City of Irvine

2020 STRATEGIC ACTIVE TRANSPORTATION PLAN

CITY OF IRVINE
STRATEGIC ACTIVE TRANSPORTATION PLAN

2020

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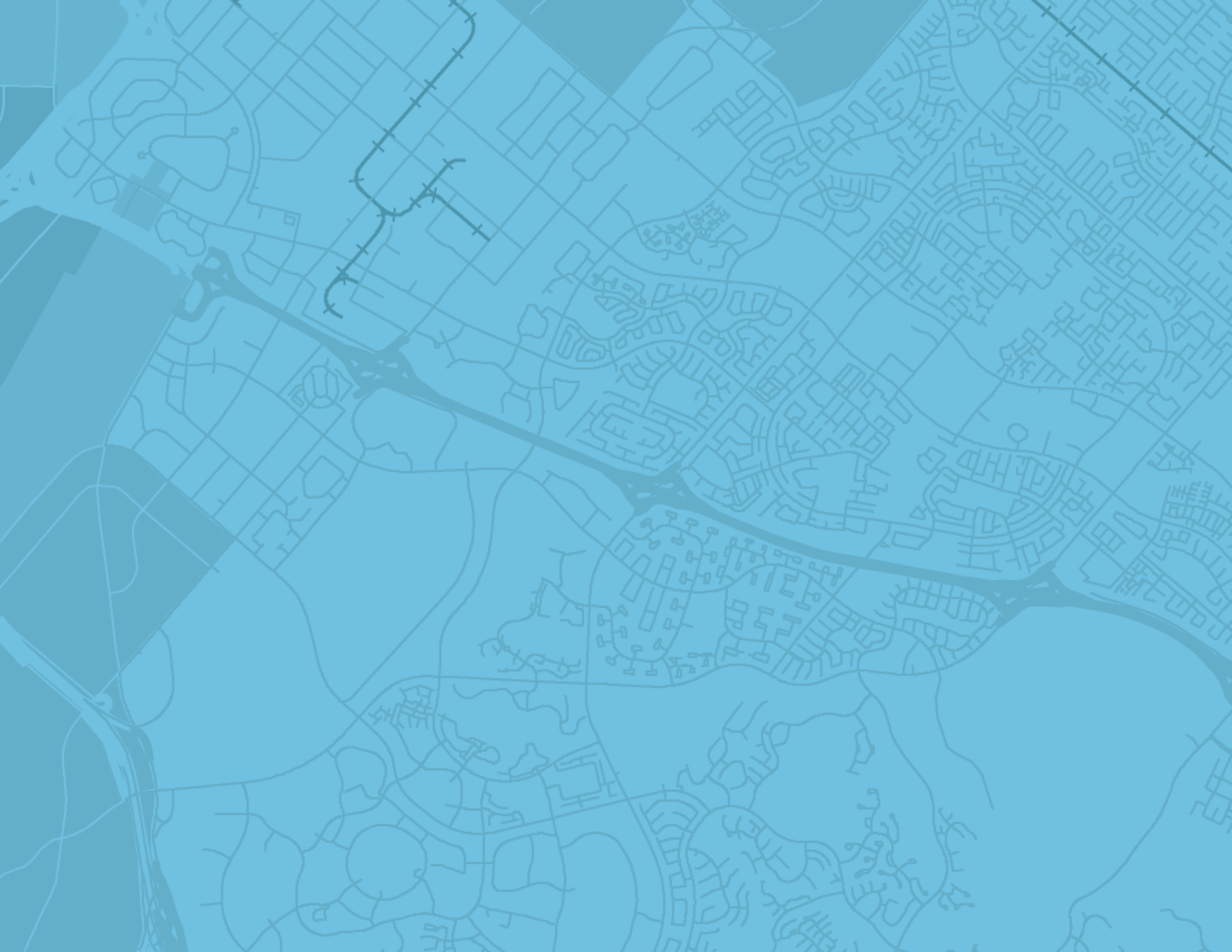
TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES (continued)

LIST OF TABLES

LIST OF TABLES (continued)



01

INTRODUCTION

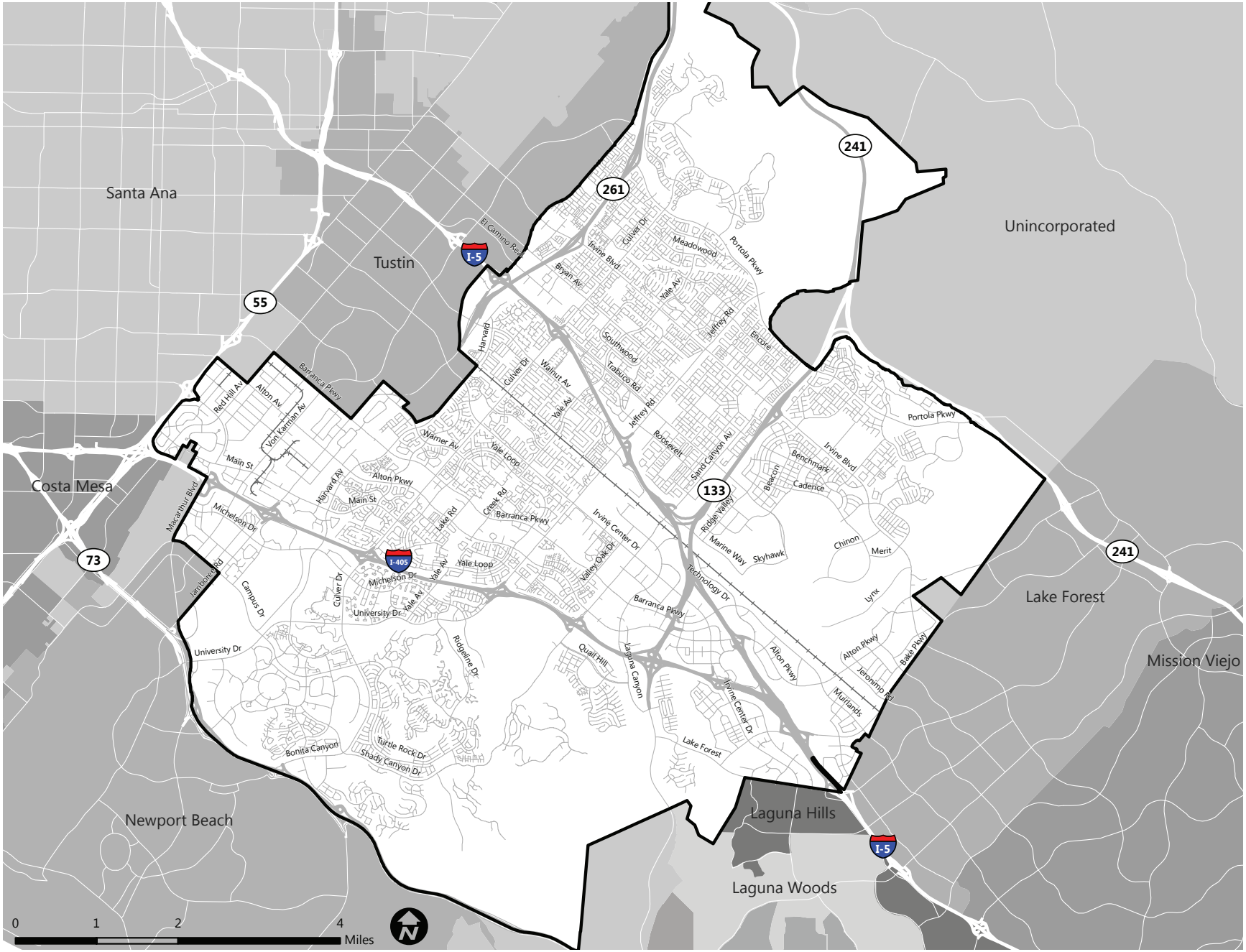
1.1 ABOUT IRVINE

The City of Irvine is located within the County of Orange, California and is 66-square-miles by area with a constantly increasing population now over 270,000, according to the United States Census Bureau (Year-2019). Cities towards the west include Tustin, Santa Ana, and Costa Mesa. Unincorporated areas of Orange County, the City of Orange, and portions of Tustin are northerly adjacent. Eastern neighboring cities include Lake Forest, Mission Viejo, and Laguna Hills. Cities to the south of Irvine include Newport Beach, Laguna Woods, and unincorporated areas of Orange County. Interstate freeways I-5 and I-405 bisect the City in an east/west alignment. State Routes SR-261 and SR-133 bisect the city along a north/south alignment, and SR-241 forms the northern boundary of the City, while SR-73 forms the southern boundary. ***Figure 1.1.1*** provides an overview of the City of Irvine and surrounding agencies.

Since its incorporation in 1971, the City of Irvine has taken significant strides in creating a place that has become desirable to live and work in. It offers a distinct experience from most of its neighboring Southern California cities not only as a master-planned community, but also one that is constantly dedicated to improving its parks, open space, nationally recognized school system, bustling business centers, and recreation opportunities. These continued efforts have included an extraordinary commitment towards sustainable active transportation. From achieving the Bicycle Friendly Community Silver Level Status (2013, 2017) and implementing more than 370 miles of bikeway facilities (on- and off-street) to adopting several key planning documents and creating connections through state-of-the-art pedestrian bridges, the City has made significant investments in the walkability and bikeability of its neighborhoods.

Unique to the City of Irvine is its master-planned community heritage, the fabric of its land use make-up, and its vibrant active transportation modal options. A guiding developmental vision is at the core of the nearly built-out municipality. The transformation of Irvine's cityscape started in the early- to mid-1900s when the Irvine Ranch began its transition from a coastal farming landscape to the meticulously developed city that Irvine is known for today. Historical tributes to the early settlers and developers can be found in the street names, landmarks, and villages (i.e. Portola, Santiago, Myford, Jamboree, Pereira, and Irvine). Villages form the developmental nodes by or around which the City is built – rich with diversity in cultures and land-use mixtures. Lastly, the active transportation efforts that pre-dated the Irvine Strategic Active Transportation Plan (ISATP) laid the foundation to establish walkable and bikeable opportunities for residents to utilize alternative transportation options.

Figure 1.1.1 Overview and Project Area Map



1.2 GOALS AND OBJECTIVES

The Irvine Strategic Active Transportation Plan (ISATP) is intended to guide the development of existing and future facilities for pedestrians and bicyclists for the short- and long-term. As such, the following goals will serve as essential indicators for the impact and implementation of pedestrian and bicycle facilities over time within the City of Irvine.

PLAN FOR SYSTEM SIGNIFICANCE

On- and off-street facility options offer a linkage between people and places. Commuters, recreationalists, and utilitarian pedestrian and bicycle trips are made possible by local and regionally significant transportation options. The ISATP prepares a two-pronged planning approach to bolster significance for local and regional trips.

IMPROVE SAFETY

Pedestrians and bicyclists alike face challenges while traveling within the City. The ISATP will strive to decrease exposure for these vulnerable users, improve comfort for a spectrum of ages and ability levels, and prepare cost-efficient infrastructure facility options.

ENHANCE ACCESSIBILITY

Pedestrian and bicyclist mobility, accessibility, and functionality within Irvine are integral to connectivity quality between origins and destinations. How mode split trends develop and impact active transportation options will strengthen implementation efforts as a result of the ISATP. Access focused improvements will seek to cultivate support for an effective system that attends to a broad demographic of users.

CREATE HEALTHY OPTIONS

Walking and biking are approachable options that encourage healthy lifestyles and can be utilized for a variety of travel options. Healthy impacts can be encouraged through the development of active transportation facilities that serve user needs.

BOLSTER ECONOMIC AND ENVIRONMENTAL SUSTAINABILITY

The ISATP presents pedestrian and bicycle improvements that are implementable and financially sustainable. To achieve long-term fiscal sustainability, the Plan showcases a list of improvements that are justified and vetted by engineers and planners.

The ISATP is intended to guide the development of facilities for pedestrians and bicyclists that adhere to the five ISATP goals: plan for system significance, improve safety, enhance accessibility, create healthy options, and bolster economic and environmental sustainability.

SYSTEM

GOAL: Identify local specific treatments to refine pedestrian and bicycle improvements, and to enhance Irvine's regional system significance.

Objective 1.1: Plan local network for active transportation users that is sensitive to gap closures, eliminates active transportation barriers, and responds to community needs.

Objective 1.2: Establish regional congruence with existing planning documents within the County of Orange that regionally connect Irvine with its neighboring communities.

SAFETY

GOAL: Improve the overall safety of active transportation users within the City of Irvine.

Objective 2.1: Reduce pedestrian and bicycle fatalities and injuries resulting from collisions at intersections and along corridors.

Objective 2.2: Prepare Design Guidelines to inform the implementation of active transportation infrastructure into the short- and long-term plan phases.

Objective 2.3: Establish best practices for efficient procedures for maintaining pedestrian and bicycle facilities and the monitoring of future collisions.

ACCESS

GOAL: Help people access employment, education, health care, and recreation resources and develop a supportive culture for walking and biking.

Objective 3.1: Invest in alternative transportation infrastructure that bolsters accessibility for all ages, ability levels, and comfort levels.

Objective 3.2: Support the development of active transportation infrastructure that improves mobility access to and from key origins and destinations.

Objective 3.3: Establish best practices for active transportation mode split and forecasting of pedestrian and bicycle transportation monitoring.

PUBLIC HEALTH

GOAL: Provide opportunities to help people improve health by including walking and biking in their daily routine by offering more active transportation options and facilities.

Objective 4.1: Limit negative externalities of chronic health diseases by providing active transportation options that promote healthy lifestyle choices.

Objective 4.2: Encourage programs at community centers and schools that teach residents safe and healthy biking and walking habits.

SUSTAINABILITY

GOAL: Invest in active transportation infrastructure options that enhance the City and avoid economic losses related to congestion, collisions, pollution, and public health costs.

Objective 5.1: Invest in facilities that bring long-term economic growth to the City.

Objective 5.2: Realize fiscal savings due to reduced congestion and subsequent travel times.

Objective 5.3: Support sustainable investments that reduce pollution (air, water, noise) and GHG impacts.

Objective 5.4: Reduce economic losses related to life and property damages.

Objective 5.5: Reduce public health costs due to a shift towards increased active transportation.

1.3 PROJECT PLANNING PROCESS

The Irvine Strategic Active Transportation Plan (ISATP) provides a linkage between community needs and active transportation improvements. Throughout the life of this project, the project team hosted community engagement opportunities, Project Development Team (PDT) and Project Management Team (PMT) meetings, developed a diverse stakeholder base, and published an online project survey and data mapping tool. These outreach efforts were integral in the development of active transportation improvements that represent the diverse community needs.

The ISATP is a result of a culmination of tasks, these are shown along a timeline on the following pages. Each component of the ISATP was integral in the outcome of the planning process, which was aided by thoughtful public input. From existing conditions assessments and updates to the Irvine Community Survey to the development of the pedestrian and bicycle recommendations a relationship was formed and strengthened with the community.

The planning process was enriched with both local and regional insights. Collaboration between intra-municipality departments, surrounding agencies, and Orange County Transportation Authority (OCTA) offered insights that pertained to their jurisdictional overlap. From the onset of the project, the development of the ISATP was led by the City of Irvine's Department of Public Works and Transportation. Support was received from the City's Public Information Office, Environmental Programs, Community Services Department, and the Public Safety. California Department of Transportation (Caltrans) District 12 and Orange County Transportation Authority (OCTA) also participated in the Project Development Team meetings held to coincide with Plan development phases.

In addition, project stakeholders were engaged in the process to ensure broad representation of the community with diversity in needs. Stakeholder representation included local businesses, local bicycle shops, Irvine and Orange County specific bicycle clubs, the University of California at Irvine (UCI), Orange County (OC) Parks, health organizations and providers, Transportation Commission representative, and land developers. The breadth of stakeholder representation was essential in preparing a plan that represented the community it serves.

Public participation with the planning process included a broad demographic, which represented an accurate snapshot of the City. Social media posts (i.e. Facebook, Twitter, Nextdoor), email communication, online mapping, and surveys allowed the project team to understand city-wide concerns. These mediums enriched the planning process and were further supplemented by hosting events during and outside of traditional work hours and days. The project team planned events that took place both on weekdays and weekends, as well as in the morning, mid-day, and evening. Those unable to attend were equipped with supplementary engagement options such as the online mapper and online survey where respondents expressed anecdotal concerns and geo-coded point- and line-based information.

ISATP Planning Process

1. Leverage local and regional insights
2. Ensure broad stakeholder representation
3. Foster diversity in public participation
4. Prepare a breadth of engagment opportuinities


WALKING TOOLBOX


Car / Carpool

Irvine Global Village Festival
September 22, 2018

uciRIDEtoberfest
October 9 - 10, 2018

Irvine Police Dept. Open House
October 20, 2018

Bicycle Group Ride
January 23, 2019

Research, Updates, & Existing Conditions

Community Engagement *(understand community concerns)*

Active Transportation System Assessment

JUN 2018 | **JUL** | **AUG** | **SEPT** | **OCT** | **NOV** | **DEC** | **JAN 2019** | **FEB** | **MAR**

Irvine Community Survey

Project Kickoff

Synthesize Survey Results

Project Management Team — *Meetings held twice monthly from June 2018 to December 2019*

Project Development Team

#1 *June 2018*

#2 *August 2018*

#3 *March 2019*

Mode Split & Forecasting Methodology Review

Design Guidelines

Technology Assessment

Propose Pedestrian & Bicycle Recommendations

Develop Implementation & Prioritization Strategies

Prepare the Irvine Strategic Active Transportation Plan

APR MAY JUN JUL AUG SEPT OCT NOV DEC 2020

Community Engagement
(review recommendations w/ public)

Project Open House
September 25th, 2019

Plan Finalization

#4
August 2019

02

EXISTING CONDITIONS

2.1 INTRODUCTION

This chapter incorporates existing conditions and background research for the Irvine Strategic Active Transportation Plan (ISATP), with a specific review of the following items - corresponding figures are prepared with supplemental content provided within ***Appendix A***:

- Relevant City Plans and Policies
- Relevant Regional Plans and Polices
- Bicycle and Pedestrian Counts
- Level of Traffic Stress, Comfort, and Suitability for Pedestrians and Bicyclists
- Existing Pedestrian and Bicycle Infrastructure
- Existing Non-Infrastructure Programs


Irvine Shares the Way - Strategic
LEGEND

2.2 RELEVANT CITY AND REGIONAL PLANS AND POLICIES

CITY PLANS AND POLICIES

The ISATP builds upon a foundation of planning and policy initiatives completed over years within the City. Aspects of each plan and policy have implications on the planning and design phases of proposed improvement measures within this Plan. A review of relevant documents informed the decisions made throughout the development of the ISATP. It is to be noted that The City is currently developing a General Plan Update, anticipated to be completed by October 2024. The effort of ISATP will provide an opportunity to further align the objectives with the General Plan Update, which is a state-mandated document containing the City's plan for long-range future development and preservation.

General Plan Element B - Circulation

Element B is the Circulation component of the City's General Plan. Three types of systems relevant to the ISATP are the road system, the public transit system, and the off-street shared-use path system. The road system section states that the automobile will continue to be an important transportation mode. The public transit system section states that public transit should become an increasingly viable transportation mode as the negative aspects of driving increases (increased traffic, accessibility for aging groups, etc.). The off-street shared-use path system is comprised of "a single equestrian trail and numerous biking and hiking paths." The off-street shared-use paths provide recreational and commuter opportunities shown in ***Figure 2.2.1***. A master plan for these facilities was updated in 2005, which includes concepts for facility surfaces, signage, landscaping, and fencing.

Element B is complete with themes relating to increased multi-modalism. The following objectives address this desire, and respective policies can be found within the General Plan.

- Objective B-3 addresses multi-modal goals by finding policies that support a pedestrian circulation system to support and encourage walking as a mode of transportation.
- Objective B-4 aims to plan, provide, and maintain a comprehensive off-street shared-use path network that together with the regional off-street shared-use path system, encourages increased use of off-street shared-use path for commuting and recreational purposes.
- Objective B-5 addresses off-street shared-use path networks, in an effort to plan, develop, and maintain a network and to support facilities to satisfy the needs of users.

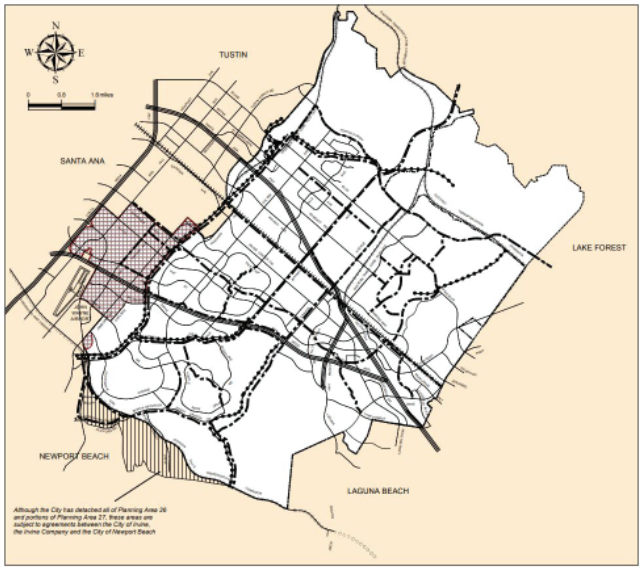


Figure 2.2.1 City of Irvine Off-Street Shared-Use Path Network (Circulation Element B, Figure B-4)

General Plan Element C - Housing

Holistically from a planning standpoint, an understanding of key origins and destinations provide a lens into intermodal transportation trends of a city. The Housing Element of the City's General Plan outlines goals that are central to the development and sustainability of housing. From an active transportation standpoint, this provides origin and destination nodes potential for active transportation users.

Element C details the Orange County Great Park's unique zoning category, "Trails and Transit Oriented Development", as a desirable template for future developments that encourages the use of localized transit options (i.e. rail, bus, and ride-hailing), and localized working/commercial opportunities. The balance between residential, commercial, institutional, industrial, and educational uses within the Trails and Transit Oriented Development zone is complemented by a vibrant pedestrian and bicycle friendly environment with lower reliance on automobiles. Refined pedestrian and bicycle connectivity from/to the Great Park Neighborhoods locally and citywide is integral to the development of a complete ISATP.

General Plan Element G - Public Facilities and Services

Complementary to the fabric of the City as a whole, public facilities contribute to the quality of life that Irvine is known for, including parks, civic centers, churches, recreational facilities, and schools. Goals and policies that compose Element G make strides to improve the facilities that are frequented by active transportation users.

- Objective G-1 Policy (b) notes the Capital Improvement Program (CIP) as the vehicle for future project consideration, funding, and implementation.
- Objective G-1 Policy (u) identifies school area pedestrian and bicycle focuses that bolster ATP specific goals.

General Plan Element K - Parks and Recreation

Element K, the Parks and Recreation section of the City's General Plan, provides an overview of existing parks and recreation opportunities, identifies trends and issues, and strategies to improve connectivity to bike and pedestrian facilities, one of which is listed below:

- Objective K-3 aims to establish parks and recreation facilities with safe and easy access via policy (c), which uses the adopted 2017 Parks Master Plan to locate parks adjacent to public shared-use paths in an effort to connect parks to nearby paths for enhanced connectivity. In addition, parks and paths should be linked to other open spaces.

General Plan Element M - Growth Management

Within Element M there are shared goals between the ISATP and the growth management initiatives. As Irvine's population increases and transportation modes are impacted, the goals herein encourage active transportation growth that will be accommodated and managed for the betterment of all users.

- Objective M-4 Policy (a): Support Air Quality Management Plan (AQMP), which promotes the use of bicycles and walking.
- Objective M-4 Policy (b): Requires applicants of new developments to submit pedestrian and bicycle circulation plans detailing such access to the subject and adjacent properties.
- Objective M-4 Policy (c): Maintain and, if feasible based on demonstrated need, increase existing levels of funding allocated for transit improvements to supplement other modes of travel.
- Objective M-5 Policy (h): Provide direct and convenient pedestrian access from the interior of planning areas to public transit stops.

General Plan Element N – Irvine Business Complex (IBC)

The Irvine Business Complex (IBC) Element is a strategic guide to effectively develop the IBC as a sustainable residential and mixed use community based on the IBC Vision Plan. Element N identifies the potential paths within IBC and the City is undertaking an IBC Trails Feasibility Study to analyze the constraints and opportunities of these paths and prioritize the planned paths for engineering design and construction. The ISATP focuses more on closing the gaps of the existing and planned facilities identified in the IBC Vision Plan, and the connections to adjacent areas.

One pedestrian-friendly goal is to build new streets to reduce the size of blocks to a pedestrian scale. Arterials should maintain street capacities required to accommodate development. However, the smaller blocks and pedestrian paseos will connect to the arterials at key locations. The standards in the Irvine Business Complex Residential Mixed-Use (IBCRMU) Overlay Zone and associated-design criteria will enforce this objective. The San Diego Creek Trail is a vital open space entity that will also connect bicyclists and pedestrians to the IBC. The Urban Neighborhood District suggests that auto-oriented uses are not appropriate and that street frontages will be pedestrian-oriented.

Connections from the IBC to the City's on- and off-street network are limited. Continuous on-street bicycle lanes currently exist along Main Street, Redhill Avenue, Alton Parkway, and Barranca Parkway. Partial bikeways are along Jamboree Road, Von Karman Avenue, Michelson Drive, and Carlson Avenue. In the IBC, there are areas where the bike lanes are not striped especially on approaches to intersections that have dual or triple right turn lanes. Future bike lanes are proposed along McGaw Avenue and Campus Drive. (***Figure 2.2.2***). Particular IBC objectives include:

- Establish the San Diego Creek Creekwalk, along the easement on the west side of the creek, providing increased connectivity to support the "Mountain to the Sea" Trail.
- Improve bicycle and pedestrian connections to San Marco Park that is adjacent to the San Diego Creek.
- Explore the opportunity to develop new off-sreet shared-use paths along the existing drainage channels and creeks within the IBC – Barranca channel and the Armstrong channel.

As a larger effort, establish the "Rails to Trails" program to convert the abandoned railroads within the IBC to off-street shared-use paths. The paths will eventually connect to the wider system of public realm improvements to create an interconnected pedestrian/bicycling experience within the street network of the IBC.

Bridges across the San Diego Creek Channel are proposed for redesign as gateways to the IBC, creating a sense of arrival with new street lighting, monuments, signage, street furniture, and landscaping - these are shown in ***Figure 2.2.2***. Additionally, new bridges are proposed to enhance pedestrian and bicycle connections within the IBC and to the wider system of shared-use paths (***Figure 2.2.2***).

Figure 2.2.2 City of Irvine IBC Off-Street Shared-Use Path System (Element N, Figure N-4)

Class I Off-Street Wayfinding Signage Study (2012)

In 2012, The City of Irvine's Department of Public Works prepared the "Class I Off-Street Bikeway Wayfinding Signage Study," which provides guidance for determining existing and future wayfinding signage for Irvine's off-street shared-use paths. The study outlines (p. 34 of the Class I Off-Street Bikeway Wayfinding Signage Study) actions that should be considered when implementing new bikeway wayfinding signage:

- New signs shall be designed to follow guidelines of the California Manual on Uniform Traffic Control Devices (CA MUTCD) for size, design, and installation.
- New sign coloration shall contain a green background with white lettering.
- New signs shall include the name of each path per the City's "Named Public Paved Off-Street Paths."
- Future signs shall be prioritized by geographic locale, connectivity to other bikeways and destinations, and potential use.
- City staff will present bikeway wayfinding signage to Planning Commission to present research and obtain input.
- New signs will include destinations for wayfinding connecting to the following destinations: off-street shared-use path intersections; Major Arterials/ class II bikeway intersections; pedestrian / bikeway bridges; Transit Stations (Irvine and Tustin); Public Services (Animal Care Center, City Hall, Library, Fire Station, Police Station, United States Post Office); Hospitals; Schools (Elementary, Middle, High); Universities/ Colleges; and Parks.

The following bikeway signage improvements are recommended within the 2012 Class I Off-Street Bikeway Wayfinding Signage Study, for implementation (p. 35 of the Class I Off-Street Bikeway Wayfinding Signage Study):

- Adoption of a distinctive directional and network signage design, directing bikeway users to destinations and access points.
- Street identification signage at the intersection of shared-use paths with City roadways, to orient bikeway users.
- Signs should be conventional, utilitarian, easy to read, functional, user-friendly, durable, logical, and easily recognizable; following specifications from the California Department of Transportation Standards.
- The signage system shall comply with specifications detailed on p. 36 of the Class I Off-Street Bikeway Wayfinding Signage Study

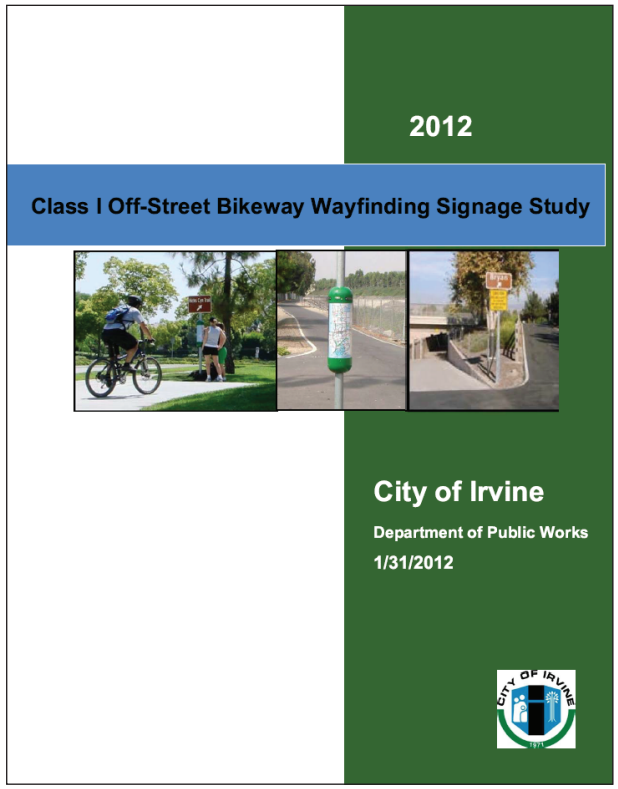


Figure 2.2.3 City of Irvine Wayfinding Signage Plan

Parks Master Plan (2017)

The Parks Master Plan (2017) serves as the guiding document for the creation of new parks and improvements to existing parks, park facilities, and open space in the City. Particularly, the document serves as a blueprint for prioritization of capital improvement and park-related projects within ten years, if funding is secured. On- and off-street bikeways support recreation and alternative forms of transportation.

The City's miles of on- and off-street bikeways, including Class I Regional Paths are considered a recreation resource (***Figure 2.2.4***). Related objectives include:

- Objective A3: to support shared-use path-related recreation in community parks separate from access paths to facilities with various lengths and difficulties for all types of people.
- Objective D, which will ensure that the City's park, recreation, and open space system is accessible to Irvine residents, including users of different abilities and demographic characteristics. This is achieved by updating park policies and standards to include travel distance guidelines for park locations (Recommendation D4, p. 31).
- Objective F, per F4, F5, and F6, the objective focuses on the development of shared-use paths that are connective and avoid conflicts with other users. Furthermore, support facilities that enhance safety are identified (F6, p. 40).

The recommended policy aims for ½ mile distances for neighborhood parks and three miles for community parks. Wayfinding recommendations include adding signage to shared-use paths to assist pedestrians. Paths are also recommended to have educational programming.

The Parks Master Plan also addresses the IBC as an opportunity site. It discusses tailoring amenities to the urban environment, as well as along paths. This is supported by the objectives listed above.

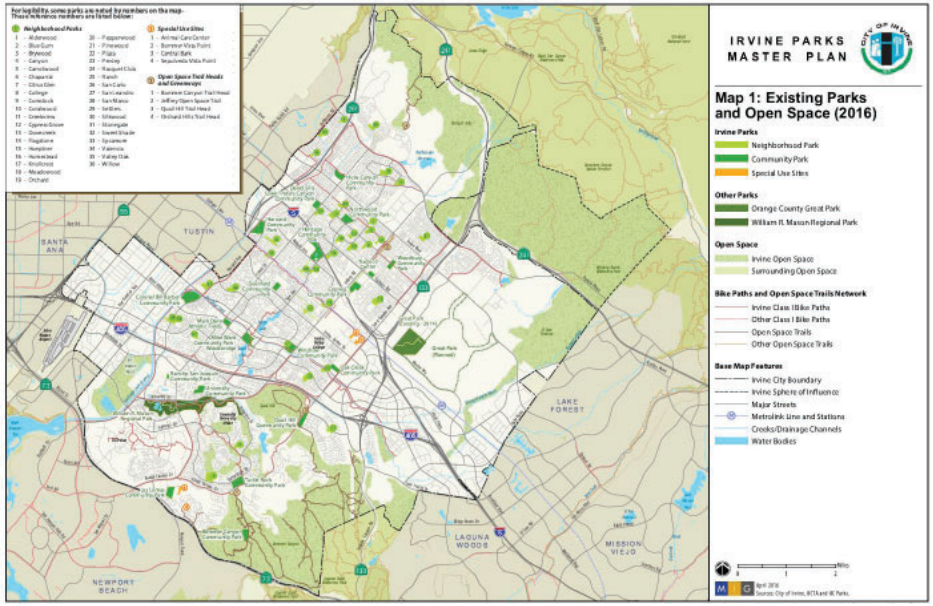


Figure 2.2.4 City of Irvine Parks Master Plan (2017)

Bicycle Friendly Community Feedback Report (2017)

The League of American Bicyclists (LAB) awarded the City of Irvine with the ranking of Silver in spring 2017 as a Bicycle Friendly Community. The League is the nation's oldest bicycle advocacy group, having been founded in 1880. The LAB is dedicated to leading the movement to create a Bicycle friendly America – conducting Bicycle Friendly Communities and Bicycle Friendly Business assessments amongst others. Their strategic planning initiatives affect communities from coast to coast, establishing a framework to bolster communities. According to the supplemental Feedback Report from the LAB, the City performs well for the following metrics:

- High speed roads with bike facilities
- Bicycle education in schools
- Bicycle-friendly laws and ordinances
- Bike Plan is current and is being implemented

In the Feedback Report, the LAB recommended that the City attends to the following areas to complement existing efforts into improving bicycling:

- Buffers or vertical barriers on bike lanes on high speed roads
- Bike Month activities
- Bicycle detection at traffic signals and automated counting program
- The ratio of bicycle network mileage to total road network mileage
- Increase the share of the transportation budget that is spent on bicycling
- Create Active Bicycle Advocacy Group and Committee
- The ratio of bike program staff to population
- Bicycle network and connectivity
- Motorist awareness and bicycling skills classes
- Mainstreaming bicycling culture (encouragement)
- Promoting safety and protecting bicyclists' rights
- Setting targets and having a plan
- Mode split shift
- Collision and fatalities mitigation

Bicycle Parking Guidance Documents

Bicycle parking within the City of Irvine is guided by Design Standards, Public Facilities Equipment Specifications, Park/Public Facility Standards, and Zoning Ordinances.

These documents set minimum requirements for parking spaces, desired material, rack styles, and locations. According to these documents, bicycle racks should be located at each park and entrances to major buildings. Additional racks may be required for major facilities, not in close proximity to buildings. Two bicycle rack definitions are found within the Zoning Ordinance Chapter 1 per facility type observed within the city:

- Class I: A stationary bicycle storage rack designed to secure the frame and both wheels of the bicycle where the cyclist supplies only a padlock
- Class II: A stationary bicycle rack, typically a vertical hoop or bar, where the cyclist supplies a padlock and chain or cable.

Bicycle parking bay minimum dimensions and surfacing requirements are found within Section 4-4 of the Zoning Ordinance:

- A minimum aisle width of 42 inches shall be provided between rows of bicycle spaces
- All bicycle parking areas shall be surfaced to keep the area in a dust-free condition.

Preferred bicycle parking models are noted in Parks/Public Facilities Section 8.2.3. Bicycle parking requirements are found within Section 4-3-7 of the City's Zoning Ordinance, which is linked to land use typologies – found in ***Appendix A***.

Bicycle Transportation Plan (Amended 2011)

The Bicycle Transportation Plan (Amended 2011) serves as a guiding document for the development and maintenance of the City's bicycle network. The plan was prepared to meet the State eligibility requirements for the Bicycle Transportation Account funding program, which was later replaced by the Active Transportation Program. Chapter 4 of the BTP outlined the existing bikeway system, including the quantity of both on-street and off-street bikeways. Chapter 5 of the BTP outlined the proposed bikeway system. The 2011 BTP Amendment added UCI projects, discussions consistent with the community survey, updated bicycle commuter estimates, and a discussion about iShuttle under Future Alternative Transportation Modes. ***Table 2.2.1*** includes City funded projects that were completed between 2011 and 2018.

Table 2.2.1 City Funded Project Status

City Funded Projects	Status
Extension of the Sand Canyon Trail parallel to Sand Canyon Avenue from the existing terminus of Walnut Trail to I-5 northbound ramps.	Complete
New off-street shared-use path on Campus Drive between California and Culver Drive (joint project with UCI).	Complete
Freeway Trail lighting	Complete
San Diego Creek Trail pavement rehabilitation	Complete
Wayfinding Signage Study	Complete
New wayfinding signs along Freeway Trail, Hicks Canyon Trail, Juanita Moe Trail, Peters Canyon Trail, San Diego Creek Trail, and Walnut Trail.	Complete

Active Transportation Plan (2015)

The predecessor to the ISATP is the City's 2015 Active Transportation Plan (ATP), which provides foundational data and recommendations to build upon. The 2015 ATP presents a detailed analysis of existing conditions, including pedestrian and bicycle barriers and demographics mapping. In particular, safety-focused collision mapping, travel mode share, population distribution, and an update to the existing on- and off-street pedestrian and bicycle network were prepared. A city-wide ATP survey was conducted to assess and confirm perceived barriers for pedestrians and bicyclists, and to identify popular pedestrian and bicycle improvements - in total the survey drew 969 responses. Lastly, the 2015 ATP presents on- and off-street spot recommendations for pedestrian and bicycle facilities. Phasing for near- and long-term projects was recommended along with some technology vendors.

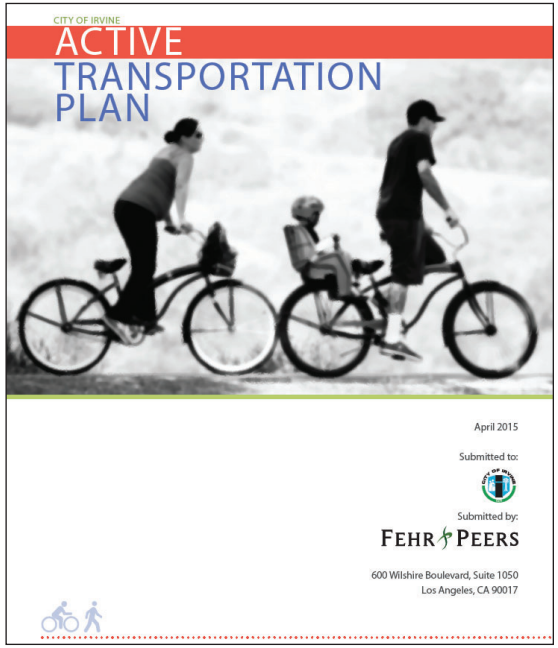


Figure 2.2.5 City of Irvine Active Transportation Plan (2015)

Citywide Bicycle, Pedestrian, and Motorist Safety Program

In 2015, City Council directed staff to pursue state Active Transportation Program funding, and the City was awarded funds for a Citywide Bicyclist, Pedestrian, and Motorist Safety Program. The goal of the program is to make bicyclists, pedestrians, and motorists aware of each other on the road and how to keep themselves and others safe. With that, the theme of the campaign is "Irvine Shares the Way", and it also has the tagline "Move with Care".

The City has pursued the following tasks since May 2016:

- Provided safety messaging to bicyclists, pedestrians, and motorists
- Implemented a media campaign
- Conducted outreach
- Created a bikeways and pedestrian map
- Attended events
- Designed guidelines for signing/striping of shared-use paths

The Citywide Safety Program was completed in March 2020.

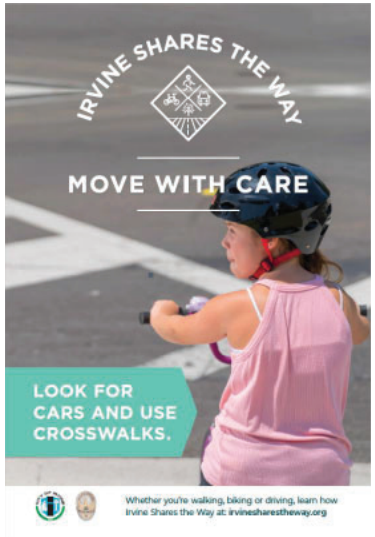


Figure 2.2.6 Sample Irvine Shares the Way Material

REGIONAL PLANS AND POLICIES

OC Foothills Bikeways Strategy (2016)

This report represents a collaborative effort between local agencies, including Irvine, to identify and prioritize potential bikeways throughout the foothills area of Orange County (Supervisorial District 3). Implementation (final design, construction, and maintenance) of bikeway corridors identified in this report will be led by the agencies that have jurisdiction. Cities or the County might need to coordinate with various landowners such as utility companies, Caltrans, rail operators, and OCTA for right-of-way acquisition. The following regional corridors are relevant to the City of Irvine (detailed maps provided within ***Appendix A***, however ***Figure 2.2.8*** provides an overview of the overlaps with the City) – listing connections made to/from the city:

- Corridor A: Regional Parks Connector – connections are made along Jamboree Road at the city boundary between Irvine and Orange via "Option B". The corridor extends south towards Portola Parkway.
- Corridor B: Lakeview-San Diego Creek – connections are made along Dyer Road/Barranca Parkway and then along the undeveloped IBC easement towards the San Diego Creek Trail (the terminus of the corridor).
- Corridor C: Cambridge-Portola – connections are made along La Colina Drive at the city boundary of Irvine and Tustin, which is just northwest of the Tustin Ranch Road intersection with La Colina Drive. The corridor extends along Portola Parkway into the northern Great Park area.
- Corridor G: Old Town to Great Park – connections are made along Bryan Avenue at the City boundary with Tustin. The corridor extends along Bryan Avenue towards the southeast and into Great Park.
- Corridor H: Warner-Edinger – connections are made along Edinger at the western boundary of Irvine and where it meets Tustin. The corridor continues southeast towards the Irvine Train Station (Barranca Parkway), making a connection with Lake Forest.
- Corridor I: Laguna Canyon-Irvine Station – connections are made along Alton Parkway, Barranca Parkway and Laguna Canyon Road within the City of Irvine. Adjacent linkages to other cities are formed at the boundary between Irvine and Lake Forest along Alton Parkway in the northeast.
- Corridor J: Jeffrey Corridor – connections are made within the City of Irvine along Jeffrey Road. The northern extent is formed with Portola Parkway, while the southern extent is made at the boundary between Newport Beach and Irvine along Culver Drive and Bonita Canyon Drive.

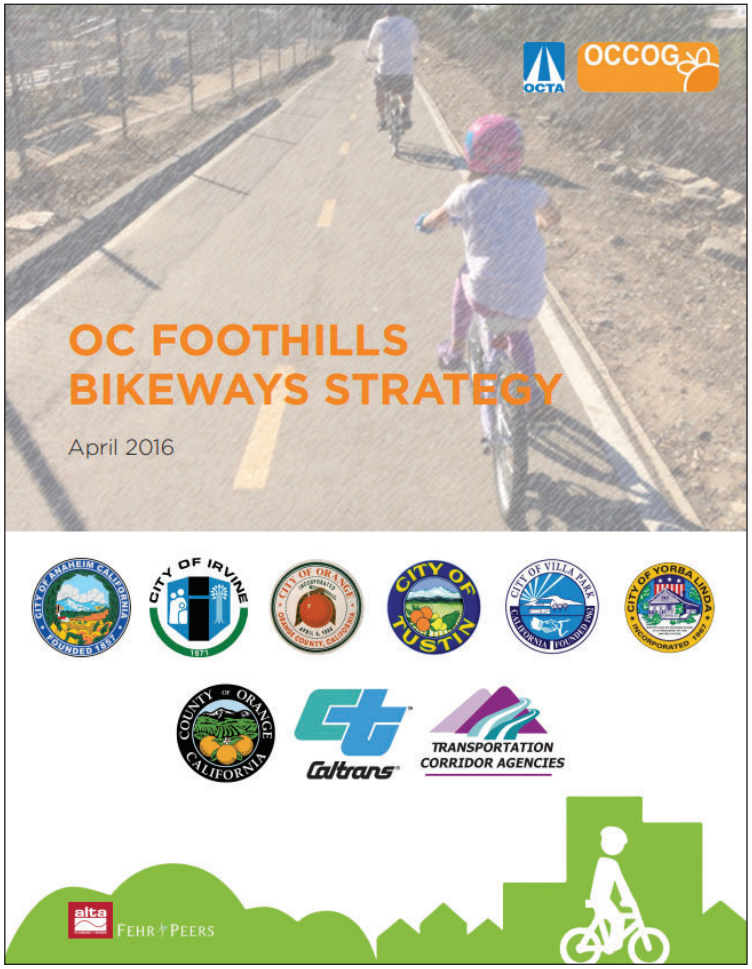
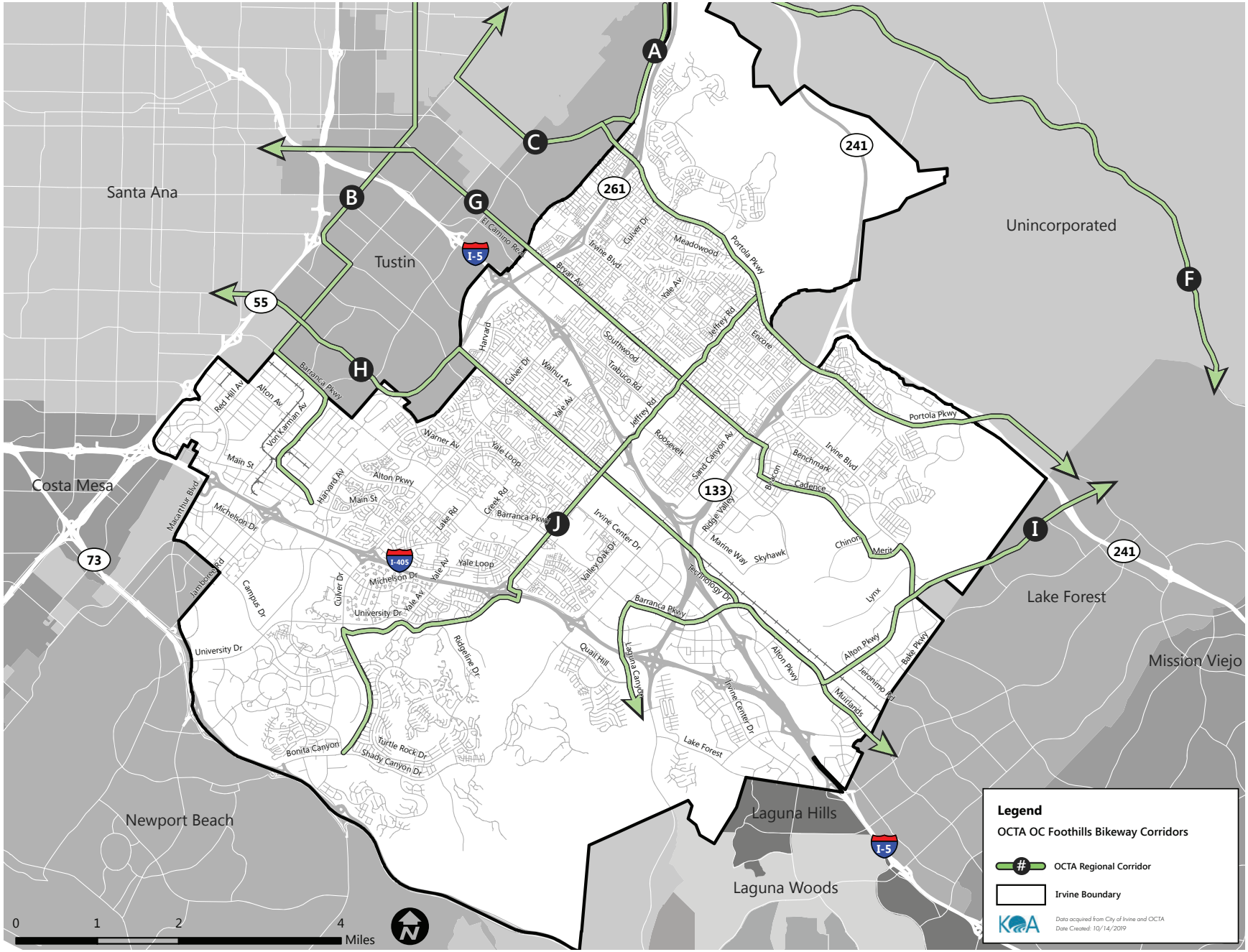


Figure 2.2.7 OC Foothill Bikeways Strategy

Figure 2.2.8 OC Foothill Bikeways Corridor Overlap with Irvine



OC Active Orange County's Bike and Pedestrian Plan (2018)

OC Active: Orange County's Bike and Pedestrian Plan is the first countywide Active Transportation Plan (ATP) for Orange County. OCTA developed this plan to provide a framework for bikeway and pedestrian planning across the county and to be compliant with the Caltrans ATP guidelines. This will allow local cities and the County of Orange to use the document as a foundation to apply for state funding to plan and implement local bicycle and pedestrian projects.

Several goals were identified to guide the decision making during the preparation of OC Active, including: 1) reduce pedestrian and bicycle collisions; 2) advance strategic walking and biking network; 3) enhance walking and biking access to transit; 4) improve high-need pedestrian areas; 5) strengthen stakeholder partnerships; 6) incorporate diverse community perspectives; 7) leverage funding opportunities. The Plan identifies key pedestrian focus areas, major regional connectors, and composite bikeway map. Utilizing countywide data (generators, barriers, attractors) and modeling, composite countywide and city-specific exhibits are included.

City of Newport Beach Bicycle Master Plan (2014)

The Newport Beach Bicycle Master Plan is intended to guide the development and maintenance of a comprehensive bicycle network and set of programs until 2034. There were 93 miles of bikeways existing in 2014, including the 26 miles of sidewalks that allow bicycle riding. A map is shown in ***Appendix A***. 10.3 additional miles were already planned, and 46 miles were proposed. If all bikeways are implemented, a total of 149 miles of bikeways will exist.

Major existing connections are made from Newport Beach, which is geographically southwest of Irvine, at the following streets/shared-use paths:

- San Diego Creek Trail (Off-street shared-use path facility) at the easternmost extent of Back Bay/ SR-73
- University Drive at SR-73 (Class II On-street facilities)
- Bison Avenue at SR-73 (Class II On-street facilities)
- Bonita Canyon Drive at SR-73 (Class II On-street facilities)
- Newport Coast Drive at SR-73 (Class II On-street facilities)
- Campus Drive at Jamboree Road (Class II On-street facilities)

City of Costa Mesa Active Transportation Plan (2017)

As of 2017, Costa Mesa had 43 miles of bike facilities - map shown in ***Appendix A***. The Active Transportation Plan proposes 53 miles of additional bicycle facilities. Major existing connections are made from Costa Mesa, which is geographically west of Irvine, at the following locations:

- Sunflower Avenue at Main Street (Class II On-street facility)
- Red Hill Avenue at I-405 (Class II On-street facility)

City of Santa Ana Complete Streets (2016)

The goal of the Santa Ana Complete Streets (2016) document is to create a walkable, bikeable, and transit-friendly downtown in the heart of Orange County for all ages. Santa Ana forms the northwest boundary with the City of Irvine along SR-55. Major existing connections are made adjacent to the City of Irvine along the following:

- Dyer Road/Barranca Parkway at the intersection with SR-55 (no facilities provided)
- MacArthur Boulevard at the intersection with SR-55 (no facilities provided)
- Sunflower Avenue and Main Street at the intersection with SR-55 (Class II On-street facilities)

City of Laguna Hills Bikeways (2015)

The City of Laguna Hills allows for four existing connections proximal to Lake Forest Drive, in the southeast sector of Irvine, which are listed below. OCTA Bikeways data from 2015 was used since no ATP or Bicycle Master Plan for the City of Laguna Hills exists.

- Tesla and Lake Forest Drive (no facilities provided)
- Scientific and Lake Forest Drive (Class II On-street facilities provided north of Lake Forest Drive)
- Irvine Center Drive and Lake Forest Drive (Class II On-street facilities provided)
- Research Drive and Lake Forest Drive (limited Class II On-street facilities provided)

City of Tustin Bikeways (2015)

The City of Tustin is void of a formal ATP or Bicycle Master Plan – however OCTA bikeways data from 2015 was used to supplement the connectivity assessment. Tustin forms the northwest boundary of Irvine. Major existing connections adjacent to the City of Irvine are:

- Portola Parkway at the intersection of Jamboree Road (Class II On-street facilities are provided)
- Tustin Ranch Road at the intersection of Jamboree Road (Class II On-street facilities are provided)
- Irvine Boulevard at the intersection of Jamboree Road (Class II On-street facilities are provided)
- Robinson Drive at the intersection of Jamboree Road (Class II On-street facilities are provided)
- Bryan Avenue at the intersection of Jamboree Road (Class II On-street facilities are provided)
- Walnut Avenue at the intersection with Myford Road at the intersection of Jamboree Road (Class II On-street facilities are provided)
- Irvine Center Drive at the intersection with Harvard Avenue (Class II On-street facilities are provided)
- Paseo Westpark at the intersection with Harvard Avenue (Class II On-street facilities are provided)
- Peters Canyon Trail north of Warner Avenue (note path does not extend north from this location until north of Walnut Trail (Off-street shared-use path provided))
- Armstrong Avenue at the intersection of Dyer Road (Class II On-street facilities are provided)

City of Lake Forest Bikeways (2015)

The City of Lake Forest forms the eastern boundary of the City of Irvine, partially along Bake Parkway. Existing facilities from the City of Lake Forest connect into the City of Irvine at multiple locations. OCTA Bikeways data from 2015 was used to supplement the lack of an ATP or Bicycle Master Plan.

- Alton Parkway at the boundary of Irvine and Lake Forest (Class II On-street facilities provided)
- Irvine Boulevard at the intersection of Bake Parkway (Class II On-street facilities provided)
- Toledo Way at the intersection of Bake Parkway (Class II On-street facilities provided)
- Jeronimo Road at the intersection of Bake Parkway (Class II On-street facilities provided)
- Barranca Parkway/Muirlands Boulevard at the boundary of the Irvine and Lake Forest (Class II On-street facilities provided)
- Rockfield Boulevard at the boundary of the Irvine and Lake Forest (Class II On-street facilities provided)

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2.3 PEDESTRIAN AND BICYCLE COUNTS

ON-STREET PEDESTRIAN, BICYCLE, AND VEHICLE COUNTS (2018)

Pedestrian, bicycle, and vehicle count data were collected between the months of March and May in 2018. Pedestrian and bicycle count data depicted in ***Figure 2.3.1*** and ***Figure 2.3.2***, respectively, show the peak hour averages of combined morning and afternoon peak hour counts. Peak hour morning and afternoon counts were collected for two days, and the resulting peak period counts and averages were drawn from these values. Data were collected at signalized intersections across the city. Usage characteristics are unique per measured category, highlighting both higher and lower demand areas within the city.

Pedestrian demand highlights potential popular destinations and attractors such as retail, school facilities, and food options. Bicycle demand captures on-street facility usage but lacks count data for Irvine's off-street shared-use path system (see further collected 2019 off-street path counts). On-street bicycle demand thus highlights connections to and from the off-street path network and where on-street options are exclusively available and/or popular. Proximity to popular destinations, bicycle and pedestrian usage is observed to be higher. Vehicular counts are noticeably linked to proximity to interstate freeways and major arterial roadways. A summary of aggregated average pedestrian and bicycle data per intersection is detailed in ***Appendix A.*** Cumulative citywide intersection averages per category are pedestrian (50); bicycle (90); and vehicle (13,192).

Figure 2.3.1 Pedestrian Two Day Combined Peak Period (AM/PM) Average On-Street Counts

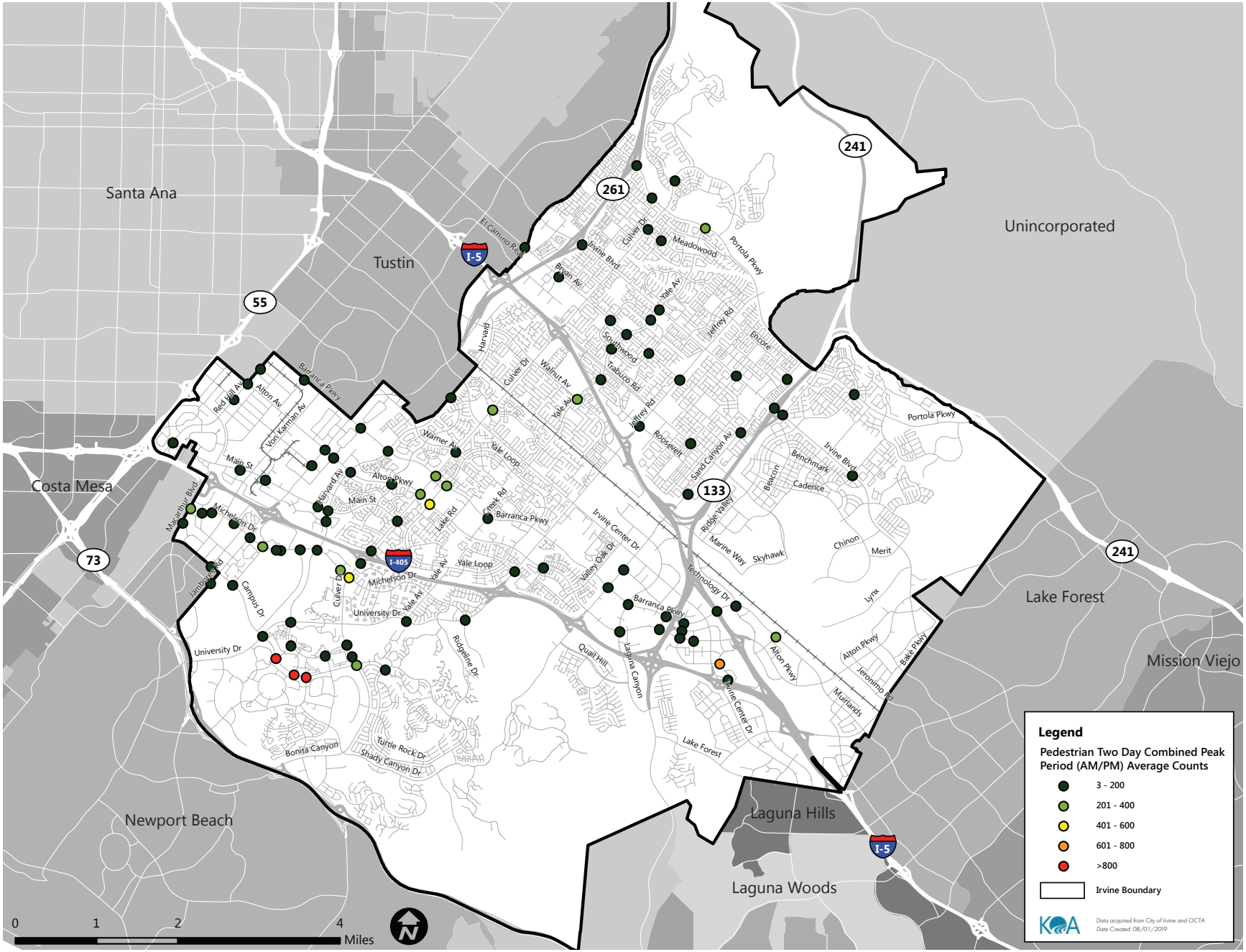
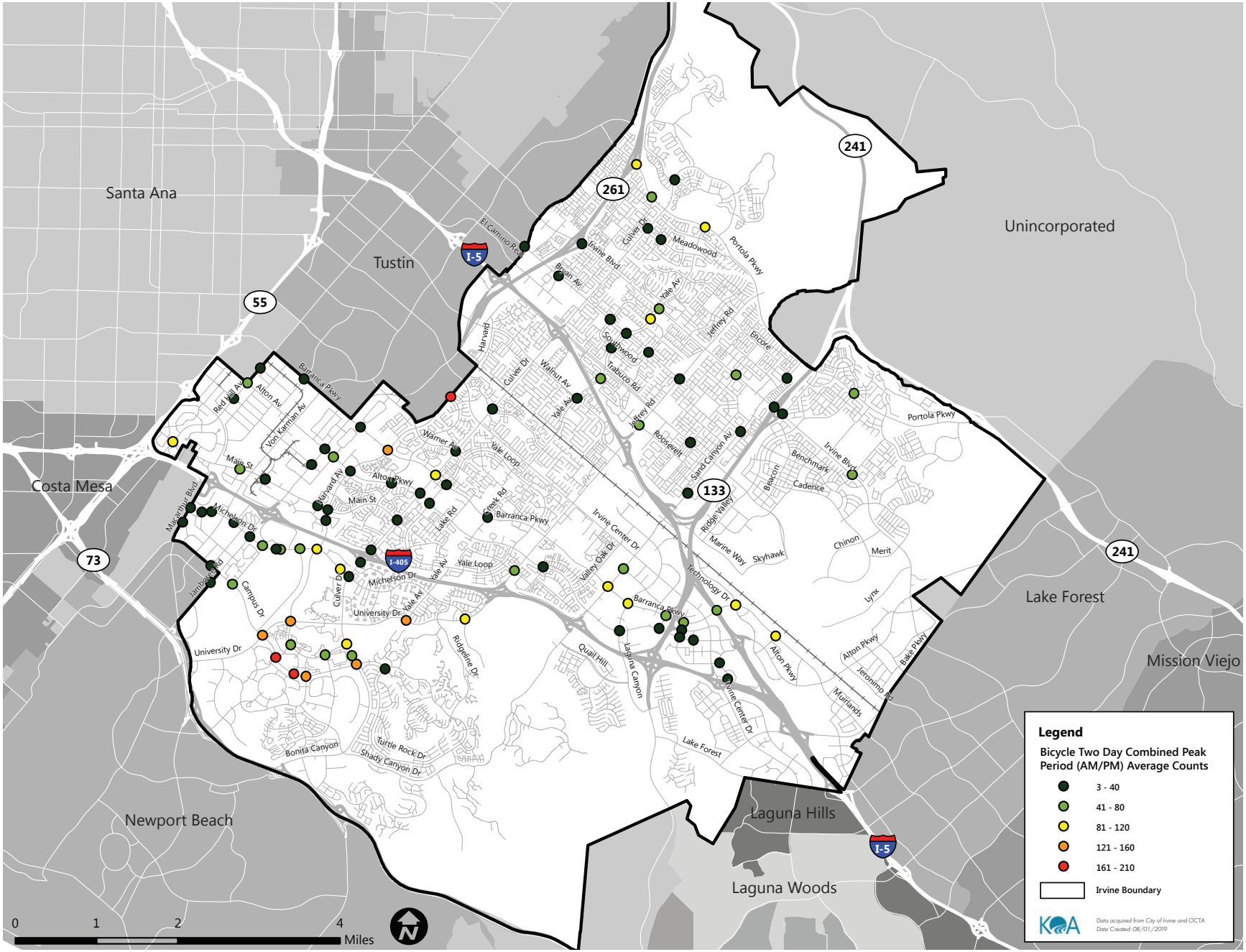


Figure 2.3.2 Bicycle Two Day Combined Peak Period (AM/PM) Average On-Street Counts



OFF-STREET PEDESTRIAN AND BICYCLE COUNTS (2019)

Weekday and weekend bicycle and pedestrian counts were collected for a cumulative 48-hour analysis at 20 off-street shared-use path locations between April 25, 2019, and May 18, 2019. To establish baseline data that can relate to future regional count campaigns, specific OCTA "cyclic" and "continuous" count locations were proposed, which are congruent with the OCTA Active Transportation Count Program (ATCP).

The "continuous" represent locations that are identified as future permanent count systems, while the "cyclic" represents count locations that are identified as future periodic counts sites to be completed on a semi-regular basis. It is to be noted that one count location "Shady Canyon Trail (north of Canyon Creek)" is host to an existing Orange County Parks permanent count location. Counts were collected to maintain consistency in collection dates with other locations.

Count Location Considerations

Below are factors considered when selecting count sites, which are consistent with the OCTA ACTP's considerations.

- Site that is located at network pinch points where all users can be captured.
- Counts should be collected on a level grade where bicyclists are not going above the average speed and where pedestrians are walking and not congregating and/or not immediately proximal to an intersection where speed variability may be a concern.
- The volume of pedestrians and bicyclists at the site should be at least 100 per day, with higher volumes preferred. Sufficient volume data is needed to make meaningful conclusions about trends.
- Maintain regional consistency and balance past and current local count locations

Pedestrian and Bicycle 48-Hour Count Locations

The following locations represent the 20 locations where 48-hour pedestrian and bicycle counts were collected, also shown in ***Figure 2.3.3***. Thirteen of the 20 locations are either "cyclic" or "continuous" locations identified within the OCTA ATCP. The remaining sites, developed exclusively for the ISATP, either supplement OCTA's proposed count sites or are congruent with Orange County Park's existing count sites.

1. San Diego Creek Trail (east of Creek Road)*
2. San Diego Creek Trail (north of Alton Parkway and north of path split)*
3. Shady Canyon Trail (north of Canyon Creek)
4. Walnut Trail (west of Yale Avenue)*
5. Jeffrey Open Space Trail (north of Bryan Avenue and south of Irvine Boulevard)*
6. Harvard Trail (Northeast of Columbus Grove Drive)*
7. Peters Canyon Trail (north of Mineral King)*
8. Hicks Canyon Trail (Mid-point between Yale Avenue and Culver Drive)*
9. San Diego Creek Trail (between California Avenue and Mesa Road)
10. Peters Canyon Trail (south of I-5)*
11. University Trail (east of Strawberry Farm Road)*
12. Freeway Trail (east of Yale Bridge)*
13. Walnut Trail (north of Shield)*
14. West Irvine Trail (south of Crestline)*
15. Cypress Trail (between Jeffrey Road and Sand Canyon Avenue)
16. Jeffrey Open Space Trail, JOST (between San Diego Creek Trail Northerly and Southerly embankments)
17. Portola Trail (between Hicks Canyon Trail and Jeffrey Open Space Trail)
18. San Diego Creek Trail (between SR-133 and Spectrum)
19. Shady Canyon Trail (west of Sunnyhill)*
20. Venta Spur Trail (between Westwood and Yale Avenue)

**Site is consistent with OCTA's ATCP proposed "cyclic" or "continuous" count site.*

Overview

Fact sheets for each site are nested in ***Appendix A***, showing independent pedestrian and bicycle counts for each day and hour. Totals are graphically and numerically displayed as well. Separate weekday and weekend peak hour identifications are made for each of the 20 sites in ***Table 2.3.1***.

Seventeen out of the 20 locations analyzed showed weekends (Saturday mornings) represented the highest volumes. This was determined by comparing the number of counts for pedestrians only, bike only, bike and pedestrian combined, and peak hour between both days for each location. It was found that nine of the 20 locations showed higher counts in nearly all four categories on Saturdays. Broadly, the peak hours for Saturdays ranged from 8:00 a.m. to 4:00 p.m., but the average peak hour, across all locations, was 10:00 a.m. to 11:00 a.m. with 109 average number of pedestrian and bicycle users counted.

Table 2.3.1 shows a summary of each location and where high volumes are. Locations 2, 3, 5, 9, and 19 represent higher usage than other locations.

Figure 2.3.3 48-hour Off-Street Pedestrian and Bicycle Count Locations

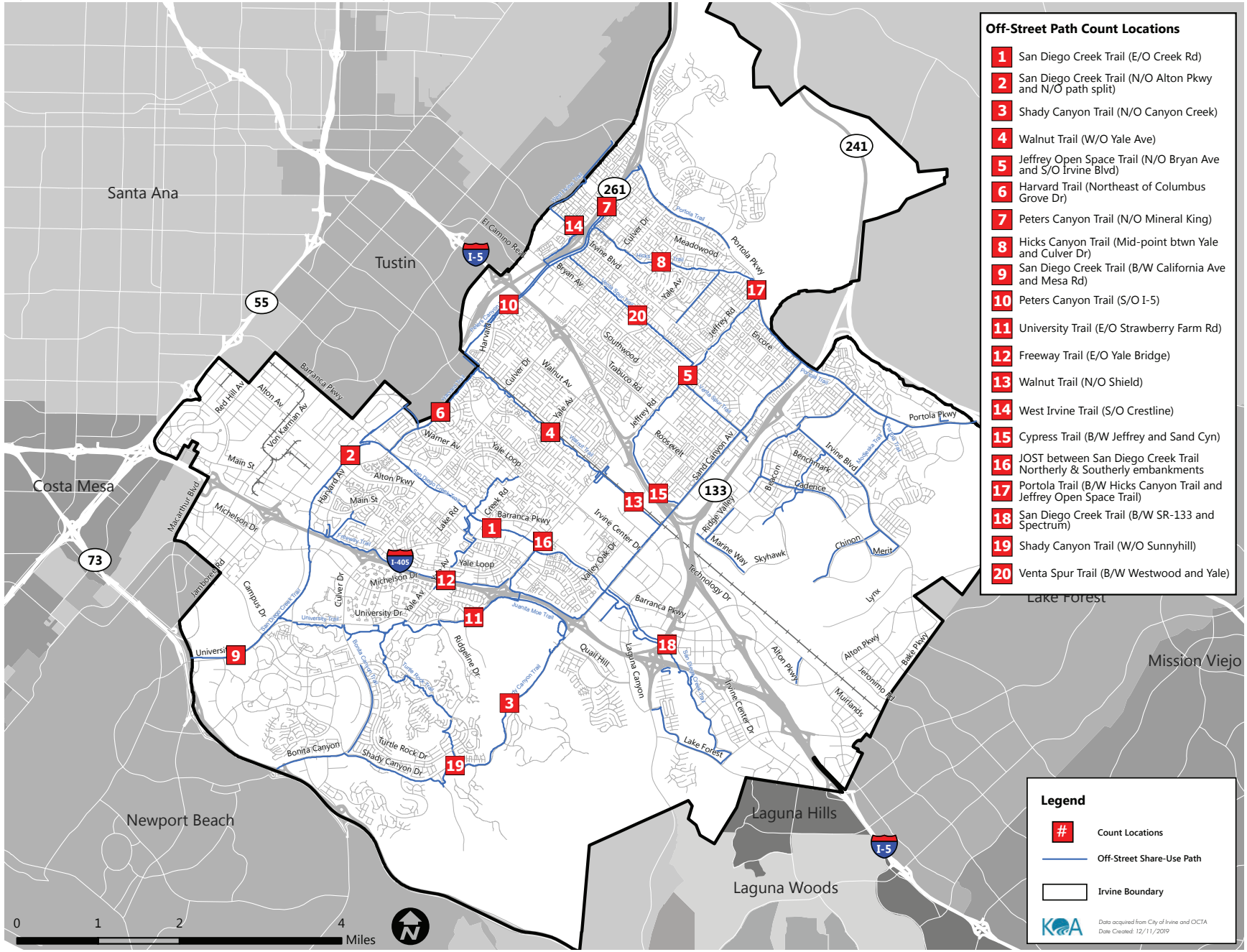
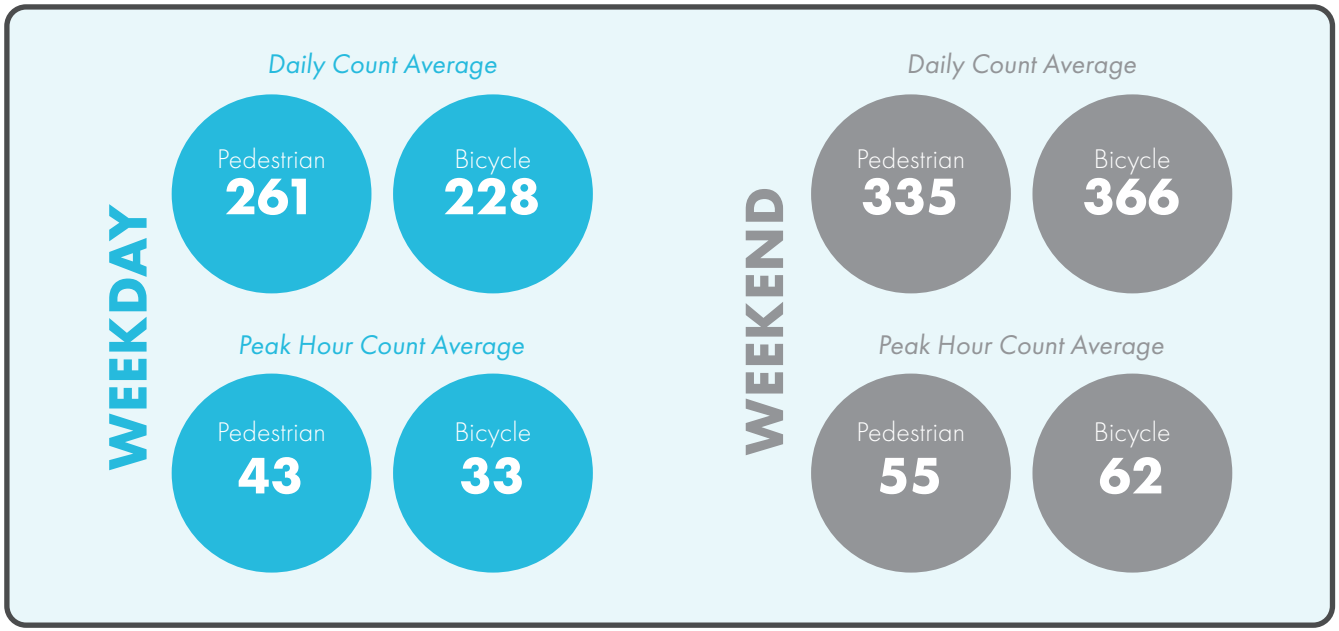


Table 2.3.1 48-hour Off-Street Pedestrian and Bicycle Count Summary

Path ID #	Location	Weekday Daily Counts		Weekday Peak Hour Counts		Weekend Daily Counts		Weekend Peak Hour Counts	
		Pedestrian	***Bicycle***	***Pedestrian***	***Bicycle***	***Pedestrian***	***Bicycle***	***Pedestrian***	***Bicycle***
1	San Diego Creek Trail (east of Creek Road)	301	380	46	43	277	494	32	59
2	San Diego Creek Trail (north of Alton Pkwy and north of path split)	516	***822***	71	***92***	481	***1057***	58	***182***
3	Shady Canyon Trail (north of Canyon Creek)	631	147	***122***	21	***1094***	408	***214***	82
4	Walnut Trail (west of Yale Avenue)	167	131	33	27	215	328	34	52
5	Jeffrey Open Space Trail (north of Bryan Avenue and south of Irvine Boulevard)	***709***	239	***132***	57	817	280	133	41
6	Harvard Trail (Northeast of Columbus Grove Drive)	84	49	11	9	84	47	13	10
7	Peters Canyon Trail (north of Mineral King)	216	207	27	27	242	494	39	88
8	Hicks Canyon Trail (Mid-Point Between Yale Avenue and Culver Drive)	***518***	77	65	14	625	223	85	37
9	San Diego Creek Trail (between California Avenue and Mesa Road)	237	***710***	59	***72***	380	***1254***	53	***242***
10	Peters Canyon Trail (south of I-5)	172	405	25	61	131	841	25	152
11	University Trail (east of Strawberry Farm Road)	35	206	6	37	71	386	15	66
12	Freeway Trail (east of Yale Avenue Bridge)	32	88	6	12	45	78	17	13
13	Walnut Trail (north of Shield)	89	189	22	40	92	226	20	29
14	West Irvine Trail (south of Crestline)	394	63	69	16	482	99	48	13
15	Cypress Trail (between Jeffrey Road and Sand Canyon Avenue)	156	87	28	15	223	62	34	11
16	Jeffrey Open Space Trail (between San Diego Creek Trail Northerly and Southerly embankments)	148	406	18	60	196	449	46	66
17	Portola Trail (between Hicks Canyon Trail and Jeffrey Open Space Trail)	51	29	10	7	197	107	39	17
18	San Diego Creek Trail (between SR-133 and Spectrum)	264	177	37	24	177	241	24	34
19	Shady Canyon Trail (west of Sunnyhill)	269	138	47	17	***638***	249	***134***	43
20	Venta Spur Trail (between Westwood and Yale Avenue)	228	11	26	2	227	1	27	1

Figure 2.3.4 48-hour Off-Street Pedestrian and Bicycle Count Averages (20 Locations)



2.4 CITYWIDE MULTI-MODAL COLLISION ANALYSIS

COLLISION ANALYSIS

The collision analysis is an essential task used to limit the exposure of bicyclists and pedestrians. Analysis of historical on-street City collision data for patterns and trends is critical in determining the implementation of specific improvements. Collision data was collected from January 2013 to June 2018 (source: Department of Public Safety). Data points are compiled based on collision reports received from California Highway Patrol field offices, local police, and sheriff jurisdictions.

From 2013 to 2018, there were 441 bicycle-involved collisions reported in Irvine, an average of 74 bicycle-involved collisions per year. During the same time frame, 265 pedestrian-involved collisions were reported, an average of 44 pedestrian-involved collisions per year.

The California Office of Traffic Safety (OTS) develops rankings for comparison of traffic safety statistics between cities with similar-sized populations. The OTS provides statistics based on rates of victims killed and injured per "1,000 daily-vehicle-miles-of-travel" (Caltrans data), per "1,000 average population" (Department of Finance) figures, and grouped cities based on population. The most recent OTS ranking data is for collisions during 2017. Irvine ranks in a 15-city group classified by populations over 250,000. Of the 15 California cities, Irvine ranked 8th based on average population for bicycle-involved collisions and 14th based on average population for pedestrian-involved collisions. A rank of "1st" out of 15 implies the agency has the highest frequency of collisions, while a rank of "15th" reflects the lowest amount of collisions within the 15-city group.

COLLISION LOCATIONS

Figure 2.4.1 and ***Figure 2.4.2*** show collision hotspots of bicycle and pedestrian-involved collisions from January 2013 to June 2018. Bicycle and pedestrian involved collisions that did not have X and Y coordinates were geocoded using TIGER/Line road network data. Collisions within 20 feet or less of an intersection were geocoded to the center of the intersection. All collisions with a distance greater than 20 feet were moved to their exact location along the primary road specified. Both figures show the number of collisions per ¼-mile, defined as the likelihood that a collision will occur within ¼-mile of travel at specific locations. Locations with a high frequency of collisions (e.g. 10-12 per ¼-mile) are defined by the likelihood that within ¼-mile of travel, 10-12 collisions are likely to occur.

Based on the frequency of collisions at specific locations, a higher frequency of bicycle-involved collisions occur along Culver Drive, Alton Parkway, Barranca Parkway, Campus Drive, Walnut Avenue, Michelson Drive, East Yale Loop, and West Yale Loop. ***Appendix A*** contains figures that visualize these collisions at a large scale and include exact collision locations symbolized by fatal/severe injury and other (visible injury, complaint of pain, and property damage only) collisions. A higher frequency of pedestrian-involved collisions occur along Culver Drive, Walnut Avenue, Jeffrey Road, and Alton Parkway.

Figure 2.4.1 Bicycle-Involved Collisions (2013-2018)

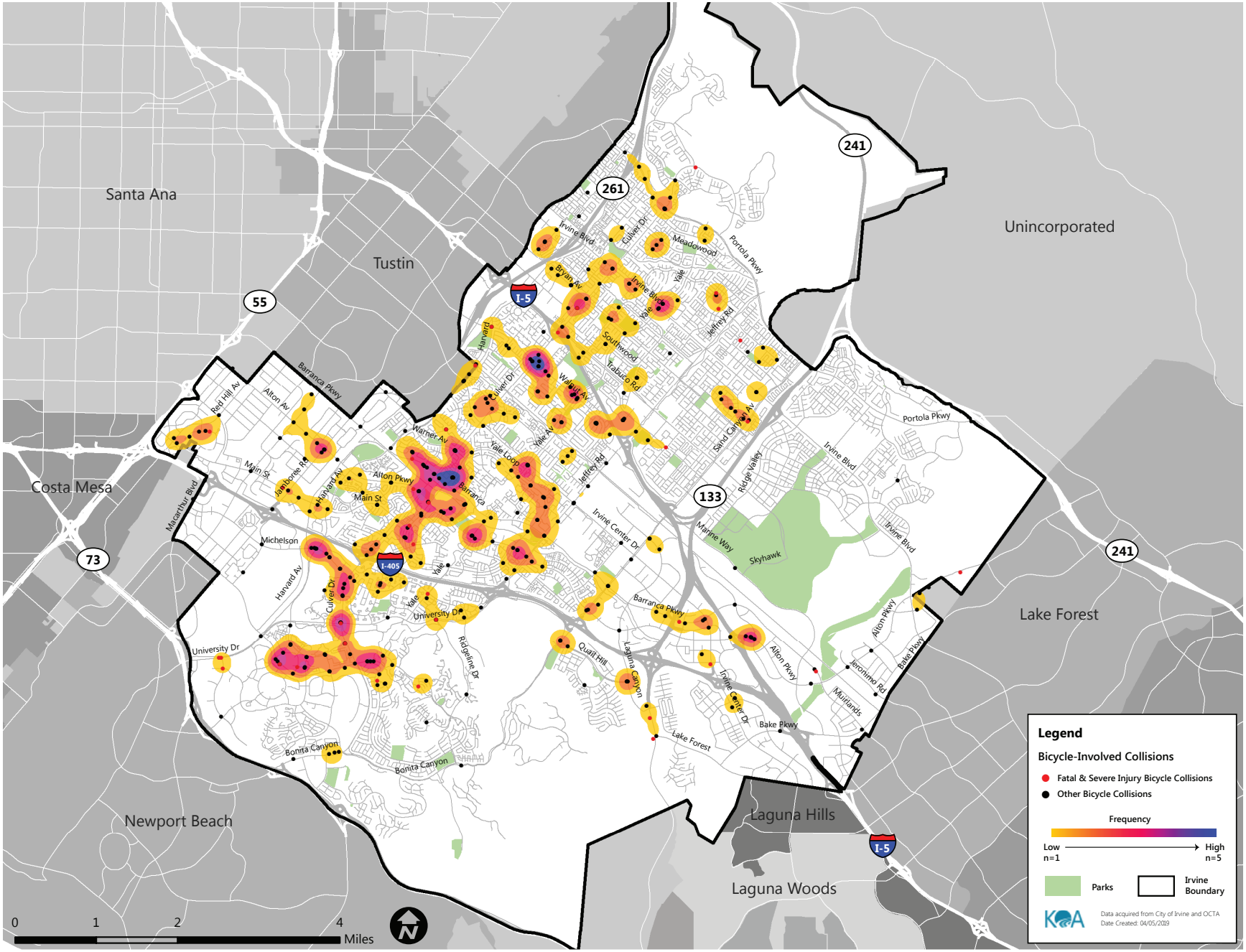
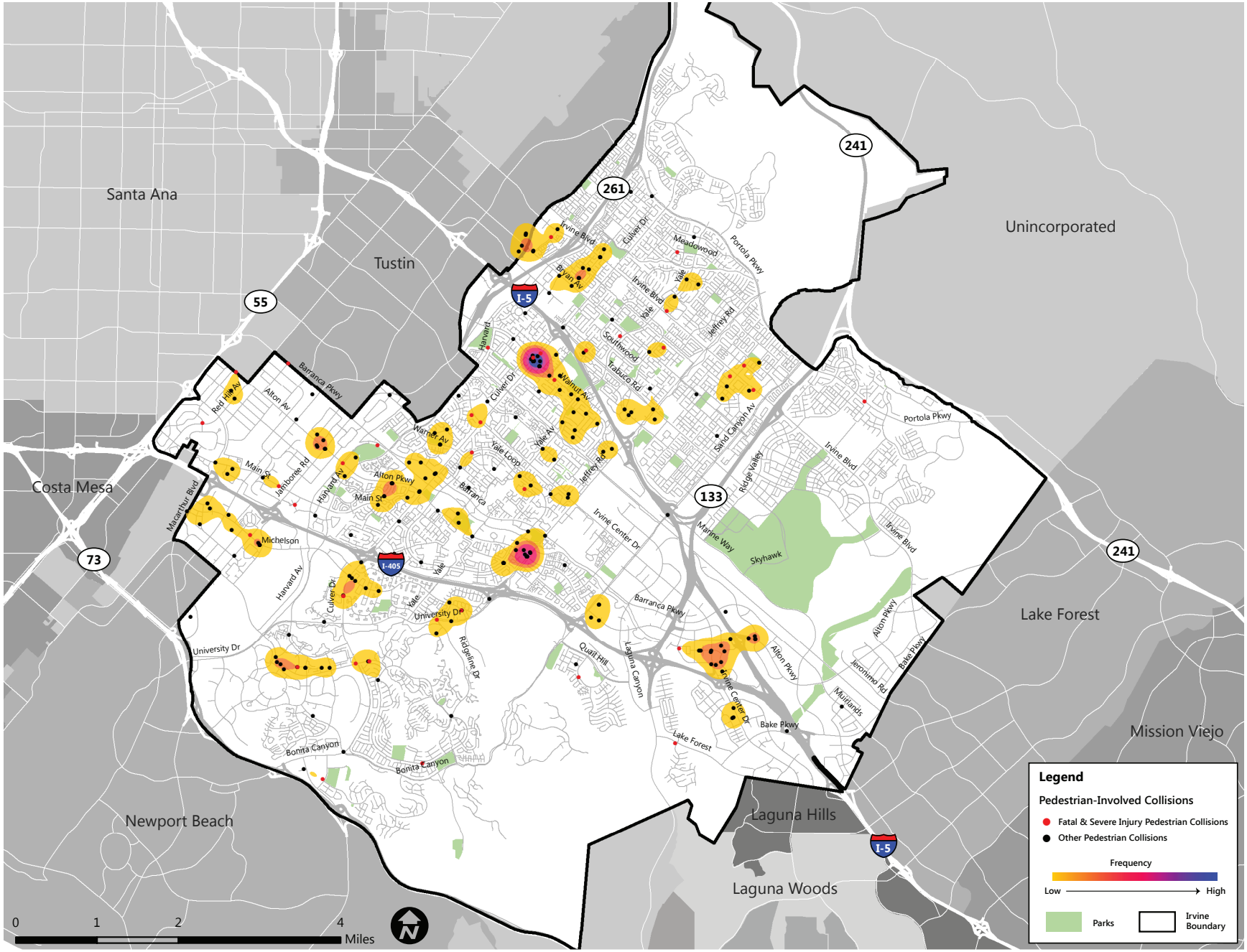


Figure 2.4.2 Pedestrian-Involved Collisions (2013-2018)



COLLISION DATA SUMMARY

The collision data was analyzed by collision severity, primary collision factors, lighting conditions, day of collision, and type of collision.

Collisions by Year and Severity

As shown in ***Table 2.4.1***, 2013 to 2018, a total of 706 collisions involving bicyclists or pedestrians were reported in the City of Irvine. The total number of collisions per year ranged from 114 to 147. However, only 58 collisions were reported in 2018 because collision data was only provided through June. Of the 706 reported collisions, 701 resulted in injuries (severe, visible, and complaint of pain), and 11 resulted in fatalities. Injuries can be greater than total collisions in the event that a single collision injures multiple persons. Bicycle-involved collisions constitute 62% of collisions while pedestrian-involved collisions make up 38% of collisions.

Table 2.4.1 Summary of Bicycle and Pedestrian-Involved Collisions Per Year (2013-2018)

Year	Bicycle Collisions			Pedestrian Collision			Total Collisions
	Fatalities	*Injuries*	*Collisions*	*Fatalities*	*Injuries*	*Collisions*	
2013	0	59	64	5	51	50	114
2014	0	89	87	2	45	46	133
2015	1	78	74	0	53	50	124
2016	0	79	78	0	61	52	130
2017	1	85	95	2	49	52	147
2018*	0	40	43	0	12	15	58
Total**	2	430	**441**	9	271	**265**	**706**

**Data in 2018 is presented through June 2018, and should be considered when referencing charts.*

***Injuries can be greater than total collisions in the event that a single collision injures multiple persons.*

Bicycle-Vehicle: Primary Collision Factors

The two most frequent collision factors for bicycle-involved collisions with vehicles were unsafe speeds and bicyclists traveling on the wrong side of the road. Bicyclists were determined to be at fault 62% of the time.

Table 2.4.2, ***Figure 2.4.3***, and ***Figure 2.4.4*** summarize the primary collision factors for the party at fault in bicycle-involved collisions.

Figure 2.4.3 Top Bicyclist-at-Fault Collision Factors

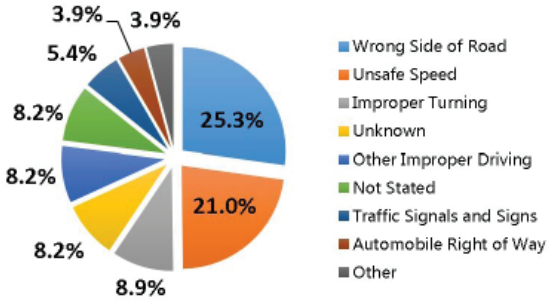


Figure 2.4.4 Top Motorist-at-Fault Collision Factors (Bicycle)

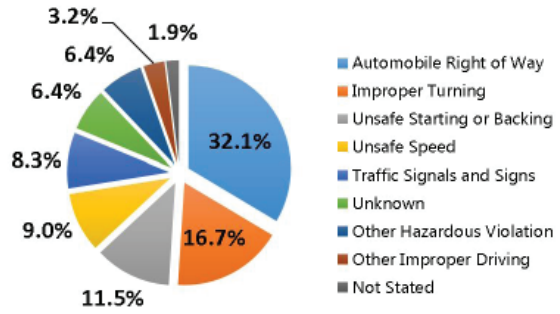


Table 2.4.2 Bicycle-Vehicle: Primary Collision Factors

BICYCLE-INVOLVED: Primary Collision Factor	Collisions				
	Party at Fault		Total	% of Bike	% of Motorist
	Bicyclist	Motorist			
Unsafe Speed	54	14	68	21.00%	9.00%
Wrong Side of Road	65	1	66	25.30%	0.60%
Automobile Right of Way	10	50	60	3.90%	32.10%
Improper Turning	23	26	49	8.90%	16.70%
Unknown	21	10	31	8.20%	6.40%
Traffic Signals and Signs	14	13	27	5.40%	8.30%
Other Improper Driving	21	5	26	8.20%	3.20%
Not Stated	21	3	24	8.20%	1.90%
Unsafe Starting or Backing	1	18	19	0.40%	11.50%
Other	10	1	11	3.90%	0.60%
Other Hazardous Violation	1	10	11	0.40%	6.40%
Unsafe Lane Change	6	1	7	2.30%	0.60%
Following Too Closely	4	2	6	1.60%	1.30%
Driving or Bicycling Under the Influence	2	0	2	0.80%	0.00%
Impeding Traffic	1	0	1	0.40%	0.00%
Lights	1	0	1	0.40%	0.00%
Other Than Driver	1	0	1	0.40%	0.00%
Pedestrian Violation	1	0	1	0.40%	0.00%
Improper Passing	0	1	1	0.00%	0.60%
Pedestrian Right of Way	0	1	1	0.00%	0.60%
Brakes	0	0	0	0.00%	0.00%
Fell Asleep	0	0	0	0.00%	0.00%
Hazardous Parking	0	0	0	0.00%	0.00%
Other Equipment	0	0	0	0.00%	0.00%
Total	**257**	**156**	**413**		

Pedestrian-Vehicle: Primary Collision Factors

The two most frequent collision factors for pedestrian-involved collisions with vehicles were pedestrian right of way and other improper driving. Additionally, the most frequent violation when a pedestrian was at fault was classified as pedestrian right of way. Motorists were found to be at fault 83% of the time.

Table 2.4.3, ***Figures 2.4.5***, and ***Figure 2.4.6*** summarize the primary collision factors for the party at fault in pedestrian-involved collisions.

Figure 2.4.5 Top Pedestrian-at-Fault Collision Factors

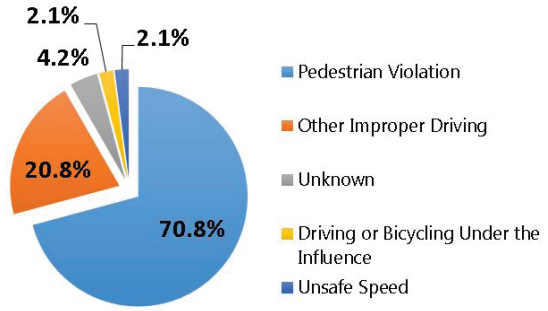


Figure 2.4.6 Top Motorist-at-Fault Collision Factors (Pedestrian)

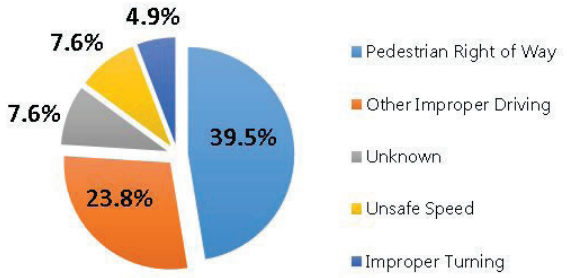


Table 2.4.3 Pedestrian-Vehicle: Primary Collision Factors

PEDESTRIAN-INVOLVED: Primary Collision Factor	Collisions				
	Party at Fault		Total	% of Ped	% of Motorist
	Pedestrain	Motorist			
Pedestrian Right of Way	0	73	73	0.00%	39.50%
Other Improper Driving	10	44	54	20.80%	23.80%
Pedestrian Violation	34	2	36	70.80%	1.10%
Unknown	2	14	16	4.20%	7.60%
Unsafe Speed	1	14	15	2.10%	7.60%
Improper Turning	0	9	9	0.00%	4.90%
Unsafe Starting or Backing	0	9	9	0.00%	4.90%
Automobile Right of Way	0	8	8	0.00%	4.30%
Driving or Bicycling Under the Influence	1	3	4	2.10%	1.60%
Improper Passing	0	3	3	0.00%	1.60%
Traffic Signals and Signs	0	3	3	0.00%	1.60%
Other Hazardous Violation	0	1	1	0.00%	0.50%
Other Than Driver	0	1	1	0.00%	0.50%
Wrong Side of Road	0	1	1	0.00%	0.50%
Brakes	0	0	0	0.00%	0.00%
Fell Asleep	0	0	0	0.00%	0.00%
Following Too Closely	0	0	0	0.00%	0.00%
Hazardous Parking	0	0	0	0.00%	0.00%
Impeding Traffic	0	0	0	0.00%	0.00%
Lights	0	0	0	0.00%	0.00%
Not Stated	0	0	0	0.00%	0.00%
Other	0	0	0	0.00%	0.00%
Other Equipment	0	0	0	0.00%	0.00%
Unsafe Lane Change	0	0	0	0.00%	0.00%
Total	**48**	**185**	**233**		

Primary Collision Factor Summary

The two most frequent collision factors for bicycle-involved collisions were unsafe speed and wrong side of the road, constituting 30% of all bicycle-involved collision factors. The two most frequent collision factors for pedestrian-involved collisions were automobile failing to yield to pedestrian right of way and other improper driving, constituting 49% of all pedestrian-involved collision factors. ***Table 2.4.4***, ***Figures 2.4.7***, and ***Figure 2.4.8*** summarize the primary collision factors for bicycle-involved and pedestrian-involved collisions. ***Figure 2.4.9*** visualizes the locations for the top two collision factors for bicycle- and pedestrian-involved collisions.

- Hotspot locations for the top two bicycle-involved collision factors include: Culver Drive, Creek Road, Alton Parkway, Irvine Boulevard, Barranca Parkway, and Sand Canyon Avenue, Campus Drive, Paseo West Park, and West Yale Loop.
- Hotspot locations for the top two pedestrian-involved collision factors include Culver Drive, Walnut Avenue, Jeffrey Road, Alton Parkway, Paseo Westpark, Sanburg Way, and Bryan Avenue.

Figure 2.4.7 Top Bicycle-Involved Collision Factors

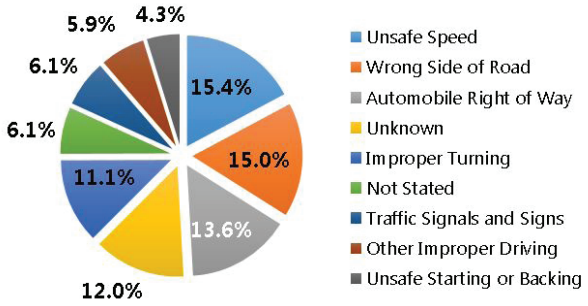


Figure 2.4.8 Top Pedestrian-Involved Collision Factors

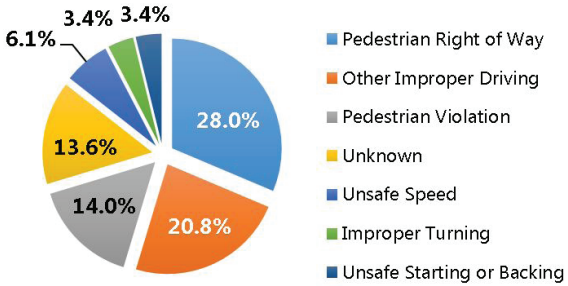
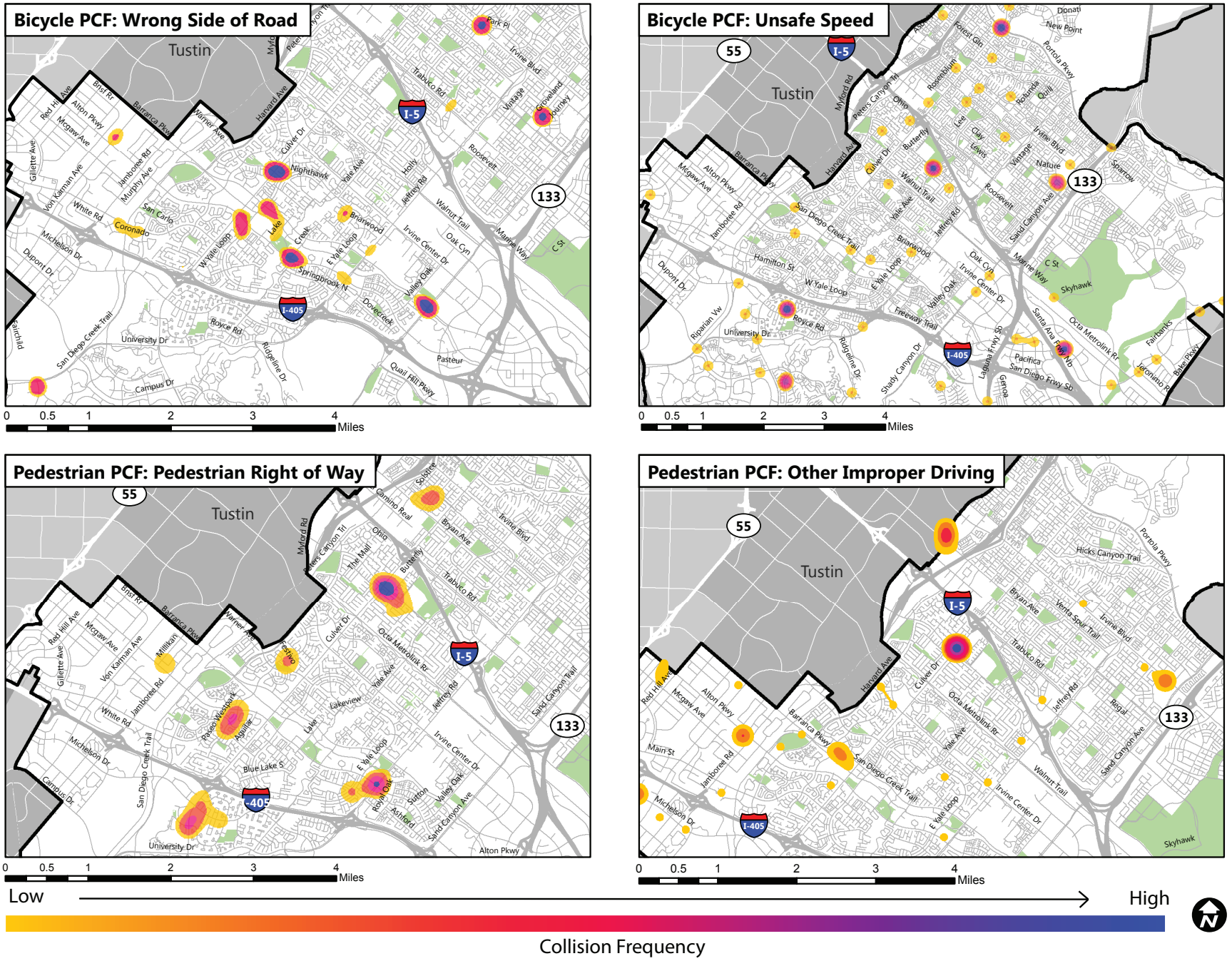


Table 2.4.4 Primary Collision Factor for Bicycle- and Pedestrian-Involved Collisions

Primary Collision Factor	Collisions		
	Bicyclist	Pedestrian	Total
Unknown	53	36	89
Unsafe Speed	68	16	84
Other Improper Driving	26	55	81
Pedestrian Right of Way	1	74	75
Wrong Side of Road	66	2	68
Automobile Right of Way	60	8	68
Improper Turning	49	9	58
Pedestrian Violation	1	37	38
Not Stated	27	4	31
Traffic Signals and Signs	27	3	30
Unsafe Starting or Backing	19	9	28
Other Hazardous Violation	12	1	13
Other	11	0	11
Unsafe Lane Change	7	0	7
Following Too Closely	6	0	6
Other Than Driver	3	3	6
Driving or Bicycling Under the Influence	2	4	6
Improper Passing	1	3	4
Impeding Traffic	1	0	1
Lights	1	0	1
Brakes	0	0	0
Fell Asleep	0	0	0
Hazardous Parking	0	0	0
Other Equipment	0	0	0
Total	**441**	**264**	**705**

**Data does not specify PCF for one pedestrian collision*

Figure 2.4.9 Collision Frequency of Top Two Primary Collision Factors (PCF) for Bicycle- and Pedestrian-Involved Collisions



Type of Collisions

33% of all bicycle-involved collisions are classified as broadside. Of the 145 bicycle-involved broadside collisions, bicyclists were at fault 56% of the time, and motorists were at fault 39% of the time. The remaining 5% of broadside collisions had specified party types as other and parked vehicle or did not specify a party at fault. 88% of all pedestrian-involved collisions are classified as vehicle-pedestrian. Of the 229 vehicle-pedestrian collisions, pedestrians were at fault 21% of the time, and motorists were at fault 69% of the time. The remaining 10% of vehicle-pedestrian collisions had specified party types as other and parked vehicle or did not specify a party at fault. Reference to ***Table 2.4.5*** provides a complete view of data.

Table 2.4.5 Summary of Bicycle- and Pedestrian-Involved Collisions

Type of Collision	Collisions		
	Bicyclist	***Pedestrian***	***Total***
Vehicle - Pedestrian	2	229	231
Other	203	1	204
Broadside	145	5	150
Sideswipe	21	6	27
Rear-End	22	5	27
Hit Object	14	10	24
Overturned	23	0	23
Head-On	5	3	8
Not Stated	5	2	7
Total	**440**	**261**	**701**

Collisions by Lighting Type and Time of Day

As shown by ***Table 2.4.6*** and ***Figure 2.4.10***, 82% of collisions occurred during the week. Tuesday and Thursday experienced the most bicycle-involved collision and Wednesday and Friday experienced the most pedestrian-involved collisions.

As shown in ***Table 2.4.7***, ***Figures 2.4.11***, and ***Figure 2.4.12***, 79% of collisions (both bicycle and pedestrian-involved) occurred during the daytime. 22% of pedestrian-involved collisions occurred at night where street lights were operating. Only six total collisions occurred in dark conditions with no street lights or where street lights were not functioning.

Table 2.4.6 Summary of Bicycle- and Pedestrian-Involved Day of Week Collisions (2013-2018)

Day	***Bicycle Collision***	***Pedestrian Collision***	***Total***
Sunday	28	14	42
Monday	56	37	93
Tuesday	87	41	128
Wednesday	63	56	119
Thursday	77	39	116
Friday	75	50	125
Saturday	55	28	83
Total	**441**	**265**	**706**

Figure 2.4.10 Pedestrian and Bicycle Collisions by Day of the Week

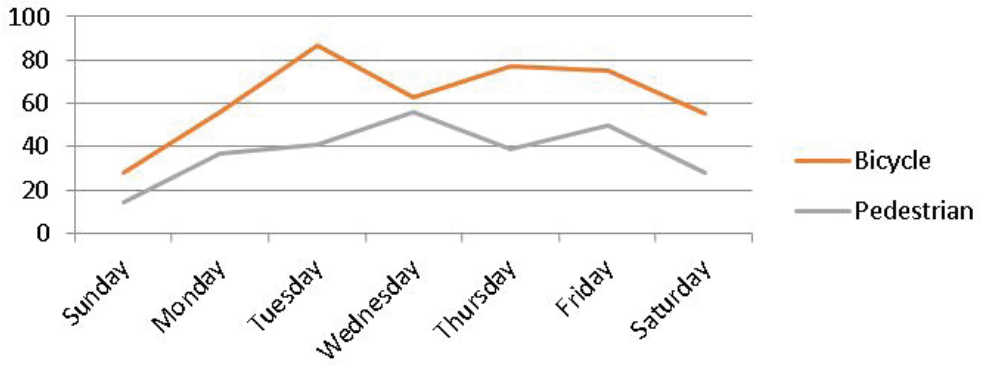


Figure 2.4.11 Bicycle-Involved Collisions by Lighting Conditions

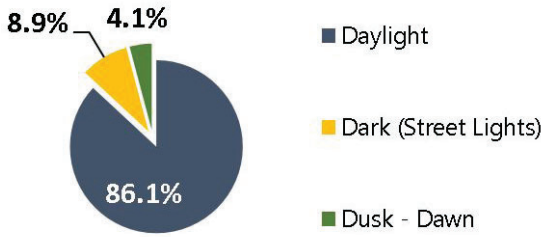


Figure 2.4.12 Pedestrian-Involved Collisions by Lighting Conditions

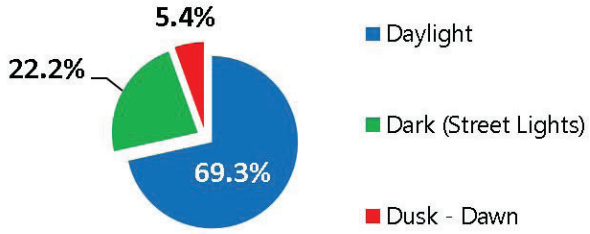


Table 2.4.7 Summary of Bicycle- and Pedestrian-Involved Collisions by Lighting Conditions

Lighting Conditions	Bicycle Collision	Pedestrian Collision	Total Collision
Daylight	378	181	559
Dark (Street Lights)	39	58	97
Dusk - Dawn	18	14	32
Not Stated	3	3	6
Dark (No Street Lights)	1	2	3
Dark (Street Lights Not Functioning)	0	3	3
Total	**439**	**261**	**700**

**Data does not specify lighting type for two bicycle and four pedestrian collisions*

2.5 LEVEL OF TRAFFIC STRESS, COMFORT, AND SUITABILITY ANALYSIS

BACKGROUND

Level of Traffic Stress (LTS) or Level of Comfort (LOC) assessments are an industry "best practice" that seeks to visualize and quantify the perceived stressfulness or comfortability one experiences as a bicyclist or pedestrian, respectively, along a linear corridor.

The functionality of a pedestrian and bicycle network is affected by a host of attributes, but to accommodate for the better portion of a population, low-stress connectivity can be deemed as the most fundamental attribute. Planning for low-stress corridors not only upholds the integrity of the pedestrian and bicycle network, but also ensures that pedestrians and bicyclists do not exceed their tolerance for traffic stress.

LTS and LOC analyses depend on the thoroughness and availability of data. Due to the variability and uncertainty of data access and thoroughness, each LTS and LOC analysis is unique. Common data inputs for a bicycle LTS analysis include: roadway speed, average daily traffic (ADT) volumes, roadway classification, number of vehicle lanes, presence of bicycle facilities, and the occasional use of latent data including collision records. Similarly, a pedestrian LOC analysis includes the same data inputs with the addition of sidewalk data and assessment of planting buffers. A unique weighting scheme is then applied to each data input. A roadway segment can be assigned a rank with higher values representing a higher level of stress and providing the least comfort.

OCTA's Master Plan of Arterial Highways (MPAH) classification established the segments for analysis, which overlaying data were tied to for these assessments. MPAH was used and applied to the City of Irvine to remain consistent with regional transportation planning models. The translation is shown in ***Table 2.5.1***.

A traditional bicycle LTS analysis ranks roadways segments based on the "Four Types of Cyclists", originally structured by Roger Geller:

1. No Way, No How: People unwilling to bicycle even if high-quality bicycle infrastructure is in place
2. Interested but Concerned: People willing to bicycle if high-quality bicycle infrastructure is in place
3. Enthused and Confident: People willing to bicycle if some bicycle-specific infrastructure is in place
4. Strong and Fearless: People willing to bicycle with limited or no bicycle-specific infrastructure

BICYCLE LEVEL OF TRAFFIC STRESS (LTS)

Data inputs for the bicycle LTS analysis include: roadway speed, roadway classification, ADT, number of lanes, and presence of bicycle facilities. This approach was originally developed by Mineta Transportation Institute at San Jose State University in 2012 and has since been modified by KOA Corporation to meet the needs and context of the City of Irvine. The LTS ranking scheme is defined in ***Table 2.5.2*** and ***Table 2.5.3***. Each data input were independently weighted and added to the LTS scoring matrices (***Appendix A***). The scoring matrices are divided into subsets based on the presence of an on-street or off-street bicycle facility and the roadway classification as defined by the City of Irvine. An LTS roadway classification conversion structure is provided in ***Table 2.5.1*** for comparison with the OCTA MPAH. The on-street Bicycle Facility LTS is shown in ***Figure 2.5.1.***

The Collector, Arterial, and Major roadway classifications each represent existing and future characteristics of roadways. As such, independent scoring matrices were used to accommodate for future build-out roadway reconfigurations, volume and capacity growth, and future LTS analysis updates. A prime example that supports the use of independent scoring matrices is Marine Way between Ridge Valley and Skyhawk. Marine Way has an ADT of 2,500 yet is classified as an arterial. This is a unique case considering arterials typically have moderate to high vehicular traffic volumes. Since the area surrounding Marine Way is under development, it is classified as an arterial to account for future build-out when vehicular traffic volumes are increased.

All off-street facilities are ranked based on the separation from a roadway segment (***Appendix A***). If an off-street facility is separated from a roadway segment, it is given a LTS rank of 1A, which represents a lower level of traffic stress as compared to a LTS rank of 1B where off-street facility runs directly adjacent to and is not significantly separated from a roadway segment. ***Figure 2.5.2*** shows the off-street bicycle LTS network.

For the on-street bicycle LTS more and less stressful corridors are identified. Examples of corridors that are more stressful include: Irvine Boulevard, Irvine Center Drive, Barranca Parkway, Alton Parkway, Culver Drive, Jeffrey Road, and Sand Canyon Avenue. Examples of less stressful corridors include: Michelson Drive and parts of Yale. A significant portion of roadways are classified as LTS 4 and LTS 3 vs LTS 2 and LTS 1.

Table 2.5.1 MPAH Classification Translation for the ISATP

ISATP Level of Traffic Stress Road Classifications; Date: 2019	**OCTA MPAH Classifications;** Date: October 2017	**Irvine MPAH Classifications;** Date: July 2015 (Source: Irvine GP Figure B-1)
MAJOR	Major Arterial	Major Highway 6-Lanes
	Principal Arterial	Major Highway 8-Lanes
		Expressway
ARTERIAL	Primary Arterial	Primary Highway
	Secondary Arterial	Secondary Highway
COLLECTOR	Collector Arterial	Commuter Highway

Table 2.5.2 Bicycle Level of Traffic Stress Ranking Scheme (On-Street)

Level of Traffic Stress	Description
LTS 1	Comfortable for almost all ages and bicycling abilities
LTS 2	Comfortable for most adults
LTS 3	Comfortable for more skilled and confident bicyclists
LTS 4	Not comfortable for most bicyclists

Table 2.5.3 Bicycle Level of Traffic Stress Ranking Scheme (Off-Street)

Level of Traffic Stress	Description
Class 1A	Completely separated from MPAH segment
Class 1B	Directly adjacent to MPAH segment

Figure 2.5.1 On-Street Bicycle Level of Traffic Stress

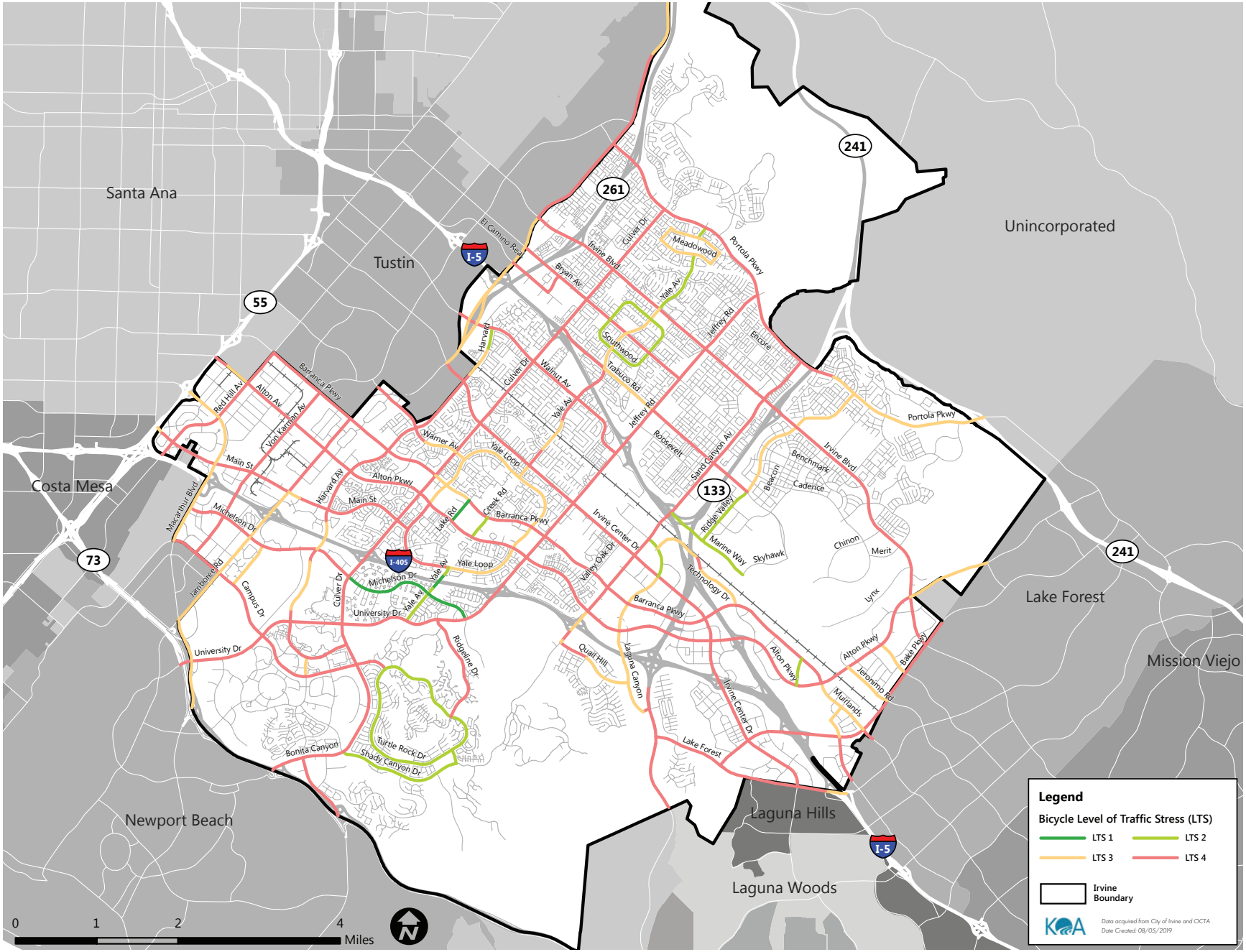
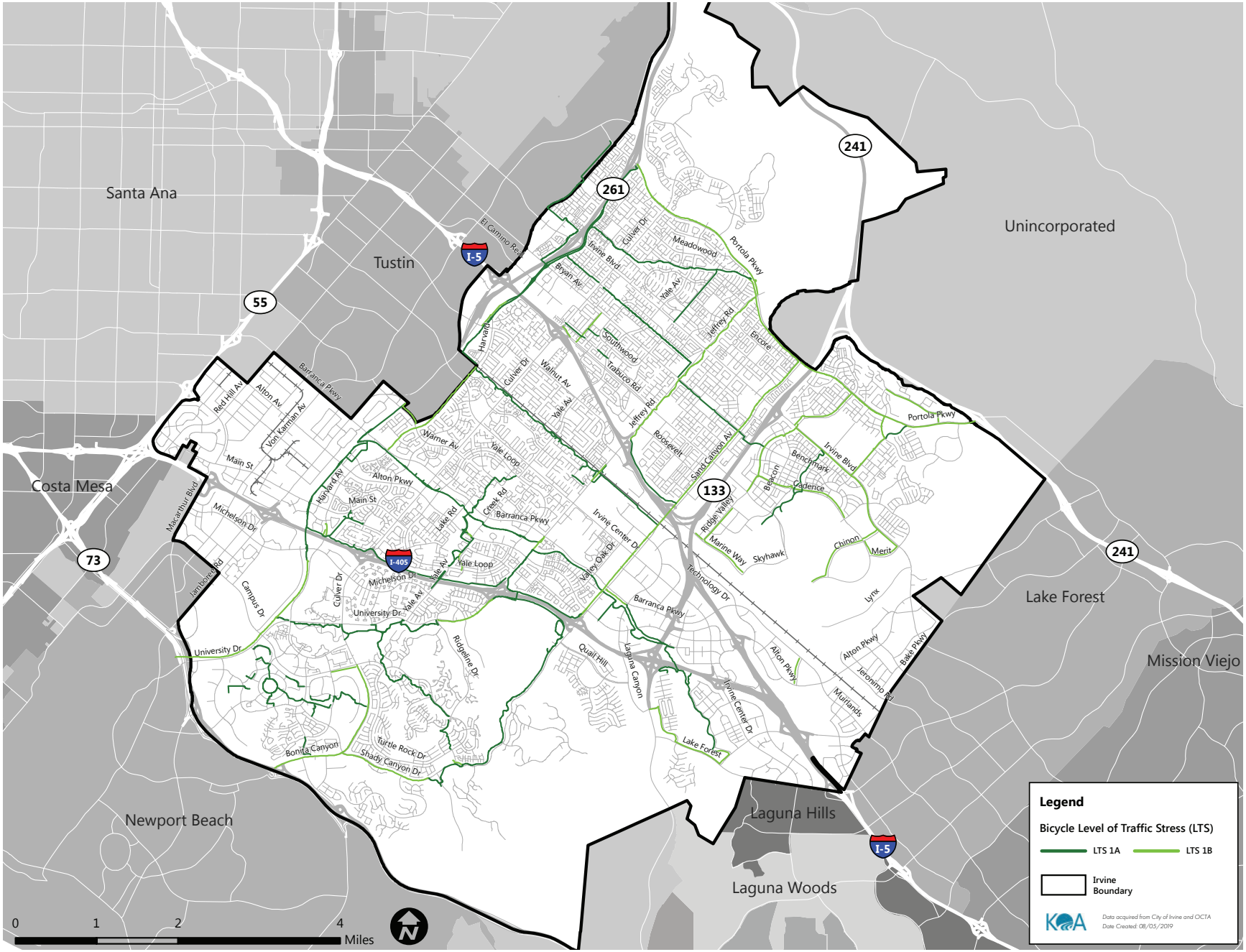


Figure 2.5.2 Off-Street Bicycle Level of Traffic Stress



PEDESTRIAN LEVEL OF COMFORT (LOC)

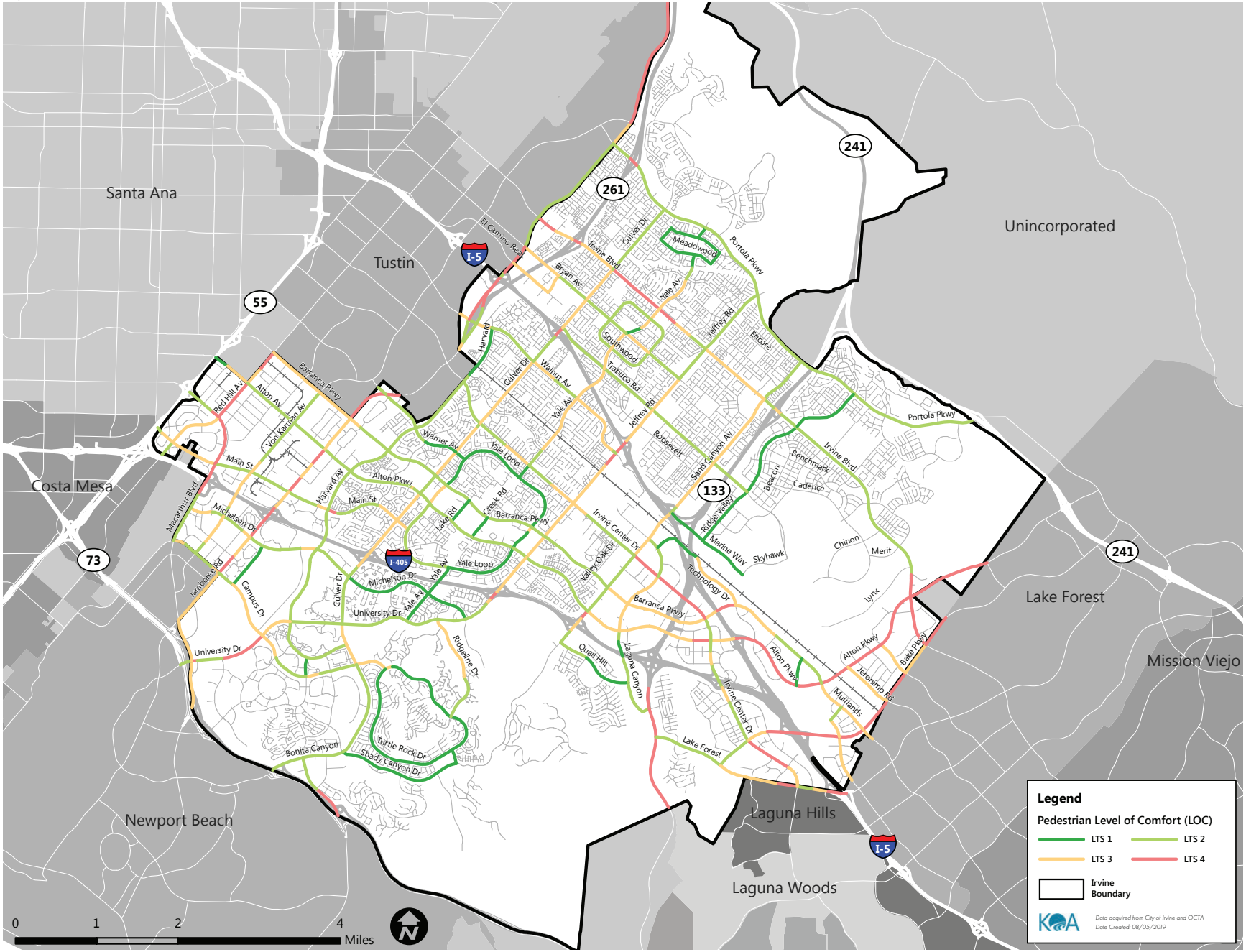
Data inputs for pedestrian LOC include: roadway speed, vehicular average daily traffic volumes (ADT), number of lanes, presence of sidewalk, and presence of planted buffer between sidewalk and roadway. This approach was originally developed by Mineta Transportation Institute in 2012 and has since been modified by KOA Corporation to meet the needs and context of the City of Irvine. The pedestrian LOC ranking scheme is defined in ***Table 2.5.4***. The scoring matrices are divided into subsets based on the presence of sidewalk and presence of roadway separation (***Appendix A***). Since the OCTA MPAH study segment is centerline based, if a segment has sidewalk on at least one side, then the segment is defined to have sidewalk present. Sidewalk separation is defined as the presence of a grass lawn or planted landscape area that horizontally separates sidewalk from roadway. The pedestrian LOC is shown in ***Figure 2.5.3***.

For the LOC assessment more and less comfortable corridors are identified. Examples of less comfortable corridors include: Culver Drive, parts of Jeffrey Road, parts of Yale Avenue, parts of Sand Canyon Avenue, Jamboree Road, and Irvine Boulevard. Examples of more comfortable corridors include: Portola Parkway, Trabuco Road, parts of Alton Parkway, Harvard Avenue, Yale Loop, Ridge Valley, and Bonita Canyon. Unlike the bicycle LTS there is an equal amount of comfortable and less comfortable corridors.

Table 2.5.4 Pedestrian Level of Comfort Ranking Scheme

Level of Comfort	Description
LOC 1	Comfortable for almost all pedestrians, including children that are trained to safely cross intersections
LOC 2	Comfortable for most adult pedestrians, but demand more attention for children
LOC 3	Comfortable for most adult pedestrians and older children with little or no supervision
LOC 4	Comfortable for adults and children with parental supervision

Figure 2.5.3 Pedestrian Level of Comfort



BICYCLE AND PEDESTRIAN FRIENDLY CORRIDOR LEVEL OF SUITABILITY

The Bicycle and Pedestrian Friendly Corridor (BPFC) Level of Suitability (LOS) analysis serves two primary purposes: 1) identify corridors that BPFC treatments would be most suitable, and 2) supplement the decision making process with a data-driven approach. To assess suitability for BPFC treatments, an approach that combines the bicycle LTS and pedestrian LOC modeling formed the foundational starting point. However, to further refine suitability, additional data layers were incorporated to assess local attractor proximity (***Table 2.5.6***). For example, schools and parks within a reasonable walking distance convey popular meeting locations within the neighborhoods that are proximal to the study segments and residential uses.

A BPFC LOS ranking output of only "A" or "B" was functionally useable. Corridors ranked beyond these classifications were eliminated as these imply higher stress bicycle and less comfortable pedestrian corridors. ***Table 2.5.5*** displays the LOS descriptions. ***Appendix A*** is host to the ranking scheme designed to classify segments based on bicycle LTS and pedestrian LOC ranks, and the proximity of the segment to a park or school. ***Figure 2.5.4*** shows the BPFC LOS.

Corridors that ranked the highest for BPFC suitability included: Meadowood, parts of Yale Avenue, parts of Yale Loop, Michelson Drive between Culver Drive and University Drive, Bonita Canyon from Sunnyhill to Culver Drive, Turtle Rock Drive, Sunnyhill, part of Quail Hill, and parts of Technology Drive. These corridors and linkages between represent the highest need and readiness for BPFC treatment implementation.

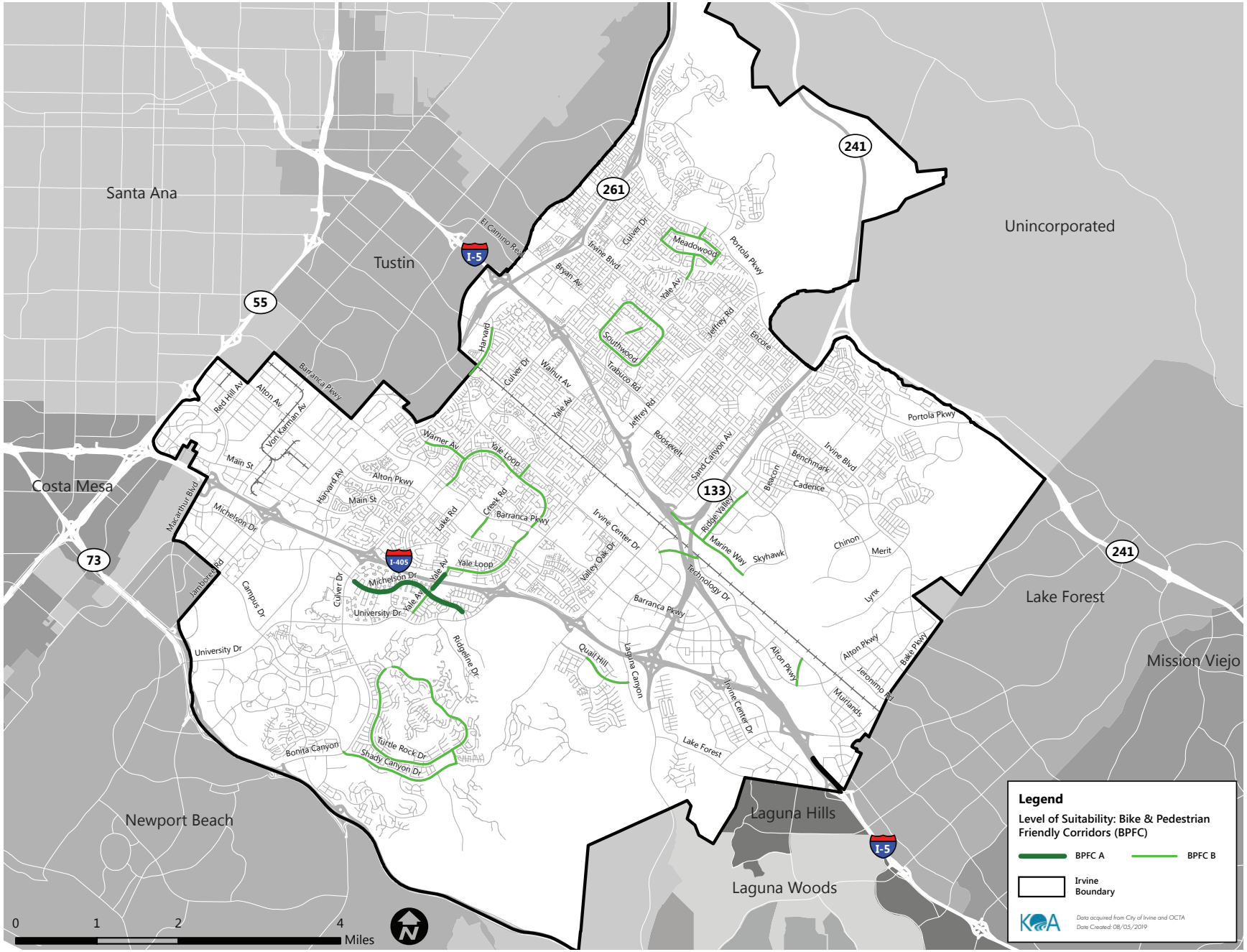
Table 2.5.5 Bicycle and Pedestrian Friendly Corridor Level of Suitability Descriptions

Level of Suitability	Description
BPFC Level of Suitability A	Suitable for immediate BPFC treatment installation. Implies corridor is more comfortable for pedestrians and less stressful for bicyclists, and is proximal to attractors.
BPFC Level of Suitability B	Suitable for near-term implementation of BPFC treatment installation. Not as suitable as LOS A corridor; slightly more stressful for bicyclists and slightly less comfortable for pedestrians, and is potentially proximal to slightly less attractors than LOS A ranked corridors.

Table 2.5.6 Bicycle and Pedestrian Friendly Corridor Ranking Scheme

Bicycle and Pedestrian Friendly Corridor		
Parks or Schools Within 1/4 Mile	***Average LTS/LOC Rank***	
	= 1.00	From 2.00 to >1.00
Greater than 1	BPFC A	BPFC B
Equal to 1	BPFC B	BPFC B

Figure 2.5.4 Level of Suitability: Bicycle & Pedestrian Friendly Corridor (BPFC)



INTERSECTION LEVEL OF COMFORT ASSESSMENT – BICYCLE AND PEDESTRIAN

The intersection LOC analysis for pedestrians and bicyclists is a point-based assessment of pedestrian and bicyclist comfort within and along crosswalks and/or crossing designations. Bicyclists are treated as vehicles within the confines of an intersection, and pedestrians represent an equally vulnerable user as they cross relatively long distances to navigate across an intersection.

For the purpose of an intersection LOC assessment, the top 24 "hot spot" intersections in the city represent the studied intersections – this was narrowed from reviewing: pedestrian and bicycle-related collision data from 2013 – 2018, ISATP Online Mapper input points (see further Section 3.3), and balanced community input and local knowledge. A two pronged approach was used to assess cumulative intersection LOC; both pedestrian and bicyclist intersection level of comfort was assessed individually. While each can be assessed individually, exhibits are prepared for combined pedestrian and bicycle scores, since in reality an intersection is interacted with by both users.

Pedestrian Assessment

Two variables are utilized for the assessment of pedestrian LOC: crossing distance from curb to curb, and roadway speed. Posted roadway speed is derived from City's data and/or field data collection. The comfort scoring matrix and variable descriptions are provided in ***Appendix A***.

Bicycle Assessment

Two variables were utilized for the assessment of bicycle LOC: crossing distance and bicycle facility completeness. Completeness was based on intersection ingress and egress bicycle facilities (i.e. presence of through bike lane leading into and out of intersection). The assumption that a higher percentage of ingress and egress bicycle facility completeness provides for a higher level of comfort leading into, within, and beyond the intersection. The comfort scoring matrix and variable descriptions are provided in Appendix A

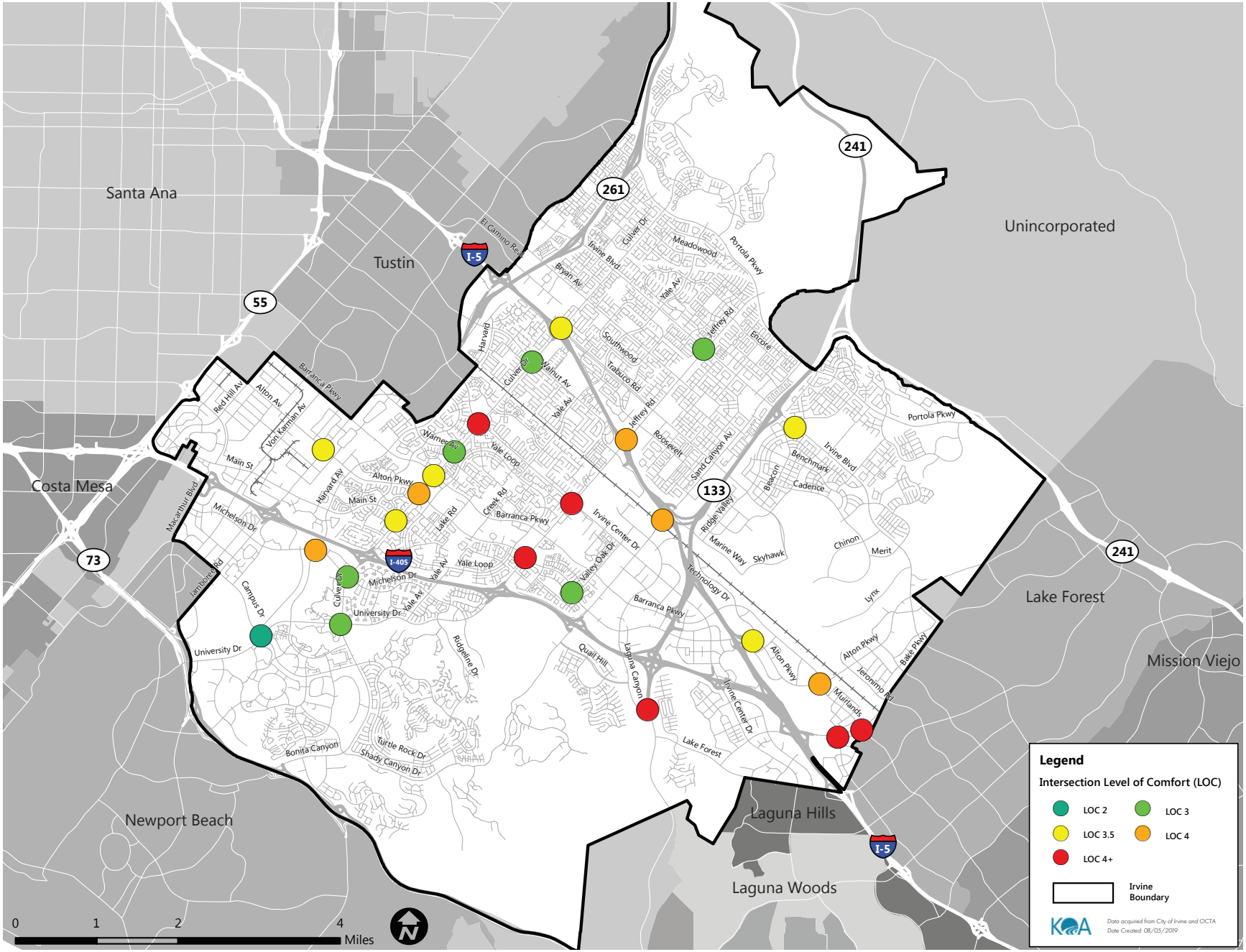
Additional Layer Assessment

Two additional layers, 1) Grade Separated Crossing and 2) Free Right Turn Lane, impact both pedestrian and bicycle movement within an intersection and/or outright offer intersection alternatives. A description is provided within ***Appendix A.*** LOC point values are subsequently added (presence of Free Right Turn Lane) or subtracted (presence of Grade Separated Crossing) from the combined pedestrian and bicycle intersection averaged LOC. The presence of Free Right Turn Lane implies the intersection is less comfortable and the presence of Grade Separated Crossing implies the intersection is more comfortable. The final max intersection LOC score will be "4+" to attend to LOC classifications upgrades/downgrades. However, to identify the top intersections, the use of LOC scores beyond LOC 4 presents further distinctions.

Combined Intersection Level of Comfort

To provide a singular LOC output from two independent variables, the average of both pedestrian and bicycle were calculated with the inclusion of the "additional layers" applied to the averaged score. Scores were not rounded since values represent exact values and comfort designation differences. In total there was one LOC 2; six LOC 3; six LOC 3.5; five LOC 4; and six LOC 4+ intersections. The lower the LOC classification the more comfortable theoretically it is for a pedestrian or bicyclist to travel through an intersection (i.e. an intersection ranked LOC 1 is more comfortable than a LOC 4 intersection). The combined pedestrian and bicycle intersection LOC is presented in ***Figure 2.5.5***, the intersection level of comfort descriptions are found within ***Appendix A***.

Figure 2.5.5 Pedestrian and Bicycle Combined Intersection Level of Comfort (LOC)



2.6 EXISTING PEDESTRIAN AND BICYCLE INFRASTRUCTURE

Bicycle and pedestrian infrastructure typologies are largely ubiquitous within the City of Irvine. Bikers and walkers can use a variety of facilities for recreational, utilitarian, and commuting options. The City's bicycle infrastructure is comprised of three facility types: on-street bike lanes, off-street shared-use paths, and intra-neighborhood routes. Pedestrians have available sidewalk to navigate the built environment along corridors, while at intersections they are supported by curb ramps and crossing control devices and markings. ***Table 2.6.1*** details the typologies of pedestrian and bicycle facilities. Bicycle and pedestrian facility completeness and locations are shown respectively in ***Figures 2.6.1*** and ***Figure 2.6.2***.

OCTA's OC Foothill Bikeways Strategy Plan identifies regionally significant corridors that overlap the City. These corridors are presented in ***Figure 2.2.5***. Existing conditions can be impacted by the OCTA Plan within the City as regional agencies, in coordination with the City, implement pedestrian and bicycle features and facilities.

Table 2.6.1 Facility User and Typology Descriptions

Facility User	Facility Type	Description
Pedestrian	Sidewalk	Connects pedestrians from origin to destination, largely complete, with some missing segments proximal to major freeways or highways; data within the Existing Conditions Maps (Figure 2.6.1 and Figure 2.6.2) does not show existing intra-neighborhood sidewalk locations, however they are largely required and present per developmental standards.
	Intersection Control types	Americans with Disabilities Act (ADA) compliant curb ramps establish a transition from sidewalk to roadway; crosswalks, and other roadway markings support pedestrian travel through intersections – see further Intersection LOC.
Bicyclist	On-Street Bike Lanes	Curb adjacent right-of-way designated for bicycle riders to use, typically between three to five feet of effective bike lane width – see further On-Street Bicycle Facility LOC, and the Existing Conditions Maps (Figure 2.6.1 and Figure 2.6.2).
	Intra-Neighborhood Routes	Routes within neighborhoods are informal and unmarked areas for cyclists to operate on – vehicular cycling protocol means bicyclists act as vehicles in these typically lower speed corridors. Parking on-street is often typical.
Pedestrian and Bicyclists	Off-Street Shared-Use Path	An existing network connects west to east, and north to south – the off-street and lower stress path system is highly utilized and connective for all ability levels and ages – see further Off-Street Path Counts, Off-Street LOC Assessment, and Existing Conditions Maps (Figure 2.6.1 and Figure 2.6.2).

Figure 2.6.1 Existing On- and Off-Street Bicycle Faciltiies

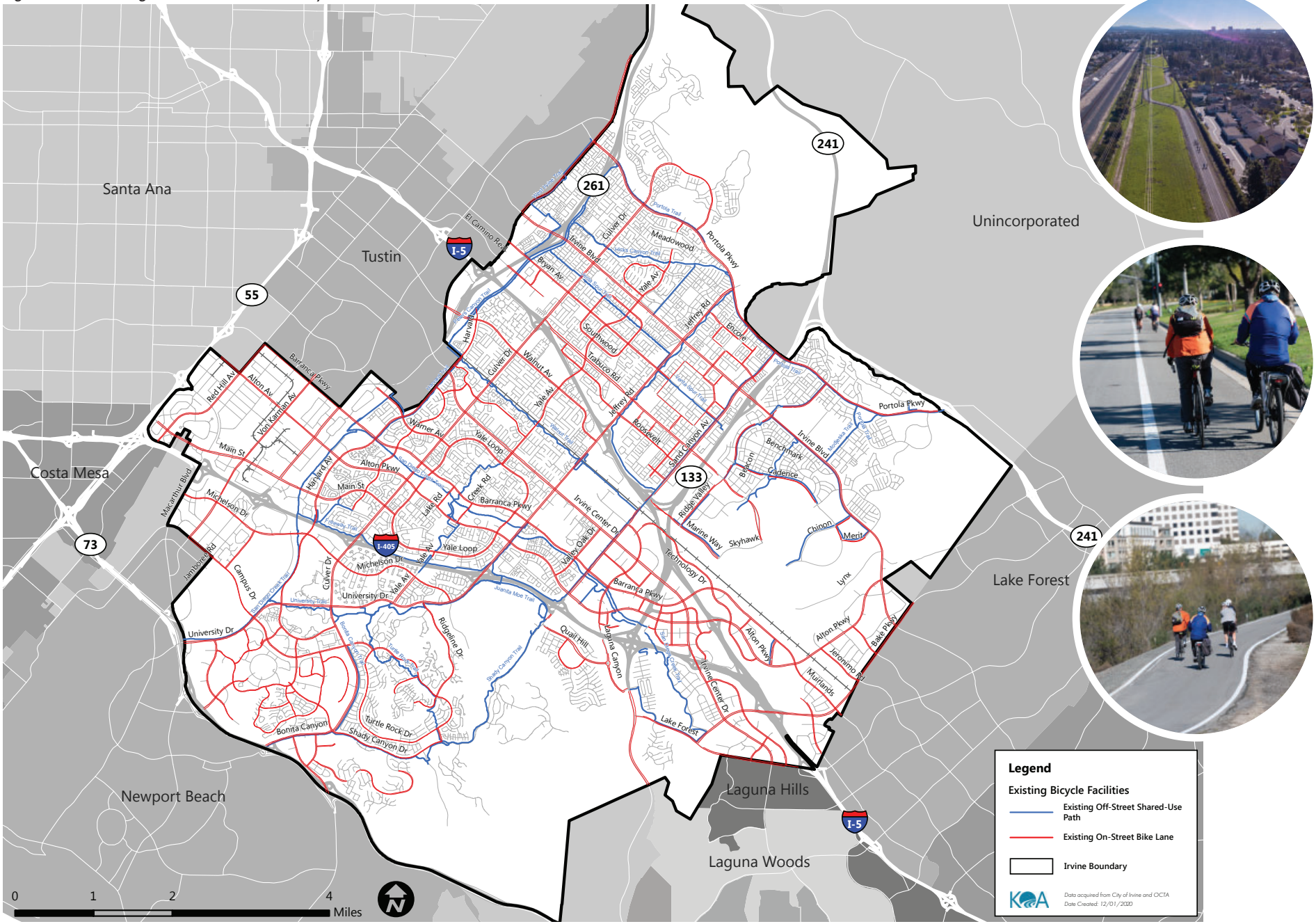
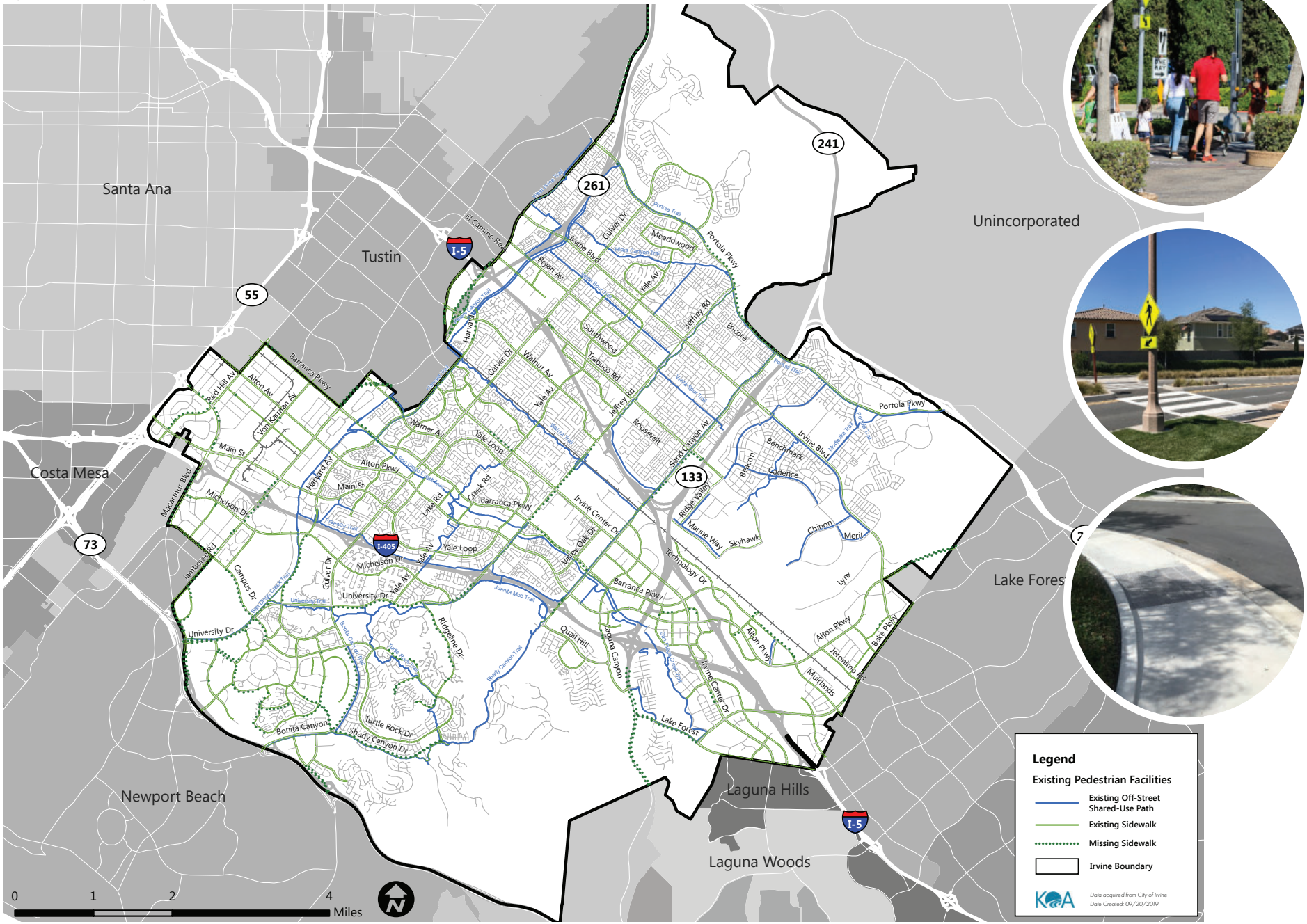


Figure 2.6.2 Existing Pedestrian Faciltiies



BICYCLE AND PEDESTRIAN FUNDING PROGRAMS

Current Bicycle and Pedestrian Projects

The City of Irvine currently operates a total budget of $31,847,842 in bicycle and pedestrian projects. ***Table 2.6.2*** identifies the amount of expenditures made as of March 2019. Federal, State of California, and County of Orange funding contributions are also represented within the Table, amounting to $2,943,921 thus far. The current projects include those identified as active Capital Improvement Programs in the City. They do not include the bicycle and pedestrian infrastructure built directly by developers as part of new development projects or those included as a part of a larger vehicular improvement project.

Table 2.6.2 Current Bicycle and Pedestrian Projects

Project[1]	Description	Budget To Date	Expenditure as of December 2020	Federal/State/County Funding	
Alternative Transport Improvement	Improvement of detection of bicyclists at intersections, striping of bicycle facilities, and evaluation of Intelligent Transportation Systems to enhance safety	$342,119	$342,119	$342,119	AQMD[2]
Bikeway Improvement	Study, design, and construction of bikeway facilities	$700,000	-		
Freeway Trail Lighting/SD CR-Culver	Improvement of lighting on Freeway Trail between San Diego Creek and Culver Drive	$878,000	$554,184	$746,460	BCIP $93,960, MSRC[4] $652,500
IBC Pedestrian Bridge (Kelvin, Jamboree/ Michelson, Jamboree n/o I-405)	Study, design, and construction of pedestrian bridge in IBC	$21,199,203	$2,370,572		
IBC Trail Feasibility Study	Study and planning trails in IBC	$174,987	$174,987		
IBC Sidewalk Improvement	Construction of new sidewalk within Irvine Business Complex (IBC)	$4,710,660	$2,288,359		
JOST Barranca to I-5	Construction of the part of Jeffrey Open Space Trail from Barranca Parkway to I-5	$6,173,900	$527,848		
JOST I-5 Bike and Pedestrian Bridge	Construction of Off-Street Bicycle and Pedestrian Bridge Over I-5 along Jeffrey Open Space Trail	$2,267,571	$1,414,462	$1,056,001	BCIP[3]
Off-Street Shared-Use Path Rehabilitation	Rehabilitation of off-street shared-use paths	$180,939	$180,939		
Peters Canyon Lighting/Walnut-RR	Improvement of lighting on Peters Canyon Trail between Walnut Avenue and Railroad Track	$878,000	$543,515	$746,460	BCIP[3]
Traffic Signal Vehicle and Bike Detection	Installation of high-definition camera system for detection of vehicles and bicyclists	$1,010,500	$250,799		
Venta Spur/SR-133 Bike Bridge	Design and construction of grade separated pedestrian/bicycle path to the Great Park over the SR-133	$5,450,000	$956,757		
Walnut Trail Landscaping	Improvement of landscaping on Walnut Trail	$3,500,000	1,078		
Wayfinding Signage Trail	Installation of signage along major bikeways	$105,000	$65,733	$45,000	State of California
TOTAL		**$47,570,879**	**$9,671,352**	**$2,936,040**	

Note:

1-The current projects include those identified as active Capital Improvement Programs in the City. They do not include the bike/pedestrian infrastructures built directly by developers as part of new development projects or those included as a part of a larger vehicular improvement project.

2- AQMD, Air Quality Mitigation District.

3 -BCIP, Orange County Transportation Authority Bicycle Corridor Improvement Program. By the time the report is developed, the City is awarded additional $4 million from BCIP for the JOST I-5 Bike and Pedestrian Bridge project.

4-MSRC Mobile Source Air Pollution Reduction Review Committee funding program.

Completed Bicycle and Pedestrian Projects

Between fiscal year 2013/2014 and fiscal year 2017/2018, a total of $6,103,437 in bicycle and pedestrian projects were completed. ***Table 2.6.3*** represents the projects, a description, and financial variables associated with each. The completed projects include those identified as closed Capital Improvement Programs in the City. They do not include the bicycle and pedestrian infrastructures built directly by developers as part of new development projects or those included as a part of a larger vehicular improvement project.

Active Transportation Funding Programs

Federal, State, and Local funding programs are available for partial or complete funding of ISATP recommended projects. ***Table 2.6.4, Table 2.6.5,*** and ***Table 2.6.6*** showcase these programs and application due dates (as available), governing agency, funding amount, match requirements, and pertinent variables. Funding offered per program is subject to change – updated values can be found within the respective oversight agency's website.

Table 2.6.3 Completed Bicycle and Pedestrian Projects

Project[1]	Description	Budget to Date	Federal/State/County Funding	
ADA Handicap Ramps	Rehabilitation of handicap access ramps	$1,356,079	$47,651	OCTA M2 Fair Share
Bike Plan Update	Study and plan citywide off-street shared-use paths	$71,832		
Campus Off-Street Path	Construction of off-street shared-use path along Campus	$565,675		
Curbs, Gutter, and Sidewalk Rehabilitation	Rehabilitation and repair of various damaged curbs, gutters, and sidewalks	$571,695		
JOST - Roosevelt Bridge	Fabrication of the bike/pedestrian bridge over Roosevelt	$2,200,000		
Off-Street Shared-Use Path Rehabilitation	Rehabilitation of off-street shared-use paths	$1,157,156		
San Diego Creek Trail Lighting Improvements	Improvement of lighting along San Diego Creek Trail	$181,000	$68,645	MSRC[2]
TOTAL		**$6,103,437**	**$116,296**	

Note:

1-The completed projects include those identified as closed Capital Improvement Programs in the City. They do not include the bike/pedestrian infrastructures built directly by developers as part of new development projects.

2-MSRC Mobile Source Air Pollution Reduction Review Committee funding program.

Table 2.6.4 Federal Funding Programs

Federal Funding Programs

Program Source	Due Date	Agency	Annual Total	Matching Requirements	Eligible Applicants	Eligible Projects		
						Commute	Recreation	Safety/ Education
Congestion Mitigation and Air Quality (CMAQ) Program via FAST Act	Variable	OCTA	$455m Statewide, and formula based by MPO	Established by OCTA	MPOs, Cities, Counties, Transit Operators.	X	X	X
Highway Safety Improvement Program (HSIP)	Cycle 10: TBD	Caltrans	$140-$160 million	10% Match	County, City, tribal government	X	X	---
Land and Water Conservation Fund	July; Variable	California Department of Parks and Recreation	Varies	50% Match	Cities, Counties, JPA, Federally recognized Native American tribes, Non-State agency recreation and parks districts	---	X	---
Surface Transportation Block Grant Program (STBG)	Ongoing	OCTA	Varies by availability	Not Stated	Cities, Counties	X	X	---
Rivers, Trails, and Conservation Assistance Program	August 1 for the following FFY	US National Park Service	No Direct Funds, Technical Assistance	N/A	State, local, Tribal, Non- Profits	X	X	X
Better Utilizing Investments to Leverage Development (BUILD)	Variable	United States Dept. of Transportation	>$1 Billion nationally	20%	States, MPOs, local governments	X	X	X
Community Development Block Grant (CDBG)	April 2020; variable	Housing and Urban Development	Varies by availability	Not Stated	States, MPOs, local governments	X	X	X

Table 2.6.5 State Funding Programs

State Funding Programs

Program Source	Due Date	Agency	Annual Total	Matching Requirements	Eligible Applicants	Eligible Projects		
						Commute	Recreation	Safety/ Education
Systemic Safety Analysis Report Program (SSARP). *NOTE: Local Roadway Safety Plan (LRSP) replaces SSARP*	Funding to be exhausted at end of year 2020; *LRSP due April 2020/22*	Caltrans	*$7.7 million in 2018* *LRSP $72,000 maximum*	10% Local *LRSP N/A*	Cities and counties in California *LRSP funding priority to allot to those who have not received SSARP funding*	X	---	X
Active Transportation Program (ATP)	Cycle 5 due June 2020	Caltrans	$440 total through FY 2025	Not Required	Local, regional or state agencies. Transit agencies, natural resources or public land agencies. Public schools or school districts, tribal governments, and eligible nonprofits.	X	X	X

Comments	Bicycle	Pedestrian
The program funds transportation projects likely to contribute to the attainment or maintenance of a national ambient air quality standard, with a high level of effectiveness in reducing air pollution, and be included in the MPO's current transportation plan and transportation improvement program. OCTA directs these funds mainly to transit and high occupancy vehicle lane projects, but 10% is set aside for bike and pedestrian projects.	X	X
Projects that improve safety for any public road, publicly owned bicycle, pedestrian pathway, or trails. Project must show safety improvement and cost benefits.	X	X
When an LWCF project is completed, the boundary map is placed under federal protection to preserve the public's outdoor recreational use in perpetuity. Projects that acquire and develop outdoor recreation areas and facilities qualify, including an active transportation path corridor connecting neighborhoods to workplaces, schools, homes, and other recreational opportunities.	X	X
The Surface Transportation Block Grant program (STBG), formerly the Surface Transportation Program (STP), provides flexible funding that may be used by States and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals.	X	X
Technical assistance for community-led natural resource conservation and outdoor recreation initiatives. Provide guidance to develop shared-use paths and greenways.	X	X
Formerly the TIGER grant, the BUILD focuses on projects with significant regional or local impacts. While biking and walking projects are eligible, the emphasis is on larger transportation projects	X	X
CDBG is a flexible program that provides communities with resources to address a wide range of unique community development needs. On the local level, these funds are administered by the OC Housing and Community Development and can fund a range a projects including, neighborhood revitalization, transportation services, public safety programs, flood and drainage facilities, water/sewer improvements, and street improvements/sidewalks.	X	X

Comments	Bicycle	Pedestrian
The Systemic Safety Analysis Report Program (SSARP) is a state-funded program that was established in 2016. The intent of the program is to help local agencies perform collision analysis, identify safety issues on their street network, and develop a list of countermeasures that can be used to prepare for future applications related to safety improvements. These safety improvements can help reduce collisions where vehicles interact with vulnerable road users (pedestrians, bicyclists, and motorcycles). *LRSP is the replacement to the SSARP and provides a maximum allotment of $72,000 with projects required to be completed within three years*	Non-Infrastructure Plan	Non-Infrastructure Plan
Funds active transportation related infrastructure projects, plans, and education/encouragement/enforcement activities. Consolidates previous programs (Transportation Alternatives Program, Bicycle Transportation Account, and Safe Routes to Schools)	X	X

Table 2.6.5 State Funding Programs (Cont.)

State Funding Programs (Cont.)

Program Source	Due Date	Agency	Annual Total	Matching Requirements	Eligible Applicants	Eligible Projects		
						Commute	Recreation	Safety/ Education
Environmental Enhancement and Mitigation (EEM) Grant Program	Solicitation expected April 2019	CA Natural Resources Agency	Up to $7 million per year	Not Required	State, County, City, Federal Govt, Non-Profits	X	X	---
Habitat Conservation Fund - Trails Category	Future funding cycle due date pending	CA Dept. of Parks and Recreation	$2 million	Dollar for dollar match of g rant funds	Counties, Cities, and Districts	X	X	---
Sustainable Transportation Planning Grant Program	Variable	Caltrans	$29.5 million	11.47% minimum	MPOs, RTPAs, Transit Agencies, Cities, Counties, Native American Tribal Governments, Other Public Transportation Planning Entities	X	X	X
Community-Based Transportation Planning Grant (CBTP) Program	Variable	Caltrans	Variable	Not Stated	Counties	X	X	X
Office of Traffic Safety (OTS) Grants	FFY 2020 applications out Dec 2018	CA Office of Traffic Safety	--	Not Required	A public entity that cleared the Single Audit, and has a DUNS #.	---	---	X
Recreational Trails Program (RTP) for Non-Motorized Trails	2019/2020 or later	CA Dept. of Parks and Recreation	$1.7 million	Varies	Federal Agencies, State Agencies, Counties, Cities, Districts, Non- Profits	X	X	---
Rubberized Pavement Grant Program	Variable	CA Dept. of Resources Recycling and Recovery	$350,000 maximum per application; $7,750,000 for FY 18-19	Varies	Cities, Counties, JPAs, State Agencies, Qualifying Indian Tribes	X	X	---
Transportation Development Act (TDA) Funds	Variable	OCTA	Varies	Varies	Counties, Cities, and Districts	X	X	---
Urban Greening Grant Program	Variable	CA Natural Resources Agency	$80 million	Not Stated	Counties, Cities, and Districts	X	X	---
State Highway Operation and Protection Program (SHOPP)	Variable	Caltrans	--	Not Stated	Counties, Cities, and Districts	X	X	---
Strategic Partnership	---	Caltrans	~$5 million; variable	Not Stated	Counties, Cities, and Districts	X	X	---

Comments	Bicycle	Pedestrian
Roadside Recreation - Projects that enhance or mitigate environmental impacts caused by future transportation projects; can include acquisition or development of roadside recreational facilities.	X	X
Funding for land acquisition or shared-use path development which brings people to a park and/or wildlife environment.	X	X
Projects that plan for reductions in GHG and VMT, and/or integrate Land Use and Transportation planning are eligible. This includes: SRTS, ATP, shared-use path master plans, pedestrian master plans, bicycle master plans, Vision Zero, bike parking facilities planning, educational outreach, traffic calming, health equity studies, first mile/last mile, station area planning, etc.	Non-Infrastructure Plan	Non-Infrastructure Plan
The Community-Based Transportation Planning grant program aims to engage the community in transportation and land use projects. Projects support concepts such as livable and sustainable communities with a transportation or mobility focus. They should also promote community identity and quality of life, as well as, provide transportation and land use benefits to communities.	Non-Infrastructure Plan	Non-Infrastructure Plan
Bicycle and pedestrian projects have been funded through this program. Promotes traffic safety education, pedestrian and bicycle safety, police traffic services, public relations programs, and roadway safety and traffic records.	X	X
The Recreational Trails Program (RTP) provides funds annually for recreational shared-use paths and trails-related projects.	X	X
Funding for on-street bikeway and roadway projects that use 100% California waste tires. The Grant Program is designed to promote markets for recycled-content surfacing products derived from only California-generated waste tires. It is aimed at encouraging first-time or limited users of rubberized pavement in two project types – Hot-Mix and Chip Seal. Projects can combine with Class 1 bikeways, green-ways, and disability access at parks with eligible roadway projects.	X	---
Funds for planning and construction of bicycle and pedestrian facilities.	X	X
"The Urban Greening Program receives its funding from revenue generated from the state's Cap and Trade program. Projects that qualify for grants from the program are required to show net GHG benefits along with other benefits; additionally, they must include one of three project activities: Sequester and store carbon by planting trees Reduce building energy use by strategically planting trees to shade buildings; Reduce commute vehicle miles traveled by constructing bicycle paths, bicycle lanes or pedestrian facilities that provide safe routes for travel between residences, workplaces, commercial centers, and schools. "	X	X
SHOPP offers funding for capital improvement projects that relates to the state highway system. Projects focus on reducing collisions, enhancing mobility, restoring damage to roadways, and preserving bridges and roadways. This can include pedestrian and bicycle facility projects.	X	X
Strategic Partnerships grants are intended to identify and address statewide, interregional, or regional transportation deficiencies on the State highway system in partnership with Caltrans. Successful Strategic Partnerships will strengthen government-to-governments relationships and result in programmed improvements. Example project types include corridor studies, and corridor preservation studies, studies that identify interregional, inter-county, and/or statewide mobility and access needs, and projects that evaluate accessibility and connectivity of the multi-modal transportation network.	Non-Infrastructure Plan	Non-Infrastructure Plan

Table 2.6.6 Local Funding Programs

Local Programs

Program Source	Due Date	Agency	Annual Total	Matching Requirements	Eligible Applicants	Eligible Projects		
						Commute	Recreation	Safety/ Education
Developer Fees or Exactions	Ongoing	City of Irvine	Varies	---	---	X	X	---
Renewed Measure M (M2) Local Fair Share	Annually	OCTA	Varies	---	Cities within Orange County	X	X	---
State Gas Tax (Local Share)	Ongoing	State Auditor Controller	Varies	---	---	X	X	---
Systems Development Charge (SDC) - Non-Circulation	Ongoing	City of Irvine	Varies	---	---	X	X	---
Project O Regional Capacity Program	Varies	OCTA	$32 million	Varies	Local cities or OCTA	X	---	---
Comprehensive Transportation Funding Program (CTFP) / OC Go	Varies	OCTA	Varies	Varies	Local cities or OCTA	X	---	---
Sustainable Planning Grant	Annually	Southern California Association of Governments (SCAG)	$23 million	---	Local cities or OCTA	X	X	X
Bicycle Corridor Improvement Program (BCIP)	Annually	OCTA	$25 million total through FY 2024	Variable	Local cities	X	X	---

Comments	Bicycle	Pedestrian
Funds sourced from developer fees may be required for development of bikeways.	X	X
Funding for streets, roads, and transit projects. This includes various traffic signal and street rehabilitation projects along with replacement of LED lamps for traffic signals. Bicycle and pedestrians projects can be a component of this application.	X	X
Solely for street-related purposes such as new street construction, rehabilitation, and maintenance. Includes traffic sign repair and upgrades for traffic components and networks.	X	X
Funds received through the City's Building Permit Process for design and construction of Capital Improvement Projects including bikeways and trails.	X	X
Streets and road improvement funding including safety oriented improvements for three RCP programs: ACE, ICE, and FAST. Bicycle and pedestrians projects can be a component of this application.	X	X
CTFP represents a collection of competitive grant programs offered to local agencies to assist in funding street improvements, transit expansion, and even environmental mitigation projects. The CTFP was created to provide a common set of guidelines and project selection criteria for a variety of funding programs, establishing a simplified and consistent process. Each program has a specific objective, funding source and set of selection criteria.	X	X
Provides technical support to members in SCAG's jurisdictions. Grants can be used toward planning and policy efforts that allow for the implementation of the regional RTP/SCS. Grants in the program falls into three categories: Integrated Land Use – Sustainable Land Use Planning, Transit Oriented Development (TOD) and Land Use & Transportation Integration; Active Transportation – Bicycle, Pedestrian and Safe Routes to School Plans; Green Region – Natural Resource Plans, Climate Action Plans (CAPs) and Green House Gas (GHG) Reduction programs	Non-Infrastructure Plan	Non-Infrastructure Plan
"The Bicycle Corridor Improvement Program (BCIP) makes funding available to local Orange County agencies for bicycle and pedestrian projects that reduce traffic congestion and improve air quality. The goals of the BCIP are to: Increase the number of biking and walking trips; Provide regional linkages to key destinations; Close bikeways corridor gaps; Promote mobility options by increasing safety; and Implement projects with community support. Improve air quality across Orange County."	X	X

2.7 NON-INFRASTRUCTURE PROGRAMS

ENCOURAGEMENT AND SAFETY PROGRAMS

Encouragement programs are a form of transportation demand management (TDM) as it relates to active transportation. Increased familiarity with active transportation might have positive impacts on active transportation uses within the City and region. Both the 2015 Irvine ATP and 2011 BTP provide foundational guidance on such programs – below is a summary of the encouragement programs and relevant updates.

Citywide Bike Map

A map with bicycle routes serve as an encouragement and educational tool. As recreational and utilitarian riders alike seek optimal routes throughout the City a bike map can encourage and facilitate this process in a positive way. Maps are distributed at public facilities throughout the City, through the Bicycle Club of Irvine (BCI), at local bike shops, and able to be dowloaded on the City website.

Neighborhood (Village) Walking and Biking Maps

Localized walking and bicycling maps can be developed at the neighborhood (village) level to help residents, employees, and students better understand how to connect with nearby destinations by bike or on foot, supporting first last mile connectivity.

Suggested Routes to School Maps

The City's Neighborhood Traffic Engineering Division has prepared Suggested Routes to School Maps for each school throughout the City. The maps show the boundary of each school and identifies the suggested route to bike and walk to school.

Senior Walking Clubs

Senior walking clubs can be organized to encourage seniors to walk in groups and exercise at a pace and location comfortable to the participants. Walking clubs help seniors connect with others who share similar schedules and hobbies.

UCI Transportation

Bicycle and Pedestrian Safety Diversion Program

The City's Bicycle and Pedestrian Safety Diversion Program provides an alternative to paying a fine or appearing in court. Adolescents/teens who receive administrative citations for bicycle and pedestrian traffic laws can attend an educational class free of charge. Citations can be focused on common or uniquely hazardous driving behaviors such as unsafe passing of bicyclists by motorists or wrong way riding by bicyclists.

Bike to Work Day

Bike to Work Day, held in May, is a nation-wide event that encourages biking to work. The City of Irvine can encourage residents, employers, and students to participate in Bike to Work Day. Rallies can be held to promote bicycling and highlight new or improved bikeways within the City. Local bike shops can organize booths to teach people about bike equipment, safety, and maintenance. The City can consider supplementary "Bike to Work Day" events throughout the year.

Bike Skills Training/Repair Courses (for adults)

Bicycle training and repair classes work to increase community knowledge of bicycle maintenance issues and street riding skills. Such classes encourage beginner to intermediate bicyclists who would like to improve their understanding of bicycle maintenance and street riding skills.

Walking School Bus/Bicycle Trains

Walking school buses and bicycle trains are organized walking and bicycling groups, respectively, where adults "pick up" walkers and bicyclists along specific routes to school at specific locations. This way, children are supervised during their travel to school and encourage safe travel via alternative travel modes from a young age.

Conduct Surveys

The success of various bicycling and walking programs as well as bicycle facilities can be measured by public surveys. Surveys can be distributed every few years to determine if public perceptions or behaviors have changed over a certain period – or if efforts need to be redirected. Questions can build off those found within the ISATP or structured around project-specific feedback goals.

EDUCATION PROGRAMS

The City found that bicycle collisions typically involve improper actions on the part of bicyclists, motorists, or both – many of which are right-of-way violations (Irvine Bicycle Transportation Plan, 2011). Educational programs for all roadway users can help prevent potential collisions. The City's bicycle and pedestrian education programs in cooperation with the school districts, and parent teacher organizations, community leaders, and organizations are outlined below:

Area Traffic Officer Program

The City's four Area Traffic Officers address neighborhood traffic complaints, utilizing creative, proactive approaches. Each Officer covers a set geographical area: University Area, Crossroads Area, and Portola Area. Concerns include speeding vehicles, parking violators, abandoned vehicles, school zone traffic safety, or other traffic related issues. These officers are selected for their strong community relations and problem solving skills and work with City departments and the community to implement long-term strategies that aim to permanently address a wide range of traffic related issues.

Community and Parent Workshops

Community and parent workshops are provided by the City's Public Safety and Neighborhood Traffic Engineering Division to engage the community on the importance and the benefits of bicycle and pedestrian safety. Workshops address concerns of traffic speed and traffic volume around schools, identify the benefits of bicycling, and encourage parents to allow their children to bike and walk to school.

Community Bicycle Helmet Program

The City's Public Safety officers and staff educate the community on the proper use and fit of bicycle helmets. Public Safety staff provides inspections at community events, child safety programs, bicycle safety diversion programs to ensure that helmets fit properly. Studies of children and adolescents aged four to eighteen years found that 96% of helmets were incorrectly fitted. The program supports the distribution of helmets to students and community members participating in bicycle rodeos.

Student Workshops, Assemblies, and Rodeos

The City's Public Safety Department in conjunction with the traffic officers, Drug Abuse Resistance Education (D.A.R.E), and crime prevention, provide elementary and middle schools with student workshops and assemblies. Officers emphasize ten smart routes to bicycle safety, the do's and don'ts, measures to protect against theft, and participate in riding them to school acting as a chaperone. D.A.R.E officers talk about bicycle safety and the bicycle helmet law in their 5th-grade curriculum. Middle school programs build upon the elementary program, include more involved and interactive experiences. Students are given bicycle license applications and D.A.R.E. officers make themselves available on a specified school day to register bicycles and talk to students at the bicycle rack. The program establishes positive relationships between students and law enforcement, teachers, parents, and other community leaders.

Traffic S.T.A.R.S. Program

This program, which stands for Traffic Safety Training and Riding Skills, is geared towards Irvine's elementary-aged youth who ride bicycles in the community. It is a two-hour class taught by traffic officers and provided on weekends that includes an hour of classroom instruction in which kids are taught skills to ensure their safety when riding or walking in the community. They are then able to demonstrate these skills on a fun and interactive skills course in which they navigate various cone patterns on their bikes in a safe environment.

Bicycle Safety Video

The City has developed a bicycle safety video, which is available on the City's website and for use at educational and community forums. The bicycle safety video provides an overview of the following topics:

- Types of bicycles
- Safety equipment and helmet
- Potential road hazards
- California and Municipal Vehicle Code
- Share the bikeway and road with other vehicles, bicyclists, and pedestrians
- City's Bikeways Map

Citywide Bicycle, Pedestrian, and Motorist Safety Program

Beginning in 2015, the City was awarded funds for a Citywide Bicyclist, Pedestrian, and Motorist Safety Program. The goal of the program is to make bicyclists, pedestrians, and motorists aware of each other on the road and how to keep themselves and others safe. With that, the theme of the campaign is "Irvine Shares the Way", and it also has the tagline "Move with Care". Messaging is found at bus shelters, via social media, and supporting print materials available at municipal locations.

REGIONAL PROGRAMS UPDATE

OCTA Community Smart Cycling Classes

OCTA hosted day-long Community Smart Cycling Classes under League of American Bicyclists (LAB) protocol. At the classes, there was an in-class presentation on the rules of the road while on a bicycle, along with a presentation on useful equipment. Following the presentations were on-bike drills to improve bicycle handling and safety maneuvers (away from cars for practice). A short group ride was then conducted to put skills covered from the presentation and drills into use on city streets. Attendees were required to be over the age of eighteen and bring their own bike and helmet. These events were hosted at various cities in Orange County. Irvine was host to the League Certified Instructor (LCI) training seminar, as a separate initiative.

OC Foothills Bikeways Strategy (2016)

The following encouragement and education programs are outlined within the 2016 OC Foothills Bikeways Strategy report and summarized below – it is the goal to align programs with engineering improvements:

Bike Fleet

Employers sponsored in-house bike fleet offers employees the opportunity to make errands and attend meetings during the day or recreational rides. Engaged bike fleet operations can reduce dependence on traditional auto-centric forms of transportation for micro-transit. Because several Orange County cities have multiple divisions in separate buildings, many of which are relatively close to one another, a municipal bike fleet could be a great asset to city employees.

Employer-Based Encouragement Programs

A workplace based encouragement program can help provide information to employees about commuting by bicycle and provide resources to ease the transition. OCTA can work to provide consistent branding and messaging to make the dissemination of employer-based program material more accessible to interested employers.

National Bike Month

Bike Month has gained traction over the years with expansive activities in celebration of the national awareness initiative. While the League of American Bicyclists has national breadth, OCTA's bike month year after year impacts a full spectrum of cyclists and engages many cities. Activities include bike-to-work day, group rides/rodeos, and events throughout the month.

Employer/Employee Incentives

An additional layer to encouragement can be found in financial incentives to support bicycle travel to and from an employee's place of residence and work. As of 2019 the federally subsidized Bicycle Subsidy Benefit Program was not in effect however, employers can self-fund their own incentive programs. This can benefit the business with promotional opportunities, Bicycle Friendly Business (BFB) applications, and lower federal income tax costs. A cost-benefit analysis will be needed to determine the amount given to employees. Low levels offer $20/month and higher-end programs can offer $220 per month; both being non-taxable fringe benefits.

Launch Event for New Bikeways

The excitement of a completed bikeway should extend beyond internal City project management teams. A launch event for the opening of a new bikeway can provide increased awareness and messaging for localized residents and regional connection options. Invited groups can include local dignitaries, school groups, bike clubs, and local businesses or other agencies who might want to participate.

Open Street Events

Community connections to transportation investments are integral to momentum maintenance and the overall

Bicycle Friendly Community

Bicycle Friendliness is a public designation that represents the community's commitment to education, encouragement, enforcement, evaluation, and engineering programs. Sponsored by the League of American Bicyclists (LAB), communities can achieve a platinum, gold, silver, or bronze status or an honorary mention. Bicycle friendliness can indicate that a community is healthy and vibrant. Like good schools and attractive downtowns, bicycle friendliness can increase property values, spur business growth, and increase tourism. The City of Irvine is currently recognized as a silver-level Bicycle Friendly Community (BFC).

Bicycle Resource Website

OCTA has committed to providing a wealth of resources to bicyclists as well as messaging to educate both bicyclists and motorists on proper behavior. The tools provided seek to encourage safe cycling behavior, benefits to bicycling, and basic bicycle maintenance. Motorists need to understand that bicyclists have the same rights that vehicle drivers have. Including safety rules, such as the 3-foot law. OCTA website hosts several pages dedicated to bicycling/safety:

- Bikeway maps (facilities, amenities, shops, etc.) and completed plans + project updates
- Safety awareness, materials, and videos
- Events and news

Noted within the OC Foothills Bikeways Strategy, Bicycle resource websites may also include the following:

Marketing Concurrent with New Facilities

- Education about new facilities can help notify and educate both cyclists and motorists about newly installed facilities. OCTA has a history of effective

marketing using local events to highlight new facilities.

- Social media and the web are also important tools for marketing new facilities. An example of a marketing campaign associated with the OC Loop, a 66-mile largely off-street bike and pedestrian facility that connects northern inland OC with the beach communities can be found at www.octa.net/Bike/The-OC-Loop
- A marketing campaign that highlights bicyclists and pedestrian safety is an important part of creating public awareness. OCTA has a strong history of creating community outreach programs, using social media, and creating public service messages including items such as banner ads, in particular those placed on OCTA buses.

Adult Bicycling Traffic Skills Classes

Most adult bicyclists have not received any formal training on safe bicycling practices, the rules of the road, and bicycle handling skills. If they received any bike education at all, it was most likely as a child. Now, many of the adults who are being encouraged to return to bicycling feel uncomfortable. OCTA sponsored classes seek to bridge the gap in education, supplementing classes offered by LCIs.

Youth Bicycle Skills Classes

School-based bicycle education programs educate students about the rules of the road and safe bicycling skills. Safe Routes to School (SRTS) educational grants are available for these programs, which are typically offered for upper elementary and middle school-age children. Examples can be found within the Irvine Unified School District (IUSD).

Expand Upon Existing Programs

The 2015 Irvine Active Transportation Plan notes that the City of Irvine currently has various successful bicycling and walking programs that could be expanded upon geographically including:

- Bicycle Rodeos/Safety Classes
- Safe Routes to School (SRTS) Programs
- Walk to School Wednesday Program
- UCI Recycle Program
- Bicycle Safety Administrative Citation Program

Bike Share

Existing bike share options for micro-transit are provided within the City of Irvine by the Irvine Company and other entities for its properties and tenants. Docking stations can be found at key locations within the City, proximal to some Irvine Company employment hubs, retail land uses, educational institutions, and residential land uses. The main campus of UCI has the provider "ZotWheels" offered at four locations. The UCI Research Park, Irvine Business Complex (IBC), Irvine Marketplace are all equipped with bike share options through a partnership between Zagster and the Irvine Company. Zagster is free for the first four hours, a small fee thereafter is charged.


FLAVORS

03

COMMUNITY ENGAGEMENT

3.1 COMMUNITY AND PUBLIC ENGAGEMENT

Foundational to the development of the Irvine Strategic Active Transportation Plan (ISATP) were interactive outlets for the community to provide their unique insights. A combination of in-person public events, electronic and in-person surveying, and online mapping exercises were employed to help the project team understand community sentiment on pedestrian and bicycle infrastructure.

The project team in partnership with the City of Irvine's Public Works and Transportation Department and Public Information Office was able to integrate project specific content into messaging mediums utilized by the City. Branded under the "Irvine Shares the Way" slogan, the ISATP was able to reach a citywide audience.

The existing mediums included Nextdoor application messaging, Facebook, Twitter, and Instagram. Beyond these social media options, the project team also developed a stakeholder list that encompassed a breadth of interest groups within the City. Diversity in the projects' outreach process strengthened the pedestrian and bicycle recommendations to represent diverse community members. This is because through the community engagement process the project team was able to reach a variety of community members and stakeholders to understand their concerns and sentiments.

This section summarizes the community engagement process that occurred during the development of the ISATP.

PUBLIC OUTREACH MEETINGS AND EVENTS

As a part of the public outreach and engagement process, the project team planned and facilitated five opportunities for the public to provide input and talk to the project team about the active transportation efforts. Prior to each event the project team prepared a multi-faceted engagement and notification strategy that was implemented across a host of social media mediums to generate excitement and participation. Event participation ranged from the hundreds to the thousands.

Irvine Global Village Festival

September 22, 2018

The first opportunity for the Irvine community to interact with the project team was at the annual Irvine Global Village Festival. This event drew crowds in the thousands over the course of a full day where attendees could visit many multi-cultural booths and activities. This time was used to survey community members using the project specific survey that seeks to understand multi-modal habits, barriers, and general sentiment. The project team also was able to facilitate conversations with individuals and groups to understand unique anecdotes.

uciRIDEtoberfest

October 9 and 10, 2018

In October 2018 the project team partnered with UCI to participate in their uciRIDEtoberfest activities. This presented a key opportunity to survey residents, UCI Students, and stakeholders as they visited other booths and activities. The project team was able to talk with hundreds of community members and also have them fill out the project specific survey.

Irvine Police Department Open House

October 20, 2018

In the month of October 2018 the project team coordinated the inclusion of a booth at the Irvine Police Department (PD) Open House. This event was hosted by the City and is open to the public. Activities included PD vehicle displays, facility tours, K9 officer meet and greet, games/bounce house, a bike rodeo, and food trucks.

The goal of the outreach event was to: identify areas of concern residents have within the City as it relates to bicycling, walking, other modalities, and transit. This was accomplished by having participants 1) work on maps to identify areas of concern, 2) interact with a poster board activity to identify their commute mode choices (stickers), and 3) fill in on poster board areas of concern. The project survey was available for participants to complete.

Bicycle Group Ride

January 23, 2019

In the month of January 2019, the project team coordinated an interactive bicycle group ride for the key stakeholders to participate in. Over twenty-five attendees chose from the two planned routes (one short and one long) that were led by the project team. The routes left from City Hall and toured local off-street shared-use paths, on-street bicycle facilities, and made stops at key intersections within the City that were noted within the community survey are "hot spots".

Dynamic conversations were facilitated to initiate a dialogue on the positive (i.e. what works well) and negative attributes (what could be better) of the existing pedestrian and bicycle network. These attributes were documented using large format table-sized maps of the existing Irvine bicycle and pedestrian infrastructure.

Project Open House

September 25, 2019

The final community outreach event was hosted at the Irvine City Hall, drawing a diverse audience of residents, local cyclists, e-bike users, commuters, recreational walkers, bicycle advocates, and City staff. Held in September 2019, the outreach event was centered on providing community members the opportunity to review and understand the preliminary pedestrian and bicycle recommendations (network and concept plans) and overall project progress. Participants were encouraged to provide their feedback. Project team members facilitated one-on-one discussion and group conversations to build a consensus on the top priority network and concept plans. Community members marked up large format table sized maps with their positive and negative sentiment on the showcased features.

3.2 ACTIVE TRANSPORTATION PLAN SURVEY

INTRODUCTION

Building upon the City's 2015 ATP Community Survey, the ISATP Survey was developed to better understand travel needs, barriers to bicycle and pedestrian access, frequency of active transportation usage, and more.

Between September 2018 and February 2019, the survey received a total of 643 responses. Approximately half were collected from hard copy surveys administered at community outreach events. The other half of the responses were collected electronically through the survey's online format.

METHOD

Post-Processing

At the end of the surveying period, the collected data from both hard copy and online responses were compiled for internal post-processing and analysis. To further analyze the survey data, several profiles were created to evaluate the results of walking and biking characteristics within the City. These included comparing survey inputs between people who live, work, or visit Irvine, as well as people who walk or bike for commuting, recreational, social, and errand-running purposes. Respondents were considered residents if they indicated they lived in Irvine or wrote down a home zip code located within the City.

Walk and Bike Scores

To assess the frequency in which a person walks or bikes, the project survey asked participants to indicate how often they walked and how often they biked to specific key destinations, respective of each mode. The survey used eight different types of destinations to assess walking and biking frequency (***Table 3.2.1***). Each of these destination types was then further categorized into walking and biking profiles: commute, recreational, social, and errand-running.

Based on the data collected, a walk score and bike score was calculated for each survey participant as a better unit of analysis to determine the frequency. Each of the six possible frequency choices was assigned an individual score to represent the average number of (walking/biking) trips per week (***Table 3.2.2***).

If a trip destination profile included more than one destination, a composite score was calculated. For example, if a respondent indicated that they generally walked to the home of a friend or relative five or more times a week, but walked to a coffee shop one to three times per month, they would receive an average walk score of (5+0.5) / 2 = 2.75, placing them in the 'Regular' Social Walker group. A participant's response for each destination was then scored based on this system.

Table 3.2.1 Trip Destination Profile

How often do you walk / How often do you bike to the following places?	Trip Destination Profile
1. Work or school (for yourself)	Commute
2. Taking someone else to school or daycare	
3. A restaurant or a coffee shop	Social
4. The home of a friend or relative	
5. A store (grocery, retail, or mall, etc.)	Errand-Running
6. A service provider (bank, post office, barber, dentist, tutoring, etc.)	
7. Recreational activity (park, dog walking, sports)	Recreational

Table 3.2.2 Walking and Biking Frequency - Walk/Bike Score

Walking/Biking Frequency	Survey Response	Average # Walk/Bike Score (# of trips per week)
Frequent	5 or more times per week	5
Regular	2 to 4 times per week	3
Occasional	About 1 time per week	1
Infrequent	1 to 3 times per month	0.5
	Less than 1 time per month	0.25
(Never)	Never	0

KEY FINDINGS

1. Survey data showed little variation in results between Irvine residents, employees, and visitors.
2. Regardless of whether a survey participant lived, worked, or visited Irvine, they primarily traveled by foot and biked for recreational, social, and errand-running purposes than for work or school.
3. The Irvine community walked more than they biked, regardless of destination or trip type.
4. People who walked and biked for recreational and commuting purposes are doing so more frequently than those who walked and biked for social and errand-running purposes.
5. Recreational trips not only accounted for the highest number of people who walked and biked, but they also represented the most frequent trip type.
6. Limited time and distances are the top two reasons for not walking more across residents, employees, and visitors.
7. While limited time and distances were also main reasons for not biking, all three groups (residents, employees, and visitors) indicated that vehicles traveling too fast and streets feeling unsafe for bicyclists were additional concerns.
8. Residents, employees, and visitors agreed that continued expansion of connections with parks, paths, and better connections to destinations would continue to encourage them to walk or bike more.
9. Protected bike lanes were the top proposed biking improvement across all residents, employees, and visitors, followed by more bike lanes, off-street shared-use paths, and continued expansion of connections to destinations.

RESULTS

Primary Reasons for Walking and Biking

For people who lived, worked, and/or visited Irvine, the primary reasons for both walking and biking in Irvine, respectively, are to "exercise or improve my health" and "for fun or enjoyment". Over half of all residents, employees, and visitors indicated that those were the top two reasons for why they walked. The same two reasons for biking accounted for approximately 47% of each group.

Trip Destination Type

The main reason a person walked and biked may not necessarily define the destination that they traveled to. For example, an individual could still choose to have biked to work in order to improve their health. However, consistent across both modes, data showed that more of the Irvine community traveled by foot and biked for recreational, social, or errand-running purposes, than for work or school.

In classifying survey participants who walked and biked as 'Commuter', 'Recreational', 'Social', or "Errand-Running", the data helps further visualize the type of pedestrian or bicyclist someone is based on the destinations that they walked or biked to (***Figure 3.2.1***). Note that quantities do not sum to 100% as respondent could select differing frequency to destination profiles.

On average, people were less likely to walk or bike to work than they are, for example, to walk their dog, bike to a coffee shop, or visit a friend in Irvine. The City's existing infrastructure of shared-use paths and wide sidewalks provides great opportunities for walking and biking. As a result, it helps supports a culture of walking and biking for recreational and social purposes, particularly for exercise and general enjoyment.

Trip Frequency

In total, the survey data shows more people generally walked and biked to destinations like a coffee shop or bank than to work or school. However, an analysis of trip frequency shows that people were making walk and bike commuting trips more frequently than they were for running errands or social purposes. Over 22% of survey respondents were commuting by foot at least two to four times a week, with 5.4% indicating that they did so five or more times a week. A comparison of frequency between trip destination types for bicyclists showed a relatively smaller difference between them with frequent and regular bicyclist commuters making up almost 13% of respondents. Frequent and regular bicyclists who rode for social and errand-running purposes made up 9.5% and 11.7%, respectively (***Table 3.2.3***).

Yet, recreational trips not only accounted for the highest number of people walking and biking, but they also represent the most frequent trip type. Individuals identified as frequent and regular pedestrians who walked for recreational activity made up nearly half of all survey respondents. These were people who indicated that they either walked two to four times (regular) or five or more times (frequent) a week for recreational activity. Frequent and regular bicyclists who also road for recreational activity account for 19% of survey respondents (***Table 3.2.3***).

Figure 3.2.1 Percentage of Pedestrians and Bicyclists by Trip Destination Profiles

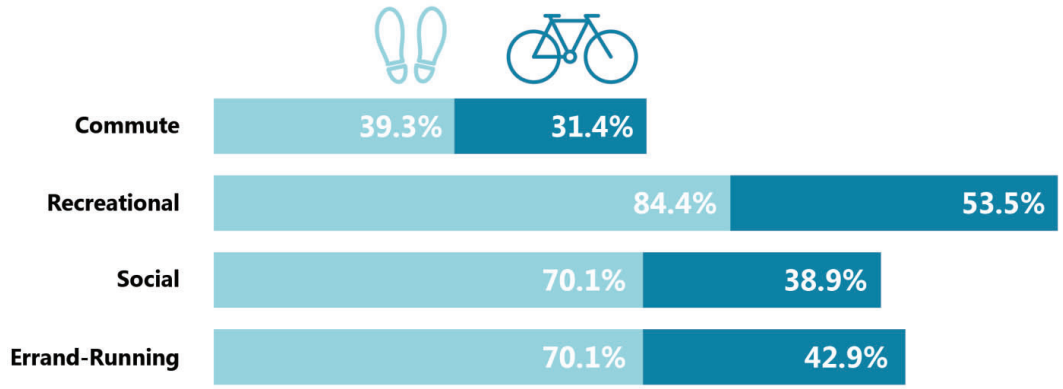


Table 3.2.3 Trip Frequencies by Destination Profile

Type	Trip Frequency	Walk %	Bike %
Commute	Frequent	5.4%	1.6%
	Regular	16.6%	11.4%
	Occasional	5.9%	0.9%
	Infrequent	11.4%	17.6%
Recreational	Frequent	26.7%	9.3%
	Regular	21.2%	9.8%
	Occasional	13.4%	7.8%
	Infrequent	23.2%	26.6%
Social	Frequent	3.7%	2.3%
	Regular	17.9%	7.2%
	Occasional	19.4%	10.0%
	Infrequent	29.1%	19.4%
Errand-Running	Frequent	3.0%	6.7%
	Regular	10.3%	5.0%
	Occasional	10.4%	4.5%
	Infrequent	21.5%	18.0%

Table 3.2.3 column values do not sum to 100% since the survey respondent's trip frequency could be different in each category. Values are best viewed via rows and cells or tabulating within each category (i.e. commute, recreational, etc.).

Challenges and Improvements to Biking

High speed limits on wide arterial roadways throughout the City presented other challenges. These roadways are the primary ways to travel between the City's residential communities, commercial destinations, and office parks. When asked what the main reasons were for not biking, top issues ranged from 'limited time' and 'distances are too far' to 'vehicles travel too fast' and 'streets do not feel safe for bicyclists'. This was consistent across residents, employees, and visitors. Approximately 11% to12% of each group also indicated that motorists tend to have negative attitudes toward bicyclists contributing to a key reason for not biking. While the existing infrastructure of Class II bike lanes and shared-use paths present opportunities for active transportation, the survey data indicates that there is still a certain level of discomfort that people experience riding their bikes.

When asked what would encourage them to bike more, suggested improvements focused primarily on more bikeway infrastructure. Receiving the most votes across residents, employees, and visitors, "protected bike lanes" accounted for approximately 22% of each group. Other suggested improvements included: more bike lanes, additional off-street shared-use paths, and more and better connections to destinations. While survey participants indicated a greater tendency to bike for recreational and social purposes, increasing the quality and number of bikeway facilities in Irvine has the potential to increase the frequency of all bike trips across the entire community. This is particularly true for those who both work and live in Irvine; 33% of all survey participants indicated that they were both a resident and employee in the City.

Challenges and Improvements to Walking

The frequency data across Commuter, Recreational, Social, and Errand-Running users show that participants are generally walking more than they are biking – regardless of destination or trip type. In particular, 27% of all survey participants indicated that they walked at least five times a week "frequent" for recreational activity (***Table 3.2.3***). Moreover, 61% of respondents indicated that they walked at least once a week for recreational activity (***Table 3.2.3***).

While survey results highlight limited time and far distances as the top two reasons for those who did not walk more, participants also indicated that more parks, paths, and better connections to destinations would encourage them to walk more. This is consistent across not only residents, employees, and visitors, but also for those who indicated that they "never" or "rarely" walked. These improvements could help increase the frequency of walking trips to all destinations. Additional non-infrastructure improvements such as a SRTS program could also encourage more commuting walking trips, where parents could walk younger children or allow older children to walk to school.

CONCLUSION

The Irvine community, regardless of resident, employee, or visitor populations, tends to walk and bike for exercise and fun. This is supported by both the amount of people and frequency in which people walk and bike for recreational activity. While there are less individuals walking and biking for commuting purposes, they are still doing so relatively more frequently than those who are walking and biking for social and errant-running purposes.

Based on the survey data, biking improvements in Irvine focused primarily on more bikeway infrastructure in the order of protected bike lanes, regular bike lanes, off-street paths, and better connections to destinations. Pedestrian improvements centered on more parks, paths, and also better connections to destinations. While these improvements can help increase the frequency of those who already walk and bike both frequently and regularly, they have the potential to encourage both occasional and infrequent users to walk and bike more. Recommendations for the ISATP should focus on enhancing existing on-street bikeways, improving gaps or connection points, and identifying opportunities for additional pedestrian and bikeway facilities in order to address concerns highlighted in these survey results.

DEMOGRAPHICS

Survey participants were primarily Caucasian/White (43.7%) and Asian or Pacific Islander (38.9%), accounting for more than 82% of all responses - shown in ***Figure 3.2.2***. This mirrors similar statistics based on the U.S. Census Bureau's American Community Survey (ACS) between 2013 and 2017 data, where Irvine's population is almost 48% White and 42% Asian. About half of all participants were represented by the age groups 25 to 34, 35 to 44, and 55 to 64. The age group 35 to 44 accounted for the largest percentage (23%) of survey participants. Exhibits are shown in ***Figure 3.2.3***.

Figure 3.2.2 Race and Ethnicity Demographic Breakdown

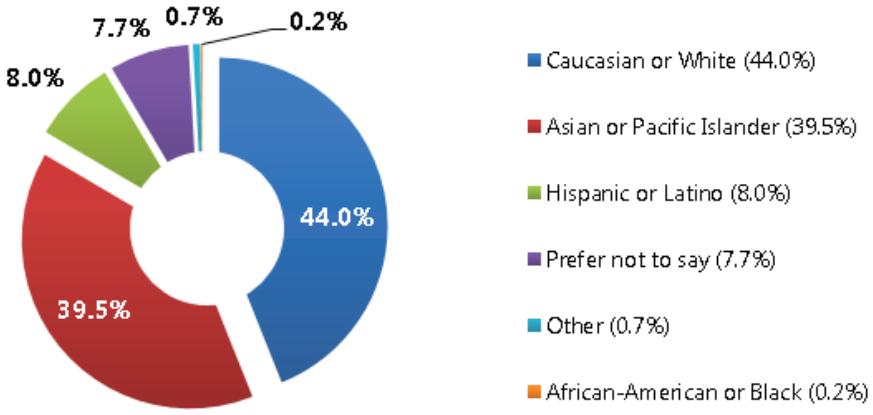
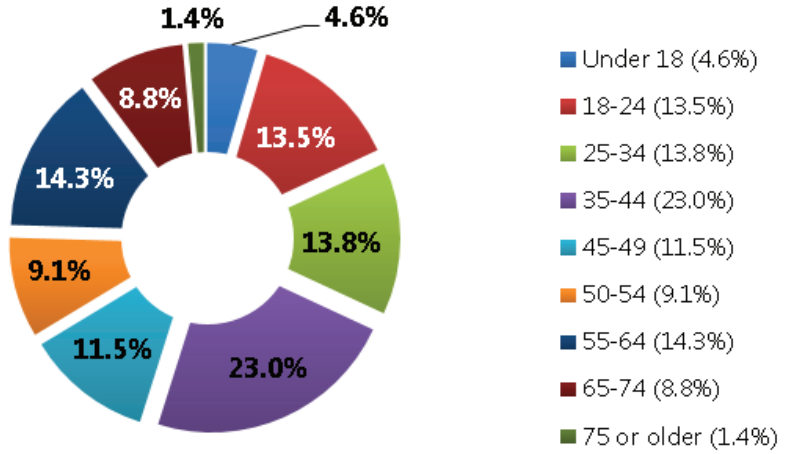


Figure 3.2.3 Age Group Demographic Breakdown



3.3 ONLINE MAPPER

An additional layer of community engagement was an online mapping tool. This tool was accessible via phone, tablet, or desktop computer, allowing community members a supplementary outlet for interaction with the project. In cases where community members were unable to engage in in-person events, the online mapper was used to bridge that gap and also supplement the experience of those that completed the project survey and attended events.

Comments were categorical point- and line-based entries that detailed the following: I walk here, I bike here, improve pedestrian access, improve pedestrian crossing, improve bicycle access, improve sidewalk, improve intersection, add/improve lighting, and add your own comment. Roughly 600 entries were made and added to the ISATP database.

The online mapper portal is shown in ***Figure 3.3.1***. A "hot spot" heatmap is presented in ***Figure 3.3.2*** that shows popular locations within the City that fielded comments via the online mapper. Cluster analysis was used to identify the top ten intersections. The top ten online mapper intersections with the highest quantity of entries are presented in ***Table 3.3.1***.

Table 3.3.1 Top Online Mapper Intersections

Rank	Location
1	Bake Parkway and Lake Forest Drive
2	Culver Drive and Trabuco Road
3	Alton Parkway and Culver Drive
4	Campus Drive and University Drive
5	Culver Drive and Irvine Center Drive
6	Harvard Avenue and Michelson Drive
7	Irvine Boulevard and Ridge Valley
8	Bake Parkway and Muirlands Boulevard
9	Bake Parkway and Rockfield Boulevard
10	Campus Drive and Carlson Avenue

Figure 3.3.1 Online Mapper Portal Screenshot

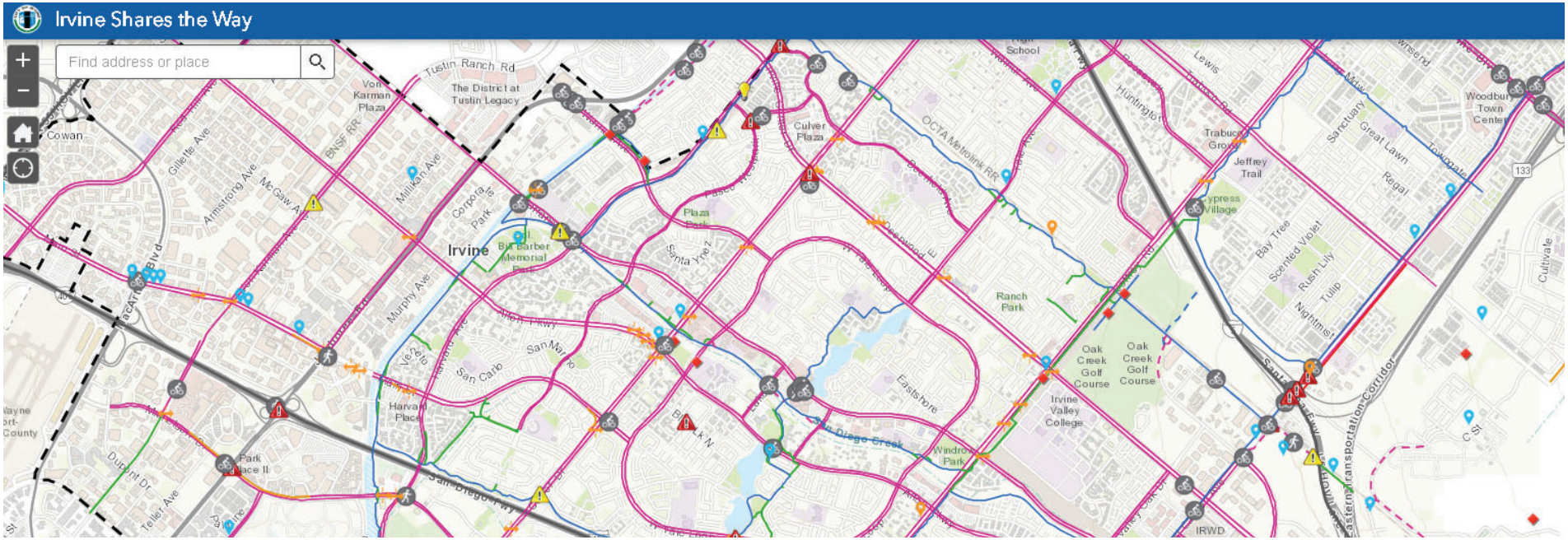
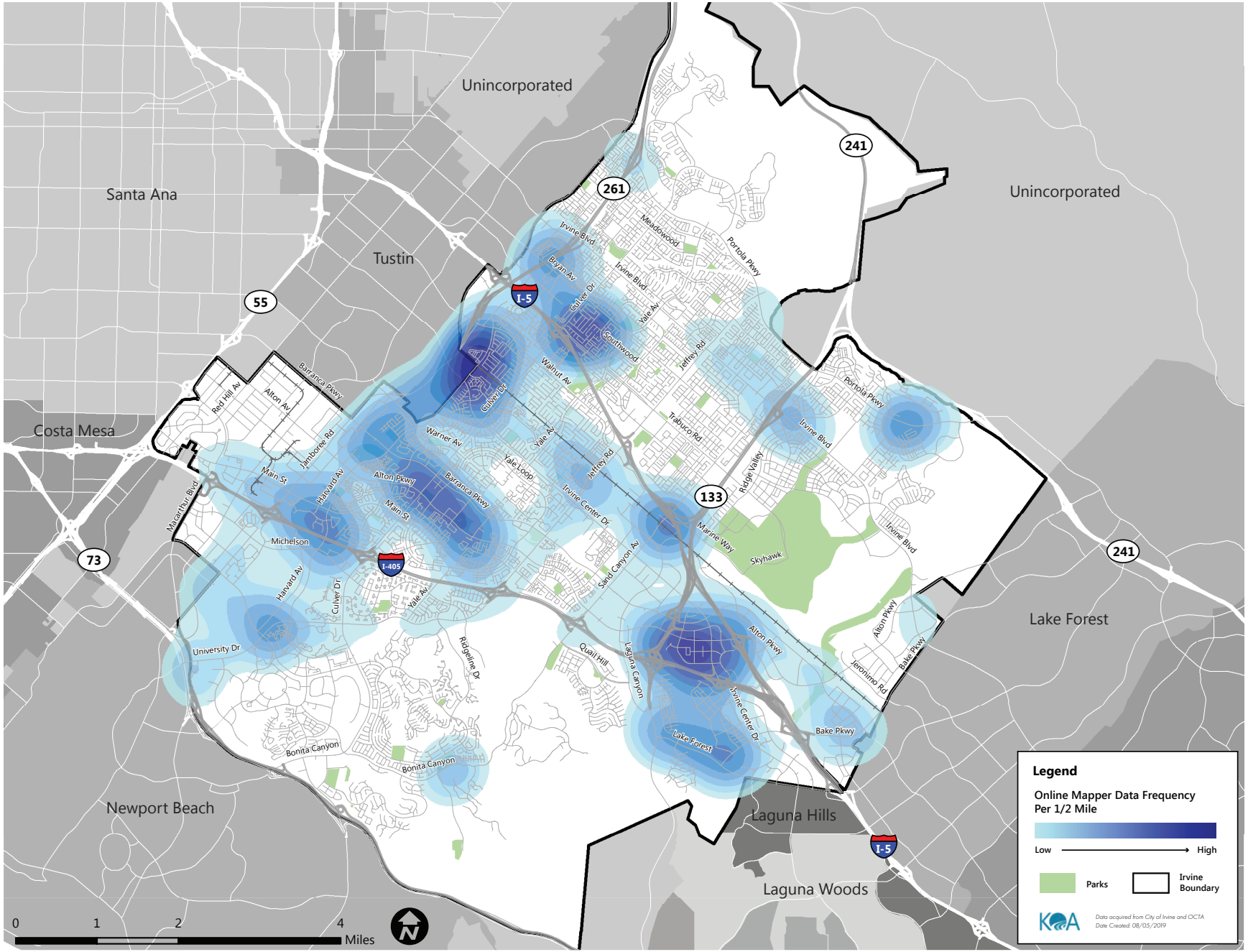
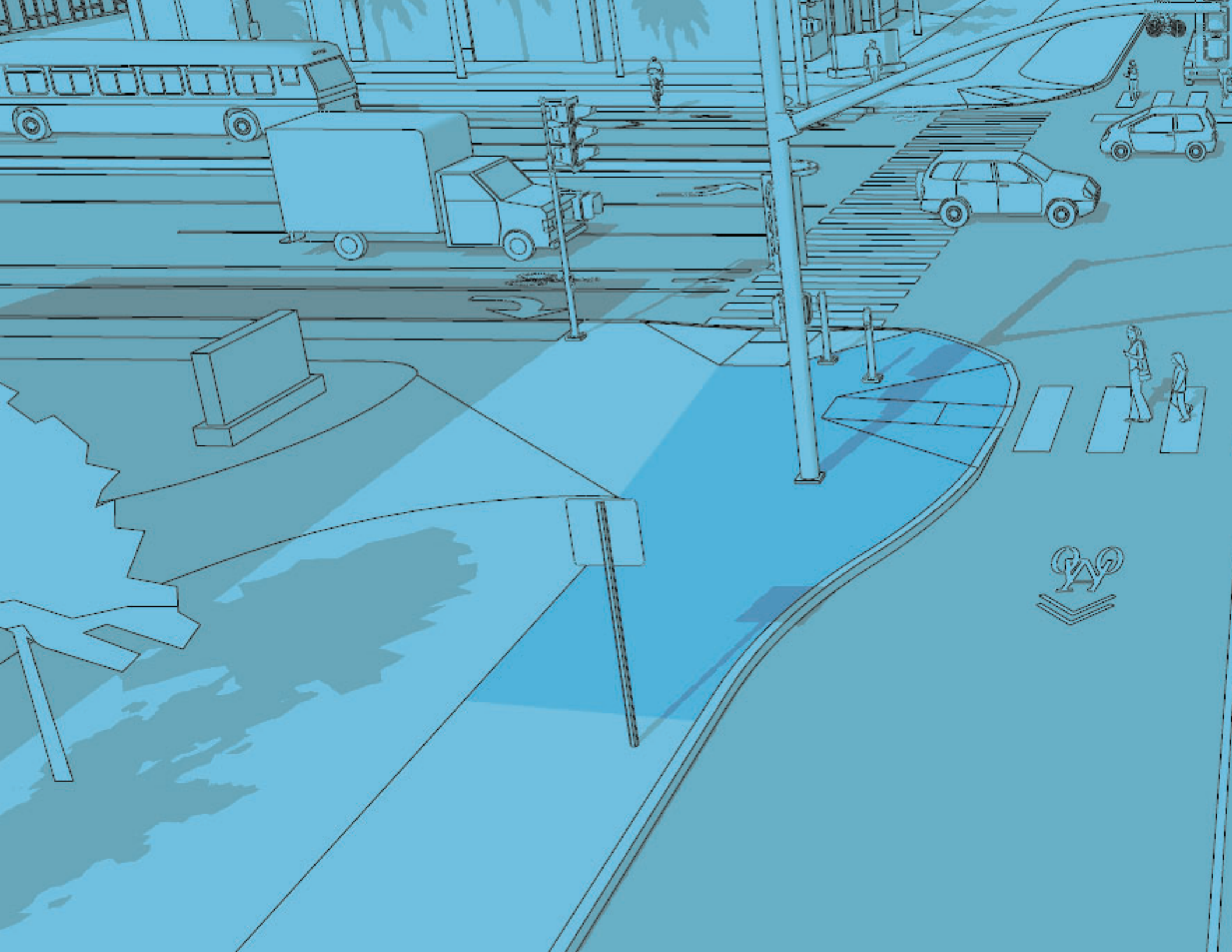
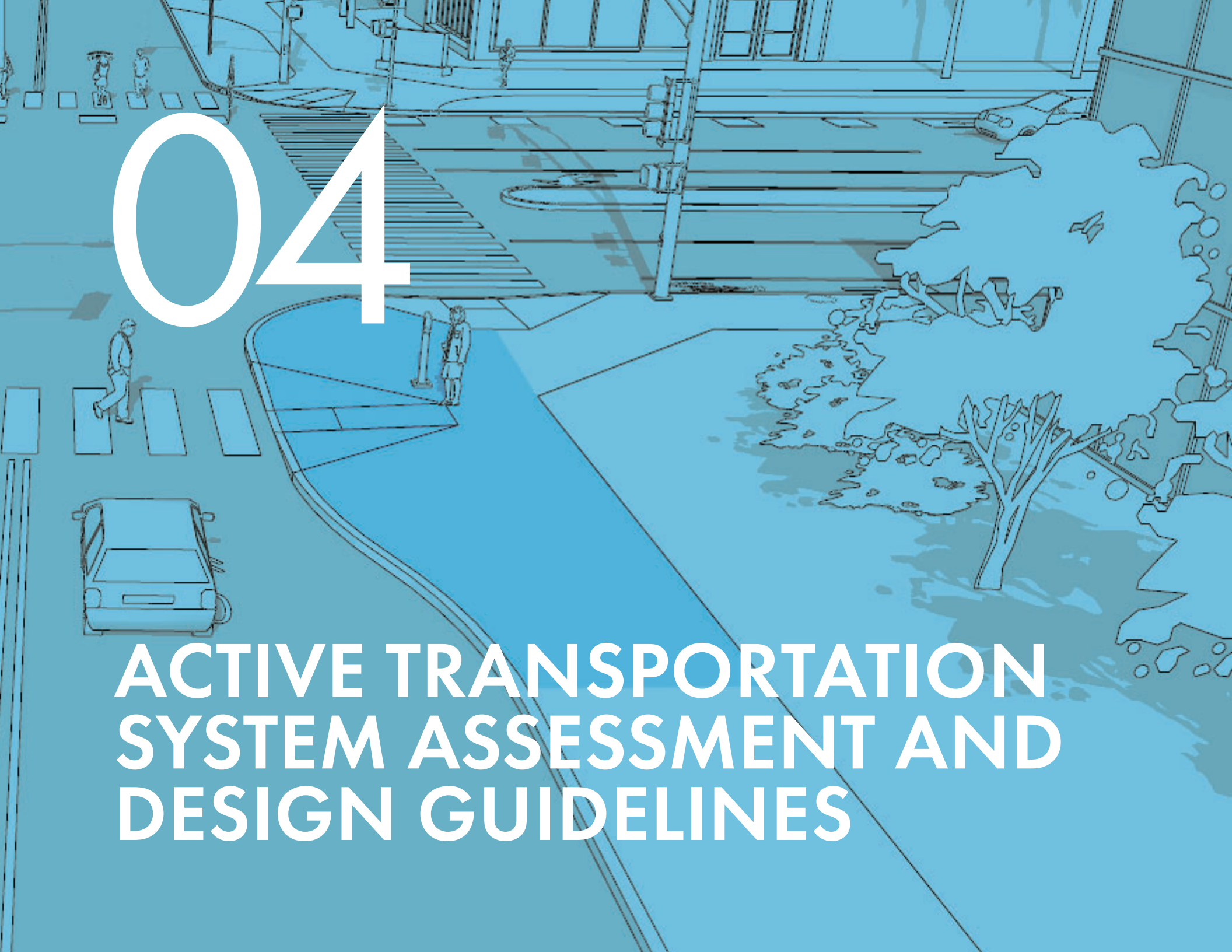


Figure 3.3.2 Online Mapper Data Collection Density Map





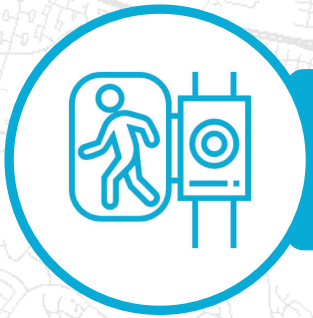


04

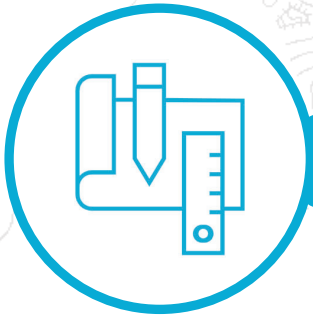
ACTIVE TRANSPORTATION SYSTEM ASSESSMENT AND DESIGN GUIDELINES

Within this chapter, active transportation system assessment tools and design guidelines best practices are provided. Each of the items covered offers a high-level overview of the underlying content. The City of Irvine as a result of the development of these assessment tools and design guidelines is equipped with the resources needed to implement active transportation projects.

Forecasting & Mode Split



Count Technology Assessment



Design Guidelines

4.1 BICYCLE AND PEDESTRIAN FORECASTING AND MODE SPLIT

To better understand future demand and impact of active transportation projects, the ISATP prepares detailed methodologies for 1) forecasting and 2) mode split modeling. The City is equipped with best practices in both these modeling efforts to inform the implementation process. Literature reviews were conducted for both forecasting and mode split efforts to ensure they are current and can be applied to the City's context, with the ultimate goal of providing accurate metrics for use in grant applications and implementation phasing.

FORECASTING

Forecast modeling seeks to provide metrics that identify potential impacts and demand on planned facilities. Utilizing baseline ACS data on commute characteristics (i.e. bicycle or walk to work), the project team researched best practices for identifying accurate forecast metrics. While multiple indicators affect assumed growth rate calculations (i.e. ADT volumes and corridor/project length), the growth factors for the ISATP were identified through a review of California Air Resource Board (CARB) methods. Flexibility in modeling is central to accommodate a variety of scenarios that the Irvine context might present. The City is equipped with a detailed methodology that prepares them for next step implementation data modeling needs - further detailed in ***Appendix B***.

MODE SPLIT

The process of forecasting pedestrian and bicyclist mode split is integral to justifying pedestrian and bicycle facilities. When planning future projects, the City can utilize the mode split data exports for consideration in phasing. Where there is high demand, facilities can be fast tracked for near-term planning, and where lower demand is observed phasing can be representative of long-term planning. A variety of methods have been studied and the City is recommended to choose appropriate methods based on the context of a given project or service. The mode split methodology equips the City to prepare metrics that can be used in competitive grant applications and internal funding cycles – further discussion within ***Appendix B***.

4.2 COUNT TECHNOLOGY ASSESSMENT

Infrastructure and technology play an important role in the ability to provide safe, dependable, and consistent management of traffic for all users, both on- and off-street. A transportation network system with a high level of communications, monitoring, and operational reliability is the objective of the Technology Assessment.

The City of Irvine's goal for technology and communication improvement is to upgrade and expand its Intelligent Transportation Systems (ITS) components throughout the City utilizing its existing robust communication network. The City would like to utilize new ITS solutions to help gather data of bicycle and pedestrian counts at both on-street and off-street locations for active transportation planning and engineering (See also ***Section 2.3***).

OPPORTUNITIES

The City of Irvine owns and operates over 370 traffic signals. All intersections currently have a communication system and technologies with interconnection. The city also operates and maintains more than 65-miles of off-street shared-use paths. Currently, there is no communication system implemented for the off-street paths. Conducting bicycle and pedestrian counts at signalized intersections and along off-street paths may require different technologies. The goal is to bring information back to the traffic management center if possible or transfer data through the cloud or other online applications. As such, a host of ITS providers and their products were studied for suitability and application within Irvine – these included: Iteris, Miovision, Flir, Gridsmart, Numia, Q-Free, and EcoCounter. A summary of findings is shown in ***Table 4.2.1***, while a complete product Implementation Plan is found in ***Appendix C***.

Table 4.2.1 Count Technology Assessment Overview

Product	Application		Overview	Cost	Recommendation
	Signalized Intersection	***Off-Street Shared-Use Path***			
Iteris	X		Based on the existing Iteris processors within the City of Irvine, 35 intersections have high readiness for installation of Pedtrax or VantageLive. Older processors would need to be upgraded to allow for multi-modal counting.	Small quant.: $5,625/year per intersection Medium quant.: $625/year per intersection Large quant.: $500/year per intersection	#1 Signalized Intersection Option: Install Pedtrax at all newer processors, install VantageLive at all older processors (04 and 05)
Miovision	X	X	Offers both pedestrian and bicycle counting capabilities, can replace existing in-ground detection needs, however no existing installs within the City. Power source from cabinets.	$18,900 per intersection with *$2,000 fee per year after first two years*	
Flir	X		Uses thermal imaging and Wi-Fi to adapt the traffic signal based on presence of pedestrians, bicycles, and vehicular traffic. Offered products fold in capabilities to count all user data with TrafiSense2, while TrafiOne does not yet have capabilities for full user counting. Power over Ethernet.	TrafiOne $5,500 per approach, and TrafiSense2 $6,800 per approach	#2 Signalized Intersection Option: where Iteris system is not in place - City can implement TrafiSense2
GridSmart	X		Mounts 360 degree camera on intersection pole for complete detection and operation for pedestrians, bicyclists, and motor vehicles. Counting capabilities, however quality decreases with large groups of pedestrian traffic. In place in Newport Beach - data is accessible via cloud. Power over ethernet (5W nominal).	$16,000 to $20,000 per intersection; annual fee unknown	
Numia	X	X	Pole mounted sensor for both signal and shared-use path pedestrian and bicycle detection. Powered by solar with battery back-up or hard wired - data transmitted via 4G/LTE cellular network. Can work within existing environment without changes needed.	Small quant.: $6,000 per sensor Medium quant.: $3,400 per sensor Large quant.: $2,500 per sensor *$1,400/year for hosting/maintenance/ data*	#2 Off-Street Shared-Use Path Option: Install Numia pedestrian and bicycle counter on street light pole with power source.
Q-Free		X	Monitors up to four cycle lanes and four pedestrian lanes - roadside detection powered by solar with battery back-up. Data transmission over cellular network to cloud based interface. Option to showcase count data to public live.	N/A	
EcoCounter		X	Post mounted (Pyro Sensor) pedestrian and bicycle path counting system powered by battery or hard wired based on option selection. Data retrieval would require technician to download data via Bluetooth to web data portal. Option to showcase count data to public live (Classic/+).	Pyro Sensor: $5,000 to $7,000 Classic/+: $35,000 to $40,000 per location. *~$1,000 per year for data access*	#1 Off-Street Shared-Use Path Option: Install and place EcoCounter Classic near-term at "continuous" sites; Install EcoCounter Post at long-term "cyclic" locations.
Chamber Electronics		X	Pedestrian and bicycle counter via radiobeam to technician download. Battery life of two years - no local installs.	$3,725 per sensor	

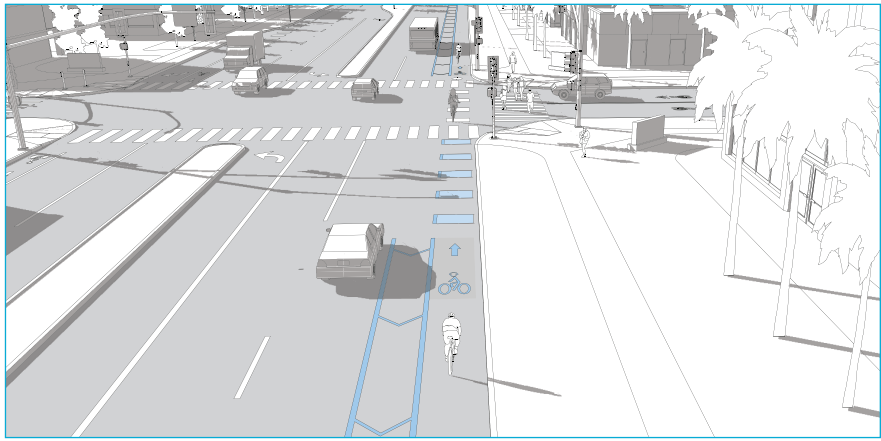
4.3 DESIGN GUIDELINES

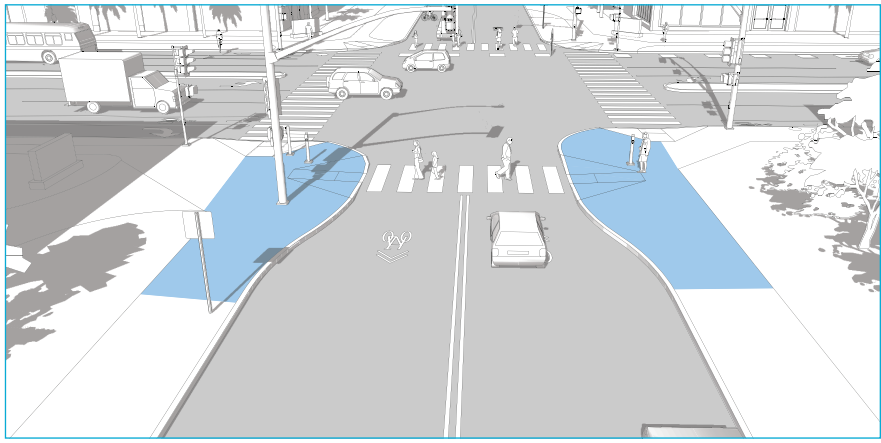
Pedestrian and bicycle infrastructure features outlined within the Design Guidelines serve to equip users with an expanded knowledge base of each elements' design guidance. The complete Design Guidelines are provided in ***Appendix D***. Users can consider the facility treatments as potential countermeasures for implementation within an active transportation system and at intersections. The guidelines neither replace the need to conform to the California MUTCD, nor the need for engineering expertise. Engineering judgment shall remain the gatekeepers for overall guidance. The Design Guidelines are intended to provide supplemental and consolidated information rooted in existing local, state, and national guidance.

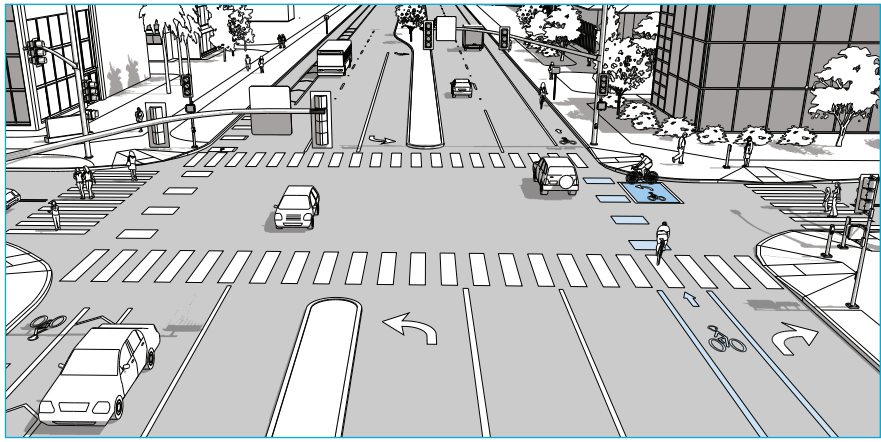
DESIGN GUIDELINES STRUCTURE

The Design Guidelines are prepared under the following structure – each facility factsheet presents the following – a description of the facility, a 3D model or image example, design guidance, discussion, and any additional references.

1. Review of the Design Context: national, state, and local standards are reviewed to highlight the multi-standard impact on each facility
2. Pedestrian Facilities: Essential to comfortable and connective travel, the guidelines highlight pedestrian paths, signage features, pavement markings, and signal strategies.
3. Bicycle Facilities: A spectrum of facility offerings are reviewed including on- and off-street infrastructure features, as well as intersection treatments.
4. Electric Mobility: Regulations and design best practices that pertain to electric mobility are discussed within the local context.







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LifeStorage
ONE WAY

05

RECOMMENDATIONS

5.1 ACTIVE TRANSPORTATION TOOLBOX

This Active Transportation Toolbox can be used to create walking and biking environments that bolster user comfort and local and regional connectivity. Application of this Toolbox can be made to the Network (***Section 5.2***) and Corridor Recommendations (***Section 5.3***).

The icons shown in ***Figure 5.1.1*** categorize the different recommendation types that can be found within this Toolbox. The features represented within the Toolbox generally fall under three categories: Bicycle, Pedestrian, and Operational Improvements. The use and intent for each "tool" is outlined on the following pages, noting improvement benefits and design considerations. Please refer to the latest editions of Caltrans Highway Design Manual (HDM), Federal Highway Administration (FHWA), California Manual on Uniform Traffic Control Devices (MUTCD), and other federal or state guidelines for specific design and signage standards - these are also laid out in more detail within the Design Guidelines section found in ***Appendix D***.

References:

1. MUTCD (CA)
2. FHWA Small Town and Rural Multimodal Networks (2016)
3. National Association of City Transportation Officials (NACTO) Urban Design Bikeway Guide
4. Essentials of Bike Parking (APBP) (2016)
5. ADA Best Practices Toolkit for State and Local Governments
6. National Center for Safe Routes to School
7. FHWA Safety Program - Road Diet Information Guide
8. Safety Benefits of Raised Medians and Pedestrian Refuge Areas - FHWA
9. pedbikesafe.org (FHWA)
10. Pedestrian Hybrid Beacon Guide-Recommendations and Case Study
11. Flexing Rumble Strip Design for Bicycle Accommodation (Rumble Strips and Rumble Stripes - FHWA)
12. Caltrans HDM

Figure 5.1.1 Active Transportation Toolbox Overview

BICYCLE

Bicycle-related treatments in this toolbox include bikeway facilities, bicycle parking, amenities, signage, and intersection elements. While bikeway facilities can be classified into three categories— off-street, on-street, and shared street— these broad categories include more specific bikeway types. Recommended treatments are context-sensitive and include street type, vehicle traffic speed, and vehicle and bicycle volumes.

PEDESTRIAN

Pedestrian-related treatments focus on enhancing pedestrian visibility, reducing motorist speed, and improving pedestrian infrastructure. Providing and improving pedestrian facilities like sidewalks and crossing treatments can help create a more comfortable experience for pedestrians as they travel within the City.

OPERATIONAL IMPROVEMENT

The purposes of operational improvements are to reduce vehicle collision factors and create a safer environment for active transportation users within the City. Recommended treatments are context-sensitive and include street type, vehicle traffic speed, volume, and pedestrian and bicyclist demand on existing facilities.

CLASS I: BIKE PATH

An off-street bicycle facility that is physically separated from any street or highway, commonly planned along rights-of-way such as waterways, utility corridors, flood control access roads, railroads, and similar paths that offer continuously separated riding opportunities[12].

BENEFITS:

- Generally used to serve corridors not served by streets and highways or where wide right-of-way exists
- Can provide recreational opportunities or serve as commute routes
- Offers bicycling opportunities not provided by the road system

DESIGN & OTHER CONSIDERATIONS:

- Right-of-way availability
- High costs associated with new construction and long-term maintenance
- Possible shared use with pedestrians (see also "shared-use path")

CLASS II: BIKE LANE

A portion of the roadway that is designated by striping, signing, and/or pavement markings for the exclusive use of bicyclists. They are established along streets and corridors where there is bicycle demand, and where there are distinct needs that can be served by them[12].

BENEFITS:

- Delineates right-of-way assigned to bicyclists and motorists and provides for more predictable movements by each

DESIGN & OTHER CONSIDERATIONS:

- Roadway reconfiguration may be needed if insufficient room exists for side-by-side sharing of existing streets by motorists and bicyclists
- Locations with right-turn-only lanes should provide a minimum four-foot width for bicycle use between the right-turn and through lane when bikes are permitted. Where posted speed is greater than 40 miles per hour, minimum width should be six feet[12]
- Installation of rumble strips allowed by HDM Chapter 300 Index 302.1

CLASS II: BUFFERED BIKE LANE

An additional striped buffer can provide greater separation between bicyclists and vehicular traffic. Buffered bike lanes are recommended where roadway space allows[12].

BENEFITS:

- Provides greater shy distance between motor vehicles and bicyclists
- Provides space for bicyclists to pass another bicyclist without encroaching into the adjacent motor vehicle travel lane

DESIGN & OTHER CONSIDERATIONS:

- Different design guidelines for each striping pattern
- More suitable than un-buffered Class II bike lanes on roadways with high vehicle speeds or volumes
- Typically wider than traditional Class II bike lanes in order to accommodate buffer

CLASS III: BIKE ROUTE/ SHARROWS

Class III bikeways are designated roadways where bicycles and motor vehicles share the space. Design standards require specific signage, but additional enhancement can be provided by using shared roadway markings, or "sharrows"[12].

BENEFITS:

- Provides continuity to other bicycle facilities
- Designates preferred routes through low volume roads

DESIGN & OTHER CONSIDERATIONS:

- Assure that these routes are suitable as shared roadways
- Prior to designation as a bikeway, routes may need additional improvements for bicycle travel
- Maintain routes in a manner consistent with the needs of bicyclists

CLASS III: BIKE BOULEVARD

A bicycle boulevard is a shared roadway Class III bicycle facility, designed to offer priority for bicyclists operating within a roadway shared with motor vehicle traffic. Low stress vehicle corridors are suitable for a bicycle boulevard as they are characterized by lower volumes of vehicles and lower speeds.

BENEFITS:

- Increases comfort for bicyclists by reducing motorist speeds and volumes, if diversion is included
- Connects residential roads to commercial corridors/community services

DESIGN & OTHER CONSIDERATIONS:

- May require additional paved surface to provide sidewalk space for pedestrians
- Diversion design restricts vehicle movements.

CLASS IV: CYCLE TRACK

A cycle track is a protected bikeway that includes a physical barrier between bicyclists and motor vehicle traffic. It combines the user experience of a separated path with the on-street infrastructure of a conventional bike lane.

BENEFITS:

- Provides lateral separation space for bicyclists in order to improve perceived comfort and safety
- Eliminates risk and fear of collisions with over-taking vehicles
- Reduces risk of "dooring" compared to a bike lane

DESIGN & OTHER CONSIDERATIONS:

- Streets with high bicycle volumes, motor vehicle volumes/speeds
- Requires additional maintenance for debris due to limited vehicle access
- Caltrans Design Information Bulletin (DIB) 89-01

CONFLICT ZONE MARKINGS

Conflict zone markings are used to increase the visibility of bikeways or, more commonly, zones with a high potential for motor vehicle/bicycle conflicts, by indicating cyclist right-of-way with a distinctive symbol and/or color. They are intended to regulate, warn, or guide traffic.

BENEFITS:

- Increases awareness of bicyclists
- Can be used to indicate an area of potential conflict between bicyclists and motor vehicle traffic

DESIGN & OTHER CONSIDERATIONS:

- Currently under Interim Approval by FHWA for optional use (colored marking)
- Can be costly to maintain
- Green, blue, and red are among the colors that have been tested
- Multiple meanings; dedicated cycling corridor, can also mean a shared mode facility or a "mixing zone" with cars

RUMBLE STRIP

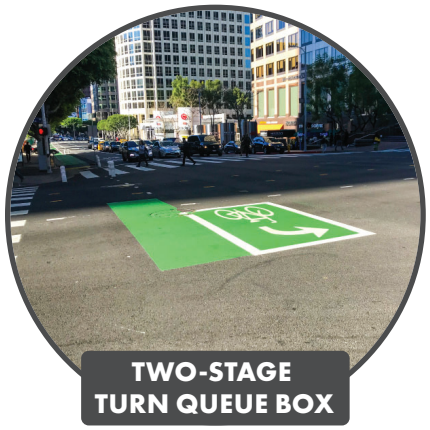
Rumble strips use both noise and vibration to alert the driver that he or she is leaving the appropriate travel path. The strategic placement of rumble strips is important as practitioners balance safety effects for motorists and bicyclists[11]. Installation of rumble strips allowed by HDM Chapter 300 Index 302.1.

BENEFITS:

- Effective countermeasure for reducing roadway departure crashes
- Flexibility in design and strategic placement can successfully accommodate variety of users

DESIGN & OTHER CONSIDERATIONS:

- Offset of the rumble strip from the lane can be adjusted to best accommodate bicyclists. This may mean using edgeline rumble strips to provide additional paved shoulder space beyond the rumble strip, or increasing the offset where narrow paved shoulders exist
- Implementation of rumble strips should always consider bicycle-friendly design such as "skip" rumble strips.
- Potential noise impacts should be monitored



TWO-STAGE TURN QUEUE BOX

Two-stage turn queue boxes offer bicyclists a way to make left turns at multi-lane signalized and unsignalized intersections from a cycle track or bike lane.

BENEFITS:

- Designates area for bicyclists waiting to proceed in a different direction and formalizes two-stage turn maneuvers in a predictable pattern
- Reduces turning conflicts between bicyclists and motor vehicles[3]

DESIGN & OTHER CONSIDERATIONS:

- Should be placed in a location downstream of the cross street intersection stop line and downstream of the crosswalk across the cross street
- Multiple positions available, depending on intersection configuration[3]
- Under Interim Approval by FHWA, allowing interim use, pending official rulemaking

INTERSECTION BICYCLE BOX

The bike box is an intersection improvement design to prevent bicycle/vehicle collisions, especially between drivers turning right and bicyclists proceeding forward[1].

BENEFITS:

- Increases the visibility of stopped bicycle traffic at a intersection
- Reduces the number of conflicts between bicyclists and turning motorists at intersections
- Reduces the number of bicycles and motor vehicles encroaching into pedestrian crosswalks when stopped at an intersection
- Can help mitigate intersection right-turn ("right-hook") conflicts

DESIGN & OTHER CONSIDERATIONS:

- Placed at least ten feet in advance of the pedestrian crosswalk or the intersection stop line
- Limited to signalized intersections

BICYCLE PARKING

Bicycle parking provides a location for bicyclists to securely lock or store their bikes. Short-term bicycle parking includes bike racks (inverted U, post and ring) and bike corrals. Long-term parking can include bike lockers and stations[4].

BENEFITS:

- Improves first and last mile connections when installed near bus stops, schools, and parks
- Supports bike upright without putting stress on wheels
- Allows for locking of frame and at least one wheel

DESIGN & OTHER CONSIDERATIONS:

- Placement varies based on facility type
- Long-term bicycle parking more costly to maintain and implement over short-term bicycle parking

SIGNS

Regulatory and advisory signs can be used to convey preferential riding behavior for predictable behavior. Common conflicts with motor vehicle occur when operating a bicycle contrary to the design of the infrastructure (i.e. wrong way riding). R5-1b "WRONG WAY" and "RIDE WITH TRAFFIC" R9-3c[1].

BENEFITS:

- Increases compliance with local traffic regulations and elimiantes visibility derived conflicts at intersections with motor vehicles.
- Encourages cyclists to ride with traffic in a predictable and safe manner.

DESIGN & OTHER CONSIDERATIONS:

- Placement should be considered along split roadways to eliminate wrong way riding on one-way roads and on all other classifications.
- Signs may be mounted back-to-back with other signs to minimize visibility to other traffic[1].

SHARED-USE PATH

Shared-use paths are separated from roadway traffic and offer network connectivity opportunities outside the traditional roadway network. The separated facility provides a pathway for bicyclists, pedestrians, and other non-motorized transportation users to travel on[2].

BENEFITS:

- Provides a low-stress separated facility for active transportation users
- Supports tourism through convenient access to natural areas or as an enjoyable recreational opportunity itself[2]

DESIGN & OTHER CONSIDERATIONS:

- Eight foot minimum for low traffic scenarios[2]
- 12 to 14 feet recommended for heavy use pathway[2]
- Often located in parks, greenbelts, or utility corridors
- Bike only facility noted in "Class I: Bike Path"

SIDEPATH

Sidepaths are bidirectional shared-use paths located immediately adjacent and parallel to a roadway. They can offer a more comfortable experience compared to on-roadway facilities, allow for reduced roadway crossing distances, and maintain community character[2].

BENEFITS:

- Completes networks where high-speed roads provide the only corridors available[2]
- Provides a more appropriate facility for users of all ages and abilities than shoulders or mixed traffic facilities on roads with moderate or high traffic intensity[2]

DESIGN & OTHER CONSIDERATIONS:

- Requires a wide roadside environment to provide for separation and pathway area outside of the adjacent roadway[2]
- Absolute minimum pathway width is eight feet, ten feet prefered minimum. Provide a minimum of two feet of clearance to signposts or vertical elements[2]

BICYCLE & PEDESTRIAN FRIENDLY CORRIDOR

Bicycle and Pedestrian Friendly Corridors establish low stress interior community roadways that offer bicycle and pedestrian priority; inclusions encompass: curb extensions, bike-only access, traffic circles, median islands, and roundabouts. The goal is to calm traffic within this corridor.

BENEFITS:

- Provides for lower stress environment for pedestrians and bicyclists
- Bolsters city connectivity to existing systems

DESIGN & OTHER CONSIDERATIONS:

- Average daily traffic volumes for motor vehicles should be assessed - typically lower ADT corridors have higher suitability for implementation
- Combination of pedestrian and bicycle features should attend to existing attractors to remain locally sensitive to needs
- See further Design Guidelines

OVER- & UNDER-CROSSING

Pedestrian and bicycle overcrossings and undercrossings provide for enhanced connections over/under freeways/highways, rail corridors, and flood channels.

BENEFITS:

- Eliminates barriers for pedestrian and bike transportation (i.e. freeways, or major roads)
- Eliminate need for user to move through intersection

DESIGN & OTHER CONSIDERATIONS:

- Minimum horizontal widths match requirements for Class I or shared-use paths
- ADA requirements impact slope of feature as well as railing height

SIDEWALK

Sidewalks are physically separated from the roadway by a curb or unpaved buffer space, providing dedicated space intended for use by pedestrians that is separated from the roadway, comfortable, and accessible to all.

BENEFITS:

- Enhances pedestrian network connectivity
- Provides safe mode of travel
- Provides opportunities for walking
- Provides connections to neighborhoods and key community destinations

DESIGN & OTHER CONSIDERATIONS:

- Right-of-way availability
- Utility conflicts
- Maintenance costs

CURB RAMP

A curb ramp is a ramp cutting through a curb or built up to it to provide a route to transition from a roadway to a curbed sidewalk and vice versa.

BENEFITS:

- Eliminates the vertical edge of the curb for easy access
- Provides accessibility to people with physical disabilities and who use wheelchairs

DESIGN & OTHER CONSIDERATIONS:

- Must meet specific standards for width, slope, cross slope, placement, and other features in order to be compliant with Title II of the ADA[6]
- Additional detectable warnings are required

MEDIAN REFUGE ISLANDS

Median refuge islands are protected spaces placed in the center of the street to facilitate bicycle and pedestrian crossings.

BENEFITS:

- Provides a protected space for pedestrians and bicyclists to wait for an acceptable gap in traffic
- Reduces the overall crossing length and exposure to vehicle traffic for a bicyclist or pedestrian
- Decreases the amount of delay that a bicyclist will experience to cross a street

DESIGN & OTHER CONSIDERATIONS:

- Right-of-way availability
- Should be at least 4 feet wide (preferably 8 feet wide for accommodation of pedestrian comfort and safety)

HIGH-VISIBILITY CROSSWALK

High-visibility ladder crosswalks provide a designated walkway for pedestrians to cross from one side of a street to the other[3].

BENEFITS:

- More visible to approaching vehicles and have been shown to improve yield behavior[3]
- Creates a more comfortable crossing experience for pedestrians[3]

DESIGN & OTHER CONSIDERATIONS:

- Supplemental measures may be required to reduce traffic speeds, shorten crossing distances, and/or provide an active warning of pedestrian presence
- Site location and pedestrian demand
- Engineering judgment may be required to assess need
- Yellow school crosswalks are to be installed within 500 ft of school

PUSH BUTTONS

Pedestrian push buttons are electronic buttons used by pedestrians to change traffic signal timing to accommodate pedestrian street crossings[7].

BENEFITS:

- Provides pedestrians at a traffic signal with sufficient time to cross a roadway

DESIGN & OTHER CONSIDERATIONS:

- Shall clearly indicate which crosswalk signal is actuated by each pedestrian pushbutton
- Are not needed if pedestrian recall is already in place for the traffic signal.
- Refer to MUTCD Chapter 4E. Pedestrian Control Features for specific design standards

PEDESTRIAN SIGNAL

Pedestrian signal heads provide special types of traffic signal indications exclusively intended for facilitating pedestrian traffic - consisting of illuminated symbols of a walking person, upraised hand, and countdown timer[8].

BENEFITS:

- Indicates to pedestrians when to cross, when not to cross, and how many seconds are left to cross

DESIGN & OTHER CONSIDERATIONS:

- Need to have pedestrian push button to supplement it
- Refer to MUTCD Chapter 4E. Pedestrian Control Features for specific design standards

MID-BLOCK CROSSING

Midblock crosswalks facilitate crossings to places that people want to go but that are not well served by the existing traffic network.

BENEFITS:

- Allows pedestrians to cross in the middle of a long block without walking all the way to a signalized intersection crosswalk

DESIGN & OTHER CONSIDERATIONS:

- Pedestrian demand for the facility
- May be supplemented with traffic control devices for optimal effect
- Design needs to consider stopping sight distances, effects of grade, cross slope, need for lighting, and other factors, making use of warrants similar to those used for standard intersections

ADVANCED YIELD LINES

Advanced yield lines are roadway markings that encourage drivers to slow down in advance when approaching a pedestrian crossing and provides guidance as to where drivers should wait while a pedestrian is crossing.

BENEFITS:

- Offers more visibility of pedestrians crossing the roadway
- Reduces the likelihood of multiple-threat crashes

DESIGN & OTHER CONSIDERATIONS:

- Must be supplemented with a crosswalk that is 20-50' from the facility and R1-5 or R1-5a MUTCD signage

SPEED FEEDBACK SIGN

A dynamic message sign that uses radar or laser technology to determine the speed of an approaching vehicle and then displays the speed to the driver. If motorists are speeding, the sign flashes the exceeded speed along with 'SLOW DOWN' or 'YOUR SPEED'.

BENEFITS:

- Activates when drivers exceed posted speed limit by five miles per hour
- Can be effective in reducing motorist speeds on wide roadways

DESIGN & OTHER CONSIDERATIONS:

- Physical constraints include requiring a special type of pole, space for footing, and if the signs are not solar — a source of electricity

PHB

A pedestrian hybrid beacon (PHB) is a traffic control device used to increase motorists' awareness of pedestrian crossings at uncontrolled marked crosswalk locations. A PHB is distinct from pre-timed traffic signals and constant flash warning beacons because it is only activated by pedestrians when needed[10].

BENEFITS:

- PHBs can lead to lower conflict and crash rates for pedestrians and vehicles[10]
- Clearly indicates that a crosswalk is being used and that all motorists must come to a complete stop[10]

DESIGN & OTHER CONSIDERATIONS:

- Should be located outside the functional area of a signalized intersection[10]
- CA MUTCD allows for installation at intersections or driveways, turn lanes may be present[1]
- In addition to the signal head displays, stop lines and marked crosswalks are required at PHB crossings. Advance stop lines should be used on multi-lane crossings to reduce the potential for multiple-threat crashes[10]

RRFB

Rectangular rapid flash beacons (RRFBs), a type of active warning beacon combine a pedestrian warning sign with user-activated light-emitting diodes (LEDs). The device flashes amber when activated through a pedestrian push button or by pedestrian detection.

BENEFITS:

- Increases driver yielding behavior at crossings because they use an irregular flash pattern similar to emergency flashers on police vehicles

DESIGN & OTHER CONSIDERATIONS:

- Use in combination with a crosswalk, wheelchair ramps, advance warning signs or pavement markings, and overhead lighting
- Usually implemented at high-volume pedestrian crossings

CURB EXTENSION

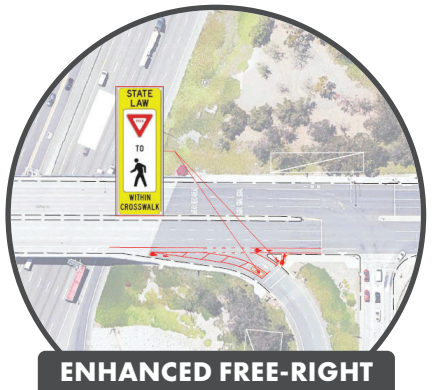
Curb extensions visually and physically narrow the roadway, creating shorter crossings for pedestrians while increasing the available space for street furniture, benches, plantings, and street trees.

BENEFITS:

- Improves ability of pedestrians and motorists to see each other
- Reduces speed of turning vehicles
- Shortens pedestrian crossing distances

DESIGN & OTHER CONSIDERATIONS:

- Appropriate where there is an on-street parking lane
- May require relocation of fire hydrants to maintain adequate curbside access in case of a fire and/or relocation of other existing underground utilities
- Impacts on drainage



ENHANCED FREE-RIGHT TURN CROSSING

Enhanced free-right turn crossings aid pedestrian and bicycle traffic with traffic calming features to decrease vehicle speeds. This can be accomplished via lane reduction into and out of the on and off ramps, advanced warning signs/beacons of pedestrian and/or bicycle traffic, and raised islands.

BENEFITS:

- Decreased crossing distance for bicylists and pedestrians via lane reduction
- Additional crossing option support for bicyclists of all ability levels (straight through intersection or to cross with pedestrians)
- Advanced warning for motorists

DESIGN & OTHER CONSIDERATIONS:

- Conflict zones should comply with minimum MUTCD Standards[1]
- Ramp geometry reconfiguration may require Caltrans coordiantion
- May require relocation of existing underground utilities

ROUNDABOUT

Roundabouts eliminate signalized or all-way-stop controlled intersections, replacing these devices with yield signs and markings to optimize traffic flow. Pedestrians benefit from having decreased crossing distances, and bicyclists benefit from either a by-pass option and/or elimination of right-angle collisions.

BENEFITS:

- Allows motorists and bicyclists to yield instead of making complete stops, improving travel times
- Reduces vehicle speeds
- Eliminate right-angle collisions between bicyclists and motorists
- Decreased pedestrian crossing distances

DESIGN & OTHER CONSIDERATIONS:

- Rounabout provision of a by-pass option for bicyclists should be considered based on ADT, number of lanes/width, and anticipated vehicle speeds
- Ensure landscaping does not impede visibility of pedestrians, bicyclists, and other motor vehicles
- May require relocation of existing underground utilities and alteration of the number of lane and widths

5.2 NETWORK RECOMMENDATIONS

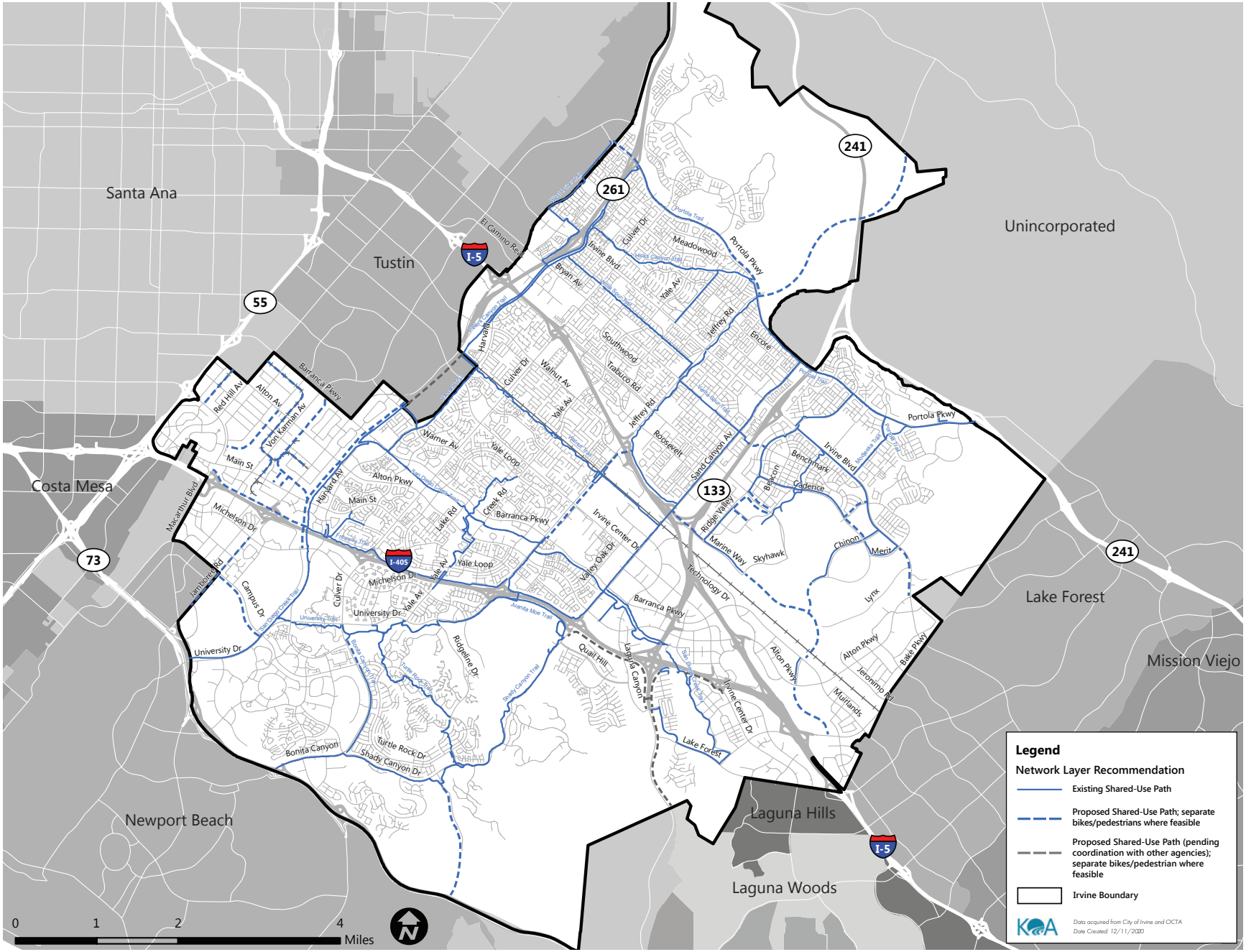
The ISATP presents a multi-layer approach to network recommendations for both bicyclists and pedestrians. The variety of user ages, ability levels, and travel types impacted the resulting network recommendations. The ISATP's network builds off the findings of the existing conditions in ***Section 2.6***, where existing bicycle and pedestrian conditions are showcased. Through community outreach efforts the project team prepared recommendations that are community-driven, highlighting their needs. The network recommendations are a composite of off- and on-street pedestrian and bicycle infrastructure for local and regionally significant systems and grade separated and safety improvement locations.

OFF-STREET SHARED-USE PATH

Off-street shared-use paths are proposed along utility easements, abandoned rail corridors, newly planned or development areas, existing informal paths without facilities, and to close gaps in the network - ***Figure 5.2.1***. This layer presents multiple opportunities for gap closures. As an example, along the east side of Jeffrey Road between Barranca Parkway and Walnut Trail, a major north/south gap closure is planned. The IBC off-street path system, although highlighted in the separately developed IBC Vision Plan, is planned along flood channels and rail corridors. The recommendations therein present feasible options that can coexist with the existing flood channels or convert old rail lines into paths.

Growth in the City's northern area presents an opportunity for the implementation of the ISATP planned shared-use paths. This will bolster the area's connections to the off-street network. Lastly, the Irvine train station is central to developmental expansion, presenting an opportunity to implement facilities in tandem with new roadway expansions into the Orange County Great Park and towards the south of the station.

Figure 5.2.1 Off-Street Network Recommendations



ON-STREET FACILITIES

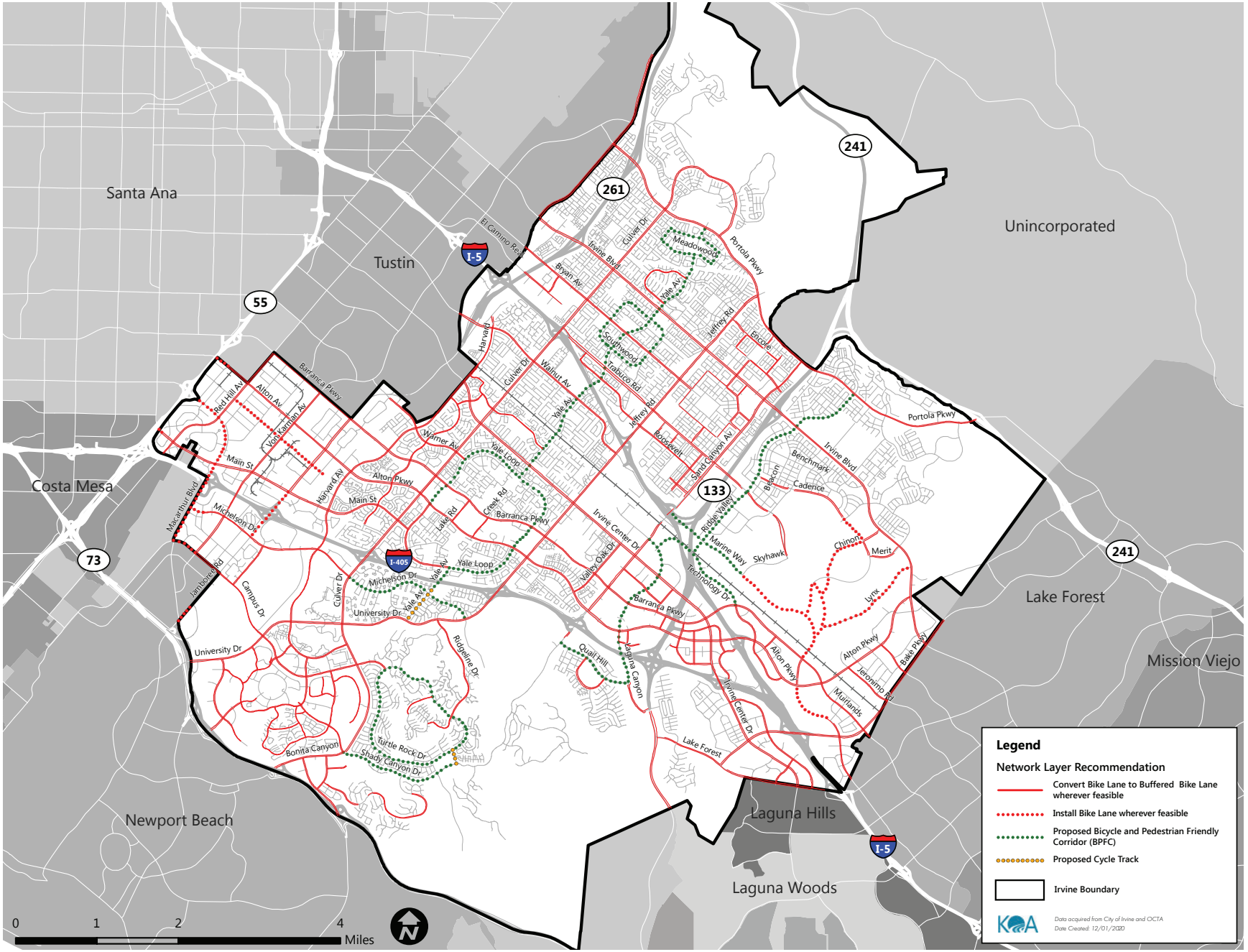
Irvine is well known for its expansive on-street bike lanes however, through community outreach efforts, the project team was able to understand barriers to comfortable travel along corridors with existing facilities. As such, network recommendations represent attention to these barriers and seek to mitigate through planned facility implementation - ***Figure 5.2.2***. Some areas within the City remain without bike lanes, and these locations and improvements are identified within the ISATP. Where standard bike lanes are present, the proposed network recommends conversion of the standard bike lane to a buffered bike lane facility to establish lateral separation between bikes and vehicles via marked pavement striping where feasible. This treatment is locationally justified via the LTS modeling conducted in ***Section 2.5***, which highlights corridors that have higher exposure to vehicular traffic, and is in line with community needs outlined in ***Section 3.2***.

Furthermore, LTS modeling was also helpful in highlighting corridors that are theoretically "more comfortable" and to present an opportunity for Bicycle and Pedestrian Friendly Corridor (BPFC) features. An ideal BPFC is characterized by lower ADT volumes and lower traffic speed with locally significant bicycle and pedestrian demand. As such, the BPFC network seeks to provide traffic calming infrastructure that prioritizes bicycle and pedestrian travel over vehicular traffic. These features include crossing support for pedestrians, possible lane reductions for vehicular traffic, bicycle facilities with lateral separation from vehicular traffic, advanced warning signage and flashers for pedestrian movements, and intersection control improvements (i.e. roundabouts).

Lastly, new to Irvine is consideration of a cycle track scenario that links part of Yale Avenue from an existing off-street shared-use path to a freeway grade separated crossing. This facility type provides separation (shown further in ***Chapter 5.3***) from vehicular traffic.

DISCUSSION: While parking against the curb where a bike lane is present is prohibited per the California Vehicle Code, voluntary compliance can be increased with the addition of CA MUTCD signs along the bike lane (R7-9a) that show a No Parking symbol and read "BIKE LANE". These can be place at regular intervals. Active enforcement can be made via local public safety officers on patrol.

Figure 5.2.2 On-Street Network Recommendations



POTENTIAL PEDESTRIAN AND BICYCLE GRADE SEPARATION, SAFETY, AND BRIDGE LOCATIONS

Potential improvements are identified at specific locations that can enhance access to existing and proposed off-street facilities. As shown in ***Figure 5.2.1***, a network of existing and proposed off-street facilities form a foundational network in the City. The proposed bicycle and pedestrian bridge locations, potential other grade separation locations, and potential safety improvement locations all encompass differing inclusions, however, each are fundamental to the complete function of the network. The City has identified key bicycle and pedestrian bridge additions that once complete allow users access over large freeways/highways, where otherwise travel would be constrained. Other grade separation locations exist across the city, these potential locations can eliminate less desirable grade crossing with motor vehicles. Safety improvement locations are identified for further consideration on mitigation strategies that can enhance bicycle and pedestrian transportation at and through these locations. ***Figure 5.2.3*** shows these locations mentioned herein.

COLLATERAL MOBILITY CONSIDERATIONS

E-Mobility

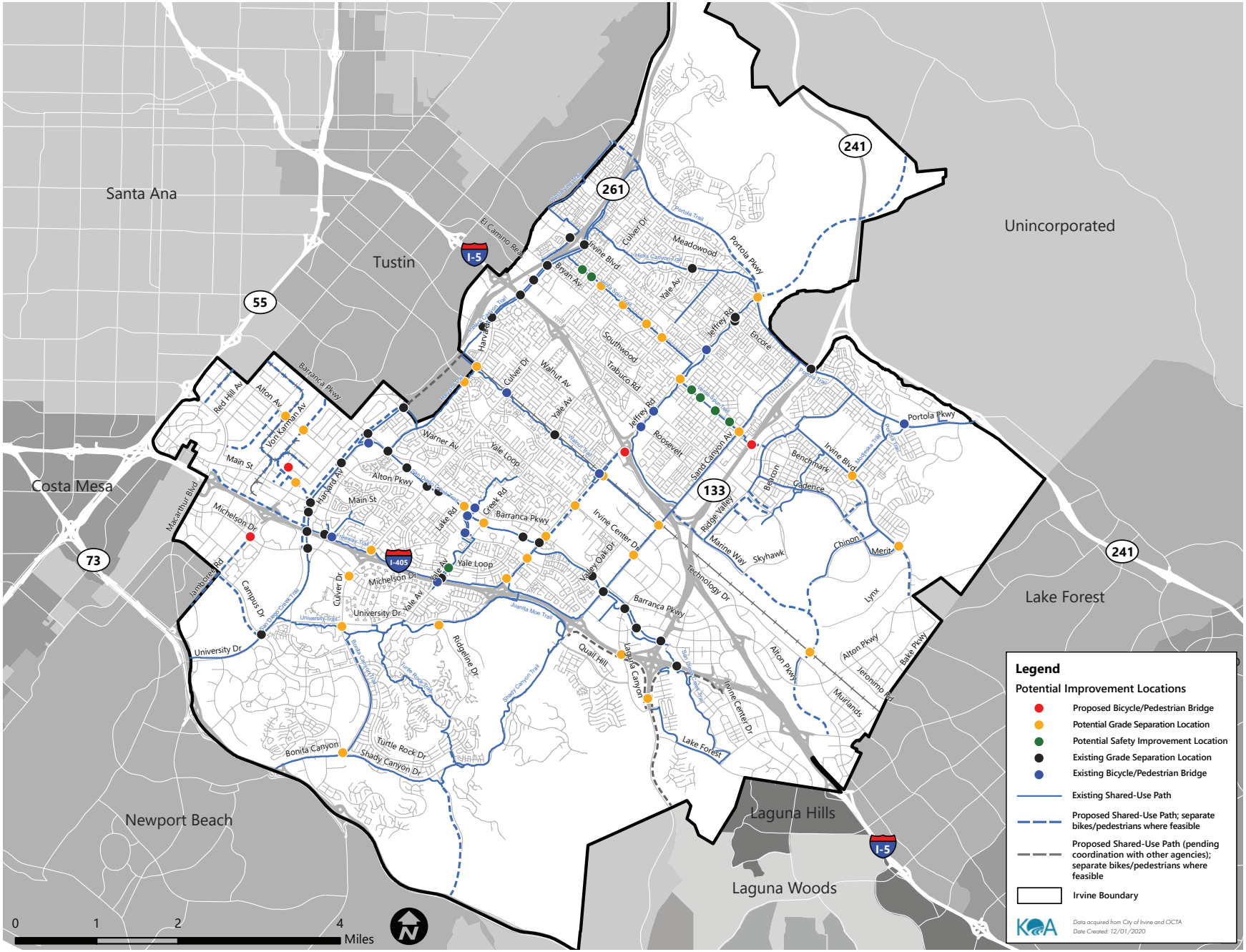
The ISATP recognizes the use of City active transportation facilities by both e-bikes and e-scooters to the extent that they are legally allowed as defined by the California Vehicle Code and/or the City Municipal Code. Further discussion is available in ***Appendix A*** (D117-D122).

Bus Turnouts

Bus turnouts are a recessed curb area that allows buses to pull out of traffic when picking up or dropping off passengers. Bus turnouts have advantages and disadvantages. They provide convenience to car and bike traffic by allowing traffic to flow around stopped buses. Bus turnouts impede bus operations, however, as they make it more difficult for buses to re-enter traffic and can cause buses to be delayed.

For new projects, under the development review process, the City asks developers to add turnouts where appropriate. Orange County Transportation Authority guidelines indicate that turnouts are warranted where passenger boardings exceed 20 per hour or where the bus dwell time exceeds 30 seconds. When added, bus turnouts should provide adequate room to make sure that the bike lanes are clear from stopped buses.

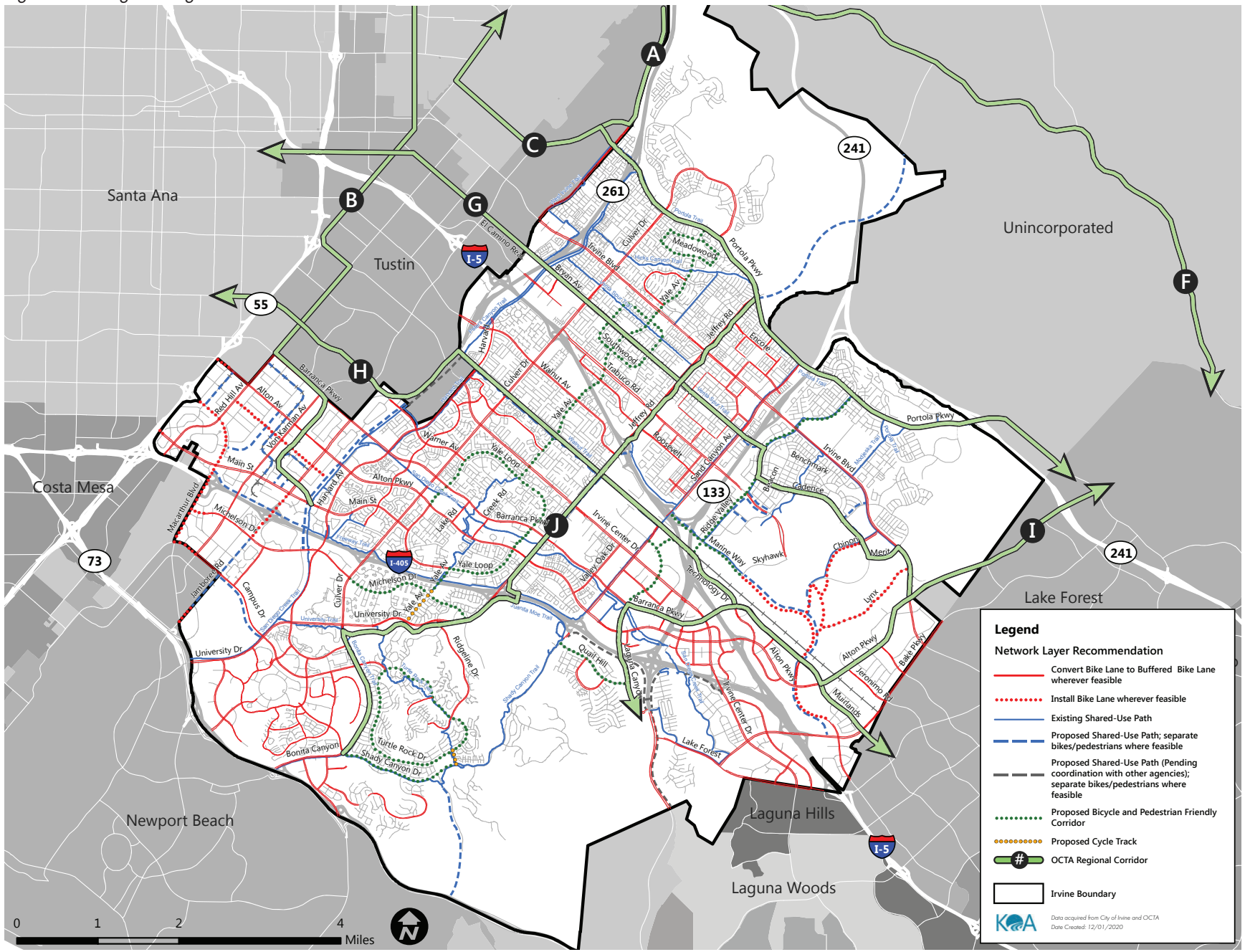
Figure 5.2.3 Potential Bicycle and Pedestrian Grade Separation, Safety, and Bridge Locations



REGIONAL NETWORK

The OC Foothills Bikeways Strategy (2016) plans for and prioritized a dozen corridors through Orange County that overlap with the City of Irvine. ***Figure 5.2.4*** shows where the regional corridors overlap City corridors. Planning efforts as part of the ISATP recognize that jurisdictions overlap and thus contribute to the OC Foothills Bikeways Strategy planning goals. Both on- and off-street network features overlap with "regional" plans as well as ISATP network recommendations. Coordination between OCTA, Caltrans, other agencies, and the City is integral to the accomplishment of a County-significant network. Regional corridors that overlap Irvine are discussed in ***Section 2.2*** and shown in ***Figure 2.2.8***.

Figure 5.2.4 Regional Significant Network Recommendations



5.3 CORRIDOR RECOMMENDATIONS AND CONCEPT PLANS

The corridor recommendations and concept plans prepared for the ISATP represent a culmination of pedestrian and bicycle planning that balances public concerns and engineering best practices. A total of seventeen planning-level concept plans are prepared along seven corridors at ten unique locations, which showcase treatments and alternatives for consideration. While actual corridors and intersections were utilized for purposes of drafting specific intersection or corridor scenarios, these plans have broad-reaching applications to similar scenarios city-wide.

Concept plans can be used for future pedestrian and bicycle spot improvements or corridor enhancement applications. The concept plans showcase typical improvements for enhanced pedestrian crossings, enhanced intersection movement for bicyclists, stop control conversion to roundabouts, traffic operation strategies, buffered bike lanes, cycle tracks, bicycle and pedestrian friendly corridor, and intersection strategies.

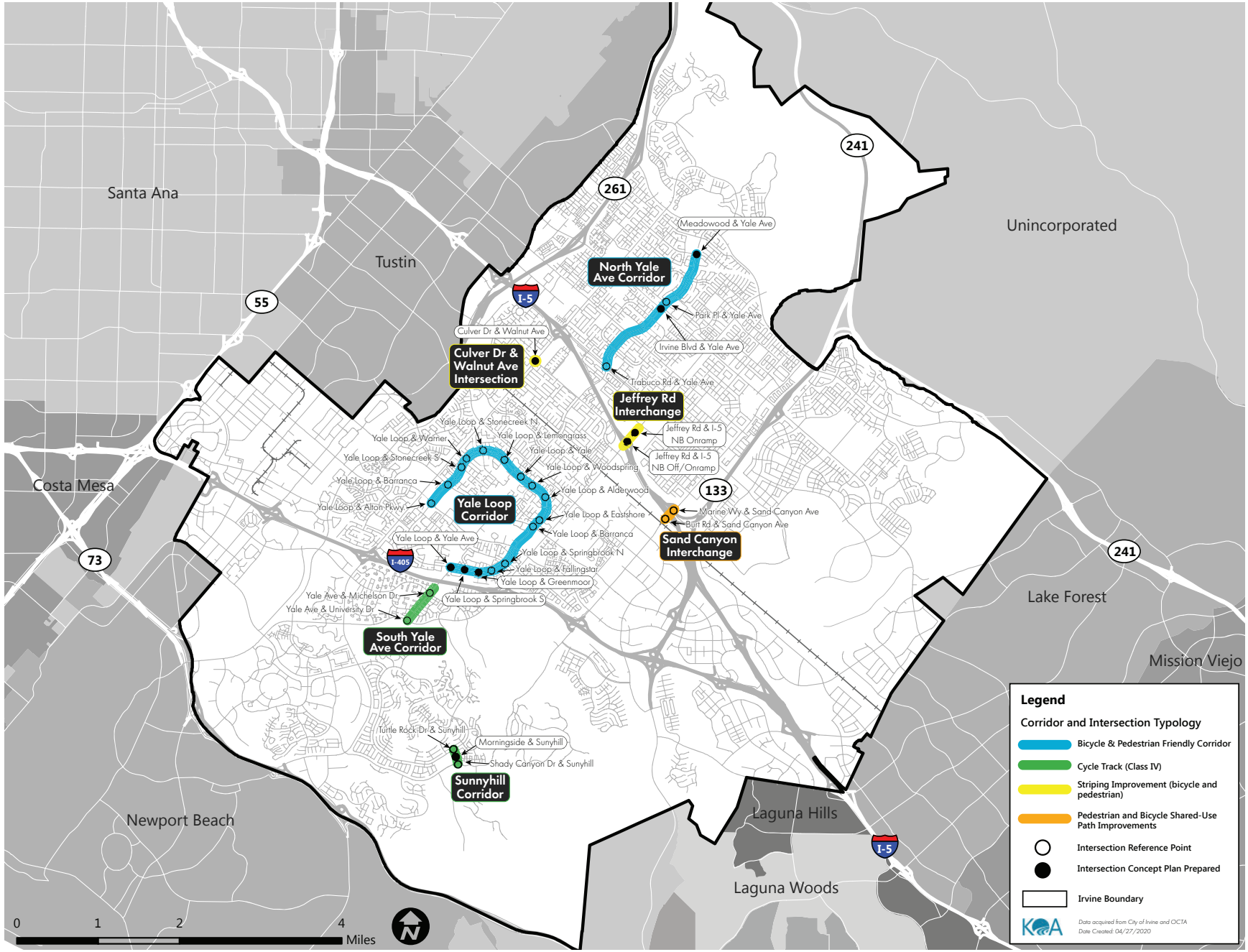
Alternative concept plans are available to display options for consideration by the City as projects are selected to advance through the project development phases (i.e., feasibility studies, environmental review, preliminary engineering, final engineering, and construction).

Figure 5.3.1 details the proposed corridors which are color-coded based on features represented within the concept plans. Furthermore, reference intersections are called out to help with user orientation on the overview map - a "corridor snapshot" map is provided for each concept plan sheet. Intersections along corridors where a detailed concept plan is provided are called out. The following are the represented projects within the ISATP and their corresponding treatments:

- North Yale Avenue Corridor - Bicycle and Pedestrian Friendly Corridor
- Yale Loop Corridor - Bicycle and Pedestrian Friendly Corridor
- Sunnyhill Corridor - Cycle Track
- South Yale Avenue Corridor - Cycle Track
- Culver Drive and Walnut Avenue Intersection - Striping Improvement (bicycle and pedestrian)
- Jeffrey Road at 1-405 Interchange - Striping Improvement (bicycle and pedestrian)
- Sand Canyon Interchange - Pedestrian and Bicycle Off-Street Shared-Use Path Improvements

NOTE: Concept plans presented within the ISATP should not be considered final. These concepts are subject to additional design and constructibility review, as well as community input.

Figure 5.3.1 Corridor Typology and Concept Plan Location Overview Map



NORTH YALE AVENUE CORRIDOR

INTERSECTION OVERVIEW

Meadowood and Yale Avenue is positioned in the north-central sector of the City along the **NORTH YALE AVENUE CORRIDOR**. The corridor is planned as a Bicycle and Pedestrian Friendly Corridor (BPFC).

Major arterial roadways in the vicinity include Portola Parkway to the north, Culver Drive to the west, Jeffrey Road to the east, and Irvine Boulevard to the south.

Yale Avenue is classified under the MPAH as a mix between Commuter Highway and Primary Highway roadway designations. Operationally Yale Avenue is characterized as a Collector roadway. Average Daily Traffic (ADT) volumes are noted to be in the 8,000 vehicles per day range, according to a three-year average study conducted by the City between 2015 and 2017.

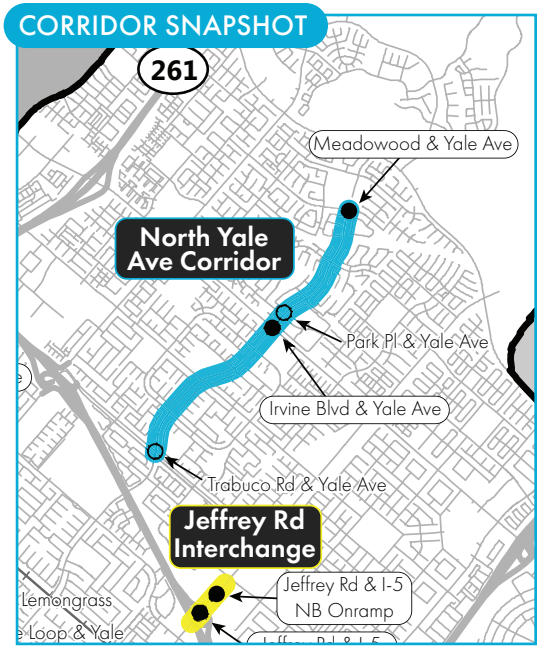
Meadowood is classified as a "Commuter Highway" per the City's MPAH with ADT volumes less than 10,000 vehicles per day. Operationally Meadowood is characterized as a Collector roadway.

Meadowood Park is located immediately north of the intersection between Meadowood and Yale Avenue, as well as Canyon View Elementary School.

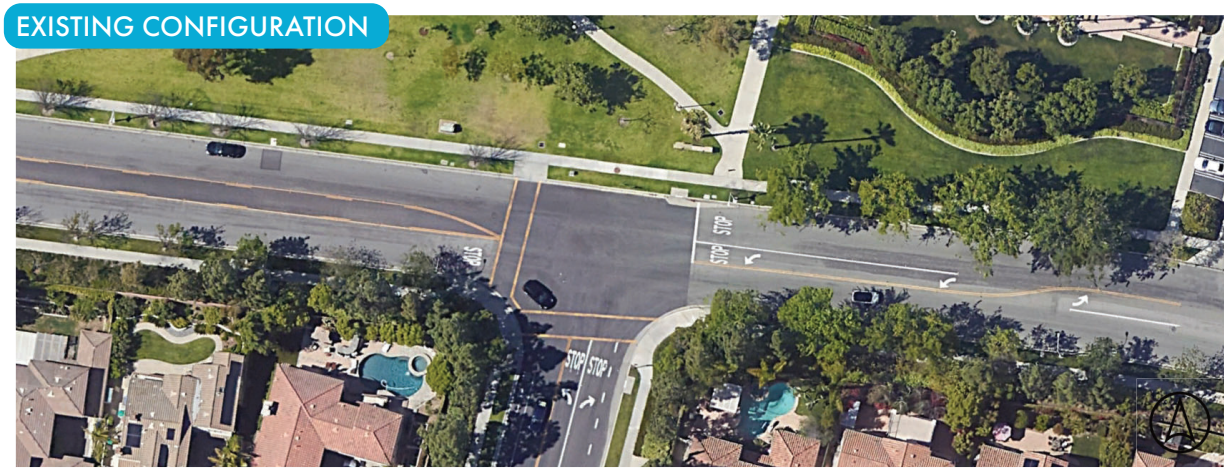
PROPOSED TREATMENTS

- Stop bar relocation behind existing crosswalk and installation of new crosswalk where none exists currently; reposition pavement arrow markings
- Provide curb extension on the southeast corner of the intersection to extend north and west
- Reposition bicycle lane between left and right turn lanes from being curb adjacent on northbound Yale Avenue
- Install curb cut for north and south moving bicycle traffic along Yale Ave across the intersection with Meadowood
- Provide intersection conflict zone pavement markings with green backed bicycle symbol with arrow markings
- Install curb ramp at the northeast corner; widen sidewalk to curb face along the north side of Meadowood between pedestrian crosswalks
- Install stop sign for southbound bicycle traffic; install advisory sign (R9-3) that restricts pedestrian from crossing at bicycle ramps; install BIKE ROUTE (D11-1) sign with directional arrows

CORRIDOR SNAPSHOT

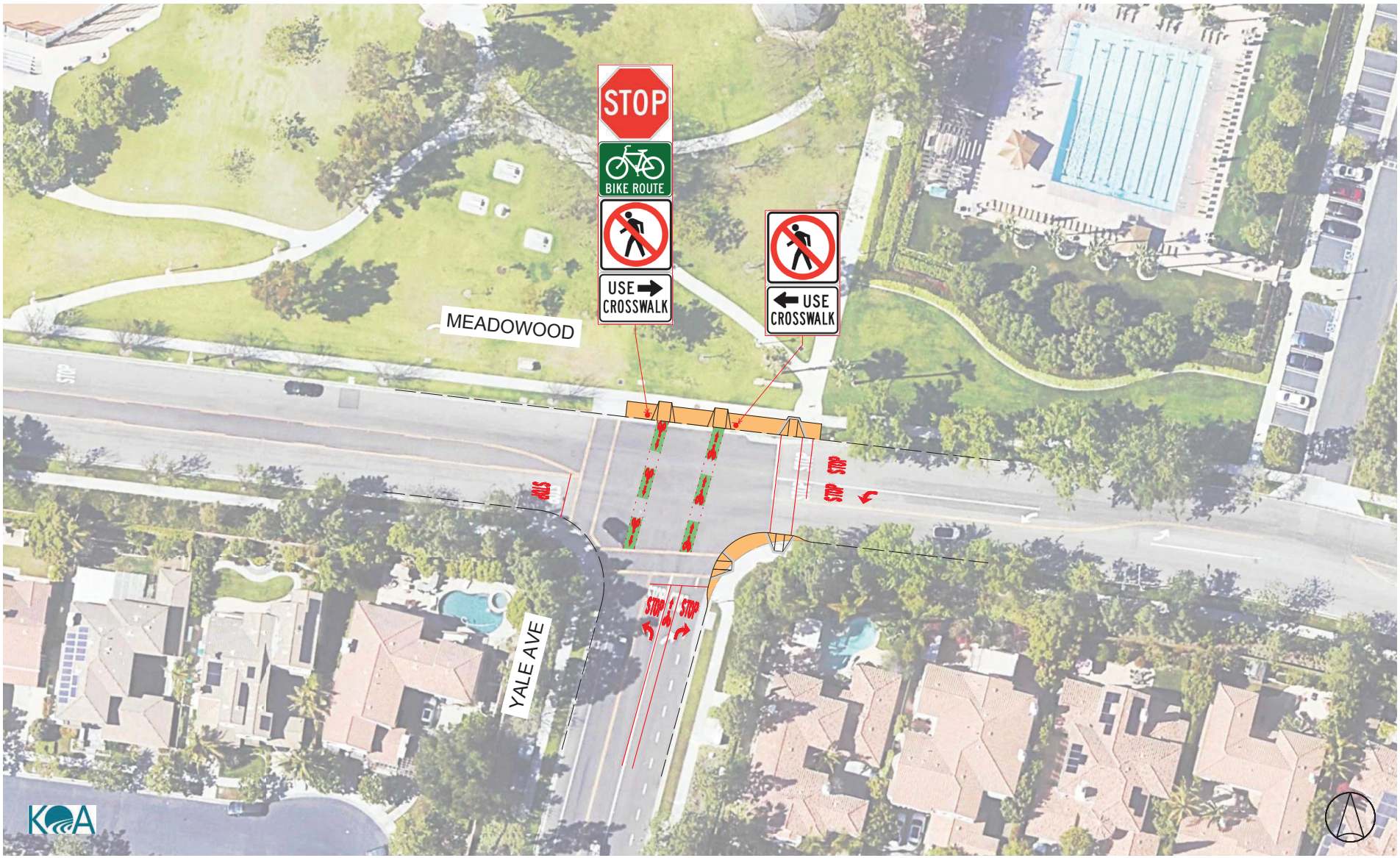


EXISTING CONFIGURATION



Meadowood and Yale Avenue

RECOMMENDATION CONCEPT SHEET



NORTH YALE AVENUE CORRIDOR

INTERSECTION OVERVIEW

Irvine Boulevard and Yale Avenue is an intersection located within the north-central sector of the City along the **NORTH YALE AVENUE CORRIDOR**. The corridor is planned as a Bicycle and Pedestrian Friendly Corridor (BPFC).

Major arterial roadways within the proximity of this intersection include Jeffrey Road to the east, Culver Drive to the west, and Portola Parkway to the north.

Operationally Irvine Boulevard is characterized as a "Thruway" with Average Daily Traffic (ADT) Volumes between 26,000 and 27,000 vehicles per day, according to a three-year average study conducted by the City between 2015 and 2017. Under the MPAH, Irvine Boulevard is planned as a "Major Highway 6-Lanes".

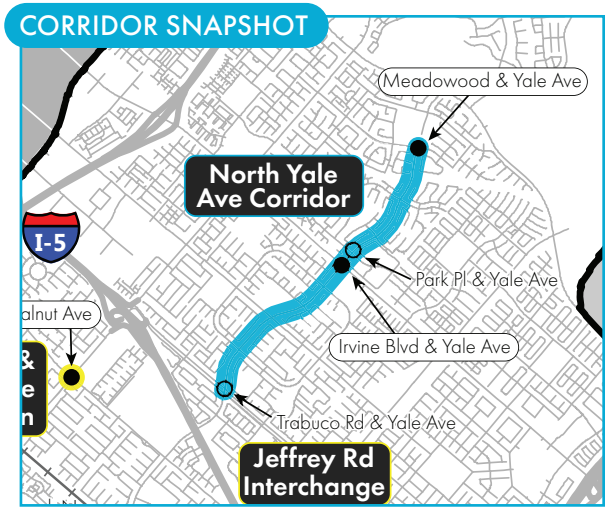
Yale Avenue is designated under the MPAH as a "Primary Highway". Operationally Yale Avenue is characterized as a Collector roadway. ADT volumes are noted to be in the 8,000 vehicles per day range.

Schools within the vicinity of this intersection include Santiago Hills Elementary, Eastwood Elementary, and Sierra Vista Middle. Eastwood Neighborhood Park, Northwood Community Park, and Silkwood Park are within close proximity to the intersection.

PROPOSED TREATMENTS

- Provide crosswalk refuge islands for pedestrian crossings for the west and east legs of the intersection
- Provide pedestrian push buttons that are reachable from the median island space
- Provide bicycle lane striping through the intersection for all movements
- Install high visibility ladder style crosswalk at each leg of the intersection
- Pull back the north and south legs raised curb to allow for uninterrupted pedestrian crossing

CORRIDOR SNAPSHOT



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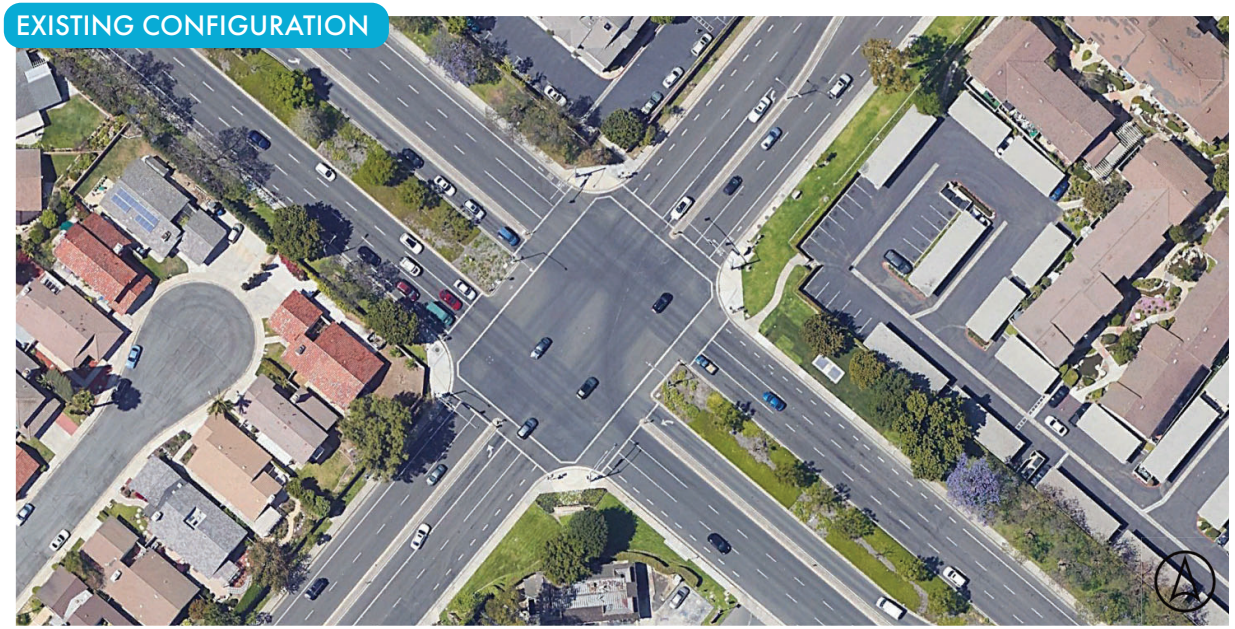
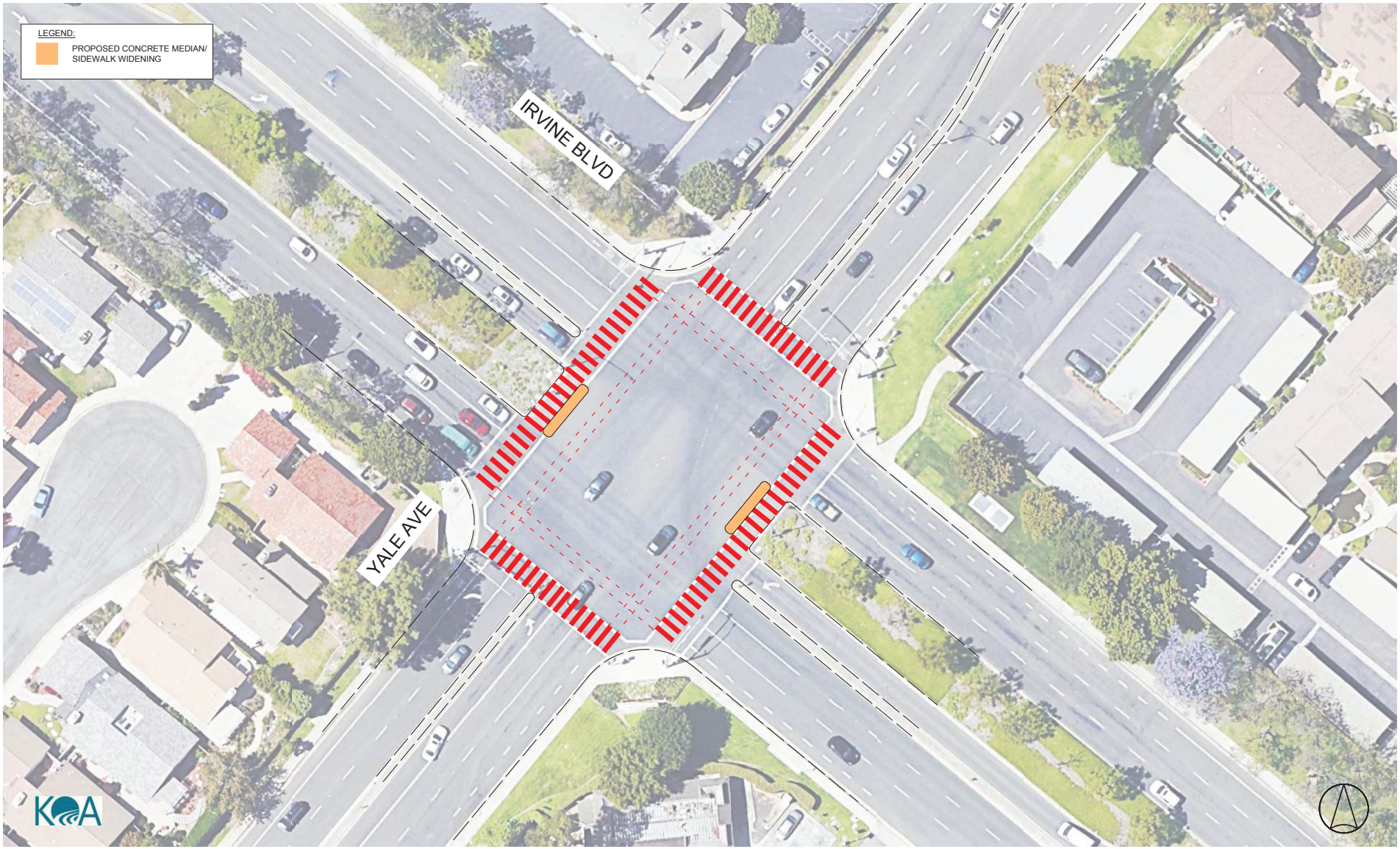


Irvine Boulevard and Yale Avenue

RECOMMENDATION CONCEPT SHEET



YALE LOOP CORRIDOR

INTERSECTION OVERVIEW

Yale Loop and Yale Avenue is an intersection located within the central section of the City, just north of I-405 along the **Yale Loop Corridor**. The corridor is planned as a Bicycle and Pedestrian Friendly Corridor (BPFC).

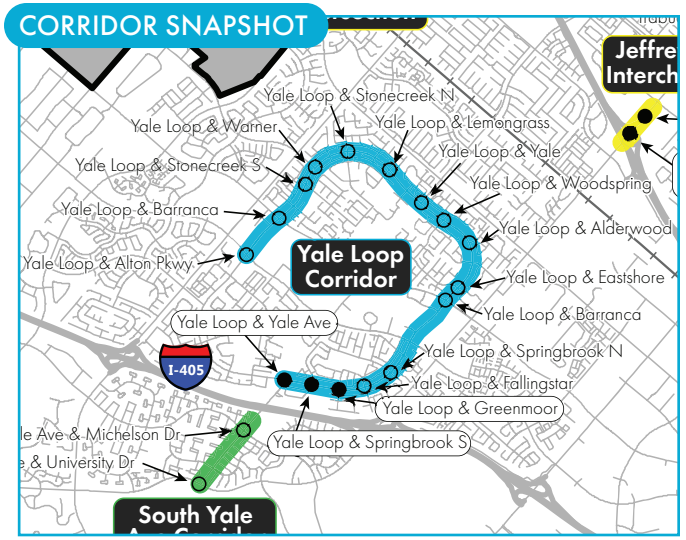
Major arterial roadways within close proximity of the intersection include Culver Drive to the west, Alton Parkway to the north, and University Drive/Jeffrey Road to the east. The Average Daily Traffic (ADT) volumes along Yale Loop within the study area are between 5,000 and 9,000 vehicles per day according to a three-year average study conducted by the City between 2015 and 2017. ADT volumes along Yale Avenue are anticipated to be much lower since through vehicle access is restricted by the pedestrian only freeway overpass. Yale Loop is classified as a "Secondary Highway" according the City's MPAH, and is operationally characterized as a "Collector" roadway. Yale Avenue within the study area is classified as a "Commuter Highway" according to the City's MPAH, and is operationally characterized as a "Collector" roadway.

Schools in close proximity to the study intersection include Springbrook Elementary, Meadow Park Elementary, and South Lake Middle. Mike Ward Community Park is the closest facility to the study intersection as well as intra-neighborhood parks and recreation facilities.

PROPOSED TREATMENTS

- *Alternative A:* Install high visibility crosswalk, ADA curb ramp, yield lines, signage, and rectangular rapid-flashing beacon or other traffic control device
- *Alternative B:* Install high visibility crosswalks, ADA curb ramps, yield lines, signage, RRFB, and add 2' buffer to bike lane
- *Alternative C:* Install mini-roundabout; Convert existing two lane roadway into one lane each way with buffered bike lane and painted separation markings east of the intersection; Provide for enhanced pedestrian and bicyclist crossing with median islands and curb extensions that are a part of the mini-roundabout; & At pedestrian and bicycle conflict points install yield line marking and bicyle yield signage

CORRIDOR SNAPSHOT



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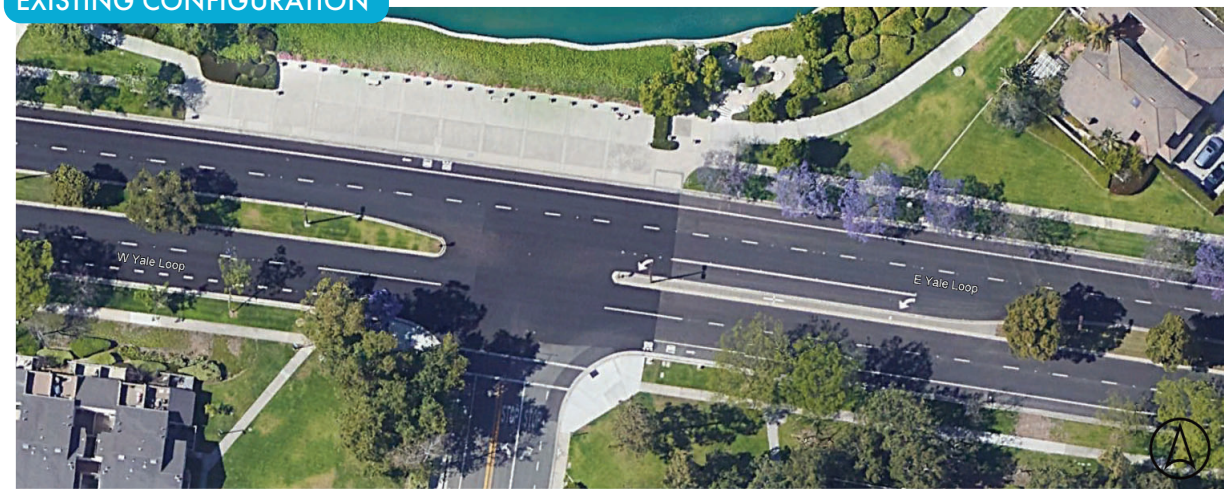
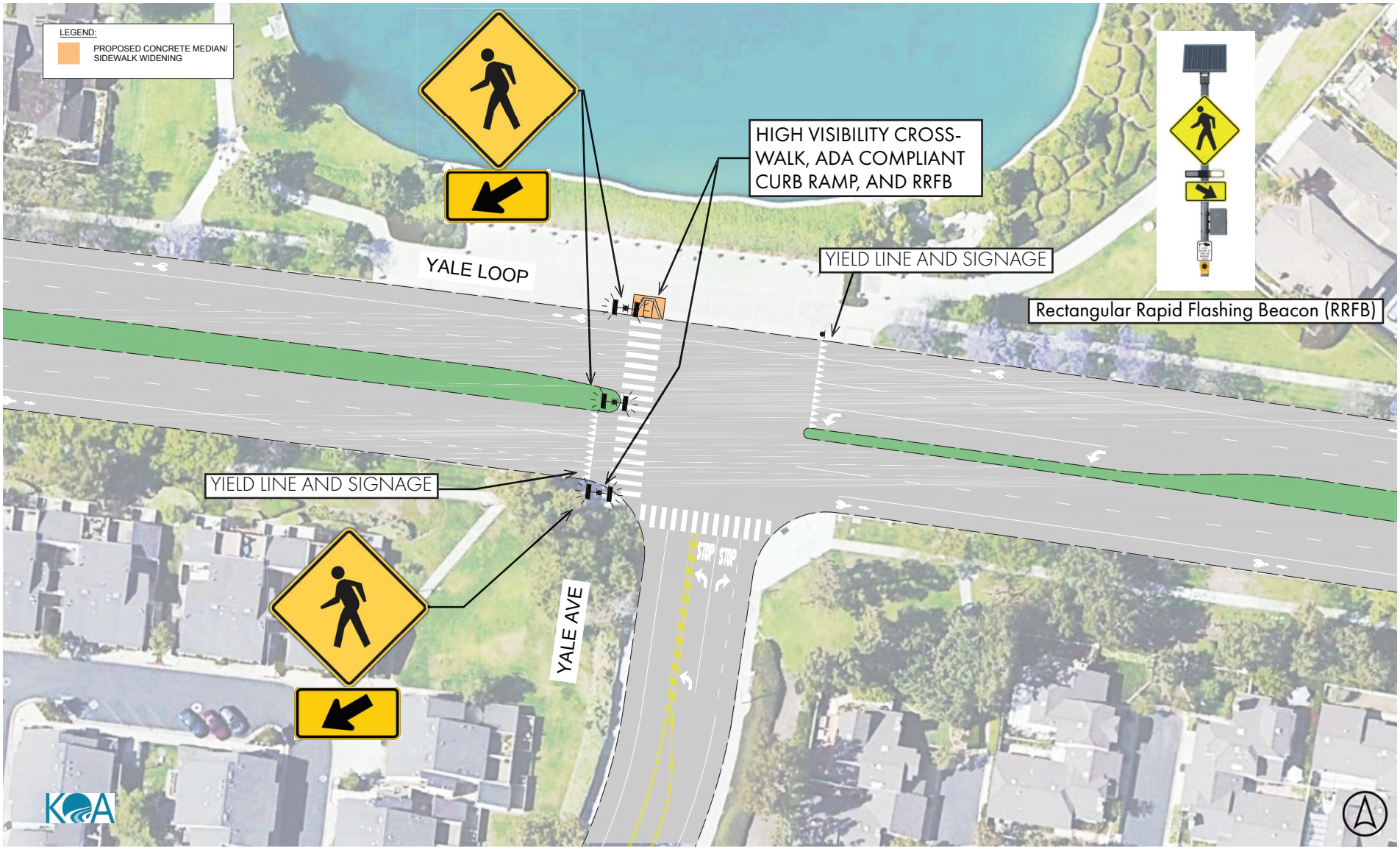


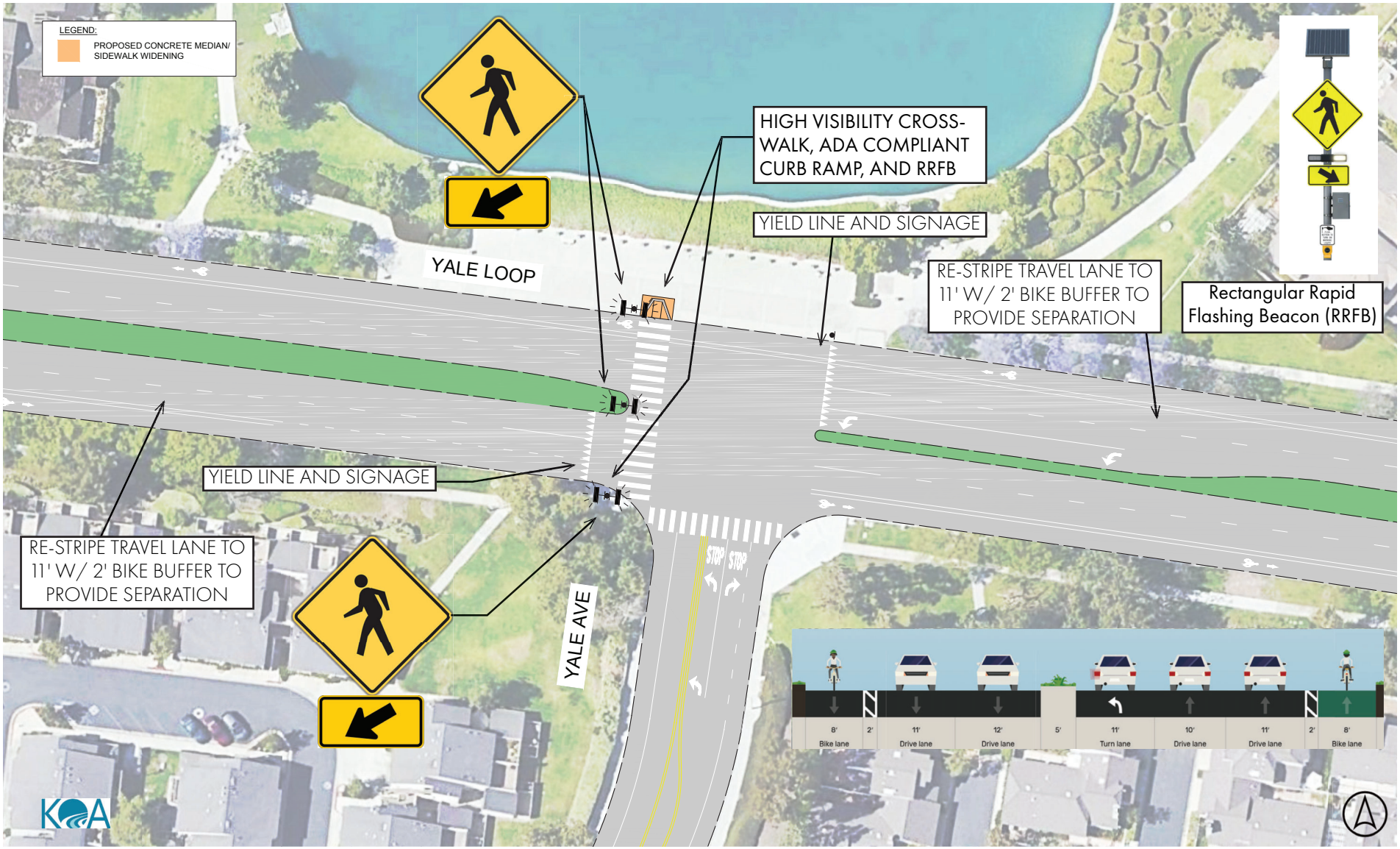
Yale Loop and Yale Avenue: Alternative A

RECOMMENDATION CONCEPT SHEET



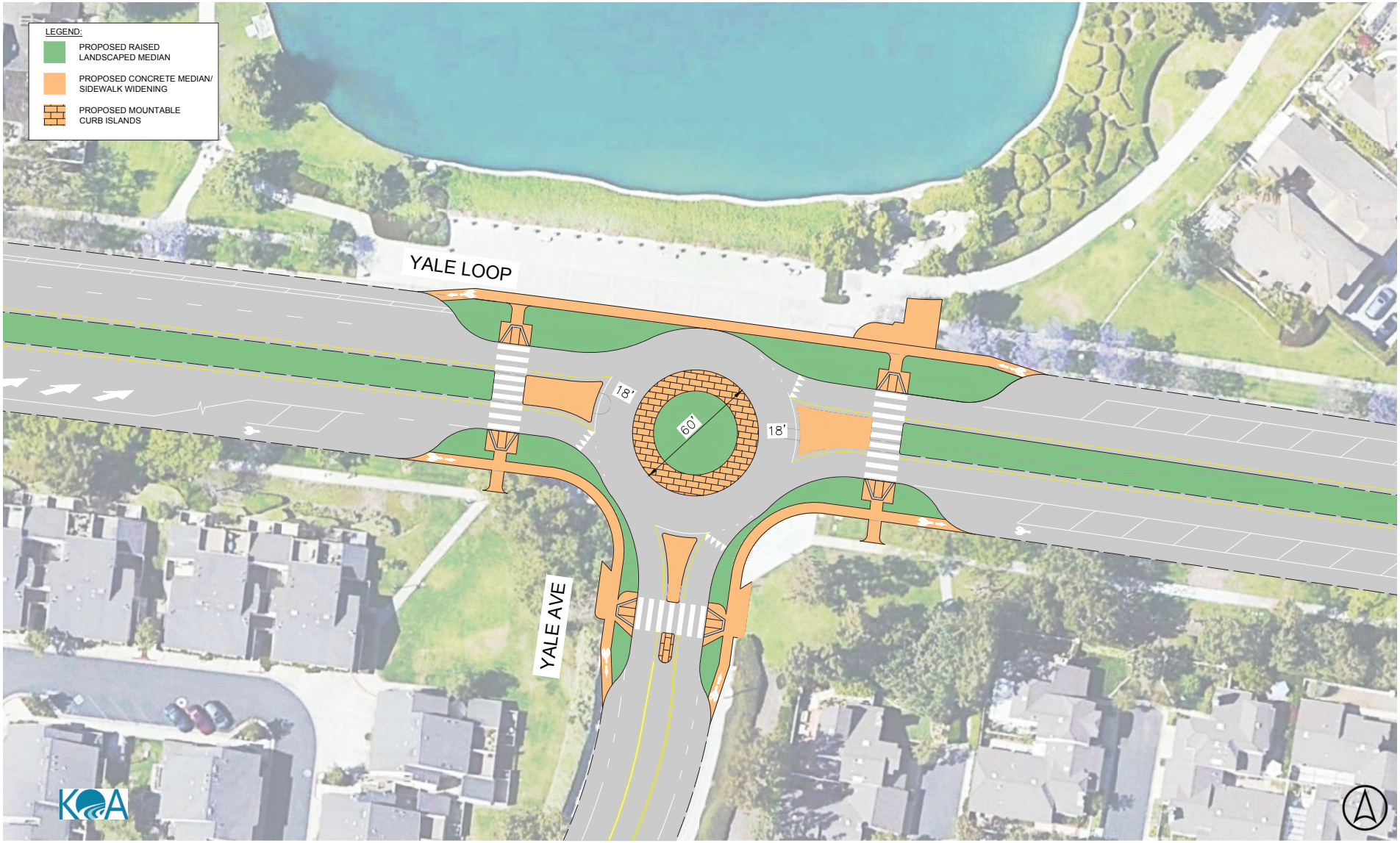
Yale Loop and Yale Avenue: Alternative B

RECOMMENDATION CONCEPT SHEET



Yale Loop and Yale Avenue: Alternative C

RECOMMENDATION CONCEPT SHEET



YALE LOOP CORRIDOR

INTERSECTION OVERVIEW

Yale Loop and Springbrook South is located within the central portion of the City along the **YALE LOOP CORRIDOR**. The corridor is planned as a Bicycle and Pedestrian Friendly Corridor (BPFC).

Major arterial roadways within the vicinity of this intersection include: Culver Drive to the west, Alton Parkway to the north, and Jeffrey Road to the east.

Yale Loop within the focus area is planned under the MPAH as a "Secondary Highway". Operationally Yale Loop is characterized as a Collector roadway and exhibits Average Daily Traffic (ADT) volumes around 5,000 vehicles per day, according to a three-year average study conducted by the City between 2015 and 2017.

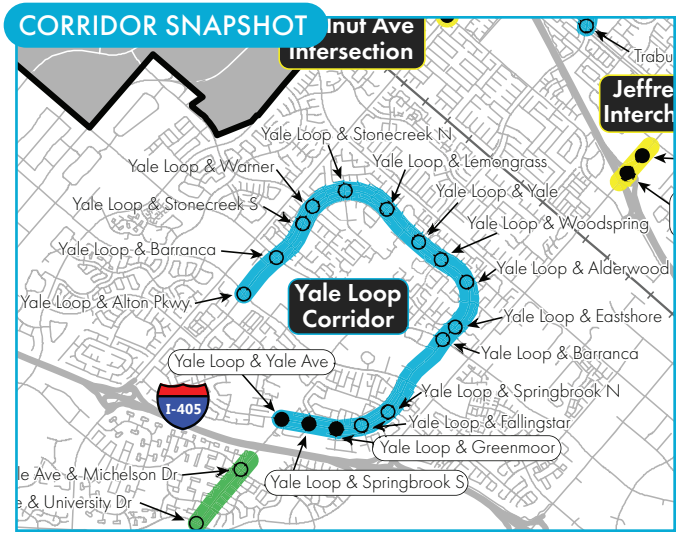
Springbrook South is an interior residential roadway with access to Yale Loop. ADT volumes are anticipated to be significantly less than those observed on Yale Loop within the study area.

Schools in close proximity to the study intersection include Springbrook Elementary, Meadow Park Elementary, and South Lake Middle. Mike Ward Community Park is the closest facility to the study intersection as well as intra-neighborhood parks and recreation facilities.

PROPOSED TREATMENTS

- *Alternative A:* Install high visibility crosswalks at each leg of the intersection; install advanced stop lines on major legs
- *Alternative B:* Install high visibility crosswalks at each leg of the intersection and install 2' buffer to existing bike lane; install advanced stop lines on major legs
- *Alternative C:* Convert the existing all-way-stop control to mini roundabout; Convert existing two lanes to one lane with buffered bicycle lane; buffer to include painted separation and no vertical separation elements; Enhance joint pedestrian and bicyclists crossings with marked crosswalks, median refuge islands, and decreased crossing distances

CORRIDOR SNAPSHOT



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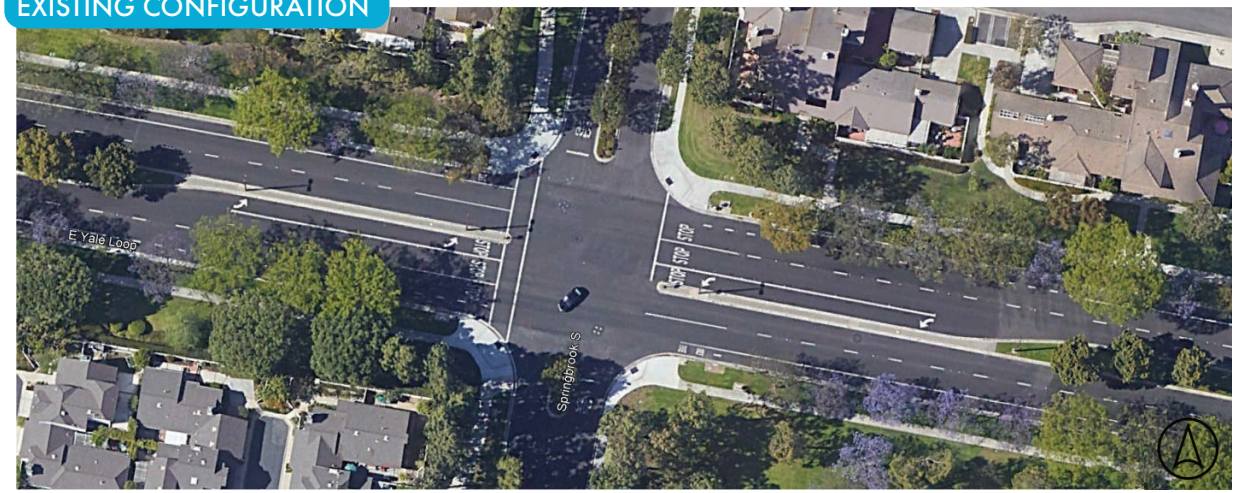
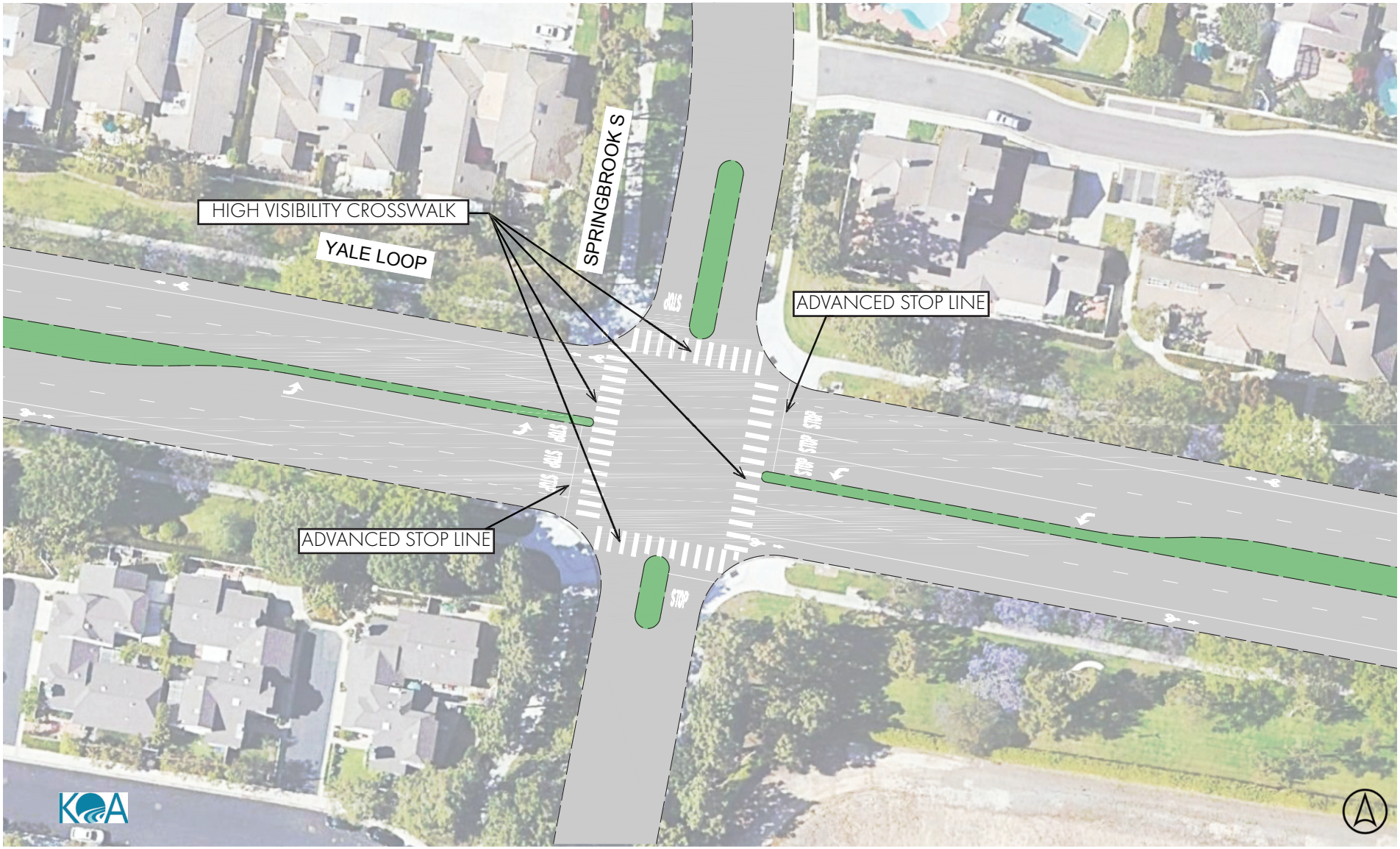


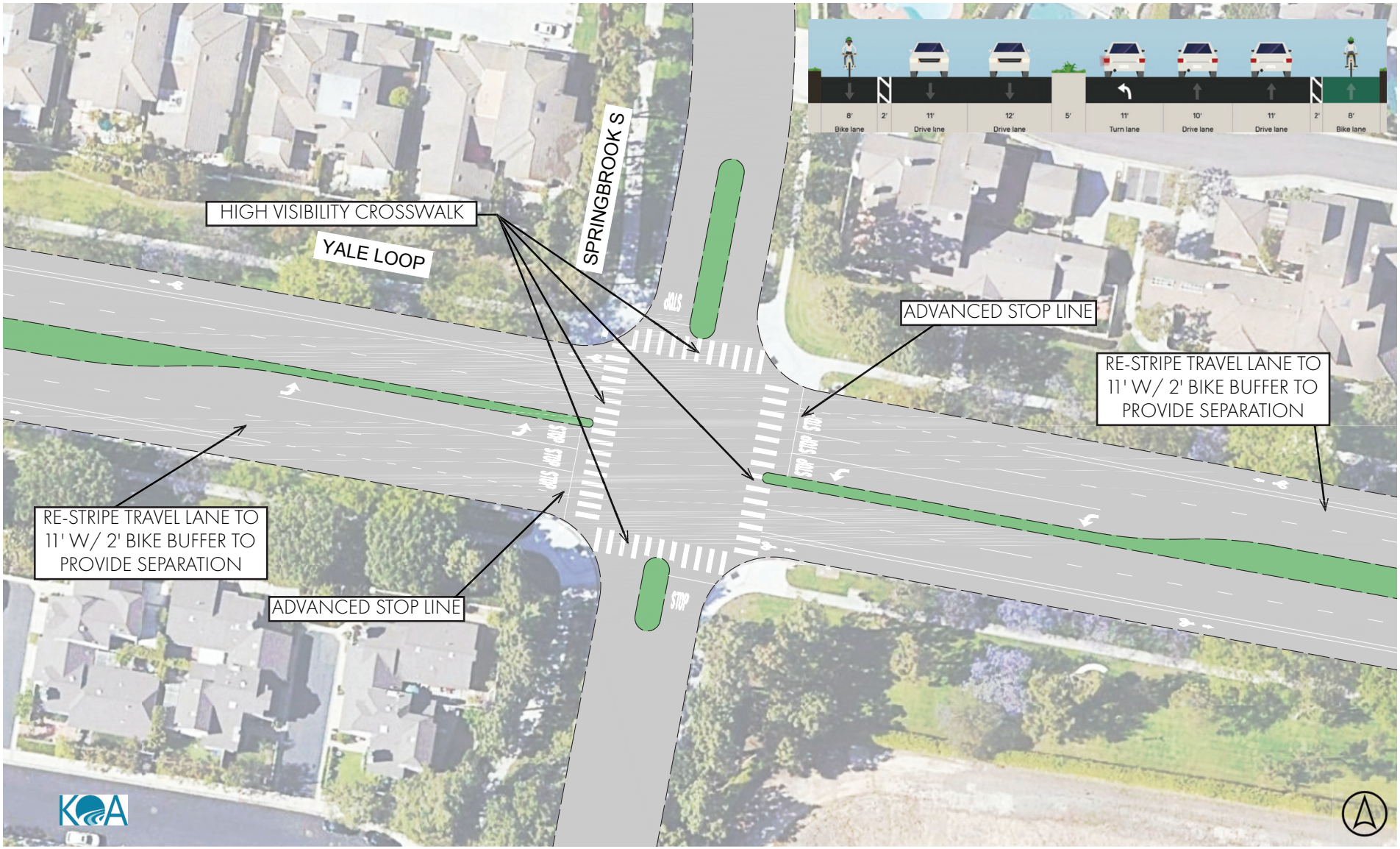
Yale Loop and Springbrook South: Alternative A

RECOMMENDATION CONCEPT SHEET



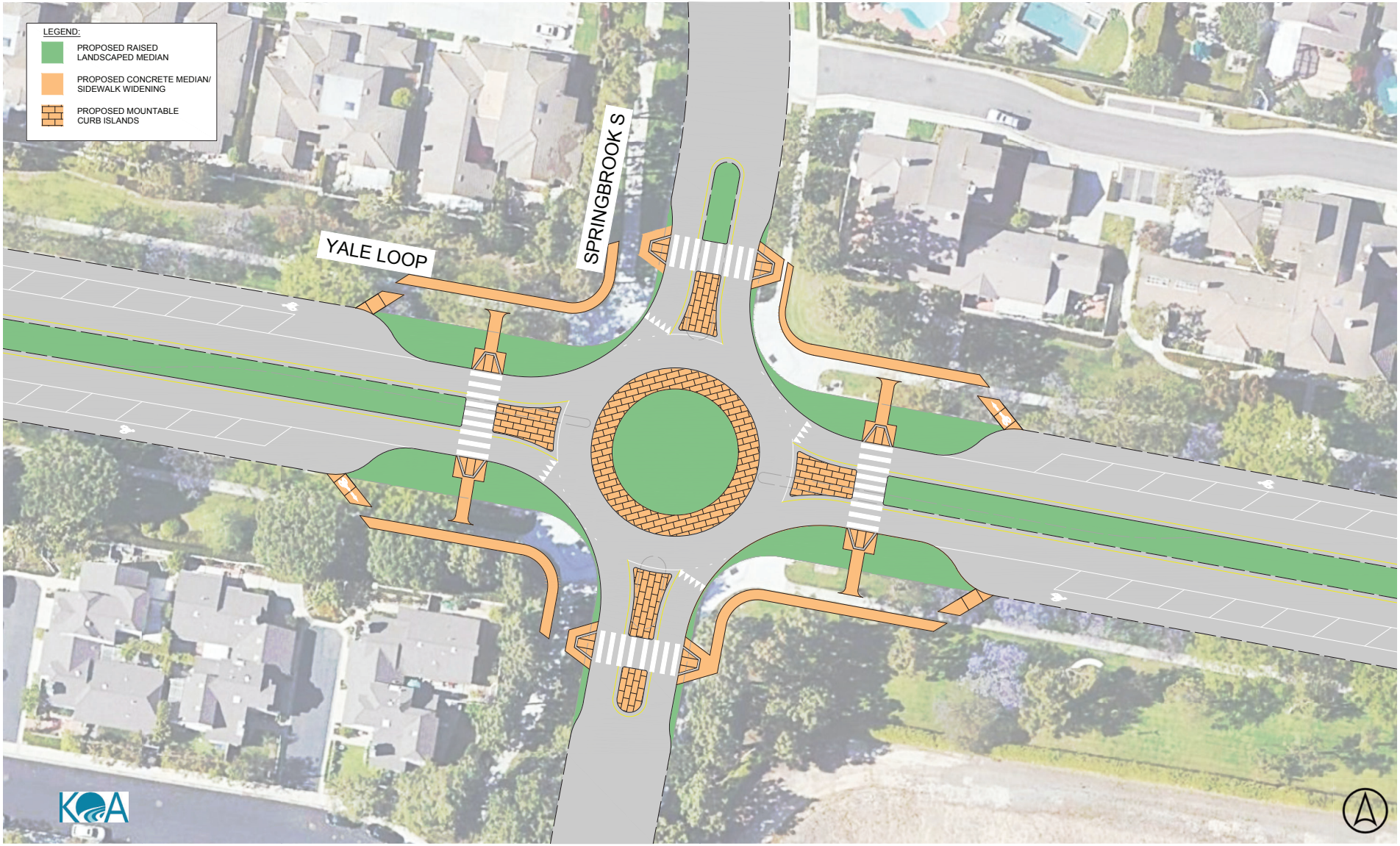
Yale Loop and Springbrook South: Alternative B

RECOMMENDATION CONCEPT SHEET



Yale Loop and Springbrook South: Alternative C

RECOMMENDATION CONCEPT SHEET



YALE LOOP CORRIDOR

INTERSECTION OVERVIEW

Yale Loop and Greenmoor is located within the central area of the City and north of I-405 along the **YALE LOOP CORRIDOR**. The corridor is planned as a Bicycle and Pedestrian Friendly Corridor (BPFC).

Major arterial roadways in close proximity to this intersection include: Alton Parkway to the north, Jeffrey Road/University Drive to the east, and Culver Drive to the west. Yale Loop within the study area exhibits Average Daily Traffic (ADT) volumes around 5,000 vehicles per day, according to a three-year average study conducted by the City between 2015 and 2017. Yale Loop is classified as a "Secondary Highway" under the MPAH, and operationally as a "Collector" roadway.

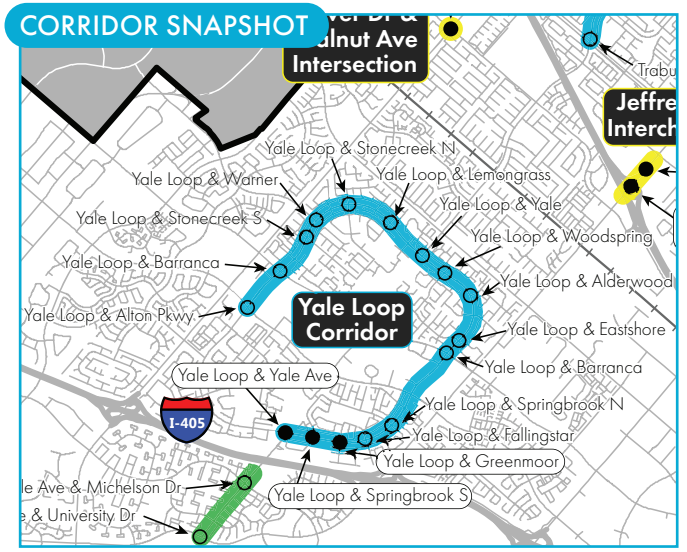
Greenmoor is an interior residential roadway with access to Yale Loop, which provides access to the circulation system greater. ADT volumes are anticipated to be significantly less than those observed on Yale Loop within the study area.

Schools within the vicinity of the study intersection include Springbrook Elementary, Meadow Park Elementary, and South Lake Middle. Mike Ward Community Park is the closest facility to the study intersection as well as intra-neighborhood parks and recreation facilities.

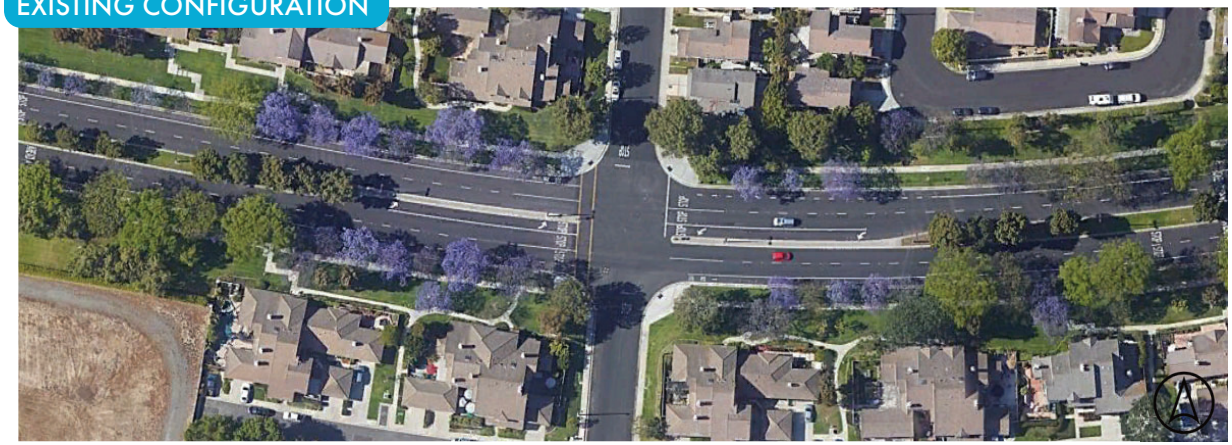
PROPOSED TREATMENTS

- *Alternative A:* Install high visibility crosswalks at each leg of the intersection; install advanced stop lines on major legs; modify median nose
- *Alternative B:* Install high visibility crosswalks at each leg of the intersection and install 2' buffer to existing bike lane; install advanced stop lines on major legs; modify median nose
- *Alternative C:* Convert the existing two-lane roadway each way into one vehicular lane each way – this will be accomplished via the addition of a buffered bike lane with painted separation markings; Install high visibility marked crosswalk for enhanced pedestrian crossing and relocate "STOP" bar and legend behind crosswalks; Install "Sharrow" markings within the mixing zone between through bicycle traffic and right-turning vehicles

CORRIDOR SNAPSHOT

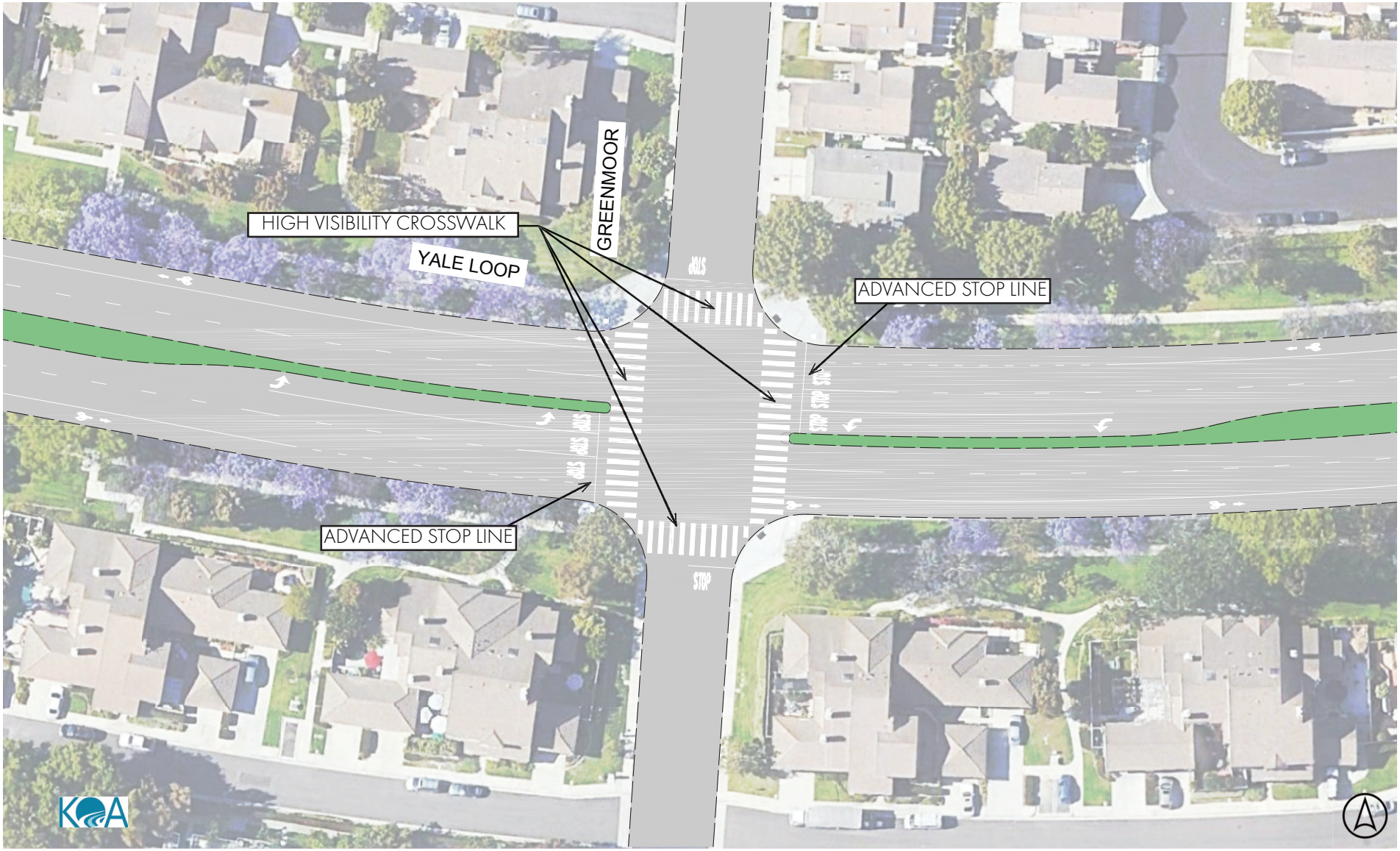


EXISTING CONFIGURATION



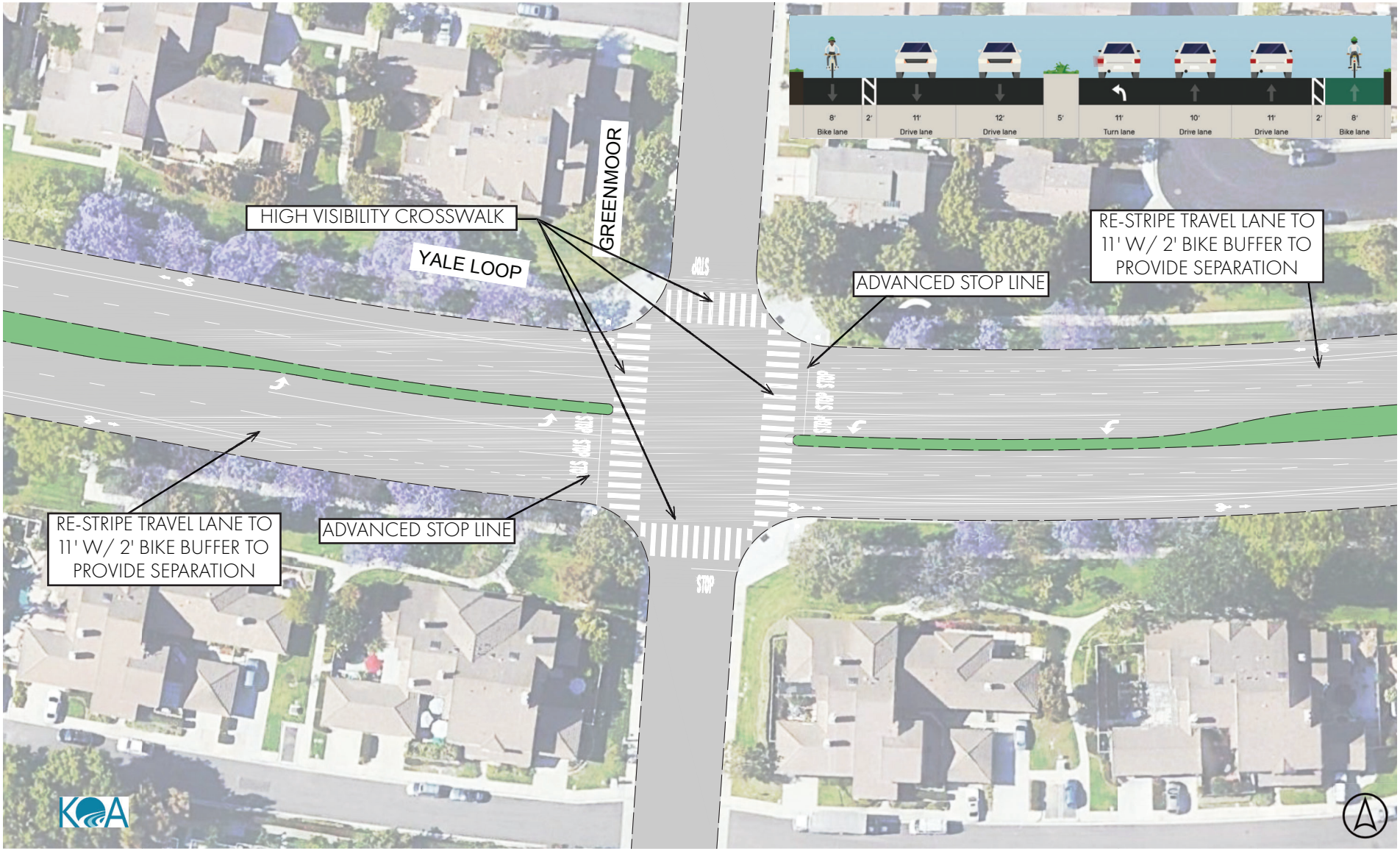
Yale Loop and Greenmoor: Alternative A

RECOMMENDATION CONCEPT SHEET



Yale Loop and Greenmoor: Alternative B

RECOMMENDATION CONCEPT SHEET



Yale Loop and Greenmoor: Alternative C

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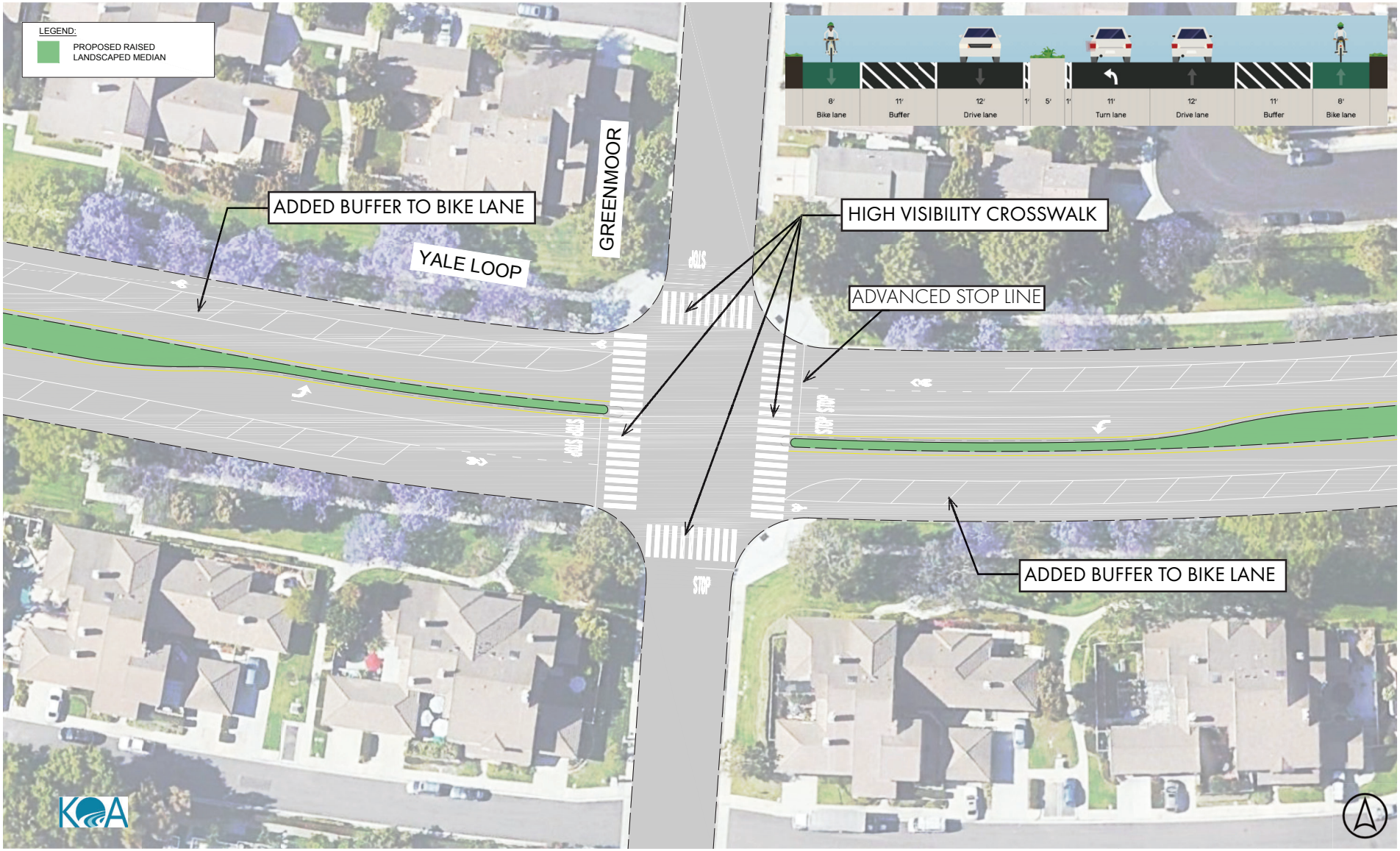


SUNNYHILL CORRIDOR

INTERSECTION OVERVIEW

Sunnyhill (Between Turtle Rock Drive and Shady Canyon Drive) is a segment located within the south-central portion of the City along the **SUNNYHILL CORRIDOR**. The corridor is planned as a Cycle Track (Class IV) with additional pedestrian enhancement inclusions.

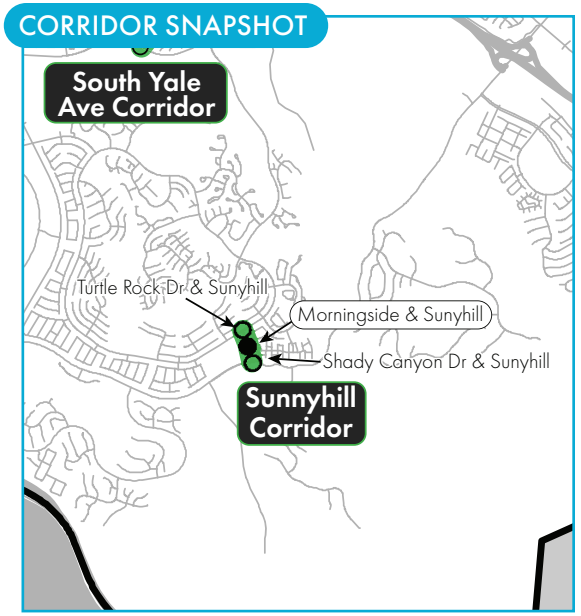
Major arterial roadways within close proximity to the segment include University Drive to the north, Shady Canyon to the south, and Culver Drive to the west. The Average Daily Traffic (ADT) volumes, according to a three-year average study conducted by the City between 2015 and 2017, for the Sunnyhill segment are not explicitly available, however the roadways within the vicinity of the segment exhibit volumes between 4,000 and 8,000 vehicles per day. The study segment is classified as a "Secondary Highway" according to the City's MPAH, operationally the segment is characterized as a "Collector" roadway.

Schools and other destination areas within close proximity of this segment include: Bonita Canyon Elementary, Chapparal Park, Turtle Rock Community Park, and other recreational facilities.

PROPOSED TREATMENTS

- Reconfigure space of existing roadway to support pedestrian and bicycle operation
- Convert wide travel lane and existing bike lane into the narrowed travel lane and one-way cycle track separated by a raised median or painted buffer pending final design per concerns on maintenance access and drainage flow
- Contribute to street beautification via potential raised median separation with added green space
- Install high visibility pedestrian crossing along the south leg of intersection with Morningside and Sunnyhill
- Install curb extensions at the northeast, southeast, and southwest legs of the intersection with Morningside and Sunnyhill
- Provide conflict zone pavement marking for bicycle movements leading into the intersection with Morningside and Sunnyhill

CORRIDOR SNAPSHOT



EXISTING CONFIGURATION

Sunnyhill (Between Turtle Rock Drive and Shady Canyon Drive)

RECOMMENDATION CONCEPT SHEET

SOUTH YALE AVENUE CORRIDOR

INTERSECTION OVERVIEW

Yale Avenue (between University Drive and Michelson Drive) is a segment located within the mid- to south-central part of the City, immediately south of I-405 along the **SOUTH YALE AVENUE CORRIDOR**. The corridor is proposed to include a Cycle Track (Class IV), alternatives showcase painted buffer cycle track and bike lane.

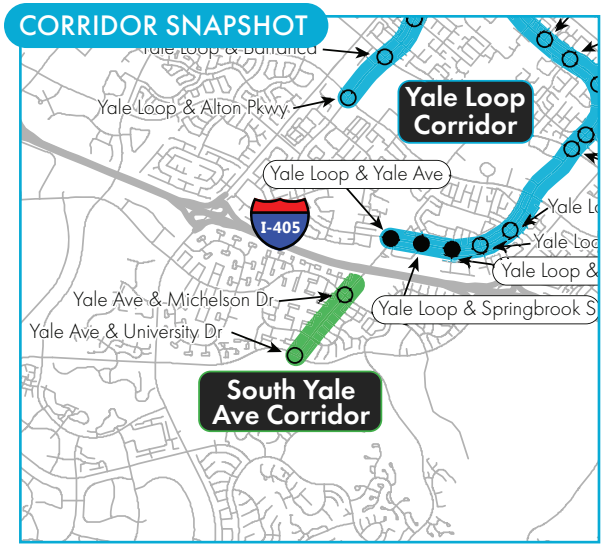
Major arterial roadways within close proximity to the study segment include Culver Drive to the west, University Drive to the south, which also forms the closest eastern roadway transitioning into Jeffrey Road. Average Daily Traffic (ADT) volumes along the study segment are noted to be 1,000 vehicles per day, according to a three-year average study conducted by the City between 2015 and 2017. University Drive located immediately to the south is noted to have 34,000 to 43,000 vehicles per day. Yale Avenue is classified as a "Secondary Highway" according to the City's MPAH, operationally the segment is characterized as a "Collector" roadway.

Schools within close proximity Yale Avenue include Rancho San Joaquin Middle, University Park Elementary, and University High. Parks within close proximity include University Park and various other intra-neighborhood parks and recreation facilities.

PROPOSED TREATMENTS

- *Alternative A:* Roadway operational space reconfiguration; convert existing wide travel lanes and bike lane to painted buffered bike lane with narrowed vehicular lanes. Proposed effective bike right-of-way width of eight feet with painted separation of eight feet. Provide enhanced bicycle movement flow and delineation to and from the pedestrian freeway overpass crossing
- *Alternative B:* Provide roadway operational space reconfiguration; install painted buffer two-way cycle track on the northwest side of Yale Avenue; install buffered bike lane (painted) with curb adjacent parking on the right side of the lane (for nearby school use); eliminate center turn lane. Install traffic exclusion domes or planter boxes within painted cycle track buffer. Provide enhanced bicycle movement flow and delineation to/from the pedestrian freeway overpass crossing. Provide curb extensions at the north and west corners of Yale Avenue at Royce Road, Yale Avenue at Michelson Drive, and the north curb at Yale Avenue at University Drive

CORRIDOR SNAPSHOT



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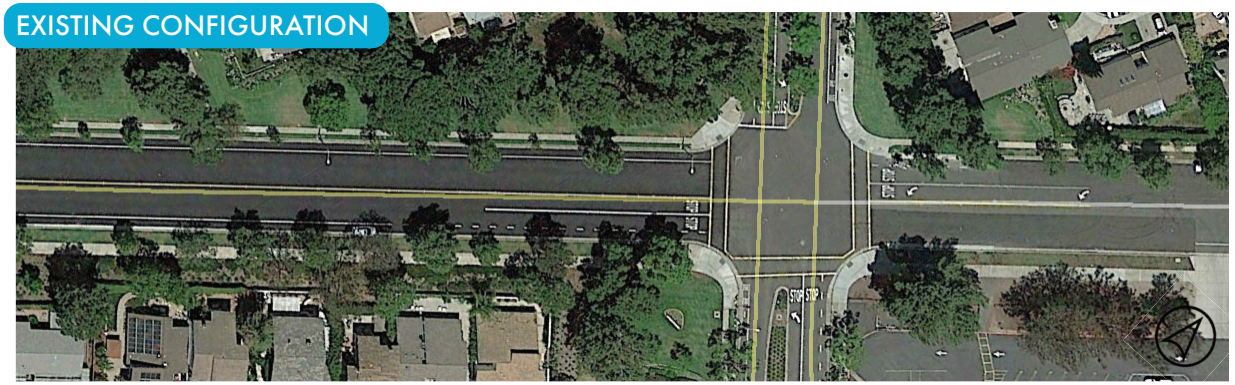


Yale Avenue Concept A & B (Between University Drive and Michelson Drive)

RECOMMENDATION CONCEPT SHEET

A

B

CULVER DRIVE AND WALNUT AVENUE INTERSECTION

INTERSECTION OVERVIEW

Culver Drive and Walnut Avenue is an intersection located in the western part of the City. The corridor is planned to incorporate striping improvements for pedestrians and bicyclists.

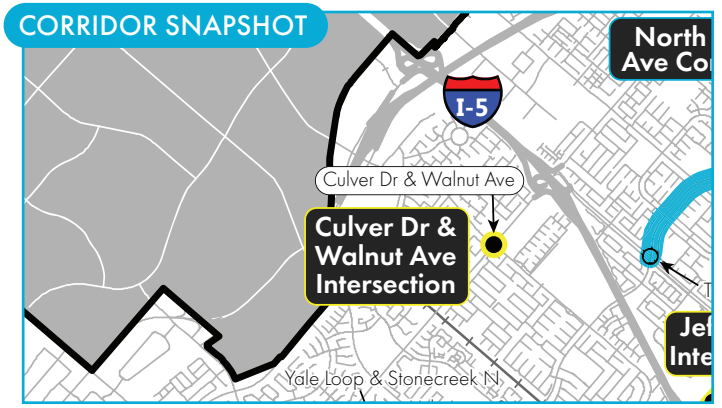
Culver Drive is a north/south operating corridor classified as a "Major Highway 6-Lanes" according to the City's MPAH; Walnut Avenue is classified as a "Primary Highway" under the same document. Operationally Culver Drive and Walnut Avenue are characterized as "Thruway" and "Collector" roadways respectively by the City. Average Daily Traffic (ADT) volumes along Culver Drive north and south of Walnut Avenue are observed to be 48,000 and 40,000 vehicles per day respectively. ADT volumes along Walnut Avenue west and east of Culver Drive are observed to be 17,000 and 19,000 vehicles per day. Major arterial roadways in close proximity to the intersection include I-5 to the north, Irvine Center Drive to the south, Jamboree Road to the west, and Jeffrey Road to the east.

Three schools are located within close proximity to the study intersection, including College Park Elementary, Irvine High, and Greentree Elementary. Heritage Community Park, College Park, Flagstone Park, and various intra-neighborhood recreation facilities and centers are within close proximity to the study intersection.

PROPOSED TREATMENTS

- Provide high visibility ladder crosswalk for pedestrian crossing support at all legs of the intersection
- Provide leading pedestrian interval integrated within the signal phasing to reduce conflict at each crossing of the intersection

CORRIDOR SNAPSHOT



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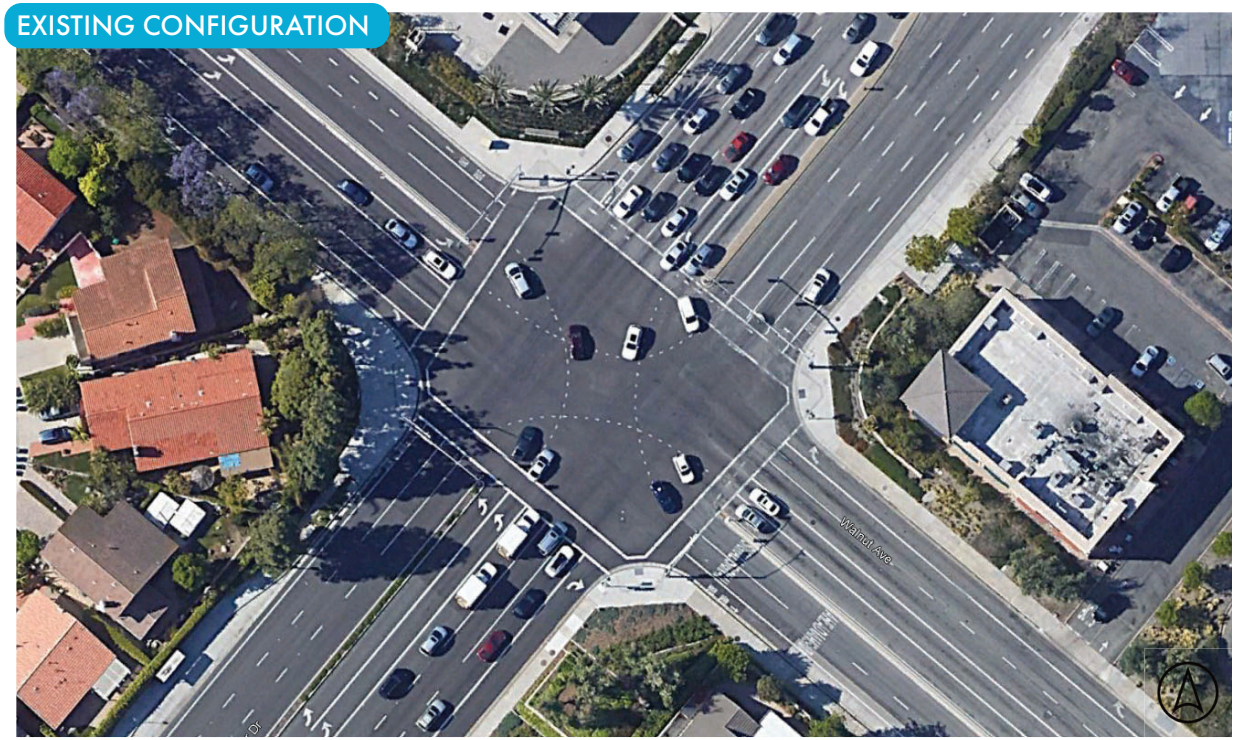
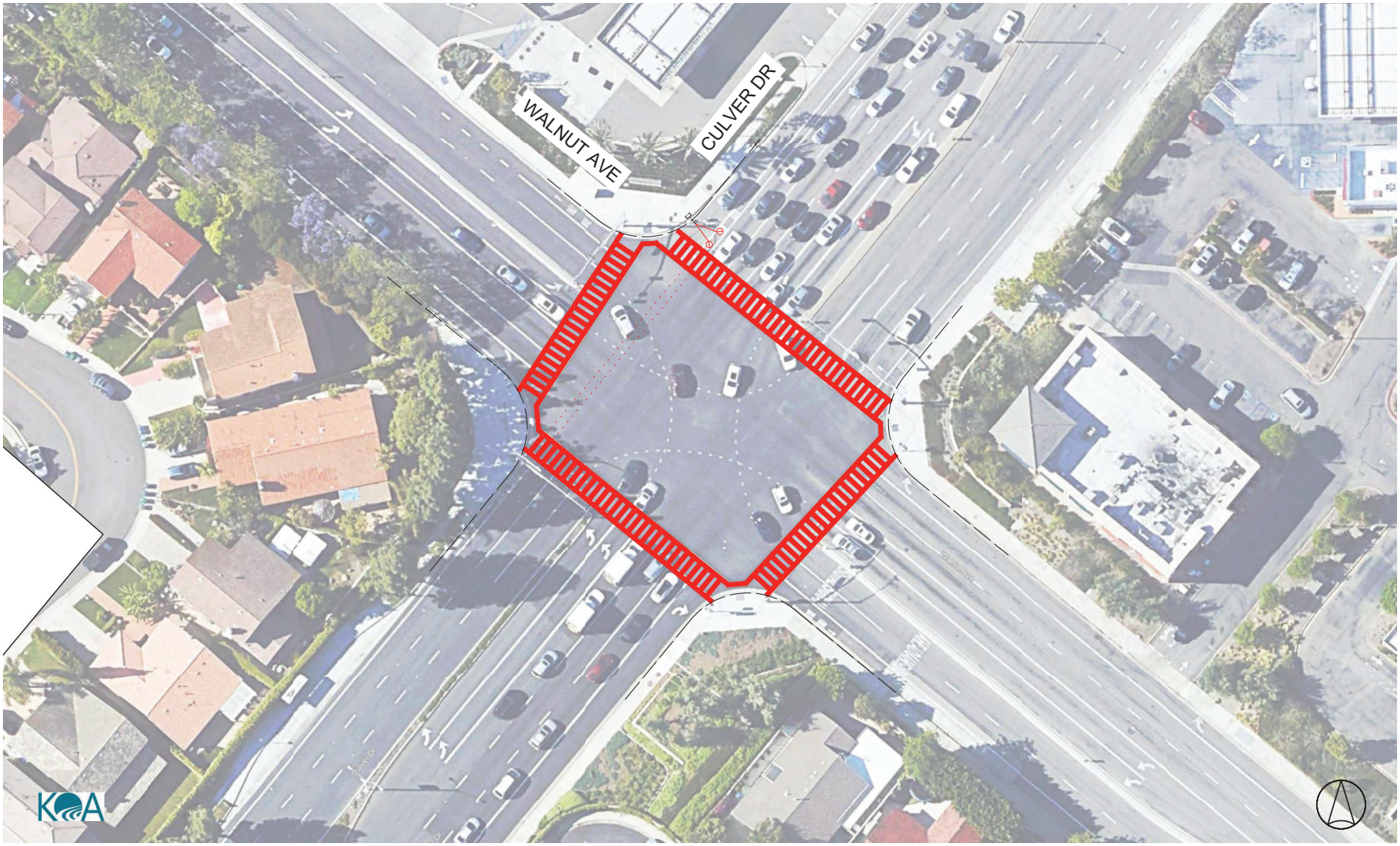


Culver Drive and Walnut Avenue

RECOMMENDATION CONCEPT SHEET



JEFFREY ROAD AT I-405 INTERCHANGE

INTERSECTION OVERVIEW

Jeffrey Road and I-5 Northbound On- and Off-Ramps is a set of interchange intersections with the I-5 northbound on and off-ramps located in the central part of the City along the **JEFFREY ROAD AT I-405 INTERCHANGE**. The corridor is planned to incorporate striping improvements for pedestrians and bicyclists.

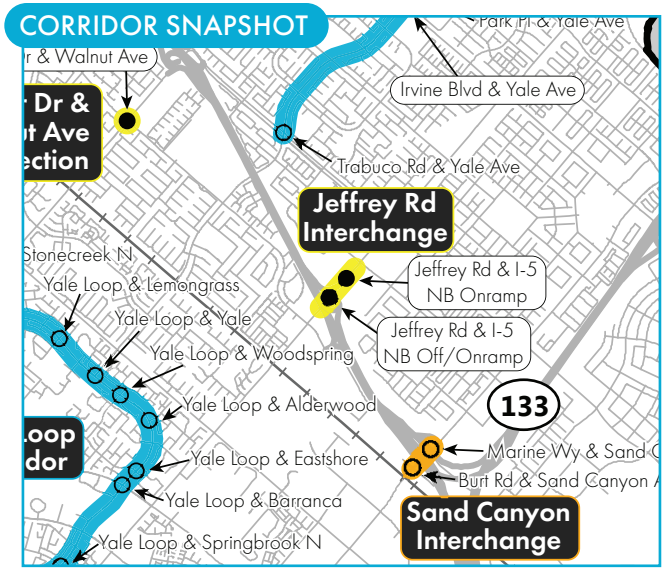
Jeffrey Road is a north/south "Major Highway 6-Lanes" according to the City's MPAH. The closest major arterial roadways include Trabuco Road to the north, Irvine Center Drive to the south, Sand Canyon Avenue to the east, and Culver Drive to the west. Operationally Jeffrey Road is characterized as a "Thruway" roadway. Average Daily Traffic (ADT) volumes, according to the three-year average study conducted by the City between 2015 and 2017, are 46,000 vehicles per day north of I-5 and 41,000 vehicles per day south of the I-5.

The Cypress Community Park and Trabuco Center Park, and various intra-neighborhood recreation facilities and centers are within close proximity to the study segment. Jeffrey Trail Middle and New Horizon Elementary are located within the vicinity of the study segment.

PROPOSED TREATMENTS

- Provide interchange enhancements for both pedestrians and bicyclists to support choices in crossing intersections for all users
- Provide conflict zone pavement markings within the vehicular right-of-way
- Reduce the number of vehicle lanes on entry to on-ramps and/or narrow lane entry
- Provide striping and signage upgrades for advanced warning of bicycle and pedestrian crossings that also prevent freeway access for bicycle and pedestrian traffic
- Support/approval from and coordination with Caltrans on the treatment measures are required since this location is within their jurisdiction

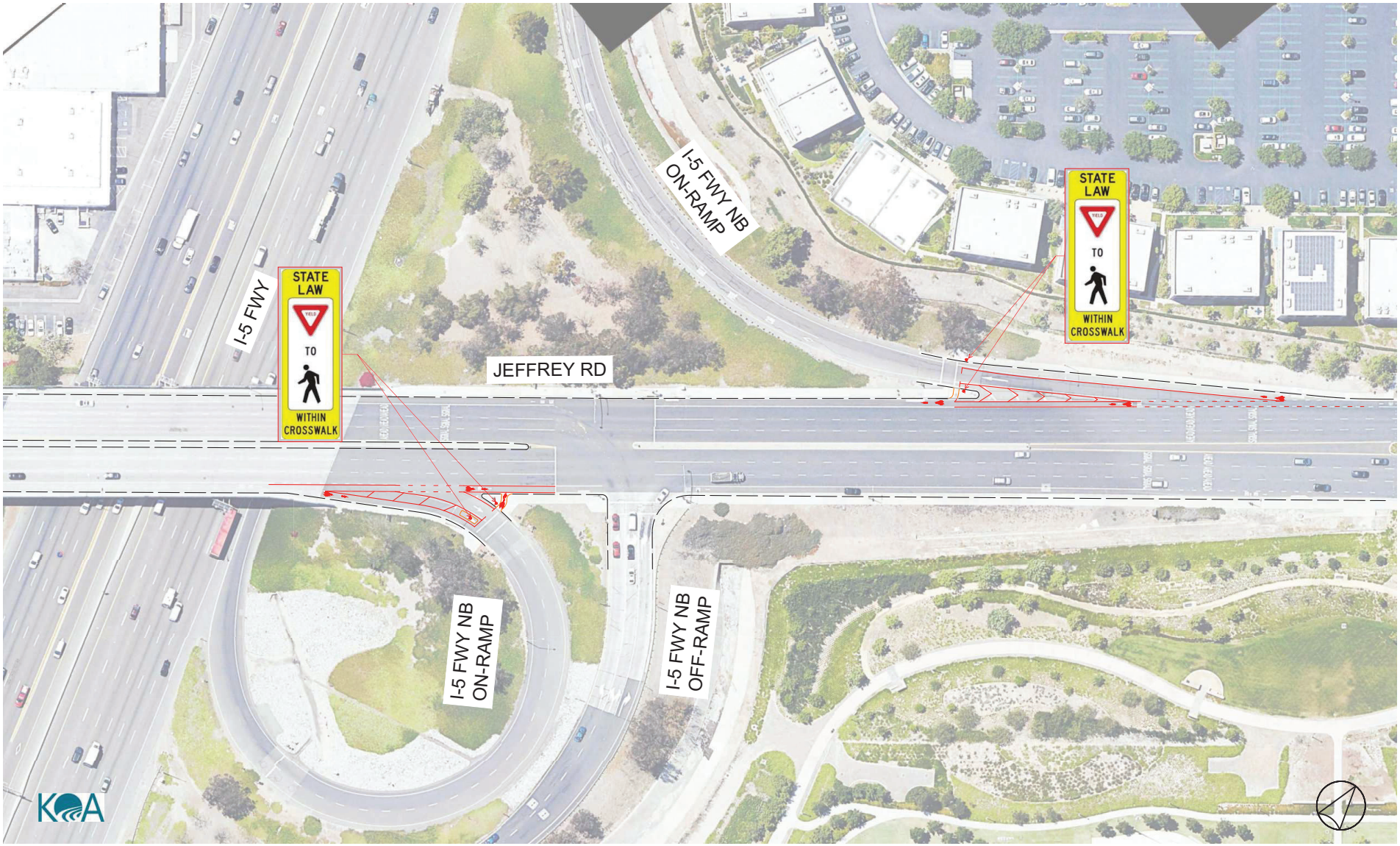
CORRIDOR SNAPSHOT



EXISTING CONFIGURATION

Jeffrey Road and I-5 Northbound On- and Off-ramps

RECOMMENDATION CONCEPT SHEET



SAND CANYON INTERCHANGE

INTERSECTION OVERVIEW

Sand Canyon Avenue (between Burt Road and Marine Way) is a segment that is located in the east-central part of the City at the **SAND CANYON INTERCHANGE**. The corridor is planned to incorporate improvements to the pedestrian and bicyclist sidewalk.

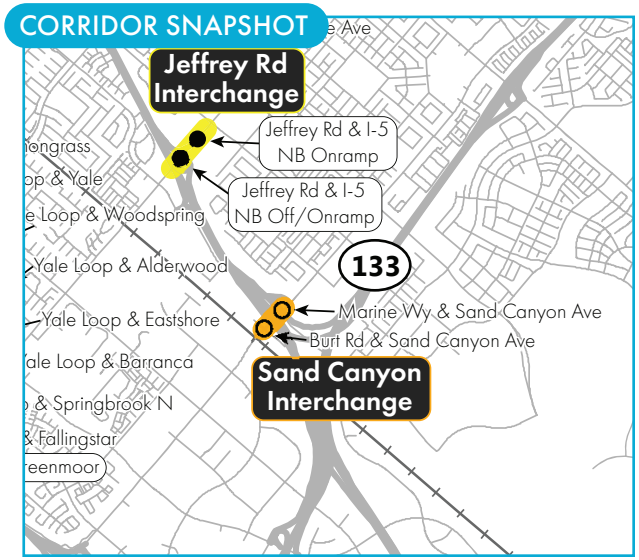
The segment is bisected via the grade separated I-5. Major arterial roadways include: Irvine Center Drive to the south, Trabuco Road to the north, Jeffrey Road to the west, and Ridge Valley to the east. According to the three-year average study conducted by the City between 2015 and 2017, the Average Daily Traffic (ADT) volumes are observed to be 40,000 vehicles per day north of the I-5 and 27,000 vehicles per day south of the I-5. The study segment is classified as "Major Highway 6-Lanes" according to the City's MPAH, and operationally characterized as a "Thruway" roadway.

Cypress Village Elementary School is the only school within the vicinity of this corridor. The Orange County Great Park, Cypress Grove Park, and various intra-neighborhood parks and recreation facilities are within the vicinity of the study segment.

PROPOSED TREATMENTS

- Widen existing sidewalk to establish sidepath on west and east side of the segment between Burt Road and Marine Way, final widths pending final design
- Provide pedestrian/bicycle lighting for sidepath under the I-5 Freeway on both sides of the roadway
- Support/approval from and coordination with Caltrans on the treatment measures are required since this location is within their jurisdiction

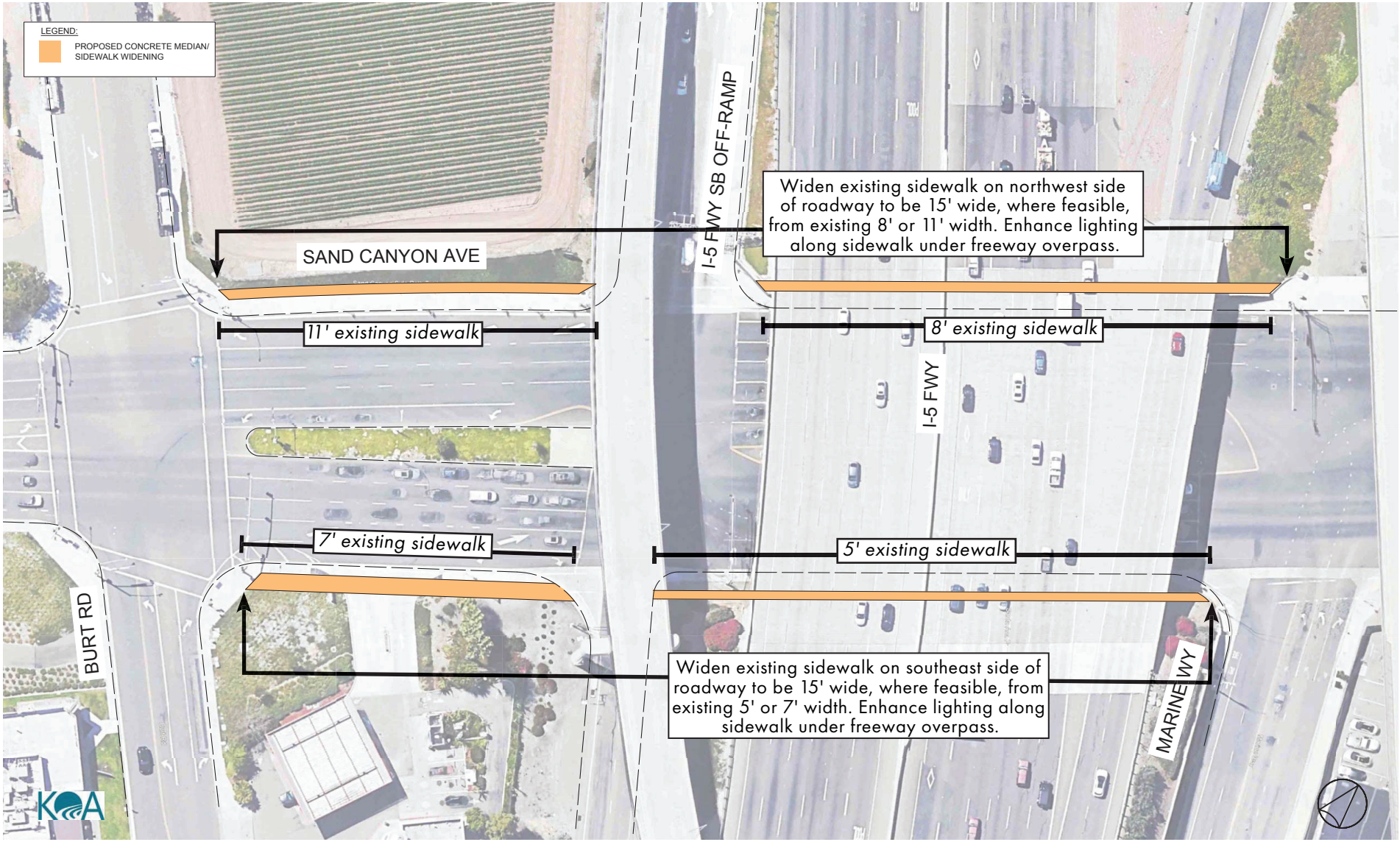
CORRIDOR SNAPSHOT



EXISTING CONFIGURATION

Sand Canyon Avenue (Between Burt Road and Marine Way)

RECOMMENDATION CONCEPT SHEET



5.4 LOCAL FOCUS SPOT TREATMENTS

Local spot treatment sites are identified as prototypes for focused active transportation recommendations. Through a series of assessment processes and outreach efforts, the project team selected *16* "top intersection improvement locations", *one* "regionally significant enhancement location", and *17* "interchange enhancement locations" for bicyclists and pedestrians. In total *34* local focus spot treatment sites are selected. ***Figure 5.4.1*** shows all local focus spot treatment locations. ***Table 5.4.1*** lists the top intersection improvement locations, ***Table 5.4.2*** lists interchange enhancement locations, and ***Table 5.4.3*** lists the regionally significant location. Each table notes the corresponding treatments that can be applied.

Top intersection selection was informed through an Intersection LOC assessment that is detailed in ***Section 2.5*** (***Figure 2.5.5***). Intersections ranked greater than an intersection LOC level 3 were included within the top intersection list. If an intersection ranked lower than level 3.5, such as University Drive and Campus Drive, it was omitted.

Public sentiment was an additional layer that was folded into the selection process, including an aggregation of information gathered through outreach events (online and in-person), surveying efforts, and conversations with the PDT. Reference was made to the online mapper top intersections, where two intersections that were not represented within the intersection LOC but were represented within the online mapper top intersections list (***Table 3.3.1***) were added to the ISATP "Top Intersection Improvement Locations" list (***Table 5.4.1***). University Drive and Campus Drive was represented within the online mapper top intersection list, but was omitted from ***Table 5.4.1*** because it ranked in the Intersection LOC as level 2, well below the level 3.5 cut off threshold.

Conflict points and negative comfort perceptions at on- and off-ramps along I-5, I-405, SR-133, and SR-261 informed the selection of "interchange enhancement locations". Lastly, the single "regionally significant location" requires cross-jurisdictional coordination for implementation between the Cities of Irvine, Costa Mesa, and Santa Ana, as well as Caltrans District 12 and OCTA to partner and prepare bicycle and pedestrian improvement plans.

An Active Transportation Toolbox (***Section 5.1***) is provided that is complete with bicycle, pedestrian, and operational improvement features. These can be applied within the City to create intersection and interchange enhancements for pedestrians and bicyclists, supplementing the general bicycle and pedestrian treatments noted within ***Table 5.4.1***, ***Table 5.4.2***, and ***Table 5.4.3***.

Table 5.4.1 Top Intersections Improvement Locations and Corresponding Treatment

ID#	Roadway #1	Roadway #2	Corresponding Treatment	Reference Concept Plan[1]
1 *	Campus Drive	Carlson Avenue	Bicycle/pedestrian intersection crossing enhancements, conflict zone improvements, and leading interval integration into signal operation	Irvine Boulevard & Yale Avenue, and Culver Drive & Walnut Avenue
2	Jamboree Road	Alton Avenue	Bicycle/pedestrian intersection crossing enhancements, conflict zone improvements, and leading interval integration into signal operation	Irvine Boulevard and Yale Avenue, and Culver Drive and Walnut Avenue
3	Harvard Avenue	Michelson Drive	Free-right-turn elimination, bicycle/pedestrian crossing support (i.e. conflict zone markings, bulb outs), leading interval integration into signal operation	Irvine Boulevard & Yale Avenue, Culver Drive & Walnut Avenue, and Jeffrey Road & I-5 NB Ramps
4	Culver Drive	Main Street	Bicycle conflict zone marking and pedestrian crossing enhancements at free-right-turn lanes and within intersection, leading interval signal integration	Irvine Boulevard & Yale Avenue, Culver Drive & Walnut Avenue, and Jeffrey Road & I-5 NB Ramps
5	Culver Drive	Alton Parkway	Bicycle conflict zone marking and pedestrian crossing enhancements at free-right-turn lanes and within intersection, leading interval signal integration	Irvine Boulevard & Yale Avenue, Culver Drive & Walnut Avenue, and Jeffrey Road & I-5 NB Ramps
6	Culver Drive	Barranca Parkway	Bicycle conflict zone marking and pedestrian crossing enhancements at free-right-turn lanes and within intersection, leading interval signal integration	Irvine Boulevard & Yale Avenue, Culver Drive & Walnut Avenue, and Jeffrey Road & I-5 NB Ramps
7	Culver Drive	Irvine Center Drive	Bicycle conflict zone marking and pedestrian crossing enhancements at free-right-turn lanes and within intersection, leading interval signal integration	Irvine Boulevard & Yale Avenue, Culver Drive & Walnut Avenue, and Jeffrey Road & I-5 NB Ramps
8	Jeffrey Road	Alton Parkway	Bicycle conflict zone marking and pedestrian crossing enhancements at free-right-turn lanes and within intersection, leading interval signal integration	Irvine Boulevard & Yale Avenue, Culver Drive & Walnut Avenue, and Jeffrey Road & I-5 NB Ramps
9	Jeffrey Road	Irvine Center Drive	Bicycle conflict zone marking and pedestrian crossing enhancements at free-right-turn lanes and within intersection, leading interval signal integration	Irvine Boulevard & Yale Avenue, Culver Drive & Walnut Avenue, and Jeffrey Road & I-5 NB Ramps
10	SR-133	Laguna Canyon Road	Bicycle/pedestrian intersection crossing enhancements at free-right, conflict zone improvements, and leading interval integration into signal operation	Irvine Boulevard & Yale Avenue, Culver Drive & Walnut Avenue, and Jeffrey Road & I-5 NB Ramps
11	Irvine Boulevard	Ridge Valley	Free-right-turn lane crossing enhancements for pedestrians and conflict zone marking in mixing zone for bicyclists, and leading interval signal integration	Irvine Boulevard & Yale Avenue, Culver Drive & Walnut Avenue, and Jeffrey Road & I-5 NB Ramps
12	*Lake Forest Drive*	Bake Parkway	Bicycle/pedestrian intersection crossing enhancements, conflict zone improvements, and leading interval integration into signal operation	Irvine Boulevard & Yale Avenue, and Culver Drive & Walnut Avenue
13	Alton Parkway	Technology Drive	Bicycle/pedestrian intersection crossing enhancements, conflict zone improvements, and leading interval integration into signal operation	Irvine Boulevard & Yale Avenue, Culver Drive & Walnut Avenue, and Jeffrey Road & I-5 NB Ramps
14	Alton Parkway	Muirlands	Free-right-turn lane crossing enhancements for pedestrians and conflict zone marking in mixing zone for bicyclists, and leading interval signal integration	Irvine Boulevard & Yale Avenue, Culver Drive & Walnut Avenue, and Jeffrey Road & I-5 NB Ramps
15	Bake Parkway	Rockfield Boulevard	Free-right-turn lane crossing enhancements for pedestrians and conflict zone marking in mixing zone for bicyclists, and leading interval signal integration	Irvine Boulevard & Yale Avenue, Culver Drive & Walnut Avenue, and Jeffrey Road & I-5 NB Ramps
16	Bake Parkway	Muirlands Boulevard	Free-right-turn lane crossing enhancements for pedestrians and conflict zone marking in mixing zone for bicyclists, and leading interval signal integration	Irvine Boulevard & Yale Avenue, Culver Drive & Walnut Avenue, and Jeffrey Road & I-5 NB Ramps

[1]Concept plan reference is not intended to match specific "top Intersection" demands, concept plans showcase elements that can be considered for application to different scenarios

Table 5.4.2 Interchange Enhancement Locations and Corresponding Treatment

ID#	Roadway #1	Roadway #2	Corresponding Treatment	Reference Concept Plan[1]
17	Macarthur Boulevard	I-405	Pedestrian/bike crossing enhancement within intersection and on/offramp, conflict zone marking near intersection and in free-right mixing zones	Jeffrey Road & I-5, Sand Canyon Avenue (between Burt Road and Marine Way), Irvine Boulevard & Yale Avenue
18	Jamboree Road	I-405	Pedestrian crossing enhancement at intersections, decrease number of onramp lanes for reduced crossing distance, conflict zone marking at mixing zones	Jeffrey Road & I-5, Sand Canyon Avenue (between Burt Road and Marine Way), Irvine Boulevard & Yale Avenue
19	Culver Drive	I-405	Pedestrian/bike crossing enhancement at intersections, decrease number of onramp lanes for reduced crossing distance, conflict marking at mixing zones	Jeffrey Road & I-5, Sand Canyon Avenue (between Burt Road and Marine Way), Irvine Boulevard & Yale Avenue
20	University Drive	I-405	Pedestrian/bike crossing enhancement at intersections, decrease number of onramp lanes for reduced crossing distance, conflict marking at mixing zones	Jeffrey Road & I-5, Sand Canyon Avenue (between Burt Road and Marine Way), Irvine Boulevard & Yale Avenue
21	Sand Canyon Avenue	I-405	Pedestrian/bike crossing enhancement at intersections, decrease number of onramp lanes for reduced crossing distance, conflict marking at mixing zones	Jeffrey Road & I-5, Sand Canyon Avenue (between Burt Road and Marine Way), Irvine Boulevard & Yale Avenue
22	I-405	Irvine Center Drive	Pedestrian/bicycle crossing enhancement at intersections, advanced warning signs, conflict zone marking at free-right mixing zones	Jeffrey Road & I-5, Sand Canyon Avenue (between Burt Road and Marine Way), Irvine Boulevard & Yale Avenue
23	Bake Parkway	I-405/I-5	Pedestrian/bike crossing enhancement at intersections, decrease number of onramp lanes for reduced crossing distance, conflict marking at mixing zones	Jeffrey Road & I-5, Sand Canyon Avenue (between Burt Road and Marine Way), Irvine Boulevard & Yale Avenue
24	SR-133	Barranca Parkway	Pedestrian/bicycle crossing enhancement at intersections, advanced warning signs, conflict zone marking at free-right mixing zones	Jeffrey Road & I-5, Sand Canyon Avenue (between Burt Road and Marine Way), Irvine Boulevard & Yale Avenue
25	I-5	Alton Parkway	Pedestrian/bike crossing enhancement at intersections, decrease number of onramp lanes for reduced crossing distance, conflict marking at mixing zones	Jeffrey Road & I-5, Sand Canyon Avenue (between Burt Road and Marine Way), Irvine Boulevard & Yale Avenue
26	I-5	Sand Canyon Avenue	Widen sidewalk for pedestrians and bicyclists, enhance street lighting, conflict zone for bicyclists, and stripe on-street bicycle facilities	Sand Canyon Avenue (between Burt Road and Marine Way), Irvine Boulevard & Yale Avenue
27	SR-133	Irvine Boulevard	Pedestrian/bike crossing enhancement at intersections, decrease number of onramp lanes for reduced crossing distance, conflict marking at mixing zones	Jeffrey Road & I-5, Sand Canyon Avenue (between Burt Road and Marine Way), Irvine Boulevard & Yale Avenue
28	I-5	Jeffrey Road	Decrease number of onramp lanes for reduced crossing distance Pedestrian/bike, conflict zone markings, by pass option, advanced warning signs	Jeffrey Road & I-5, Sand Canyon Avenue (between Burt Road and Marine Way), Irvine Boulevard & Yale Avenue
29	I-5	Culver Drive	Decrease crossing distance for pedestrian/bike at onramp, conflict marking at free-right mixing zones, pedestrian/bike crossing enhancement at intersections	Jeffrey Road & I-5, and Irvine Boulevard & Yale Avenue
30	SR-261	Walnut Avenue	Decrease crossing distance for pedestrian/bike at onramp, conflict marking at free-right mixing zones, pedestrian/bike crossing enhancement at intersections	Jeffrey Road & I-5, and Irvine Boulevard & Yale Avenue
31	I-5	Jamboree Road	Decrease crossing distance for pedestrian/bike at onramp, conflict marking at free-right mixing zones, pedestrian/bike crossing enhancement at intersections	Jeffrey Road & I-5, Sand Canyon Avenue (between Burt Road and Marine Way), Irvine Boulevard & Yale Avenue
32	SR-261	Irvine Boulevard	Bike crossing enhancements at intersections	Jeffrey Road & I-5, and Irvine Boulevard & Yale Avenue
33	SR-261	Portola Parkway	Bike crossing enhancements at intersections	Jeffrey Road & I-5, and Irvine Boulevard & Yale Avenue

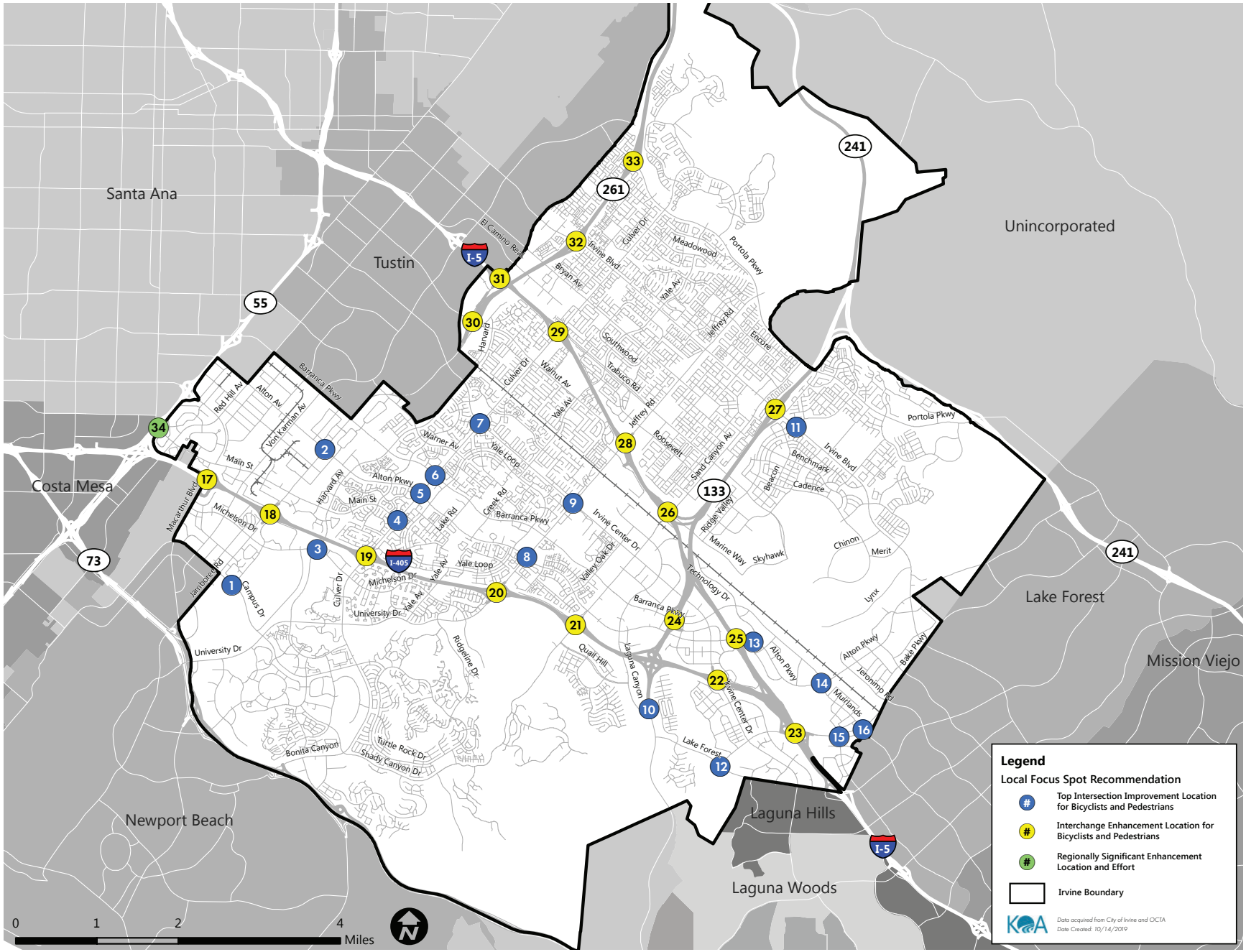
[1]Concept plan reference is not intended to match specific "top Intersection" demands, concept plans showcase elements that can be considered for application to different scenarios

Table 5.4.3 Regionally Significant Location and Corresponding Treatment

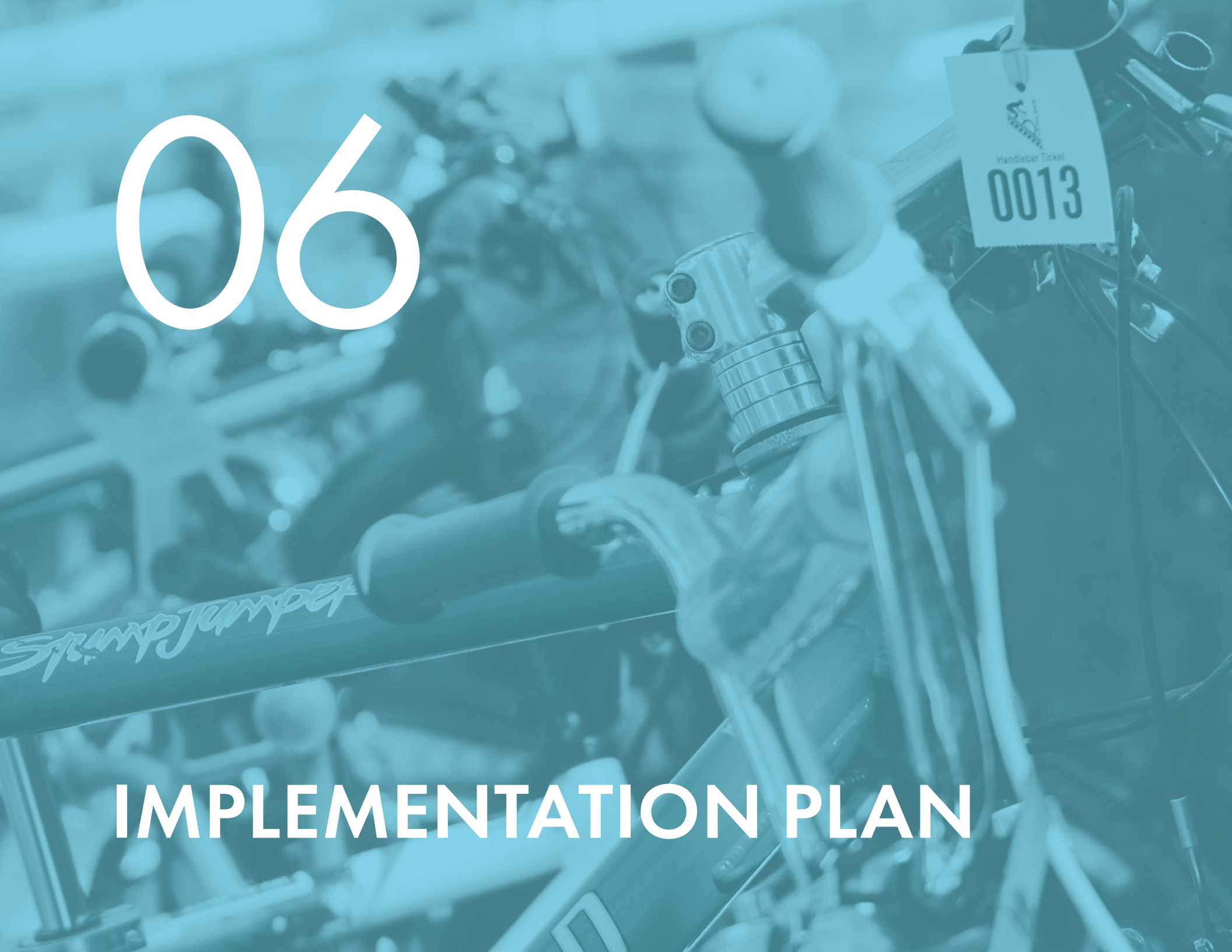
ID#	Roadway #1	Roadway #2	Corresponding Treatment	Reference Concept Plan[1]
34	SR-55 to McDurmott	Main Street	On-street bicycle facilities to decrease exposure and increase visibility, regional coordination, enhanced pedestrian/bike lighting	Sand Canyon Avenue (between Burt Road and Marine Way)

[1]Concept plan reference is not intended to match specific "top Intersection" demands, concept plans showcase elements that can be considered for application to different scenarios

Figure 5.4.1 Intersection and Interchange Local Focus Spot Treatment Locations




CYCLE
AWARE



06

IMPLEMENTATION PLAN

6.1 PROJECT PRIORITIZATION

The purpose of establishing project priority (***Table 6.1.1***) is to provide the City with a framework for the implementation of the ISATP pedestrian and bicycle improvements - see further ***Section 5.1*** for an overview of these improvement types by category. Specific project ranking is shown in ***Table 6.3.1***.

While projects with higher rankings should be considered for implementation before projects with a lower rank, the City may choose to advance specific projects for other reasons or as certain types of funding become available. Additional analyses should be conducted periodically in response to major changes in population, the environment, and the circulation network.

Categorical project priority for the ISATP utilized a three-pronged planning level approach:

- Community Support – responds to the sentiment understood from the community through inclusive outreach efforts, including online mediums and in-person events.
- System Significance – assesses the effect of corridors and encompassing improvements have on levels of traffic stress mitigation and level of comfort bolstering.
- Project Readiness – total corridor and improvement cost balanced against resource synergy for local and regional opportunities that can reflect the readiness of projects for implementation.

Table 6.1.1 Categorical Project Prioritization

Improvement Type	**Scale** *(Network, Corridor, and/or Spot Location)*	**Community Support**	**System Significance**	**Project Readiness** *(Ready or Additional Research Needed)*	**Phasing** *(Near- or Long-term)*	**ISATP Reference**
Bicycle and Pedestrian Friendly Corridor (BPFC)	Network and Corridor	*High*	*BPFC Level of Suitability (LOS) conducted, which uses a quantifiable modeling approach to assess suitability of BPFCs within the City.*	*Ready*	*Short-term*	*Figure 2.5.4, Figure 5.2.2, Figure 5.2.4, Figure 5.3.1*
Interchange Enhancements Locations	Corridor and Spot Location	*High*	*Intersection Level of Comfort (LOC) Provides decreased exposure options through interchanges for pedestrians and bicyclists; Caltrans jurisdiction - City has already started conversation.*	*Ready*	*Short-term*	*Figure 2.5.5, Figure 5.4.1*
Top Intersection Improvement Locations	Spot Location	*High*	*Intersection Level of Comfort (LOC) quantifies high exposure situations for pedestrians and bicyclists, factors based of safety, community input, and intersection variables.*	*Ready*	*Short-term*	*Figure 2.5.5, Figure 5.4.1*
Cycle Track (On-Street)	Network and Corridor	*Medium*	*Proposed cycle tracks present a first-of-its-kind treatment and would represent a "pilot" implementation that would be monitored for efficacy and safety.*	*Ready*	*Short-term*	*Figure 5.2.2, Figure 5.3.1*
Buffered Bike Lane (On-Street)	Network	*High*	*High levels of traffic stress corridors are identified through the On-Street Bicycle Level of Traffic Stress (LTS) assessment. High exposure corridors present an opportunity to decrease exposure through lateral separation elements (i.e. painted buffer).*	*Ready*	*Short- and Mid-term*	*Figure 2.5.1, Figure 5.2.2, Figure 5.2.4, Figure 5.3.1*
Bike Lane (On-Street)	Network	*Medium*	*Areas within the City that are void of existing bike lanes or bike lanes on both sides of the street present gaps in the network. Closure of gaps would enhance connectivity and right-of-way designations for bicyclist.*	*Additional Research Needed*	*Short- and Mid-term*	*Figure 5.2.2, Figure 5.2.4*
Off-Street Path	Network	*High*	*Off-Street bicycle level of Traffic Stress (LTS) conducted by using quantifiable metrics to assess comfort of network. Proposed system proximity to attractors, gap closures, and path upgrades are integral to strong community support.*	*Additional Research Needed*	*Mid-term*	*Figure 2.5.2, Figure 5.2.1, Figure 5.2.4*
Regionally Significant Enhancement Location	Spot Location	High	Linkage between Costa Mesa/Santa Ana and Irvine.	Additional Research Needed	Long-Term	*Figure 5.2.4, Figure 5.3.1*
Off-Street Shared-Use Path (Pending Jurisdictional Coordination)	Network	Medium	Cross jurisdictional coordination needed.	Additional Research Needed	Long-Term	Figure 5.2.1, Figure 5.2.4

6.2 PROJECT PHASING

Project phasing provides a structured approach to the implementation of project recommendations as well as highlights the anticipated amount of time it will take to implement said recommendations. It is designed to aid the City in planning for projects that can be phased in the near future versus the projects that will not be foreseeable until several years from now. The categories group projects at corridor and network scales for both pedestrians and bicyclists, designed to distinguish project phasing that is chronologically scalable and fiscally conscious.

In some cases the implementation of some treatments might occur over a prolonged period of time through piecemeal and pilot program testing. In these cases the City can adapt the phasing to slow or expedite implementation. Where unforeseen urgency develops, phasing can similarly be altered to attend to the demands. The structure herein is a suggested guideline for the City to follow.

SHORT-TERM (0-2 YEARS)

Short-term projects are those with a high "readiness" factor, meaning the proposed projects can be quickly implemented. Both network and corridor bicycle and pedestrian projects within the City that are phased as "short-term" present opportunities for more rapid implementation and reflect strong community support and impactful effect on the system.

Bicycle and pedestrian friendly corridor (BPFC), pedestrian interchange enhancements, ADA curb ramps, high visibility crosswalks, pavement markings, signage, and RRFB's

BPFC, interchange enhancements, cycle track, new class II bike lane, and conversion of existing bike lane to bike lane with a buffer

MID-TERM (2-5 YEARS)

Mid-term projects are phased beyond short-term projects due to their level of community support, system significance, and readiness. Projects either require additional research or are ready for implementation, however impacts on vehicular right-of-way, utility easements, and/or other constraints must be considered. The system significance and in general, community support, is not as impactful as short-term projects.

Off-street shared-use path, sidewalk (with curb and gutter), curb extensions / bulbouts

Bike lane with buffer, restriping exisitng bike lanes and buffered bike lanes, off-street shared-use path

LONG-TERM (5-10 YEARS)

These projects can be considered as forecasted projects and require added resources prior to implementation. These projects require more attention in the engineering and design phases or include the need for coordination with adjacent agencies or county governing bodies. Cost sharing and/or grant application demands can impact "readiness".

Grade separated freeway or roadway crossing for shared-use path, traffic signals, roundabouts, and any project that requires the City to modify/add hard wiring infrastructure

Grade separated freeway or roadway crossing enhancements, regionally significant bicycle facilities

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6.3 COSTS

Planning level cost estimates have been conducted for the concept recommendations identified in the previous section (***Section 5.2***). An overall cost estimate for the project concepts is provided in ***Table 6.3.1***.

The ISATP recommends at least $4.6 million in pedestrian and bicycle facilities for seven projects across the City. Costs for the implementation of City-wide network recommendations, both on- and off-street, would assume an even higher cost based on the demands of the larger scale facilities.

Discussion: cost estimates shown in ***Table 6.3.1*** represent the most expensive cost for a given location out of the alternatives presented (i.e. Yale Loop Corridor). Less expensive costs for locations with multiple alternatives are not represented in the table and do not exceed the cost for the "top-end cost".

Planning level cost assumptions are derived from similar projects across Southern California. Key cost assumption factors include design, environmental, construction management, mobilization, right-of-way, construction, and other contingencies to ensure cost reflects as accurate as possible implementation financial expectations.

Each project represented within the ISATP is similar with regard to the pedestrian and bicycle focused infrastructure improvements showcased. Network recommendation cost estimates are case specific for on- and off-street improvements, contingent on developmental, engineering, and land use variables. More detailed engineering cost estimates should be conducted at the feasibility and preliminary design phase.

Additional cost estimation is needed for on-street and off-street bicycle and pedestrian network improvements identified on the network maps within ***Section 5.1*** (***Figure 5.1.1*** and ***Figure 5.1.2***), which include proposed off-street shared-use paths, network gap closures, and buffered bike lanes. The cost for these improvements may be structured within capital improvement projects and in conjunction with private development.

The cost for critical intersection safety improvements for bicyclists and pedestrians are also needed with intersection improvement feasibility studies. For example, the project team understands that the City is in the process of preparing a project study for the intersection of Michelson Drive and Harvard Avenue. The improvement for bicycles and pedestrians will need to be considered as part of the intersection improvement plan.

Table 6.3.1 Project Cost Estimate Overview

Project Name	Rank	Top-End Cost[1]	Type of Treatment	# of Intersections Assessed Along Corridor
North Yale Avenue Corridor	*1*	$664,000	Bicycle and Pedestrian Friendly Corridor	Six and various midblock crossings
South Yale Avenue Corridor	*2*	$749,000	Cycle Track	Two
Jeffrey Road at I-405 Interchange	*3*	$65,000	Striping Improvement (bicycle and pedestrian)	Two
Sand Canyon Interchange	*4*	$122,000	Bicycle and pedestrian sidewalk widening and lighting	Three
Yale Loop Corridor[1]	*5*	$2,544,000	Bicycle and Pedestrian Friendly Corridor	Sixteen
Sunnyhill Corridor[1]	*6*	$431,000	Cycle Track	Three
Culver Drive and Walnut Avenue Intersection	*7*	$45,000	Striping Improvement (bicycle and pedestrian)	One
TOTAL		**$4,620,000**		

[1]Cost estimates represent the most expensive cost for a given location out of the alternatives presented (i.e. Yale Loop Corridor). Less expensive costs for locations with multiple alternatives are not represented in this table and do not exceed the "top-end cost" to be conservative.

6.4 FUNDING OPPORTUNITIES

There are potential federal, state, regional, and local funding sources that the City can seek for the implementation of ISATP recommendations. These opportunities are highlighted in ***Section 2.6*** within ***Table 2.6.4*** (Federal Funding), ***Table 2.6.5*** (State Funding), and ***Table 2.6.6*** (Local Funding). The City or County can consider applying for a variety of funding opportunities to implement infrastructure recommendations and complementary non-infrastructure programs – both of which attend to ISATP Goals and Objectives.

Based on the project prioritization detailed in the previous section, the City could seek grant funding to design and construct the recommended infrastructure projects using the prioritization rankings as a guide. The City or County may individually advance the implementation of a project where there is interest, funding is available, or there is incorporation into an existing infrastructure improvement project or feasibility study.

6.5 PERFORMANCE MEASURES

Performance measures are specific variables that evaluate the effectiveness of active transportation planning and implementation with quantitative data. Performance measures provide several benefits to agencies that use them. They show the value of projects to community stakeholders, inform smart budgeting decisions, and demonstrate to grant administrators the importance of and need for project funding - ***Table 6.5.1***.

The following performance measures are recommended to help ensure the success of the goals and objectives laid out at the beginning of the ISATP (***Section 1.2***). A suggested performance measure is provided for each of the listed objectives, including the data source required to track and assess this metric.

Most State ATP funded projects have requiredbefore and after studies. Caltrans recently updated and published the *Interim Count Methodology Guidance for Active Transportation Program,* which requires all ATP projects funded after October 2019 to conduct a before and after study based on the guidelines. A copy of the guidelines is included in ***Appendix E*** of the ISATP.

Table 6.5.1 ISATP Performance Measures

Goal	Objective	Performance measure	Data Source
1. Plan for System Significance	Plan local active transportation network	Miles/quantity of bicycle and pedestrian infrastructure	City Inventory
	Establish regional congruence that connect Irvine to neighboring communities	Miles/quantity of bicycle and pedestrian infrastructure	City/Adjacent Cities/County Inventory
2. Improve Safety	Reduce pedestrian and bicycle fatalities/injuries	Number of bicycle and pedestrian fatalities/injuries over five years	SWITRS/TIMS
	Prepare an Active Transportation Design Guidelines	Prepare Design Guidelines	City of Irvine Strategic Active Transportation Plan
	Establish best practices for maintaining pedestrian and bicycle facilities and monitoring future collisions	City maintenance tracking system updated regularly, and city quarterly/yearly collision data portal	City Inventory, and SWITRS/TIMS
3. Enhance Accessibility	Invest in accessible alternative transportation infrastructure for all ages/abilities/ comfort levels	Miles/quantity of alternative transportation infrastructure	City Inventory
	Support the development of active transportation infrastructure that improves mobility access to and from origins and destinations	Connectivity Assessment of baseline vs implemented active transportation facilities	City Inventory
	Establish best practices for mode-split and forecasting of pedestrian and bicycle transportation monitoring	Prepare Mode-split and Forecasting Tools	City of Irvine Strategic Active Transportation Plan
4. Create Healthy Options	Reduce chronic health diseases by providing active transportation options that promote healthy lifestyle choices	Obesity rates, physical activity rates	CalEnviroScreen/Healthy Places Index/Community Survey
	Encourage programs at community centers and schools that teach residents safe and healthy biking and walking habits	Number of active transportation programs per year, number of staff or teachers trained in active transportation issues	City/County Inventory
5. Bolster Economic and Environmental Sustainability	Invest in facilities that bring long-term sustainable economic growth to the City	Number of jobs added to the economy as a result of improved transportation conditions	REMI model via SCAG
	Realize fiscal savings due to reduced congestion and subsequent travel times	Average commute time compared across vehicular, bicycle, and pedestrian traffic	American Communities Survey/ Mode Share Tool (ISATP)
	Support sustainable investments that reduce pollution (air, water, noise) and GHG impacts and costs	Number of sustainable projects and CalEnviroScreen 3.0	City/County Inventory and OEHHA CalEnviroScreen 3.0
	Reduce economic losses related to life and property damages	Cost associated with loss of life and property damages	SWITRS/TIMS
	Reduce public health costs due to shift towards increased active transportation	Cost spent associated with physical inactivity externalities	City/County/Health Provider Inventory

6.6 NEXT STEPS

The City of Irvine, working with its stakeholders, including residents and businesses, intends to pursue the goals and actions outlined within the ISATP. The City will build on the policies and the program recommendations to make Irvine a city where people can circulate without a car, where an increasing number of residents and visitors can commute by bicycles, where more people use non-motorized transportation for utilitarian trips, fitness and recreation, and where significant business and economic benefits can be provided.

The City intends to pursue available federal, state, and local funding options and leverage funds to maximize matching opportunities. In addition to infrastructure improvements, the City intends to continue to provide education, encouragement, and enforcement programs for motorists, pedestrians, and bicyclists. The City's Police Department will ensure that traffic laws are enforced and that people are educated as to traffic laws related to all modes of transportation.