this into decision making in meaningful ways. All SRTS programs should begin with listening to and asking questions of students, families, teachers, school leaders, and community organizations. Robust community engagement is important to ensuring successful SRTS initiatives and can lead to:

» More vibrant, creative programs. Diverse perspectives, cultures, and upbringings are things to be celebrated and highlighted in SRTS programming, not managed or incorporated into mainstream culture.

» Increased inclusivity and participation among the entire school community. When various perspectives are involved and listened to and programs grow, develop, and evolve with different lived experiences in mind, programs feel more accessible to people from all walks of life.

» Stronger buy-in, community champions, and ownership of changes. When community members are involved early in the process, it leads to a greater sense of ownership of a project or outcome.

» Stronger, more trusting relationships with the community that will benefit not only your SRTS program, but can lay the groundwork for lasting partnerships and lead to mutual support for future efforts.

» Using resources more efficiently and effectively. By involving community members' perspectives early on, your program and community can avoid spending money on solutions that do not meet the community's actual needs.

Community Engagement Strategies

A comprehensive engagement strategy includes efforts to:

» Make space. Invite members of the community to participate in SRTS planning and programming and actively prepare a space for them on your team. As you extend invitations to community members, be clear about how their perspective will inform the outcomes of the project and explain how you are prepared to offer mutual support for shared community goals.

» Step back. Recognize that sometimes, despite passion, content expertise, and experience, you are not the best person to lead a conversation or activity in or with a particular community. It can be more effective and respectful to let others with authentic ties to a particular community or neighborhood lead conversations, planning processes, and even programming.

» Show up for issues not related to SRTS. Attend meetings of community organizations, even when they are considering issues not relevant to SRTS, to listen, understand needs, assist with their needs, and build relationships. Ask for input about SRTS at existing community meetings and events so you aren't requiring people to attend another meeting to share their thoughts.

» Collaborate. Commit to making collaborative decisions with the input and full voice of community members.

» Share (or relinquish) decision making power. Give community members the decision-making authority to chart the course of SRTS plans and programs and effectuate change in community.

» Value differences. People experience life differently, and all lived experiences are valid. True community engagement aims to recognize, validate, and plan for the breadth of lived experiences rather than attempt to amalgamate them.

» Invest for the long run. Make investments that go beyond gifts and incentives. For example, provide skill development training and financing for joint community initiatives, share materials and supplies that can be used for other types of community events, etc.

Engagement Resources

The Safe Routes Partnership is a national nonprofit organization working to advance safe walking and rolling to and from schools and in everyday life, improving the health and well-being of people of all races, income levels, and abilities, and building healthy, thriving communities for everyone. The Safe Routes for Youth Toolkit[2] provides strategies for engaging teens, building innovative partnerships, and designing and implementing programs. The Safe Routes Partnership Community Engagement Cards[3] are a collection of arts-based activities that can be used during engagement events to spark creativity and foster community. Cards give instructions for implementing a creative community engagement activity and are meant to be easily adapted to meet the needs of participants.

Engagement in the Six "Es"

Engagement is the foundation on which all SRTS programs should be built. Meaningful engagement will inform the remaining five "Es:"

Equity: a diverse and robust engagement program provides a lens into the lived experiences and perspectives of others and helps to ensure that a SRTS program supports safe, healthy, and fair outcomes for students of color, students of all genders, students with disabilities, and others.

Education: in addition to safety education for students, SRTS programs should consider the best ways to educate the community, reaching them where they are and in the languages they speak.

Encouragement: students of color, with disabilities, and of varying sexualities and genders should see themselves represented in encouragement efforts. Leaders of these communities should be invited to participate or lead these efforts.

Students help with a Share the Road campaign

Engineering: proposed engineering changes should serve all populations, being mindful of changes that may inadvertently affect certain populations' ability to reach critical services, and prioritizing areas most in need of improvements.

Evaluation: the community should be involved in identifying evaluation methods and how to measure program success.

7.1.3 Equity

A focus on equity is a key component of supporting the creation of

[2] Safe Routes Toolkit: https://www.saferoutespartnership.org/sites/default/files/resource_files/safe_routes_for_youth_engaging_teens_in_vision_zero_final_web.pdf

[3] Safe Routes Partnership Community Engagement Cards: https://www.saferoutespartnership.org/healthy-communities/safe-routes-engagement-cards#:~:text=Weather%20Photo%20Contest-,Safe%20Routes%20Community%20Engagement%20Cards,in%20a%20variety%20of%20settings.

healthy, thriving communities for people of all ages, races, ethnicities, incomes, and abilities. The addition of this E to the SRTS strategies in recent years helps to ensure that underserved communities and schools can advance SRTS.

Practices to Promote Equity

Selection of Schools

Children from low-income families are more likely to walk to school, but often face poorer infrastructure and more safety challenges on their route to school. SRTS programs have the potential to advance equity in communities but must recognize their potential to exacerbate disparities if investments are not prioritized in low-income communities or designed to serve the needs of different demographic groups.

The 2019 National Program Assessment Report found that 60% of SRTS programs indicated they work with schools that express interest in the program.[4] Using expressed interest as a selection factor may lead to increased disparities if more affluent schools are targeted because they have more knowledge of and ability to engage with these programs. Selection should include factors that advance equity and address communities with the most need, such as economic factors.

[4] National Program Assessment Report: https://www.saferoutespartnership.org/sites/default/files/resource_files/national_srts_census_report_final.pdf

Targeted Engagement and Programming

A targeted approach is an important tool to encourage participation by a range of demographic groups. Engaging a diverse group of community members as part of the engagement strategies can help to promote activities for underserved groups and identify specific needs of different groups.

Reduce Barriers to Participation

Accessible infrastructure and tools should meet the needs of all individuals to allow for greater participation. Strategies can include providing students with free or low cost resources such as bicycles - including adaptive bicycles to allow students of all abilities and experiences to participate - helmets, locks, and skills classes and other educational tools. Ensuring that all materials are translated into languages that meet the needs of the community is also important for expanding the reach of SRTS programs and breaking down barriers to participation.

7.1.4 Education

SRTS refers to a variety of multi-disciplinary programs aimed at increasing the number of students walking and bicycling to school. Education programs are an essential component of a SRTS program. Education programs generally include outreach to students, parents and guardians, and motorists. Students are taught bicycle, pedestrian, and traffic safety skills. Parents and motorists receive

Bicycle safety education

Safe Crossing Lesson

information on transportation options and driving safely near schools.

7.1.5 Safety Education

Pedestrian and bicycle safety education aims to ensure that each child understands basic traffic laws and safety rules. Pedestrian safety education teaches children basic traffic safety rules, sign identification, and decision-making tools. Pedestrian training is typically recommended for first and second graders and teaches basic lessons such as "look left, right, and left again," "walk with your approved walking buddy," "stop, look, and listen," and "lean and peek around obstacles before crossing the street." Trained safety professionals can administer pedestrian safety in the classroom or physical education class. Classroom teachers may use established pedestrian safety curriculum, such as the curriculum taught by The Street Trust[5] to make sure children know how and where to walk and cross the street.

The San Diego County Bicycle Coalition provides a number of bicycle education resources for students of all ages.[6] Their Elementary Safety Assembly is geared for grades K-3 and covers the basics of pedestrian and bicycle safety, including a helmet fitting demonstration, bicycle safety talk, pedestrian safety talk, and interactive intersection crossing demonstration involving bicycles and pedestrians. The middle and high school workshops address the basics of riding a bicycle, including laws, bicycle handling tips, bicycle maintenance, sustainability, and health.

Safe Moves[7] is a local resource in pedestrian and bicycle safety education for children. This resource develops and provides a variety of programs, including bicycle safety seminars and rodeos, lesson plans uniquely designed for each age group and grade level, parent education, and public awareness campaigns.

Bicycle Rodeos

Bicycle Rodeos are family-friendly events that incorporate a bicycle safety check, helmet fitting, instruction about the rules of the road, and an obstacle course. Adult volunteers can administer rodeos or they may be offered through the local Police or Fire Department. Bicycles rodeos can be incorporated into health fairs, back to school events, and Walk and Bike to School days. Rodeos also provide an opportunity to check children's bicycles and instruct them on proper helmet use.

School Zone Traffic Safety Campaign

A School Zone Traffic Safety Campaign creates awareness of students walking and bicycling to school. A safety campaign is an effective way to reach the general public and encourage drivers to slow down and look for students walking and bicycling to school. A School Zone Traffic Safety Campaign uses signs and banners located near schools (for example, in windows of businesses, yards of people's homes, and print publications) to remind drivers to slow down and use caution in school zones. This campaign can be kicked off at the start of each school year or in conjunction with special events, such as Walk and Bike to School Month, which takes place in October. Banners and signs can be effective tools to remind motorists about traffic safety in school zones. Large banners can be hung over or along roadways near schools with readable letters cautioning traffic to

Bus safety campaign

[5] Bicycle Transportation Alliance safety courses: https://www.thestreettrust.org/bicycle-safety

[6] San Diego County Bicycle Coalition: https://sdbikecoalition.org/classes-workshops/

[7] Safe Moves: https://safemoves.org/

slow down, stop at stop signs, or watch for students in crosswalks with memorable messages such as: "Give Our Kids a Break," and "Drive 25, Keep Kids Alive."

Bus Safety Campaign

Many schools use buses to transport students who are too far away to walk to school. School buses are large and restrict sight lines for drivers, pedestrians, and bicyclists. It is difficult for drivers and students to see each other around school buses. Schools can implement a bus safety campaign that reminds students to walk and ride cautiously around buses and to wave and communicate to the bus driver.

7.1.6 Encouragement

Encouragement programs focus on bringing the fun back to walking and bicycling while increasing public awareness of the benefits of walking and bicycling to school. Events and activities help increase the number of students walking and bicycling to school. The activities often include a variety of special events and contests, outreach campaigns, and presentations to school and community groups. Encouragement programs can be used to educate parents, school personnel, students, and the community about the health and safety benefits of a successful SRTS program. Encouragement programs do not need much funding but their success depends on a school champion or group of volunteers for sustained support.

Walk and Bike to School Day/Week/Month

Walk and Bike to School Day/Week/Month are special events encouraging students to try walking or bicycling to school. The most well-known of these events is International Walk to School Day, a major annual event that attracts millions of participants in over 40 countries in October. Walk and Bike to School Days can be held yearly, monthly, or even weekly, depending on the level of support and participation from students, parents, and school and local officials. Some schools organize more frequent days – such as weekly Walking/Wheeling Wednesdays or Walk and Roll Fridays – to give people an opportunity to enjoy the event on a regular basis. Parents and other volunteers accompany the students and staging areas can be designated along the route to school where groups can gather and walk or bicycle together. These events can be promoted through press releases, articles in school newsletters, and posters and flyers for students to take home and circulate around the community.

Information about International Walk to School Day can be found at: http://www.walkbiketoschool.org/.

Walk and Bike to School Day celebrations

Suggested Route to School Maps

Suggested Route to School maps show stop signs, signals, crosswalks, sidewalks, trails, overcrossings, paseos, and crossing guard locations around a school. These maps can be used by families to identify the best way to walk or bicycle to school. Cities and school districts sometimes cite liability concerns as reasons to not publish walking route maps. While no walking route will ever be completely free of pedestrian safety concerns, a well-defined walking route should provide the greatest physical separation between walking students and traffic, expose students to the lowest traffic speeds, and have the fewest roadway crossings.

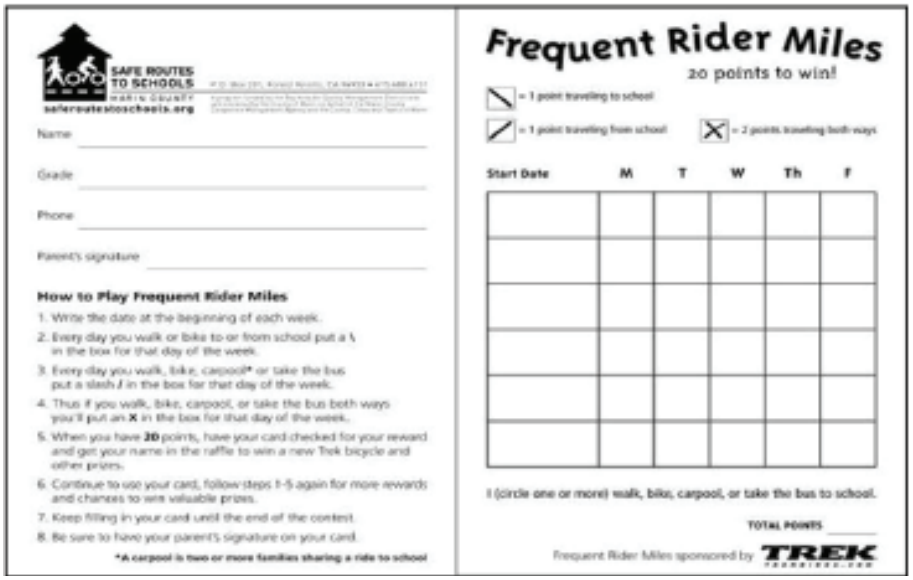
Friendly Walking/Bicycling Competitions (Incentive Programs)

Contests and incentive programs reward students by tracking the number of times they walk, bicycle, carpool, or take transit to school. Contests can be individual, classroom competitions, or inter-school competitions. Local businesses may be willing to provide incentive prizes for these activities. Students and classrooms with the highest percentage of students walking, bicycling, or carpooling compete for prizes and "bragging rights." Small incentives, such as shoelaces, stickers, and bicycle helmets, can be used to increase participation. It can also be effective to allow different grades and schools (high school vs. grade school vs. middle school) to compete against each other in a mobility challenge.

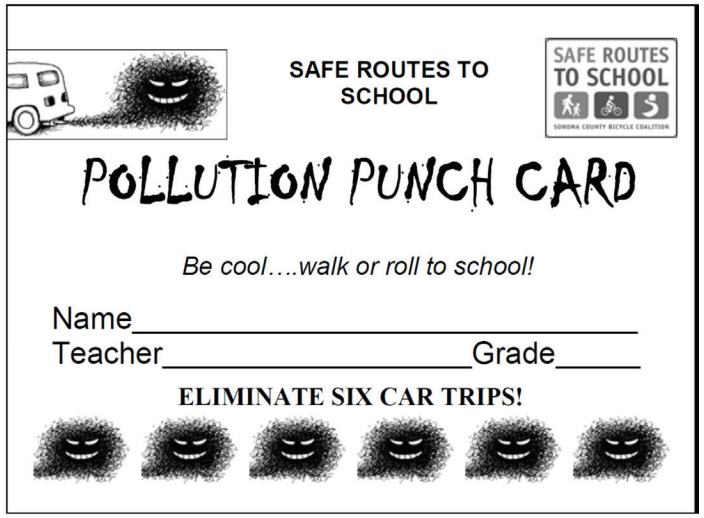
Each of the examples of programs below can be modified for students who live too far away from school to walk or bicycle. Modification can include walking or bicycling at lunch time or gym class. Students can also count miles walked or bicycled with parents and guardians outside of the school day. Examples of walking and bicycling competitions include:

On-campus walking clubs (mileage clubs) - Children are issued tally cards to keep track of "points" for each time they walk, bicycle, bus, or carpool to or from school. When they earn a specified number of points, they get a small prize and are entered in a raffle for a larger prize. At the end of the school year, there is a drawing for major prizes.

Pollution Punchcard - This year-round program is designed to encourage school children and their families to consider other options for getting to school, such as bicycling, walking, carpooling, and public transportation. Every time a student walks, bicycles, or carpools to school, a parent volunteer or school representative stamps or punches the card. Students receive a reward when the punch card is complete.



Example of a Frequent Rider Miles sheet



Example of a Pollution Punchcard

Source: Pollution Punch Card Program Guidebook, Sonoma County Safe Routes to School,2015.

Physical activities before school are part of the friendly competition

Bicycles around a school campus

Walk and Bike Challenge Week/Month - This month-long encouragement event is generally held in conjunction with National Bike Month in May. Students are asked to record the number of times they walk and bicycle during the program. The results are tallied and competing schools or classrooms compare results. Students who are unable to walk or bicycle to school because they live too far away can participate by either walking during a lunch or gym period or getting dropped off near the school and walking with their parents the last several blocks.

Golden Sneaker Award - Each class keeps track of the number of times the students walk, bicycle, carpool, or take the bus to school and compiles these figures monthly. The class that has the most participation gets the Golden Sneaker Award. The award can be created by taking a sneaker, mounting it to a board like a trophy, and spray painting it gold.

Walk Across America/California/Pacific Crest Trail - This is a year-round program and is designed to encourage school children to track the number of miles they walk throughout the year. Students will be taught how to track their own mileage through learning about how many steps or blocks are in a mile and will also learn about places in the United States on their way. Teacher or volunteer support is required. Each of these programs can use incentives to increase participation and reward the students for their efforts. Examples of incentives include:

- Shoelaces
- Dog tags
- Pedometers
- Reflective zipper pulls
- Bicycle helmets
- Raffle tickets for a bicycle from a local bicycle shop
- Early dismissal
- Extra recess time

A schoolpool map from Marin County shows area neighborhoods and student household locations

Students show their coloring job of a street scene

» Pizza parties

Back-to-School Blitz

Families set transportation habits during the first few weeks of the school year, and many families are not aware of the many transportation options available to them. As a result, most families will develop the habit of driving to school. A "Back to School Blitz" can be used at the beginning of the school year to promote bus, carpool, walking, and bicycling as school transportation options. The "Back to School Blitz" includes many of the other programs in this Toolkit, including Suggested Route Maps, articles in school newsletters, and encouragement activity. A packet can also be given to each family containing information about school transportation options, such as:

» Cover letter signed by the principal encouraging parents to create transportation habits with students that promote physical activity, reduce congestion, increase school safety, and improve air quality

» School transportation maps or suggested routes to school maps that include bicycling and walking routes, transit and school bus stops, drop-off and parking areas, and bicycle parking locations

» Transit schedules

» Pledge forms about reducing the number of times that families drive to school; entries go into a raffle for a prize donated by local businesses

In addition to the packet, the following strategies can be included:

» Table at back-to-school night with materials and trained volunteers who can answer questions about transportation issues

» Post "schoolpool map" showing all student households as dots; parents then check the corresponding school directory listing to see families located in their neighborhood who are interested in walking, bicycling, and carpooling to school together. Only families who opt into the directory are listed

» Article in first school newsletter about transportation options and resources

» Enforcement activities, such as school zone speed and crosswalk enforcement

» Strict enforcement of parking policies during first month of school (and throughout the year if possible)

Stop and Walk

This year-round campaign is designed to encourage parents to stop several blocks from school and walk the rest of the way to school.

Not all students are able to walk or bicycle to school. They may live too far away from school to walk or their route to school may include hazardous traffic situations, such as a high-speed arterial road with limited crossing opportunities. This type of campaign is used to allow students who are unable to walk or bicycle to school a chance to participate in school walking programs. It also helps reduce traffic congestion at the school.

The program can be included as a part of other encouragement activities, such as the Golden Sneaker Award, Walk Across California, and the Mileage Clubs. An additional benefit to implementing a "Stop and Walk" program is reduced traffic volume directly surrounding a school. Reducing the number of motor vehicles in the school environment increases traffic safety and encourages walking and bicycling to school.

Walking School Buses

Parents and guardians often cite distrust of strangers and the dangers of traffic as reasons why they do not allow their students to walk to school. Walking school buses are a way to make sure that children have adult supervision as they walk to school. Walking school buses are formed when a group of children walk together to school and are accompanied by one or two adults (usually parents or guardians of the children on the "bus"). As the walking school bus continues on the route to school they pick up students at designated meeting locations. Walking school buses can be informal arrangements between neighbors with children attending the same school or official school-wide endeavors with trained volunteers and structured meeting points with a pick-up timetable. A walking school bus "how to" guide is available om the National Center for Safe Routes to School.[8]

[8] National Center for Safe Routes to School "how to" guide: http://www.pedbikeinfo.org/pdf/SRTSlocal_WalkingSchoolBus_guide.pdf

Students participate in a walking school bus

Students participate in a bicycle train

Bicycle Trains

A bicycle train is very similar to a walking school bus. Groups of students accompanied by adults bicycle together on a pre-planned route to school. Routes can originate from a particular neighborhood or, in order to include children who live too far to bicycle, begin from a park, parking lot, or other meeting place. They may operate daily, weekly, or monthly. Bicycle trains help address parents' concerns about traffic and personal safety while providing a chance for parents and children to socialize and be active. Bicycle trains are best suited for older students who have undergone bicycle safety training. Helmets and parent waivers should be required before participating in a bicycle train.

7.1.7 Engineering Tools

The environment near the school is often a determining factor when a parent or guardian decides whether or not to allow their child to walk or bicycle to school. There are a variety of engineering solutions available to enhance pedestrian and bicyclist safety and comfort near schools. Engineering improvements are implemented to slow cars, increase the visibility of students walking and bicycling, and make it easier for students to cross the street. While some engineering efforts can be costly, many, such as posting signs and striping crosswalks or bicycle lanes, are relatively inexpensive.

Lower-Cost Pedestrian and Bicycle Safety Enhancements

Designated on-street bicycle facilities can provide a space for older or more experienced children to bicycle on the street. Pedestrian and bicycle safety improvements include:

Bicycle Lanes and Routes

A Bicycle lane is a striped portion of the roadway that designates an area specifically for bicyclists, making them more visible to motorists. Bicycle lanes are better suited for older and more experienced children who have learned the skills needed for bicycle handling, avoiding road hazards, and following the rules of the road. Bicycle lanes can be

Example of a bulb-out at an intersection

Bicycle Lanes

striped on any street that meets the width requirements and has the characteristics of a good bicycle route. Bicycle routes provide for shared use of the travel lane with motor vehicles and are identified by signage and/or shared lane markings only.

Secure Bicycle Parking

Providing a secure and convenient location for bicycle parking is one way to help encourage more children to bicycle to school. Good bicycle parking is located conveniently (near the school entrance, for example), and protects bicycles from vandalism/theft, damage, and weather.

High-Visibility School Zone Signage

Signs inform street users about what to expect from the street surroundings. School zone signs notify motorists that they are entering an environment where there are vulnerable road users such as children. The city is required to follow guidelines listed in the California MUTCD when installing signs. Key school zone sign assemblies include the School Warning, School Crosswalk Warning, School Speed Limit, and School Advance Warning. One way of increasing the visibility of school area signage is through the use of fluorescent, yellow-green signs.

Sidewalks

Sidewalks create a designated space for pedestrians. A complete sidewalk network is an important component of the transportation system for students. An incomplete sidewalk network or sidewalks in disrepair create a hazard for students walking and bicycling and may force students to walk in the roadway.

Trails and Paseos

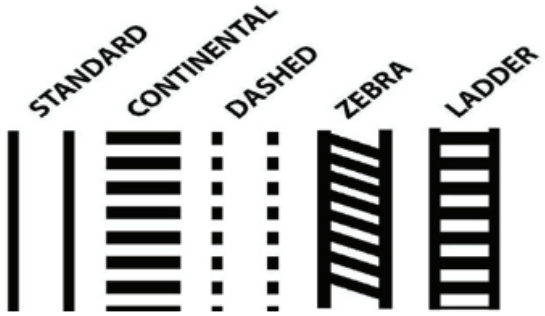
Trails, pathways, and paseos are often viewed as recreational facilities, but they can also serve an important function as a walking and bicycling corridor to school. Multi-use pathways and paseos are designed to serve both bicyclists and pedestrians and provide additional width over a standard sidewalk. Pathways may be constructed adjacent to roads, through parks or open space areas, along creeks, or along linear corridors, such as abandoned railroad lines. Regardless of the type, pathways constructed next to the road should have some type of buffer to separate the path area from the adjacent travel lane.

High-Visibility Crosswalk Striping

High-visibility striping makes crosswalks more noticeable to motorists. According to the California MUTCD, crosswalks located on roads within a certain distance of a school may be painted yellow. Several different crosswalk striping patterns can be used – the most common types of crosswalk striping patterns are shown in the diagram to the right. The standard crosswalk striping pattern consists of two parallel lines, called the "transverse" pattern. A number of "high-visibility" patterns are also available, such as the

High-visibility school zone signs

Sidewalk near school



High-visibility crosswalk striping

ladder, zebra, and continental patterns, which add bars for increased visibility. High-visibility markings should be considered for all high-volume crossings near schools, as well as where the conditions warrant an increased visibility marking (e.g. a mid-block location). Standardizing crosswalk markings helps both motorists and pedestrians recognize designated crossings.

Pedestrian-Scale Lighting

Safe sidewalks are essential components of good pedestrian environments, and well-lit environments convey a feeling of comfort and safety, particularly at night. Lighting should illuminate the sidewalk and roadway crossings to increase pedestrian visibility. Lighting is also an important element for multi-use pathways, at underpasses, and at other isolated locations. Lower-level pedestrian-scale lights can be mounted separately or on typical street light poles to extend over the sidewalk to increase pedestrian visibility to road users and enhance visibility along the walking path.

Advance Stop Bars and Yield Lines at Mid-Block Crosswalks

Advance stop bars and yield lines enhance pedestrian safety by prompting motor vehicles to stop/yield well in advance of marked crosswalks, thereby providing a clearer line of sight to pedestrians entering the crosswalk. Without an advance stop bar or yield line, drivers may decide to stop right at the crosswalk, which may obstruct visibility for vehicles traveling in the inside lane of a multi-lane roadway, increasing the possibility of a vehicle-pedestrian collision. Stop bars are used at signalized mid-block crosswalks and should be accompanied by a "Stop Here for Pedestrians" sign. Yield lines, also known as "shark teeth" due to their triangular shape, are used at unsignalized/uncontrolled mid-block crosswalks and should be accompanied by a "Yield Here to Pedestrian" sign. Advanced stop bars and yield lines should be placed between 20 and 50 feet in advance of the crosswalk based on roadway conditions.

Advance Stop Bars

Example of a countdown signal head

Traffic Signal Enhancements

Pedestrian Countdown Signals

Pedestrian countdown signals provide pedestrians information about how much time they have left to cross the street. Young pedestrians are still learning the skills needed to be a safe pedestrian. Without proper information, a flashing hand can confuse some child pedestrians and lead to running in the crosswalk in order to complete the crossing before the signal changes. Countdown signals help children make good decisions about whether or not to enter the crosswalk by displaying to them how much time they have left to cross the street.

Leading Pedestrian Interval

A Leading Pedestrian Interval (LPI) is an option that can be added to a traffic signal. An LPI gives pedestrians a walk signal before the motorists get a green light, which makes pedestrians more visible to motorists and therefore makes motorists more likely to yield to them.

Pedestrian-Only Signals

One type of pedestrian-only signal is called a HAWK (High-intensity Activated Crosswalk). It can be used at midblock crossings with high pedestrian volumes or at intersections that do not already have a traffic signal. Pedestrians use a push button to activate the warning signal and motorists receive a flashing red light and then a solid red light. When the motorists have a solid red light, pedestrians then see a white "walk" symbol, letting them know they are allowed to cross the street. After pedestrians have finished crossing the street, motorists then receive a blinking red light that lets them know that they may proceed when safe. The HAWK signal has been implemented in a number of cities and is included in the federal and California MUTCD guidelines for pedestrian traffic signals.

Loop Detectors/Video Detectors for Bicycles

Where a minor road crosses a major road at a signalized intersection, the light on the minor road will turn green when a vehicle is present if proper detection has been installed. Often, the devices that detect vehicles (loop detectors or video detectors) don't detect smaller objects, like bicycles. These devices should be calibrated to detect bicyclists. Loop detectors are in-pavement devices used at intersections that are actuated by the presence of a vehicle in the roadway to allow the vehicle to "trip" the signal and receive a green light. When a bicyclist stops over a properly calibrated loop detector, the detector uses a magnetic field to detect the metal frame of the bicycle and turns the signal green. Video detectors are mounted on a traffic signal standard and can typically detect bicycles over a larger area than loop detectors can. Video detectors, when positioned properly, will also turn the light green for a bicyclist.

Crossing over a freeway

Grade-Separated Crossings

Occasionally, it may be necessary to raise or lower a pedestrian crossing above or below the existing street level using a pedestrian bridge or underpass. Due to their high costs, grade-separated crossings should only be considered when there are no alternative routes, such as at a freeway, major highway, rail line, or waterway, and pedestrian/bicycle demand is high. Even in these cases, pedestrian-only grade-separated crossings should be built only after careful consideration. Those that require significant elevation change, such as to cross over a freeway, may be a challenge to construct due to ADA requirements for slopes and vehicle transitions. Ultimately, pedestrian facilities should be incorporated into existing and new vehicle crossings where feasible.

Traffic Calming

Traffic calming measures are physical improvements to roadways and/or intersections intended to enhance pedestrian and bicyclist safety by slowing vehicles through narrowing the roadway cross-section and/or horizontal deflection and reducing cut-through traffic on local neighborhood streets. Types of traffic calming include:

Medians and Pedestrian Refuge Islands

Medians and pedestrian refuge islands are located at an intersection or in the middle of a block. Medians are curbed areas in the center of the roadway that reduce the roadway width and speed of traffic. Pedestrian refuge islands are medians with a cut-out ("refuge") for pedestrians. Pedestrian refuge islands are often used with a marked crosswalk and are a minimum of four feet wide. They enhance pedestrian safety by creating a curb-protected location in the middle of the street. This facility allows pedestrians to cross one lane of traffic at a time. They are best used on higher volume streets with high-visibility crosswalks and signs.

Curb Extensions/Bulb-outs

Curb extensions, often referred to as bulb-outs, have many benefits for pedestrians. They force vehicles to slow down by narrowing the roadway cross section, shorten the street crossing distance for pedestrians, provide additional space at corners, allow pedestrians to see and be seen before entering the crosswalk, and simplify the placement of curb ramps.

Speed Tables and Speed Cushions

Speed tables and cushions slow vehicles by forcing them to go over a raised surface. Speed tables are longer and wider than jarring speed bumps found in locations like parking lots. They are generally used on lower volume streets and may not be permitted or advised on larger or higher-volume streets.

Chicanes

Chicanes are two curb extensions or roadside islands that create a serpentine path for autos. Street traffic must slow down in order to effectively maneuver around the in-street

Example of a Pedestrian Refuge Island

Example of a chicane

barriers. Chicanes are typically used on collectors and local streets near school sites.

Pinch Points

Pinch points are very similar to chicanes. While chicanes are offset curb extensions, pinch points are paired curb extensions or roadside islands used create a single auto lane. Pinch points slow traffic by reducing the width of the street. They are appropriate for neighborhood streets.

Traffic Circles

Traffic circles are in-street speed reduction devices used at intersections, typically in residential neighborhoods. They slow traffic because vehicles must "deflect" to go around them. Traffic circles can also be used to visually enhance the street using plantings or public art.

Single Lane Roundabouts

Roundabouts can be used at intersections as an alternative to traffic signals, particularly if signal warrants are not met. They reduce the speed of traffic while maintaining traffic flow for all approaches. They also provide refuge islands making it easier for pedestrians to cross. They can be used on low- and high-traffic volume roads. Pedestrian safety is improved due to decreased vehicle speeds.

7.1.8 Evaluation

Evaluation of the SRTS program is important to understand its effectiveness, identify necessary improvements, and ensure that the program can continue in the long-term. Evaluation can measure shifts in travel behavior, changes in attitudes toward bicycling and walking, awareness of the SRTS program, grant money received, and projects completed.

School Site Audit

A school site audit, sometimes called a walking audit or walkabout, is an evaluation of the pedestrian and bicycling conditions around the school environment. Typically, school site audits are conducted by a local school group or task force on foot by walking the routes that students use to get to school. A site audit may also be conducted on bicycle in order to better evaluate bicycling conditions.

The goal of a site audit is to document conditions that may discourage walking and bicycling to school and to identify solutions to improve those conditions. The audit should involve an assessment of the built environment around a school (e.g., streets, sidewalks, pathways, crosswalks and intersections, bike routes, traffic controls), drop-off and pick-up operations (e.g. presence of designated loading areas), as well as behaviors of students, parents, and motorists that could contribute to hazardous conditions for bicyclists or pedestrians (e.g. speeding, jaywalking, failure to yield to pedestrians).

Crossing guards help students navigate busy roads near schools

A school site audit checklist form asks for detailed information related to:

1) Student drop-off and pick-up areas
2) Bus loading zones
3) Sidewalks and bicycle routes
4) Intersections and crosswalks near the school property
5) Sight distance
6) Traffic signs and signals, speed controls, and pavement markings

The local school task force can use the school site audit checklist as a basis for conducting their walkabout.

Along with the checklist, an aerial map of the school area is helpful for the site audit. Aerial photos can be marked up with identified issues and suggested improvements.

Program Evaluation

There are many different education and encouragement programs that can be implemented in a school environment to help increase the number of students walking and bicycling to school. Not every program is the correct fit for every school. It is important to evaluate programs in the context of the school environment prior to deciding what would be a good choice for each school. Once the programs have been implemented it is necessary to evaluate what worked well and where improvements can be made. Below are some suggested steps for proceeding with the program evaluation process.

Program evaluation can be administered by following these steps:

1) Survey local traffic conditions and issues (much of this information can be found from the school site audit)
2) Determine the goals of the program
3) Identify methods to implement the programs
4) Determine success benchmarks to evaluate the effectiveness of the program
5) Interview program administrators (teachers, volunteers) and participants (students) to discuss what worked well and what did not

Perform Annual Hand Tally and Parent Surveys

Since 2005, the Federal Safe Routes to School program has set aside federal funding to help states, cities, towns, and schools increase the number of students walking and bicycling to school. One requirement of receiving this money is that schools must perform annual hand tally and parent surveys so that the national program can track the effectiveness of the various programs across the country.

The National Center for Safe Routes to School has developed a recommended methodology, survey, count forms, and reporting forms.[9] A teacher administers the hand tally survey to the students in the classroom. The parent surveys are either mailed or sent home with students to give to parents or guardians.

7.2 Policies

The policies in this chapter focus on methods to ensure that vehicle traffic, busing and transit, and walking and bicycling to school are conducted in the safest and most efficient way possible. Many of the identified policies focus on vehicle pick-up and drop-off activities. Implementing policies can often be low cost, although they may involve a greater outlay of staff resources and new procedures may take time to gain acceptance.

Parent Drop-off/Pick-up Operations

Creation of a parent drop-off/pick-up loop can help maximize capacity and safety and minimize delay in drop-off and pick-up operations. The loop can be either a dedicated lane just for pick-up/drop-off or a portion of the larger parking lot that has been marked with cones to serve as the pick-up/drop-off loop. Having supervisors present can help to ensure that loading/unloading moves forward smoothly, efficiently, and safely.

[9] National Center for Safe Routes to School recommended data collection methodology: http://guide.saferoutesinfo.org/pdf/SRTS-Guide_Evaluation.pdf

Valet Drop-off

Valet drop-off is a technique to improve traffic flow within the drop-off and pick-up loop by assisting students into and out of vehicles. A "valet" is present at the pick-up/drop-off area to open car doors and assist students into and out of arriving vehicles, improving traffic flow. The valet system eliminates the need for parents to get out of the vehicle to open the door for a child and remove bags or other items. The valet system is typically staffed by school staff or parent volunteers who can quickly and efficiently move children into and out of vehicles and hold onto backpacks and other items. Some schools use older grade students as valets, such as 5th or 6th graders. However, student volunteers must get out of class early to prepare for pick-up. A supplement to the valet system is a nameplate in the vehicle window that identifies what student needs to be picked up. This nameplate allows the valet to find students and bring them to the vehicle as it arrives.

Platooning Drop-off/Pick-up System

In a platooning system, all vehicles are unloaded/loaded simultaneously, then proceed to the exit. If a vehicle unloads or loads more efficiently than the vehicle in front of it, the rear vehicle must wait for the lead vehicle to finish the unloading/loading, then follow it out of the loop. This tool is best used to control the parent inclination to always drop-off and pick-up the student directly in front of the school. Often, additional curb loading is available downstream of the school and is severely underutilized, creating excess congestion and delay prior to entering the loop. At least two monitors are needed to effectively operate the vehicle platoon – one at the loop entrance to direct the maximum number of vehicles into the loop for a single cycle, and a second to ensure that the lead vehicle proceeds to the front-most loading stall.

Dedicated Bus Zones

Establishing separate areas for vehicular and bus traffic can help improve traffic flows in the pick-up/drop-off area. Conflicts often oc-

Signs outside the school inform parents about pick-up and drop-off procedures

Students assist with the drop-off process

Cones mark the dedicated bus zone

cur when private vehicles and buses arrive at the same time and in the same location. Separating traffic often necessitates establishing an on-street bus zone dedicated solely to buses. Private vehicles should not be allowed to load/unload in the bus zone. Bus zones need to be large enough to accommodate all the buses that might be parking there at one time. Sometimes it is possible to stagger the arrival times of the buses, thus requiring less space. The zones must be clearly marked and there should be adequate sidewalk space for students to wait for the bus.

Staggered Bell Times

Staggered bell times can help to disperse the traffic peak at schools with a large student population or when two or more schools are in close proximity to one another. For a single school application, students' start and end times should be grouped by grade levels. The start times of these groups should be at least 15 minutes apart. This staggering allows the vehicles from the first group to leave the school or be completely out of the area by the time the second group arrives. With multiple schools, staggering the bell times can be coordinated among two or more schools to ensure that significant numbers of vehicles do not use competing transportation facilities simultaneously.

7.2.1 Detailed Implementation Example

Establishing a Walking School Bus

How does the walking school bus program work?

A walking school bus is a group of children walking to school with one or more adults. The "bus" follows the same route every time and picks up children from their homes at designated times. Children like the walking school bus because it gives them active social time before the school day begins (or, as one participating child put it, "it's like recess before school!"). Adults like the walking school bus because they feel more comfortable with children walking when there are trained, trustworthy adult escorts. Teachers and principals like the walking school bus because it helps kids arrive ready to concentrate on school.

How can we get started with a walking school bus?

Ideally, the program should run every day so that families can count on it. However, it is possible to start small by selecting one or two days per week, and/or by targeting specific neighborhoods (e.g. a housing

Pedestrian Safety Training (walking school bus)

development close to the school) as a way to begin developing the program. Start with a special one-time walking school bus, such as for International Walk to School Day in October, is also possible.

A walking school bus can be an informal effort led by a few parents in one neighborhood. For a school-wide program, however, it is important to designate a coordinator. In some cases a dedicated volunteer coordinator can be successful, but it is highly recommended that this be a paid position to ensure consistency and reliability. Some programs only travel to school because many children have after-school programs, go somewhere other than their home after school, or may not have a parent waiting for them at home.

One way to increase participation is to designate a "bus stop" where families who live far from the school can drop off children to join the bus. A park or community center (with parking facilities) is ideal for this purpose.

What planning needs to happen?

The walking school bus coordinator should begin by assessing both resources (such as parent volunteers) and interest. A school-wide survey distributed to parents can help to identify interested households and volunteers.

Sample survey: http://saferoutespartnership.org/sites/default/files/pdf/wsb_student_and_family_survey.docx

When interested households have been identified, the school coordinator should map out draft walking routes. Walking routes should be sited on streets with complete pedestrian facilities, prioritizing safe crossings and lower traffic speeds and volumes, as well as low-crime streets. Stops may either be at each child's house (which is more convenient for parents but may take longer) or at gathering points (e.g. one meeting place per block, as well as gathering spaces at parks). Finalized routes and stop locations should be mapped out for parent and volunteer reference.

Once routes have been developed and the number of children on each route has been determined, the coordinator should decide how many adults will be needed for each route. The US Center for Disease Control recommends one adult per three children for children ages 4 to 6 and one adult per six children for older elementary children ages 7 to 9.

Walking school bus organizers should work closely with the school district to address liability concerns. The school district risk management specialist should be able to figure out if the program can be covered under the existing liability coverage, and, if not, what options exist. Partnership with a third party (such as the PTA or the city) may also allow access to existing liability coverage. Parents should also sign permission slips and liability waivers (the exact language should be determined by the risk manager).

Who are the bus "drivers?"

Bus "drivers" (route leaders) are usually volunteers, but it is important to make sure that the volunteers are dedicated, responsible, and well-supported. Some communities have had outstanding success partnering with a local college or university, where volunteers are recruited at the beginning of the semester each year. While students do not receive payment, they may receive college credit, which can increase their commitment to the program. An active senior group may also be a good partner organization to find volunteers who are available during the day. Interested parents are also natural volunteers. It is also an option to pay route leaders a small stipend (as some crossing guard programs do).

The school coordinator should screen each potential volunteer through an interview and criminal background check. All route leaders must also attend a detailed training covering:

- The goals and outline of the walking school bus program
- Expectations for route leaders
- Traffic safety and group management techniques
- Emergency procedures (including injury protocol and what to do if a route leader cannot serve on a given day)
- Alternate school schedule and inclement weather policy
- What to do if a child is late or if a child's behavior is inappropriate
- Any tracking protocols that should be followed (such as a daily attendance worksheet)

The coordinator should also provide first aid kits and safety vests to each volunteer, along with the route map and parent contact information for each participating family.

What can kids and families expect?

Outreach begins two weeks after the start of school. Strategies to promote the program include:

- Sending home materials with other school orientation materials
- Reaching out to/through the PTAs
- Hosting a booth at back to school night
- Distributing newspaper/radio ads
- Creating an easy-to-use website where families can sign up online

Parents need to sign a permission slip, emergency contact form, and liability waiver for their child to participate in the program. Once families are signed up, the route leader (who has passed a criminal background check and received training) calls the family to introduce themself. Parents get to know the route leader and they also know that if the bus gets canceled for any reason, or if there will be a substitute "driver," they will receive a prompt call from the school coordinator. Some routes, especially larger ones, are shared by several leaders.

Parents also receive an information packet containing the route map, their nearest stop, expectations for child behavior, protocol for if a child is late to a stop, what to do if their child will not attend on a given day, and alternate school schedule and inclement weather policy. They will also receive phone numbers for their route leader(s) and the school coordinator.

7.3 Other Education and Encouragement Programs

In addition to the city's SRTS Program, there are a variety of other programs the city should consider to educate and encourage bicycling. The 2011 Bicycle Master Plan identified many of these education and encouragement programs. These programs have been reviewed and relevant programs have been compiled in Appendix B.

7.4 Other Evaluation Programs and Policies

The city's SRTS program includes evaluation techniques. In addition to the SRTS program, this section discusses other programs and policies that will help develop more bicycling opportunities in National City.

Convene a Permanent Bicycle Advisory Committee

Target audience	Citizen advocates
Primary agency	City of National City
Potential partners	Regional bicycling groups, such as San Diego County Bicycle Coalition (SDCBC)
Purpose	Advise City on bicycling issues
Timeframe	Ongoing
Sample program	Beaver Creek, OH: http://ci.beavercreek.oh.us/boards-commissions/bikeway-advisory/

Many states, regional agencies, and cities have an official Bicycle Advisory Committee made of citizen volunteers, appointed by City Council or the appropriate body, to advise on bicycling issues. An advisory committee establishes the city's commitment to making bicycling safer and more desirable and has the potential to assist the city in securing funding for bicycle-related projects. The Bicycle Advisory Committee (BAC) should be composed of representatives from all bicycle stakeholder groups.

The role of the BAC should include some or all of the following:

- Review and provide citizen input on capital project planning and design as it affects bicycling (e.g., corridor plans, street improvement projects, signing or signal projects, and parking facilities)
- Review and comment on changes to zoning, development code, comprehensive or specific plans, and other long-term planning and policy documents
- Participate in the development, implementation, and evaluation of Bicycle Master Plans and bikeway facility standards
- Provide a formal liaison between local government, staff, and the public
- Develop and monitor goals and indices related to bicycling in the city
- Promote bicycling, including bicycle safety and education

Because BAC members are volunteers, it is essential to have strong participation in order for the committee to be successful. An agency staff person should be formally assigned to the BAC and should take charge of managing the application process, managing agendas and minutes, scheduling meetings, bringing agency issues to the BAC, and reporting back to the agency and governing body about the BAC's recommendations and findings.

Perform Annual Bicycle Counts

Target audience	N/A
Primary agency	City of National City
Potential partners	Regional bicycling groups, local volunteers
Purpose	Track bicycling trends and measure success of the Bicycle Master Plan implementation
Timeframe	Annually
Model program	National Bicycle & Pedestrian Documentation Project: http://bikepeddocumentation.org/

Many jurisdictions do not perform regular bicycle counts. As a result, they do not have a mechanism for tracking bicycling trends over time or for evaluating the impacts of bicycle-related projects, policies, and programs. It is recommended that National City perform and/or coordinate annual counts of bicyclists (and ideally pedestrians as well) on both on- and off-street facilities according to national practices. The National Bicycle and Pedestrian Documentation Project has developed a recommended methodology, survey and count forms, and reporting forms. This approach may be modified to serve the needs and interests of individual jurisdictions. The city should manage tracking, analysis, and reporting. Counts can be done manually by staff/volunteers or using video or a variety of other technologies.

Coordinate Roadway Safety Enforcement Actions

Target audience	Motorists and bicyclists
Primary agency	City of National City law enforcement
Potential partners	Caltrans
Purpose	Deter unsafe behaviors by motorists and bicyclists by enforcing traffic laws
Timeframe	Ongoing

While enhancing roadway safety for active transportation users can largely be accomplished with a combination of targeted physical design elements and education efforts, it can be supplemented by enforcement actions such as motor vehicle speed enforcement, radar speed feedback sign deployment, bicycle light enforcement, and other actions. Speeding vehicles put bicyclists and pedestrians at risk and discourage non-motorized transportation. Targeted speed enforcement activities can address these issues. Law enforcement agencies can enforce speed limits on designated bikeways, near schools, and in response to resident reports. A radar speed feedback sign request program will deploy radar speed feedback trailer units at the request of neighborhood associations and schools. The trailer units can be deployed temporarily, supplemented by radar enforcement, and then moved to another location. The goal of these enforcement actions is not to issue a set number of citations or to instill feelings of fear in drivers; it is to encourage safe behavior and educate those operating motor vehicles about actions they can take to increase safety for active transportation users.

Chapter 8
Costs and Funding

8.1 Network Costs

Cost ranges for the recommended network's facility types, shown in Table 8-1, are based on construction data from recently bid and awarded bicycle and active transportation projects in the San Diego region. While these ranges were determined using recent costs, inflationary pressures may cause them to be inaccurate in the future and they should serve only as rough estimates for future prioritization rather than full or actual facility costs. While Class II bicycle lanes and Class III bicycle routes only require signage and striping, recent best practices for these types of projects also include pavement reconstruction or slurry seal of the pavement and more robust intersection treatments to provide additional safety for bicycles and pedestrians.

Table 8-2 shows each ranked unfunded project and the approximate cost score for each. The approximate cost score is a high-level assessment of the cost magnitude for a project. It shows the general scale of cost for each project relative to the others rather than specific costs. The approximate cost score can thus be used to compare potential project cost magnitudes across the recommended unfunded network and begin to assess which projects may cost more than others for prioritization purposes. These scores were determined using the facility cost ranges per mile shown in Table 8-1 and should similarly not be used as actual project cost estimates.

TABLE 8-1: Facility Unit Cost Ranges by Classification

Facility	Facility Cost Ranges Per Mile ($/Mi)
Class I – Bicycle Path	$1M to $2.5M
Class II – Bicycle Lane	$750K to $2M
Class III – Bicycle Route	$200K to $500K
Class III – Bicycle Boulevard	$1.5M to $3M
Class IV – Cycle Track	$2.5M to $5M

Source: WSP (2022)

Note: These estimated costs assume typical conditions found in the city and project areas, as well as recent construction costs in the San Diego region, at the time of this Bicycle Master Plan's adoption rather than actual project costs. They serve as estimates for project prioritization.

TABLE 8-2: Facility Priority and Approximate Cost Score by Segment

Rank	Project Name	Street	Bounds	Facility Type	Facility Length (Miles)	Approximate Cost Score
1	18th Street Bicycle Boulevard	18th Street	Palm Avenue to Rachael Avenue	Class IIIB	1	◕
2	Highland Avenue Bike Lanes	Highland Avenue	30th Street to SR 54 exit ramp	Class II	0.39	◑
3	F Avenue Bicycle Boulevard	- F Avenue	- 18th Street to 28th Street	Class IIIB	1.31	◕
		- 26th Street	- D Avenue to 18th Street			
4	8th Street Complete Street Improvements	- 8th Street	- Harbison Avenue to Paradise Valley Road (Class III)	Class II	0.47	◑
		- Paradise Valley Road	- 8th Street east to City Boundary (Class II)	Class IIIR	0.27	
5	D Avenue Bicycle Boulevard	D Avenue	Division Street to 18th Street	Class IIIB	1.13	◕
6	Division Street Cycle Track	Division Street	Lauren Avenue to Euclid Avenue	Class IV	0.68	●
7	30th Street Cycle Track	30th Street	Hoover Avenue to Highland Avenue	Class IV	0.7	●
8	16th Street Bicycle Corridor	16th Street	Highland Avenue to Harbison Avenue	Class IIIR	1.46	◑
9	Granger Avenue Bicycle Corridor	- Lanoitan Avenue	- 16th Street to 24th Street	Class IIIR	1	◔
		- Granger Avenue	- 18th Street to 24th Street			
		- 24th Street	- Euclid Avenue to Granger Avenue			
10	24th Street Complete Street Improvements	24th Street	Hoover Avenue to Highland Avenue (Class II) and Highland Avenue to N Avenue (Class III Bicycle Boulevard)	Class II	0.69	◑
				Class IIIB	0.38	
11	Las Palmas Bicycle Corridor	- Roselawn Street	- L Avenue to N Avenue	Class IIIR	0.53	◔
		- N Avenue	- Roselawn Street to 22nd Street			
		- 22nd Street	- N Avenue to Palm Avenue			
		- Palm Avenue	- 22nd Street to 18th Street			

TABLE 8-2: Facility Priority and Approximate Cost Score by Segment (Cont.)

Rank	Project Name	Street	Bounds	Facility Type	Facility Length (Miles)	Approximate Cost Score
12	Hoover Avenue Cycle Track	Hoover Avenue	22nd Street to 33rd Street	Class IV	0.76	●
13	22nd Street Cycle Track	22nd Street	Wilson Avenue to D Avenue	Class IV	0.57	◕
14	Harbison Avenue Bicycle Corridor	- Harbison Avenue - Earle Drive	4th Street to 16th Street, Earle Drive	Class IIIR	1.02	◔
15	Olive Avenue Bike Lanes	Olive Avenue	8th Street to Plumas Street	Class II	0.28	◔
16	D Avenue Bike Lanes	D Avenue	30th Street to southern terminus	Class II	0.23	◔
17	Civic Center Drive Cycle Track	Civic Center Drive	Tidelands Avenue to Wilson Avenue	Class IV	0.26	◑
18	Highland Avenue Complete Street Improvements	Highland Avenue	Delta Street to 2nd Street (Class II) and 2nd Street to 4th Street (Class III)	Class II Class IIIR	0.4 0.13	◑
19	19th Street Cycle Track	19th Street	Kiss Street to McKinley Avenue	Class IV	0.43	◕
20	B Avenue Bicycle Boulevard/Advisory Bicycle Lanes	B Avenue	1st Street to 4th Street	Class IIIB	0.19	◔
21	Bay Marina Drive Bike Lanes	Bay Marina Drive	Tidelands Avenue to Marina Way	Class II	0.25	◔
22	Roosevelt Avenue North Bike Lanes	Roosevelt Avenue	8th Street to 12th Street	Class II	0.25	◔
23	16th Street Bike Lanes	16th Street	Wilson Avenue to National City Boulevard	Class II	0.31	◔
24	Roosevelt Avenue South Bike Lanes	Roosevelt Avenue	Civic Center Drive to 16th Street	Class II	0.19	◔
25	21st Street Bicycle Corridor	21st Street	F Avenue to L Avenue	Class III	0.38	◔

Source: WSP (2022)

8.2 Funding Sources

There are a variety of potential funding sources, including local, state, regional, and federal funding programs as well as private sector funding that can be used to construct the recommended improvements. Most of the federal, state, and regional programs are competitive and involve the completion of extensive applications with clear documentation of the project need, costs, and benefits. With regard to funding opportunities, the following should be noted:

- Funding sources are highly competitive with many agencies competing for the same "pots" of money
- Funding is limited; capital funding needs far outweigh available funding each year
- Applying for funding is a time-consuming and staff-intensive process
- Collaboration and partnerships with local agencies and community groups is key

Table 8-3 summarizes some available funding sources and identifies eligibility requirements for each. The following discussion is provided to assist National City staff in identifying appropriate sources of funding for the projects recommended in this plan.

8.3 Federally-Administered Funding

In 2021, the Infrastructure Investment and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law (BIL), reauthorized the federal surface transportation grant programs. The BIL makes available a total of $1.2 trillion in infrastructure spending. Key programs funded by the BIL which include active transportation and/or bicycle components are Safe Streets and Roads for All (SSRA), Healthy Streets, Transportation Alternatives, Recreational Trails Program, Active Transportation Infrastructure Investment Program, Safe Routes to School, Carbon Mitigation and Air Quality Improvement Program (CMAQ), RAISE grants, Reconnecting Communities, Carbon Reduction Program, and the Surface Transportation Block Grant Program.

To be eligible for Federal transportation funds, states are required to develop a State Transportation Improvement Program (STIP) and update it at least every four years. A STIP is a multi-year capital improvement program of transportation projects; it serves to coordinate transportation-related capital improvements of MPOs such as SANDAG.

In California, the STIP includes projects on and off the State Highway System and is funded with revenues from the Transportation Investment Fund and other funding sources. The California STIP is typically updated every two years. To be included in the STIP, projects must be included in the Interregional Transportation Improvement Plan (ITIP) prepared by Caltrans or the Regional Transportation Improvement Plans (RTIPs) prepared by MPOs and regional agencies. Bicycle and pedestrian projects are eligible for inclusion.

8.4 State-Administered Funding

The State of California uses both federal sources and its own budget to fund the following bicycle and pedestrian projects and programs.

Road Repair and Accountability Act (SB1)

In 2017, the California State Legislature voted to approve the Road Repair and Accountability Act (SB1). SB1 raised motor vehicle fuel taxes $0.12 for gasoline and $0.20 for diesel fuels. Additionally, to address the lack of revenue from zero-emissions vehicles, a $100.00 registration fee is applied to alternatively fueled vehicles, which the Department of Motor Vehicles began collecting on July 1, 2020. The fuel tax increase is anticipated to raise an additional $54 billion over the next decade, which will provide much needed funds for roadway maintenance and repairs, transit, and active transportation facilities statewide. The bill directs the California Transportation Commission

(CTC) to oversee the administration of these funds and make recommendations on appropriations granted each year from the California State Legislature.

Active Transportation Program

Every two years, the CTC releases a Notice of Funding Availability for the ATP. These funds are used for the implementation of active transportation projects across the state. The last cycle (cycle 6) issued a call for projects in March 2022, and $650,000,000 was available to project sponsors for implementation, planning, and non-infrastructure projects. The amount of funding fluctuates every round depending on appropriations from the California State Legislature. 50% of that funding is competitive, with 40% of the ATP funding going to MPOs such as SANDAG to fund local projects at the MPO's discretion. Disadvantaged communities are guaranteed at least 25% of the program's funds. These funds are used to further California's commitment to reduce automobile trips and increasing the safety of non-motorized users of the State's transportation system.

Local Partnership Program

The Local Partnership Program (LPP) is another SB1 grant program. The program continuously appropriates $200,000,000 annually to provide local assistance to entities which tax themselves for transportation improvements and services. The Notice of Funding Availability for this program comes out every two years. 40% of these funds is part of the competitive program, while 60% is part of the formulaic program, appropriating funds to local governments based on proportional revenue from local jurisdictions. The program aims to provide infrastructure improvements either through maintenance or adding capacity to the transportation system across all modes.

Caltrans Sustainable Transportation Planning Grants

Caltrans operates a grant program independent of CTC to fund transportation planning projects statewide. A total of $84 million is expected to be available (according to the draft application guide submitted for public comment in October 2022) during the FY 2023-2024 grant cycle, of which $29.5 million will be made available for sustainable communities grants, $4.5 million will be made available for strategic partnerships with Caltrans, and $50 million will be made available for a one-time climate adaptation planning grant pool. Funding availability is contingent upon appropriations by the California State Legislature. These grants are available annually and are typically less than $1 million each.

Other Grant Opportunities

The State of California is a national leader in sustainability and is committed to reducing the harmful effects of greenhouse gases, congestion, and poor public health. Agencies across California often release funding opportunities for smaller grant opportunities or start-up programs. Keeping track of these potential opportunities will be necessary to successfully fund infrastructure programs.

8.5 Regional Agency-Administered Funding

TransNet

SANDAG imposes a half-cent sales tax to all San Diego County residents and non-residents completing transactions in the County. These funds go directly to local governments to fund transportation improvements. The sales tax is a component of a larger transportation plan in San Diego County to reduce congestion and improve air quality. There are several grant programs which TransNet funds at the county-wide level, one of which is specifically aimed at funding active transportation projects.

Active Transportation Grant Program

TransNet funds this grant program for both capital and planning active transportation projects. To implement TransNet's active transportation priorities, this grant program provides funding for local jurisdictions to provide accessibility for pedestrians and cyclists, as well as bicycle parking, educational programs, encouragement, and awareness programs. These funds are available for any jurisdiction within SANDAG's jurisdiction, and typically amount to less than $1 million each for capital infrastructure.

8.6 Local Agency-Administered and Non-Traditional Funding Sources

SANDAG Transportation Funding

MPOs typically administer local funding to municipalities and other local governments to help fund transportation improvements. SANDAG serves as the region's MPO and has their own dedicated transportation funding source which is available to National City.

Enhanced Infrastructure Financing District

The California Department of Finance (DOF) allows for local municipalities to collect taxes to fund specific infrastructure improvements in a concentrated part of a municipality. Established by SB 628, this addition to the California Government Code allows cities to implement concentrated tax mechanisms to fund local infrastructure priorities. The geographic bounds of this tool are not specified, but it could cover a street or neighborhood and could cross jurisdictional boundaries to allow for priorities which may require collaboration with other governments. This collaboration can be established at any time, without any public vote.

Volunteer and Public-Private Partnerships

Local schools or community groups can maintain bikeways as projects for the year, possibly working with a local designer or engineer. A challenge grant program with local businesses may be a source of local funding where corporations 'adopt' a bikeway and help construct and maintain the facility.

TABLE 8-3: Potential Funding Sources

Grant Source	Frequency	Administering Agency	Average Annual Total	Matching Requirement	Eligible Applicants	Eligible Phase	Comments
State Administered Funding							
Active Transportation Program	Every two years	California Transportation Commission	~$400 million	N/A	Government agencies and nonprofits	Capital, Planning	ATP funds come around every 2 years, and typically fund only active transportation improvements. 25% of these funds are reserved for disadvantaged communities.
Local Partnership Program	Every two years	California Transportation Commission	~$200 million	100%	Government agencies	Capital only (except for DB)	This program funds all transportation improvements, so active transportation is likely to be a smaller component.
Sustainable Transportation Planning Grant	Annual	Caltrans	~$34 million	11.47% for Sustainable Communities, Climate Adaptation Planning, Strategic Partnerships - Transit; 20% for Strategic Partnerships	Government agencies	Planning	This program is split into two components, one where Caltrans is involved in implementing state priorities and one where only local priorities are provided funding. The latter has a larger portion of funding available.
Locally Administered Funding							
Active Transportation Grant Program	Annual	SANDAG	~$3-5 million	N/A	SANDAG municipalities	Capital and Planning	This program is available every few years to all agencies in the SANDAG region.

Appendices

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A

Appendix A: Detailed Project Prioritization

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A robust scoring method was used to prioritize all recommended unfunded bicycle projects to provide National City with a roadmap for planning which facilities to fund and construct first. Due to funding and implementation constraints, facilities are constructed on a rolling basis. It is therefore important to prioritize the list of bicycle project recommendations.

The prioritization method took into account key factors that are important to National City in the implementation of bicycle facilities. Similarly, this method recognized that not all factors are of equal importance to the city and adjusted the weighting of these factors accordingly. The detailed project priority scores and adjustment factors are shown in the following pages.

Recommended Unfunded Bicycle Projects Prioritization

Project Name	Street	Bounds	Facility Type	Facility Length (Miles)	Previously Identified 4: Previously identified 3: Previously identified but amended 2: Not previously identified	Placemaking 4: Will directly connect to both park and school or 3+ schools 3: Will directly connect to park or school 2: Will indirectly connect to park or school 1: Will not connect to park or school	Safety Need 4: High number of collisions 3: Moderate number of collisions 2: Low number of collisions 1: No collisions	Bicycle Propensity 4: Adjacent to area with high number of modeled bike trips 3: Adjacent to area with moderate number of modeled bike trips 2: Adjacent to area with low number of modeled bike trips 1: Adjacent to area with very low modeled bike trips	Engineering Feasibility 4: 0 complications 3: 1 complications 2: 2 or 3 complications 1: ROW or Environmental Complications: - Parking - Intersection Operations - Interagency Coordination (Caltrans/MTS/CPUC)	Regional Connectivity 4: Direct connection to existing regional facility 3: Direct connection to planned regional facility 2: Relative connection to regional facility due to proximity 1: No connection to regional facility	Composite Score	Rank
18th Street Bicycle Boulevard	18th Street	Palm Avenue to Rachael Avenue	Class III Bicycle Boulevard	1.00	4	4	4	3	3	4	3.66	1
Highland Avenue Bike Lanes	Highland Avenue	30th Street to SR 54 exit ramp	Class II	0.39	4	3	4	4	2	4	3.49	2
F Avenue Bicycle Boulevard	- F Avenue - 26th Street	- 18th Street to 28th Street - D Avenue to 18th Street	Class III Bicycle Boulevard	1.31	4	4	4	4	3	1	3.37	3
8th Street Complete Street Improvements	- 8th Street - Paradise Valley Road	- Harbison Avenue to Paradise Valley Road (Class III) - 8th Street east to City Boundary (Class II)	Class II Class III Bicycle Route	0.47 Class II 0.27 Class III	4	3	3	2	3	3	2.96	4
D Avenue Bicycle Boulevard	D Avenue	Division Street to 18th Street	Class III Bicycle Boulevard	1.13	2	4	4	2	2	3	2.92	5
Division Street Cycle Track	Division Street	Laurel Avenue to Euclid Avenue	Class IV	0.68	4	3	1	4	2	4	2.86	6
30th Street Cycle Track	30th Street	Hoover Avenue to Highland Avenue	Class IV	0.7	2	4	2	4	3	2	2.85	7
16th Street Bicycle Corridor	16th Street	Highland Avenue to Harbison Avenue	Class III Bicycle Route	1.46	4	3	2	2	4	2	2.76	8
Granger Avenue Bicycle Corridor	- Lanoitan Avenue - Granger Avenue - 24th Street	- 16th Street to 24th Street - 18th Street to 24th Street - Euclid Avenue to Granger Avenue	Class III Bicycle Route	1.13	4	3	2	1	4	3	2.75	9
24th Street Complete Street Improvements	24th Street	Hoover Avenue to Highland Avenue (Class II) and Highland Avenue to N Avenue (Class III Bicycle Boulevard)	Class II Class III Bicycle Boulevard	0.69 Class II 0.38 Bicycle Boulevard	3	2	4	3	2	2	2.72	10
Las Palmas Bicycle Corridor	- Roselawn Street - N Avenue - 22nd Street - Palm Avenue	- L Avenue to N Avenue - Roselawn Street to 22nd Street - N Avenue to Palm Avenue - 22nd Street to 18th Street	Class III Bicycle Route	0.53	4	3	1	2	4	2	2.55	11
Hoover Avenue Cycle Track	Hoover Avenue	22nd Street to 33rd Street	Class IV	0.76	4	2	1	3	2	4	2.52	12
22nd Street Cycle Track	22nd Street	Wilson Avenue to D Avenue	Class IV	0.57	4	3	3	2	2	1	2.48	13
Harbison Avenue Bicycle Corridor	- Harbison Avenue - Earle Drive	4th Street to 16th Street, Earle Drive	Class III Bicycle Route	1.02	4	2	1	2	4	2	2.38	14
Olive Avenue Bike Lanes	Olive Avenue	8th Street to Plumas Street	Class II	0.28	4	3	1	2	2	3	2.36	15
D Avenue Bike Lanes	D Avenue	30th Street to southern terminus	Class II	0.23	2	1	2	4	3	2	2.34	16
Civic Center Drive Cycle Track	Civic Center Drive	Tidelands Avenue to Wilson Avenue	Class IV	0.26	4	1	4	1	1	3	2.32	17
Highland Avenue Complete Street Improvements	Highland Avenue	Delta Street to 2nd Street (Class II) and 2nd Street to 4th Street (Class III)	Class II Class III Bicycle Route	0.40 Class II 0.13 Class III	3	1	3	2	2	3	2.32	18
19th Street Cycle Track	19th Street	Kidd Street to McKinley Avenue	Class IV	0.43	2	1	2	3	2	4	2.31	19
B Avenue Bicycle Boulevard/Advisory Bicycle Lanes	B Avenue	1st Street to 4th Street	Class III Bicycle Boulevard	0.19	4	1	2	1	4	2	2.25	20
Bay Marina Drive Bike Lanes	Bay Marina Drive	Tidelands Avenue to Marina Way	Class II	0.25	4	1	2	2	2	3	2.24	21
Roosevelt Avenue North Bike Lanes	Roosevelt Avenue	8th Street to 12th Street	Class II	0.25	4	3	1	3	2	1	2.23	22
16th Street Bike Lanes	16th Street	Wilson Avenue to National City Boulevard	Class II	0.31	4	3	1	1	3	2	2.21	23
Roosevelt Avenue South Bike Lanes	Roosevelt Avenue	Civic Center Drive to 16th Street	Class II	0.19	2	2	1	1	3	1	1.64	24
21st Street Bicycle Corridor	21st Street	F Avenue to L Avenue	Class III Bicycle Route	0.38	2	1	1	2	3	1	1.64	25

Project Priority Score Adjustment Factors

Criteria	Weight
Previously Identified	0.75
Placemaking	1.00
Safety Need	1.25
Bicycle Propensity	1.00
Engineering Feasibility	1.00
Regional Connectivity	0.90

B

Appendix B: Bicycle Facility Design Guidelines

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Shared Roadways Guidelines

Design Summary

Use D11-1 Bike Route Sign at:

- Beginning or end of Bicycle Route (with applicable M4 series sign below)
- Entrance to bicycle path (Class I) – optional
- At major changes in direction or at intersections with other bicycle routes (with applicable M7 series sign below)
- At intervals along bicycle routes not to exceed ½ mile (0.8 km)

Discussion

Class III bicycle facilities (Caltrans designation) are defined as facilities shared with motor vehicles, identified exclusively by signage and/or shared lane markings. They are typically used on roads with low speeds and traffic volumes; however, they can be used on higher volume roads with wide outside lanes or shoulders. Shared roadways often have a centerline stripe only and no designated shoulders. Shared lane markings in addition to signage may be more appropriate for roadways with narrow travel lanes and parking.

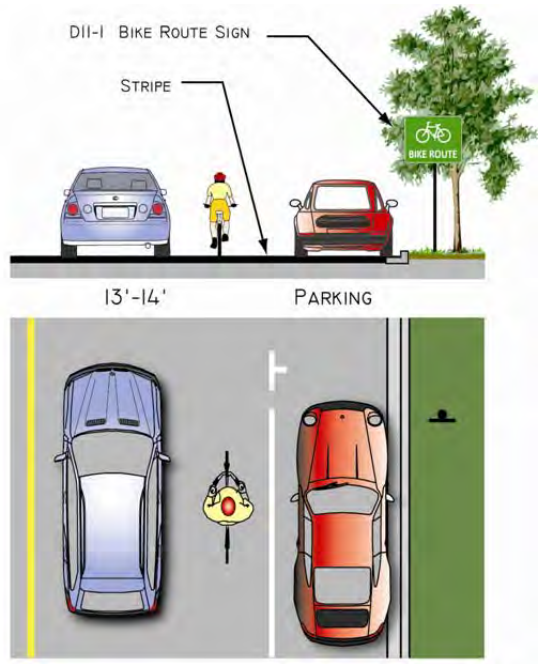
Shared roadways provide key connections to destinations and trails where providing additional separation is not possible.

Guidance

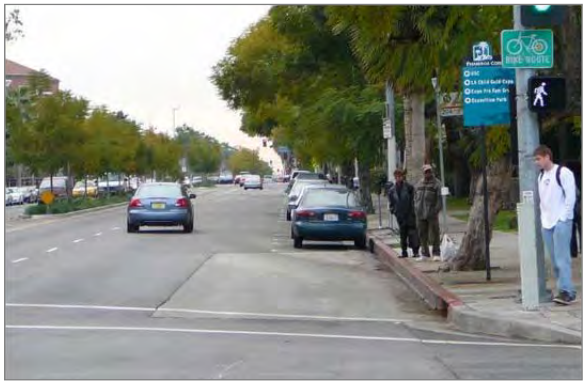
- From Caltrans *Highway Design Manual (HDM)* Chapter 1000:

> *"Class III bikeways (bike routes) are intended to provide continuity to the bikeway system. Bike routes are established along through routes not served by Class I or II bikeways, or to connect discontinuous segments of bikeway (normally bike lanes). Class III facilities are shared facilities, either with motor vehicles on the street, or with pedestrians on sidewalks, and in either case bicycle usage is secondary. Class III facilities are established by placing Bike Route signs along roadways."*

- AASHTO Guide for the Development of Bicycle Facilities
- California *MUTCD*, Part 9



Shared roadway recommended configuration.



This bike route in the City of Los Angeles provides a wide outside lane adjacent to on-street parking.

D11-1 "Bike Route" sign should be used along designated shared roadways.

Bicycle Lanes Guidelines

Design Summary

Width varies depending on roadway configuration; see following pages for design examples. Five to eight feet is standard, measured from edge of gutter pan. Striping:

- Separating vehicle lane from bicycle lane (typically left sideline): 6 inches.
- Separating bicycle lane from parking lane (if applicable): 4 inches.
- Dashed white stripe when:
  - Vehicle merging area (optional): Varies
  - Approach to intersections: 100-200 feet
  - Delineate conflict area at intersections (optional): Length of conflict area

Signing: use R-81 Bicycle Lane Sign at:

- Beginning of bicycle lane
- Far side of all bicycle path (Class I) crossings
- At approaches and at far side of all arterial crossings
- At major changes in direction
- At intervals not to exceed ½ mile

Pavement markings: the preferred pavement marking for bicycle lanes is the bicycle lane stencil with directional arrow to be used at:

- Beginning of bicycle lane
- Far side of all bicycle path (Class I) crossings
- At approaches and at far side of all arterial crossings
- At major changes in direction
- At intervals not to exceed ½ mile
- At beginning and end of bicycle lane pockets at approach to intersection

Approved R-81 Sign.

Approved California Bicycle lane stencils (either is optional, as is arrow).

Discussion

Bicycle lanes or Class II bicycle facilities (Caltrans designation) are defined as a portion of the roadway that has been designated by striping, signage, and pavement markings for the preferential or exclusive use of bicyclists. Bicycle lanes are generally found on major arterial and collector roadways and are 5-8 feet wide. Bicycle lanes can be found in a large variety of configurations and can have special characteristics including coloring and placement if beneficial. Bicycle lanes enable bicyclists to ride at their preferred speed without interference from prevailing traffic conditions and facilitate predictable behavior and movements between bicyclists and motorists. Bicyclists may leave the bicycle lane to pass other bicyclists, make left turns, avoid obstacles or debris, and to avoid conflicts with other roadway users.

Additional Guidance

- AASHTO *Guide for the Development of Bicycle Facilities*
- Caltrans *Highway Design Manual* (Chapter 1000)
- California *MUTCD*
- Additional standards and treatments for bicycle lanes are provided in the following pages

Bicycle Lane Adjacent to On-Street Parallel Parking

Design Summary

Bicycle Lane Width:

- 5′ recommended when parking stalls are marked
- 4′ minimum in constrained locations
- 8′ maximum (greater widths may encourage vehicle loading in bicycle lane)

Shared bicycle and parking lane width:

- 12′ for a shared lane adjacent to a curb face
- 11′ minimum for a shared bicycle/parking lane where parking is permitted but not marked on streets without curbs
- If the parking volume is substantial or turnover is high, an additional 1 to 2 feet of width is desirable

Discussion

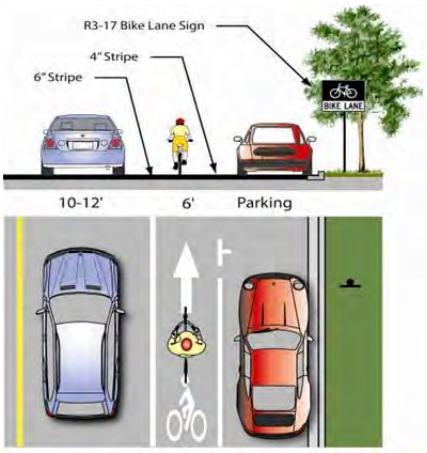
Bicycle lanes adjacent to on-street parallel parking are common in the U.S. A suddenly-opened vehicle door presents a hazard for bicyclists using this type of facility, especially when adequate separation from parked vehicles is not provided. Conversely, wide bicycle lanes may encourage the bicyclist to ride farther to the right (door zone) to maximize distance from passing traffic. Wide bicycle lanes may also cause confusion with unloading vehicles in busy areas where parking is typically full.

Treatments to encourage bicyclists to ride away from the 'door zone' include:

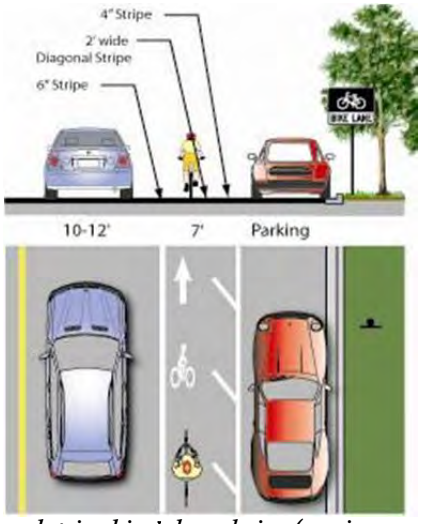
- Installing parking "T's" and smaller bicycle lane stencils placed to the left (see graphic at top)
- Using diagonal stripes to encourage bicyclists to ride on the left side of the bicycle lane (shown middle; this treatment is not standard and should be studied before use)
- Provide a buffer zone (preferred design; shown bottom). Bicyclists traveling in the center of the bicycle lane will be less likely to encounter open car doors. Motorists have space to stand outside the bicycle lane when loading and unloading.

Guidance

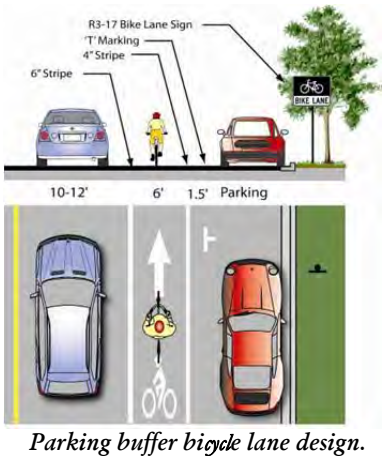
- AASHTO *Guide for the Development of Bicycle Facilities*
- Caltrans Highway Design Manual (Chapter 1000)
- California *MUTCD*



Parking 'T' bicycle lane design.



Diagonal stripe bicycle lane design (maximum width).



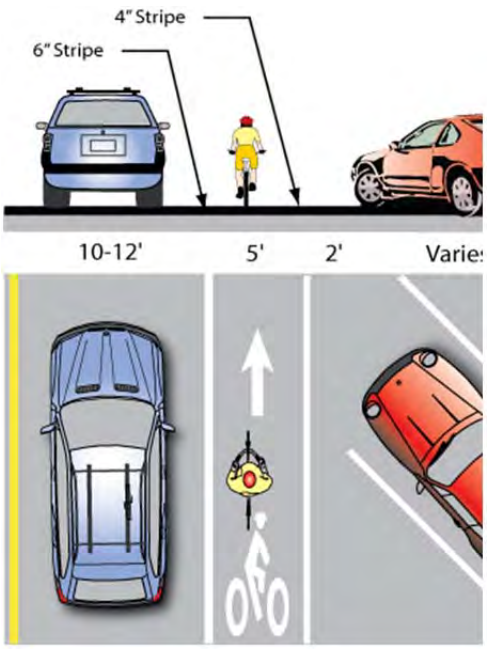
Parking buffer bicycle lane design.

Bicycle Lane Adjacent to On-Street Diagonal Parking

Design Summary

Bicycle Lane Width:

- 5' minimum
- White 4" stripe separates bicycle lane from parking bays
- Parking bays are sufficiently long to accommodate most vehicles (vehicles do not block bicycle lane)



Recommended bicycle lane adjacent to on-street diagonal parking design.

Discussion

In areas with high parking demand such as urban commercial areas, diagonal parking can be used to increase parking supply. Conventional "head-in" diagonal parking is not recommended in conjunction with high levels of bicycle traffic or with the provision of bicycle lanes as drivers backing out of conventional diagonal parking spaces have poor visibility of approaching bicyclists.

The use of 'back-in diagonal parking' or 'reverse angled parking' is recommended over head-in diagonal parking. This design addresses issues with diagonal parking and bicycle travel by improving sight distance between drivers and bicyclists and has other benefits to vehicles including: loading and unloading of the trunk occurs at the curb rather than in the street, passengers (including children) are directed by open doors towards the curb, no door conflict with bicyclists. While there may be a learning curve for some drivers, using back-in diagonal parking is typically an easier maneuver than conventional parallel parking.

'Back-in' diagonal parking enhances safety for bicyclists by improving drivers' visibility as they exit the parking space.

Guidance

- AASHTO *Guide for the Development of Bicycle Facilities*

Bicycle Lane without On-Street Parking

Design Summary

Bicycle lane width:

- 4′ minimum when no curb & gutter are present (rural road sections)
- 5′ minimum when adjacent to curb and gutter (3′ more than the gutter pan width if the gutter pan is wider than 2′)
- 6′ recommended where ROW allows

Maximum Width:

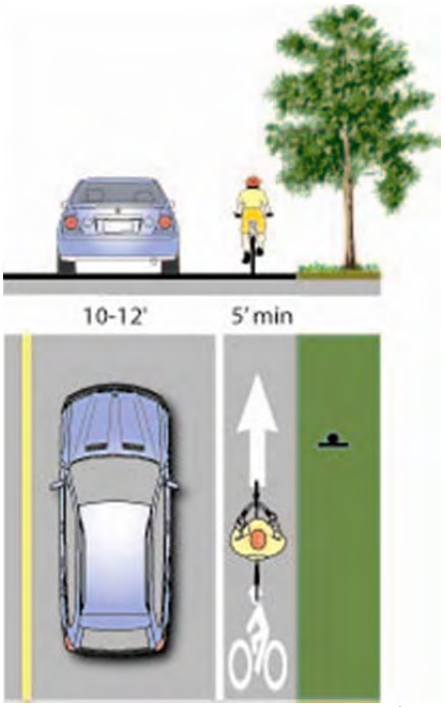
- 8′ adjacent to arterials with high travel speeds (45+ mph)

Discussion

Wider bicycle lanes are desirable in certain circumstances such as on higher speed arterials (45+ mph) where a wider bicycle lane can increase separation between passing vehicles and bicyclists. Wide bicycle lanes are also appropriate in areas with high bicycle use. A bicycle lane width of six to eight feet makes it possible for bicyclists to ride side-by-side or pass each other without leaving the bicycle lane, increasing the capacity of the lane. Appropriate signing and stenciling is important with wide bicycle lanes to ensure motorists do not mistake the lane for a vehicle lane or parking lane.

Guidance

- AASHTO *Guide for the Development of Bicycle Facilities*
- Caltrans *Highway Design Manual* (Chapter 1000)
- California *MUTCD*



Recommend bicycle lane without on-street parking design.

Where on-street parking is not allowed adjacent to a bicycle lane, bicyclists do not require additional space to avoid opened car doors.

Bicycle Lane Intersection Treatments

Bicycle Signal Actuation

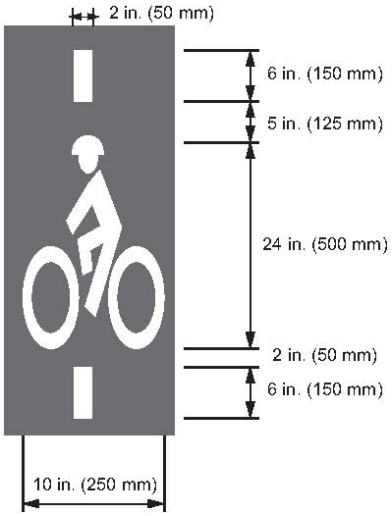
Design Summary

At signalized intersections, bicyclists should be able to trigger signals when cars are not present. Requiring bicyclists to dismount to press a pedestrian button is inconvenient and requires the bicyclist to merge into traffic at an intersection. It is particularly important to provide bicycle actuation in a left-turn only lane where bicyclists regularly make left turn movements.

Discussion

Loop Detectors

Bicycle-activated loop detectors are installed within the roadway to allow the presence of a bicycle to trigger a change in the traffic signal. This allows the bicyclist to stay within the lane of travel and avoid maneuvering to the side of the road to trigger a push button. Many demand-actuated signals use loop detectors embedded in the roadway pavement, which can be attuned to be sensitive enough to detect any type of metal, including bicycle frames. Identify with the "Bicycle Detector Symbol" shown in Figure 9C-7(CA) in the CA-MUTCD.



Recommended loop detector marking design.

Detection Cameras

Video detection cameras can also be used to determine when a vehicle is waiting for a signal. These systems use digital image processing to detect a change in the image at the location. Cameras can detect bicycles, although bicyclists should wait in the center of the lane, where an automobile would usually wait, in order to be detected. Detection cameras are currently used for bicyclists in the City of San Luis Obispo, CA, where the system has proven to detect pedestrians as well.

Example bicycle actuator marking.

Remote Traffic Microwave Sensor Detection (RTMS)

RTMS is a system developed in China which uses frequency modulated continuous wave radio signals to detect objects in the roadway. This method is marked with a time code which gives information on how far away the object is. The RTMS system is unaffected by temperature and lighting, which can affect standard detection cameras.

Instructional Sign (MUTCD Sign R10-15).

Guidance

- ITE Guidance for Signal Detection for Bicycles: https://www.ite.org/technical-resources/topics/complete-streets/bicycle-signals/signal-detection-for-bicycles/

Bicycle Lane Intersection Treatments

Bicycle Lanes at Channelized Intersection with Right Turn Pocket

Design Summary

- Shared turn lane width – min. 12 feet
- Bicycle lane pocket width – min. 4 feet

Discussion

This treatment is recommended at intersections lacking sufficient space to accommodate a standard bicycle lane and right turn lane. The shared bicycle/right turn lane places a standard-width bicycle lane on the left side of a dedicated right turn lane. A dashed stripe delineates the space for bicyclists and motorists within the shared lane. This treatment includes signage advising motorists and bicyclists of proper positing within the lane.

According to the CA MUTCD and Chapter 1000 of the Caltrans HDM, the appropriate treatment for right-turn only lanes is to place a bicycle lane pocket between the right-turn lane and the right-most through lane or, where ROW is insufficient, to drop the bicycle lane entirely approaching the right-turn lane. Dropping the bicycle lane is not recommended, and should only be done when a bicycle lane pocket cannot be accommodated.

Colored bicycle lanes can help distinguish the bicycle lane in the merging area (see colored bicycle lane guidelines).

Advantages:

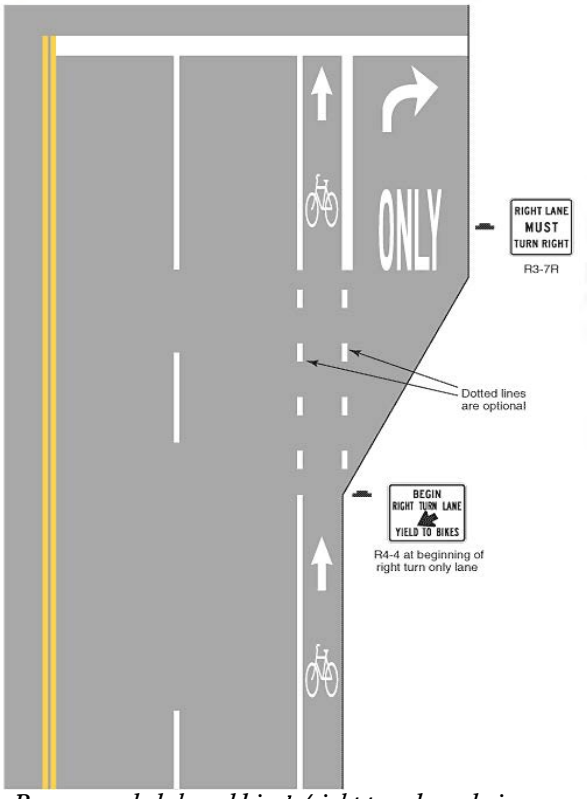
- Aids in correct positioning of bicyclists at intersections with a dedicated right-turn lane without adequate space for a dedicated bicycle lane
- Encourages motorists to yield to bicyclists when using the right turn lane
- Reduces motor vehicle speed within the right-turn lane

Disadvantages:

- May not be appropriate for intersections with large percentages of right-turning heavy vehicles

Guidance

- This treatment has been implemented in San Francisco, CA and Eugene, OR
- AASHTO *Guide for the Development of Bicycle Facilities*
- Caltrans *Highway Design Manual* (Chapter 1000)
- California *MUTCD*, Part 9



Recommended shared bicycle/right turn lane design.

Shared bicycle-right turn lanes require warning signage as well as pavement markings.

Retrofitting Existing Streets with Bicycle Lanes

Roadway Widening

Design Summary

Bicycle Lane Width:

- 4 feet minimum (see bicycle lane guidance)
- 5 – 6 feet preferred

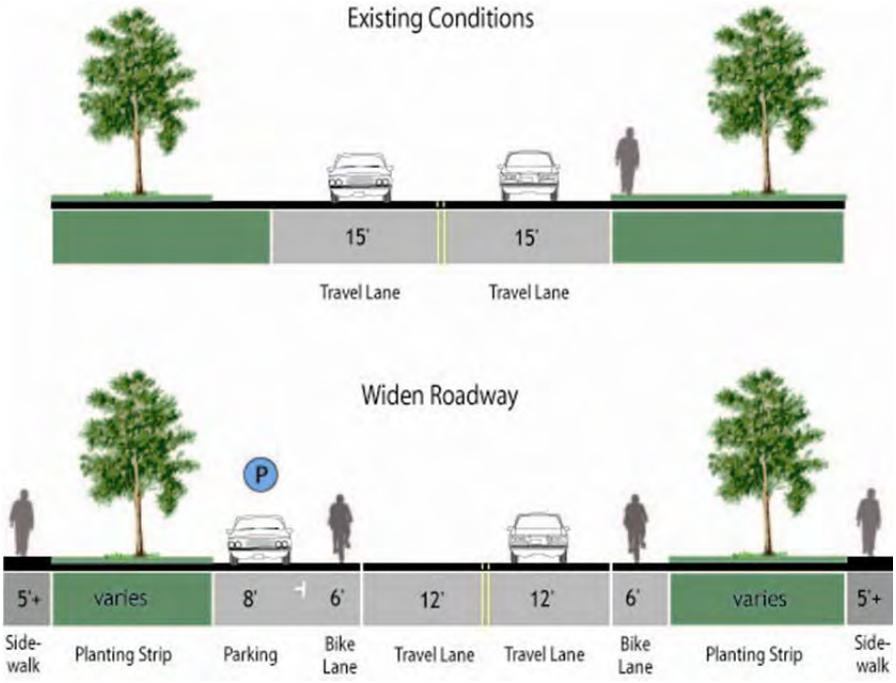
Roadway widening is preferred on roads lacking curbs, gutters, and sidewalks

Discussion

Bicycle lanes may be accommodated on streets with excess ROW through shoulder widening. Although street widening incurs higher expenses when compared to re-striping projects, bicycle lanes can be added to streets currently lacking curbs, gutters, and sidewalks without major infrastructure reconstruction.

Guidance

- AASHTO *Guide for the Development of Bicycle Facilities*
- Caltrans *Highway Design Manual* (Chapter 1000)
- Rosales, Jennifer. (2006). *Road Diet Handbook: Setting Trends for Livable Streets*



Example of roadway widening to accommodate bicycle lanes and sidewalks.

Retrofitting Existing Streets with Bicycle Lanes

Lane Narrowing (Road Diet 1)

Design Summary

- Vehicle lane: before 12′ to 15′; after: 10′ to 11′
- Bicycle lane width: see bicycle lane design guidance

Discussion

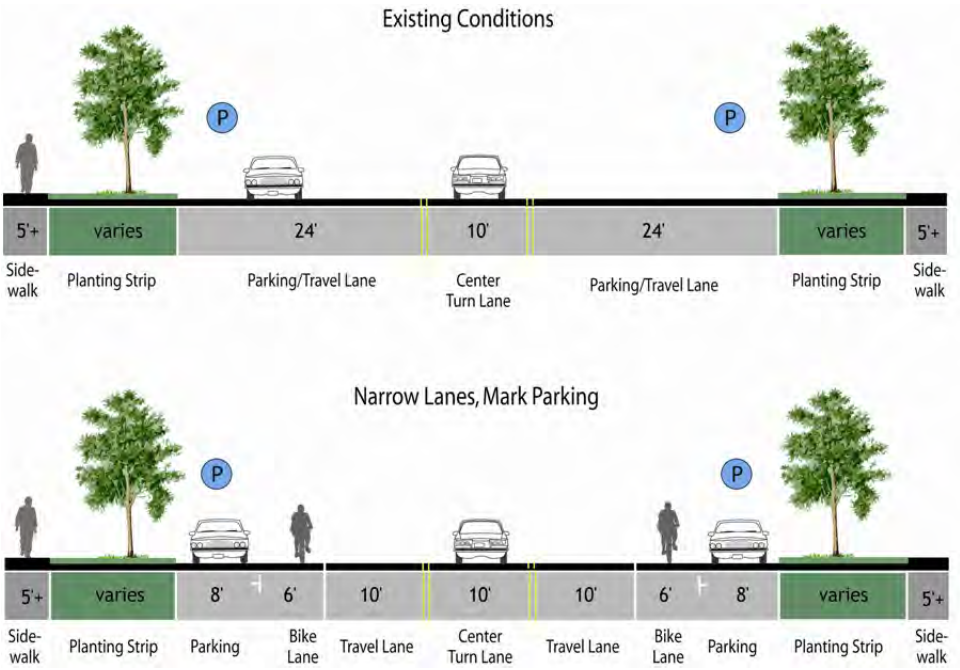
Also called a "Road Diet," lane narrowing utilizes roadway space that exceeds minimum standards to create the required width to provide bicycle lanes. Many roadways have lanes that are wider than currently established minimums contained in the AASHTO *Policy on the Geometric Design of Highways and Streets* and the Caltrans HDM. Most standards allow for the use of 11′ and sometimes 10′ travel lanes.

Special considerations should be given to the amount of heavy vehicle traffic and horizontal curvature before the decision is made to narrow travel lanes. Center turn lanes can also be narrowed in some situations to create pavement space for bicycle lanes.

This street in Portland, Oregon previously had 13' lanes which were narrowed to accommodate bicycle lanes without removing travel lanes.

Guidance

- AASHTO *Guide for the Development of Bicycle Facilities*
- Caltrans Highway Design Manual (Chapter 1000)
- Rosales, Jennifer. (2006). *Road Diet Handbook: Setting Trends for Livable Streets*



Example of vehicle travel lane narrowing to accommodate bicycle lanes.

Retrofitting Existing Streets with Bicycle Lanes

Lane Reconfiguration (Road Diet 2)

Design Summary

- Vehicle lane width depends on project. Lane narrowing may not be needed if a lane is removed
- Bicycle lane width: see bicycle lane design guidance

Design Example

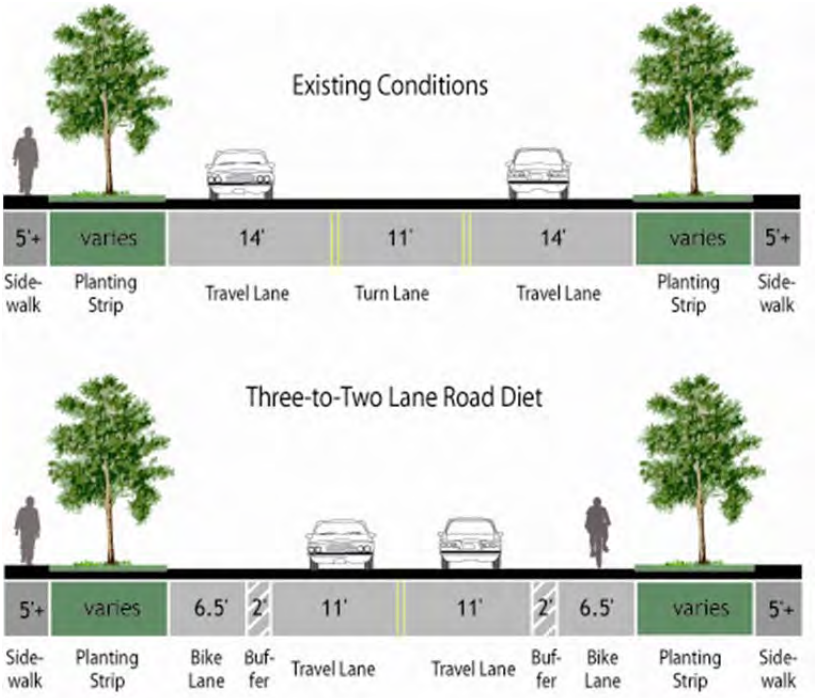
This road was re-striped to convert four vehicle travel lanes into three travel lanes with bicycle lanes.

Discussion

The removal of a single travel lane will generally provide sufficient space for bicycle lanes on both sides of a street. Streets with excess vehicle capacity provide opportunities for bicycle lane retrofit projects. Depending on a street's existing configuration, traffic operations, and user needs, various lane reduction configurations may be applied. For instance, a four-lane street (with two travel lanes in each direction) could be modified to include one travel lane in each direction, a center turn lane, and bicycle lanes. Prior to implementing this measure, a traffic analysis should be performed to identify potential impacts.

Guidance

- Slated for inclusion in the update to the AASHTO *Guide for the Development of Bicycle Facilities*
- Rosales, Jennifer. (2006). *Road Diet Handbook: Setting Trends for Livable Streets*



Example of vehicle travel lane reconfiguration to accommodate bicycle lanes

Retrofitting Existing Streets with Bicycle Lanes

Parking Reduction (Road Diet 3)

Design Summary

- Vehicle lane width depends on project. Lane narrowing may not be needed depending on the width of the parking lane to be removed
- Bicycle lane width: see bicycle lane design guidance

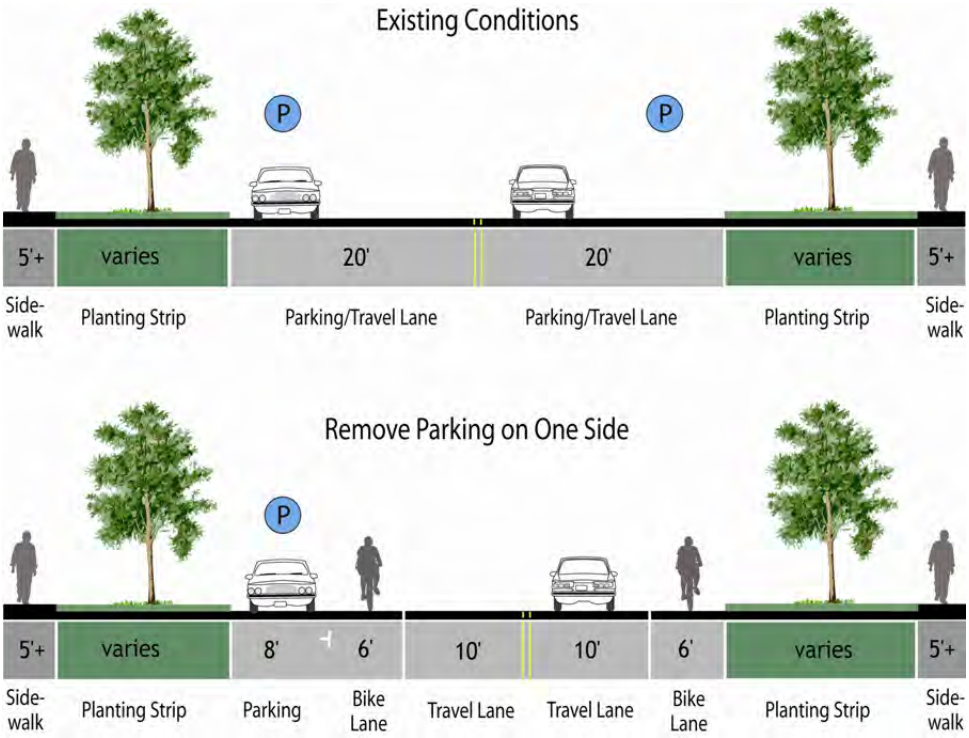
Some streets may not require parking on both sides

Discussion

Bicycle lanes could replace one or more on-street parking lanes on streets where excess parking exists and/or the importance of bicycle lanes outweighs parking demand. For instance, parking may be needed on only one side of a street (as shown below and at right). Eliminating or reducing on-street parking also improves sight distance for bicyclists in bicycle lanes and for motorists on approaching side streets and driveways. Prior to reallocating on-street parking for other uses, a parking study should be performed to gauge demand and to evaluate impacts to people with disabilities.

Guidance

- Rosales, Jennifer. (2006). *Road Diet Handbook: Setting Trends for Livable Streets*



Example of parking removal to accommodate bicycle lanes.

Bicycle Routes/Boulevards

Design Summary

- Roadway width varies depending on roadway configuration
- Use D11-1 "Bike Route" signs as specified for shared roadways
- Shared lane markings may be applied
- Intersection treatments, traffic calming, and traffic diversions can be applied to improve the bicycling environment, as discussed in the following pages

Discussion

Bicycle boulevards are low-volume streets where motorists and bicyclists share the same space. Treatments for bicycle boulevards include five "application levels" based on their level of physical intensity, with Level 1 representing the least physically-intensive treatments that can be implemented at relatively low costs.

Traffic calming and other treatments are applied along the corridor to reduce vehicle speeds such that motorists and bicyclists travel at similar speeds, creating a more comfortable environment for all users. Bicycle boulevards incorporate treatments to facilitate convenient crossings where the route crosses a major street. They work best in well-connected street grids where riders can follow reasonably direct and logical routes and when higher-order parallel streets exist to serve through vehicle traffic.

Bicycle boulevards can be enhanced with shared lane markings, directional signage, traffic diverters, chicanes, chokers, and other traffic calming measures to reduce vehicle speeds and/or volumes. The level of treatment provided at a specific location depends on several factors, discussed in the following pages.

Guidance

- Bicycle boulevards have been implemented in Berkeley, Emeryville, Palo Alto, San Luis Obispo, and Pasadena, CA; Portland and Eugene, OR; Vancouver, BC; Tucson, AZ; Minneapolis, MN; Ocean City, MD; and Syracuse, NY
- Alta Planning + Design and IBPI. *Fundamentals of Bicycle Boulevard Planning & Design:* https://trec.pdx.edu/sites/default/files/BicycleBoulevardGuidebook(optimized).pdf
- City of Berkeley. (2000). *Bicycle Boulevard Design Tools and Guidelines*: https://nacto.org/wp-content/uploads/2012/06/City-of-Berkeley-2000.pdf
- AASHTO *Guide for the Development of Bicycle Facilities*
- California *MUTCD*

Recommended design for bicycle boulevards.

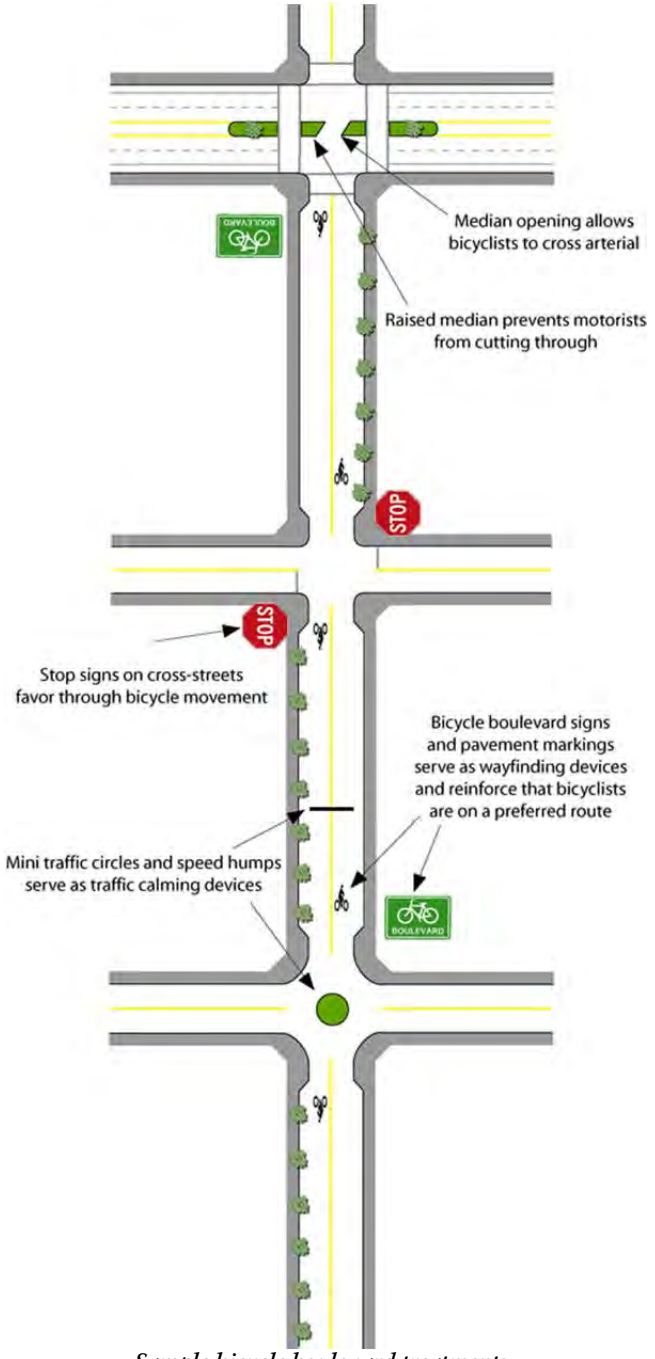
Bicycle boulevards are designed for low-speed/ volume streets to provide a comfortable and pleasant experience for bicyclists.

Bicycle Routes/Boulevards

Discussion (continued)

Bicycle boulevards serve a variety of purposes:

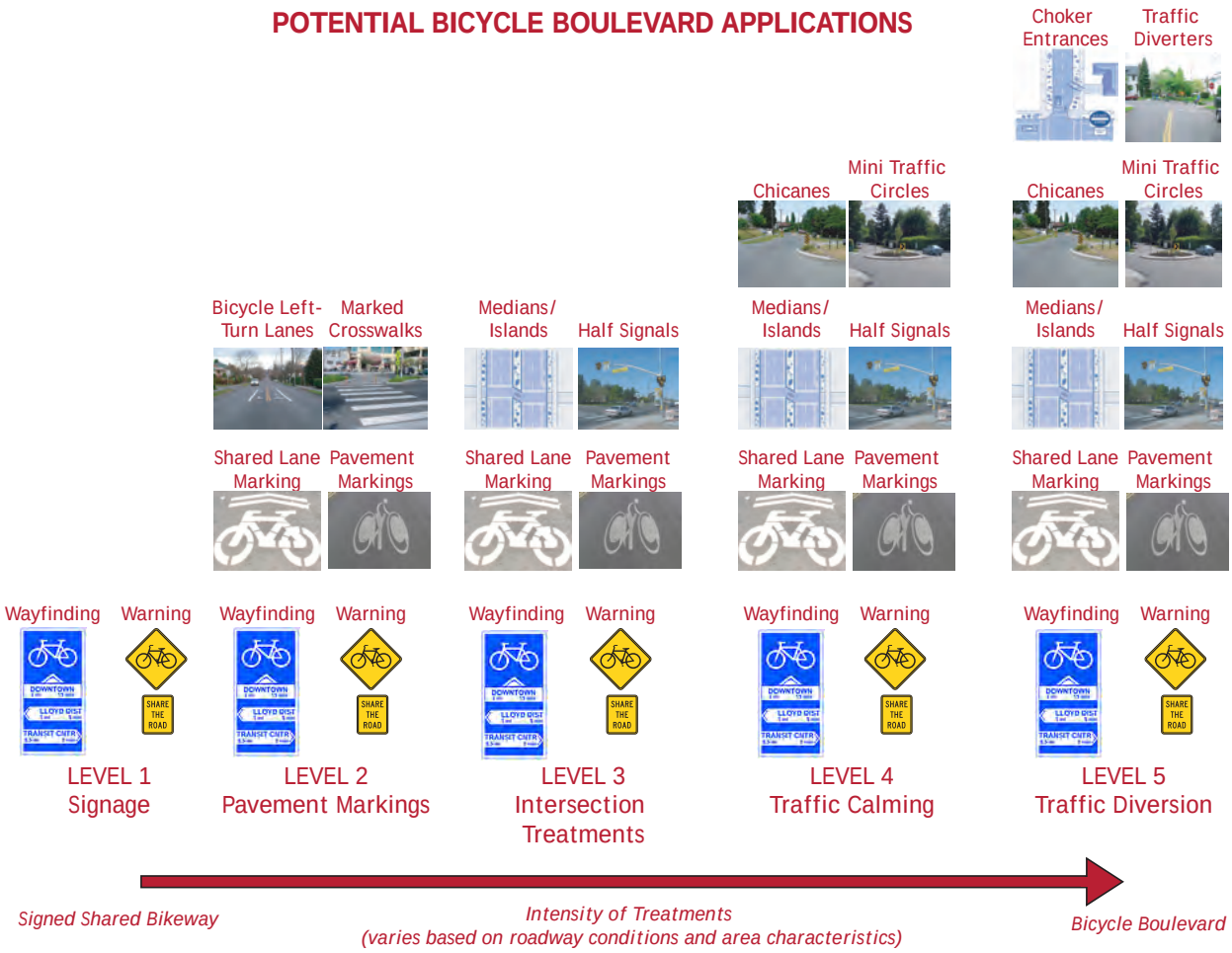
- Parallel major streets lacking dedicated bicycle facilities:
  - Higher-order streets typically include major bicyclist destinations (e.g., commercial and employment areas). However, these corridors often lack bicycle lanes or other dedicated facilities, creating an uncomfortable, unattractive, and potentially challenging riding environment. Bicycle boulevards serve as alternate parallel facilities that allow bicyclists to avoid major streets for longer trips.
- Parallel major streets with bicycle facilities that are uncomfortable for some users:
  - Some users may not feel comfortable using bicycle lanes on major streets due to high traffic volumes and vehicle speeds, conflicts with motorists entering and leaving driveways, and/or conflicts with buses loading and unloading passengers. Children and less-experienced riders may find these environments especially challenging. Utilizing lower-order streets, bicycle boulevards provide alternate route choices for these types of bicyclists. It should be noted that bicycle lanes on major streets provide important access to key land uses, and the major street network often provides the most direct routes between major destinations. For these reasons, bicycle boulevards should complement a bicycle lane network and not serve as a substitute.
- Ease of implementation on most local streets:
  - Bicycle boulevards incorporate cost-effective and less physically-intrusive treatments than bicycle lanes and cycle tracks. Relatively inexpensive treatments such as new signage, pavement markings, and striping can be applied to enhance bicyclists' mobility and safety. Other treatments such as curb extensions, medians, and signal modifications can be implemented at reasonable costs, with consideration for emergency vehicle access.
- Benefits beyond an improved bicycling environment:
  - Residents living on bicycle boulevards benefit from reduced vehicle speeds and through traffic. Pedestrians and other users can also benefit from bicycle boulevards through improved crossings at intersections.



Sample bicycle boulevard treatments.

Bicycle Routes/Boulevards

Bicycle Boulevard Application Levels



This section describes various treatments commonly used for developing Bicycle Boulevards. The treatments fall within five basic "application levels" based on their level of physical intensity, with Level 1 representing the least physically-intensive treatments that could be implemented at relatively low costs and constitute Bicycle Routes. Identifying appropriate application levels for individual Bicycle Boulevard corridors provides a starting point for selecting appropriate site-specific improvements. The five Bicycle Boulevard application levels are as follows:

- Level 1: Signage
- Level 2: Pavement Markings
- Level 3: Intersection Treatments
- Level 4: Traffic Calming
- Level 5: Traffic Diversion

It should be noted that corridors targeted for higher-level applications would also receive relevant lower-level treatments since a Bicycle Boulevard is a Bicycle Route where additional traffic calming measures have been implemented. For instance, a street targeted for Level 3 applications should also include Level 1 and 2 applications as necessary. Additionally, it may not be necessary to apply all treatments for a specific level. National City should gather input from the bicycling community and neighborhood groups during the planning stages.

Level 1: Bicycle Route/Boulevard Signing

Design Summary

- Signage is a cost-effective, yet highly-visible treatment that can improve the riding environment on a bicycle boulevard
- Consistent signage and pavement markings should be applied

Discussion

Wayfinding Signs

Wayfinding signs are typically placed at key locations leading to and along bicycle boulevards, including where multiple routes intersect and at key bicyclist "decision points." Wayfinding signs displaying destinations, distances, and "riding time" can dispel common misperceptions about time and distance while increasing users' comfort and accessibility to the boulevard network.

Wayfinding signs also visually cue motorists that they are driving along a bicycle route and should correspondingly use caution. Note that too many signs tend to clutter the ROW and it is recommended that these signs be posted at a level most visible to bicyclists and pedestrians, rather than per vehicle signage standards.

Warning signs

Warning signs advising motorists to "share the road" and "watch for bicyclists" may also improve bicycling conditions on shared streets. These signs are especially useful near major bicycle trip generators such as schools, parks and other activity centers. Warning signs should also be placed on major streets approaching bicycle boulevards to alert motorists of bicyclist crossings.

Guidance

- Alta Planning + Design and IBPI. Fundamentals of Bicycle Boulevard Planning & Design: https://trec.pdx.edu/sites/default/files/BicycleBoulevardGuidebook(optimized).pdf
- City of Berkeley. (2000). *Bicycle Boulevard Design Tools and Guidelines*
- AASHTO *Guide for the Development of Bicycle Facilities*
- California *MUTCD*, Part 9

Level 2: Bicycle Route/Boulevard Pavement Markings

Design Summary

- The shared lane marking is the only wayfinding/bicycle boulevard pavement marking approved by the California MUTCD

Discussion

Directional Pavement Markings

Directional pavement markings (also known as "bicycle boulevard markings" or "breadcrumbs") lead bicyclists along a boulevard and reinforce that they are on a designated route. Markings can take a variety of forms, such as small bicycle symbols placed every 600-800 feet along a linear corridor, as previously used on Portland, Oregon's bicycle boulevard network.

Recently, jurisdictions have been using larger, more visible pavement markings. Shared lane markings may be used as bicycle boulevard markings. Portland, OR is moving towards this option.

In Berkeley, California, non-standard pavement markings include larger-scale lettering and stencils to clearly inform motorists and bicyclists of a street's function as a bicycle boulevard.

On-Street Parking Delineation

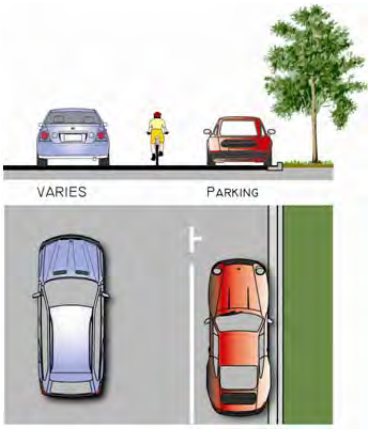
Delineating on-street parking spaces with paint or other materials clearly indicates where a vehicle should be parked and can discourage motorists from parking their vehicles too far into the adjacent travel lane. This marking helps bicyclists by maintaining a wide enough space to safely share a travel lane with moving vehicles while minimizing the need to swerve farther into the travel lane to maneuver around parked cars. In addition to benefiting bicyclists, delineated parking spaces also promote the efficient use of on-street parking by maximizing the number of spaces in high-demand areas.

Guidance

- Alta Planning + Design and IBPI. Fundamentals of Bicycle Boulevard Planning & Design: https://trec.pdx.edu/sites/default/files/BicycleBoulevardGuidebook(optimized).pdf
- City of Berkeley. (2000). *Bicycle Boulevard Design Tools and Guidelines*
- AASHTO *Guide for the Development of Bicycle Facilities*
- California *MUTCD*

Bicycle boulevard directional marker.

Shared lane markings also provide directional support for bicyclists.



Example of on-street parking delineation.

Level 3: Bicycle Routes/Boulevards at Minor Unsignalized Intersections

Design Summary

- Encourage use of bicycle boulevards, enhance bicyclist safety and reduce bicycle travel time by eliminating unnecessary stops and improving intersection crossings

Discussion

Stop Sign on Cross-Street

Unmarked intersections are concerning for bicyclists because cross-traffic may not be looking for them. Stop signs are a relatively inexpensive treatment to minimize bicycle and cross-vehicle conflicts. However, placing stop signs at all intersections along bicycle boulevards may be unwarranted as a traffic control measure. Yield signs should be considered if stop signs are not warranted.

Curb Extensions and High-Visibility Crosswalks

This treatment is appropriate near activity centers with large amounts of pedestrian activity, such as schools or commercial areas. Curb extensions should only extend across the parking lane and not obstruct bicyclists' path of travel or the travel lane. Curb extensions and high-visibility crosswalks both calm traffic and increase the visibility of pedestrians waiting to cross the street.

Bicycle Forward Stop Bar

A second stop bar for bicyclists placed closer to the centerline of the cross street than the first stop bar increases the visibility of bicyclists waiting to cross a street. This treatment is typically used with other crossing treatments (i.e. curb extension) to encourage bicyclists to take full advantage of crossing design. They are appropriate at unsignalized crossings where fewer than 25 percent of motorists make a right turn movement.

Guidance

- Alta Planning + Design and IBPI. Fundamentals of Bicycle Boulevard Planning & Design: https://trec.pdx.edu/sites/default/files/BicycleBoulevardGuidebook(optimized).pdf
- City of Berkeley. (2000). *Bicycle Boulevard Design Tools and Guidelines*
- AASHTO *Guide for the Development of Bicycle Facilities.*
- California *MUTCD*, Part 9

Stop signs effectively minimize conflicts along bicycle boulevards.

Curb extensions can be a good location for pedestrian amenities, including street trees.

Bicycle forward stop bars encourage bicyclists to wait where they are more visible.

Level 3: Bicycle Routes/Boulevards at Major Unsignalized Intersections

Design Summary

- Increase crossing opportunities with medians and refuge islands
- Instructional and regulatory signage should be considered with installation of a bicycle signal. Instructional signage is not standard in the State of California. Part 4 of the California MUTCD covers bicycle signals

Medians on bicycle boulevards should provide space for a bicyclist to wait.

Discussion

Medians/Refuge Islands

At uncontrolled intersections at major streets, a crossing island can be provided to allow bicyclists to cross one direction of traffic at a time when gaps in traffic allow. The bicycle crossing island should be at least 8' wide to be used as the bicycle refuge area. Narrower medians can accommodate bicycles if the holding area is at an acute angle to the major roadway. Crossing islands can be placed in the middle of the intersection, prohibiting left and through vehicle movements.

Bicycle Signals

Bicycle signals have been an approved traffic control device in California since the technology was studied and approved after years of service in the City of Davis. A bicycle signal provides an exclusive signal phase for bicyclists traveling through an intersection. This element takes the form of a new signal head installed with red, amber, and green bicycle indications. Bicycle signals can be actuated with bicycle-sensitive loop detectors, video detection, or push buttons.

Where few crossing gaps exist and major street traffic does not typically stop for pedestrians and bicyclists waiting to cross, "half signals" can be installed to improve the crossing environment. Half signals include pedestrian and bicycle activation buttons and may also include loop detectors on the bicycle boulevard approach. Many of these models have been used successfully for years overseas, and their use in the U.S. has increased dramatically over the last decade.

Half-signals for bicyclists should be clearly marked to minimize confusion.

Example of instructional signage from Portland, OR.

Guidance

Note: While bicycle signals are approved for use in California, information should be provided such that at intersections with bicycle signals, bicycles should only obey the bicycle signal heads.

- Alta Planning + Design and IBPI. Fundamentals of Bicycle Boulevard Planning & Design: https://trec.pdx.edu/sites/default/files/BicycleBoulevardGuidebook(optimized).pdf
- City of Berkeley. (2000). *Bicycle Boulevard Design Tools and Guidelines*
- AASHTO *Guide for the Development of Bicycle Facilities*
- California *MUTCD*

Level 3: Bicycle Routes/Boulevards at Offset Intersections

Design Summary

- Installing turning lanes or pockets at offset intersections provides bicyclists with a refuge to make a two-step turn
- Bicycle left turn lanes – 5 feet wide minimum, with a total of 11 feet required for both turn lanes and center striping

Example of a bicycle left-turn lane.

This bicycle-only left-turn pocket guides bicyclists along a popular bicycle route.

Discussion

Offset intersections can be challenging for bicyclists, who need to transition onto the busier cross-street in order to continue along the boulevard.

Bicycle Left-Turn Lane

Similar to medians/refuge islands, bicycle left-turn lanes allow the crossing to be completed in two phases. A bicyclist on the boulevard can execute a right-hand turn onto the cross-street and then wait in a delineated left-turn lane for a gap in oncoming traffic.

Bicycle Left -Turn Pocket

A bicycle-only left-turn pocket permits bicyclists to make left turns while restricting vehicle left turns. If the intersection is signal-controlled, a left arrow signal may be appropriate, depending on bicycle and vehicle volumes. Signs should be provided prohibiting motorists from turning. Ideally, the left turn pocket should be protected by a raised curb, but the pocket may also be defined by striping if necessary. Because of the restriction on vehicle left-turning movements, this treatment also acts as traffic diversion.

Guidance

- Alta Planning + Design and IBPI. Fundamentals of Bicycle Boulevard Planning & Design: https://trec.pdx.edu/sites/default/files/BicycleBoulevardGuidebook(optimized).pdf
- AASHTO *Guide for the Development of Bicycle Facilities*

Level 4: Bicycle Boulevard Traffic Calming

Design Summary

- Traffic calming treatments are intended to reduce vehicle speeds, enabling motorists and bicyclists to safely co-exist on the same facility

Discussion

Chicanes

Chicanes are a series of raised or delineated curb extensions on alternating sides of a street forming an S-shaped curb, which reduce vehicle speeds through narrowed travel lanes and horizontal deflection. Chicanes can also be achieved by establishing on-street parking on alternating sides of the street. These treatments are most effective on streets with narrower cross-sections.

Mini Traffic Circles

Mini traffic circles are raised or delineated islands placed at intersections, reducing vehicle speeds through tighter turning radii and narrowed vehicle travel lanes (see right). These devices can effectively slow vehicle traffic while facilitating all turning movements at an intersection. Mini traffic circles can also include a paved apron to accommodate the turning radii of larger vehicles like fire trucks or school buses.

Speed Humps

Shown to the right, speed humps are rounded raised areas of the pavement requiring approaching motor vehicles to reduce speeds. These devices also discourage through vehicle travel on a bicycle boulevard when a higher-order, parallel route exists. Speed humps should never be constructed so steep that they may cause a bicyclist to lose control or be distracted. In some cases, a gap may be provided allowing bicyclists to continue on the level roadway surface, while still requiring vehicles to slow down to cross the barrier.

Curb Extensions and High-Visibility Crosswalks

See previous discussion in section Level 3: Bicycle Routes/Boulevards at Minor Unsignalized Intersections.

Guidance

- Alta Planning + Design and IBPI. Fundamentals of Bicycle Boulevard Planning & Design: https://trec.pdx.edu/sites/default/files/BicycleBoulevardGuidebook(optimized).pdf
- City of Berkeley. (2000). *Bicycle Boulevard Design Tools and Guidelines*
- AASHTO *Guide for the Development of Bicycle Facilities*

Chicanes require all vehicles to slow down.

Traffic circles provide an opportunity for landscaping, but visibility should be maintained.

Speed humps are a common traffic calming treatment.

Level 5: Bicycle Boulevard Traffic Diversion

Design Summary

- Traffic diversion treatments maintain through bicycle travel on a street while physically restricting through vehicle traffic
- Traffic diversion is most effective when higher-order streets can sufficiently accommodate the diverted traffic associated with these treatments

Discussion

Choker Entrances

Choker entrances are intersection curb extensions or raised islands allowing full bicycle passage while restricting vehicle access to and from a bicycle boulevard. When approaching a choker entrance at a cross-street, motorists on the bicycle boulevard must turn onto the cross-street while bicyclists may continue forward. These devices can be designed to permit some vehicle turning movements from a cross-street onto the bicycle boulevard, while restricting other movements.

Traffic Diverters

Similar to choker entrances, traffic diverters are raised features directing vehicle traffic off the bicycle boulevard while permitting through bicycle travel.

Advantages:

- Provides safe refuge in the median of the major street so that bicyclists only have to cross one direction of traffic at a time; works well with signal-controlled traffic platoons coming from opposite directions
- Provides traffic calming and enhances safety by preventing left turns and/or through traffic from using the bicycle boulevard

Disadvantages:

- May increase travel time for motorists and potentially result in loss of parking
- Crossing island requires maintenance

Guidance

- Alta Planning + Design and IBPI. Fundamentals of Bicycle Boulevard Planning & Design: https://trec.pdx.edu/sites/default/files/BicycleBoulevardGuidebook(optimized).pdf
- City of Berkeley. (2000). *Bicycle Boulevard Design Tools and Guidelines*
- AASHTO *Guide for the Development of Bicycle Facilities*

Choker entrances prevent vehicular traffic from turning from a major street onto a traffic-calmed bicycle boulevard.

Traffic diverters prevent through-vehicle traffic as well as cross-traffic.

Off-Street Facility Design Guidelines

A Class I facility allows for two-way, off-street bicycle traffic and may also be used by pedestrians, skaters, wheelchair users, joggers, and other non-motorized modes. These facilities are frequently found in parks, along rivers, and in greenbelts or utility corridors where there are few conflicts with motorized vehicles. Class I facilities can also include amenities such as lighting, signage, and fencing (where appropriate). In California, design of Class I facilities is dictated by Chapter 1000 of the Highway Design Manual.

Shared-use paths can provide a desirable facility particularly for novice riders, recreational trips, and bicyclists of all skill levels preferring separation from traffic. Shared-use paths will generally provide new travel opportunities.

Shared-use paths serve bicyclists and pedestrians and provide additional width over a standard sidewalk. Facilities may be constructed adjacent to roads, through parks, or along linear corridors such as active or abandoned railroad lines or waterways. Regardless of the type, paths constructed next to the road must have some type of vertical (e.g., curb or barrier) or horizontal (e.g., landscaped strip) buffer separating the path from adjacent vehicle travel lanes.

Elements that enhance shared-use path design include:

- Providing frequent access points from the local roadway network; if access points are spaced too far apart, users will have to travel out of direction to enter or exit the path, which will discourage use
- Placing directional signs to direct users to and from the path
- Designing a strong enough structural section to allow heavy maintenance equipment to use the path without causing it to deteriorate
- Limiting the number of at-grade crossings with streets or driveways
- Terminating the path where it is easily accessible to and from the street system, preferably at controlled intersections or at the beginning of a dead-end street. If not properly designed, the point where the path joins the street network can put pedestrians and bicyclists in a position where motor vehicles are not expecting to see them
- Identifying and addressing potential safety and security issues up front
- Whenever possible, and especially where heavy use can be expected, separate bicycle and pedestrian ways should be provided to reduce conflicts
- Providing accessible parking spaces at trailheads and access points

Shared-use paths (also referred to as "trails" and "multi-use paths") are often viewed as recreational facilities, but they are also important corridors for utilitarian trips.

Shared-Use Path Design

Design Summary

- Width standards:
  - 8 feet is the minimum allowed for a two-way multi-use path and is only recommended for lower facility use
  - 10 feet is recommended in most situations and will be adequate for moderate to heavy use
  - 12 feet is recommended for heavy use situations with high concentrations of multiple users such as joggers, bicyclists, rollerbladers and pedestrians
- Lateral Clearance: 2' or greater shoulder on both sides (required by Caltrans' HDM, Chapter 1000)
- Overhead Clearance: 10' minimum recommended
- Maximum design speed: 20 mph; speed bumps or other surface irregularities should never be used to slow bicycles
- Recommended maximum grade: 5%; steeper grades can be tolerated for short distances (see guidelines following)

Discussion

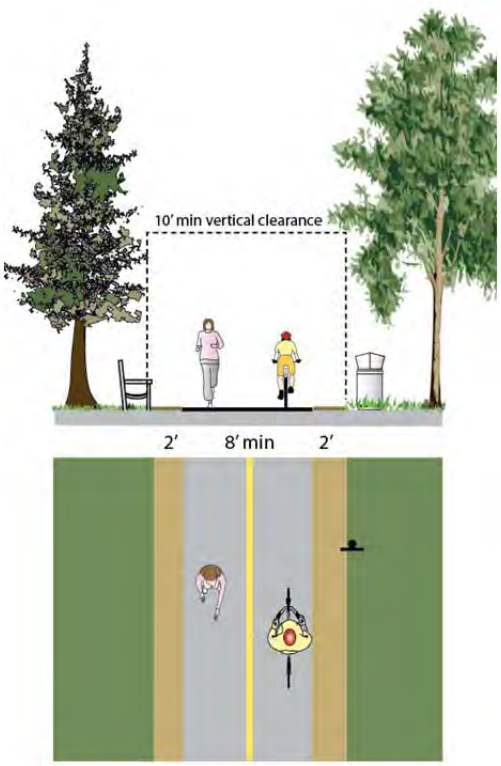
A hard surface should be used for multi-use trails. Concrete, while more expensive than asphalt, is the hardest of all trail surfaces and lasts the longest. However, joggers and runners prefer surfaces such as asphalt or decomposed granite due to its relative "softness". While most asphalt is black, dyes (such as reddish pigments) can be added to increase the aesthetic value of the trail itself.

When concrete is used the trail should be designed and installed using the narrowest possible expansion joints to minimize the amount of 'bumping' bicyclists experience on the trail.

Shared-use paths should be designed according to ADA standards. Constructing trails may have limitations that make meeting ADA standards difficult and sometimes prohibitive. Prohibitive impacts include harm to significant cultural or natural resources, a significant change in the intended purpose of the trail, construction methods that do not comply with federal, state, or local regulations, or presence of terrain characteristics that prevent compliance.

Guidance

- U.S. Access Board (2014). *Accessibility Standards for Federal Outdoor Developed Areas:* https://www.access-board.gov/files/aba/guides/outdoor-guide.pdf
- U.S. Access Board (2013). *Public Rights-of-Way Accessibility Guidelines*: https://www.access-board.gov/files/prowag/PROW-SUP-SNPRM-2013.pdf
- AASHTO *Guide for the Development of Bicycle Facilities*



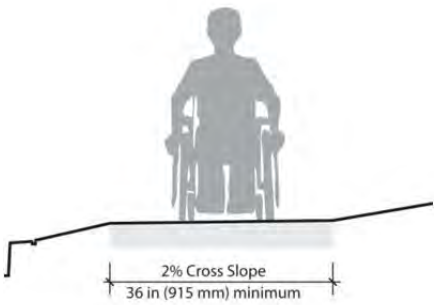
Recommended shared-use path design.

The Cedar Lake Regional Trail in Minneapolis, MN has sufficient width to accommodate a variety of users.

Trail Accessibility

Design Summary

- Where less than 5', a 3' minimum clear width passing space should be provided at least every 100'
- Cross slope should not exceed 5%
- Provide signs indicating the length of the accessible trail segment
- Provide curb ramps at roadway crossings and curbs. Tactile warning strips and audible crossing signals are recommended



ADA clearance requirement.

Discussion

Slopes should not exceed 5%. However, certain conditions may require the use of steeper slopes. For conditions exceeding a 5% slope, the recommendations are as follows:

- Up to an 8.3% slope for a 200 feet maximum run; landings or resting intervals must be provided every 20'
- Up to a 10% slope for a 30 feet maximum run; resting intervals spaced at 30 feet minimum
- Up to 12.5 % slope for 10 feet maximum run; resting intervals spaced at 10 feet minimum

The trail surface shall be firm and stable. The Forest Service Accessibility Guidelines defines a firm surface as a trail surface that is not noticeably distorted or compressed by the passage of a device that simulates a person who uses a wheelchair. Where ROWs are available, paths which exceed a 5% slope can be made more accessible by creating side paths that meander away from the primary path.

Shared-use paths surfacing materials affect which types of users can benefit from the facility.

Guidance

- *American with Disabilities Act* (ADA) for accessible trails
- U.S. Access Board (2014). Accessibility Standards for Federal Outdoor Developed Areas: https://www.access-board.gov/files/aba/guides/outdoor-guide.pdf
- Forest Service Accessibility Guidelines

Managing Multiple Users

Design Summary

- Barrier separation – vegetated buffers or barriers, elevation changes, walls, fences, railings and bollards
- Distance separation – differing surfaces
- User behavior guidance signage

Discussion

On trails that have high bicycle and pedestrian use, conflicts can arise between faster-moving bicyclists and slower bicyclists, as well as pedestrians and other users. As this conflict is a common problem in more urban areas, a variety of treatments have been designed to alleviate congestion and minimize conflicts.

Centerline Striping

On trails of standards widths, striping the centerline identifies which side of the trail users should be on.

Physical Separation

Differing surfaces suitable to each user group foster visual separation and clarity of where each user group should be. When trail corridors are constrained, the approach is often to locate the two different trail surfaces side by side with no separation.

Offsetting of the pedestrian path should be provided if possible. Otherwise, physical separation should be provided in the form of a small hump or other crossable barrier. The bicycle path should be located on whichever side of the path will result in the fewest number of anticipated pedestrian crossings. For example, the bicycle path should not be placed adjacent to large numbers of destinations. Site analysis of each project is required to determine expected pedestrian behavior.

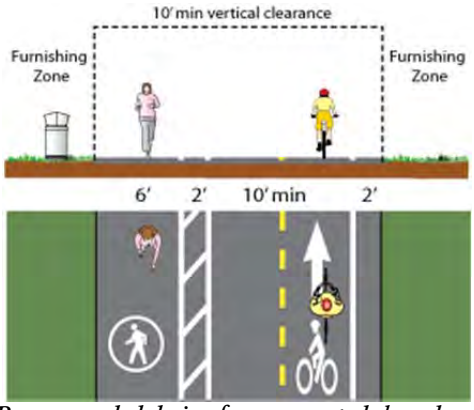
Trail Etiquette Signage

Informing trail users of acceptable trail etiquette is important when multiple user types are anticipated. Yielding the right-of-way is a courtesy and a necessary part of a safe trail experience involving multiple trail users. Trail right-of-way information should be posted at trail access points and along the trail. The message must be clear and easy to understand. Where appropriate, trail etiquette systems should instruct trail users to the yielding of bicyclists to pedestrians and equestrians and the yielding of pedestrians to equestrians.

Guidance

- California *MUTCD*, Part 9. Section 9C.03 contains additional information about centerline striping on a trail

Centerline striping and directional arrows encourage bicyclists to provide space for other trail users to pass.



Recommended design for a separated shared-use path.

A commonly used multi-use trail etiquette sign.

Trails Along Roadways

Design Summary

- 5' minimum buffer should separate the path from the edge of the roadway; otherwise, a physical barrier should be installed

Shared-use paths may be considered along roadways under the following conditions:

- The path will generally be separated from all motor vehicle traffic
- Bicycle and pedestrian use is anticipated to be high
- To provide continuity with an existing path through a roadway corridor
- The path can be terminated at each end onto streets or trails with good bicycle and pedestrian facilities
- There is adequate access to local cross-streets and other facilities along the route
- Any needed grade separation structures do not add substantial out-of-direction travel
- The total cost of providing the proposed path is proportionate to the need, compared to the cost of providing on-street facilities

Trails directly adjacent to roadways can be challenging for users at roadway intersections.

Discussion

Concerns about shared-use paths directly adjacent to roadways (e.g., with minimal or no separation) are:

- Half of bicycle traffic may ride against the flow of vehicle traffic, contrary to the rules of the road
- When the path ends, bicyclists riding against traffic tend to continue to travel on the wrong side of the street, as do bicyclists who are accessing the path. Wrong-way bicycle travel is a major cause of crashes
- At intersections, motorists crossing the path often do not notice bicyclists approaching, especially where sight distances are poor
- Bicyclists are required to stop or yield at cross-streets and driveways, unless otherwise posted
- Stopped vehicles on a cross-street or driveway may block the path
- Because of the proximity of vehicle traffic to opposing bicycle traffic, barriers are often necessary to separate motorists from bicyclists. This type of improvement increases construction and maintenance costs
- Paths directly adjacent to high-volume roadways diminish users' experience by placing them in an uncomfortable environment

As bicyclists gain experience and realize some of the advantages of riding on the roadway, some riders stop using paths adjacent to roadways. Bicyclists may also tend to prefer the roadway as pedestrian traffic on the shared use path increases. When designing a bikeway network, the presence of a nearby or parallel path should not be used as a reason to forego adequate shoulder or bicycle lane width on the roadway, as the on-street bicycle facility will generally be superior to the "sidepath" for experienced bicyclists and those who are bicycling for transportation purposes. Bicycle lanes should be provided as an alternate (more transportation-oriented) facility whenever possible.

Guidance

- Both the California *Highway Design Manual* Chapter 1000 and the AASHTO G*uide for the Development of Bicycle Facilities* recommend against the development of multi-use paths directly adjacent to roadways without providing adequate buffers/barriers between path users and motorists.

Path/Roadway Crossings

Design Summary

At-grade path/roadway crossings will generally fit into one of four basic categories:

- Type 1: Marked/Unsignalized Crossings - Include trail crossings of residential, collector, and sometimes arterial streets or railroad tracks. May include flashing beacons and other treatments to enhance visibility
- Type 2: Route Users to Existing Signalized Intersections - Trails that emerge near existing signalized intersections may be routed to these locations provided that sufficient protection is implemented at the existing intersection
- Type 3: Signalized/Controlled Crossings – Include trail crossings that require signals or other control measures due to high traffic volumes, speeds, and trail usage
- Type 4: Grade-Separated Crossings - Bridges or under-crossings provide the maximum level of safety but are also generally the most expensive to build and maintain

An offset crossing forces pedestrians to turn and face the traffic they are about to cross.

Discussion

While at-grade crossings create conflicts between path users and motorists, well-designed crossings have not historically presented safety issues for path users. This trend is evidenced by the thousands of successful paths around the United States with at-grade crossings. In most cases, at-grade path crossings can be properly designed to meet existing traffic safety standards.

Evaluation of path crossings involves analysis of vehicular and anticipated path user traffic patterns, including:

- Vehicle speeds
- Street width
- Sight distance
- Traffic volumes (average daily traffic and peak hour traffic)
- Path user profile (age distribution, destinations served)

Crossing features for all roadways should include warning signs for both vehicles and path users. Consideration must be given for proper warning distance based on vehicle speeds and line of sight. Signs must be clearly visible to drivers. Treatments such as flashing lights, enhanced roadway striping, and changes in pavement texture can improve driver awareness of the crossing. Signing for path users must include a standard "STOP" sign and pavement markings, sometimes combined with other features such as bollards or a deflection in the pathway to slow bicyclists.

Guidance

- Federal Highway Administration (FHWA) Report (2005), *Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations.* https://www.fhwa.dot.gov/publications/research/safety/04100/04100.pdf
- California *Highway Design Manual,* Chapter 1000
- AASHTO *Guide for the Development of Bicycle Facilities*

Type 1: Marked/Unsignalized Crossings

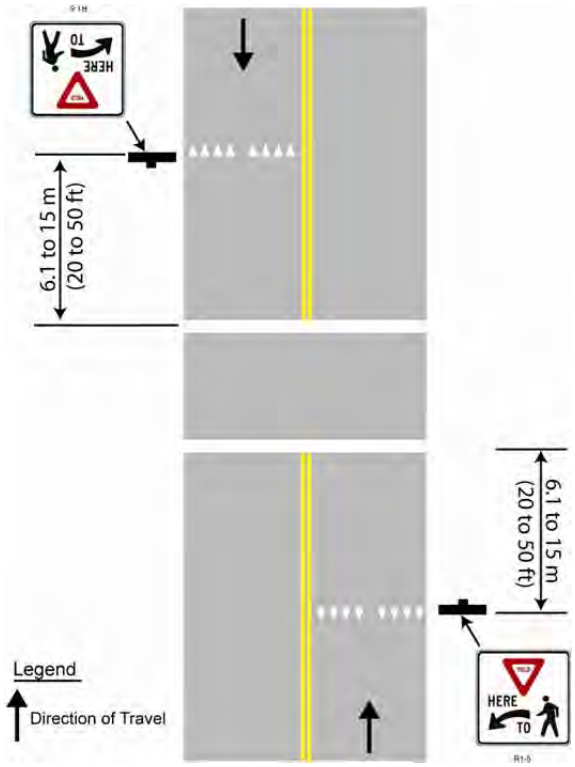
Uncontrolled Mid-Block Crossing

Design Summary

- Installed where there is a high demand for crossing and no nearby existing signalized crossings
- If yield lines are used for vehicles, they shall be placed 20–50' in advance of the nearest crosswalk line to indicate the point at which to yield and 'Yield Here to Pedestrians' signs shall be placed adjacent to the yield line
- The Bicycle Warning (W11-1) sign may be used to alert road users of unexpected entries into the roadway by bicyclists
- A ladder-style crosswalk may be used to enhance visibility
- Warning signs and markings on the path should be installed

Discussion

The California MUTCD recommends the use of yield lines and "Yield Here to Pedestrians" signs at uncontrolled crossings of a multi-lane roadway. The Federal MUTCD includes a trail crossing sign (W11-15 and W11-15p), which may be used where both bicyclists and pedestrians cross the roadway, such as at an intersection with a shared-use path.



Recommended design from CA-MUTCD, Figure 3B-15

Recommended signage from FHWA-MUTCD, Figure 9B-3

Guidance

- California *MUTCD*, Part 9
- FHWA-MUTCD, Part 9
- AASHTO *Guide for the Development of Bicycle Facilities*

Type 2: Route Users to Existing Signalized Intersections

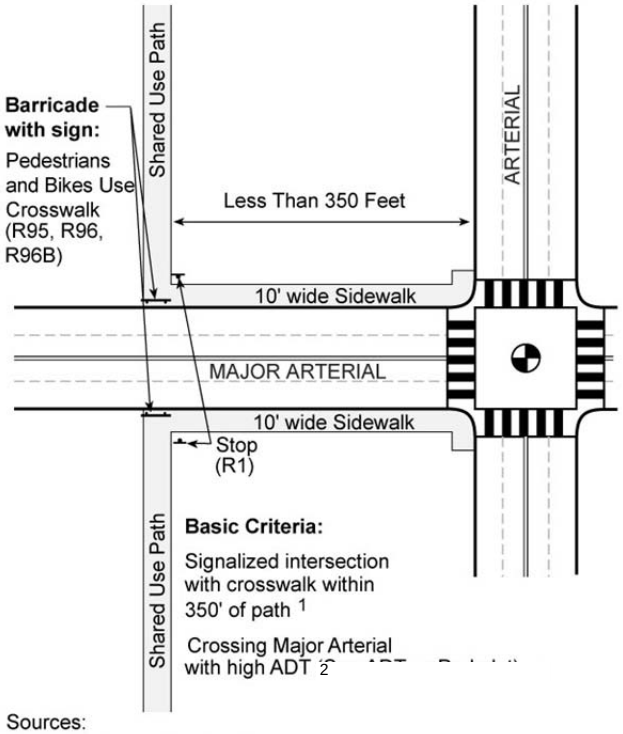
Design Summary

- A path should cross at a signalized intersection if there is a signalized intersection within 350 feet of the path and the crossroad is a high-volume arterial
- Intersection warning signs (W2-1 through W2-5) may be used on the path to indicate the presence of an intersection and the potential for turning or entering traffic. A trail-sized stop sign (R1-1) should be placed about 5 feet before the intersection

This option eliminates conflicting vehicle traffic by redirecting path users.

Discussion

Shared-use paths within 350 feet of an existing signalized intersection with pedestrian actuation are typically diverted to the signalized intersection to enhance safety. For this option to be effective, barriers and signage should be implemented to direct shared-use path users to the signalized crossings.



Recommended diversion of shared-use path to existing signalized intersection where path is within 350 feet of signalized intersection.

Guidance

- California *Highway Design Manual*, Chapter 1000
- California *MUTCD*, Part 9
- AASHTO *Guide for the Development of Bicycle Facilities*
- AASHTO *Policy on the Geometric Design of Highways and Streets*
- FHWA-RD-87-038 *Investigation of Exposure-Based Pedestrian Accident Areas: Crosswalks, Sidewalks, Local Streets, and Major Arterials*

Type 3: Signalized/Controlled Crossings

Design Summary

- Use when greater than 300 feet from an existing signalized crossing
- Use where the 85th percentile travel speeds are greater than 40 mph and/or ADT exceeds 15,000 vehicles
- Section 4C.05 in the CA MUTCD describes minimum pedestrian volume requirements (referred to as warrants) for a mid-block pedestrian-actuated signal
- Stop lines at midblock signalized locations should be placed at least 40' in advance of the nearest signal indication

Discussion

New signalized crossings may be recommended for crossings that meet pedestrian, school, or modified warrants, are located more than 300 feet from an existing signalized intersection, where 85th percentile travel speeds are 40 mph and above, and/or ADT exceeds 15,000 vehicles. Each crossing, regardless of traffic speed or volume, requires an engineering survey to identify sight distance, potential impacts on traffic progression, timing with adjacent signals, capacity, and safety.

Shared-use path signals are normally activated by push buttons, but may also be triggered by motion detectors. The maximum delay for activation of the signal should be two minutes, with minimum crossing times determined by the width of the street. The signals may rest on flashing yellow or green for motorists when not activated and should be supplemented by standard advanced warning signs. As described earlier, various types of pedestrian signals, such as "half signals" may be used at Type 3 crossings.

Signalized Mid-Block Crossing

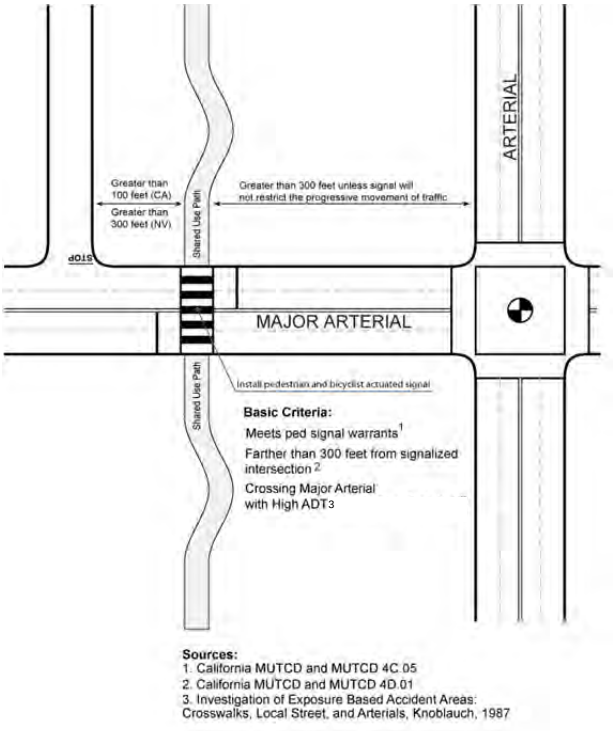
Warrants from the CA MUTCD combined with sound engineering judgment should be applied when determining the type of traffic control device to be installed at path-roadway intersections. Pedestrian volume warrants can be applied for bicyclists.

Experimental Treatment

A Toucan crossing (derived from: "two can cross") may be considered where pedestrians and bicyclists cross together.

Guidance

- MUTCD – California, Part 3 and 9 and Section 4C.05 and 4D
- AASHTO Guide for the Development of Bicycle Facilities, Chapter 2



CA-MUTCD guidance for a signalized mid-block crossing.

Type 3 Crossing

Toucan Crossing (this experimental treatment has not been approved for use in California).

Type 4: Grade-Separated Undercrossing

Design Summary

- 14′ minimum width to allow for access by maintenance vehicles if necessary
- 10′ minimum overhead height
- The undercrossing should have a centerline stripe even if the rest of the path does not have one
- Lighting and/or skylights may be desirable for longer crossings to enhance users' sense of security

Discussion

Undercrossings should be considered when high volumes of bicycles and pedestrians are expected along a corridor and:

- Vehicle volumes/speeds are high
- The roadway is wide
- A signal is not feasible
- Crossing is needed under a grade-separated facility such as a freeway or rail line

Advantages:

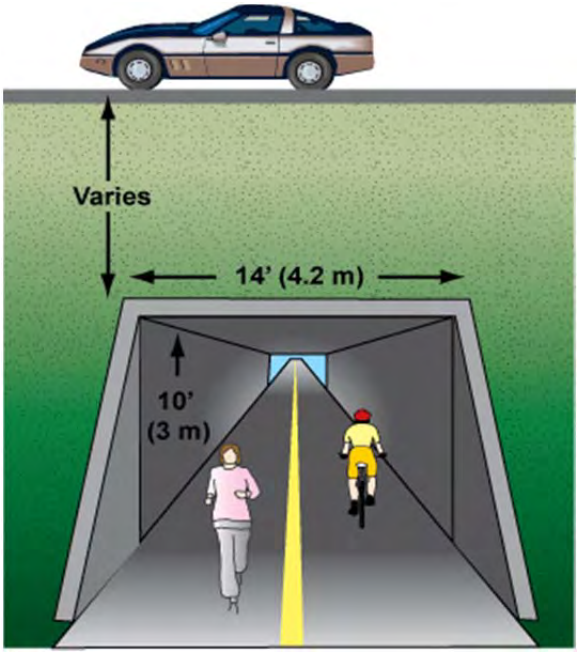
- Improves bicycle and pedestrian safety while reducing delay for all users
- Eliminates barriers to bicyclists and pedestrians
- Undercrossings often require less ramping and elevation change for the user versus an overcrossing, particularly for railroad crossings

Disadvantages:

- If crossing is not convenient or does not serve a direct connection it may not be well utilized
- Potential issues with vandalism, maintenance
- Security may be an issue if lighting and sight lines through the undercrossing and approaches are inadequate
- Higher costs associated with grade separation

Guidance

- AASHTO *Guide for the Development of Bicycle Facilities*
- Caltrans *Highway Design Manual* (Chapter 1000)



Recommended undercrossing design.

Undercrossings provide key connections and allow path users to avoid at-grade crossings of major streets or avoid barriers such as freeways and raillines.

Type 4: Grade-Separated Overcrossing

Design Summary

- 10′ minimum width, 12′ preferred
- If overcrossing has scenic vistas additional width should be provided to allow for path users to stop
- A separate 6′ pedestrian area may be provided in locations with high bicycle and pedestrian use
- Minimum of 17′ of vertical clearance to the roadway below
- 10′ headroom on overcrossing
- The overcrossing should have a centerline stripe even if the rest of the path does not have one
- Ramp slopes should be ADA-accessible: 5% (1:20) grade with landings at 400′ intervals, or 8.3% (1:12) with landings every 20′

Overcrossings are frequently used over a major roadway.

Discussion

Overcrossings require a minimum of 17 feet of vertical clearance to the roadway below versus a minimum elevation differential of approximately 12 feet for an undercrossing. This requirement results in longer ramps for bicycles and pedestrians to negotiate.

Overcrossings should be considered when high volumes of bicycles and pedestrians are expected along a corridor and:

- Vehicle volumes/speeds are high
- The roadway is wide
- A signal is not feasible
- Crossing is needed over a grade-separated facility such as a freeway or rail line

Advantages:

- Improves bicycle and pedestrian safety while reducing delay for all users
- Eliminates barriers to bicyclists and pedestrians

Disadvantages:

- If crossing is not convenient or does not serve a direct connection it may not be well utilized
- Overcrossings require at least 17 feet of clearance to the roadway below involving up to 400 feet or greater of approach ramps at each end
- Potential issues with vandalism, maintenance
- Higher costs associated with grade separation

Guidance

- AASHTO *Guide for the Development of Bicycle Facilities*
- Caltrans *Highway Design Manual* (Chapter 1000)

Path Amenities Guidelines

Design Summary

A variety of amenities can make a path inviting to the user. Costs vary depending on the design and materials selected for each amenity. Amenities shall be designed and located so as not to impede accessibility.

Discussion

Benches

Providing benches at key rest areas and viewpoints encourages people of all ages to use the trail by ensuring that they have a place to rest along the way. Benches can be simple (e.g., wood slates) or more ornate (e.g., stone, wrought iron, concrete).

Benches and rest areas encourage trail use by seniors and families with children.

Restrooms/Drinking Fountains

Restrooms benefit path users, especially in more remote areas where other facilities do not exist. Restrooms can be sited at trailheads along the path system. Drinking fountains should be provided at restrooms to allow trail users to rehydrate and recover.

Bicycle Racks/Parking

Bicycle racks allow recreational users to safely park their bicycles if they wish to stop along the way, particularly at parks and other desirable destinations. Bicycle parking allows trail users to store their bicycles safely for a short time. Bicycle parking should be provided if a trail transitions to an unpaved pedestrian-only area.

Bathrooms are recommended for longer trails and in more remote areas.

Trash Receptacles

Trash receptacles should be placed at access points. Litter should be picked up once a week and after any special events held on the trail, except where specially designed trash cans have been installed. If maintenance funds are not available to meet trash removal needs, it is best to remove trash receptacles.

Kiosks/Wayfinding Signs

Informational kiosks with maps at trailheads and signage for key destinations can provide valuable information for trail users.

Art installations can provide a sense of place for the trail.

Art

Local artists can be commissioned to provide art for the pathway system, creating a sense of place. Pathway art can be functional as well as aesthetic, providing places to sit and play.

Guidance

- AASHTO *Guide for the Development of Bicycle Facilities*

Pedestrian-Scale Lighting

Design Summary

- Depending on the location, average maintained horizontal illumination levels of 5 lux to 22 lux should be considered (AASHTO)
- Where security problems exist, higher illumination levels may be considered
- Light standards (poles) should meet the recommended horizontal and vertical clearances

Recommended pedestrian-scale lighting.

Discussion

Pedestrian-scale lighting enhances safety and enables the facility to be used year-round, particularly on winter afternoons. Lights should not have a visible source, either to the trail users or to neighboring residences, as they can blind users and pollute the night sky. Low level lighting, such as very short poles or bollards, are often problematic, due to their easy access for vandalism. In some areas, street lighting provides sufficient light for trail users. If pedestrian-scale lighting is desired, some neighborhood-friendly options include:

- In-ground lighting – dim lights which indicate the extent of the path
- Bollards – low-level lighting; can be susceptible to vandalism
- Solar lighting – best used in situations where running power to the trail would be costly or undesirable

Pedestrian-scale lighting can have screens to minimize glare. In addition, lights can be programmed to dim or turn off later in the night. A guideline for lighting a pedestrian way is illumination of between 0.5 foot-candle to 1 foot-candle.

Guidance

- AASHTO *Guide for the Development of Bicycle Facilities*
- Caltrans *Highway Design Manual* (Chapter 1000)

Bollards

Design Summary:

- Where removable bollards are used, the top of the mount point should be flush with the path's surface so as not to create a hazard
- Posts should be permanently reflectorized for night time visibility and painted a bright color for improved daytime visibility
- Striping an envelope around the post is recommended
- When more than one post is used, an odd number of posts at 5 feet spacing is desirable
- Recommended bollard height is 4 feet

Bollards deter motorists from driving on the trail.

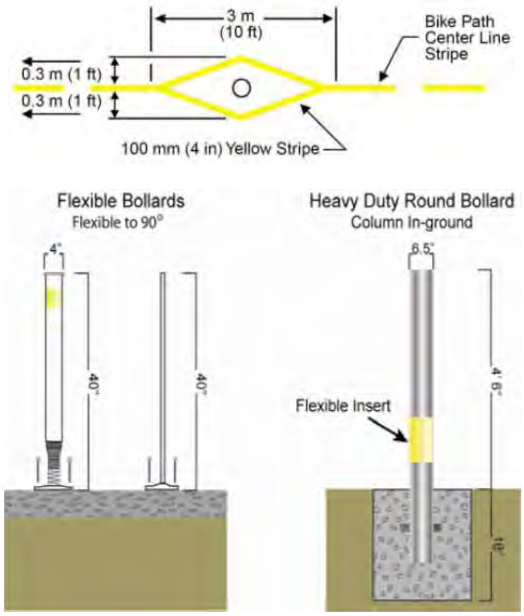
Discussion

Bollards are posts that can be used to block vehicle access to the path and can provide information such as mile markings, wayfinding for key destinations, or small area maps. Minimize the use of bollards to avoid creating obstacles for bicyclists. The California MUTCD explains "Such devices should be used only where extreme problems are encountered" (Section 9C.101). Instead, design the path entry and use signage to alert drivers that motor vehicles are prohibited.

Flexible bollards and posts are designed to give way on impact and can be used instead of steel or solid posts. These bollards are typically made of plastic that is bolted to the roadway and bend and return to their original position when hit. They are intended to deter vehicular access but allow access for emergency vehicles and maintenance equipment.

Bollards are typically installed using one of two methods: 1) The bollard is set into a concrete footing in the ground; and 2) the bollard is attached to the surface by mechanical means (mechanical anchoring or chemical anchor).

Where used, bollards should have high-visibility, reflective tape or paint. Bollards should be placed in the middle of the path, with sufficient space for path users of all abilities, using a variety of mobility devices, to pass. They can create bottlenecks with path users at intersections and should therefore be used with caution.



Recommended bollard designs.

Guidance

- AASHTO *Guide for the Development of Bicycle Facilities*
- Caltrans *Highway Design Manual* (Chapter 1000)
- California *MUTCD*, Part 9

Fencing

Design Summary:

- Height: 4.5 ft (minimum)
- Fencing provides access control, visual screening, and channeling of path users

Post and wire fence.

Discussion

Fencing is a means of enhancing safety for both trail users and neighboring residents by deterring unwanted access onto or off of the trail. However, fencing both sides of the trail right of way can result in a "tunnel" effect with the perception of being trapped, resulting in a detrimental effect on the trail user experience. Additionally, solid fencing could inhibit community surveillance of the trail and should be discouraged.

Fencing should not be a barrier to wildlife passage across the corridor. A small six-inch gap between the bottom of the fence and the ground should allow smaller wildlife to pass.

Fencing that allows a balance between the need for privacy, while simultaneously allowing informal surveillance of the trail, should be encouraged. If fencing is requested purely for privacy reasons, vegetative buffers should be considered.

Open boundaries can be created where users may be entering the trail.

Some factors to consider when deciding on fencing necessity and styles include:

- Cost: Fencing and other barriers, depending on the type of materials used and the length, can be costly
- Security: Fencing between the path and adjacent land uses can protect the privacy and security of the property owners
- Fencing height: The height and design of a fence influences whether lateral movement will be inhibited. Heavy-duty fencing such as wrought iron or other styles of fencing that are difficult to climb are often more expensive
- Noise and dust: Trail corridors adjacent to busy roadways, freeways, or rail lines may be subject to noise, dust, and vibration. Methods of reducing this impact include the addition of vegetation or baffles to fencing barriers

Guidance

- AASHTO *Guide for the Development of Bicycle Facilities*
- Caltrans *Highway Design Manual* (Chapter 1000)

Landscaping

Design Summary:

Safety and security concerns on a trail can be addressed through Crime Prevention Through Environmental Design (CPTED) guidelines. The four principles of CPTED are:

- Natural surveillance – maintain sight lines and visibility to deter criminal activities
- Natural access control – use of fences, lighting, signage, and landscaping to clearly define where people and vehicles are expected to be
- Territorial reinforcement – use of physical designs such as pavement treatments, landscaping, and signage to develop a sense of proprietorship over the trail
- Maintenance - if graffiti or vandalism occurs and is not addressed in a timely manner, it can send the message that no one is watching or that no one cares

Plantings adjacent to the trail can be attractive, but should be managed to maintain visibility and keep the path clear.

Discussion

Whether natural or planted, vegetation can serve as both a visual and physical barrier between a roadway and a path, make the path more attractive, and provide shelter from the sun. The density and species of plants in a vegetative barrier determine how effective the barrier can be in deterring potential trespassers. A dense thicket can be, in some cases, just as effective as a fence (if not more so) in keeping trail users off restricted areas. Even tall grasses, although less effective than trees and shrubs, can discourage trail users from venturing into these areas. Planted barriers typically take a few years before they become effective barriers. Separation of the path may need to be augmented with other temporary barriers until planted trees and hedges have sufficiently matured.

All proposed trailside, trailhead, and screen landscaping should consist of an approved native and drought-tolerant plant palette. A preliminary plant palette should be designed in conjunction with local botanical expertise, biological expertise, and landscape architectural consultation.

Guidance

- Trail landscaping guidelines are not discussed in great detail within the AASHTO Guide or Caltrans Highway Design Manual, Chapter 1000, but are briefly referenced as a buffer or retaining mechanism

Trailheads

Design Summary:

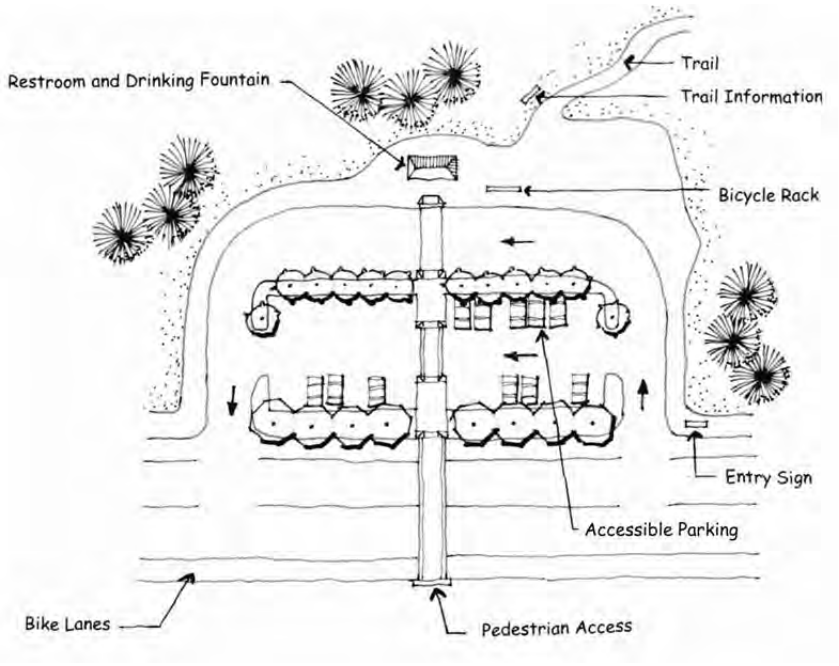
- Major trailheads should include automobile and bicycle parking, trail information (maps, user guidelines, wildlife information, etc.), trash receptacles, and restrooms
- Minor trailheads can provide a subset of these amenities

Discussion

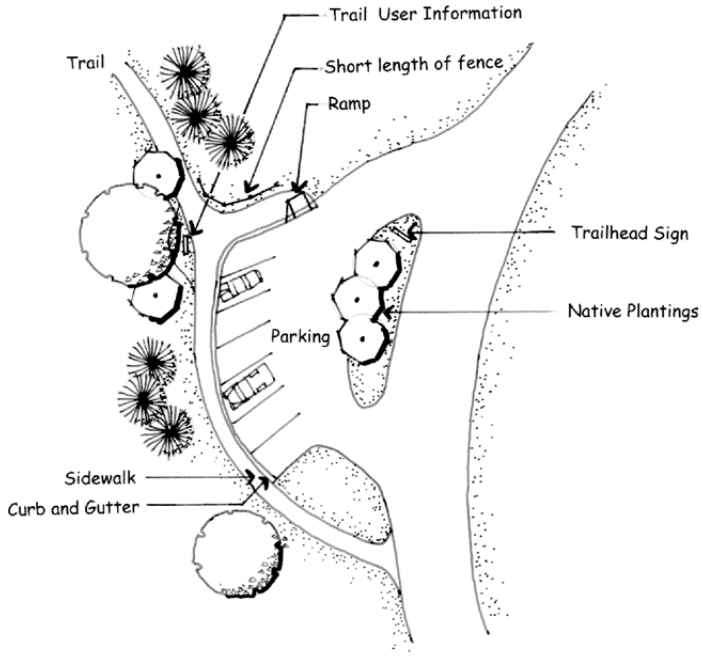
Good access to a path system is a key element for its success. Trailheads (formalized parking areas) serve the local and regional population arriving to the path system by car, transit, bicycle or other modes. Trailheads provide essential access to the shared-use path system and include amenities such as parking for vehicles and bicycles, restrooms (at major trailheads), and posted maps. Trailheads with a small parking area should also include bicycle parking and accessible parking. Neighborhood access can be provided from local streets crossing the trail. Parking does not need to be provided, and in some cases "No Parking" signs are desirable to minimize impacts to the neighborhood.

Guidance

- AASHTO *Guide for the Development of Bicycle Facilities*



Example major trailhead.



Example minor trailhead.

Wayfinding Standards and Guidelines

Design Summary:

Types of signage include:

- **Regulatory signs -** indicate to bicyclists the traffic regulations which apply at a specific time or place on a bikeway
- **Warning signs -** indicate upcoming changes in the roadway or path enviroment that requires caution and may require a reduction in speed
- **Guide and information signs -** indicate information for route selection, locating off-road facilities, or identifying geographical features or points of interest

MUTCD Sign R5-6 is a regulatory sign that designates where bicycling is prohibited.

Discussion

The ability to navigate through a region is enhanced by landmarks, natural features, and other visual cues. Signs placed at strategic locations can indicate to pedestrians and bicyclists their direction of travel, location of key destinations, and travel time/distance to those destinations.

Warning signs are yellow, such as this combination of W11-15 and W11-15P from the MUTCD

Guidance

- AASHTO *Guide for the Development of Bicycle Facilities*
- Caltrans *Highway Design Manual* (Chapter 1000)
- California *MUTCD*, Part 9

Wayfinding signs are green, and include directional arrows. (MUTCD sign D1-3C).

Multi-Use Trail Signage

Design Summary:

- Signage style and imagery should be consistent throughout the trail to provide the trail user with a sense of continuity, orientation, and safety
- Do not over sign the trail. Where possible, incorporate signage into trailside vertical elements such as bollards

Discussion

Directional Signage

Directional signage provides orientation to the trail user and emphasizes trail continuity. Street names should be called out at all trail intersections with roadways. In addition to providing a distance reference, mileage markers are attractive to users who target exercise for set distances.

Directional signing may be useful for pathway users and motorists alike. For motorists, a sign reading "Path Xing" along with a city emblem or logo helps warn drivers and promote use of the path itself. The directional signing should impart a unique theme so path users know which path they are following and where it goes. The theme can be conveyed in a variety of ways such as, engraved stone, medallions, bollards, and mile markers.

Directional signage should identify key destinations along the trail route and include schools, parks, municipal centers, connecting trails, and other points of interest.

Trail Etiquette Signage

Establishing goals and policies sets a common framework for understanding trail rules and regulations. Rights and responsibilities of trail usage should be stated at main trail access points. Once rules and regulations are established, the trail managing agency has a means of enforcement. Local ordinances may be adopted to help enforce trail policies. Penalties such as fines or community service may be imposed in response to non-compliance.

Interpretive Signage

Interpretive signage enriches the trail user experience, focuses attention on the unique attributes of the local community, and provides educational opportunities. Natural and cultural resources in trail corridors, including historic signs and photos, boat ramps, and wildlife may provide opportunities for interpretation.

Guidance

- AASHTO *Guide for the Development of Bicycle Facilities*
- Caltrans Highway Design Manual (Chapter 1000)
- California *MUTCD*, Part 9

Sample trail directional sign.

Directional and shared-use path etiquette signage.

On-Street Bikeway Signage

Design Summary:

Destinations for on-street bikeway signage may include:

- Other bikeways
- Commercial centers
- Parks and trails
- Public transit stations
- Civic/community destinations
- Hospitals
- Schools

Recommended uses for on-street signage include:

- **Confirmation signs** - confirm that a bicyclist is on a designated bikeway. Confirmation signs can include destinations and their associated distances, but not directional arrows
- **Turn signs** - indicate where a bikeway turns from one street onto another street. Turn signs are located on the near-side of intersections
- **Decision signs** - mark the junction of two or more bikeways. Decision signs are located on the near-side of intersections. They can include destinations and their associated directional arrows, but not distances

Wayfinding signage concept MUTCD signs D1-3C.

Wayfinding that includes distance and time can aid bicyclists in route finding.

Discussion

Signage can provide wayfinding and enhance safety by:

- Familiarizing users with the pedestrian and bicycle network
- Helping users identify the best routes to key destinations
- Addressing misperceptions about time and distance
- Helping overcome a "barrier to entry" for infrequent bicyclists or pedestrians (e.g., "interested but concerned" bicyclists)

Bicycle wayfinding signs also visually cue motorists that they are driving along a bicycle route and should use caution.

Signs are typically placed at key locations leading to and along bicycle routes, including the intersection of multiple routes. Too many road signs tend to clutter the ROW. It is recommended that bikeway signs be posted at a level most visible to bicyclists and pedestrians, rather than per vehicle signage standards. Additional recommended guidelines include:

- **Place the closest destination to each sign in the top slot.** Destinations that are further away can be placed in slots two and three. This placement allows the nearest destination to 'fall off' the sign and subsequent destinations to move up the sign as the bicyclist approaches.
- **Use pavement markings to help reinforce routes and directional signage.** Markings, such as bicycle boulevard symbols, may be used in addition to or in place of directional signs along bicycle routes. Pavement markings can help bicyclists navigate difficult turns and provide route reinforcement.

Guidance

- City of Oakland. (2017). *Design Guidelines for Bicycle Wayfinding Signage*
- City of Portland (2002). *Bicycle Network Signing Project*

Bicycle Parking

Design Summary

- Short-term parking accommodates visitors, customers, messengers, and others expected to depart within two hours. This parking requires approved standard rack(s), appropriate location and placement, and weather protection
- Long-term parking accommodates employees, students, residents, commuters, and others expected to park more than two hours. This parking is to be provided in a secure, weather-protected manner and location.

Discussion

Bicycle Rack Placement Guidelines

Design Issue	Recommended Guidance
Minimum Rack Height	To increase visibility to pedestrians, racks should have a minimum height of 33 inches or be indicated or cordoned off by visible markers.
Signing	Where bicycle parking areas are not clearly visible to approaching bicyclists, signs at least 12 square inches should direct them to the facility. The sign should include the name, phone number, and location of the person in charge of the facility, where applicable.
Lighting	Lighting of not less than one foot-candle illumination at ground level should be provided in all bicycle parking areas.
Frequency of Racks on Streets	In popular retail areas, two or more racks should be installed on each side of each block. This frequency does not eliminate the inclusion of racks which do not fall in these areas by requests from the public. Areas officially designated or used as bicycle routes may warrant the consideration of more racks.
Location and Access	Access to facilities should be convenient. Where access is by sidewalk or walkway, ADA-compliant curb ramps should be provided where appropriate. Parking facilities intended for employees should be located near the employee entrance, and those for customers or visitors near main public entrances. Convenience should be balanced with the need for security if the employee entrance is not in a well traveled area. Bicycle parking should be clustered in lots not to exceed 16 spaces each. Large expanses of bicycle parking make it easier for thieves to be undetected.
Locations within Buildings	Provide bicycle racks within 50 feet of the entrance. Where a security guard is present, provide racks behind or within view of a security guard. The location should be outside the normal flow of pedestrian traffic.
Locations near Transit Stops	To prevent bicyclists from locking bicycles to bus stop poles (which can create access problems for transit users, particularly those with disabilities) racks should be placed in close proximity to transit stops where there is a demand for short-term bicycle parking.
Locations within a Campus-Type Setting	Racks are useful in a campus-type setting at locations where the user is likely to spend less than two hours, such as classroom buildings. Racks should be located near the entrance to each building. Where racks are clustered in a single location, they should be surrounded by a fence and watched by an attendant. The attendant can often share this duty with other duties to reduce or eliminate the cost of labor being applied to bicycle parking duties; a cheaper alternative to an attendant may be to site the fenced bicycle compound in a highly visible location on the campus. For long-term parking needs of employees and students, attendant parking and/or bicycle lockers are recommended.
Retrofit Program	In established locations, such as schools, employment centers, and shopping centers, the city should conduct bicycle audits to assess bicycle parking availability and access, and add additional bicycle racks where necessary.

Guidance

- AASHTO *Guide for the Development of Bicycle Facilities*
- Caltrans *Highway Design Manual* (Chapter 1000)
- California *MUTCD*, Part 9

Short-Term Bicycle Parking

Design Summary:

- See dimensions below

Discussion

Short-term bicycle parking facilities include racks which permit the locking of the bicycle frame and at least one wheel to the rack, and support the bicycle in a stable position without damage to the wheels, frame, or components. Short-term bicycle parking is currently provided at no charge at various locations in National City. Such facilities should continue to be free, as they provide minimal security but encourage cycling and promote proper bicycle parking.

The majority of short-term bicycle parking is provided via a 'staple' on the sidewalk, located within the buffer zone.

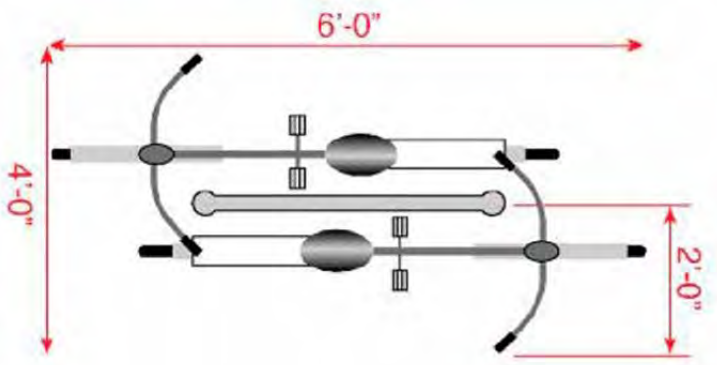
Art racks can be an attractive way of providing bicycle parking facilities. Costs can be subsidized by businesses sponsoring racks that compliment their business (e.g., a pair of glasses for an optician).

Guidance

- AASHTO Guide for the Development of Bicycle Facilities
- Caltrans Highway Design Manual (Chapter 1000)
- California MUTCD, Part 9

Standard bicycle 'staple' rack.

Art racks can be an attractive way of marketing bicycle parking.



Staple rack parking configuration.

Long-Term Bicycle Parking

Design Summary:

- Dimensions and configuration depends on the type of parking

Bicycle lockers at a transit station.

Discussion

Long-term bicycle parking facilities are intended to provide secure, long-term bicycle storage. Long-term facilities protect the entire bicycle, its components, and accessories against theft and inclement weather, including snow and wind-driven rain. Examples include lockers, check-in facilities, monitored parking, restricted access parking, and personal storage.

Long-term parking facilities are more expensive to provide than short-term facilities but are also significantly more secure. Although many bicycle commuters would be willing to pay a nominal fee to guarantee the safety of their bicycle, long-term bicycle parking should be free wherever automobile parking is free. Potential locations for long-term bicycle parking include transit stations, large employers, and institutions where people use their bicycles for commuting rather than consistently throughout the day.

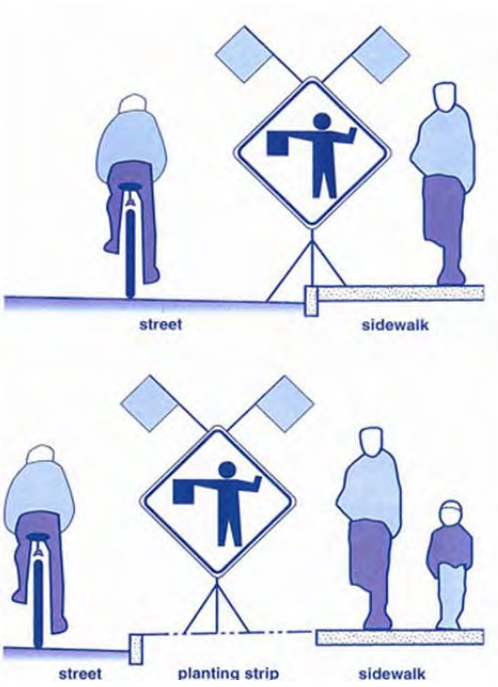
Guidance

- AASHTO Guide for the Development of Bicycle Facilities
- Caltrans *Highway Design Manual* (Chapter 1000)
- California *MUTCD*, Part 9

Bicycle Access through Construction Zones

Design Summary:

- Bicyclists should not be led into conflicts with work site vehicles, equipment, moving vehicles, open trenches, or temporary construction signage
- Efforts should be made to re-create a bicycle lane (if one exists) to the left of the construction zone. If re-creation is not possible, then a standard-width travel lane should be considered
- Construction signage actions:
  - Place in a location that does not obstruct the path of bicyclists or pedestrians (see graphic)
  - Detour and/or closure signage related to bicycle travel should be included on all bikeways where construction activities occur. Signage should also be provided on all other impacted roadways
- Recommendations for bicycle travel over steel plates:
  - Ensure that steel plates do not have a vertical edge greater than ¼" without an asphalt lip
  - Use non-skid steel plates without a raised steel bar
  - Require temporary asphalt (cold mix) around plates to create a smooth transition
  - Use steel plates only as a temporary measure during construction, not for extended periods
  - Use warning signage where steel plates are in use



Recommended signage placement.

Discussion

Safety of all roadway users must be considered during road construction and repair. Wherever bicycles are allowed, measures should be taken to provide for the continuity of a bicyclist's trip through a work zone area. Detouring pedestrians and bicyclists to another street when travel vehicle lanes remain open should be avoided unless necessary to maintain safety. Contractors performing work for the city should be made aware of the needs of bicyclists and be properly trained in how to safely route bicyclists through or around work zones.

Steel Plates

Steel plates used to cover trenches typically have a 1" to 2" vertical transition on the edges, which can puncture a hole in a bicycle tire and cause a bicyclist to lose control. Bicyclists are often left on their own to merge with vehicles in the adjacent travel lane. Although it is common to use steel plates during non-construction hours, they can be slippery, particularly when wet. Use of temporary asphalt on edges and advanced warning signs can enhance safety for bicyclists.

Guidance

- Caltrans Highway Design Manual (Chapter 1000)
- California *MUTCD*, Part 9

Bikeway Maintenance

Design Summary:

- Guidelines for regularly maintaining bicycle facilities are provided to the right

Discussion

Sweeping

Bicyclists often avoid shoulders and bicycle lanes filled with gravel, broken glass, and other debris; they will ride in the travel lane to avoid these hazards, causing conflicts with motorists. Debris from the roadway should not be swept onto sidewalks (pedestrians need a clean walking surface), nor should debris be swept from the sidewalk onto the roadway. A regularly scheduled inspection and maintenance program helps ensure that roadway debris is properly picked up or swept.

Action items involving sweeping activities include:

- Establish a seasonal sweeping schedule that prioritizes roadways with major bicycle routes
- Sweep walkways and bikeways whenever there is an accumulation of debris on the facility
- In curbed sections, sweepers should pick up debris; on open shoulders, debris can be swept onto gravel shoulders
- Pave gravel driveway approaches to minimize loose gravel on paved roadway shoulders
- Provide extra sweeping in the fall where leaves accumulate

Recommended Walkway and Bikeway Maintenance Activities

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

Roadway Surface

Bicycles are more sensitive to subtle changes in roadway surface than motor vehicles. Some paving materials are smoother than others and compaction/uneven settling can affect the surface after trenches and construction holes are filled. Uneven settlement after trenching can affect the roadway surface nearest the curb where bicycles travel. Sometimes compaction is not achieved to a satisfactory level, and an uneven pavement surface can result due to settling over the course of days or weeks. When resurfacing streets, the city should use the smallest chip size and ensure that the surface is as smooth as possible to improve safety and comfort for bicyclists.

Recommended action items involving maintaining the roadway surface include:

- On all bikeways, use the smallest possible chip for chip sealing bicycle lanes and shoulders
- During chip seal maintenance projects, if the pavement condition of the bicycle lane is satisfactory, it may be appropriate to chip seal the travel lanes only
- Ensure that on new roadway construction, the finished surface on bikeways does not vary more than ¼"
- Maintain a smooth surface on all bikeways that is free of potholes
- Maintain pavement to ensure that any ridges at the gutter-to-pavement transition and adjacent to railway crossings are within ¼" of the pavement surface
- Inspect the pavement 2 to 4 months after trenching construction activities are completed to ensure that excessive settlement has not occurred

Bikeway Maintenance

Discussion (continued)

Gutter-to-Pavement Transition

On streets with concrete curbs and gutters, 10"-20" of the curbside area is typically devoted to the gutter pan, where water collects and drains into catch basins. On many streets, the bikeway is situated near the transition between the gutter pan and the pavement edge. It is at this location that water can erode the transition, creating potholes and a rough surface for travel. The pavement on many streets is not flush with the gutter, creating a vertical transition between these segments. This area can buckle over time, creating a hazardous environment for bicyclists. Since it is the most likely place for bicyclists to ride, this issue is significant for bicycle travel.

Action items related to maintaining a smooth gutter-to-pavement transition include:

- Ensure that gutter-to-pavement transitions have no more than a ¼" vertical transition
- Examine pavement transitions during and after roadway construction projects, including maintenance activities

Drainage Grates

Drainage grates are typically located in the gutter area near the curb of a roadway. Drainage grates typically have slots through which water drains into the municipal stormwater system. Many grates are designed with linear parallel bars spread wide enough for a bicycle tire to become caught, which may cause the bicyclist to tumble over the handlebars and sustain potentially serious injuries. The city should consider the following:

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

Pavement Overlays

Pavement overlays represent good opportunities to improve conditions for bicyclists. A ridge should not be left in the area where bicyclists ride (this issue occurs where an overlay extends part-way into a shoulder bikeway or bicycle lane). Overlay projects offer opportunities to widen a roadway, or to re-stripe a roadway with bicycle lanes. Action items related to pavement overlays include:

- Extend the overlay over the entire roadway surface to avoid leaving an abrupt edge
- If there is adequate shoulder or bicycle lane width, it may be appropriate to stop at the shoulder or bicycle lane stripe, provided no abrupt ridge remains
- Ensure that inlet grates and manhole and valve covers are within ¼" of the pavement surface and are made or treated with slip resistant materials
- Pave gravel driveways to property line to prevent gravel from spilling onto shoulders or bicycle lanes

Signage

Signage is critical for safe and comfortable use of the bicycle and pedestrian network. Signage is vulnerable to vandalism and wear and requires regular maintenance and replacement as needed. The city should consider the following:

- Inspect regulatory, warning, and wayfinding signage along bikeways for signs of vandalism/graffiti and normal wear
- Replace signage along the bikeway network as-needed
- Perform a regularly-scheduled check on the status of signage for compliance with federal, state, and regional guidelines, with follow-up as necessary
- Create a Maintenance Management Plan (see below)

Bikeway Maintenance

Discussion (continued)

Landscaping

Bikeways can become inaccessible due to overgrown vegetation. All landscaping needs to be designed and maintained to ensure compatibility with the use of the bikeways. After a flood or major storm, bikeways should be checked along with other roads, and fallen trees or other debris should be removed promptly. Landscaping maintenance action items include:

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

Maintenance Management Plan

Bikeway users need accommodation during construction and maintenance activities when bikeways may be closed or unavailable. Users must be warned of bikeway closures and given adequate detour information to bypass the closed section. Users should be warned through the use of standard signing in advance of each affected section (e.g., "Bicycle Lane Closed," "Trail Closed"), including information on alternate routes and dates of closure. Alternate routes should consider travel time, roadway and traffic characteristics, and should include proper bikeway signage.

Action items related to a Maintenance Management Plan include the following:

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

Guidance

- Caltrans Highway Design Manual (Chapter 1000)
- California *MUTCD*, Part 9

C

Appendix C: Recommended Bicycle Programs

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Develop and Launch a Bicycle Safety Awareness Media Campaign

Target audience	General public
Primary agency	City of National City
Potential partners	Regional bicycling groups, e.g., San Diego County Bicycle Coalition (SDCBC); Caltrans
Purpose	Increase awareness of bicycling; promote safety
Time frame	Late spring or early summer, or in conjunction with Bike to Work Day or back to school
Sample program	Sonoma County (CA) Transit: http://www.sctransit.com/bikesafe/bikes.htm

A marketing campaign that highlights bicyclist safety is an important part of creating awareness of bicycling in National City. This type of high-profile campaign is an effective way to reach the general public, highlight bicycling as a viable form of transportation, and reinforce safety for all road users.

A well-produced safety campaign will be memorable and effective. One good example is the Sonoma County Transit "You've got a friend who bikes!" campaign. It combines compelling ads with an easy-to-use website targeted towards motorists, pedestrians, and bicyclists. This type of campaign is particularly effective when kicked off in conjunction with other bicycling/walking events or back to school in the fall.

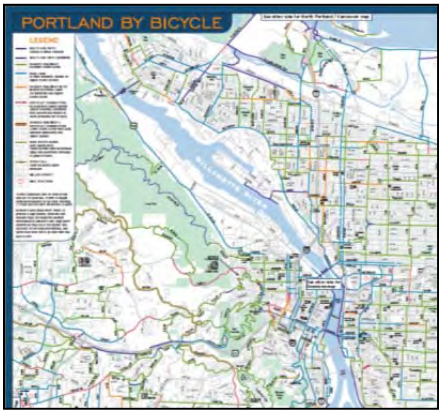
It is recommended that the city develop and launch a safety awareness campaign similar to that of Sonoma County Transit, with additional messages related specifically to safety and "sharing the road." The safety and awareness messages should be displayed near high-traffic corridors (e.g., using signs or banners), printed in local publications, and broadcast as radio and/or television ads.

Bicycle Maps

Target audience	Current and potential bicyclists
Primary agency	City of National City
Potential partners	National City Chamber of Commerce, SDCBC, local bicycle shops
Purpose	Assist bicyclists in wayfinding by offering a map with clear symbols and graphics, destinations and services attractive for bicyclists, and a good selection of routes
Time frame	One-time, with regular updates; can happen at any time
Sample programs	Sample bicycle maps: ▪ Des Moines Regional Trails Map (online): http://www.dsmbikecollective.org/node/74/zoomify ▪ Des Moines Regional Trails Map (PDF): http://www.dsmbikecollective.org/dmbcfiles/maps/DM_Regional_Trails_Map.pdf ▪ Long Beach, CA: http://admin.longbeach.gov/civica/filebank/blobdload.asp?BlobID=27418

One of the most effective ways of encouraging people to bicycle for transportation and for recreation is through the use of maps and guides showing where the infrastructure exists to demonstrate how easy it is to access different parts of the city by bicycle and to highlight unique destinations, shopping districts, or recreational areas. Bicycling maps can be used to promote tourism, encourage residents to bike, and promote local business districts. Maps can be citywide, district-specific, or neighborhood/family-friendly maps.

As the on- and off-street bikeway system is further developed, the city (possibly in collaboration with other local jurisdictions) should continue to update and make available the local bicycle facilities map. The Bicycle Advisory Committee, once established, may be able to help identify and confirm commonly used routes in addition to priority bicycle routes.



Once a bicycle map is updated, it should be made available online

and distributed to residents by mail, at local bicycle shops, and/or at community events. The bicycle map can also be promoted through flyers in utility bills, city newsletters, and other community media outlets. The map should be updated every few years to incorporate new bikeways or other changes.

Develop a National City "Bike Central" Website	
Target audience	Current and potential bicyclists
Primary agency	City of National City
Potential partners	Regional and state bicycling groups, e.g. San Diego County Bicycle Coalition, California Bicycle Coalition
Purpose	Make bicycling information easier to find by providing resources, maps, safety information, events, group listings, and more in one central place.
Time frame	Ongoing
Sample programs	Bike Long Beach (CA) Website: http://www.bikelongbeach.org/

As National City's bicycle programs and infrastructure continue to expand, a "one-stop shopping" website with comprehensive bicycling information will direct current and potential bicyclists information about bicycling laws, events, maps, tips, and groups.

The National City "Bike Central" website should include:

- A list of all local and regional bicycling groups, including clubs, racing teams, and advocacy groups
- Information about the Bicycle Advisory Committee (including how to get involved, meeting times and dates, agendas, and minutes)
- Information about current projects and how to get involved (e.g. public meetings, comment periods)
- Maps and other resources for National City and the region (links to online maps and brochures, project contacts, and how to request mailed materials)
- Links to laws and statutes relating to bicycling
- Bicycling tips and safety information
- Links to all relevant local jurisdictions and their bicycling contacts
- Information about bicycling events (rides, classes, volunteer opportunities)
- A list of local bicycle shops, including phone numbers and addresses

The website may also feature:

- Events calendar
- Request form for route planning assistance
- Message boards

- Blog featuring stories and news
- Photo galleries from events and submitted by readers
- Popular ride routes

A one-stop bicycle website will not be difficult to set up, but it will only be successful if the site is both easy to use and updated regularly. All website content should be reviewed regularly for accuracy. The bicycle community can assist in keeping the site up to date. The city should consider adding a standing agenda item for the Bicycle Advisory Committee to discuss the website in order to hear about new content that should be added or out-of-date content that should be updated or removed.

Youth Bicycle Safety Education	
Target	School-age children
Primary agency	City of National City/National School District
Potential partners	Parent groups at schools, community volunteers
Purpose	In-school and/or after-school on-bike skills and safety training
Time frame	Ongoing
Sample programs	LAB's Kids I and Kids II curriculum: http://www.bikeleague.org/programs/education/courses.php#kids1 BTA's Bike Safety Education Program: http://www.bta4bikes.org/resources/educational.php

Nearly every child in America can look forward to in-depth training before receiving a driver's license. Bicycles are also vehicles that are used on the roads, but most Americans do not receive any training about the rules of the road, how bicycles work, or how to ride a bicycle on the roadway.

National City should launch an on-bicycle education program for kids. The curriculum should cover:

- Parts of a bicycle
- How a bicycle works
- Flat fixing
- Rules of the road
- ROW
- Road positioning
- On-bicycle skills lessons (braking, turning, steering)
- On-bicycle community ride

At the time that this program is planned, the city should decide whether to start a program from scratch or modify an existing program. The League of American Bicyclists' Smart Cycling program can be used as a foundation.

Adult Cycling Skills Education

Target audience	Parents, schoolchildren, administrators, city planners & engineers
Primary agency	City of National City
Potential partners	Regional bicycling groups, e.g. SDCBC; local League Certified Instructors (LCIs)
Purpose	Educate adults on safe bicycling skills; encourage bicycling
Time frame	Flexible (one-time or on-going)
Sample programs	League of American Bicyclists Smart Cycling program

Most bicyclists learn to ride when they are children and do not have the opportunity to learn riding skills or safe road positioning. Adult bicycle skills training is an excellent way to improve both bicycling confidence and safety. Any training should include a significant on-bicycle section.

The League of American Bicyclists has developed a comprehensive bicycle skills curriculum that is considered the national standard for adults seeking to improve their on-bicycle skills. Various classes are offered, including basic and advanced on-road skills, as well as commuting, and driver education, and youth courses. Local League Certified Instructors (LCIs) can be found on the League of American Bicyclists' website.

Launch Parties for New Bicycle Facilities

Target audience	General public, particularly residents living near a newly-completed facility
Primary agency	City of National City
Potential partners	Regional bicycling groups, local bicycle shops
Purpose	Inform residents about new bicycle facilities to encourage use and promote awareness
Time frame	As new bikeways are built
Sample program	When a new bikeway is built, the City of Vancouver throws a neighborhood party to celebrate. Cake, t-shirts, media, and festivities are provided and all neighbors are invited as well as city employees (engineers, construction staff, and planners) who worked on it.

When a new bicycle facility is built, some community members will become aware of it and use it, but others may not realize that they have improved options available to them. A launch party/campaign is a good way to inform community members about a new bikeway and can also be an opportunity to share other bicycling information (such as maps and brochures) and answer questions. It should be a media-friendly event, with elected official appearances, ribbon cuttings, and a press release that includes information about the new facility, other

facilities and support services, and any timely information about bicycling (such as an increase in bicycling or walking mode share or user counts, Bicycle Friendly Community designation, etc.).

Host National Bike-to-Work Day/Week/Month Activities	
Target audience	Current and potential bicyclists
Primary agency	City of National City
Potential partners	SANDAG's iCommute program, SDCBC, National City Chamber of Commerce, local bicycle shops, large employers
Purpose	Encourage bicycling to work and other destinations by hosting group rides and events and offering incentives and rewards
Time frame	Annually in May
Sample programs	League of American Bicyclists: http://www.bikeleague.org/bikemonth Bike Month NYC: http://bikemonthnyc.org/index.php

Bicycling to work (and to other destinations) is a great way to get exercise, save money, reduce pollution, and have fun. Cities and towns across the country participate in National Bike Month and Bike-to-Work Day/Week. The League of American Bicyclists hosts a website for event organizers. The website contains information on nationwide and local events, an organizing handbook, and promotional materials.

It is recommended that the city work with SANDAG to begin Bike-to-Work Day/Week/Month activities in National City with the support of regional bicycling groups, such as the San Diego County Bicycle Coalition, and local bicycle shops. These events and activities can target the US Naval Base, large employers, and the general public by providing information and incentives in easily accessible ways. These types of activities are likely to be popular among those who already commute by bicycle or are interested in giving bicycle commuting a try.

Possible activities to promote Bike-to-Work Week/Month/Day include:

- Bike to Work Day events: morning commute energizer stations with food, encouragement, information, and sponsored goodies for participants; rally or celebration with raffles, food, and vendors.
- Group rides to business centers with the mayor and/or local celebrities.
- Discounts at local businesses for bicycle commuters.
- Bike vs. Bus vs. Car challenge. This is a fun competition to determine which transportation mode arrives downtown n the least amount of time.
- Commuter Challenge in which local companies

participate by recording the number of employees who bicycle to work over a given time period. The percentage of bicycle commuters is then compared among participating companies and recognition is awarded through press, trophies or plaques, and a final award party or event.

- Family or themed rides, such as a Mother's Day Ride or a ride to visit local parks or cultural destinations.
- Bicycle commuting workshops held by local groups or volunteers.

Establish a "Create a Commuter" Bicycle Program for Adults	
Target audience	Low-income residents
Primary agency	City of National City
Potential partners	Local bicycle groups, local resident groups
Purpose	Empower low-income residents to bicycle for transportation
Time frame	Ongoing
Sample program	Community Cycling Center "Create a Commuter" Program, Portland, OR: http://www.communitycyclingcenter.org/index.php/programs-for-adults/create-a-commuter/

A "Create a Commuter" program provides basic bicycle safety education and fully-outfitted commuter bicycles to low-income or other adults striving to connect to work, workforce development, or other daily needs by bicycle.

Bicycles can be donated by members of the community and refurbished with volunteer or local group support. Participants are outfitted with everything a bicycle commuter would need, including fenders, front and rear lights, locks, pumps, patch kits, tools, and racks.

The program can work with local social service agencies or service providers to identify candidates. Candidates should complete a half-day bicycle safety education and commuting basics course before receiving their bicycle.

The course should cover the following topics:

- Mechanical skills
- Safety checks
- Parts identification
- Cleaning and basic maintenance
- Safe riding skills and making safe decisions on the road
- Laws and rules of the road
- Helmet fitting
- Group riding skills
- Map reading
- Hand signals

The San Diego County Bicycle Coalition offers Smart Cycling classes as well as a commuting presentation that provides safety tips, information on the law, and a question and answer portion for potential commuters.

Host Bicycle Programs for US Naval Personnel/Staff and their Families	
Target audience	US Naval Personnel, Staff, and Families
Primary agency	City of National City
Potential partners	US Navy housing and service groups, regional bicycling groups
Purpose	Encourage Naval personnel, staff, and families to bicycle for transportation and recreation; provide bicycling education for military and civilians
Time frame	One-time or ongoing, particularly as new personnel, staff, and families move to National City

Bicycling programs targeted toward US Naval personnel, staff, and families residing in National City can encourage these individuals and families to choose bicycling for transportation and recreation. The programs can provide important bicycling information, such as maps and safety guidelines, or access to bicycles through giveaways or loan programs. The city should work with the appropriate agencies or groups to reach this population.

Activities may include:

- Bicycle skills/safety course for children and adults
- Summer bicycle camps for children and stay-at-home parents
- Distribution of bicycling maps, brochures, and incentives to homes
- Basic bicycle maintenance workshops
- Group rides or other community bicycling events
- Information about transporting children or cargo
- Bicycle safety checks, helmet giveaways, bicycle giveaways or loaner program

Hold a Summer Streets Car-Free Street Event	
Target audience	General public
Primary agency	City of National City
Potential partners	Local and regional bicycling groups, e.g. SDCBC; local volunteers
Purpose	Encourage walking and bicycling by providing a car-free street event
Time frame	Generally in the summer and on a Sunday; can be a one time event, annual, or multiple times per year
Sample programs	New York City Summer Streets: http://www.nyc.gov/html/dot/summerstreets/html/home/home.shtml Portland Sunday Parkways: http://www.portlandonline.com/Transportation/index.cfm?c=46103 http://www.streetfilms.org/portlands-sunday-parkways/ (video)

These programs have many names: Summer Streets, Sunday Parkways, Ciclovias, or Sunday Streets. Summer Streets are periodic street closures (usually on Sundays) that create a temporary park which is open to the public for walking, bicycling, dancing, hula hooping, roller skating, etc. They have been very successful internationally

and are rapidly becoming popular in the United States. They promote health by creating a safe and attractive space for physical activity and social contact, and are cost-effective compared to the cost of building new parks for the same purpose. These events can be seasonal (i.e., once a month in the summer, annual, or one-time events), and are generally very popular and well-attended. Summer Streets events often include guided rides and walks with themes, such as walks for seniors, women's or family rides, or bicycle rides with the Mayor/City Council.