



Sustainable Mobility Plan

January 2024



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Introduction

On July 14, 2023, Mayor Farrah Khan requested and the City Council supported the development of Citywide Sustainable Mobility Plan. This plan describes the City of Irvine's firm commitment to implement sustainable mobility infrastructure and programs in support of our Climate Action and Adaptation Plan goals. The actions described in this document build on the recommendations from other plans including the City's Transit Vision and Strategic Active Transportation Plan.



The Sustainable Mobility Plan evaluates new and improved transportation options and provides steps towards implementation aimed at helping residents get around our City. The study aims to increase the use of transit, walking, and bicycling and to help reduce vehicle miles traveled and the associated emissions.

What is sustainable mobility?

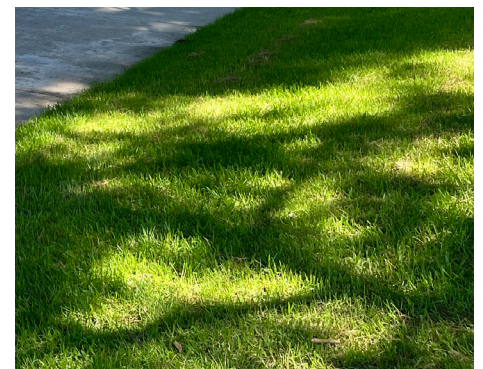
Sustainable mobility is the term used to refer to transportation from an environmental or ecological mindset. The goal for sustainable mobility is to mitigate excessive fuel consumption and reduce greenhouse gas emissions.



What is included in this plan?

The Citywide Sustainable Mobility Plan includes:

1. A plan for implementing a network of protected or enhanced bicycle lanes connecting all parts of the City.
2. A model for developing local networks of enhanced bike facilities within each residential village, connecting parks, schools, community amenities and retail locations.
3. Identification of regional and local mobility hubs that include bike-share and car-share services.
4. Strategies for integrating the bike, pedestrian, transit and trails networks to facilitate multi-modal, non-automobile travel options.



Achieving League of American Bicyclists Gold Status for Irvine

Irvine currently has Silver status from the League of American Bicyclists. In their 2021 report card, the League describes several steps that the City can take to achieve Gold status. These include: improving and

expanding the low-stress bicycle network, increasing the quantity of bicycle parking, improving bicycle safety education for riders of all ages, adopting a safety plan for improving bicycle safety, and adopting a City-wide Complete

Streets policy. The City has been proactive and has already addressed the latter three steps in its Suggested Routes to School, Local Roadway Safety Plan, and upcoming General Plan Update, respectively.

Meeting Irvine’s Climate Action & Adaptation Goals

The City’s Climate Action and Adaptation Plan included a greenhouse gas emissions inventory that identified on-road transportation as the single largest contributor to the City’s greenhouse gas emissions.

By increasing the access and appeal of more sustainable modes of travel, including biking, walking, and transit, this plan will assist the City in its efforts to meet its goals of reducing emissions from on-road transportation.

The implementation of the Sustainable Mobility Plan will support reductions in transportation-related greenhouse gas emissions by providing lower emission alternatives to single occupancy vehicles.

2019 Community GHG Emissions Inventory

Sector	GHG Emissions (MTCO ₂ e)	Percent of Total
On-Road Transportation	1,144,205	51
Nonresidential Building Energy	550,138	24
Residential Building Energy	291,405	13
Solid Waste	160,626	7
Off-Road Vehicles and Equipment	68,756	3
Water Supply	30,798	1
Wastewater Treatment	5,665	<1
Total	2,251,593	100



On-road transportation accounts for 51% of Irvine’s total GHG emissions

Source: Draft Greenhouse Gas Emissions Inventory Report (June 2023)

Vision, Goal & Strategies

SUSTAINABLE MOBILITY VISION

The City's vision is to offer a variety of sustainable transportation options that are accessible, comfortable and convenient for Irvine residents. The Sustainable Mobility Plan (SMP) illustrates this vision by expanding upon the recommendations from the Strategic Active Transportation Plan; creating opportunities to implement safety improvements consistent with the Local Roadway Safety Plan (LRSP); and supporting the City's ongoing Safe Routes to School and Americans with Disabilities Act (ADA) Accessibility efforts.

SUSTAINABLE MOBILITY GOAL

The primary goal of the SMP is a measurable Citywide **mode shift** toward sustainable transportation options resulting in **reduced VMT** and **reduced greenhouse gas (GHG) emissions** from transportation-related sources. This goal is aligned with the City's Climate Action and Adaptation Plan (CAAP) which seeks reductions in GHG emissions from all sources. The City recognizes that other efforts beyond the scope of this plan will also need to be implemented in order to achieve the City's transportation related greenhouse gas reduction goals including land use changes that are being addressed in the update to the City's General Plan.

STRATEGY 1 PROTECTED & ENHANCED BIKEWAYS NETWORK

Irvine residents will be seeing changes to the City's roadways that will make it safer, more comfortable and practical to travel by bicycle. A key element of the SMP is to reallocate roadway space away from automobiles to improve the quality and comfort of the City's on-street bike facilities along segments and intersections, resulting in a Citywide protected or enhanced bikeways network including 180 miles of new on-street bike facilities.

STRATEGY 2 MOBILITY HUBS

The SMP provides a vision for mobility hubs in Irvine. The City's various land use contexts and village-based development pattern provide opportunities for offering mobility services that connect residential areas, community amenities, commercial and office centers, and regional transit. The City will continue to maintain existing multimodal infrastructure and work with residents and the private sector to explore opportunities for expanding shared mobility services.

STRATEGY 3 SAFE ROUTES TO SCHOOL

The City of Irvine has worked with the Irvine Unified School District to ensure that students living in Irvine are in close proximity to their local schools. As a result, the vast majority (90%+) of students live within the following distances of their school as they progress through the grades:

- Elementary School – 1.5 miles
- Middle School – 2 miles
- High School – 3 miles

The distances increase over the years as students become more independent and are able to walk, bike, e-bike or take transit to school. In addition, the City will continue to work with the Irvine Police Department to host safety education programs and prepare and promote Suggested Routes to Schools maps to encourage sustainable transportation to schools.

STRATEGY 4 ADA ACCESSIBILITY

The City of Irvine prohibits discrimination against persons with disabilities, ensuring that such people can fully participate in and benefit from the public services offered by the City. All new sustainable transportation infrastructure will be built and operated in compliance with ADA accessibility standards and guidelines. This applies to sidewalks, traffic signals, intersections, crosswalks, bus stops, bicycle infrastructure, and all aspects of the public right-of-way. It also applies to transit vehicles and mobility hub infrastructure at public facilities. In addition, the City will also review and address any deficiencies to existing facilities.

STRATEGY 5 VILLAGE CONNECTIVITY

Beyond workplace or residential travel, trips made to parks, community centers or retail centers are an important component in sustainable mobility. Through the combined benefits of each of the previous four strategies, Irvine residents will have safe, convenient, and sustainable options to travel within or between the villages.



An event on South Yale Avenue demonstrates the features of a forthcoming protected bikeway

Ongoing Efforts Summary

The City has implemented improvements related to sustainable mobility in a number of areas, outlined in this section.

SAFETY

The City of Irvine is committed to improving safety for all who walk, ride, drive or are driven on its streets. Through their initiative, [Irvine Shares the Way](#), the City helps raise awareness of its efforts and best practices for all roadway users to reduce collisions and stay safe. This Sustainable Mobility Plan supports these efforts to further safety for all of Irvine's residents, workers, and visitors.

Suggested Routes to School

In 2020, the Irvine Unified School District partnered with the Irvine Police Department and the City Traffic Engineering Division to develop suggested routes for school-age children to safely walk or ride their bicycles to school. For all elementary schools, a map was developed to indicate the routes suggested to take to and from school. Information on bicycle safety and availability of crossing guards at schools is also provided.

Local Roadway Safety Plan

In Spring of 2022, the City completed its first city-wide safety plan. The plan identified the following key systemic safety trends:

- Pedestrians crossing in a crosswalk were in about two thirds of all pedestrian collisions.
- When compared to the City population, younger road users, aged 19 or younger, were represented in a disproportionate share of collisions.
- The share of pedestrians and bicyclists involved in fatal or serious injury collisions was twice the share of all injury collisions.

With these and other systemic trends, the LRSP identified five hot spot locations and Citywide systemic improvements to focus safety project implementation.

Bicycle Safety

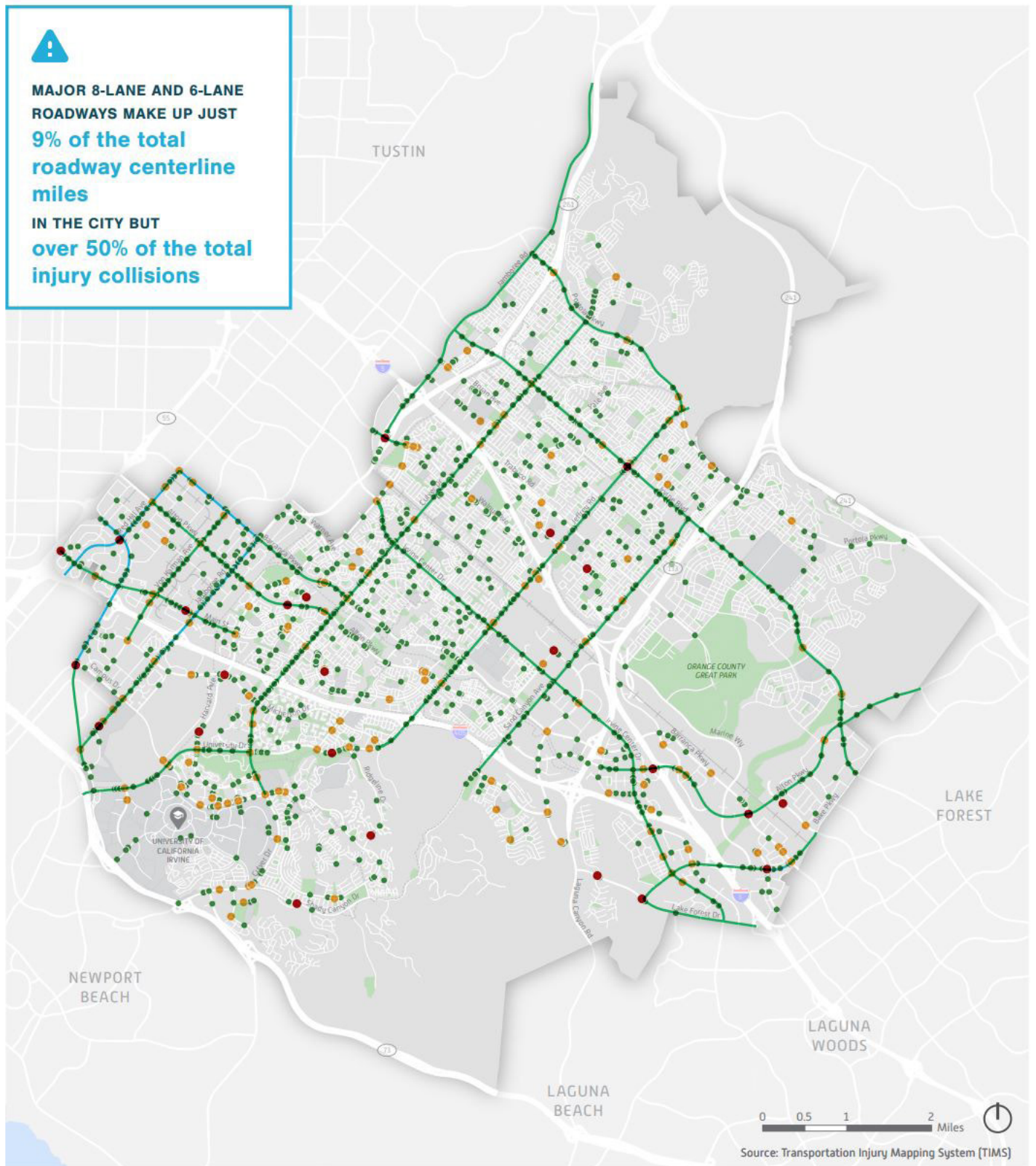
The City's comprehensive bicycle safety strategy is a multi-pronged approach, including infrastructure development, public awareness campaigns, and collaborative efforts among safety partners to enhance the safety and comfort of roadway users.

In 2023, Irvine City Council passed ordinance No. 23-17 amending portions of the municipal code relating to contraflow bicycle riding and riding on sidewalks. The impetus for the amendments included a marked increase in e-bike collisions involving juveniles. These amendments complement existing regulations relating to bike path speed limits (20 mph) and a prohibition of use on un-designated playgrounds, parks, and school grounds.

The passed ordinance amended the municipal code to explicitly permit the use of e-bikes on sidewalks in Irvine unless otherwise prohibited by appropriate signage. In addition, the ordinance amended regulations to explicitly state that bicycle/e-bike/scooter operators are required to travel in the same direction as vehicles would travel on roadways (e.g. right-side). This provision applies to operation on roadways, bike lanes, and sidewalks less than 8 feet in width. While the provisions of the ordinance provide clearer guidelines related to e-bike safety, a challenge remains in ensuring sufficient resources are dedicated for enforcement.



MAJOR 8-LANE AND 6-LANE ROADWAYS MAKE UP JUST 9% of the total roadway centerline miles IN THE CITY BUT over 50% of the total injury collisions



CITY OF IRVINE

All Injury Locations

2015-2019

ALL INJURY COLLISIONS

- Fatal
- Severe Injury
- Other Injury
- Major 8-Lane
- Major 6-Lane
- Parks
- Schools

ADA COMPLIANCE

The City of Irvine prohibits discrimination against persons with disabilities, ensuring that such people can fully participate in and benefit from the public services offered by the City. The City of Irvine ADA Compliance Officer, who is located within the Human Resources Department, oversees the City's and each department's ADA compliance. In addition, an ADA Coordinator has been established for each City department. Complaints, grievances, concerns or recommendations regarding public access to any of the City programs, services or activities should initially be reported to that department's ADA Coordinator, who will immediately begin to resolve the matter.

All new City infrastructure, including improvements identified in this plan, will comply with ADA standards.

PUBLIC TRANSIT SERVICE IMPROVEMENTS

Transit in the City is operated by the Orange County Transportation Authority (OCTA), which operates fixed-bus service, the local Irvine iShuttle, and demand-response services such as OC Access.

In 2022, OCTA released their final South Orange County Multimodal Study, the goal of which was to evaluate the long-term needs of South Orange County. Locally Preferred Strategies include interchange improvements, high frequency transit, mobility hubs, active transportation improvements, and transportation demand management strategies. The Countywide Transit Master Plan, OC Transit Vision, was completed in 2018 and identified several transit opportunities, including potential for Freeway Bus Rapid Transit (BRT) along Interstate 5 and State Route 55. OCTA began an update to their OC Transit Vision in Summer of 2023 and is expected to complete the plan in 2024.

Irvine Transit Vision and Pilot Project

In 2022, the City completed a study to evaluate potential additional transit needs that would complement existing transit provided by the OCTA bus system and iShuttle while also reducing greenhouse gas

emissions, increasing resident and business mobility, and reducing congestion from traffic. The study recommends a number of potential service upgrades, one of which, the Yale-Barranca Pilot Route, will begin service in 2024. This route is shown on the following page.

Irvine Station First Last Mile Plan

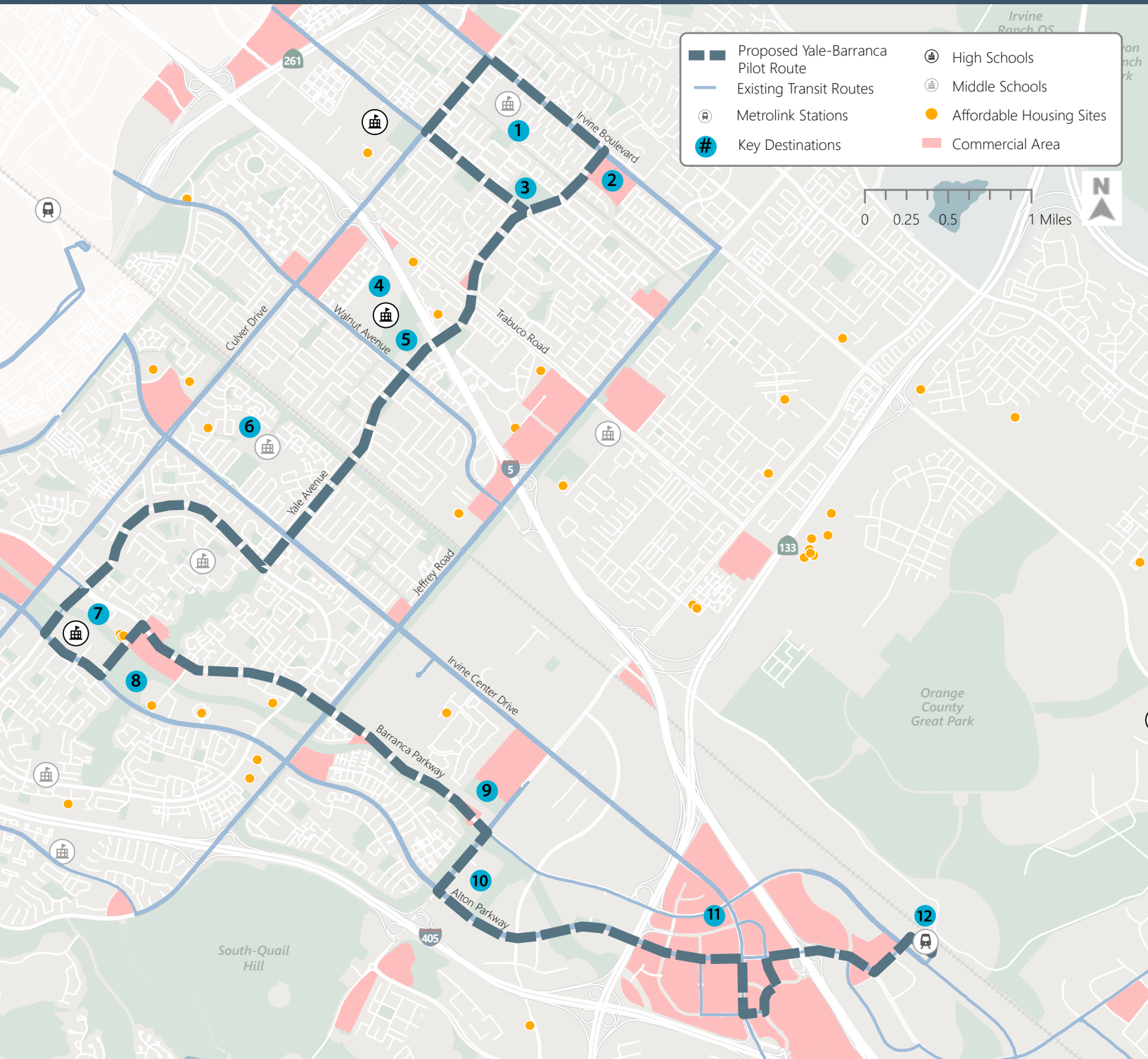
In 2021, the City conducted a study of Metrolink's Irvine Station in order to recommend improvements for pedestrian, bike, and transit access. The study found that while Irvine Station is routinely accessed by millions of annual users primarily during weekday working hours, accessibility needs to be improved for bicyclists and pedestrians. Recommended bicycle improvements focused on the addition of buffers to bike lanes, closing gaps between existing bicycle infrastructure, and adding off-street shared use paths. Recommended pedestrian improvements primarily focused on closing gaps between existing facilities, as well as buildouts of shared-use paths, particularly in the area north of Irvine Station. Out of the five major and local corridors surrounding Irvine Station, the study recommended prioritizing Alton Parkway, Barranca Parkway, and Irvine Center Drive as sites for implementation projects.

YALE-BARRANCA PILOT ROUTE

Northwood to Irvine Station via Yale Avenue, Barranca Parkway, and Alton Parkway

Route Description

The Yale-Barranca pilot route connects from Northwood along Yale Avenue, serves Woodbridge along the northwest portion of the Yale Loop, and then provides service along Barranca Parkway and Alton Parkway to the Irvine Station.



Existing Conditions

MODE SPLIT

Mode split data from the 2012 California Household Travel Survey shows that over 85% of all trips in Irvine are taken by car. This share is similar when looking at commute trips in 2019. Notably, newer commute data from the 2021 American Community Survey reveals that just over a third of workers surveyed indicated that they worked from home, a pandemic-era shift that shows a reduced share primarily in the commute trips taken by car.

VMT

VMT data calculated using the City of Irvine's Transportation Analysis Model (ITAM) shows that residential VMT per capita for Irvine residents is similar to Orange County and the SCAG region. Commute trip lengths for jobs located in Irvine are also close to the average for Orange County and the SCAG region. However, for per employee non-residential VMT, the City of Irvine has lower than average VMT for the SCAG region, as the SCAG regional average was found to be substantially higher than both the Orange County and City of Irvine averages.

SAFETY

All Collisions by Year

Between 2015 and 2019, 2,681 collisions occurred on local roadways in Irvine. The number of injury collisions in Irvine declined between 2016 and 2019.






Collisions by Mode

Pedestrians and bicyclists are particularly vulnerable to injury in traffic collisions. Pedestrians and bicyclists make up a disproportionate share of KSI (killed or severely injured) collisions compared to all collisions. The share of pedestrians and cyclists in KSI collisions is almost twice their share in all injury collisions. The share of pedestrians in KSI collisions is over three times their share in all injury collisions.

Primary Collision Factor

Unsafe speed violations were the primary collision factor in nearly a third of injury collisions in Irvine between 2015 and 2019. Speed is a key safety issue in Irvine, as its streets were built to accommodate high speeds, and speed is often a contributing factor in severe collisions even where it is not cited as the primary violation.

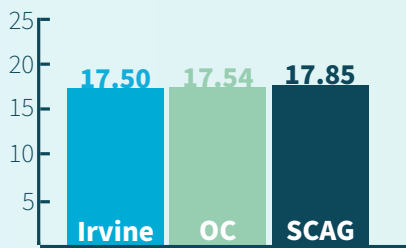
MODE SPLIT

	All Trips (2012)	Work Trips (2019)	Work Trips (2021)
 Drive	85.6%	83%	60.5%
 Transit	0.7%	1.2%	0.3%
 Walk	10.9%	4.3%	2.6%
 Bike	1.7%	1.5%	1.3%
 Other incl. work from home	1.1%	10%	35.3%

Sources: All Trips - 2012 California Household Travel Survey; Work Trips - 2019 and 2021 American Community Survey 5-yr estimates

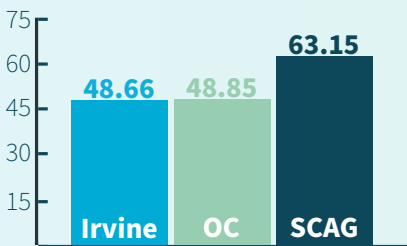
VMT

Residential VMT per Capita



Residential VMT in Irvine is similar to Orange County and the SCAG region

Non-residential VMT per Employee

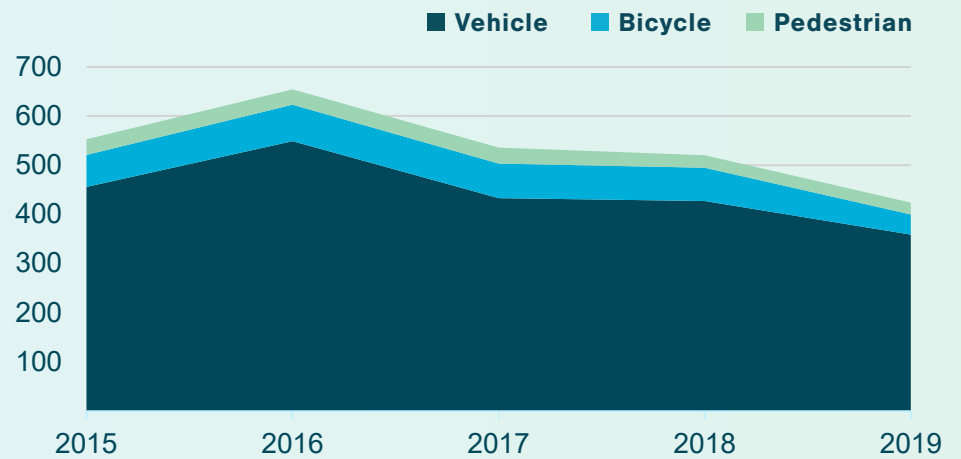


Non-residential VMT for employees in Irvine is similar to Orange County, but lower than the SCAG region

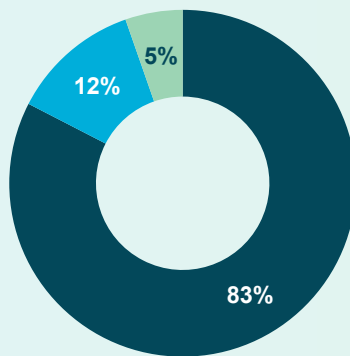
Source: City of Irvine Traffic Study Guidelines, 2020

SAFETY

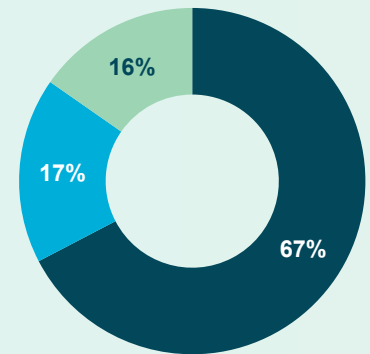
INJURY COLLISIONS, 2015-2019



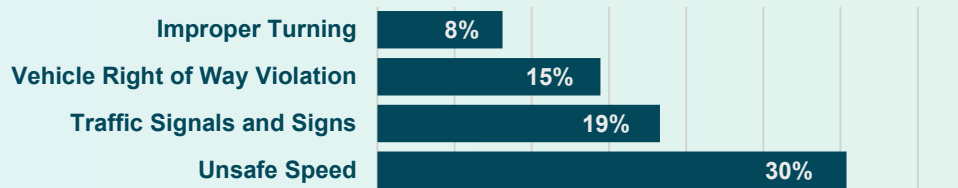
MODE SPLIT FOR INJURY COLLISIONS 2015-2019



MODE SPLIT FOR KSI COLLISIONS 2015-2019



PRIMARY VIOLATION FOR ALL INJURY COLLISIONS, 2015-2019



Source: City of Irvine LRSP, 2015-2019 collision data from TIMS

Summary of Public Outreach

Community input was collected through two in-person pop-up events, one in-person workshop, and an online survey in late Summer and Fall of 2023. In each event, project team staff facilitated dialogues around sustainable transportation in Irvine. Public feedback was collected from residents, workers, and visitors of the City and taken into consideration for this plan.

SOUTH YALE AVENUE DEMONSTRATION EVENT

AUGUST 26, 2023

Following efforts from the City's Strategic Active Transportation Plan, the City partnered with SCAG, GoHuman, and the California Office of Traffic Safety to setup a temporary class IV bikeway on Yale Avenue from Royce Road to Michelson Drive. Visitors from as near as the neighborhood to as far as Costa Mesa attended the event and provided their preferences for facilities with additional bike protection or enhancement at specific locations in the City. In attendance were also City leaders including Mayor Farrah Khan and numerous city council members.

“A protected bikeway on Barranca and on Yale would greatly improve access throughout Irvine.

IRVINE GLOBAL VILLAGE FESTIVAL

OCTOBER 14, 2023

The project team secured a booth at the Irvine Global Village Festival which received around 17,400 visitors in total. Festival attendees, including Irvine residents, workers, and visitors, came by the booth to view the roadways planned for additional protected or enhanced bikeways and also vote on which they would like to see prioritized. Yale Avenue received the highest number of votes. Attendees were excited by this plan and to see protected facilities being planned. A lot of positive feedback was received.

PUBLIC WORKSHOP

NOVEMBER 9, 2023

An in-person workshop was held at Irvine City Hall where attendees had the opportunity to converse with the project team, learn about the City's ongoing efforts, and voice their preferences. Poster boards with proposed cross sections provided an easy visual tool to see the different methods of protecting or enhancing a bikeway. Attendees were provided stickers to vote on their preferred type of bikeway protection, mobility hub amenities, and roadways where additional protected lanes for bicycles was desired. The information discussed at the meeting was also uploaded as an online survey where respondents could vote and provide feedback on community hubs, cross sections and protected bikeways.

“ I would love to bike with my kids!

- public engagement participants

SURVEY RESULTS

How Survey Respondents Travel in Irvine:

A majority of survey respondents walk, bike, or take transit to travel in Irvine



Reenvision Yale
August 26, 2023

Preferred bikeway barrier type:

Raised median with landscaping

Most requested amenities:

More secure bike storage areas

Water fountains and benches



Global Village
October 14, 2023

Top areas and corridors requested for protected or enhanced bike facilities:

Great Park

Irvine Business Complex

UC Irvine

Irvine Spectrum

Yale Avenue

Irvine Boulevard

Barranca Parkway

Alton Parkway



Public Workshop
November 9, 2023

Protected & Enhanced Bikeways

Protected bikeways are enhanced to provide additional safety and comfort to bicycle users by providing vertical separation from vehicle lanes. Bicycle lane protection can vary from painted buffers to flexible dividers to concrete or landscaped medians. Each of these treatments has a variety of considerations in regard to vehicle speeds, bicycle volumes, cost, maintenance, cleaning/sweeping, access, and aesthetics.

In 2021, the City completed its Strategic Active Transportation Plan (SATP) which identified specific roadways across the City as suitable locations for protected & enhanced bikeways. The SATP identified roadways and intersections for bike improvements programmed to begin in as soon as two years for some locations. While the SATP provided recommendations of bikeway protection, it did not differentiate between the types of vertical and horizontal separation. Faster streets with higher vehicle

volumes are best suited for vertical separation, while painted buffers can work on slower, lower volume streets.

The following section goes into further detail on the types of bikeways being considered for implementation.

Examples of protected bikeway buffer treatments can be found in **Appendix A**.

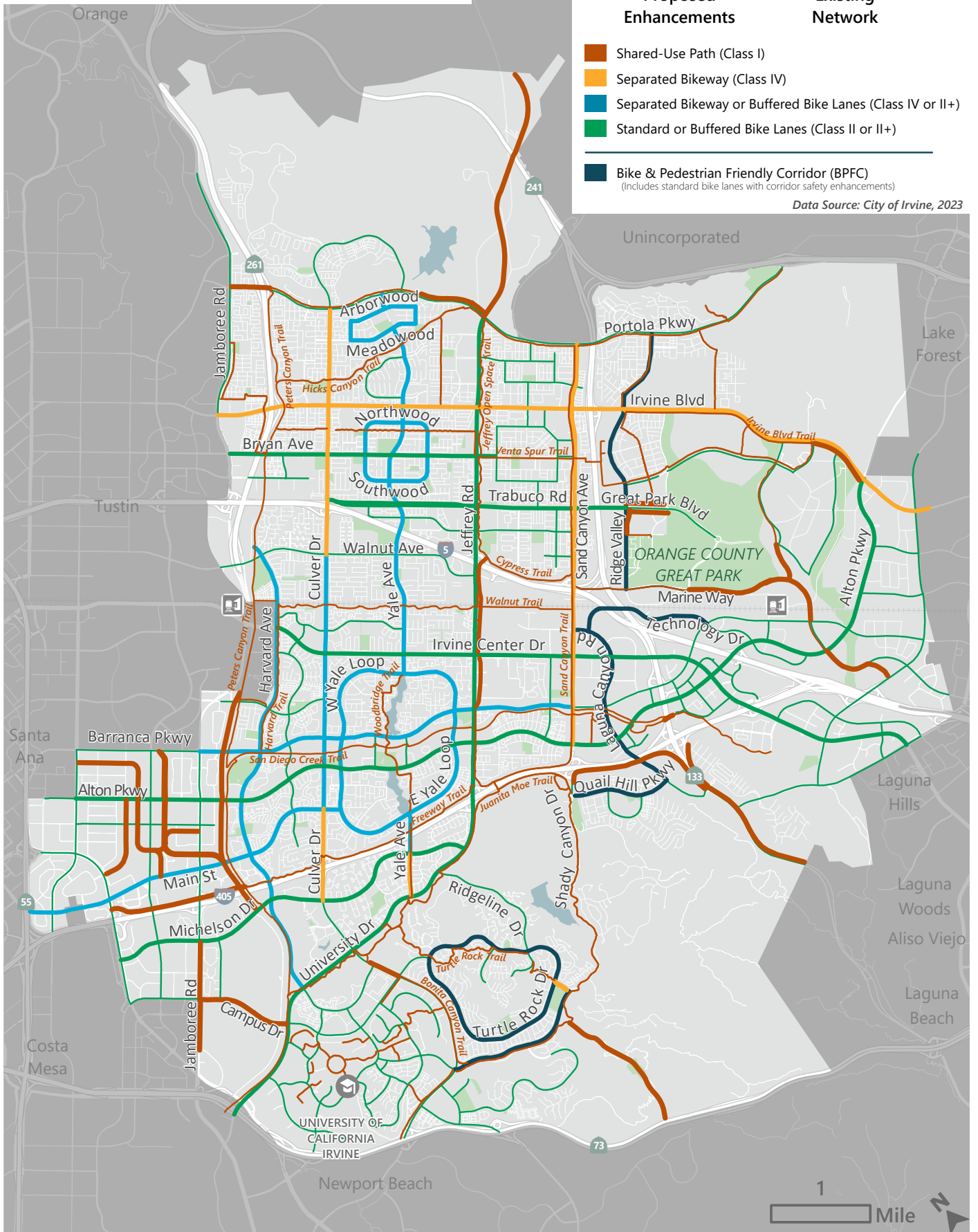
Additional Guidance:
[FHWA Bikeway Selection Guide](#)

PROTECTED & ENHANCED BIKEWAYS MAP

The following page shows a map of proposed on-street bike facilities and other bikeway improvements.

Proposed Improvement		Centerline Miles
On-Street Facilities		180
	Separated Bikeway (Class IV)	18
	Separated Bikeway or Buffered Bike Lanes (Class IV or II+)	28
	Standard or Buffered Bike Lanes (Class II or II+)	134
Additional Bikeway Improvements		49
	Shared-Use Path (Class I)	35
	Bike & Pedestrian Friendly Corridor	14
Total		229

Irvine Bikeway Improvements



BUFFERED BIKE LANES (CLASS II+)

Benefits

These bikeways provide separation from vehicle lanes through painted buffers, without a vertical element. Painted buffers often contain chevron or diagonal striping to further draw driver's attention to the presence of bike lanes. These easily-implementable and

relatively low-cost treatments are a proven safety countermeasure. By narrowing vehicle travel lanes, buffered bike lanes can also create a traffic calming effect to slow vehicle speeds. The additional space also provides opportunities for faster bicyclists wishing to pass slower ones.

Considerations

While Class II+ facilities provide a number of benefits, including increased visibility and separation

from vehicle lanes, they may not be suitable for all contexts. Without physical separation, drivers may encroach into buffers and bike lanes, using the bike lanes as unofficial turn lanes or loading zones and increasing conflicts with bicyclists. Areas with numerous driveways, transit stops, or right turn lanes should consider green conflict markings to manage interactions between bicyclists and other vehicles.



Source: City of Irvine

SEPARATED BIKEWAYS (CLASS IV)

Benefits

Also referred to as “Cycle Tracks,” Class IV facilities offer a higher level of protection than Class II+ by adding a physical barrier in addition to a painted buffer to separate bicyclists from vehicle lanes. These physical barriers can take the form of flexible guideposts, grade separation,

plant boxes, hard- or landscaped-medians, or parking lanes. Separated bikeways have a documented safety benefit and appeal to a wide range of bicyclist age groups, comfort levels and experience. They can be installed as one- or two-way facilities, depending on context and bicycle volumes.

Considerations

With greater protection, Class IV facilities can carry additional

costs and complications for installation and maintenance. New or modified curbs may require additional stormwater considerations. When installed adjacent to parking, care should be taken to avoid car door and bicycle lane conflicts, known as “dooring.” In areas with limited right-of-way, Class IV bikeways may require additional adjustments to accommodate ADA access, driveways, and transit stops.



Source: StreetsblogLA

Temple City, CA

BUS/BIKE INTERFACE

In many cities, transit corridors can often overlap with major bicycle routes. To ensure a safe and comfortable experience for transit passengers and bicyclists alike, it is critical to plan for the interface of bus and bike interactions. In some contexts, boarding islands, such as the example below, allow for an uninterrupted bike lane that

runs behind the bus stop while also reducing conflicts between buses, bicyclists and pedestrians. Bus boarding islands can be implemented with either buffered bike lanes or protected bikeways when sufficient right-of-way is available. These boarding islands also provide a high-visibility waiting area for pedestrians waiting to board.

Another option is to create well-defined conflict markings for mixing zones where buses and bicycles share space. By providing designated areas for buses, bicyclists, and vehicles, the movements of each mode can be more predictable and increase the quality of experience for all.

Additional Guidance:
[NACTO Transit Street Design Guide](#)



Source: BikePortland.org

Portland, OR

INTERSECTIONS

Intersections, whether signalized or not, are areas with the highest number of conflicts between roadway users. To enhance safety and comfort for bicyclists, a number of design and planning tools are available to increase visibility of bicyclists for drivers, and reduce vehicle speeds. Options include the use of green conflict paint or other markings, which can be used crossing the intersection and/or on the intersection approach. These

high-visibility markings provide increased visibility to drivers and serve as a reminder of the presence of bicyclists. Turning conflicts between bicyclists and vehicles may be further reduced through the usage of tighter curb radii or curb corner islands, which encourage drivers to slow their speed when making a turn and provide a shorter crossing distance for pedestrians.

These intersection treatments are not without their tradeoffs and may not be appropriate in all

contexts. Intersection treatments should be evaluated for compatibility with other factors such as intersection capacity, bus routes or truck routes.

Protected intersections, like the one shown below, combine many of these different elements together into one intersection design, with a focus on separate space and time for all modes.

Additional Guidance:
[NACTO Don't Give Up at the Intersection](#)



ON-STREET BIKE FACILITY DESIGN CONSIDERATIONS

There are a number of bike facility design, lane configuration, and buffer options that can be made when implementing an enhanced or protected bike facility. Choices should be made with the roadway context in mind, including posted speed limit, number of lanes, vehicle and bicycle volumes, density of intersections and driveways, on-street parking, and presence of transit. Constraints such as the existing right-of-way width and the presence of medians should also be taken into consideration. The cross sections on the following pages represent the variety of these contexts and constraints that exist throughout Irvine and provide bikeway design options well-suited for each roadway type.

Lane Widths

Standard **travel lanes** and **turn lanes** can be narrowed to provide more space for enhanced and protected bike facilities based on roadway context. By reallocating this road space from motor vehicles to bicycles, the City hopes to

increase bike mode share and the overall sustainability of the transportation system.

Bike lanes in Irvine will typically be 7 to 8 feet wide, which exceeds the minimum width requirements in state and national guidance. Providing these wider bike lanes allows bicyclists to maintain

a safe distance from curbs and other vertical elements in protected bikeways. It also provides sufficient space for faster bicyclists to pass slower bicyclists without leaving the bike lane in most cases. This need for passing is more important with the proliferation of electric assist bicycles.



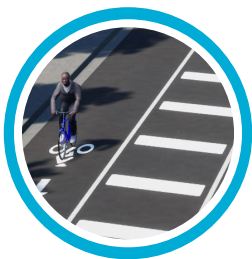
The City of Santa Monica used an extruded curb method to create concrete barriers along the bike facility on 17th Street.

Buffer Options

The cross sections on the following pages highlight a number of buffer and vertical separation options for bikeways in Irvine. Buffer options are largely interchangeable, and may be swapped from what is shown in the cross section examples, based on project costs, community input, or other constraints or considerations.

Vertical separation should be used on streets with higher vehicle volumes and speeds, while buffers may be suitable for lower speed and lower volume streets.

A variety of buffer options are shown below. Additional buffer options and more detailed design considerations are provided in **Appendix A** of this report.



Painted Buffers provide increased horizontal separation between bicyclists and motor vehicles but provide no vertical separation. The preferred minimum buffer width is 3 feet, but a narrower buffer may be used.



Flexible Barriers can be used to add vertical separation to painted buffers. There are a variety of products on the market that fall into this category and the spacing of barriers may vary depending on the context and goals of the project.



Raised Bike Lanes can be used to provide vertical separation where there is insufficient space for a buffer or vertical barrier. They are typically constructed a few inches above street grade behind a mountable curb, but can also be constructed at sidewalk level behind a vertical curb. The mountable curb allows for fire clearances to be met while still providing vertical separation for bicyclists.



Raised Medians are a more durable alternative to flexible barriers with typically higher construction costs, but lower maintenance costs and improved aesthetics. They will typically be at least 3 feet wide which can allow for concrete or decorative pavers to be used. Options such as extruded and pre-cast curb are included in this category.



Landscaped Raised Medians can be implemented in locations where there is at least 5 feet of buffer area and provide an opportunity to improve the overall aesthetics of the roadway. Construction and maintenance costs will be higher for landscaped raised median than for concrete raised medians.

1 40 ft Street with Raised Bike Lane

Potential locations:

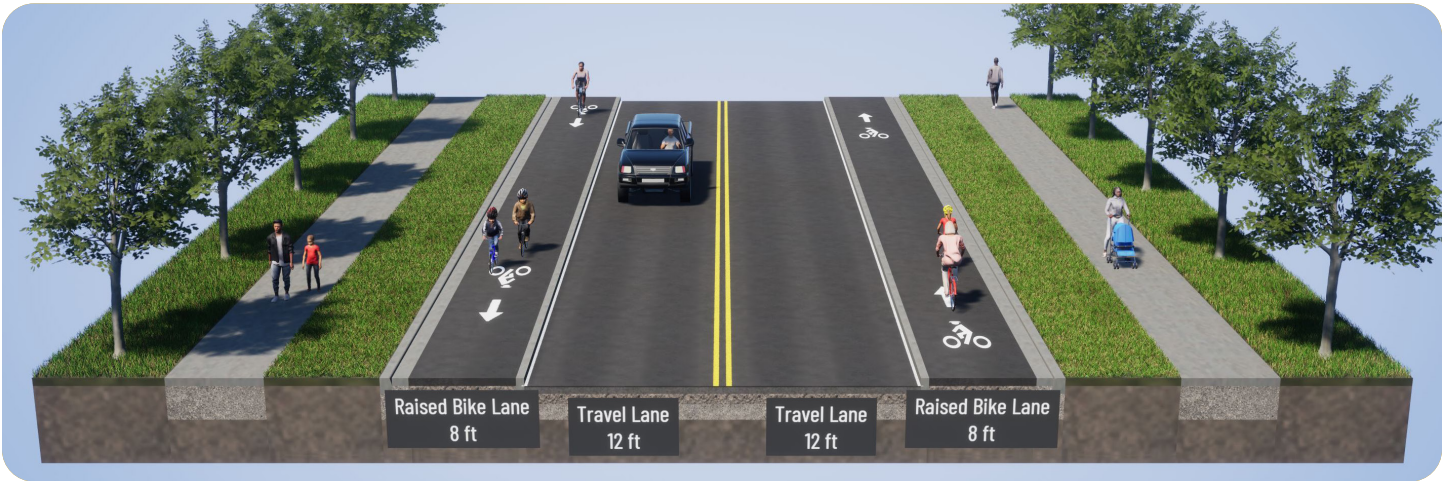
- North end of Yale Ave.
- Narrow Bridges

Pros:

- No horizontal buffer required

Cons:

- Less common treatment



2 50 ft Street with Protected Bikeway (Landscaped Median)

Potential locations

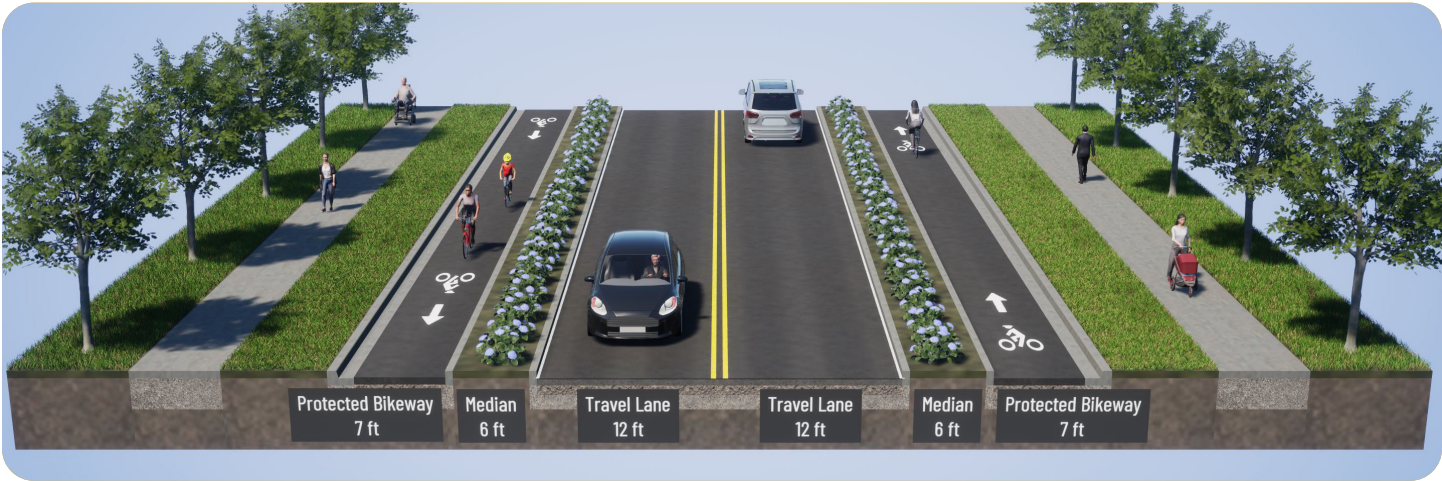
- Meadowood
- Canyonwood
- Amberwood
- Citrusglen

Pros:

- Vertical and horizontal barrier with improved aesthetic

Cons:

- Requires irrigation and maintenance for landscaping



3 70 ft Street with Raised Bike Lane

Potential locations

- Eastwood
- Westwood

Pros:

- Meets minimum (20 ft) fire clearance

Cons:

- Less common treatment



4 70 ft Street with Buffered Bike Lane

Potential locations:

- Eastwood
- Westwood

Pros:

- Provides horizontal separation and easy implementation

Cons:

- Less protection for bicyclists



5 78 ft Street with Protected Bikeway

Potential locations:

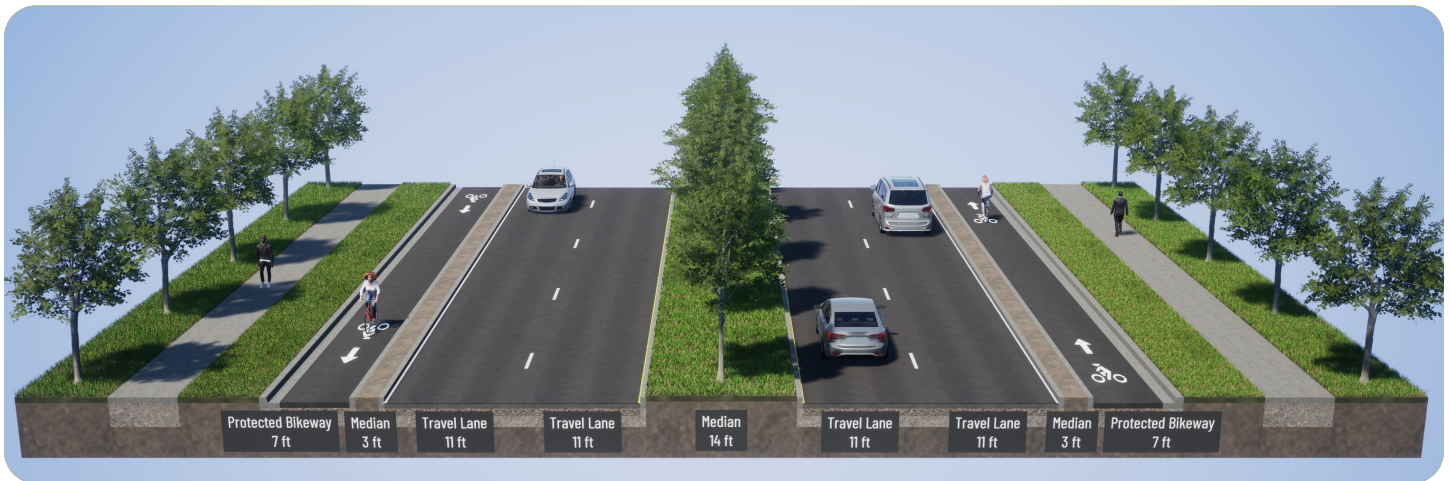
- Harvard Ave.
- Alton Pkwy. (west of Pacifica)
- Barranca Pkwy.

Pros:

- Provides horizontal and vertical separation

Cons:

- May be less visible in low-light conditions



6 102 ft street with Protected Bikeway (Flexposts)

Potential locations:

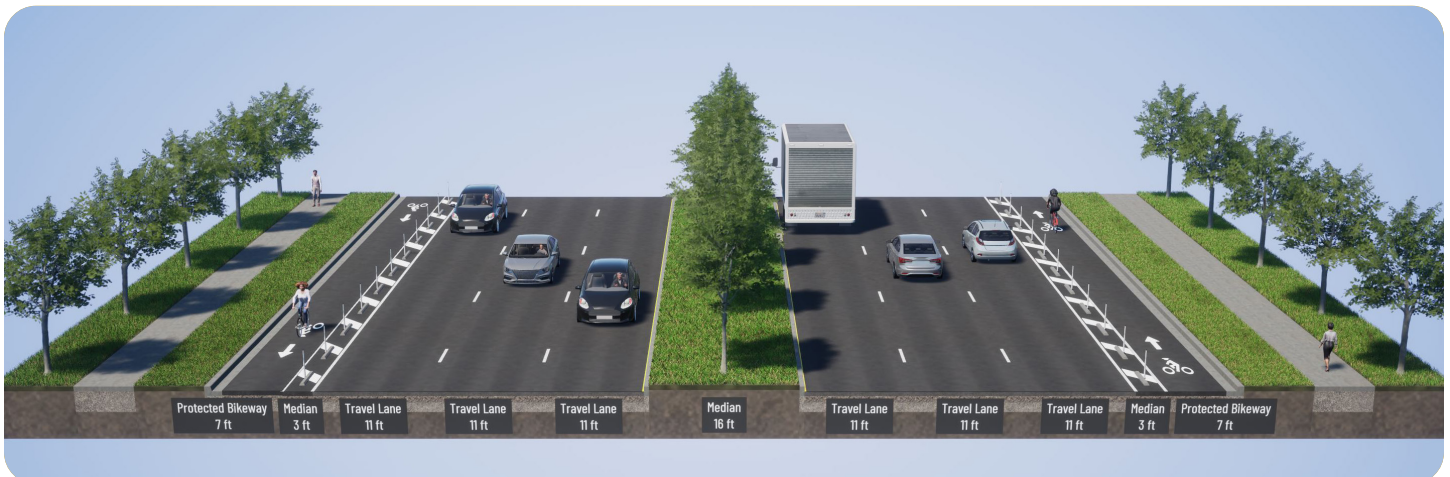
- Culver Dr.
- Alton Pkwy. (east of Pacifica)
- Irvine Center Dr. (east of Sand Canyon Ave.)

Pros:

- Provides horizontal and vertical separation

Cons:

- Less aesthetic appeal



7 108 ft street with Protected Bikeway

Potential locations:

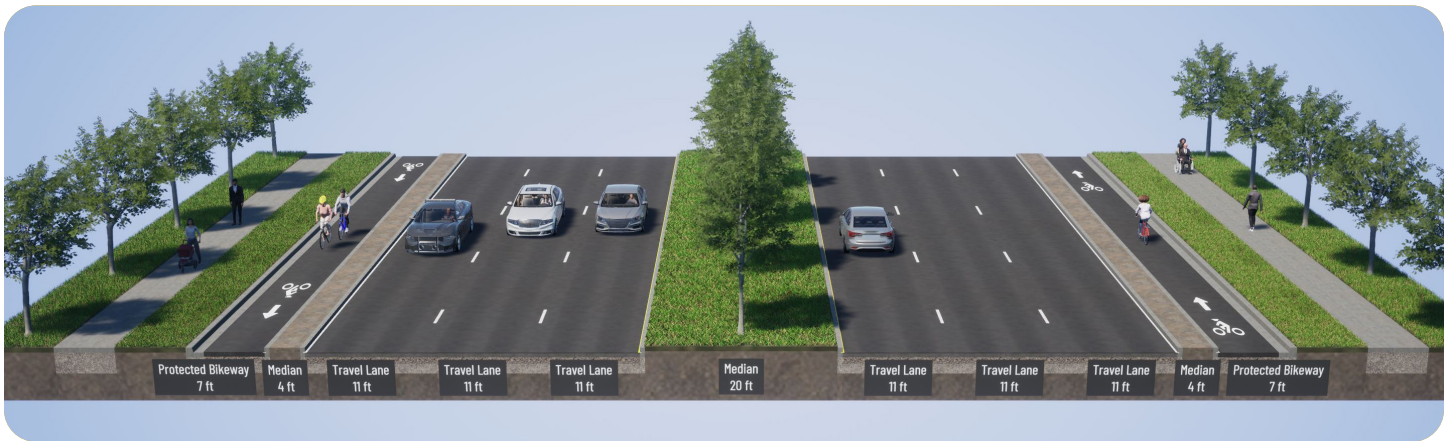
- Irvine Blvd.
- Main St. (west of Harvard Dr.)
- Irvine Center Dr. (west of Sand Canyon Ave.)

Pros:

- Provides horizontal and vertical separation

Cons:

- May be less visible in low-light conditions



8 142 ft street with Protected Bikeway (Landscaped Median)

Potential locations:

- Sand Canyon Ave.
- Main St. (eastbound, east of MacArthur Blvd.)

Pros:

- Provides horizontal and vertical separation
- Aesthetic Appeal

Cons:

- Requires additional maintenance and irrigation



Mobility Hubs

Mobility hubs are sites that offer a range of travel options and other community amenities in a centralized location. At these hubs, travelers have many mobility options for their trip, such as bike or scooter share, bus or rail, Transportation Network Companies (TNCs) such as Uber or Lyft, and more. Additional amenities, such as bike repair services, restrooms, and water bottle filling stations, help support people at the start or end of the trip. This concept is flexible for a variety of different locations throughout Irvine.

REGIONAL MOBILITY HUB

Built around frequent and high-capacity transit, regional mobility hubs offer a safe, comfortable, and convenient space to seamlessly transfer from one type of transportation to another.

These larger mobility centers serve as a gateway between regional and local trips, linking high-quality transit with personal or shared mobility options.

Services

Regional Rail	Bike Repair
Local Bus	Bike Share
Park & Ride	Car Share
Bike Parking & Lockers	
Electric Vehicle Charging	
TNCs & Pick-up/Drop-off	

Location Options

Transit Stations
Park & Ride Lots



Bike Repair



Bike Share



Car Share

COMMERCIAL MOBILITY HUB

Anchored by a retail or office destination, commercial mobility hubs allow for travel to and from retail, business, or entertainment destinations through offering services and amenities that support trips of different modes.

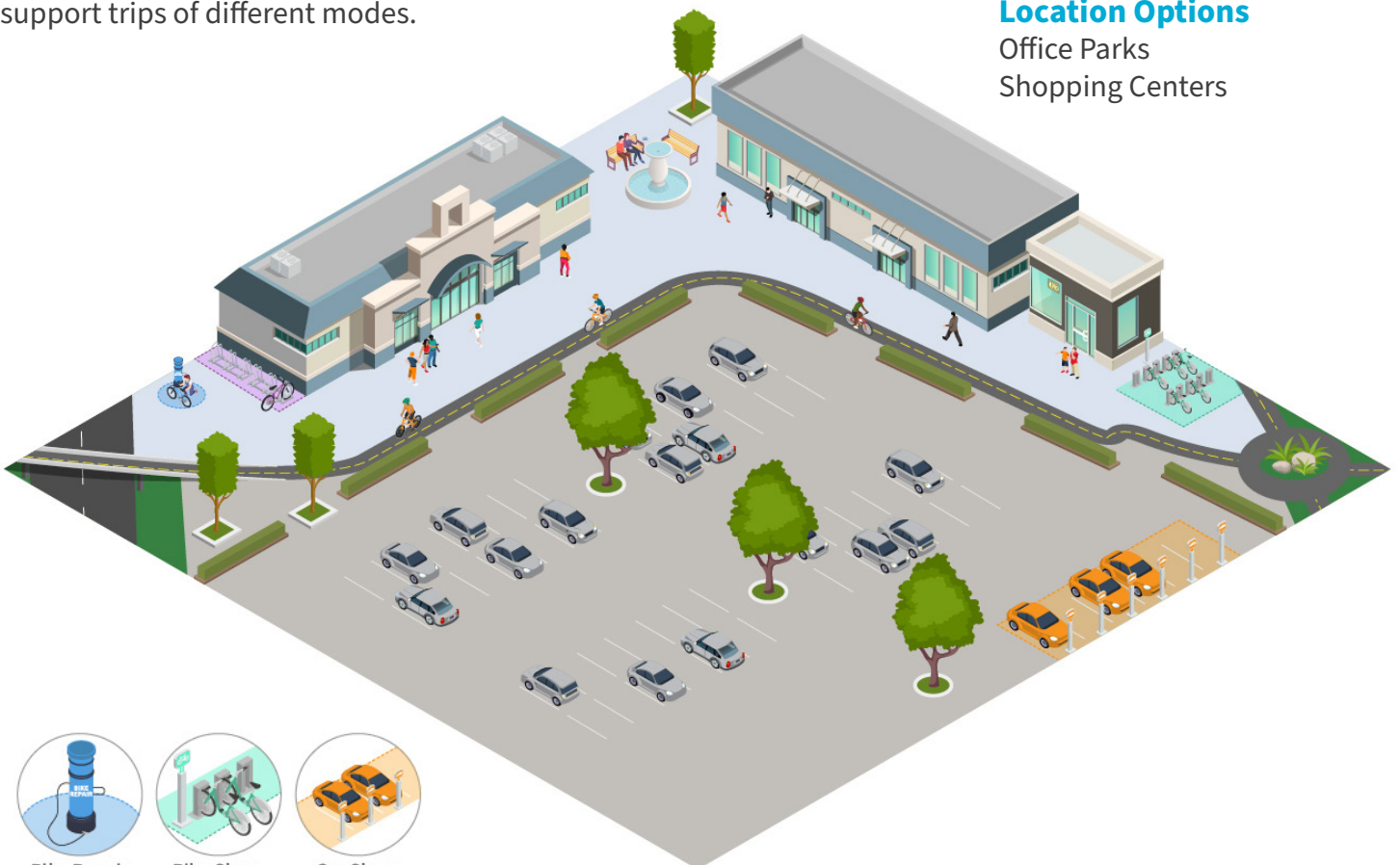
Shared mobility helps close the first/last mile gap with regional transit. Bicycle access is prioritized with direct access to the commercial center from local or regional bikeways.

Services

- Bike Repair
- Bike Share
- Bike Parking
- Car Share

Location Options

- Office Parks
- Shopping Centers



Bike Repair



Bike Share



Car Share

COMMUNITY MOBILITY HUB

Centered around recreation or community centers with parking lots, community mobility hubs provide access to other nearby destinations through an emphasis on shared mobility, transit

services, and protected bikeways. Shared mobility options and bike amenities help make it easier to reach community and recreation centers from the surrounding community.

Services

- Bike Repair
- Bike Share
- Car Share
- Bike Parking & Lockers

Location Options

- Community Centers
- Parks with Parking Lots



Bike Repair



Bike Share



Car Share

NEIGHBORHOOD MOBILITY HUB

Co-located with neighborhood parks, neighborhood mobility hubs enhance sustainable travel with convenient access to bike facilities, shared bike systems, and amenities such as bike repair

stations. With a small footprint, these mobility hubs have the flexibility to be located at almost any neighborhood location, and do not require a parking lot.

Services

Bike Repair
Bike Share

Location Options

Neighborhood Parks



Bike Repair



Bike Share

VILLAGE CONNECTIVITY

Each of the different elements of sustainable transportation have an important role to play in supporting multimodal travel for Irvine residents within their neighborhoods so that they can easily and comfortably travel to local destinations, such as schools, parks, community centers, and shopping centers.

The map on the following page shows how the proposed protected & enhanced bikeway network and local transit pilot route connect these important community services. Mobility hub elements, which could be implemented based on the location types explained on the prior pages, play an important role at the start/ end of trips and transfer points, providing shared mobility services and supportive amenities. Shopping centers, community centers and neighborhood parks where mobility hubs could be located, are shown on the map.

These proposed projects help connect the existing elements of Irvine’s transportation network together.

Existing Elements

Existing Bike Parking



Existing Retail Bike Connector



Existing Bike Paths

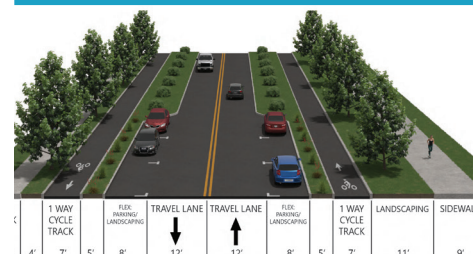


Neighborhood Traffic Calming

In addition to the projects and programs discussed previously, the City of Irvine also has a neighborhood traffic management program to help support safe and sustainable mobility within communities.

Proposed Elements

Separated or Buffered Bikeway



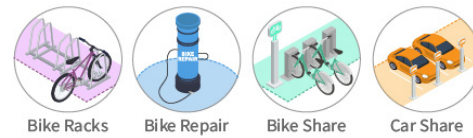
Buffered or Standard Bikeway



Local Transit Connection Pilot



Mobility Hub Elements

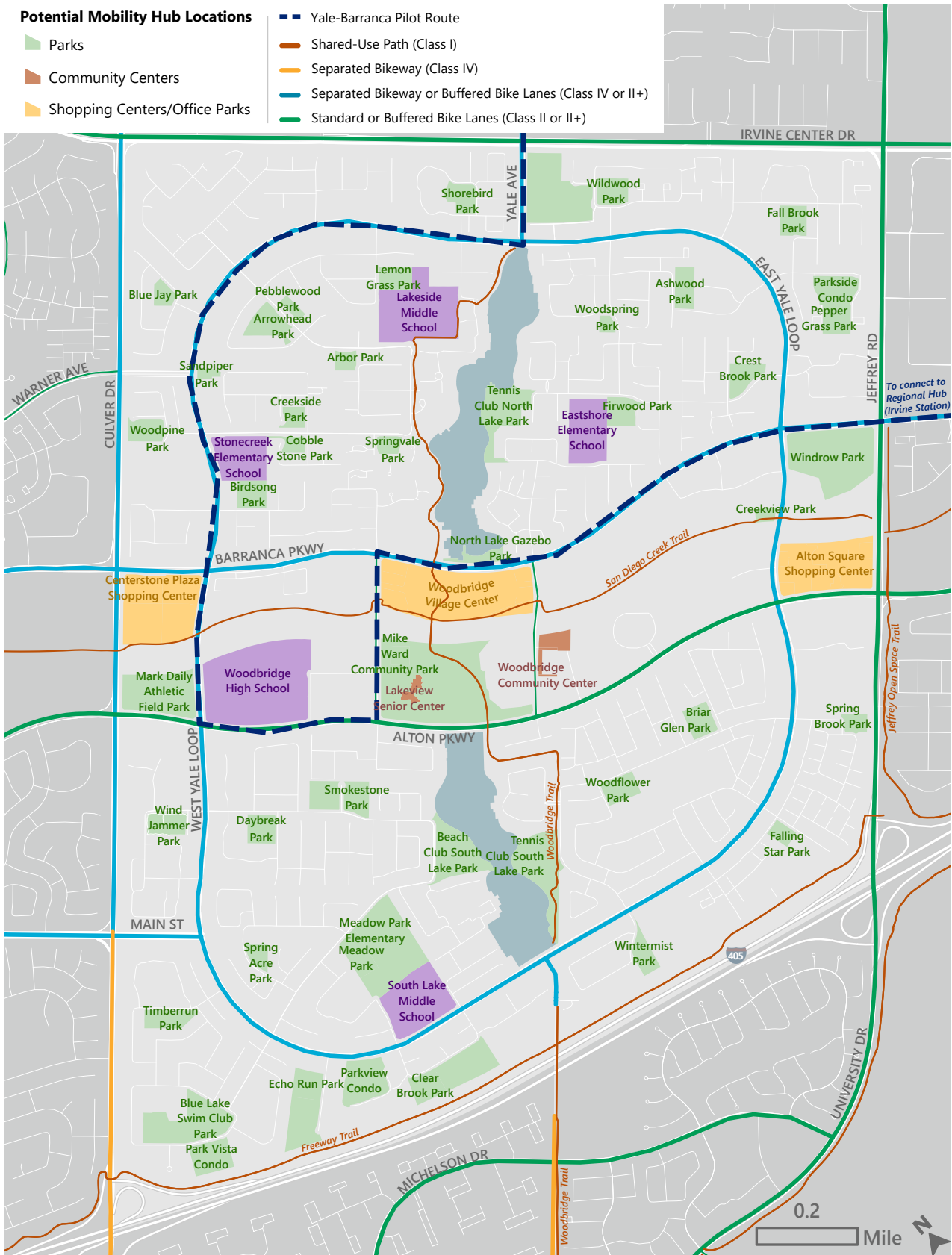


Village Connectivity Example

Potential Mobility Hub Locations

- Parks
- Community Centers
- Shopping Centers/Office Parks

- Yale-Barranca Pilot Route
- Shared-Use Path (Class I)
- Separated Bikeway (Class IV)
- Separated Bikeway or Buffered Bike Lanes (Class IV or II+)
- Standard or Buffered Bike Lanes (Class II or II+)



How Irvine is Improving Connections to Transit and Trails

The City has made and continues to make strides in closing the gap between transit access and regional Class I facilities. In recent implementation plans, including the 2020 Strategic Active Transportation Plan, 2021 Irvine Station First Last Mile Plan and the 2022 Local Roadway Safety Plan, enhanced or protected bikeways are recommended as achievable improvements to the

network. As shown on page 16, enhanced or protected bikeways are recommended along major transit routes to further encourage non-auto travel. Wayfinding signs directing on-street bicyclists to City and regional off-street facilities and transit stations are standard implementations.



Implementation Framework

IMPLEMENTATION

The table on the following page illustrates how the City of Irvine can categorize the project types explored in this plan into immediate improvement opportunities and longer-term opportunities. Implementation action items for each of the key project types are listed, along with how the City can identify projects for prioritization and implement them within the framework of existing City programs.

Immediate improvement opportunities can be prioritized for faster implementation due to alignment with planned projects, seamless integration with existing facilities, or because funding has already been identified for implementation.

Shorter-term bikeway projects will typically fit within the existing right-of-way and will not require changes to curbs or medians.

These projects include adding striped buffers to existing bike lanes or constructing separated bikeways by reducing the width of vehicle travel lanes. Based on system significance, project readiness, and cost efficiency, the following corridors are identified for immediate improvements in the next two years:

- Barranca Parkway from Harvard Avenue to Jeffrey Road
- Alton Parkway from Harvard Avenue to Jeffrey Road
- Ridge Valley from Marine Avenue to Irvine Boulevard
- Culver Drive from Irvine Center Drive to Portola Pkwy
- Main Street from Harvard Avenue to Yale Loop
- Harvard Avenue from Barranca Parkway to University Drive
- Yale Avenue from Irvine Center Drive to West Yale Loop
- Warner from Culver Drive to West Yale Loop
- Culver Drive-Orchard Hills Drive north of Portola Parkway

Longer-term opportunities are those that may require additional coordination across departments or jurisdictions, community input, or additional funding, environmental analysis or engineering design. The figure below illustrates the typical length for each of these steps in the City of Irvine's project implementation process. The process described below is for typical capital improvement projects. Other types of projects, such as transit services or mobility hubs, may follow a different implementation process.

The first projects to move forward would be those identified in the existing planning documents and those with fewer complications such as right-of-way challenges.

IRVINE PROJECT IMPLEMENTATION PROCESS

** Indicates step can be completed concurrently*



ACTION ITEMS

Action	Description	Considerations
Immediate Improvement Opportunities		
Protected or Enhanced Bikeway Implementation	Projects that can be done as part of street rehabilitation or other CIP projects, prioritizing anything that can be done within existing curb-to-curb right-of-way.	Integrate bikeway projects into existing pavement management plan and CIP schedule over next five years.
Mobility Hubs Elements	Implement mobility hub elements that can be completed without an outside vendor or partner, including adding bike parking and bike repair stations; prioritize locations where City would be “filling gaps” where some services already exist (e.g. Irvine Station).	Prioritize locations on City-owned and managed property (e.g. public parks and community centers).
Transit Improvements	Implement the Yale-Barranca Pilot Route, including both new transit service and bus stops. Service is scheduled to begin in 2024.	Implementing the transit pilot will provide more opportunities for mobility hubs.
Safe Routes to School	Expand suggested routes to school to include maps for middle and high schools. Work with IUSD to update existing maps and create new maps as needed to account for new schools, campus expansion, or roadway modifications.	These maps could be developed in tandem with protected bikeways implementation.
ADA Accessibility	Assess and upgrade existing facilities to meet current ADA accessibility requirements within public right-of-way.	Ensure there is budget in the CIP to continue addressing deficiencies.

ACTION ITEMS

Action	Description	Considerations
Longer-Term Opportunities		
Protected or Enhanced Bikeway Implementation	Longer-term projects include those that require changes to the curb or right-of-way.	These projects to be included in future CIP as stand-alone projects.
Mobility Hub Elements	Implement mobility hub elements that require partnerships or vendors (e.g. car share or bike share), as well as on locations not owned or managed by the City (e.g. shopping centers).	Elements like bike share or car share may be dependent on the interest and schedule of partner organizations.
Transit Improvements	Expand localized transit coverage and integrate regional (and community, as appropriate) mobility hubs to regional transit networks to provide better connections and transfers.	Future pilot programs can be modeled after the Yale-Barranca Pilot Route.
Safe Routes to School	Ensure that the Citywide bikeway network adequately serves schools and that appropriate mobility hub services are accessible to students.	Coordinate with schools on prioritization and education campaigns.
ADA Accessibility	Develop and implement inspection program and accessibility guidelines that are updated with current regulations and best practice.	ADA Improvements can be integrated with the City's maintenance activities and constructed as part of longer-term protected bikeway projects.

EVALUATION

An ongoing evaluation program helps to inform future project development and allows the City to understand how it is performing relative to the goal of encouraging sustainable modes of travel. In addition, an evaluation program can serve as an important reporting tool to communicate the City of Irvine's progress towards achieving the goals of the SMP with stakeholders.

The table on the following page identifies metrics the City of Irvine can use to evaluate progress towards the SMP vision and goal. The two primary categories for evaluation focus on tracking project implementation progress and how project implementation has impacted travel behavior within Irvine. These metrics can be summarized and reported on annually or more regularly. Metrics under the "Mobility

Changes" category include potential ranges that may be expected for mode shift, GHG reduction, and VMT reduction, based on research compiled for the 2021 California Air Pollution Control Officers Association (CAPCOA) Handbook for Analyzing Greenhouse Gas Emission Reductions and analysis performed for the Orange County Mobility Hubs Strategy.

IMPLEMENTATION GUIDANCE RESOURCES

Bikeways

[FHWA: Bikeway Selection Guide](#)

[FHWA: Separated Bike Lane Planning & Design Guide](#)

[NACTO: Don't Give Up at the Intersection](#)

[Caltrans Design Information Bulletin 89-01 for Class IV Bikeway Guidance](#)

Mobility Hubs

[OCTA: Orange County Mobility Hubs Strategy](#)

Transit

[NACTO: Transit Street Design Guide](#)

Evaluation

[CAPCOA: Handbook for Analyzing Greenhouse Gas Emission Reductions](#)


EVALUATION METRICS

Metric	Description	Resources
Project Implementation		
Number of projects completed	Report on the number of sustainable mobility projects completed (including locations with new mobility hub elements)	CIP and stand-alone project tracking by City staff
Roadway space reallocated to bicycles	Calculate the roadway space that has been reallocated to bike use through project implementation	CIP and stand-alone project tracking by City staff
Funding dedicated to sustainable mobility projects	Report on City and outside grant funding that has supported sustainable mobility project implementation	CIP and grant tracking by City staff
Mobility Changes		
Mode Shift	Potential mode shift away from drive-alone trips: <ul style="list-style-type: none"> • Mobility hubs: Up to 26.3% within service area 	Orange County Mobility Hubs Strategy, OCTA 2022
GHG Reduction	Potential GHG emissions mitigation: <ul style="list-style-type: none"> • Expand bikeway network: Up to 0.5% • Extend transit network coverage: Up to 4.6% 	Handbook for Analyzing Greenhouse Gas Emission Reductions, CAPCOA 2021
VMT Reduction	Potential VMT reduction: <ul style="list-style-type: none"> • Expand bikeway network: Up to 0.5% • Extend transit network coverage: Up to 4.6% • Mobility hubs: Up to 11.3% within the service area 	Handbook for Analyzing Greenhouse Gas Emission Reductions, CAPCOA 2021 Orange County Mobility Hubs Strategy, OCTA 2022

Appendix A: Quick Build Bike Lane Buffer Treatments and Materials

The following toolbox contains a variety of quick-build bike lane buffer treatments that have been implemented throughout the US. Specifications are provided for each treatment, including the weight, dimensions, material, and reflectivity, in addition to the unit cost and distributor contact information, up to date as of January 2024. Each treatment is also evaluated on its aesthetics, comfort for bicyclists using the facility, durability and reflectivity. This information was compiled based on information provided from the vendors, in addition to interviews conducted with cities that have implemented the treatments.

The following implementation considerations based on case study interviews and built examples should also be reviewed when selecting your preferred buffer treatment.

 Denotes treatments recommended by another jurisdiction, based on staff interviews.

QUICK-BUILD BUFFER VERTICAL ELEMENT LINEAR TREATMENT SPACING

- Most jurisdictions start with 10'-20' spacing on center between vertical elements for urban arterials. Treatments such as K-Rail can be continuous.
- Consider tighter spacing closer to intersections or driveways, where auto encroachment may be more prevalent.
- Consult with engineering staff on drainage and maintenance considerations for closely spaced buffer treatments.
- Design speed of the corridor may also influence treatment spacing. Larger spacing between treatments may be appropriate on higher speed roadways.

COMBINING TREATMENTS

- Low-profile curb treatments such as Tuff Curb are typically more durable than flex posts and other vertical elements, while flex posts are typically more visible than curbs alone. Consider combining curb and other vertical elements for a more durable, visible buffer treatment.

MAINTENANCE

- Consider more durable or reinforced treatments at locations where head-on or high-impact collisions with the buffer treatments are more likely, such as at intersections, to minimize ongoing maintenance costs. For example, pair flexible posts with a curb treatment, or invest in reinforced concrete similar to a median nose at those locations over pre-cast or fabricated plastic elements. Pair end treatment with reflective device for enhanced visibility.
- In addition to annual maintenance, regular routine maintenance (i.e. street sweeping), is required to keep facilities clear of debris.
- Consider ordering 20%-50% extra product for ongoing maintenance, depending on the durability of the treatment.

ADA CONSIDERATIONS

- Adjacent to ADA parking, use a 5' buffer (in addition to the bike lane width) for parking-protected bike lanes so that the buffer space can be used as an access aisle from ADA parking spaces.
- Particularly with lower-profile treatments, consider the potential tripping hazards for visually impaired pedestrians.
- Do not continue the treatment through the crosswalk or bus boarding island to aide in navigability for users who require mobility devices.

COST CONSIDERATIONS

- The costs included in this resource are for materials only. Cost of installation is not included.
- Low, medium and high cost categories help to show the approximate relative cost of options against the others included in this resource.

Table of Contents

BIKE LANE BUFFERS AND TREATMENTS BY TYPE

LOW PROFILE BARRIERS

1. CycleLane
2. Zebra (and Zebra Zero)
3. Zipper
4. Tuff Curb
5. Precast Curb
6. Cast in Place Curb
7. Extruded Concrete Curb
8. Rubber Curb Stop

FLEXIBLE PLASTIC BOLLARDS

9. K-71 Flexible Post
10. K-72 Post
11. MP Flex Post - Short Squeeze

VERTICAL ELEMENTS WITH CURB

12. Omega Post
13. Narrow Cycle Lane Defenders
14. Tuff Curb XLP (with delineators)
15. BikeRail
16. RailRibbon
17. RailScreen

K-RAIL AND PLANTERS

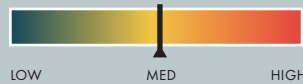
18. K-Rail
19. Low Barrier Wall
20. Self-Watering Planters
21. SteelGreen Planters

CycleLane

Key Considerations

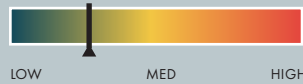
MINIMUM REQUIRED BUFFER

2 feet



ESTIMATED COST

\$81/unit
+ TAXES AND FEES



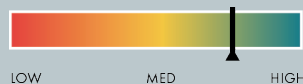
AESTHETICS



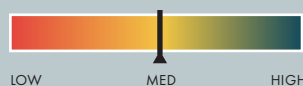
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY
Traffic Logix

WEIGHT
10 LB

DIMENSIONS
29.5" L x 4.75" W x 4" H

MATERIAL
Compression molded recycled rubber

ANCHORING
2-3 anchor points

DISTRIBUTOR LOCATION
California

DISTRIBUTOR CONTACT
Jim Merrill
jmerrill@trafficlogix.com
(925) 784-7865

ADDITIONAL INFORMATION CAN BE FOUND AT
<https://trafficlogix.com/cycle-lane/>

Additional Notes

BIKE COMFORT

The elevated profile on the vehicle side prevents motorists from entering the bike lane, while the sloped profile on the bicyclist side gently guides cyclists back into the bike lane.

DURABILITY AND MAINTENANCE

Can be difficult to install. Reflective tape often needs to be replaced. When hit on 90 degree side (vehicle side), the product slightly lifts up from pavement and leans towards the bike lane side. Product is already pulling up after one year of installation in Kailua.

REFLECTIVITY

3.5" W x 20" L optional reflective highway tape along the top of the CycleLane

CITIES WITH THE PRODUCT INSTALLED

Kailua (Kalapawai), HI
Hamilton, Ontario
Alameda, CA
New York City, NY

Zebra

(and Zebra Zero)



Key Considerations

MINIMUM REQUIRED BUFFER

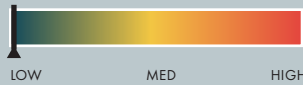
2 feet



ESTIMATED COST

Zebra 9

\$39/unit
+ TAXES AND FEES



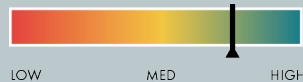
Zebra 13

\$59/unit
+ TAXES AND FEES

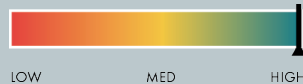
AESTHETICS



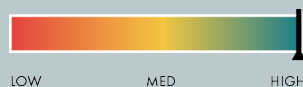
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY
Zicla

WEIGHT
3-18.75 LB (VARYING SIZES)

DIMENSIONS
Zebra 5: 32.3" L x 4.7" W x 2" H
Zebra 9: 30.5" L x 6.5" W x 3.5" H
Zebra 13: 32.3" L x 8.3" W x 5.1" H

MATERIAL
100% recycled plastic

ANCHORING
3 anchor points

DISTRIBUTOR LOCATION
Barcelona

DISTRIBUTOR CONTACT
Ramón Santiago
rsantiago@zicla.com
(+ 34 932242731)

ADDITIONAL INFORMATION CAN BE FOUND AT
<https://www.zicla.com/en/zebra-family/>



Additional Notes

BIKE COMFORT
Dependent on size of Zebra. Larger ones are more of a physical barrier between travel lane and bike lane.

DURABILITY AND MAINTENANCE
Minimal. Replace as needed.

REFLECTIVITY
40% reflective surface

CITIES WITH THE PRODUCT INSTALLED
Houston, TX
San Luis Obispo, CA
New York City, NY
Fremont, CA

LOW PROFILE BARRIERS

FLEXIBLE PLASTIC BOLLARDS

VERTICAL ELEMENTS WITH CURB

K-RAIL & PLANTERS

Zipper

Key Considerations

MINIMUM REQUIRED BUFFER

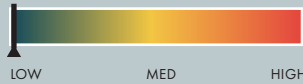
2 feet



ESTIMATED COST

Four Piece Unit

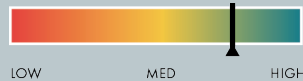
\$150/unit
+ TAXES AND FEES



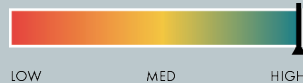
AESTHETICS



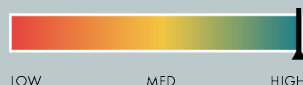
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY
Zicla

WEIGHT
7lb 11oz (curved piece) and 11lb 7 oz (full square)

DIMENSIONS
Modular: 11" L x 11" W x 4.9" H (can have curved edge)

MATERIAL
100% recycled plastic

ANCHORING
4 anchor points per middle piece
3 per corner piece

DISTRIBUTOR LOCATION
Barcelona

DISTRIBUTOR CONTACT
Ramón Santiago
rsantiago@zicla.com
(+ 34 932242731)

ADDITIONAL INFORMATION CAN BE FOUND AT
<https://www.zicla.com/en/zipper-system/>

Additional Notes

BIKE COMFORT

Elevated profile on vehicle side (left side of photo above) prevents motorists from entering bike lane. Sloped profile on bike lane side provides gradual redirection for cyclists accidentally hitting the Zebra.

DURABILITY AND MAINTENANCE

Debris may build up between modular units. Replace as needed.

REFLECTIVITY

50% of structure (top) is reflective

CITIES WITH THE PRODUCT INSTALLED

Bentonville, AR
New York City, NY

Tuff Curb

Key Considerations

MINIMUM REQUIRED BUFFER

2 feet



ESTIMATED COST

Tuff Curb

\$160/unit
+ TAXES AND FEES



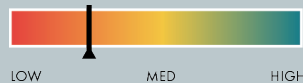
End Caps

\$82/unit
+ TAXES AND FEES

AESTHETICS



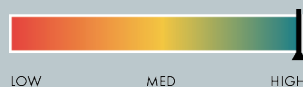
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY
Impact Recovery

WEIGHT

Curb section - 12 lbs.
Optional end section - 4 lbs.

DIMENSIONS

Curb section - 40" L x 12.5" W x 3.5" H
Optional end cap - 18" L x 3.5" W x 2" H

MATERIAL

Injection molded polyethylene

ANCHORING

3 anchor points

DISTRIBUTOR LOCATION

Honolulu

DISTRIBUTOR CONTACT

Gregg Ubelhart
Gubelhart@impactrecovery.com
(800) 736-5256

ADDITIONAL INFORMATION CAN BE FOUND AT

<https://www.impactrecovery.com/products/tuff-curb1/>



Additional Notes

BIKE COMFORT

Alerts and prevents motorists from veering out of the travel lane. The gradual slope of the curb makes the curb less useful for minimizing encroachment, but does increase the durability of the product. Tuff Curbs are higher profile than Tuff Curb XLPs, and recommended for the highest-conflict areas.

DURABILITY AND MAINTENANCE

Tuff curb is secure and needs minimal maintenance. Bollards may need to be replaced more regularly.

REFLECTIVITY

2 reflective square markers on the base.

CITIES WITH THE PRODUCT INSTALLED

New York, NY

Precast Curb

Key Considerations

MINIMUM REQUIRED BUFFER

2 feet



ESTIMATED COST

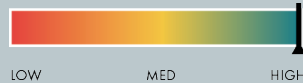
Varies/unit



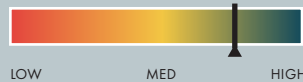
AESTHETICS



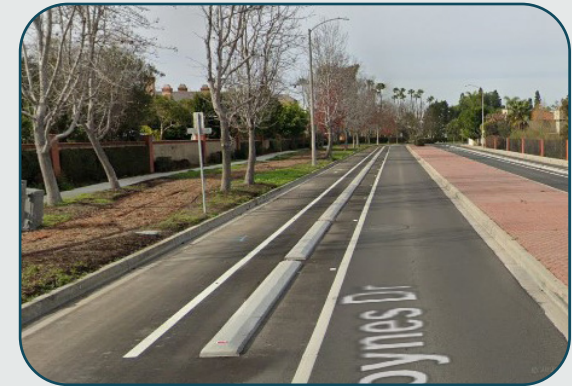
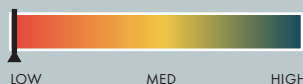
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY

Multiple

WEIGHT

VARIES PER DESIGN

DIMENSIONS

Min. 2' wide, height and length are per design.

MATERIAL

Concrete

ANCHORING

Doweled

DISTRIBUTOR LOCATION

N/A

DISTRIBUTOR CONTACT

N/A

N/A

N/A

ADDITIONAL INFORMATION CAN BE FOUND AT

N/A

Additional Notes

BIKE COMFORT

If spaced closely, the curb acts similar to the sidewalk curb, significantly minimizing the likelihood of encroachment.

DURABILITY AND MAINTENANCE

Durable midblock. Consider using a traditional reinforced concrete detail at the intersections and other locations where frontal/high-impact collisions are likely.

Precast units will not be entirely flush with roadway and therefore may be prone to debris buildup.

ADDITIONAL DETAILS

Precast concrete structures are prefabricated and cured off-site. Precast structures are fabricated in a similar fashion as cast-in-place structures, except they are fabricated prior to installation in a manufacturing plant.

CITIES WITH THE PRODUCT INSTALLED

Cupertino, CA
Long Beach, CA
Seattle, WA

Cast in Place Curb



Key Considerations

MINIMUM REQUIRED BUFFER

2 feet



ESTIMATED COST

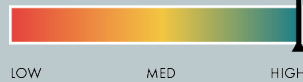
Varies/unit



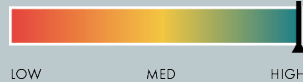
AESTHETICS



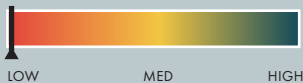
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY

Multiple

WEIGHT

Varies based on manufacturer and curb dimensions.

DIMENSIONS

Min. 2' wide, height and length is per design.

MATERIAL

Concrete

ANCHORING

Doweled

DISTRIBUTOR LOCATION

N/A

DISTRIBUTOR CONTACT

N/A

ADDITIONAL INFORMATION CAN BE FOUND AT

N/A

Additional Notes

BIKE COMFORT

If spaced closely, the curb acts similar to the sidewalk curb, significantly minimizing the likelihood of encroachment.

DURABILITY AND MAINTENANCE

Durable midblock. Consider using a traditional reinforced concrete detail at the intersections and other locations where frontal/high-impact collisions are likely.

Provide gaps between units to maintain drainage.

ADDITIONAL DETAILS

The term "Cast-in-Place" is used for the construction method of placing and curing concrete on-site. It consists of creating a mold on-site primarily using wood or steel panels and placing concrete directly to the final position of the structure.

CITIES WITH THE PRODUCT INSTALLED

Santa Monica, CA
Cupertino, CA
Bethesda, MD

Extruded Concrete Curb



Key Considerations

MINIMUM REQUIRED BUFFER

2 feet



ESTIMATED COST

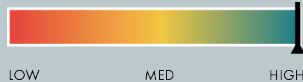
Varies/ unit



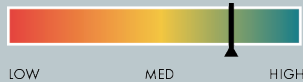
AESTHETICS



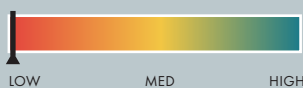
BIKE COMFORT



DURABILITY



REFLECTIVITY



via Streetsblog LA



Technical Specifications

MANUFACTURED BY
Multiple

WEIGHT
N/A

DIMENSIONS
Min. 2' wide, height and length is per design.

MATERIAL
Concrete

ANCHORING
Dependent on design

DISTRIBUTOR LOCATION
N/A

DISTRIBUTOR CONTACT
N/A

ADDITIONAL INFORMATION CAN BE FOUND AT
N/A

Additional Notes

BIKE COMFORT

The curb acts similar to the sidewalk curb, significantly minimizing the likelihood of encroachment.

DURABILITY AND MAINTENANCE

Highest durability and lowest maintenance for quick-build treatment.

ADDITIONAL DETAILS

Extruded Curb is similar to Cast-In-Place installation, but uses different machinery without the need for a mold to be placed before concrete is poured.

CITIES WITH THE PRODUCT INSTALLED

Santa Monica, CA
Portland, OR

Rubber Curb Stop

Key Considerations

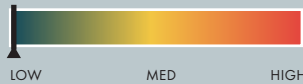
MINIMUM REQUIRED BUFFER

2 feet

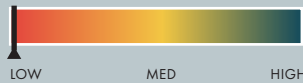


ESTIMATED COST

\$65/unit
+ TAXES AND FEES



AESTHETICS



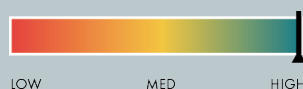
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY
ULINE

WEIGHT
20 LB

DIMENSIONS
72"L x 6"W x 4"H

MATERIAL
Rubber

ANCHORING
4 anchor points

DISTRIBUTOR LOCATION
Pleasant Prairie, WI

DISTRIBUTOR CONTACT
customer.service@uline.com
800.295.5510

ADDITIONAL INFORMATION CAN BE FOUND AT
<https://www.uline.com/Product/Detail/H-4608B~Y/Parking-Lot-Safety/Parking-Stops-6-Rubber-Black-Yellow?model=H-4608B/Y&RootChecked=yes>



Additional Notes

BIKE COMFORT

The elevated profile minimizes encroachment. The profile is the same on both sides, lacking the benefits of other products that have a gentler slope on one side for cyclists.

DURABILITY AND MAINTENANCE

Highly durable. Minimal maintenance needed.

CITIES WITH THE PRODUCT INSTALLED

Santa Monica, CA
Long Beach, CA
Seattle, WA

K-71 Flexible Post

Key Considerations

MINIMUM REQUIRED BUFFER

2 feet



ESTIMATED COST

**\$100 to
\$110/unit**

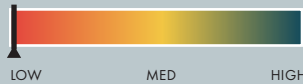
+ TAXES AND FEES
EXCLUDING
ANCHORING
MATERIALS



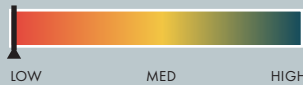
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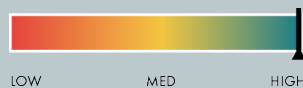
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY
US Reflector

WEIGHT
5 LB

DIMENSIONS
4 models: 3-8" W x 15-40" H

MATERIAL
Blend of polyethylene and UV inhibitors

ANCHORING
1 anchor point

DISTRIBUTOR LOCATION
Newington, CT

DISTRIBUTOR CONTACT
Nicole Kemp
Nicole@endotocorp.com
(860) 289-8033

ADDITIONAL INFORMATION CAN BE FOUND AT
<https://www.usreflector.com/product/k71-flexible-traffic-post/>



Additional Notes

BIKE COMFORT

Serves as a visual queue to drivers, but is designed to allow vehicles to run over the product with no to minimal damage.

DURABILITY AND MAINTENANCE

Regular maintenance and replacements needed.

REFLECTIVITY

2 wide-reflective collars

CITIES WITH THE PRODUCT INSTALLED

Los Angeles, CA
Long Beach, CA
San Jose, CA
Fremont, CA

K-72 Post

Key Considerations

MINIMUM REQUIRED BUFFER

2 feet



ESTIMATED COST

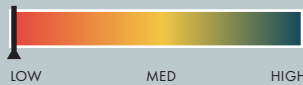
**\$120 to
\$130/unit**
+ TAXES AND FEES
EXCLUDING
ANCHORING
MATERIALS



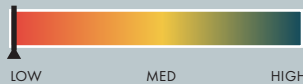
AESTHETICS



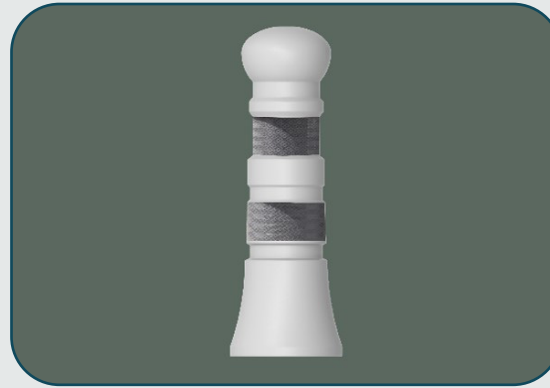
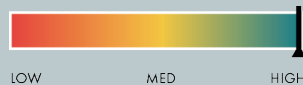
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY
US Reflector

WEIGHT
Information Unavailable

DIMENSIONS
30" tall 10" diameter base

MATERIAL
Blend of polyethylene and UV inhibitors

ANCHORING
One anchor point

DISTRIBUTOR LOCATION
Newington, CT

DISTRIBUTOR CONTACT
Nicole Kemp
Nicole@endotocorp.com
(860) 289-8033

ADDITIONAL INFORMATION CAN BE FOUND AT
<https://www.usreflector.com/product/k72-flexible-style-traffic-post/>



Additional Notes

BIKE COMFORT

Serves as a visual queue to drivers, but is designed to allow vehicles to run over the product with no to minimal damage.

DURABILITY AND MAINTENANCE

Regular maintenance and replacements needed.

CITIES WITH THE PRODUCT INSTALLED

Los Angeles, CA,
West Hollywood, CA

MP Flex Post Short Squeeze

Key Considerations

MINIMUM REQUIRED BUFFER

2 feet

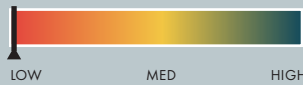


ESTIMATED COST

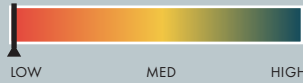
\$90-\$105
/unit
+ TAXES AND FEES



AESTHETICS



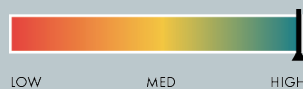
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY

Garden State Highway Products

WEIGHT

Information Unavailable

DIMENSIONS

2.375" W x 48" H (additional sizes available.
This is becoming City standard)

MATERIAL

Flexible HDPE plastic

ANCHORING

4 anchor points. Surface-mount fixed base
(8"x8"x1")

DISTRIBUTOR LOCATION

Millville, NJ

DISTRIBUTOR CONTACT

N/A
sales@gshpinc.com
800.338.5685

ADDITIONAL INFORMATION CAN BE FOUND AT

<https://www.gshpinc.com/mp-flex-post/>



Additional Notes

BIKE COMFORT

Serves as a visual queue to drivers, but is designed to allow vehicles to run over the product with no to minimal damage.

DURABILITY AND MAINTENANCE

Regular maintenance and replacements needed.

REFLECTIVITY

2x 3" bands of reflective sheeting / collars

CITIES WITH THE PRODUCT INSTALLED

Honolulu, HI (current standard)

Omega Post

Key Considerations

MINIMUM REQUIRED BUFFER

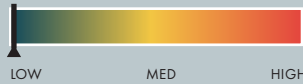
2 feet



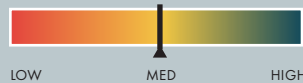
ESTIMATED COST

\$47 unit

+ TAXES AND FEES
EXCLUDING
ANCHORING
MATERIALS



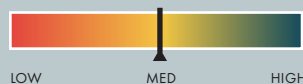
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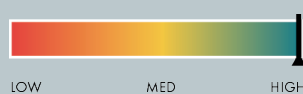
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY
Impact Recovery

WEIGHT
1.5 LB

DIMENSIONS
28", 36", or 42" tall 2.375" diameter

MATERIAL
Proprietary thermoplastic

ANCHORING
Can be attached to a Tuff Curb XLP, which can be installed with 4 screws or epoxy.

DISTRIBUTOR LOCATION
San Antonio, TX

DISTRIBUTOR CONTACT
Gregg Ubelhart
Gubelhart@impactrecovery.com
(800) 736-5256

ADDITIONAL INFORMATION CAN BE FOUND AT
<https://www.impactrecovery.com/products/omegapost/>

Additional Notes

BIKE COMFORT

Alerts and prevents motorists from veering out of the travel lane, especially when combined with Tuff Curb XLP. Effectiveness depends on post spacing.

DURABILITY AND MAINTENANCE

Can be attached to Tuff Curb, which is secure and needs minimal maintenance. Bollards rated to withstand 200 impacts at 70mph.

REFLECTIVITY

2 reflective collars around post, reflectors can also be installed on base.

CITIES WITH THE PRODUCT INSTALLED

Culver City, CA

Narrow Cycle Lane Defenders

Key Considerations

MINIMUM REQUIRED BUFFER

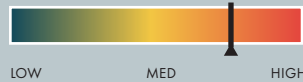
2 feet



ESTIMATED COST

\$343.25

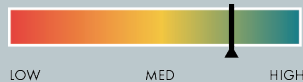
PER UNIT
+ TAXES AND FEES



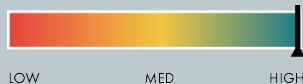
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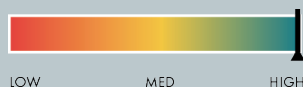
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY
Rosehill Highways

WEIGHT
53-133 LB (VARYING SIZES)

DIMENSIONS
End Section: 78.7" L x 9.3" W x 5" H
Continuation Unit: 78.7" L x 9.3" W x 5.1" H
Double End: 78.7" L x 9.3" W x 5.1" H
NCLD Lite: 39.4" L x 9.3" W x 5.1" H

MATERIAL
100% recycled tyre rubber

ANCHORING
4 anchor points

DISTRIBUTOR LOCATION
United Kingdom

DISTRIBUTOR CONTACT
George Cancelmo
george@endotocorp.com

ADDITIONAL INFORMATION CAN BE FOUND AT
<https://rosehillhighways.com/products/cycle-lane-defenders/>

Additional Notes

BIKE COMFORT

Minimizes likelihood of encroachment of vehicles and reflective posts provide visual queue to drivers.

DURABILITY AND MAINTENANCE

Dependent on environment (leaves, debris build-up). Impact-resistant.

REFLECTIVITY

Large glass eyes molded into the ends of the unit and can be furnished with reflective posts for increased visibility.

CITIES WITH THE PRODUCT INSTALLED

Los Angeles, CA
New York City, NY

Tuff Curb XLP (with delineators)

Key Considerations

MINIMUM REQUIRED BUFFER

2 feet

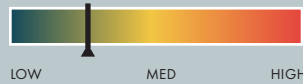


ESTIMATED COST

XLP Only

\$78/unit

+ TAXES AND FEES



XLP with Omega Post

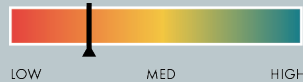
\$125/unit

+ TAXES AND FEES

AESTHETICS



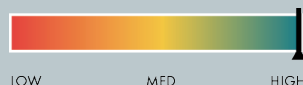
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY
Impact Recovery

WEIGHT
6.5 LB (FOR 40" CURB SECT.)

DIMENSIONS
40" L x 8" W x 2" H

MATERIAL
Injection-molded polyethylene (single piece)

ANCHORING
2-3 anchor points

DISTRIBUTOR LOCATION
Honolulu

DISTRIBUTOR CONTACT
Gregg Ubelhart
Gubelhart@impactrecovery.com
(800) 736-5256

ADDITIONAL INFORMATION CAN BE FOUND AT
<https://www.impactrecovery.com/products/tuff-curb-xlp/>



Additional Notes

BIKE COMFORT

Alerts and prevents motorists from veering out of the travel lane. The gradual slope of the curb makes the curb less useful for minimizing encroachment, but does increase the durability of the product. XLPs are a lower profile than Tuff Curbs, which reduces impacts if bikes hit them.

DURABILITY AND MAINTENANCE

Tuff curb is secure and needs minimal maintenance. Bollards may need to be replaced more regularly.

REFLECTIVITY

Part of the base and reflective collar around the delineator post

CITIES WITH THE PRODUCT INSTALLED

Portland, OR
Seattle, WA

BikeRail

Key Considerations

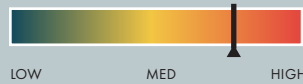
MINIMUM REQUIRED BUFFER

2 feet



ESTIMATED COST

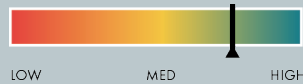
**\$75/
linear foot**
+ TAXES AND FEES
ASSUMING
DELINEATORS
EVERY 16 TO 24
FEET



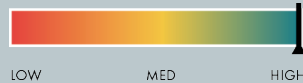
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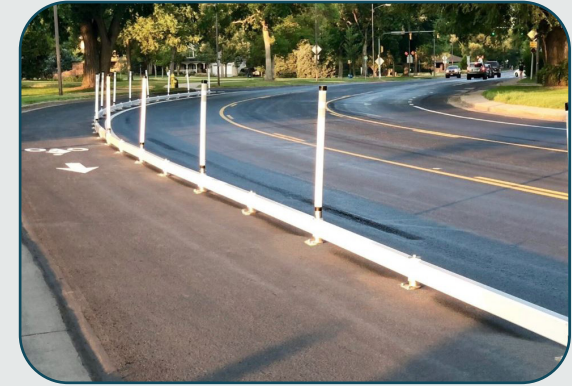
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY
DezignLine

WEIGHT
Information Unavailable

DIMENSIONS
4-8" L x 3" W x 5" H (rail height 7", includes 2" clearance for water below rail)

MATERIAL
Powder coat galvanized steel rail & plastic flex posts

ANCHORING
Anchored at joints (2 anchors per joint)

DISTRIBUTOR LOCATION
Minneapolis

DISTRIBUTOR CONTACT
Susan Altenbach, President
susan@dezignline.com
(877) 944-8900

ADDITIONAL INFORMATION CAN BE FOUND AT
<https://www.dezignline.com/protected-bikeway-pedestrian-products/bikerail/>

Additional Notes

BIKE COMFORT
Curb minimizes likelihood of encroachment of vehicles and bollards provide visual queue to drivers.

DURABILITY AND MAINTENANCE
Steel rail is very durable. Replacement needed only after significant crash.

REFLECTIVITY
Vertical posts have 2 reflective collars (size approx 3"). Main structure is not reflective.

CITIES WITH THE PRODUCT INSTALLED
Minneapolis, MN
Colorado Springs, CO
Reno, NV

RailRibbon

Key Considerations

MINIMUM REQUIRED BUFFER

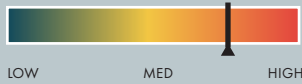
2 feet



ESTIMATED COST [BIKERAIL COST NOT INCLUDED]

4' Arc

\$40/unit
+ TAXES AND FEES



8' Arc

\$80/unit
+ TAXES AND FEES

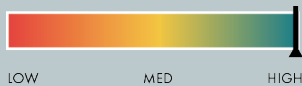
Half Arc

\$80/unit
+ TAXES AND FEES

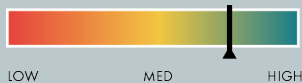
Sphere

\$80/unit
+ TAXES AND FEES

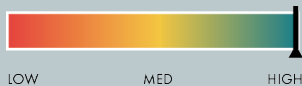
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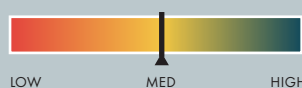
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY
DezignLine

WEIGHT
Information Unavailable

DIMENSIONS
Width matches BikeRail, height varies

MATERIAL
Powder coat galvanized steel rail + plastic ribbon

ANCHORING
Anchored at joints (2 anchors per joint)

DISTRIBUTOR LOCATION
Minneapolis

DISTRIBUTOR CONTACT
Susan Altenbach, President
susan@dezignline.com
(877) 944-8900

ADDITIONAL INFORMATION CAN BE FOUND AT
<https://dezignline.com/railribbon/>

Additional Notes

BIKE COMFORT
Curb minimizes likelihood of encroachment of vehicles and bollards provide visual queue to drivers.

DURABILITY AND MAINTENANCE
Steel rail is very durable. Replacement needed only after significant crash.

CITIES WITH THE PRODUCT INSTALLED
Reno, NV
Charlotte, NC

RailScreen

Key Considerations

MINIMUM REQUIRED BUFFER

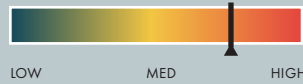
2 feet



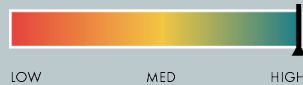
ESTIMATED COST [BIKERAIL COST NOT INCLUDED]

**\$390/
panel**

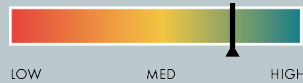
+ TAXES AND FEES
DEPENDENT ON
DESIGN
COMPLEXITY



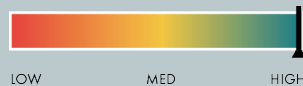
AESTHETICS



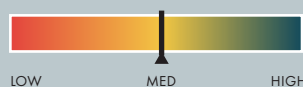
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY
DezignLine

WEIGHT
Information Unavailable

DIMENSIONS
36" tall, mounted on top of BikeRails.

MATERIAL
Powder coat galvanized steel rail and panels

ANCHORING
Anchored at joints (2 anchors per joint)

DISTRIBUTOR LOCATION
Minneapolis

DISTRIBUTOR CONTACT
Susan Altenbach, President
susan@dezignline.com
(877) 944-8900

ADDITIONAL INFORMATION CAN BE FOUND AT
<https://dezignline.com/protected-bikeway-pedestrian-products/railscreen/>

Additional Notes

BIKE COMFORT

Curb minimizes likelihood of encroachment of vehicles and bollards provide visual queue to drivers.

DURABILITY AND MAINTENANCE

Steel rail is very durable. Replacement needed only after significant crash.

CITIES WITH THE PRODUCT INSTALLED

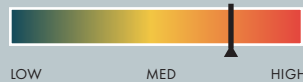
Charlotte, NC
Fort Collins, CO

K-Rail

Key Considerations

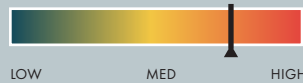
MINIMUM REQUIRED BUFFER

30 inches



ESTIMATED COST

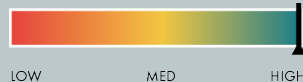
Varies/unit



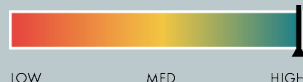
AESTHETICS



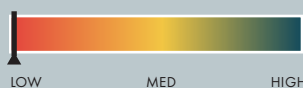
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY

Multiple

WEIGHT

Varies

DIMENSIONS

20'L x 24"W x 32"H

MATERIAL

Concrete

ANCHORING

None

DISTRIBUTOR LOCATION

N/A

DISTRIBUTOR CONTACT

N/A

ADDITIONAL INFORMATION CAN BE FOUND AT

N/A

Additional Notes

BIKE COMFORT

If spaced closely, the K-Rail acts similar to the sidewalk curb, significantly minimizing the likelihood of encroachment.

DURABILITY AND MAINTENANCE

Highly durable. Any custom wrap may need to be replaced more regularly due to graffiti and sun damage.

CITIES WITH THE PRODUCT INSTALLED

Burbank, CA
New York City, NY
Seattle, WA

Low Wall Barrier

Key Considerations

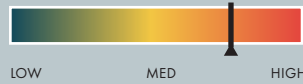
MINIMUM REQUIRED BUFFER

2 feet



ESTIMATED COST

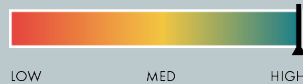
Contact
Manufacturer



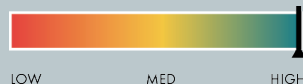
AESTHETICS



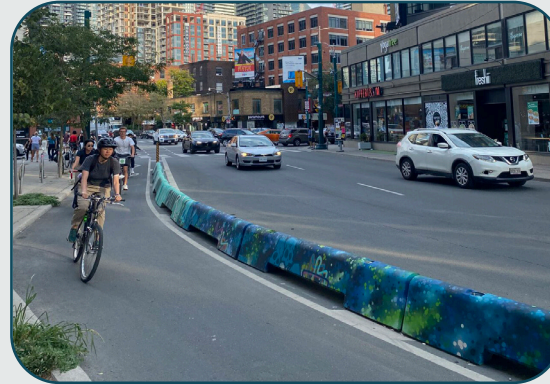
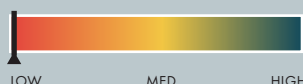
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY
Power Precast Solutions

WEIGHT
1,670 lbs

DIMENSIONS
118 1/8"L x 17 3/4"W x 17 3/4"H

MATERIAL
Concrete

ANCHORING
None

DISTRIBUTOR LOCATION
Ottawa, ON

DISTRIBUTOR CONTACT
sales@powerprecast.com
(613) 822-1488

ADDITIONAL INFORMATION CAN BE FOUND AT
<https://powerprecast.com/product-category/active-transportation/>

Additional Notes

BIKE COMFORT

The Low Wall Barrier acts similar to the sidewalk curb, significantly minimizing the likelihood of encroachment.

DURABILITY AND MAINTENANCE

Highly durable. Any custom artwork may need to be replaced more regularly due to graffiti and sun damage.

CITIES WITH THE PRODUCT INSTALLED

Toronto and Hamilton, ON

Self-Watering Planters

Key Considerations

MINIMUM REQUIRED BUFFER

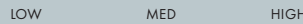
3 feet

FOR URBAN RECTANGLE



4 feet

FOR METROPOLITAN RECTANGLE



ESTIMATED COST

Urban Rectangle

\$639/unit

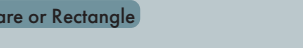
+ TAXES AND FEES



Metropolitan Square or Rectangle

\$559/unit

+ TAXES AND FEES



AESTHETICS



BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY

EarthPlanter

WEIGHT

Information Unavailable

DIMENSIONS

Urban Rectangle: 40"L x 22"W x 24"H

Metropolitan Square: 32"L x 32"W x 26"H 24"L x 24"W at base

Metropolitan Rectangle: 40"L x 22"W x 24"H

MATERIAL

Linear Low-Density Polyethylene

ANCHORING

None

DISTRIBUTOR LOCATION

Auburn, NY

DISTRIBUTOR CONTACT

Robert Buckley
Rbuckley@earthplanter.com
(877) 815-9276

ADDITIONAL INFORMATION CAN BE FOUND AT

<https://earthplanter.com/shop-self-watering-planters/urban-rectangle/>

Additional Notes

BIKE COMFORT

Bike comfort varies based on what additional materials the planters are paired with. Planters should not be used alone and should instead be paired with some vertical element and/or curb.

DURABILITY AND MAINTENANCE

Water reservoir needs to be refilled regularly (every ~2 weeks depending on weather and plant species)

CITIES WITH THE PRODUCT INSTALLED

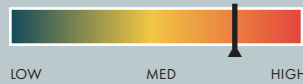
Oakland, CA
Bethesda, MD

SteelGreen Planters

Key Considerations

MINIMUM REQUIRED BUFFER

30 inches

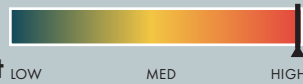


ESTIMATED COST

Galvanized

\$1200/unit

+ TAXES AND FEES

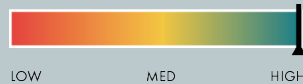


Power-coat color

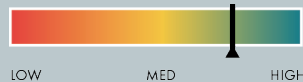
\$1700/unit

+ TAXES AND FEES

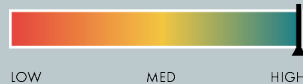
AESTHETICS



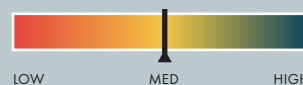
BIKE COMFORT



DURABILITY



REFLECTIVITY



Technical Specifications

MANUFACTURED BY
DezignLine

WEIGHT
Information Unavailable

DIMENSIONS
48"L x 24"W x 25"H

MATERIAL
Powder coat galvanized steel

ANCHORING
Anchor-ready

DISTRIBUTOR LOCATION
Minneapolis

DISTRIBUTOR CONTACT
Susan Altenbach, President
susan@dezignline.com
(877) 944-8900

ADDITIONAL INFORMATION CAN BE FOUND AT
<https://dezignline.com/protected-bikeway-pedestrian-products/steelgreen-planters/>



Additional Notes

BIKE COMFORT

If anchored, the planters provide significant protection.

DURABILITY AND MAINTENANCE

Water reservoir needs to be refilled regularly (every ~2 weeks depending on weather and plant species)

CITIES WITH THE PRODUCT INSTALLED
Bellevue, WA

OPTIONAL ADD-ONS

Optional Hand Rails

\$250/unit

+ TAXES AND FEES

Optional Reservoirs

\$350/21 gal

+ TAXES AND FEES

Optional Reservoirs

\$130/2.5 gal

+ TAXES AND FEES

Optional Foot Rest

\$145/unit

+ TAXES AND FEES