Orange County Council of Governments

May 2016
Edition 1

Complete Streets Initiative Design Handbook

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OCCOG

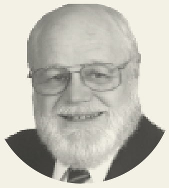
I am pleased to present the first edition of the Orange County Complete Streets Initiative (OCCSI) Design Handbook. The OCCSI Design Handbook provides policy and design best practices guidelines for jurisdictions, agencies, design professionals, private developers, and community groups for the improvement of streets and pedestrian areas throughout Orange County.

The primary goal of the OCCSI was to provide Orange County jurisdictions with draft policies that can be incorporated into the Circulation Element of their General Plan, ensuring the requirements of Assembly Bill 1358, the California Complete Streets Act, are met. The OCCSI Design Handbook provides a menu of complete street policies that range from basic to advanced, allowing jurisdictions to tailor a complete streets approach that addresses their individual needs and takes into account existing infrastructure.

The OCCSI Design Handbook also includes examples of design goals and strategies that can be utilized by jurisdictions to develop a unique, layered complete streets network. The design goals and strategies highlight the diversity that exists within Orange County and provide examples of options for complete streets for all modes of travel.

Since the majority of Orange County is developed, the OCCSI Design Handbook contemplates ways for jurisdictions to add in elements of complete street principles without replacing existing infrastructure and provides cost effective design elements for a range of budgets. Finally, the Handbook recognizes that the layered network does not have fixed boundaries and encourages jurisdictions to work with each other to promote seamless transitions between jurisdictions to make for a more efficient system for users across all modes.

The OCCSI Design Handbook is a living document and it will be updated periodically to address evolving practices and aspirations as funding becomes available. It is a one-of-a-kind document that is not prescriptive and allows jurisdictions the flexibility to implement a complete streets program that takes into account the diverse conditions that exist within Orange County.



Arthur Brown
Chair, Orange County Council of Governments Board of Directors

Contents

Introduction

The Orange County Complete Streets Initiative (OCCSI) Design Handbook provides policies and design best practice guidelines for jurisdictions, agencies, design professionals, private developers, and community groups for the improvement of streets throughout Orange County.

About this document

Streets are an essential part of our cities and communities. Streets make up around 21% of Orange County's urban fabric, and fulfill two core functions: providing mobility and places for people. They enable people to get to work, to travel to school, to do their shopping, and to access community facilities. They are also places in their own right which people want to visit and spend time in.

Complete Streets are streets for everyone. They are designed and operated to enable safe access for all users in a community. People of all ages and abilities should be able to move along and across streets, regardless of how they are traveling. Complete Streets make it easy to cross the street, walk around your neighborhood, and bicycle to the beach. They help buses to run on time and make it safe for people to walk to and from school.

This document is a tool to help realize Complete Streets in Orange County. The OCCSI Design Handbook is written to be used by all - communities, jurisdictions, agencies, advocacy groups, developers, elected officials and more - to understand what Complete Streets are, how to shape policies to help deliver them, how to design them, and how to evaluate success.

Ultimately, the goal of the OCCSI Design Handbook is to help inform the design and operation of a transportation network that enables safe access for all users, regardless of age, ability, or mode of travel. It does this by providing design guidance and principles that relate to the diverse range of street types found in Orange County, in order to inform, streamline, and better coordinate decision-making on all street design projects. This means that every transportation project – whether a small-scale improvement or a comprehensive retrofit - will make the street network better and safer for drivers, transit users, pedestrians, and bicyclists.

The OCCSI Design Handbook relates to and integrates key policies, by-laws, standards and guidelines for the right-of-way, and uses the most appropriate best practices for agencies and jurisdictions of Orange County. It recognizes and responds to the diverse local conditions, contexts, and character of Orange County communities. It has also been informed by in-depth research and outreach to local communities and jurisdictions to identify needs and aspirations of Orange County.

Policy context

Creating Complete Streets requires communities to broaden their approach to serving transportation needs. Priorities need to be balanced between a variety of demands including traffic operations, public safety and health, social equity, and quality of life. In California this approach has been sanctioned through legislation; the California Complete Streets Act (AB 1358) of 2008 requires the circulation element of jurisdictions' General Plans to "plan for a balanced, multimodal transportation network that meets the needs of all users of the streets, roads, and highways for safe and convenient travel in a manner that is suitable to the rural, suburban, or urban context".

The Act requires that jurisdictions' General Plans must be updated upon any substantive revision to the Circulation Element. This document aims to help Orange County jurisdictions achieve this compliance by providing a framework of sample policies that can be used in their region.

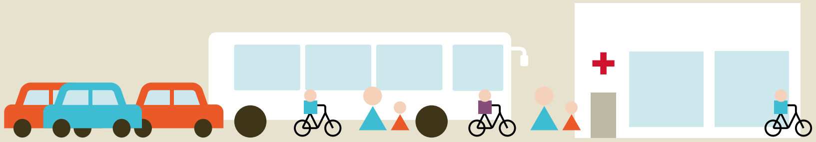
The production of the OCCSI Design Handbook has been sponsored by the Orange County Council of Governments (OCCOG) and produced by Steer Davies Gleave, Fehr & Peers, and Leslie Scott Consulting.

California AB 1358 Complete Streets Act of 2008

The California Complete Streets Act (AB 1358) 2008 (the Act) requires the circulation element of General Plans to be modified to: "plan for a balanced, multimodal transportation network that meets the needs of all users of the streets, roads, and highways defined to include motorists, pedestrians, bicyclists, children, persons with disabilities, seniors, movers of commercial goods, and users of public transportation, in a manner that is suitable to the rural, suburban, or urban context of the general plan".

The Act declares this to:

- Support the targets in the California Global Warming Solutions Act of 2006, to reduce the greenhouse gas emissions from transportation, which represents 41 percent of total greenhouse gas emissions in California.
- Shift transportation mode share from single passenger cars to public transit, bicycling and walking, to reduce vehicle miles travelled, most notably in relation to the 41 percent of trips in urban areas nationwide which are two miles or less in length, and the 66 percent of urban trips that are one mile or less and made by an automobile.
- Realize additional benefits from walking and bicycling of improving public health and reducing treatment costs for conditions associated with reduced physical activity including obesity, heart disease, lung disease, and diabetes. Medical costs associated with physical inactivity were estimated by the State Department of Health Care Services to be $28 billion in 2005.



About Complete Streets

Complete Streets are streets that are planned, designed, operated, and maintained to provide safe mobility for all users. Complete Streets recognize the variety of users, but importantly, the variety of non-automotive users.

In Orange County, the range of people who use streets is wide, and includes bicyclists, pedestrians, persons with disabilities, transit users, truckers, motorists, neighborhood electric vehicles, equestrians, and skateboarders. A Complete Streets approach considers who uses different streets and prioritizes modes accordingly.

Complete Streets can be applied as a standalone project to improve transportation facilities along a street, however Complete Streets can also be applied as a network-based approach. A network-based approach means a more comprehensive view to achieve the goal of providing residents with the ability to safely and comfortably traverse a city, regardless of transportation mode. A network-based approach also allows for greater flexibility in the application of Complete Streets principles in places where some users may not be able to be accommodated adequately along a particular street.

For instance, a single street may not be able to accommodate the needs of all users due to constrained space, however considering the street as part of a network may help identify parallel routes where a different balance of transportation modes can be achieved. The transportation facilities of different streets then work together as a larger network to provide safe and efficient trips for all modes.

Complete Street networks are inclusive. Because they accommodate all ages and abilities including children, older people, and people with disabilities, they are comfortable and welcoming for everyone.

Complete Street networks are appropriate to their function and context. Every street within a Complete Street network looks different, according to the role of a particular street, its context, and the needs and desires of the community it serves. What it takes to make a street "complete" varies depending on many factors, so there is no single definition. However, ingredients may include sidewalks, bicycle lanes, special bus lanes, comfortable and accessible transit stops, adequate truck routes and loading zones, frequent crossing opportunities, median islands, accessible pedestrian signals, curb extensions, and more.

A Complete Streets approach can be applied to both new road projects (e.g. as part of new development areas), and also to retrofit existing roads.

Orange County communities and contexts are diverse, and facilities must acknowledge and respond to this. The different scales and types of urban form found across Orange County will influence the type of Complete Street solutions implemented. For example, the rectilinear street grids found in some communities are very different to the curving roads and culs-de-sac of others, so the resulting design approaches are likely to look different too.

Current issues

There are several pivotal issues facing Orange County that the implementation of Complete Streets will help to improve. These include a declining health in children, an aging population, a growing opportunity gap between high- and low-income families, decreased safety on roads, and environmental concerns.[1]

Declining health in children
The nationwide obesity rate in children has been growing to more than double of what it was just three decades ago. Along with national trends, almost one-third of Orange County children are overweight or obese. As a result, obesity-related chronic diseases such as diabetes and heart disease are also rising.[2]

A network that does not incorporate a Complete Streets approach limits children (and adults) the opportunity to choose more active mobility. Complete Street networks provide opportunities for increased physical activity by incorporating features that promote regular walking, cycling, and transit use which supports healthier lifestyles.[3]

An aging population
The percentage of Orange County residents 65 and older is projected to grow in the next 25 years, from 14% to 24% of the entire population, with other age groups shrinking proportionately.[4]

Complete Streets can help improve mobility for older residents in various ways. For example new infrastructure that slows down vehicles creates a better driver and pedestrian environment through more easily navigated streets, increased visibility, and additional multi-modal options to choose from.[5]

Growing gap between high- and low-income families
In the past few decades, there has been increasing disparity between high- and low-income earners in Orange County, as those with lower educational attainment struggle to close the growing "opportunity gap." The poverty rate in Orange County has increased 53% in less than nine years, from 8.8% to 13.5%.[6] Lower income populations are more dependant on non-automobile transportation.

The development of Complete Streets creates an opportunity for more equitable streets as these corridors are planned, designed, and maintained to be for everyone regardless of age, ethnicity, income, or educational background.

Creating a safe and functional place for all residents to walk, ride bicycles, or take public transportation helps populations that usually suffer disproportionately from poor street design through a decreased likelihood of illness, injury, and death.[7]

The proportion of Orange County residents 65 and older is projected to grow in the next 25 years, from 14% to 24% of the entire population

The nationwide obesity rate in children has been growing to more than 2x what it was just three decades ago

1 Orange County Community Indicators Project. OC Community Indicators. Santa Ana : s.n., 2015. http://bit.ly/1qiTOo6
2 OC Community Indicators. Santa Ana : s.n., 2015 http://bit.ly/1qiTOo6
3 National Complete Streets Coalition. Health. Smart Growth America. [Online] 2015 http://bit.ly/1PlPd46
4 Orange County Community Indicators Project. OC Community Indicators. Santa Ana: s.n., 2015. http://bit.ly/1qiTOo6
5 National Complete Streets Coalition. Older Adults. Smart Growth America. 2015. http://bit.ly/1N3YvfQ
6 Orange County Community Indicators Project. OC Community Indicators. Santa Ana : s.n., 2015. http://bit.ly/1qiTOo6
7 National Complete Streets Coalition. Benefits of Complete Streets. Smart Growth America. 2015 http://bit.ly/1ROJOOO

Safety on roads

In 2014, Orange County had 31,216 automobile collisions. 164 of these collisions resulted in 173 fatalities. Forty-nine, or 28%, of these fatalities were pedestrians, and 17 (10%) were on bicycles.[8] Auto-oriented streets that do not include safe places for people to walk, cross, wait for transit, or ride bicycles put users at risk.

With Complete Streets, the provisions for non-motorized users and the number of non-motorized travelers increases. This improves safety indirectly, according to a study that showed that more people walking and biking reduces risk per trip. Changes in street infrastructure to be more complete also create long-lasting speed reduction which benefits the safety of all road users – motorists, pedestrians, and bicyclists.[9]

Environmental concerns

A majority of the census tracts within Orange County experience a Pollution Burden of over 50%. Pollution Burden measures how exposed and affected census tracts are by multiple sources of pollution. Different indicators are used to reflect impact of air quality, water quality, and waste facilities within each census tract in California. A high pollution burden means a community is vulnerable to multiple sources of pollution. Orange County has several cities where the Pollution Burden exceeds 90%, particularly in its more urban areas.[10]

Disadvantaged communities (with high pollution burdens) in California are specifically targeted for investment of proceeds from the State's cap-and-trade program. These investments are aimed at improving public health, quality of life, and economic opportunity in California's most burdened communities and at the same time they are reducing the pollution that causes climate change.

With the transportation sector being the fastest growing carbon dioxide source in the United States[11], any mode shift from driving to walking, biking, or transit is a mitigation strategy. Walking and bicycling are zero-emission transportation modes, and transit is a lower-emissions mode – using transit can help a solo commuter who switches from driving to transit to reduce carbon dioxide emissions by 20 pounds per day, or more than 4,800 pounds in a year.

Boulder, CO, saw a reduction in car trips due to the implementation of Complete Streets that has cut annual CO_2 emissions by half a million pounds in just over a decade. By reducing emissions through Complete Streets, communities can see a measurable improvement in the environment.[12]

PEDESTRIAN SURVIVAL WHEN HIT BY A VEHICLE

20mph
9 out of 10 pedestrians survive when hit by a vehicle traveling at 20mph

30mph
5 out of 10 pedestrians survive when hit by a vehicle traveling at 30mph

40mph
1 out of 10 pedestrians survive when hit by a vehicle traveling at 40mph

8 California Highway Patrol. 2014 Annual Report of Fatal and Injury Motor Vehicle Traffic Collisions. 2014. http://bit.ly/1X7FQS8

9 National Complete Streets Coalition. Safety. Smart Growth America. 2015. http://bit.ly/1NkEcFP

10 Office of Environmental Health Hazard Assessment. CalEnviroScreen 2.0 Pollution Burden Indicators. OEHHA. 2014. http://bit.ly/1fvzkBX

11 CO2 emission rates are rising at 2% per year. Projections show that more efficient fuels and 'clean' vehicles will not be enough to affect the projected 59% increase in driving between now and 2030. Ewing, R. Bartholomew, K. Winkelman, S.Walters, J. Chen, D. Urban Cooler: The Evidence on Urban Development and Climate Change. 2007. http://on.nrdc.org/1MpGd8l

12 National Complete Streets Coalition. Green Streets. Smart Growth America. [Online] 2015. http://bit.ly/1PmTGiF

Benefits

Complete Streets have a wide range of positive impacts on individuals, businesses, the environment and the wider community that would benefit Orange County.

Economic revitalization
Complete Streets can reduce transportation costs (up to $9,000 annually for individuals who switch from driving to transit)[13] and travel time, while increasing property values (in a survey of 15 real estate markets a one-point increase in the walkability of a neighborhood as measured by WalkScore.com increased home values by $700 to $3,000)[14], and job growth in communities. A balanced transportation system that includes Complete Streets can bolster economic growth and stability by providing accessible and efficient connections between residences, schools, parks, public transportation, offices, and retail destinations.

Livable communities
Streets are an important part of the livability of our communities and should be designed to be for everyone, whether young or old, motorist or bicyclist, walker or wheelchair user, local resident or visitor. More than half of Americans recently surveyed would like to walk more and drive less. Increased bicycling and walking are indicative of vibrant and livable communities.[15]

Ease congestion
Designing streets for automobiles only reduces opportunities for safe travel choices that can ease traffic congestion such as walking, bicycling, and taking public transportation. The Orange County Transportation Analysis Model (OCTAM) shows that during the AM peak period home-based work trips only make up 30% of all trips at that time. Therefore, around 70% of all other trips are for non-home based work purposes (such as shopping, going to school or the gym, or running errands). Many such trips are short and could be made safely by walking, bicycling, or taking transit – if the streets are complete. A comprehensive approach to transportation planning and design will increase transportation choices and encourage efficient use of current roadways by offering alternatives to the automobile, especially during peak travel times.[16]

Improved return on infrastructure investments
Integrating sidewalks, bicycle lanes, transit amenities, and safe crossings into the initial design of a project spares the expense of retrofits later. The careful planning encouraged by Complete Streets policies also helps jurisdictions find many effective measures that can be accomplished at little or no extra cost. On a project-by-project basis, any additional money spent on Complete Streets can be considered part of a long-term investment in the financial and physical health of the community.[17]

13 American Public Transportation Assosiation, Transit Savings Report. 2012. http://bit.ly/1N4hdE6
14 CEOs for Cities. Walking the Walk. 2009.
15 National Complete Streets Coalition. Livable Communities. Smart Growth America. 2015. http://bit.ly/1Ok4xEq
16 National Complete Streets Coalition. Ease Congestion. Smart Growth America. 2015. http://bit.ly/1N5MkPN
17 National Complete Streets Coalition. Costs. Smart Growth America. http://bit.ly/1SvkpEX

Background information

B5 **Resources:** Refer to `B5: Resources' for additional background information relevant to the OCCSI Design Handbook.

This includes:

- Initiatives related to complete streets
- Legislation, manuals, standards and guidance
- Background work undertaken which has informed the OCCSI
- Glossary of terms

Part A
Vision and Policy Framework

A1

Vision

The intent of the OCCSI Design Handbook is to do more than help implement a state-mandated policy, it seeks to promote a phased transformation of Orange County's overall street system through design, implementation and maintenance.

This chapter presents OCCOG's overarching vision for the delivery of Complete Street networks in Orange County. This is a County-level vision; it is up to each jurisdiction to develop their own vision for what Complete Streets should be in their community. For help in writing a vision (and accompanying policy), please refer to guidance set out in Chapter A2.

This chapter also describes tools to help users consider the role and function of Orange County streets, including:

- How to think about streets in terms of movement and place functions, and in relation to existing roadway classifications
- Introducing the nine street types which form the basis of the OCCSI Design Handbook
- Describing the Layered Network approach

Vision statement

"Complete Streets in Orange County communities offer safety, comfort, and convenience for all street users, regardless of transportation mode, user age, or ability. Complete Streets are designed in response to their unique local context in Orange County, while also recognizing their role in moving people and goods from one place to another, and also as spaces for people to recreate, exercise, conduct business, engage in community activities, and interact with their neighbors. The implementation of Complete Streets will benefit Orange County communities through decreased numbers and severity of traffic collisions; reduced expenditure on road-widening; increased physical activity and reduced health risks; reduced consumption of resources and a cleaner environment; and encouraging local spending and supporting economic vitality."

Key Considerations

There are a number of additional key considerations to support this vision:

Projects and programs	Support and complement other projects and programs, such as Safe Routes to School and Active Transportation Plans.
Connectivity objectives	Contribute to meeting wider connectivity objectives for improved walking and bicycle and transit networks.
Americans with Disabilities Act	Help meet Americans with Disabilities Act requirements.
Sustainability	Help conserve water and support local biodiversity through sustainable street design measures.
All project phases	Apply to all phases of projects, from concept to post-completion, including both new and rehab works.

Delivering the vision

One of the biggest challenges to the vision is balancing the various demands on Orange County's streets and roads, and supporting their different functions and priorities in different locations. This must be done in a way that can be easily explained and understood by all local communities and stakeholders.

To achieve the ambition expressed in the vision and tackle the challenges of safely meeting the needs of different users, the OCCSI Design Handbook sets out a framework for understanding, managing, and developing Orange County's streets. This is based around understanding streets in terms of:

- 'Movement' and 'place' functions.
- Relationship to existing road designations (e.g. the MPAH – Master Plan of Arterial Highways).
- Layered networks of transportation facilities.
- Nine street types.

To achieve the ambition expressed in the vision and tackle the challenges of safely meeting the needs of different users, the OCCSI Design Handbook sets out a framework for understanding, managing, and developing Orange County's streets

These tools and their application are explained in the following sections of this chapter. They are designed to enable jurisdictions, agencies, communities, and other stakeholders to:

- Identify user needs in different circumstances and set priorities / make trade-offs accordingly.
- Reflect changing functions and aspirations as streets change over time.
- Balance locally specific needs with the overall function of transportation networks, recognizing that needs may not be the same along the entire length of a street corridor.
- Identify the types of design elements that may be appropriate in a particular context, and with regard to the overall function of the network.
- Understand the need for intervention within the County context, considering long distance and local trips.

The tools and the understanding they provide are intended to help mediate between different demands on Orange County streets to improve their function and better balance provisions for different road users, which must consider the context of the wider transportation network. Not all streets can or should be prioritized for bicycles or pedestrians, given the need to accommodate essential automobile trips on strategic routes. Likewise, vehicle throughput cannot take priority in the design of every street.

The tools described in this and later chapters are not about providing a prescriptive design solution for each street type or specific design element. What they provide is a guide for design, to help achieve the right solution in the right place and make a street more complete by using existing standards and guidance to design particular elements. They can be applied to both new-build and retrofit projects.

Figure A1.1 illustrates the process for identifying street types and therefore design principles when considering a specific street or part of a street. Further details of how to apply this process are provided over the following pages.

FIGURE A1.1: STREET TYPE PROCESS OVERVIEW

Task 1
Consider existing roadway classification

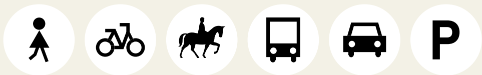
Task 2
Consider movement and place aspects

Task 3
Identify street type

MF MC ML BP NM DS AL RS SS

Task 4
Locate in layered network

Task 5
Identify modal priorities



What they provide is a guide for design, to help achieve the right solution in the right place and make a street more complete by using existing standards and guidance to design particular elements

Movement and place

Movement and place theory

All streets are multi-functional spaces. For example, a street may be a key route for people traveling to work and for goods vehicles to deliver to local businesses, while also being a destination for local people to do their shopping, to meet friends, or to attend a school. All these functions can be broadly grouped into two categories `movement' or `place'.

Movement

`Movement' is about moving people or goods, by various modes of transportation. Streets have a wide range of movement functions, from roads carrying very high volumes and mixes of automobile traffic/people across the County, to streets which provide access to residents on a local neighborhood street.

Streets within communities are also part of longer corridors as well as the overall strategic road network in the County. The strategic road network is expressed through the Master Plan of Arterial Highways (MPAH), Freeways and the Toll Roads. These roads must work together efficiently to facilitate longer distance movement.

However, this does not mean that automobile movement is necessarily the sole priority on these streets. Movement includes pedestrians, bicyclists, buses, and other modes, and roads that perform a strategic role must also consider and accommodate these other users. This should encompass the established layers of transportation networks that make up strategic movement functions, including:

- The transit network – buses, and the proposed streetcar
- The bicycle network – including all classes of bikeways
- Goods and truck network

The objectives for all types of movement are similar; safe, direct, quick, and convenient journeys without disruption. However, roadway space is finite and conflict can occur between the requirements for different transportation modes. The OCCSI Design Handbook recognizes this and provides a flexible approach to guide the resolution of some of these conflicts. The overlay and interface between these various networks is discussed further in the layered network approach described in the following section.

Place

`Place' relates to functions which attract people to walk or spend time in areas adjacent to the street; these functions are equally important to movement. Indeed it is `place' that gives our communities character, amenity, and purpose, and ultimately makes them livable, desirable places to spend time. Place captures all the street functions which are not just about moving from one location to another, and has a strong relationship with context, particularly land uses and the activity generated by surrounding buildings.

A street which is a strategic place is one which attracts people from across the County, such as a street in a downtown area; or one which attracts people nationally or internationally, such as the streets in Anaheim's Disneyland Resort area. A street which is a local place meets specific neighborhood needs. This could, for example, be an access road for local homes used primarily by local residents for parking and storing trash cans.

Movement and place matrix
Figure A1.2 illustrates movement and place as axes on a chart.

On these axes, 'local significance' in terms of movement means that a street has low volumes of traffic, and that traffic is more likely to have a specific start or end point on the street in question rather than passing through as part of a longer distance trip. Local significance in terms of place means that the street has minimal activity generated by adjacent land uses, and performs a specific function rather than offering a mix of uses.

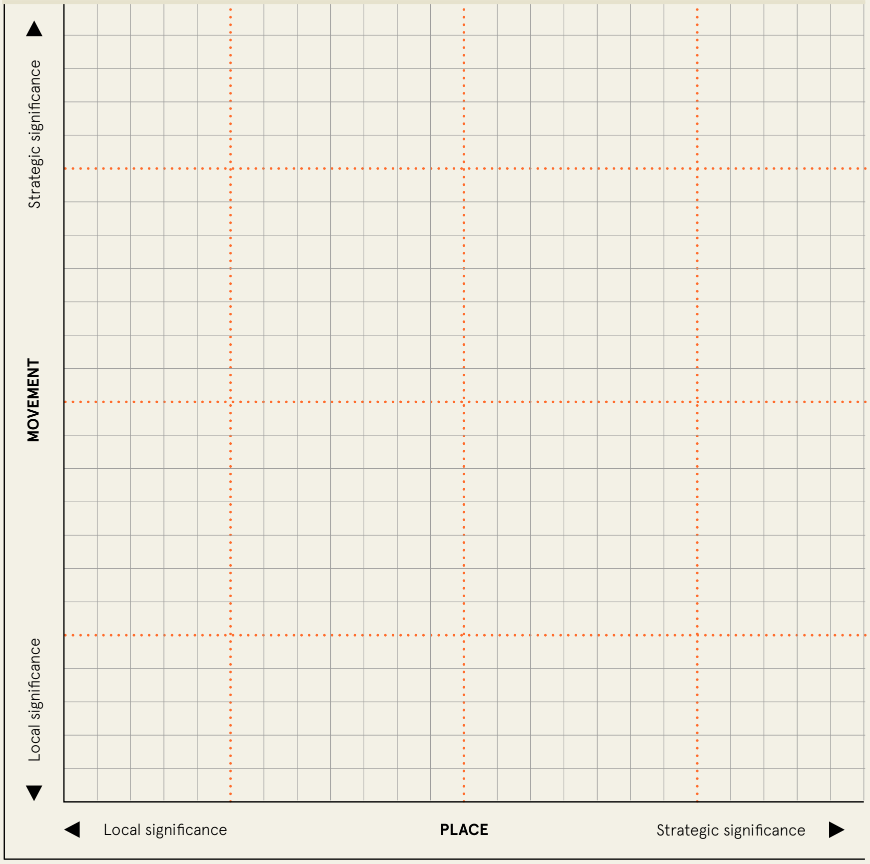
'Strategic significance' in terms of movement means that a street has high volumes of traffic, and that a large part of the traffic is likely to be passing through the area (e.g. on a longer distance trip) rather than making a specific journey to a building or location on that street. Strategic significance in terms of place means that the street also attracts a lot of activity due to its mix of land uses and/or strong identity as a destination, and people come from across a wide area for work, shopping, leisure etc.

The Master Plan of Arterial Highways Guidelines (MPAH)

The MPAH defines a county-wide circulation system in response to existing and planned land uses. In order to be eligible for certain funding sources, including Measure M2, a jurisdiction's General Plan circulation element must be consistent with the MPAH. Local agencies may freely determine whether to maintain consistency with the MPAH or not.

http://bit.ly/1FWiWYU

FIGURE A1.2: THE MOVEMENT AND PLACE AXES



All streets are multi-functional spaces. These functions can be broadly grouped into two categories 'movement' or 'place'.

Movement and place and existing roadway classifications
The movement and place concept works with existing classifications of streets. These include the MPAH roadway categories, Freeways, and the Toll Roads.

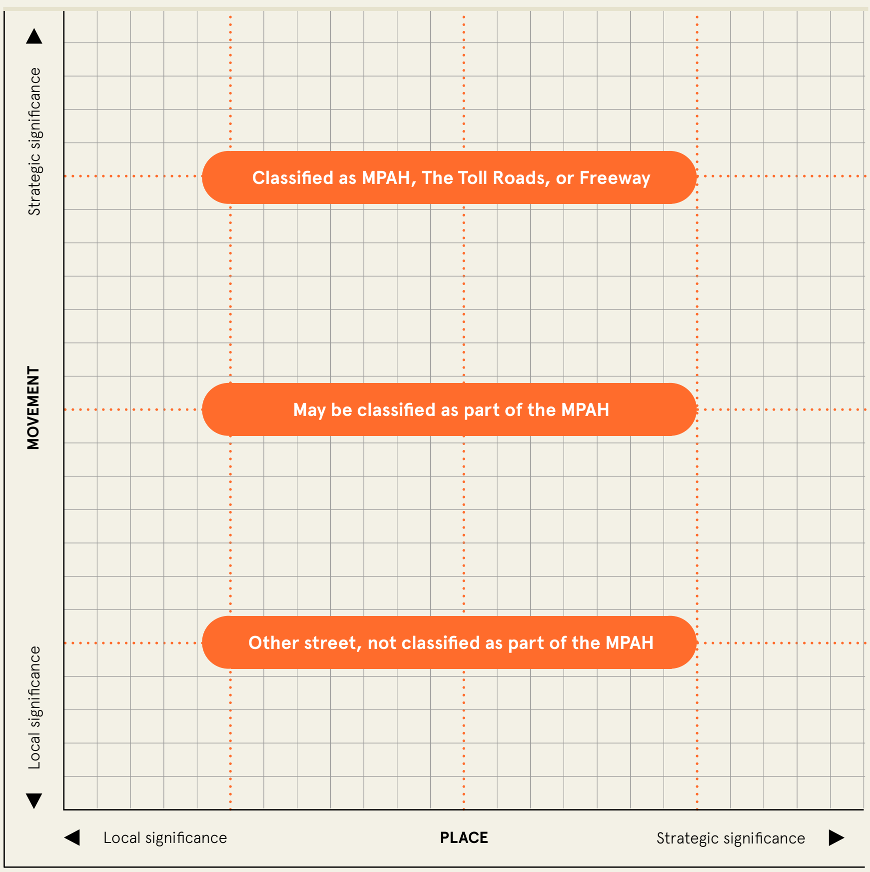
Streets that cater for high volume and long distance movement are most likely to be strategically significant and classified as part of the MPAH, as a Freeway or one of the Toll Roads. If these streets are considered in terms of movement and place, they would be located in the top row of the movement and place matrix, as shown below.

Streets that have moderate volumes and are part of a wider area network such as industrial areas, or neighborhood main streets may be classified as part of the MPAH, or they may not. These would be located in the middle row of the movement and place matrix.

Streets with low volumes of traffic and local movement functions such as residential culs-de-sac are not classified in the MPAH.

The OCCSI Design Handbook is intended to offer design principles that can be applied to all street types, regardless of whether or not they are already classified as part of the MPAH, as a Freeway, or the Toll Roads. Understanding whether a street is classified in this way is the starting point to understanding priorities and what design principles may be applied. This is explained further on the page 22.

FIGURE A1.3: ROADWAY CLASSIFICATIONS AND THE MOVEMENT AND PLACE AXES

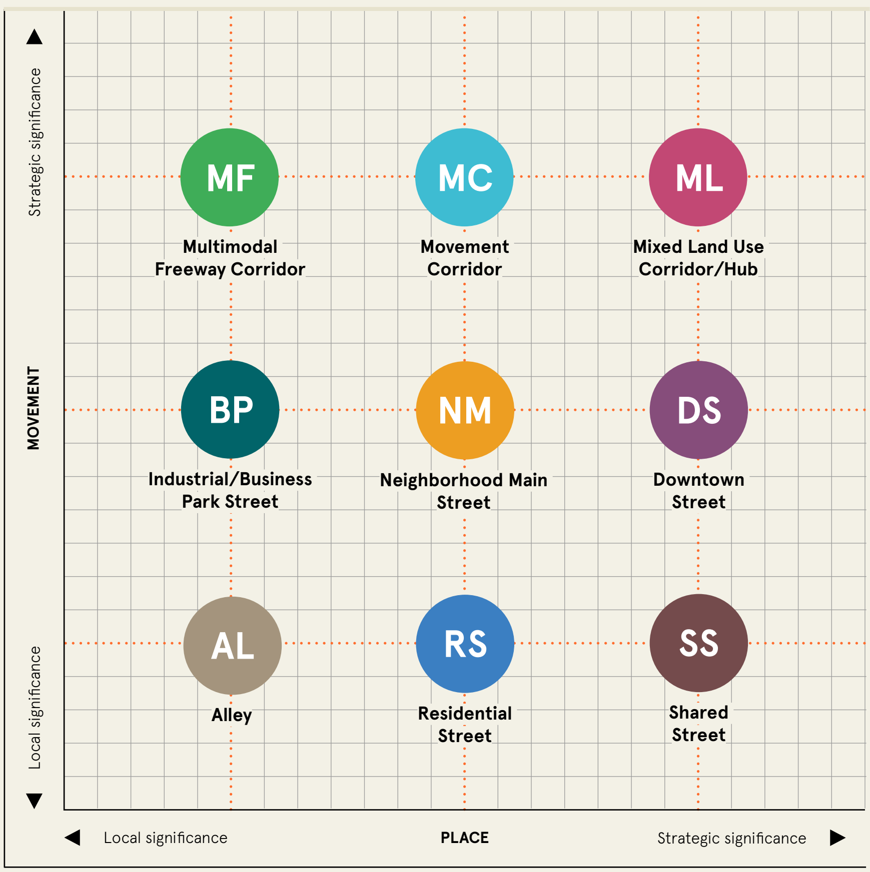


The movement and place concept works with existing designations of streets. Existing designations include the MPAH roadway categories, Freeways, and Toll Roads.

Bringing movement and place together: Orange County's street types
Different types of streets can be mapped against both the movement and place axes, according to how 'local' or 'strategic' in significance they are in terms of movement and place functions, and taking into account the mix and balance of transportation modes, the nature of the built environment/aesthetic quality, and character of different places.

The OCCSI Design Handbook identifies nine broad types of streets and roads in Orange County and maps them on the movement and place axes. These streets represent the diversity of Orange County's roads. The individual types are described in more detail later in this chapter.

FIGURE A1.4: OCCSI STREET TYPES AND THE MOVEMENT AND PLACE AXES



The OCCSI identifies nine broad types of streets and roads in Orange County and maps them on the movement and place axes

Application of street types

The approach taken to naming the street types is deliberately different to those used in the MPAH and other roadway classification documents. In these documents an auto-centric approach is used to name street types. The OCCSI Design Handbook street types are intended to recognize that streets in Orange County are about moving people, not just automobiles, and that their roles and functions are sensitive to their context. All of the street types identified are present in Orange County.

This categorization is intended to be a practical tool for use by all, providing a way of thinking about a street in its context. However, at the same time it is not intended to be prescriptive about design, and some flexibility in application will be required to recognize variety within a street type. For instance, a residential street in a coastal city compared to a central Orange County city will have the same function, and its position in the movement and place matrix will be the same. The design principles to make these streets complete will also be the same. However, the design details to complete the street may look different in response to particular local conditions.

In addition, there may be a number of ways to achieve a complete street of a certain type, for example, with different traffic lane configurations, on-street parking, medians, etc. This is elaborated in later sections of this document through the use of 3D visuals, design principles, and a selection of cross-sections which show a variations of approaches within the street types.

The street types are intended to clarify the roles played by different streets, and therefore set priorities for them. This provides a framework for making decisions about balancing competing demands and to guide proposals to complete the street. Ideally, street improvement projects can deliver improvements for many different users at the same time, but in some cases this will not be possible, and trade-offs will need to be considered.

To identify what type a particular street is requires consideration of its existing conditions in terms of both movement and place, and then locating the closest category of street on the matrix that represents these conditions. To aid this process, a decision making flow chart with a series of questions as prompts is included over the page (see 'How to identify a street type'). There will, naturally, be occasional exceptions; streets that when examined in detail do not match any of the nine types and will need to be considered as a combination of two types, or perhaps as special cases in their own right.

In some places, the jurisdiction may desire to change the nature of a street from one category to another. This may be for instance where an area is changing from a business park to mixed use with residential and retail. Depending on the extent of these changes and the resultant activity at street level, this may support a change in the nature of the street from a local place function, to a strategic place function. If it is likely that the context of the street (or a network of streets, if considering a wider area) will change then the future street type should be identified so that the design principles applied will make this street more complete for its future role.

For street types in the lower left part of the matrix (e.g. Alleys and Residential Streets), the design approach will likely have a lighter touch, given their lower significance in terms of place and movement. For a street in the top left hand corner of the matrix (e.g. Multimodal Freeway Corridor) the focus will be on supporting reliable and efficient movement for automobile traffic, while seeking to mitigate impacts such as severance, noise, and air pollution on neighboring communities as much as possible. This will be linked to wider network management priorities as determined by the layered networks described in a later section of this chapter.

OCCSI street types and roadway classifications

As noted earlier in this chapter, the relationship between the OCCSI Design Handbook street types and the MPAH and other roadway classifications is important. Consideration of a particular street in terms of whether or not it is designated MPAH, Freeway, or part of the Toll Roads should be the starting point in identifying a street type, and identifying design priorities. The table below illustrates how these categories relate to the OCCSI street types.

For some street types, the relationship is very direct, such as Multimodal Freeway Corridor which can only be a Transportation Corridor.

Others, such as the Mixed Land Use Corridor/Hub may be one of a number of MPAH categories. Movement along a Mixed Land Use Corridor/Hub is high by its definition, but depending on the role it plays in the wider MPAH network it may be, for example, classed as a Principal Arterial or a Secondary Arterial, or another category in the MPAH definitions.

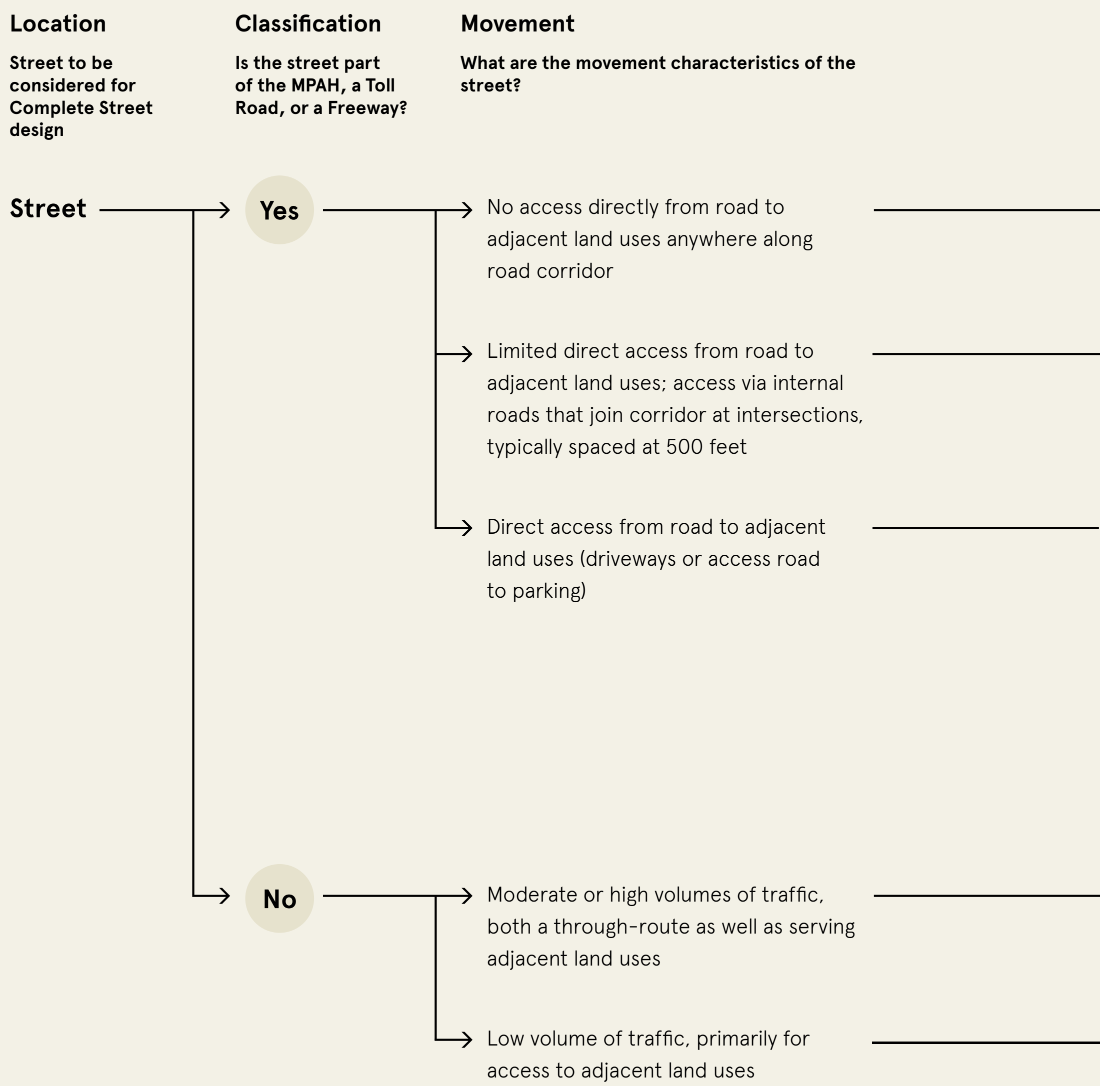
FIGURE A1.5: COMPARISON OF STREET TYPOLOGIES WITH EXISTING ROADWAY CLASSIFICATIONS

	Multimodal Freeway Corridor	Movement Corridor	Mixed Land Use Corridor/ Hub	Industrial / Business Park Street	Neighborhood Main Street	Downtown Street	Alley	Residential Street	Shared Street
OCCSI Design Handbook categories:	MF	MC	ML	BP	NM	DS	AL	RS	SS
FREEWAY OR THE TOLL ROADS									
Transportation Corridor:	✓								
MPAH CLASSIFICATIONS									
Principal Arterial:		✓	✓						
Major Arterial:		✓	✓						
Primary Arterial:		✓	✓	✓					
Secondary Arterial:			✓	✓		✓			
Divided Collector Arterial:			✓	✓	✓	✓			
Smart Streets (Special Designations):			✓		✓	✓			
Collector Arterial:					✓	✓			
UNCLASSIFIED ROADS									
Other local roads:							✓	✓	✓

How to identify a street type

This flow chart explains the decisions needed to identify a particular street type. Specific criteria related to each street type are provided in the following pages, and help explain the decisions to be made.

FIGURE A1.6: STREET TYPE IDENTIFICATION PROCESS



Place

What are the place characteristics of the street?

Street type

The OCCSI Design Handbook street type identified

- Properties are physically separated from roadway → MF Multimodal Freeway Corridor
- Properties are set back behind sound attenuation wall or landscape zone, with infrequent gaps for pedestrian access → MC Movement Corridor
- Mix of land use
  - Single use buildings in commercial center or strip on large plots spread over several blocks → ML Mixed Land Use Corridor / Hub
  - Mixed use buildings in dense urban street grid with taller buildings → DS Downtown Street
  - Mixed use buildings 1 or 2 stories high, in linear strip over 1 or 2 blocks → NM Neighborhood Main Street
- Single use - business / industrial land use → BP Industrial /Business Park Street
- Residential land use
  - Houses front onto the street → RS Residential Street
  - Street runs at side or rear of buildings → AL Alley
- Mix of land use
  - Buildings in intimate scale setting, high pedestrian activity, potentially curbless design and may be used for open street or other temporary closure events. → SS Shared Street

MF

Multimodal Freeway Corridor

Design Guidance: p.88

This category includes Freeways and the Toll Roads. These are high volume and high speed traffic environments, with controlled access points via freeway interchanges. They are essential for movement of general automobile traffic and trucks across the county. The surrounding built environment tends to be single land use, and buildings are physically separated from the road behind a landscape zone or walls.

I5, at Beach Boulevard interchange, Buena Park

Identify this street type

Designation	Transportation Corridor	
Movement	Access to adjacent land uses:	No direct access from road, access to wider street network – via freeway interchanges only
	Scale of traffic movement:	Very high volumes of automobile traffic
Place	Land uses:	Varies, but in all cases is physically separated from the roadway
	Character:	Defined by role as major automobile through-route
	Frontage activity:	None; buildings do not front onto the road
	Sidewalk activity:	None; no sidewalks

Existing conditions

- 8 or more lanes
- 12 feet wide travel lanes
- HOV lanes
- Access via major interchanges only
- No on-street parking
- No sidewalk provisions
- Separated crossings
- No cycle provisions
- Fenced off to physically separate from surrounding areas

Complete Street vision

- Maintain automobile priority but improve provisions for other modes within the corridor (where land is available typically in toll roads) and at freeway interchanges
- Implement transit supportive infrastructure along the corridor (where land available, typically in toll roads)
- Provide off-road trails for bicycles and pedestrians along corridor, with sound attenuation
- Include bridges or underpasses across the freeway for pedestrian and bicycle route connections
- Provide at-grade crosswalks at ramp intersections
- Provide drought tolerant shade trees that provide shade along off-road sidewalks and trails
- Provide street lighting for pedestrians and cyclists

CA State Route 55, Costa Mesa, between Fairview Road and E Wilson Street

I405 Irvine

CA State Route 133

MC

Movement Corridor

Design Guidance: p.96

Movement corridors are in all cases physically separated from the road, with landscape zones, and/or sound barrier walls. Surrounding land uses may vary from place to place, but tend to be single use. They are high volume and fast moving traffic environments and are typically heavily used commuter routes and often also transit routes, truck routes, and emergency routes. They have limited vehicle access points in between major intersections.

Alicia Parkway Laguna, Niguel

Identify this street type

Designation	Principal Arterial, Major Arterial, or Primary Arterial	
Movement	Access to adjacent land uses:	No direct access from street block; access via internal roads that join corridor at intersections spaced (typically) at 500 feet
	Scale of traffic movement:	High to very high volumes of automobile traffic
Place	Land uses:	Varies, but has no direct relationship or interface with street
	Character:	Major automobile through-route with landscape zone
	Frontages:	No active frontages on street, properties face internal roads
	Sidewalk activity:	Properties set back behind landscape strip or sound attenuation wall, so sidewalk activity limited

Existing conditions

- 4 or more lanes
- Wide travel lanes
- Presence of major intersections, with limited number of side road entries between intersections
- No (or limited) direct vehicular access to properties from road
- Limited on-street parking
- Sidewalk provisions, sometimes curbside and sometimes weaving through landscape
- Cycle provisions limited (Class II facilities)
- Landscaped zones either side of road and a landscaped central median strip
- Physical separation of surrounding built environment

Complete Street vision

- Maintain automobile priority but improve provisions for other modes
- Reduce width of travel lanes where appropriate
- Comfortable and sheltered waiting areas for transit users
- Comfortable sidewalk width of 5-7 feet
- Crossings to match wider pedestrian network, including at mid-block where appropriate
- Buffered, separated or off-road bikeways (Class I, II or IV)
- High quality landscape character
- Provide shade trees along sidewalks and bikeways
- Provide street lighting that relates to pedestrians and cyclists

West Macarthur Boulevard, Santa Ana


Imperial Highway, Yorba Linda


Pacific Coast Highway, Crystal Cove

ML

Mixed Land Use Corridor/Hub

Design Guidance: p.110

Mixed land use corridors/hubs are typical of many areas in Orange County. They are streets which carry high volumes of general automobile traffic, and are often transit routes, truck routes, and emergency routes. However, they also present a mix of uses with retail and other business uses in shopping centers or large, continuous strip malls.

North Tustin Avenue, Santa Ana

Identify this street type

Designation	Varies – May fall into a number of MPAH categories other than Transportation Corridor or Collector Arterial	
Movement	Access to adjacent land uses:	Multiple direct access points for automobiles to properties within a street block
	Scale of traffic movement:	High to very high volumes of automobile traffic
Place	Urban form:	Large plot sizes with standalone/detached buildings, typically with large footprints
	Land uses:	Single use buildings, but a mix of land uses is apparent extending along the corridor (e.g. half a mile or more in length)
	Character:	Strip mall or commercial center on major road or at major intersection
	Frontages:	Properties face the street, either set back behind car parking, or located at the back of the sidewalk
	Sidewalk activity:	Pedestrian activity generated where buildings front onto the sidewalk

Existing conditions

- 4 or more lanes
- Wide travel lanes
- Presence of major intersections with side road entries between intersections
- Direct vehicular access to properties from road is more frequent on older corridors, less in more recent master planned areas
- Limited or no on-street parking
- Basic sidewalk provisions
- Cycle provisions limited (Class II facilities)
- Mixed land uses, tending towards retail and some commercial space and increasingly development of apartment complexes
- Buildings set back behind off-street parking areas

Complete Street vision

- Maintain automobile priority but improve provisions for other modes
- Reduce width of travel lanes
- Reduce frequency / consolidate access points to adjacent built development
- Comfortable and sheltered waiting areas for transit users
- Wider sidewalks (8-12 feet) with shade trees
- Provide street lighting that relates to the pedestrian space as well as the roadway
- Crossings to meet pedestrian routes, including mid-block crossings
- Separated bikeways (Class IV)
- Landscaping to reinforce sense of place

Pacific Coast Highway, Corona Del Mar

Beach Boulevard at I5, Buena Park

Harbor Boulevard, Anaheim

BP

Industrial/Business Park Street

Design Guidance: p.120

Industrial or business park streets serve commercial zones with large buildings set back from the road behind parking and landscaped areas. The streets are designed for automobile priority and are largely used by traffic accessing specific businesses located in the area.

Babcock Street, Costa Mesa

Identify this street type

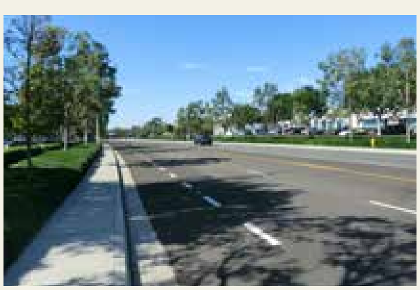
Designation	May not be allocated as MPAH, but if so likely to be Primary Arterial, Secondary Arterial, or Divided Collector Arterial	
Movement	Access to adjacent land uses:	Multiple direct access points to off-street parking (lots or parking structures) within a street block
	Scale of traffic movement:	Moderate to high volumes of automobile traffic
Place	Urban form:	Large plot sizes with standalone/detached buildings typically with large footprints (e.g. large industrial sheds or office blocks), but may also include smaller footprint industrial units
	Land uses:	Single use buildings with predominant use along corridor either business or industrial
	Character:	Business/office park environment
	Frontages:	Properties typically face the street, but are set back within the plot behind privately owned landscaped areas or car parking
	Sidewalk activity:	Limited pedestrian activity

Existing conditions

- Two to four lanes
- Wide travel lanes
- Private side roads provide direct vehicular access to properties from street
- Limited or no on-street parking
- Basic sidewalk provisions
- Limited provisions for cyclists
- Office or industrial uses
- Buildings set back behind landscaped areas and off-street parking

Complete Street vision

- Maintain automobile priority but improve provisions for other modes
- Reduced width of travel lanes
- Comfortable and sheltered waiting areas for transit users
- Sidewalks are at least 5-7 feet wide with drought tolerant shade trees
- Provide street lighting that relates to the pedestrian space as well as the roadway
- Crossings to meet pedestrian routes, including mid-block crossings
- On road bicycle lane (Class II)


Technology Drive, Irvine


East Alton Avenue, Santa Ana


Von Karman Plaza, Irvine

NM

Neighborhood Main Street

Design Guidance: p.130

Mixed use main street attracting people from across the neighborhood or city. Streets are generally already designed for a mix of transportation modes including pedestrian and sometimes bicycle movement. Buildings are usually two to three stories in scale and positioned on the edge of the sidewalk. Uses include shops, workplaces, and recreation facilities. May also feature small individual strip malls that serve a local neighborhood.

Main Street, Seal Beach

Identify this street type

Designation	May not be allocated as MPAH, but if so likely to be a Smart Street or Divided Collector Arterial	
Movement	Access to adjacent land uses:	No direct access points for automobiles to properties within a street block; parking typically on-street parking or in smaller off-street parking lots / structures behind buildings
	Scale of traffic movement:	Moderate volumes of automobile traffic
Place	Urban form:	Smaller plot sizes with small-scale adjacent and contiguous buildings two stories in height, forming a single linear main street-type or local strip-mall type frontage over the length of one or two street blocks of a road corridor
	Land uses:	Uses are mixed within buildings and within blocks, and comprise local retail facilities (e.g. local stores, services and cafes etc.)
	Character:	A neighborhood place which serves the local community rather than attracting people from across the County
	Frontages:	Properties face the street, located at the back of the sidewalk
	Sidewalk activity:	Pedestrian activity generated on sidewalk from active frontages such as stores and cafes

Existing conditions

- Two to four lanes
- On-street parking
- Wide sidewalks
- Conventional or buffered bikeway facilities, if present
- Retail-led mixed uses
- Buildings front directly onto sidewalk, or smaller isolated neighborhood strip mall that is set back from the road to allow parking

Complete Street vision

- Slower traffic speeds and balanced priority between modes
- Reduced width of travel lanes
- High quality waiting areas for transit users
- 8-12 feet wide sidewalks with high quality streetscape environment
- Traffic calming features
- Frequent crossings on routes that pedestrians wish to take
- Curb extensions at key crossing points, including mid-block crossings where appropriate
- Shade trees and other planting
- Street lighting that relates to the pedestrian space as well as the roadway
- Shared bikeway/sharrow (Class III) designation or buffered bikeway (Class II) where space allows

Avenida Del Mar, San Clemente

Main Street, Yorba Linda

E Chapman Avenue, Orange

DS

Downtown Street

Design Guidance: p.138

Mixed use street in the heart of a downtown area, typically attracting visitors and workers from across the city and the County. Streets are generally already designed for a mix of transportation modes including pedestrian and transit, and often bicycle movement. Buildings are four or more stories in scale and positioned on the edge of the sidewalk. Uses include shops, workplaces, and recreation facilities.

North Main Street, Santa Ana

Identify this street type

Designation	May not be allocated as MPAH, but if so likely to be Secondary Arterial, Smart Street, Divided Collector Arterial, or Collector Arterial	
Movement	Access to adjacent land uses:	Limited direct access points for automobiles to properties within a street block; parking typically in off-street parking structures
	Scale of traffic movement:	Moderate volumes of automobile traffic
Place	Urban form:	Dense, urban environment with larger scale, taller buildings (e.g. four or more stories) arranged over a grid of streets
	Land uses:	Uses are mixed within buildings and within blocks, and include larger office-based employment uses, large leisure facilities, retail units and restaurants
	Character:	A busy destination which attracts people from across the County for work or recreation
	Frontages:	Properties face the street, located at the back of the sidewalk
	Sidewalk activity:	High level of pedestrian activity generated on sidewalk from active frontages such as stores and restaurants as well as main entrances to large buildings

Existing conditions

- Two to four lanes
- On-street parking
- Wide sidewalks
- Conventional or buffered bikeway facilities, if present
- Mix of business, retail and leisure uses
- Buildings are large in scale and front directly onto sidewalk

Complete Street vision

- Slower traffic speeds and balanced priority between modes
- Reduced width of travel lanes
- High quality waiting areas for transit users
- 8-12 feet wide sidewalks with high quality streetscape environment
- Traffic calming features
- Frequent crossings on routes that pedestrians wish to take
- Curb extensions at key crossing points, including mid-block crossings where appropriate
- Shade trees and other planting
- Street lighting that relates to the pedestrian space as well as the roadway
- Separated bikeways (Class IV) when high speed or traffic volume

West 5th Street, Santa Ana

South Lemon Street, Anaheim

Intersection S Lemon Street and W Center Street Promenade, Anaheim

AL

Alley

Design Guidance: p.146

Alleys are at the side or rear of buildings and have low traffic volumes. They are primarily used for parking, deliveries, garbage storage/collection and emergency access. There are two alley scenarios; residential and commercial. In residential areas, adjacent land use is predominantly single family or multi-occupancy housing. In commercial areas, adjacent land use is predominantly retail.

Alley off North Broadway, Santa Ana

Identify this street type

Designation	Not part of the MPAH	
Movement	Access to adjacent land uses:	Direct access points for automobiles to parking garages within adjacent properties as well as refuse and emergency vehicle access. Localized pedestrian and cyclist access
	Scale of traffic movement:	Very low volumes of automobile traffic
Place	Urban form:	Single or multi-story buildings
	Land uses:	Single or multi-occupancy residential dwellings, or commercial and mixed use development
	Character:	Residential or commercial
	Frontages:	Either the rear boundary of plot or the rear side of building face the alley (primary building frontage is on other side of block)
	Sidewalk activity:	No sidewalks; the street functions as a shared space. On-street activity is limited in residential areas. In commercial areas an alley may function as an informal public space with outdoor seating

Existing conditions

- No marked lanes
- Informal and/or controlled on-street parking
- No sidewalks
- No bikeway facilities
- Shared use
- Land use is residential or commercial
- Buildings abut street directly

Complete Street vision

- Retain largely as is, maintaining as shared use environment
- Replace concrete or other surfacing with pervious paving for sustainable drainage
- Pocket areas of planting, where appropriate
- Support use of alleys for community place-making
- Residential alleys - temporary closure and use as play streets
- Commercial alleys – design as mini-plazas to encourage the space to be used by the public and local businesses, e.g. high quality design treatments with special lighting, seating, surfacing, planting, public art etc.

Alley off Main Street, Huntington Beach

Alley in Newport Beach

Ramona Avenue, Laguna Beach

RS

Residential Street

Design Guidance: p.152

Street serving a residential area, as well as schools and local community facilities. Low to moderate traffic volumes. Streets are predominantly automobile-focused. Land use is predominantly residential in the form of single family or multi-occupancy housing.

Paseo Talavera, San Juan Capistrano

Identify this street type

Designation	Not part of the MPAH	
Movement	Access to adjacent land uses:	Direct access points for automobiles to driveways and parking garages within adjacent properties
	Scale of traffic movement:	Low volumes of automobile traffic
Place	Urban form:	Single or two story detached buildings on residential plots
	Land uses:	Single or multi-occupancy residential dwellings
	Character:	Residential
	Frontages:	Set back behind front yard
	Sidewalk activity:	Provision of sidewalks varies considerably and may or may not be present, activity typically exercise and recreation (dog-walking, jogging, etc.)

Existing conditions

- Two lanes, marked or unmarked
- On-street parking
- Sidewalks not always present
- No bikeway facilities, unless part of a wider network
- Residential uses
- Buildings set back behind yards
- Landscape strip / easement between curb and sidewalk

Complete Street vision

- Slower traffic speeds and balanced priority between modes
- Traffic calming features
- Comfortable width of sidewalks where appropriate to street, with shade trees
- Provide street lighting that adequately illuminates the pedestrian space and the roadway
- Curb extensions at key crossing points, including mid-block crossings where appropriate
- Sharrows, and bicycle lanes where appropriate

French District, Santa Ana

Ocean Avenue, Seal Beach

Washington Street, Westminster

SS

Shared Street

Design Guidance: p.160

Busy mixed use street in the heart of a district center, typically attracting visitors and workers from across the city and the County. Already designed for a mix of transportation modes with provisions for walking and biking. Buildings are typically three or four stories in scale and positioned on the edge of the sidewalk. Uses tend to be shops and recreation facilities. Sometimes used for open street events.

Main Street, Balboa, Newport Beach

Identify this street type

Designation	Not part of the MPAH	
Movement	Access to adjacent land uses:	No direct access points for automobiles to properties within a street block; parking typically limited to on-street spaces on the street or streets within surrounding area
	Scale of traffic movement:	Low volumes of automobiles, but high volumes of pedestrians and bicyclists in the street environment, forcing drivers to slow down or negotiate their way through the street environment
Place	Urban form:	Intimate scale environment with smaller scale contiguous buildings (e.g. two to three stories) arranged linearly over a block or two
	Land uses:	Uses are mixed within buildings and within blocks, and include leisure uses, retail units and restaurants
	Character:	A busy destination that attracts people from across the county for recreation
	Frontages:	Properties face the street, located at the back of the sidewalk
	Sidewalk activity:	High level of pedestrian activity generated along street from active frontages such as stores and restaurants with seating on the street; activity may spill over into the roadway simply due to volumes of people, or via means of an open street type event

Existing conditions

- Two lanes
- On-street parking
- Wide sidewalks
- Slow traffic speeds
- Mix of retail and leisure uses
- Buildings front directly onto sidewalk

Complete Street vision

- Very slow traffic speeds and promotion of pedestrian and bicycle priority over automobiles
- Reduced width of travel lanes
- Roadway designed with special pavement materials
- Wide sidewalks with high quality streetscape environment
- Provide shade trees and other planting
- Provide street lighting that relates to the pedestrian space as well as the roadway
- Ability to cross on direct routes which pedestrians want to take, including away from formal crossings
- No demarcated bikeways; all users mix at low speed
- Street design may accommodate temporary closure from motorist traffic to facilitate community events

Main Street, Huntington Beach

East Wilshire Avenue, Fullerton

Main Street, Balboa Village, Newport Beach

Street types along a corridor

It is important to recognize that street types are not necessarily consistent along the length of a corridor. A road corridor that has a strategic movement function, for example, may change from a Movement Corridor to a Mixed Land Use Corridor/Hub depending on its surrounding context. In some instances, a corridor may also change from a strategic function to a less strategic function, for example moving from a Mixed Land Use Corridor/Hub to a Neighborhood Main Street.

East Chapman Avenue in Orange changes from a Movement Corridor to a Mixed Land Use Corridor/ Hub, to a Neighborhood Main Street

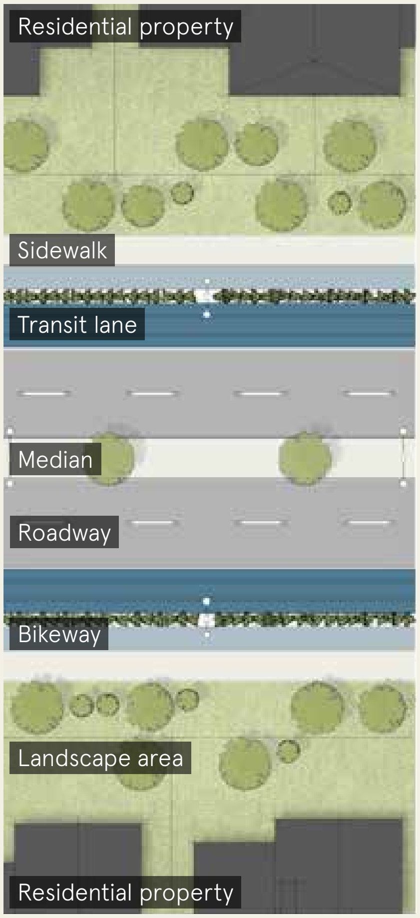
Movement Corridor, East Chapman Avenue

Mixed Land Use Corridor/Hub, East Chapman Avenue

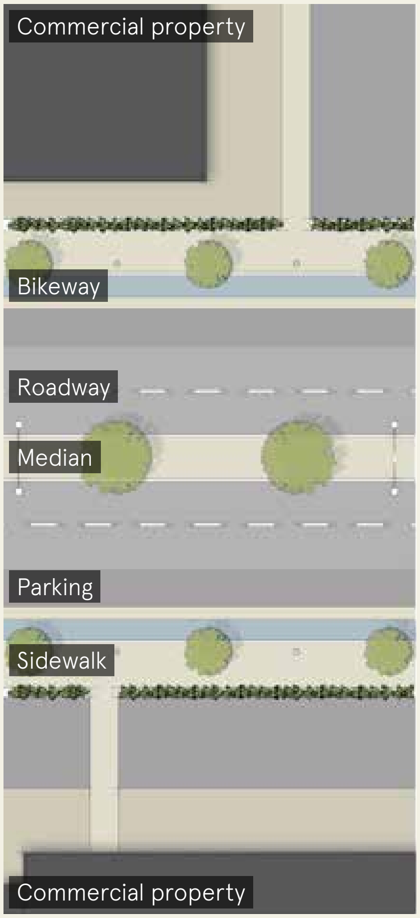
Neighborhood Main Street, East Chapman Avenue

FIGURE A1.7 STREET TYPES ALONG A CORRIDOR

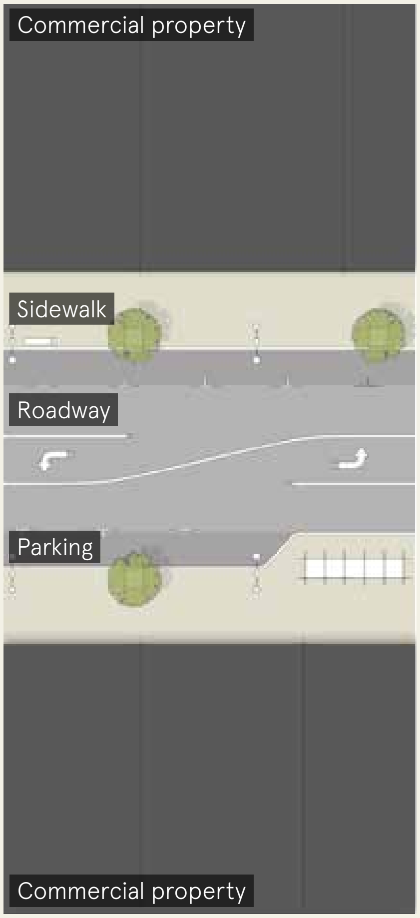
MC
Movement Corridor



ML
Mixed Land Use Corridor/Hub



NM
Neighborhood Main Street



Layered network

The final element in the classification of street types to identify design principles is the layered network. The layered network approach is considered a best practice in implementing Complete Streets principles. Optimum service levels can rarely be provided on all streets for all modes. This is due to competing interests that arise when different travel modes mix.

For example, pedestrian friendly streets typically have slow vehicle travel speeds, short-distance pedestrian crossings, and include some type of buffer between the vehicle travel way and the pedestrian walkway. However, automobile friendly streets characteristically have wide travel lanes, multiple turn lanes (increasing the pedestrian crossing distance), and high automobile speeds. As such, creating streets friendly to both of these priority modes becomes difficult to accomplish.

A layered street network prioritizes streets for a specific mode (or multiple modes) with the intent of providing a complete network of streets that provide mobility for all users of all ages and all abilities.

The adjacent figure shows conceptually the layered transportation networks that within the County. A larger plan is provided in the Appendix which shows the detail of the layered networks across the whole County, including both existing and planned networks. It illustrates auto-priority streets (those designated in the MPAH as well as Freeways and the Toll Roads), bicycle-priority streets (those designated in the OCTA district bikeway studies), and transit-priority streets (those with high frequency transit). Layering of these networks maximizes connectivity for all modes.

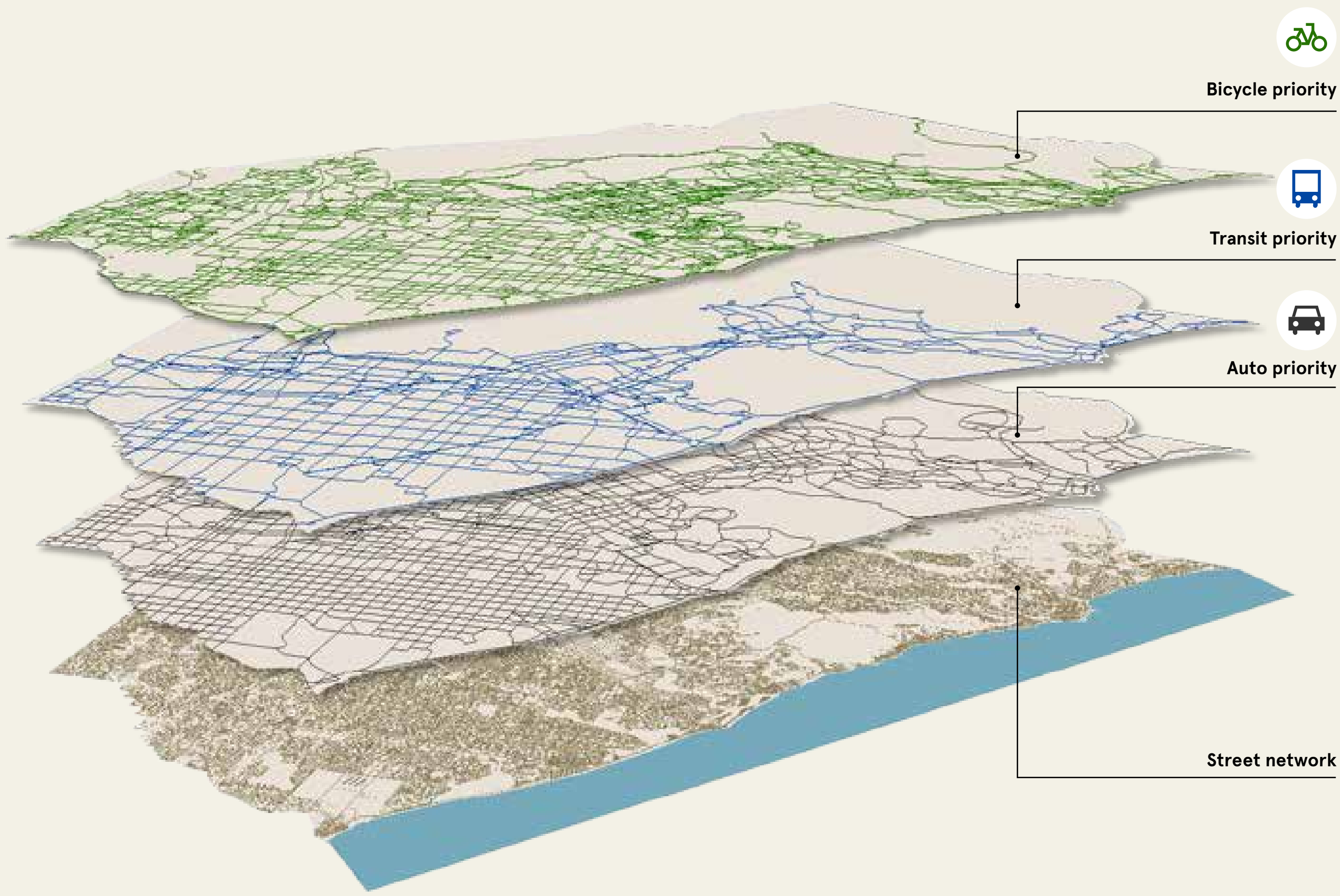
When considering a particular street for a Complete Streets intervention, it should be located on the layered network. The street type sets the overall design principles for a street. The layered network then sets the modal priorities. For example, if a street is identified through the movement and place analysis as a Mixed Land Use Corridor/Hub, and it is a transit priority street in the layered network map, then the design approach used should be a variation on the Mixed Land Use Corridor/Hub design principles that gives priority to transit within the roadway, e.g. with a traffic lane converted to transit.

If however the same street is identified as a bicycle priority street then the design approach used would be the variation that gives priority to bicycles within the roadway, e.g. with traffic lanes narrowed or removed, and roadway space reallocated to provide a bikeway.

If the street is an auto priority street then comfortable provisions should still be made for pedestrians and other users as appropriate, however additional high quality provisions may be made elsewhere in the network that better meet these users needs.

The layered network approach is the final element of the decision process to designate a particular street and shape its design. Chapter B2 sets out the design principles for each street type and also includes a number of variants illustrated in cross-sections to reflect the different modal priorities that may typically occur on such streets in a layered network.

FIGURE A1.8 ORANGE COUNTY LAYERED NETWORKS



Layered network plan

Refer to the Appendix for a copy of the full layered network plan for Orange County.

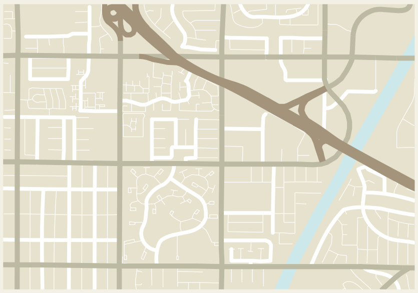
Establishing a layered network

The following diagrams illustrate how to approach the establishment of a layered network of streets. The layered network can form the basis of a complete streets network, helping to establish modal priorities for different streets within the network. This can be done at various scales, e.g. across several jurisdictions, for the area within a jurisdiction's boundaries, or for a specific planning area.

FIGURE A1.9 ESTABLISHING A LAYERED NETWORK

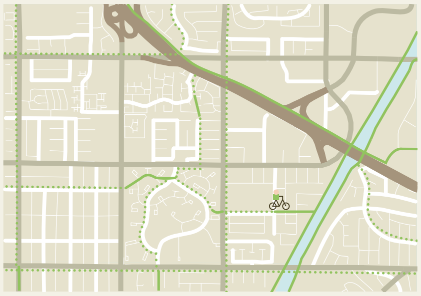
1. Define the street network

- This may be a whole jurisdiction, or another large area, such as an area for which a specific plan is proposed to be developed.
- It can be useful to consider land uses and important trip generators / destinations (e.g. schools, shopping malls, office parks, downtown areas, resorts etc.) at this stage, as these may inform the definition of the street network.



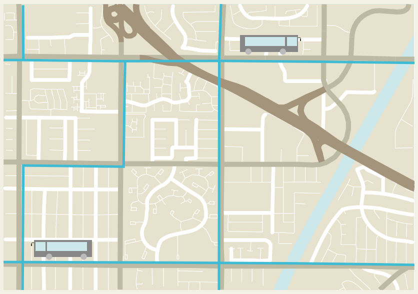
2. Map the bicycle network

- This should include existing and proposed bicycle facilities.
- Various considerations for bicycle facilities include ensuring routes are continuous, connected, unobstructed, and safe.
- Design principles that apply to bicycle networks are further explained in section B1.



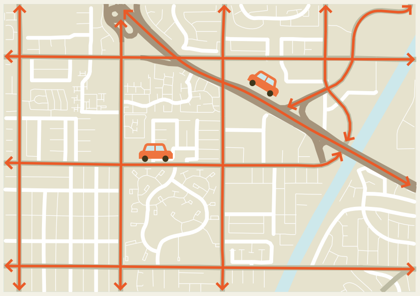
3. Map the transit network

- This should include existing and proposed transit facilities.
- Consideration should be given to bus, streetcar and rail networks, as appropriate to the area, and include stops and routes.
- Design principles that apply to transit networks are further explained in section B1.



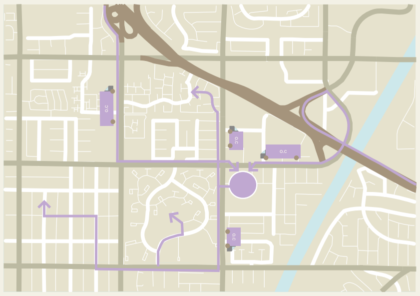
4. Map the auto-priority network

- This should include existing and proposed roadway facilities.
- Consideration should be given to the priorities established by the roadway classifications in the MPAH, the Freeways, and the Toll Roads.
- Design principles that apply to vehicular mobility are further explained in section B1.



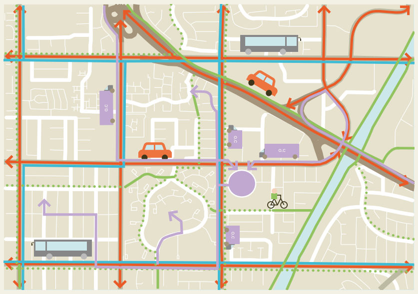
5. Map the truck routes

- This should include existing and proposed truck routes.
- Design principles that apply to transit networks are further explained in section B1.



6. Create the layered network

- Overlay the bicycle, transit and auto-priority networks on the street network to establish the overall layered network.
- Used to identify streets which should be prioritized for redesign, and establish modal priorities on specific streets, or blocks.



- If a street is identified as, for example, auto-priority it does not mean that there should be no provisions for other modes, however it may mean that only minimum standard facilities are provided. Funding may be focused on other streets where a multimodal approach is a priority.

A2

Policy Framework

This chapter of the OCCSI Design Handbook is a tool and a resource to aid Orange County jurisdictions in the development of written policies related to Complete Streets. It can also be used by other agencies that have an interest or role in street design in the County. It is non-prescriptive in nature, and is intended to offer advice and suggestions for consideration in the development of new policies or updating of existing policies.

To accomplish this purpose, the policy framework provides:

- A summary of the various policy and planning tools and processes by which a Complete Streets approach can be promoted in Orange County; and
- Guidance on how to develop written policy for Complete Streets that meets the ten best practice elements as defined by the National Complete Streets Coalition.

Further information and resources related to policy are provided in Chapter B5, including a concise overview of existing manuals and standards of relevance to street design in Orange County, many of which contain design principles that relate to a Complete Streets approach.

Policy Guidance

Introduction

This section presents guidance on how to write policies related to Complete Streets. Firstly, it explains what is required as a minimum in order to comply with the California Complete Streets Act of 2008. Secondly, it sets out sample policies related to Complete Streets which jurisdictions can adapt to their own needs.

The sample policies are written to address the ten best practice elements of Complete Streets policies, as defined by the National Coalition of Complete Streets.

For each of the ten elements, suggestions are made as to what a basic level policy needs to include as a minimum to meet best practice and what could be included for a more comprehensive or stronger policy. Examples are provided in pull-out boxes to illustrate how other jurisdictions in California and elsewhere in the U.S. have addressed these elements.

Recognizing the varied nature of communities across the County, it is expected that these policy suggestions will be adapted by jurisdictions to suit the local context and situation of each unique place.

The development of an effective Complete Streets policy must take into account existing policy, practice, and politics

General policy guidance

The development of an effective Complete Streets policy must take into account existing policy, practice, and politics. The actual form the policy takes will vary between jurisdictions, depending on these factors. Additionally, it must be appropriate for the processes already in place for making transportation decisions in communities in order for it to be effective in facilitating change. You will need to decide what the best type of policy is for your local context based on these considerations.

A comprehensive Complete Streets design guide may be appropriate in some places, however, for many, a short written statement or resolution may be more effective. Regardless of the form of the policy, it should reflect the goals and vision for the community and must be implemented with any substantial revision to the General Plan.

You may not even need a specific Complete Streets policy. At the core of a Complete Streets policy is a clearly described directive that the needs of all people, regardless of how they travel, should be included in the transportation decision-making process. The safety of everyone is a priority and if this objective is reflected in policy in some fashion, even without the words "Complete Streets," then this may be sufficient.

A Complete Streets approach must not be seen as a stand-alone policy but instead an approach that is integrated with the wider transportation policy and planning processes of a jurisdiction. In this way Complete Streets becomes a key consideration in all levels of street design and planning decisions.

It is important to recognize that no matter how detailed, a Complete Streets policy cannot be a standardized approach to design. It is rather a guide to that helps provide and balance choices for transportation modes according to local circumstances, needs and demands.

Depending on the jurisdiction, an appropriate policy response might be one that fulfills the minimum requirements for compliance based on the Complete Streets Act (more explanation on this is provided below). Alternatively, a policy may be more comprehensive in terms of how many and in what way measures are introduced. If a jurisdiction is new to supporting alternative transportation modes, the Complete Streets policy is a good way to introduce ways to change this. If pedestrian and bicycle measures (and other alternative options) have already been introduced, an appropriate Complete Streets policy will be one that helps expand on this.

Depending on the jurisdiction, an appropriate policy response might be one that fulfills the minimum requirements for compliance based on the Complete Streets Act

Minimum policy statement

In order to meet the requirements of the California Complete Streets Act of 2008 (see p.9 for a summary of the Act), the minimum policy statement must address the following principles for street design:

- Provide a balanced, multimodal transportation network;
- Meet the needs of all users of streets, roads, and highways; where
- All users including motorists, pedestrians, bicyclists, children, persons with disabilities, seniors, movers of commercial goods, and users of public transportation; and
- Be suitable to its rural, suburban, or urban context.

To comply with the Act a policy amendment must be carried out when the circulation element of the General Plan is being substantively revised.

Sample policies

The following sections suggest ways of writing policy for the ten best policy elements. These ten elements are considered by the National Complete Streets Coalition as the core components that should be addressed in an effective Complete Streets policy – as highlighted on the following page. A useful reference on how to write a Complete Streets policy is the National Complete Streets Coalition policy workbook.

The National Complete Streets Coalition has identified ten elements of a comprehensive Complete Streets policy, which should apply regardless of the form of the policy.

An ideal Complete Streets policy includes:

✓ **Vision**	Includes a vision for how and why the community wants to complete its streets.
✓ **All users and modes**	Specifies that 'all users' includes pedestrians, bicyclists and transit passengers of all ages and abilities, as well as trucks, buses and automobiles.
✓ **All projects and phases**	Applies to both new and retrofit projects, including design, planning, maintenance, and operations, for the entire right of way.
✓ **Clear accountable exceptions**	Makes any exceptions specific and sets a clear procedure that requires high-level approval of exceptions.
✓ **Network**	Encourages street connectivity and aims to create a comprehensive, integrated, connected network for all modes.
✓ **Jurisdiction**	Is adoptable by all agencies to cover all roads.
✓ **Design**	Directs the use of the latest and best design criteria and guidelines while recognizing the need for flexibility in balancing user needs.
✓ **Context sensitivity**	Directs that Complete Streets solutions will complement the context of the community.
✓ **Performance measures**	Establishes performance standards with measurable outcomes.
✓ **Implementation steps**	Includes specific next steps for implementation of the policy.

Further Information

National Complete Streets Coalition. Policy Elements. Smart Growth America. 2015.

http://bit.ly/1ni216O

✓ Vision

The vision statement provides a vision of how and why a jurisdiction would like to create more Complete Streets.

Minimum
A basic level vision statement could include providing safety for users of all modes. For example:

[JURISDICTION NAME] will create a safe and convenient multimodal transportation system for users of all modes including those traveling on foot, by bicycle, car, public transportation and drivers of commercial vehicles.

A more advanced vision statement might suggest that a significant change in the way streets are considered is required to enable a jurisdiction to address the needs of all users of streets, regardless of age and ability. It might state that streets are a public space and that implementing Complete Streets measures will not only lead to safer streets but also a cleaner environment and healthier people. It could also include that Complete Streets measures apply to all phases of a project (more on this in a subsequent section below).

Comprehensive
The strongest vision statements include the words 'shall' or 'must' showing that they are clear in their direction. An example could be:

Implementing Complete Streets measures is not only about following a state-mandated policy, rather it is promoting a shift in thinking about transportation. Streets are public spaces that must consider the needs of all users, regardless of age and ability, and accommodate a range of uses such as recreation, shopping, exercise, business and socializing. Good street design not only benefits transportation and safety, it promotes better health, provides a cleaner environment, enhances a sense of place, and strengthens local economies.

Example 1
Laguna Beach, California

"Continue to investigate new techniques which promote the balancing of principles that roads are not just for cars; that residents have a right to the best quality of life, which includes the least noise possible, the least pollution possible, the safest environment possible and an environment which fosters a rich community life."

((City of Laguna Beach Transportation, Circulation and Growth Management Element of General Plan, 1999)

Example 2
Carlsbad, California

"A livable streets vision is more than implementation of a state-mandated approach during a general plan update process. It is a fundamental shift in how the city will plan and design the street system - recognizing the street as a public space and ensuring that the public space serves all users of the system."

(City of Carlsbad Mobility Element Ch. 3 of General Plan, 2015)

Example 3
St. Petersburg, Florida

"As the City of St. Petersburg grows, the roadways must evolve to continue meeting the civic goals of safety, equity, public health, quality of life, access to jobs and economic development. In particular, the City desires to be a premier destination for accessibility that includes walking and bicycling. To that end, Complete Streets are planned, designed, operated, and maintained so that people of all ages and physical and economic abilities can safely and comfortably move around the city street network. A Complete Street provides the right accommodation for the land use context and is therefore not a mandate to provide exclusive facilities for each mode on every street. Establish complete Streets will enable the City of St. Petersburg to further achieve its status as a city of opportunity where the sun shines on all who come to live, work and play."

(City of St. Petersburg administrative policy Complete Streets, 2015)

✓ All users and modes

The purpose of this element is to acknowledge and include all modes of transportation as users of streets. This means pedestrians, bicyclists, transit passengers of all ages and abilities as well as trucks, buses and cars. In certain jurisdictions this may also include skateboarders, equestrians, golf cart riders, and others.

Minimum
At a basic level, the policy should reference that walkers, bicyclists and transit users are part of transportation considerations and that their safety on roads must be considered. For example it could state:

[JURISDICTION NAME] will consider the needs and safety of all road users, including pedestrians, bicyclists and transit users.

Comprehensive
At a more advanced level there might be an understanding that each of these groups has different requirements on a street and that these need to be considered and balanced while planning and designing streets. It could also address social equity issues, such as systematic marginalization due to gender, race, ethnicity or income. It could make the connection between Complete Streets and a more active and therefore healthier lifestyle. An example could be:

The Complete Streets policy will consider the needs of all users including pedestrians, bicyclists, persons with disabilities, motorists, movers of commercial goods, users and operators of public transportation, seniors, children, youth, and families [insert other significant local users if desired, e.g. equestrians, skateboarders, drivers of agricultural vehicles, emergency vehicles, or freight]. Each of these transportation user groups has different needs which will be balanced while planning and designing any street-related works. This improved access for all will also lead to healthier lifestyles and better social equity in the community.

Example 1
Los Angeles, California

"Complete Streets Serving All Users and Modes. Metro expresses its commitment to work with partner agencies and local jurisdictions to plan and fund Complete Streets that provide safe, comfortable, and convenient travel along and across streets (including streets, roads, transit facilities, highways, bridges, and other portions of the transportation system) through a comprehensive, integrated transportation network that serves all categories of users, including pedestrians, users and operators of public transit, bicyclists, persons with disabilities, seniors, children, motorists, users of green modes, and movers of commercial goods…"

(Los Angeles County Metropolitan Transportation Authority, Metro Complete Streets Policy, 2014)

Example 2
Savannah, Georgia

"Users means individuals that use streets, including pedestrians, bicyclists, motor vehicle drivers, public transportation riders and drivers and people of all ages and abilities, including children, families, older adults and individuals with disabilities."

(Savannah Complete Street Ordinance, 2015)

Example 3
Austin, Texas

"Create a Healthy Austin Program. Investing in an accessible transit, pedestrian, and bicycling network will provide Austin residents with alternatives to driving. Through improved land use, transportation, and urban design, Austin's places can contribute to healthy lifestyles by encouraging walkable communities, parks, community gardens, open space, and recreation and by increasing access to local and nourishing food and reducing air pollution."

(Imagine Austin Comprehensive Plan, 2012)

✓ All projects and phases

This element of the policy should state that the Complete Streets measures apply to both new and retrofit projects. It should also emphasize that Complete Streets be considered in all possible phases of works, including scoping, design, planning, construction, retrofitting, maintenance and operations. The aim is to see all transportation works, even minor ones, as opportunities to create safer and more accessible streets for all.

Minimum
The policy could reference small, incremental interventions that help make streets more complete. An example of a small improvement is to change the timing of traffic lights during routine work to give pedestrians a longer time to cross, therefore making it safer for those who walk at a slower speed. An example policy statement could be:

Complete Streets measures will be introduced into all new as well as retrofit projects, even if they are minor projects such as changing the timing of traffic lights during routine work to give pedestrians a longer time to cross.

Comprehensive
A more advanced policy would reference the need to integrate Complete Streets planning into all projects. This would go beyond new construction and retrofit and also include rehabilitation, repair, major maintenance and operations projects. Furthermore, Complete Streets should be referenced in other complementary programs and initiatives such as Active Transportation Plans, Safer Routes to School, etc. An example policy is:

Complete Streets measures will be incorporated into all new and retrofit street construction projects and any rehabilitation, repair, major maintenance and operations works. They should also naturally link into other complementary programs such as Active Transportation Plans, Safer Routes to School, etc.

Example 1
Laguna Beach, California

"The City should adopt a Complete Streets Ordinance so that every project completed in the City considers Complete Streets principles. Large roadway improvement projects, along with even minor road resurfacing present opportunities to implement Complete Streets projects and should be considered whenever street improvements or modifications are planned. All projects completed by the City or private developers should be reviewed in conjunction with opportunities for Complete Streets enhancements."

(City of Laguna Beach, Enhanced Mobility and Complete Streets Transition Plan, 2015)

Example 2
Seattle, Washington

"Complete Streets may be achieved through single projects or incrementally through a series of smaller improvements or maintenance activities over time. It is the Mayor and City Council's intent that all sources of transportation funding be drawn on to implement Complete Streets. The City believes that maximum financial flexibility is important to implement Complete Streets principles."

(Seattle Department of Transportation, Complete Streets Ordinance, 2007)

Example 3
La Porte, Indiana

"The City of La Porte may approach every transportation improvement and project phase as an opportunity to create safer, more accessible streets for all users. These phases include, but are not limited: planning, programming, design, right-of-way acquisition, construction, construction engineering, reconstruction, operation and maintenance. Other changes to transportation facilities on streets and rights-of-way, including capital improvements and major maintenance, must also be included."

(La Porte Complete Streets Program Outline, 2015)

✓ Clear accountable exceptions

Another important element of the policy is that any exceptions to the Complete Streets approach are specific and made clearly accountable. Commonly used exceptions are those listed by the Federal Highway Administration's guidelines on accommodating pedestrian and bicycle travel:

- Accommodation is not necessary on corridors where specific users are prohibited, such as interstate freeways or pedestrian malls.
- Where the cost of accommodation is excessively disproportionate to the need or probable use (it is not recommended to include a percentage as different projects require different portions of the budget to be spent on modes).
- Where there is a documented absence of current and future need (an accountable person or committee should be tasked to approve this exception).
- Other exceptions might be based on local circumstances, such as severe topological constraints or the presence of environmentally sensitive areas.
- Policies should also look to the future and whether this decision might impact the implementation of plans in the years ahead. It should be noted that too many exceptions can create loopholes and weaken the overall Complete Streets vision.
- With regards to accountability, a senior-level department head, publicly accountable committee, or a board of elected officials should be responsible for approving exceptions. Exceptions should also be recorded and be made publicly available.

Minimum
An example policy could state as a minimum:

Complete Streets policies should be applied to all street works, except in one or more of the circumstances listed below. However, even when these apply, an accountable person or committee must approve these exceptions:

- *On streets where non-motorized transportation is prohibited. Pedestrians and bicyclists should be provided alternative options.*
- *The street is and is likely to only be used by vehicles now and in the future. This can be proved by documentation and approved by an accountable person or committee.*

Comprehensive
A more comprehensive policy could state:

Complete Streets policies should be applied to all street works, except in one or more of the circumstances listed below:

- *A project involves only ordinary or emergency maintenance activities designed to keep assets in serviceable condition, or where interim measures are implemented on temporary detour or haul routes.*
- *A project is exempt by the jurisdiction due to excessive and disproportionate cost of establishing a bikeway, walkway or transit enhancement.*
- *The project is not practically feasible or cost effective because of significant or adverse environmental impacts, topographical considerations, or due to impacts on neighboring land uses, including impact from right of way acquisitions.*
- *Unless otherwise determined by the City Council, the [INSERT RELEVANT PERSONS or COMMITTEE RESPONSIBLE] jointly determine it is not practically feasible or cost effective to implement the provisions of this policy through public or private project design, manuals, or other plans.*

Example 1
Dry Ridge, Kentucky

"Exemptions to the Complete Streets policy must be presented to the City of Dry Ridge in writing by the appropriate official and documented with supporting data that indicates reason for the decision are limited to the following:

- Scarcity of population, travel and attractors both existing and future indicate an absence of need for such accommodations.
- Detrimental environmental or social impacts outweigh the need for these accommodations.
- The safety or timing of a project is compromised by Complete Streets Policy.
- Limited funding for the project, or funding of the CDP elements could jeopardize the project from moving forward."

(Complete Streets Municipal Resolution, Dry Ridge, 2015)

✓ Network

This element of the Complete Streets approach promotes street connectivity in order to create an integrated and connected network for all modes. A variety of types of interconnected streets promotes a balance of the needs of all users and enables multiple transportation options across a locality. In doing so, not every street needs to be fully equipped for all users but rather the network of streets can emphasize different modes on different types of streets while still providing access for all. For example, a low-traffic route could turn into a bicycle boulevard or a route that has many pedestrians could be pedestrianized. This network could also incorporate alternative types of routes such as horse trails and bikeways.

Minimum
A simpler type of policy might promote local connectivity (such as within a neighborhood). It might state:

The Complete Streets policy will promote street connectivity in order to create local connections such as within neighborhoods so that people can easily reach destinations such as schools, parks, services and commercial areas and have a variety of transportation options to do so.

Comprehensive
A more advanced policy could look to achieve a city-wide network, or reference the County-wide strategic network. It might consider that different networks are required for different transportation modes, and that a layered network approach is used (refer to Chapter 2) to clearly identify mode prioritization that should be addressed when implementing Complete Streets. It might also make a specific reference to promoting interconnected street networks with small blocks through large new developments. An example policy could be:

The Complete Streets policy will promote connectivity across the City, and seek opportunities to rebalance rights-of-way to enhance connectivity for pedestrians, bicyclists and transit. Connectivity enhancements will also relate to the County-wide transportation network. This will be realized through a layered network approach which provides connected streets which prioritize different modes, but still provide access to services and amenities for all. Where large development or redevelopment occurs the City will seek the provision of an interconnected street network with small blocks.

Example 1
Baldwin Park, California

(A) The City of Baldwin Park will design, operate, and maintain a transportation network that provides a connected network of facilities accommodating all modes of travel.
(B) The City will actively look for opportunities to repurpose rights-of-way to enhance connectivity for pedestrians, bicyclists, and transit.
(C) The City will focus non-motorized connectivity improvements to services, schools, parks, civic uses, regional connection and commercial uses.
(D) The City will require large new developments and redevelopment projects to provide interconnected street networks with small blocks.

(City of Baldwin Park, Complete Streets Policy, 2011)

Example 2
La Porte, Indiana

"The City of La Porte may support movement along and across arterial, collector and local streets within a dense, inter-connected network. Walking, biking and transit will provide transportation options so that users may reach many potential destinations."

(La Porte Complete Streets Program Outline, 2015)

✓ Jurisdiction

The aim of this element is to emphasize that to be truly successful, all agencies need to adopt the Complete Streets approach, to ensure all roads are covered by this policy. Although not always straightforward, this might include working with state, county, and local agencies, along with private developers and transportation operators, to ensure they share the Complete Streets vision for the jurisdiction. Forming partnerships between departments within the jurisdiction is also important (such as public works, community development, public health, recreation and community services, and police). One way to do this is to include these stakeholders at the policy development stage as well as planning and maintenance stages.

Minimum
At a basic level a policy statement could be as simple as engaging with other agencies. An example policy might be:

The Complete Streets approach promotes engagement with other city agencies who are involved with streets. These should be contacted and consulted to ensure the Complete Streets vision is understood by all.

Comprehensive
A more advanced policy could be to set up a formal Complete Streets inter-agency review panel or committee (see case studies below for examples). Such a policy might state:

An inter-agency committee will be set up comprising members from different jurisdictional departments and other agencies who will be responsible for reviewing relevant streets projects. They will ensure that these works comply with the jurisdiction's Complete Streets vision and policies as set out in this document.

Additional considerations that can add weight to this policy include making reference to:

- Every department of a jurisdiction
- Requiring all developers and builders to comply with the policy
- Requiring agencies that the jurisdiction has permitting authority over to comply with the policy (e.g., water agencies, electrical utilities, communications utilities, etc.)
- Encouraging other agencies not under the jurisdiction's authority to satisfy the policy

Example 1
San Francisco, California

Inter-agency committees include the Street Design Review Team, responsible "for policy-level review of major projects, both public and private, to determine the degree to which each project meets the City's objectives for the design and use of streets as spelled out in this plan and other documents", and the Streetscape Capital Group who "conduct advance planning for capital street improvements".

(City and County of San Fransisco. Better Streets Plan, 2010)

Example 2
South Bend, Indiana

"The City shall foster partnerships with businesses, private developers, and other governmental agencies, including the State of Indiana, Michiana Area Council of Governments, St. Joseph County, the South Bend Public Transportation Corporation (TRANSPO), the City of Mishawaka, and the South Bend Community School Corporation, to develop facilities and accommodations that further Complete Streets and continue such infrastructure beyond the City's borders."

(Complete Streets Resolution No.69-2015, South Bend, 2015)

✓ Design

This policy element promotes the use of the latest and best design guidelines. However, the creation of new design guidelines is not always necessary for example if a jurisdiction's design guidelines already reflect current best practices.

Minimum
A basic level policy could refer to existing documents (see Chapter B5 for details about existing design guidance). An example policy could be:

The jurisdiction's existing design guidance along with other appropriate County, State and Federal guidance will be used to ensure that the Complete Streets measures are designed according to the appropriate standards which have been set.

Comprehensive
A more comprehensive policy would call for the development of a jurisdiction's own design guidelines. For example:

The city will prepare and adopt its own design guidelines that meet current best practice standards in order to guide the planning, funding, design, construction, operation, and maintenance of new and modified streets.

Along with using the best available guidance, a balanced approach should be taken to transportation design that can best accommodate all users and modes in a flexible way and according to the characteristics of the locality. Depending on the street type, streets can incorporate certain user modes to a greater or lesser degree while still providing basic access for all permitted users. The layered network approach (see Chapter A1) should also be considered when developing street designs. Specifically, the ultimate design should focus on providing the best possible treatments for the prioritized mode(s) along a corridor. Examples that may be included (but not limited to) are summarized below:

- Vehicle Priority: Lanes could be slightly wider and bicycle/ pedestrians should be encouraged along a parallel corridor.
- Bicycle Priority: Bicyclists should have ample facilities provided through wide bicycle lanes, slow adjacent vehicle speeds, and a potential buffer (striped or physical) between the vehicles and the bicyclist.
- Pedestrian Priority: Pedestrians should be shaded and buffered from the vehicle travel through a buffer (typically landscaping). Vehicles speeds should be slow and pedestrian exposure while crossing the street should be minimized. Lighting should be at the "pedestrian scale".
- Transit Priority: Streets should provide safe, convenient, and sheltered areas for transit boarding. Transit vehicles could receive signal priority (or dedicated right-of-way in the street). Lanes should be designed to safely accommodate a transit vehicle.

Example 1
Los Angeles, California

"The Complete Street Network layers roadway systems that prioritize a certain mode (transit/bicycle/ vehicle) within each layer. While each street will still accommodate all modes, layering networks serves to emphasize a particular mode on a particular street as part of a larger system. A layered network approach has the benefit of increasing connectivity between modes."

(City of Los Angeles Mobility Plan 2035, 2015)

Example 2
South Bend, Indiana

"The City shall follow accepted or adopted design standards and use the best and latest design standards, policies, principles, and guidelines available. Principles and strategies of good street and bikeway designs offered by the National Association of City Transportation Officials (NACTO) shall be utilized first and foremost in decision making. Guidelines and standards may include, but not be limited to, Federal Highway Administration (FHWA), American Association of State Highway Officials (AASHTO), Indiana Department of Transportation (INDOT), the Institute of Transportation Engineers (ITE), the Americans with Disabilities Act (ADA), the Public Right-of-Way Accessibility Guidelines (PROWAG), and the American Society of Landscape Architects (ASLA)."

(Complete Streets Resolution No.69-2015, South Bend, 2015)

✓ Context sensitivity

An essential part of the Complete Streets approach is sensitivity to the context, type of neighborhood and land uses along a road (this is related to the design element above). This means that different street contexts will require different treatments. For example, a quiet neighborhood street should receive a different treatment to a street next to a strip mall or rural street without many buildings. The integration between transportation and land-use goals will create more livable communities in line with the Complete Streets vision. This process would also include input from local stakeholders.

Minimum
A simple policy statement might be:

The Complete Streets measures must reflect the context and character of the local environment, both the built as well as the natural.

Comprehensive
A more advanced policy could state:

The Complete Streets approach acknowledges that any street-related improvement needs to be sensitive to its context and harmonious with surrounding land uses. This means that varying types of areas will be appropriate for the prioritization of different modes. By integrating transportation and land-use, the city will help to create more livable neighborhoods. Street improvements will also be used to promote a strong sense of place, through architecture, landscaping, streetscaping, public art etc. Local stakeholders will be consulted with to ensure their views are considered.

Another consideration for this policy is the local environmental context. For example drought-resistant planting to conserve local water supplies; landscaping that creates habitat for local fauna; and use of sustainable storm water management techniques.

Example 1
La Porte, Indiana

The City of La Porte may implement Complete Streets solutions in a manner that takes into consideration the local context and character, aligns transportation and land use goals, and recognizes that the need of users may vary by corridor."

(La Porte Complete Streets Program Outline, 2015)

Example 2
Carlsbad, California

"Livable streets recognize that each street within the city is unique given its geographic setting, adjacent land uses, and the desired use of that facility. As such, this element identifies a street typology appropriate for the uniqueness of the street and surrounding land uses and identifies which modes of travel (pedestrian, bicycle, vehicles, etc.) should be prioritized on that street."

(City of Carlsbad Mobility Element Ch. 3 of General Plan, 2015)

Example 3
Long Beach, California

"A context-sensitive street classification system categorizes a jurisdiction's streets into a hierarchy of street types organized by both function and community context, taking into account all road users and the character of adjacent properties and buildings."

(City of Long Beach Mobility Element of General Plan, 2013)

✓ Performance measures

The inclusion of performance measures ensure that the jurisdiction can check how successful their policy has been by setting measurable outcomes of Complete Streets interventions. Traditionally, performance measures for transportation planning have been limited to Level of Service (LOS), which measures car congestion on the roads. Complete Streets measures have a multi-modal approach and include all transportation modes, focusing on a combination of elements such as safety, economy, and design.

Minimum
A basic policy might prioritize safety as the main performance measure. An example policy could be:

To ensure the successful implementation of the Complete Streets policy, the following will be measured:

- *Reduction of vehicle crashes, injuries, and fatalities involving pedestrians and bicyclists*
- *Reduction of speed along non-vehicle prioritized streets*

Comprehensive
An advanced policy might look at several or all the measures listed in the NACTO guidelines (see over the page). Some other more advanced measures could cover public health, environment, or local economy. For example:

To ensure the successful implementation of the Complete Streets policy, the following will be measured:

- *Reduction of vehicle crashes, injuries, and fatalities involving pedestrians and bicyclists (by xx%)*
- *Increase of pedestrian usage of pedestrian-prioritized streets by xx%*
- *Increase of bicycle usage on bicycle-prioritized streets*
- *Increase of transit usage by xx%*
- *Improve Multi-modal Level of Service (MMLOS) by xx*
- *Air quality on xx streets is improved by xx*
- *Street water runoff is reduced by xx%*
- *Resident satisfaction increases by xx%*

Example 1
South Bend, Indiana

"The City shall measure the success of this Complete Streets Policy by using, but not limiting itself to, the following performance measures:
- Assessed value of property;
- Counts or rate of crashes, injuries, and fatalities by mode;
- Adjacent lot vacancies;
- Citywide Walk Score;
- Transportation mode share;
- Pedestrian accommodation; and
- Bicycle accommodation, categorized by facility type.

The City's Smart Streets Scorecard shall serve as a basis for the reporting of the Complete Streets Policy implementation."

(Complete Streets Resolution No.69-2015, South Bend, 2015)

Example 2
NACTO Performance Measures

- **Pedestrians:** Safety: Rate of crashes, injuries, and fatalities; Pedestrian LOS
- **Public Life Surveys:** WalkScore (walkability ratings); Pedestrian Environmental Quality Index (PEQI); Minimal delay at crossings; Foot traffic volume
- **Bicyclists:** Safety: Crash records, injuries, and fatalities; Bicycle LOS (Highway Capacity Manual); Travel Time and Delay; Bicycle Environmental Quality Index; Bicycle counts
- **Vehicles:** LOS; Travel Time; Corridor Impact Analysis; Safety: Crash records, injuries, and fatalities
- **Transit:** On-time performance; Average speed; Farebox recovery ratio; Ridership per revenue hour; Operating cost per hour
- **Freight:** Freight delivered by hour; Time spent loading/unloading
- **Emergency Vehicles:** Response time; Sustainability; LEED Neighborhood Development; STARS; GreenRoads
- **Multi-modal:** Multi-Modal LOS

(NACTO Urban Street Design Guide, 2013)

✓ Implementation steps

In order to achieve success, it is essential to know who will take the Complete Streets policies forward.

Minimum

A basic policy would be to appoint a lead office/department. For example:

The [INSERT JURISDICTION NAME] appoints the [INSERT DEPARTMENT NAME] as the lead department to implement the Complete Streets policies. They are responsible for reviewing street improvement works to ensure they comply with the Complete Streets policies.

Comprehensive

A more advanced policy would be to create a task force or commission to implement the policy. This may include representatives from relevant departments, elected officials and advocates, or an existing committee. The jurisdiction may wish to create an inventory of infrastructure, and review it to identify gaps and issues, and from this prioritize capital improvement works to deliver Complete Streets.

Setting specific implementation steps with a direction and timescales to undertake them are helpful and provide accountability. This may include regular review points to check on the success of the policy, and to adjust if need be. An example of a more advanced policy could be:

As part of this Complete Streets policy, a task force will be appointed with representatives from relevant departments, elected officials and advocates. They will be responsible for reviewing all street improvement-related works to ensure they comply with Complete Streets policies. They will maintain an inventory of infrastructure from which they will prioritize projects to encourage implementation of bicycle, pedestrian and transit improvements. Regular monitoring will be undertaken to ensure that the policy is being fulfilled, and if not the policy will be reviewed.

Four key steps have been identified for successful implementation (from Smart Growth America):

- Restructure procedures to accommodate all users on every project.
- Develop new design policies and guides or revise existing ones to reflect current best practice.
- Offer workshops and other educational opportunities to transportation professionals, community leaders, and residents.
- Institute better ways to measure performance and collect data on how well the streets are serving all users (using the performance measures).

Example 1
South Bend, Indiana

"The City will establish an interdepartmental advisory team to oversee the implementation of the Policy. The team will include members of the Department of Public Works, the Department of Community Investment, Department of Parks and Recreation, and Police Department. The team may include representatives from other governmental agencies and advocacy organizations as relevant. [Specific tasks include]:

- ...provide annually a written report... including a summary of performance measures and any exceptions granted...
- ...incorporate... principles into all existing regulations, plans, policies, manuals, practices, and programs as appropriate...
- ...review current design standards, regulations, plans, policies, manuals, and practices to ensure they implement Complete Streets as feasible.
- ...provide professional development, training... to staff...
- ...identify current and potential future sources of funding for street improvements and shall prioritize for funding those... projects creating the greatest levels of return.
- ...promote interdepartmental project coordination... to best use fiscal resources."

(Complete Streets Resolution No.69-2015, South Bend, 2015)

Part B:
Design Guidance

B1

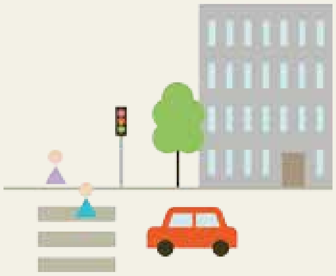
Design Goals

A set of ten overarching goals has been developed which complement the delivery of Complete Streets. These are based on best practice in urban design. They apply across all street types and should be considered from the outset.

Each goal will have a different level of influence on transportation outcomes depending on the position of the street within the movement and place matrix and its relationship to the layered network. Refer to Chapter A1 for further explanation of these concepts.

Design Goal 1

Create safer cities



Safety is a vital part of a successful urban environment. More than 1.2 million people are killed each year in traffic crashes worldwide, making traffic fatalities one of the leading causes of death.[1] In Orange County, during the year of 2009, there were 154 people killed in traffic crashes; 5.09 fatalities per 100,000 population.[2]

Summary

Traffic injuries and fatalities are often predictable and preventable, and vehicle speeds and injury/fatality rates directly correlate. Most traffic safety initiatives focus on behavioral change – such as helmet- and seatbelt-wearing campaigns – however simple design principles can dramatically reduce road deaths. This approach is espoused by Vision Zero (see Chapter B5).

Streets need to cater to all users, especially those who are vulnerable: young and old, disabled persons, and those without cars. This requires an environment where people walking or bicycling are not intimidated by vehicles, especially on routes to schools, hospitals, and other community facilities.

A recent publication, Cities Safer by Design, emphasizes two ways to improve safety. First, by building and retrofitting urban environments to reduce the need for individual vehicle trips; and second, by reducing vehicle speeds in areas where cars, pedestrians, and bicyclists mix.[3]

New developments should be designed with smaller block sizes, frequent street connections, and narrower streets to facilitate access to destinations and reduce need for vehicle travel. Reconstruction, rehabilitation, repair, and maintenance projects, should approach all transportation improvements as opportunities to create safer, more accessible streets for all users, including pedestrians, cyclists, and public transit passengers.

Design Principles

- Pedestrian facilities ranging from pedestrian-only areas, refuge islands, curb extensions, raised medians and mid-block crossings to basic, consistent sidewalks.
- Bicycling networks that feature protected bicycle lanes and pay special attention to design at intersections.
- Traffic calming measures such as curb extensions (gateways, pinch points and center islands), vertical deflections (speed humps, tables and cushions) and horizontal shifts (traffic circles and chicanes).
- Effective traffic signals that address all mobility and safety goals.
- Safe access to high-quality public transportation through improvements such as dedicated bus lanes and bus bulbs (see Movement - Integrate Transit Networks principles).

1 World Health Organization. World Health Organization Media Center. Road traffic injuries Fact Sheet N°358. October 2015. http://bit.ly/1o3a3gR

2 National Highway Traffic Safety Administration. Traffic Safety Facts Orange County, California. Washington : U.S Department of Transportation, 2005-2009. http://1.usa.gov/1SZA9TC

3 Welle, Ben, et al., et al. Cities Safer By Design Guidance and Examples to Promote Traffic Safety through Urban and Street Design. Washington : World Resources Institute, 2015. http://bit.ly/1KuIV85

Benefits

- Raised medians/crossings improve drivers' awareness of presence of pedestrians and visually turns intersection into a pedestrian-oriented zone.
- Curb extensions create space that may be used to locate street furniture, bicycle parking, etc.
- Reduced street widths will shorten pedestrian crossing distance and exposure to cars and enhance pedestrian/crossing and cyclist safety.

When planning for new developments, design should aim for smaller block sizes, frequent street connections, and narrower streets to facilitate access to destinations and consequently alleviate the need for vehicle travel

Conceptual illustration

Case Study

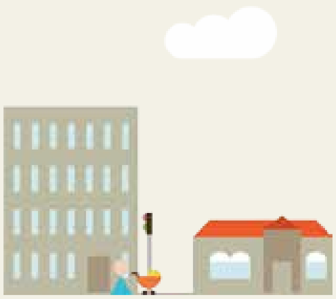
The Vision Zero initiative places the core responsibility for road collisions on the design of the infrastructure, anticipating human error. Vision Zero streets are designed with safety prioritized over speed, prompting the introduction of low urban speed limits, pedestrian zones and safer crossings.

In 2015 Los Angeles committed to a vision zero policy, reducing traffic fatalities by the year 2025. The city developed a framework that outlines the actions required to achieving vision zero and a High Injury Network plan was developed to identify areas that were in most need of safety improvements. The cities approach to meeting the vision zero targets incorporates design and engineering, enforcement, education, evaluation and monitoring and community participation.

(City of Los Angeles, Vision Zero eliminating traffic deaths in Los Angeles by 2025. 2015)

Design Goal 2

Reinforce walkability



Well-defined pedestrian-oriented streets create walkable (and bike-able) neighborhoods. Clear, consistent routes make areas permeable, connect key destinations, and reduce travel distance to schools, jobs, services, and entertainment by providing through-routes in all directions. This facilitates walking or cycling, and helps minimize and discourage car use.

Summary

Pedestrian friendly cities improve the quality of life for residents. Walking contributes to a healthier lifestyle and cleaner environment while decreasing our carbon footprint. On average people are willing to walk just over half a mile to reach a destination. Reinforcing walkability is therefore about integrating physical activity and social interaction into the design of the urban environment. This is dependent on many factors including topography, weather, and the walking environment, including directness of the route, and, importantly, the waiting time at intersection crossings. The design principles below set out key considerations to improve walkability.

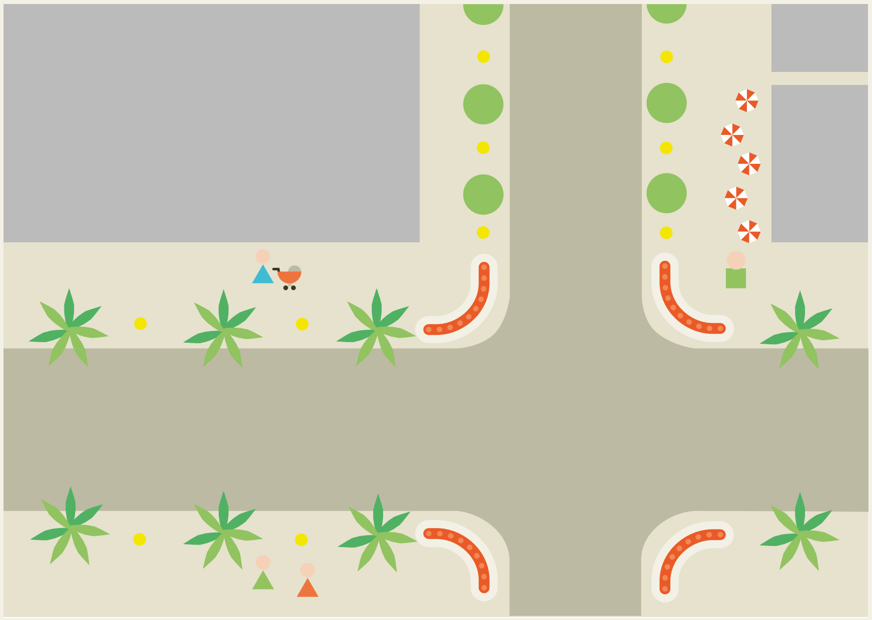
Walkable neighborhood design promotes the economic vitality of communities, bringing business and economic opportunities to residents.

Design Principles

- Walking routes should connect areas to each other and to key 'attractors' such as public transit stops, schools, work, local lunch destinations for workers, and leisure destinations.
- Walking routes should be direct and designed for the convenience of those on foot, not those in vehicles.
- Sidewalks should be uninterrupted, of suitable width and on both sides of all streets.
- Crossings should be accessible, located in relation to pedestrian routes and have short waiting times.
- Routes should be clear and legible, using signposting and wayfinding where necessary.
- Routes should be pleasant to use, allowing social interaction between people, including other road users.
- Walking routes should be safe and inviting with diversity of activity and continuous interest at ground floor level.
- Walking routes should offer high quality pavement surfaces, pedestrian-focused illumination, attractive landscape design and street furniture, with opportunities for rest and shelter.
- Safe Routes to School program should be expanded and encouraged.

Benefits

- Increasing walkability will promote healthier lifestyles for their residents by increasing the opportunity for physical activity and thereby reducing health costs.
- Walkable communities are able to have more social connections and therefore stronger communities.
- Walkability reduces the use of cars, reducing residents' spending on gas and helping decrease CO_2 emissions.
- Walkable neighborhood design promotes the economic vitality of communities, bringing business and economic opportunities to residents.



Conceptual illustration

Case Study

Orange and Irvine are excellent examples of walkable neighborhoods in Orange County. The streets have wide, paved footpaths on either side, a buffer strip between the sidewalk and road, curb ramps at crossings, large shade trees to keep sidewalks cool, and a clear street sign network to aid wayfinding. Street networks of culs-de-sac include off-street pedestrian trails to connect streets.

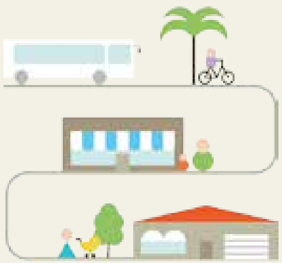
At Culver Plaza Shopping Center a pedestrian route connects the sidewalk to the mall via the car park. All sidewalks are accessible with flush at-grade brick crossings highlighting the route through the car park. Street trees and planting throughout the car park provide shade and improve the amenity for pedestrians.

Pedestrian connection from sidewalk

Pedestrian route and crossing within shopping center

Design Goal 3

Ensure connectivity



Places need to be easy to get to and be integrated physically and visually with their surroundings. This requires attention to how to get around by foot, bicycle, public transportation and the car. Good connectivity provides access to key destinations for pedestrians and seeks to discourage car use by making local trips easier and more pleasant by foot than by car.

Summary

There is a big difference in connectivity across Orange County, as illustrated conceptually on the opposite page. The street networks of coastal communities typically comprise a grid of smaller blocks which provide good connectivity. Inland communities often have larger blocks which reduce connectivity. Particularly challenging are the gated communities in southern Orange County with cul-de-sac street networks behind sound attenuation walls, which provide no openings and through-routes.

Well-designed, connected Complete Streets make travel more efficient by providing choice not only in modes, but also in routes. A well designed, highly permeable network has many short links, numerous intersections, and minimal dead-ends. It should connect key destinations such as residential areas, schools, shopping areas, bus stops, stations, and places of work. As connectivity increases, travel distances decrease and route options increase, allowing more direct travel between destinations.[1]

A street network that is already a connected grid of relatively short blocks provides better connectivity. When retrofitting existing development, communities can create an interwoven array of streets that emphasize different modes and provide quality accessibility for everyone. Some streets may emphasize vehicles or trucks, while others emphasize pedestrians or public transportation.

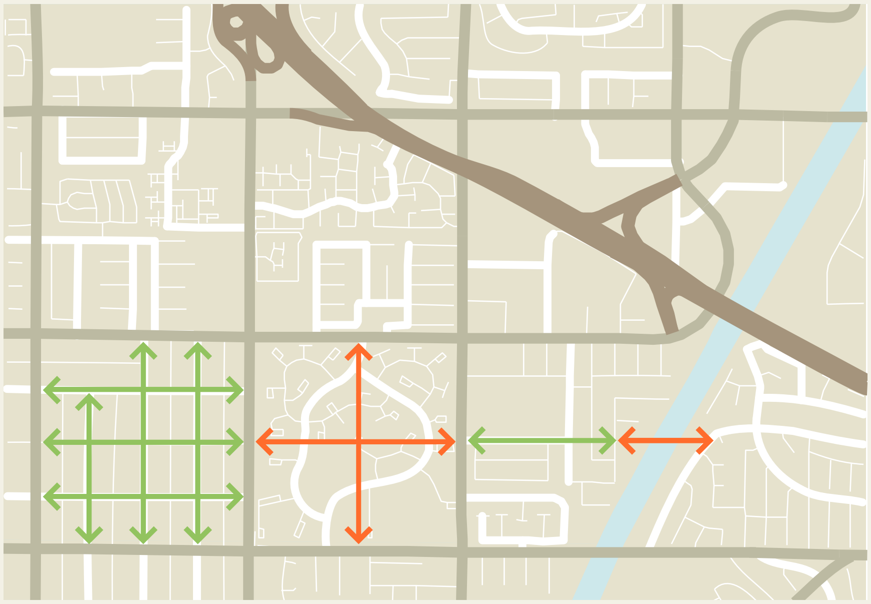
Design Principles

- Key destinations such as residential areas, schools, shopping areas, bus stops, stations, and places of work should be connected through high-quality networks of transportation modes.
- Transit hubs should be designed to provide a "go-to stop" for multiple connections.
- On-street parking should be located considering proximity to transit and connectivity amongst transportation modes.
- Multiple links for pedestrians and cyclists should be created through an interconnected complete street network.
- Bicycle rack locations should ease the transition between biking, walking, and social activities such as shopping or dining.
- Technology should assist users in making informed travel choices by providing real-time information available on a digital display or mobile app: intelligent signals, smart meters, electric vehicle sharing, car and bicycle-sharing, and way-finding for greater system efficiencies and user convenience.

1 Victoria Transport Policy Institute. Roadway Connectivity. Creating more connected roadway and pathway networks. Victoria, British Colombia, Canada : s.n., April 15, 2015. http://bit.ly/23p81Si

Benefits

- Increased connectivity = increased walkability = better health.
- Improving connectivity increases choice of routes and modes.
- Connected streets can reduce traffic congestion by dispersing traffic.



Conceptual illustration

Case Study

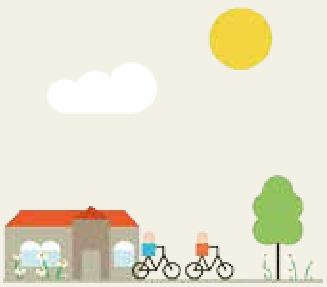
Colony Park in the historic district of Anaheim is an infill development that is walkable and well connected to jobs, transportation and commercial opportunities. The development of over 600 homes sits on a road layout grid where the average block size is 750 feet by 280 feet but within this vehicle access lanes and pedestrian walkways increase the permeability for residents. Further to this the development is located a few blocks away from Anaheim Downtown and the recently revitalized Anaheim Packing District.

Colony Park, Anaheim

Well-designed, connected Complete Streets make travel more efficient by providing choice not only in modes, but also in routes

Design Goal 4

Improve bicycle networks



It is essential to facilitate the planning and construction of networks of streets and paths that are safe and attractive for all kinds of bikeway users: complete street design should accommodate all types, levels, and ages of cyclists.

Summary

Commuter cyclists need safe, clear, direct routes which take them to business and retail, schools, parks, and mass transit without stopping short at awkward intersections or obstacles. Leisure cyclists do not necessarily want to take the most direct route somewhere, but may instead prefer a more scenic route. In either case, a mix of on-road and off-road facilities may be suitable.

Bikeways are a major incentive for people to use bicycles and injury rates drop when there is dedicated bikeway infrastructure like off-street trails and dedicated bicycle lanes.

It is also important to support and promote education and awareness of other transportation users' (including pedestrian and bicyclists') rights, responsibilities, and behaviors, as well as risk avoidance, among the motoring public.

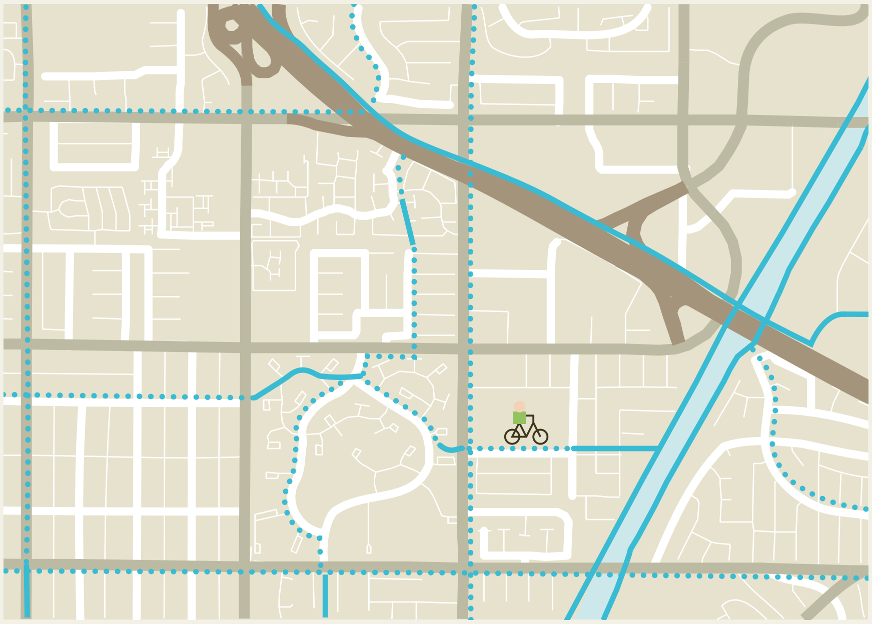
Chapter B3 provides Technical Guidance, including further details related to bikeways.

Design Principles

- Cyclists should have the most direct routes possible and a continuous right-of-way.
- Cyclists should be separated from vehicles on higher volume, higher-speeds roads based on engineering standards.
- Bicycle boxes should be used at signalized intersections especially where bicycle left-turns and motorist right-turns often conflict.
- Bikeway treatments should provide clear guidance through design to enhance safety for all users.
- Designated bicycle facilities at employment centers can include bicycle parking, repair, sales and rental bicycles, and should be provided where demand / potential demand is identified.
- Designated bicycle facilities at employment centers can include bicycle parking, repair, sales and rental bicycles, and should be provided where demand / potential demand is identified.
- Develop city-wide bicycle maps for public use.
- Bicycle hire or bicycle share programs should be encouraged where appropriate to context, to encourage bicycling.
- Safe Routes to School program should be expanded and encouraged.

Benefits

- A comprehensive bicycle network and adequate biking facilities will encourage biking use and physical activity, as well as reduce vehicle travel and environmental impacts.
- Well delineated and designed facilities for bicyclists can reduce conflict with pedestrians and automobiles, and help all users to feel more comfortable in a street.
- Making biking comfortable and safe can make car ownership optional.
- Protected bicycle lanes in streets can help boost retail performance.



Conceptual illustration

Case Study

In 2013 the City of San Clemente adopted the Bicycle and Pedestrian Masterplan that has been pivotal in the beginnings of a complete bicycle network.

The network integrates varying levels of Class I and Class II bikeways relative to traffic volumes; in areas of heavy traffic the bicycle route is separated from the roadway to improve the comfort of less confident cyclists. Road marking and signage complete the network identifying routes to bicyclists.

(City of San Clemente Bicycle and Pedestrian Master Plan 2013.)

Class II Bikeway, San Clemente

Design Goal 5

Integrate transit networks

High quality public transit carries more people and experiences fewer crashes than private vehicle travel. Research shows that a bus rapid transit system can reduce traffic deaths and severe injuries by 50 percent. For transit to make substantial gains, it must be seen as a positive choice compared to driving. This requires both improving transit options and removing incentives to drive.

Summary

Dedicated transit lanes, bus signal priority, and operational traffic improvements ensure that transit vehicles experience minimal wait time at intersections and can move freely regardless of traffic congestion, providing a passenger experience competitive with driving.

It is not enough to provide improved public transit, it is essential to also ensure safe access for commuters. The quality and availability of "first and last-mile connections," such as appropriate sidewalks and crossings, are critical to the success of any community's transit system.

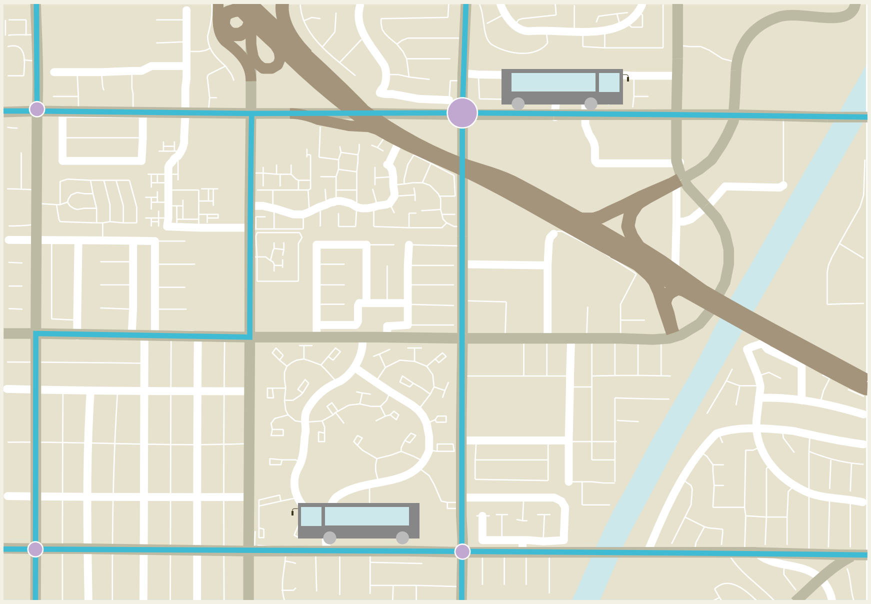
Memorable and pleasant transit stops create value for neighborhoods.

Design Principles

- Dedicated bus lanes on key routes with frequent headways (for example 10 minutes at peak) or where traffic congestion may significantly affect reliability.
- Transit signal priority should be implemented on high frequency corridors to reduce transit delays due to traffic signals.
- Every bus stop should be highly visible, convenient to access, with lines and directions of service clearly indicated by proper signage.
- Bus stops must have safe access via sidewalks and appropriate street crossing locations. Where possible, pedestrian crossings should be accommodated behind the departing transit vehicle.
- The amount of sidewalk space around a bus stop should meet the intended demand and ridership levels.
- Streets with insufficient queuing space at bus stops should consider the implementation of a bus bulb or dedicated waiting area.
- Information provided to riders at a bus or transit stop should include station name, route map, and schedule.
- The experience of passengers and passers-by should be enhanced wherever possible, through the addition of shelters, benches, area maps, plantings, vendors, and/or artworks.
- Adequate lighting should be installed around bus stops and shelters to ensure personal safety and security.
- Planning, funding, implementation, and maintenance of "first and last-mile" pedestrian and bicycle facilities to include sidewalks, bikeways, safe pedestrian crossings, wayfinding and signage, etc.

Benefits

- Bus lanes reduce delays due to traffic congestion and help raise the visibility of the high-quality service.
- Memorable and pleasant transit stops create value for neighborhoods. Larger transit hubs can serve much more than a transportation function; they can be a setting for community interaction and a place that fosters a diversity of activities.



Conceptual illustration

Case Study

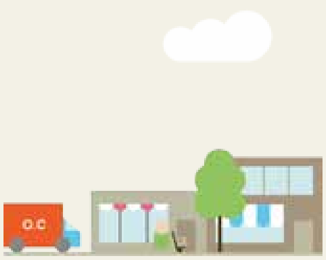
Orange Counties Measure M2 Project S provided funding to create Transit Extensions to the Metro link, connecting people to their final destination after getting off the train. As part of this program two fixed guideway projects have been developed; the Santa Ana/ Garden Grove Streetcar and the Anaheim Rapid Connection (ARC).

Both streetcar projects will be integrated into the existing street environment and provide a vital connection between a transportation hub and the main commercial district.

(OCTA. Orange County Transportation Authority. Transit Extensions to Metrolink. 2015)

Design Goal 6

Effective truck and goods movement



Goods movement is a critical piece of the transportation system, supporting a strong economy and providing residents and businesses with the products they need. In developed economies, every business and person relies on the trade of goods and services.

Summary

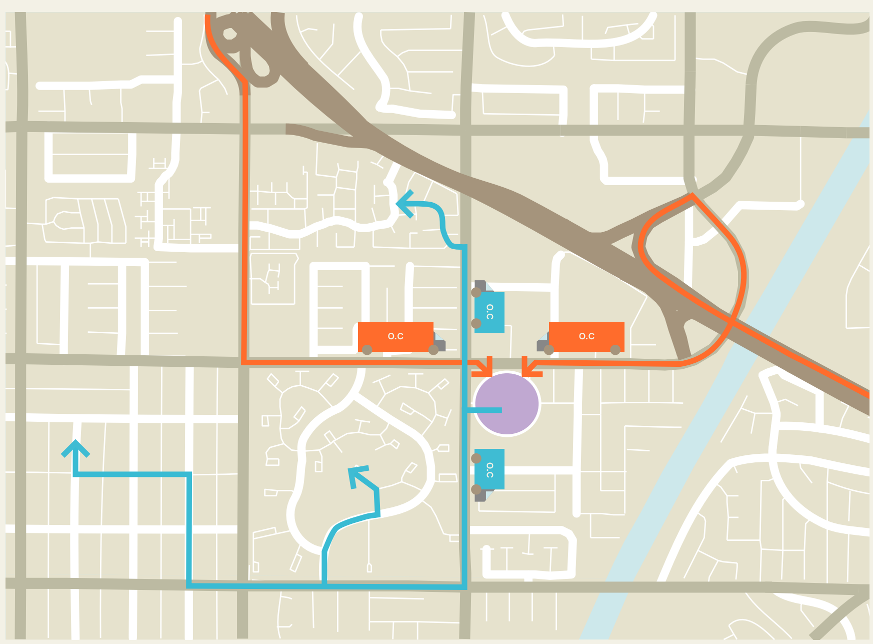
At the same time, goods movement activities have significant environmental and public health impacts on those communities located in close proximity to goods movement activities. Many metropolitan regions today are challenged to address concerns about air quality, noise, and the competition among various interests for roadway space.

Design Principles

- Using smaller trucks in downtown and busy neighborhood centers between morning and evening on weekdays.
- Reserving some on-street parking for commercial vehicles.
- Requiring permits for all over-dimension (over-size and over-weight) trucks.
- Requiring new developments to provide off-street loading areas for trucks.
- Retaining alleys for truck deliveries and garbage/recycling collection.
- Providing signage for truck drivers to note truck prohibitions and appropriate routes.

Benefits

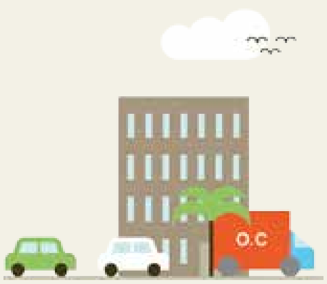
- Reduce environmental and community impacts from goods movement operations to create healthy communities and a clean environment, and improve quality of life for those communities most impacted by goods movement.
- Provide safe, reliable, efficient, and well maintained goods movement facilities.



Conceptual illustration

Design Goal 7

Maintain vehicular mobility



Streets need to be suitable for automobiles, but this should not be at the expense of pedestrians and cyclists. On streets with mixed traffic, careful design of roads, parking, and servicing arrangements, can make spaces comfortable for all users, whether on foot or in a car. Organizing traffic, simplifying complicated intersections, and optimizing signals can reduce peak congestion, but also prevent speeding at other times.

Summary

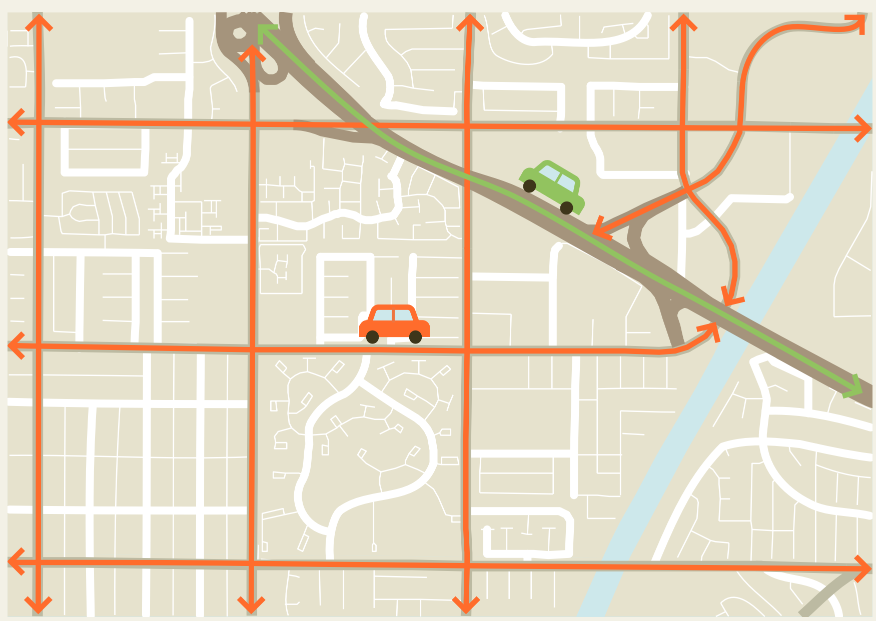
Lane widths should be considered within the overall context of a given street delineating space to serve all needs, including travel lanes, safety islands, bicycle lanes, and sidewalks. Successful intersection design addresses all mobility and safety goals as well as opportunities to enhance the public realm.

Design Principles

- Adopt lane widths that are appropriate for all road users and that encourage safe speeds.
- Simplified intersections from signal timing to crosswalks.
- Dedicated left, right, and through lanes.
- Adaptive signal control and signal optimization to manage congested areas.
- Parking regulations and pricing to reduce the amount of time vehicles park, stand, or stop at the curb, so that space turns over for new users and double parking is minimized.

Benefits

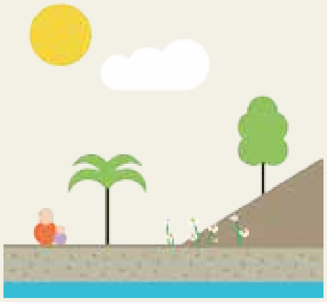
- Encouraging more people to walk, cycle, or take transit will create more capacity on the street for essential automobile traffic and reduce need to pursue road widening schemes.
- Road design that enables the traffic to move consistently, but slower, can decrease CO2 emissions, create less stress for the driver, reduce fuel consumption and vehicle wear and tear, and increase road capacity.
- Reducing delay and speeding is fundamental to allow for smoother, safer travel and it also creates more consistent journey times.



Conceptual illustration

Design Goal 8

Design for sustainable streets



Street design can help meet sustainability objectives and provide environmental benefits. Here are some simple strategies that can be used to prevent urban heat island effects, as well as to reduce CO2 and the amount of water used, and still maintain the health, appearance, and function of the landscape.

Summary

Sustainable streets should include a variety of elements that enhance pedestrian comfort, embrace local character and improve sustainability through the jurisdiction.

Particular attention must be paid to designing streets that take a sustainable approach to water. When much of California is facing drought and limited water supplies, efforts must be focused on reducing the use of water for irrigation and using drought-tolerant and native plant-species.

Particular attention must be paid to designing streets that take a sustainable approach to water

Design Principles

- Introduce appropriate tree planting to reduce carbon emissions, provide shade and cooling, intercept run-off and reduce air pollution.
- Establish resilient urban landscapes by using more native or drought-tolerant plants to create texture, color, and vibrancy.
- Avoid narrow strips of turf and minimize amenity turf areas.
- Choose water-efficient landscape designs by implementing sustainable stormwater management solutions such as: bioswales, flow-through planters, pervious strips, pervious pavement.
- Schedule irrigation during early or late hours, with systems that are well maintained to reduce water wastage through leaks, spraying of sidewalks and roadways.
- Promote the use of permeable pavements and water storage infrastructures which are beneficial strategies in time of both drought and flooding.
- Use light-colored paving to reduce heat island effect through high reflectivity.

Schedule irrigation during early or late hours, with systems that are well maintained to reduce water wastage through leaks, spraying of sidewalks and roadways

Benefits

- Landscaping provides environmental benefits by creating shade, reducing heat island effect, filtering pollutants and dust particles.
- It enhances the aesthetic quality of streets by adding visual interest, scale, and beauty.
- Trees and planters contribute to safer sidewalks by buffering pedestrians and/or cyclists from vehicular traffic.
- Sustainable stormwater management can prove less costly than upgrading large, sub-grade pipe networks, and allows for flexible, modular installation.
- Urban ecology and biodiversity can be enhanced.

Sustainable stormwater management can prove less costly than upgrading large, sub-grade pipe networks, and allows for flexible, modular installation

Conceptual illustration

Case Study

The Greenroad rating system is a third party certification to recognize and quantify roadway sustainability.

The Bristol Street Improvement and Widening project was the first in Southern California to achieve a Greenroads Bronze certification recognizing the projects commitment to sustainable transportation and construction. It was also the first Greenroads project to demonstrate the use of low impact development (LID) interventions in an arid climate.

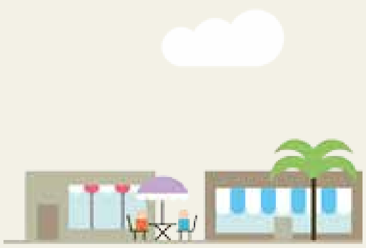
The aim of the project was to reduce traffic congestion and improve the pedestrian environment by widening a 3.9 mile segment of road from Warner Avenue to Memory Lane from four lanes of traffic to six. The project achieved certification by using recycled materials, locally sourcing aggregates and supporting sustainable storm water management with roadside vegetated swales, drought tolerant planting and native planting along the corridor.

(ForConstructonPros.com, Bristol Street Project Earns First Greenroads Certification in Southern California. [Online] December 10, 2014.)

Bristol Street, Santa Ana

Design Goal 9

Promote streets as public spaces



The creation of public open space is essential to the health of residents and the physical environment. Research has shown that residents within a three minute walk of open space utilize that space more often than those who live further away. Open space is critical to increased physical activity and a connection to the physical environment.

Summary

Interim design strategies are a set of tools and tactics that cities can use to improve their roadways and create public spaces in the near-term. They include among others: Temporary Street Closures, Public Plazas, and Parklets.

Temporary streets closures, such as play streets, block parties, street fairs, and open streets, demonstrate the range and diversity of ways in which a jurisdiction's Complete Streets may be utilized. Depending on a street's usage and characteristics, temporary street closures can take multiple forms, ranging from an emphasis on active recreation, biking, or exercise, to business activity, food, or arts. Examples include the Orange County Marathon, Costa Mesa Cattle Drive, Sunday on Main Open Streets, Villa Park Boat Parade, and RE:Imagine Garden Grove.

Public plazas transform underutilized areas of roadway into public spaces for surrounding residents and businesses. Using low-cost materials, such as epoxied gravel, movable planters, and flexible seating, interim public plazas reconfigure small areas that might otherwise be unsafe or underutilized. Some examples include small side streets or alleys in commercial areas.

Parklets, also known as street seats or curbside seating, are public seating platforms that convert curbside parking spaces into vibrant community spaces. Most parklets have a distinctive design that incorporates seating, greenery, and/or bicycle racks and accommodate unmet demand for public space on thriving neighborhood retail streets or commercial areas.

Design Principles

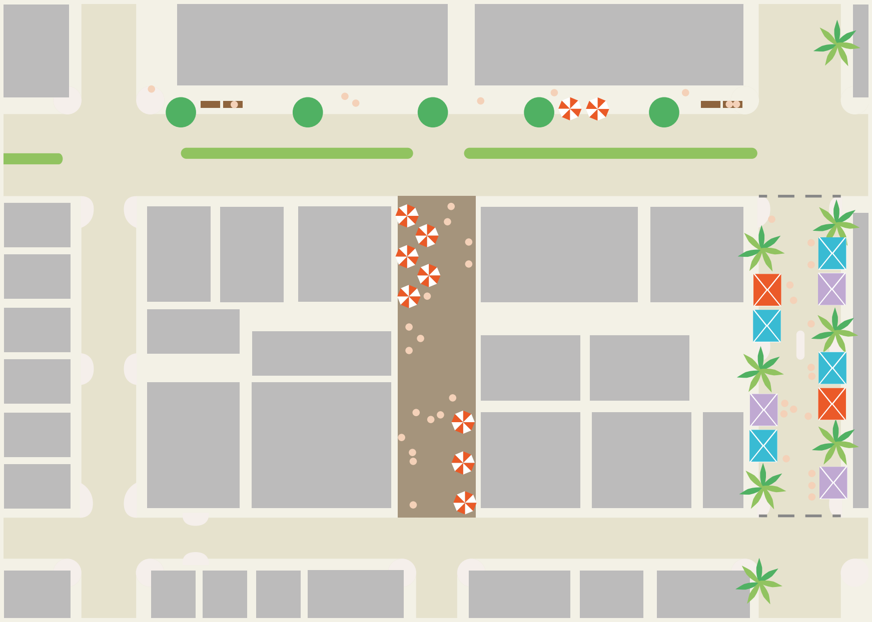
- Interim design strategies should consider areas with higher population densities: lack of public spaces, where narrow or congested sidewalks prevent the installation of traditional sidewalk cafes or where local property owners or residents see a need to expand the seating capacity and public space on a given street.
- A removable traffic control device or barrier should be used to ensure that vehicles do not encroach on a temporary closure.
- Bicyclists may be permitted to ride through temporary street closures in certain cases. Bicyclists should always be permitted to ride through "open streets" events.
- Parking shall not be allowed or permitted within the public plaza.
- Interim public plazas shall be constructed with ADA-compliant tactile warning strips at the crosswalks.
- Parklets generally entail the conversion of one or more parallel parking spaces or 3–4 angled parking spaces, but may vary according to the site, context, and desired character of the installation.

Temporary streets closures, such as play streets, block parties, street fairs, and open streets, demonstrate the range and diversity of ways in which a jurisdiction's Complete Streets may be utilized

Benefits

- Interim design strategies allow jurisdictions to assess the impacts of their intended project in real time and realize their benefits faster than typical processes allow.
- Public Health: Open streets initiatives engage participants, and encourage physical activity.
- Environmental: Removing cars from the road, even just temporarily, provides a positive environmental impact, especially if the initiative is conducted on a weekly basis.
- Economic: When located in downtown or neighborhood business districts, temporary street closures, plazas, and parklets offer new economic opportunities for many types of businesses.
- Community and Social: By temporarily removing the danger of motor vehicles, open streets provide a novel type of public space that helps people socialize with their fellow citizens.

Interim design strategies allow jurisdictions to assess the impacts of their intended project in real time and realize their benefits faster than typical processes allow



Conceptual illustration

Case Study

Surf City Nights is a free event that takes place in Huntington Beach every Tuesday from 5-9pm. When the event takes place three blocks along Main Street downtown are closed to traffic and brought to life with live music, street performers, a farmers market, street vendors and activities for children.

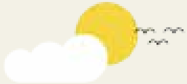
The event was initially established and managed by the City of Huntington Beach in 2007 in attempt to broaden the demographic of downtown, increase pedestrian activity and economic vitality and create a sense of place.

(CAA Planning Inc. Final Focused Environmental Impact Report Surf City Nights Project. Huntington Beach: City of Huntington Beach, 2014.)

Surf City Nights, Huntington Beach

Design Goal 10

Promote Context Sensitive Design and neighborhood character



Context Sensitive Design is an approach to develop better and improved ways of designing roads, highways, and other transportation facilities that are integrated with their environment and are more consistent with the needs of the communities they serve, thereby achieving planning and design excellence.

Summary

Another way of describing Context Sensitive Design is "merging the function of a transportation project with its setting." Urban environments need the flexibility to be able to change with circumstance and progress. Contributing to a distinct character sustains community by nurturing the identity of the neighborhood.

This approach is an effort to design transportation projects in harmony with the project's context, such that these projects respect the community values, physical needs, natural environment, social needs, cultural characteristics, aesthetics, and transportation needs.

The "context" of the project can include a variety of elements such as community, natural landscape, coastline, rivers, historic districts, residential character, parks, farmland, wetlands, and commercial neighborhoods.

Context Sensitive Design should be considered as an integral part of all Complete Streets transportation design activities. The key elements of Context Sensitive Design include many of the thematic principles described in previous sections:

- Purpose and Transportation Need
- Environment
- Public Participation
- Transportation Design Elements
- Safety and Mobility

Design Principles

Transportation projects should be designed to:

- blend in with the character of the area
- be aesthetically pleasing
- have minimum impacts to the existing environment and be environmentally sustainable
- be consistent with the surrounding land use and neighborhood requirements
- preserve the historic character of the district
- involve the community from the very start throughout all phases of the project

Context Sensitive Design is "merging the function of a transportation project with its setting."

Benefits

- Minimized overall negative impact to human and natural environment
- Improved community satisfaction
- Improved quality of life for community
- Design features appropriate to context
- Increased stakeholder/public participation, ownership, and trust

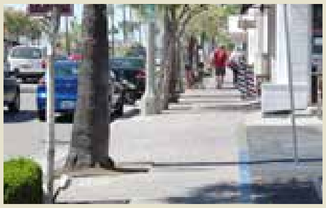
Designing streets that are sensitive to their context helps improve the quality of life for communities

Conceptual illustration

Case Study

In 1991 the City of San Clemente adopted Design Guidelines to preserve and strengthen the city's unique atmosphere and historic identity as "The Spanish Village by the Sea" and maintain high quality public spaces. Specifically the guidelines set out to develop and improve the Del Mar Commercial District as the "Village" of San Clemente, a unique pedestrian-orientated business district. Over a decade later the Del Mar Commercial District has sustained its distinctive built environment through the adherence to the guidelines and the preservation and enhancement of historical features. The area continues to develop and meet modern community needs whilst maintaining a sense of place identity.

(City of San Clemente. Design Guidelines. San Clemente. 2015. http://bit.ly/23xW9Kn)



Del Mar, San Clemente

B2

Street types

This chapter considers the street types identified across Orange County and:

- Illustrates of existing and recommended situations to explain design principles and considerations for each street type.
- Illustrates variants of each street that may occur to accommodate different transportation mode priorities.

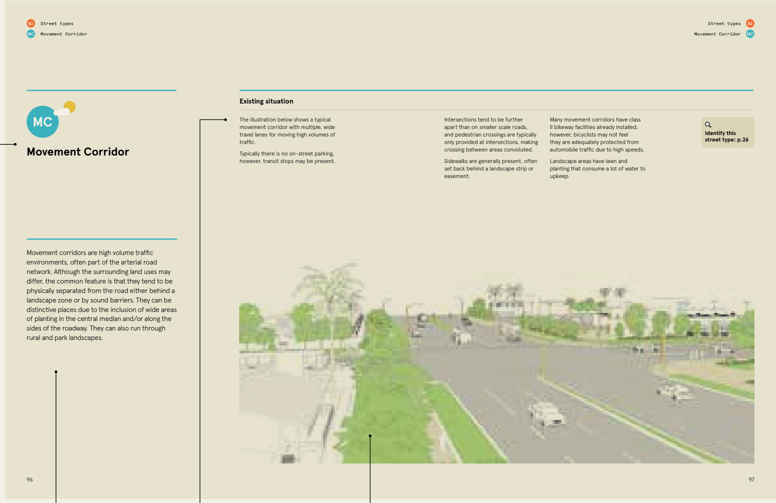
The principles are aimed at helping Orange County communities design streets that are safe, multimodal, and green. These principles can be used to guide the planning and construction of privately and publicly funded roadways.

How to use the information in this chapter

This chapter highlights key design considerations for each of the nine street types by illustrating a typical existing situation, principals for making the street more complete and street type variants to address different transportation mode priorities.

FIGURE B2.1 HOW TO USE THE INFORMATION IN THIS CHAPTER

Street type: Existing situation



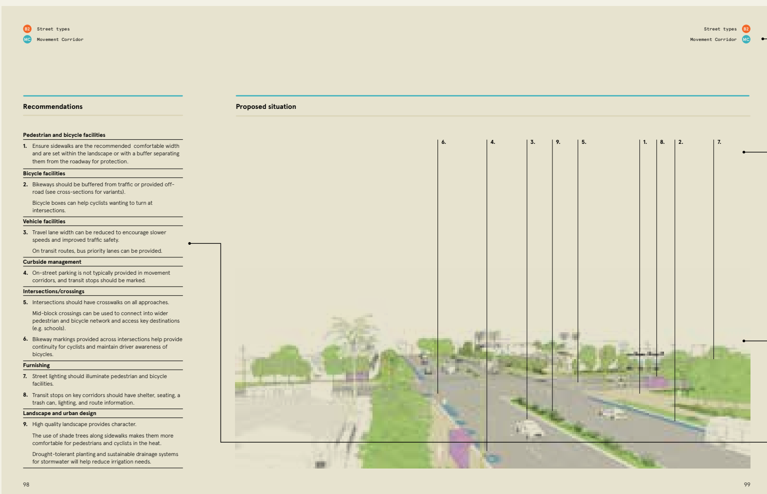
3D Image
Conceptually illustrates the existing situation

Existing situation
Describes typical components

Overview
Describes characteristics

Street type
Name and color identify the street type

Street type: Proposed situation



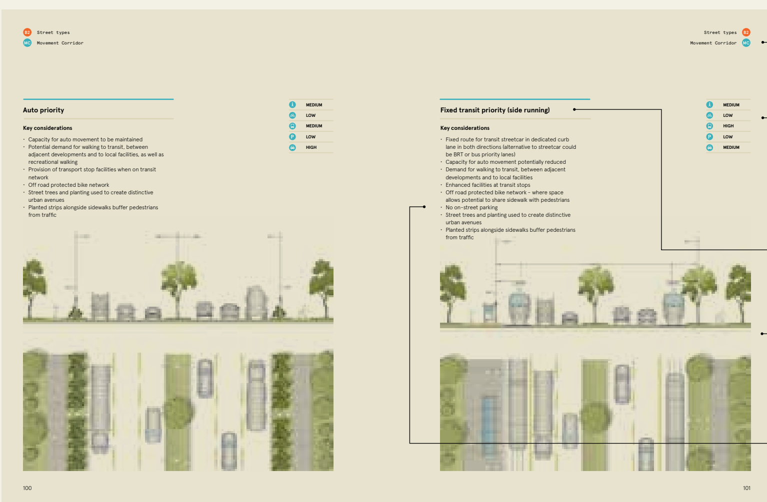
Street type
Name and color identify the street type

Annotations
The numbers relate to points listed in recommendations

3D Image
Conceptually illustrates the application of the recommendations

Recommendations
Provide guidance for key components of the street

Cross sections



Street type
Name and color identify the street type

Relative priority
Icons indicate the relative priority of different transportation facilities for this street type variant

Variant of street type
Indicates the main modal priority

Cross-section and plan
Illustrate the concept for the street type variant

Key considerations
Provide guidance on important design factors

MF

Multimodal Freeway Corridor

Freeways and the Toll Roads support high volume and high speed traffic with multiple lanes separated by a median. They have controlled access via ramps at interchanges. Freeways are essential for movement of automobile traffic across the County and maintenance of this function is critical. However, there is a need to address the severance they cause in communities and pursue opportunities to make better use of available land within the freeway corridor for other transportation modes.

Existing situation

The illustration below depicts a typical section of freeway corridor and an interchange.

Freeways often have no, or very few, crossing points for pedestrians and cyclists, outside of interchanges.

Facilities for pedestrians and cyclists at interchanges are often missing or discontinuous.

Location of signs for drivers entering or leaving freeway often obstruct views of pedestrians at crossings.

Uncontrolled pedestrian crossings on high speed entrance ramps.

Freeway corridors provide for automobile traffic, however, land within the corridor is sometimes sufficient to allow for other facilities (e.g. bikeways or transit lanes) to be inserted safely, turning the freeway into a multimodal corridor.

Identify this street type: p.24

Recommendations

Pedestrian and bicycle facilities

1. Bridges or underpasses to cross freeway, positioned at places that provide connectivity into the wider pedestrian and bicycle networks.
2. Off-road trails can be introduced along corridor, physically separated from traffic lanes.

Vehicle facilities

3. Automobile priority must be maintained on the roadway itself, however consideration can be given to a high quality transit facility in the central zone either at ground level or elevated. Toll road facilities in Orange County have been specifically designed to have space in the median for future HOV lanesand potentially for transit.

   Over time consideration could be given to lane removal or narrowing.

Intersections/crossings

4. Realignment of on/off ramps to reduce approach speeds and allow for safe crossing.
5. Interchanges should provide for pedestrian crossing on all approaches.
6. Continuous bikeways should be provided across interchanges.

Furnishing

7. Bridges, underpasses, and trails should be lit where they are in urban areas and likely to be used in the evening (e.g. by commuters).

Landscape and urban design

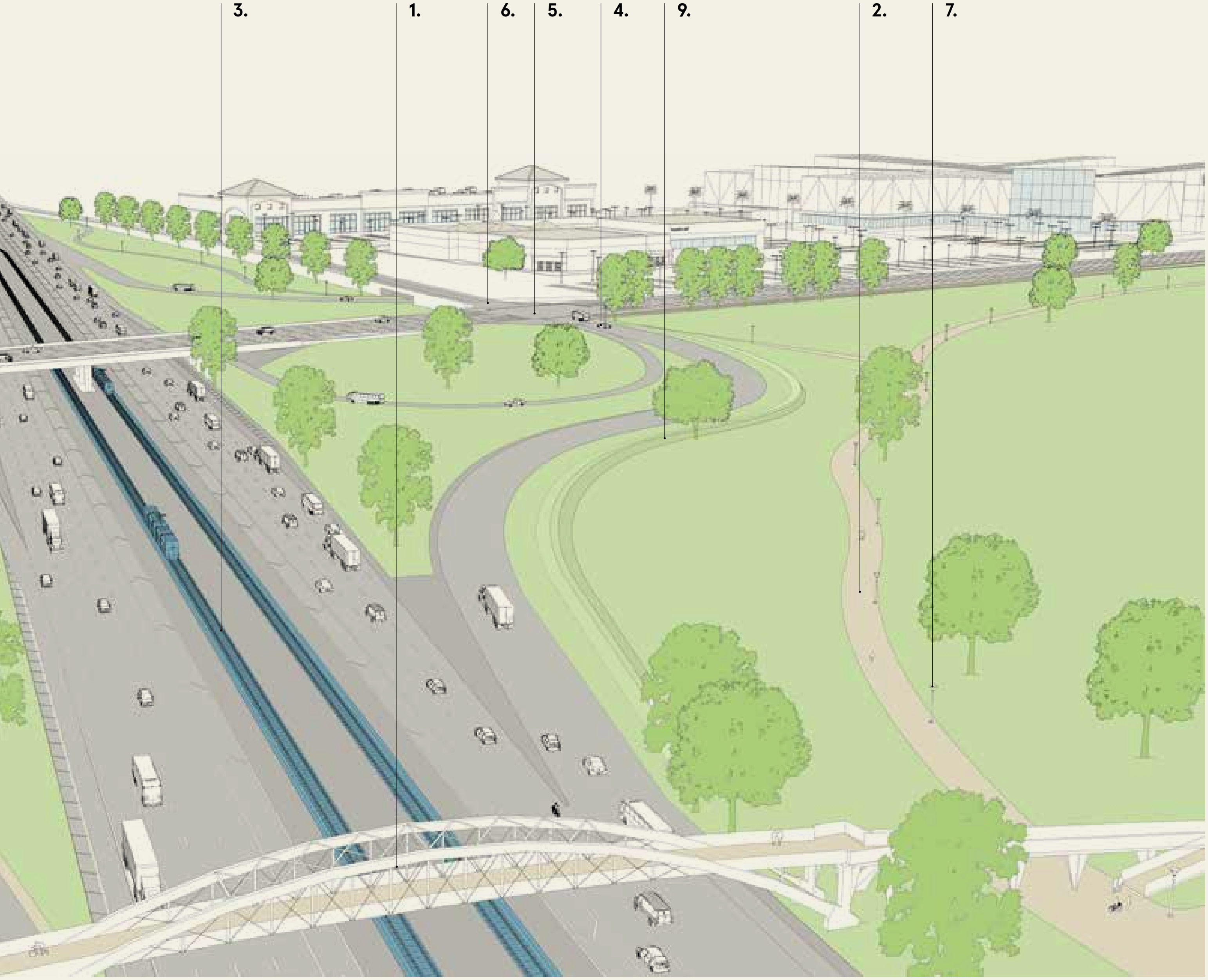
8. Use drought tolerant shade trees along sidewalks and trails to keep pedestrians and cyclists cool.
9. Use sound attenuation walls or bunds to mitigate impact of noise.

   Use drought-tolerant and preferably native planting in landscape zone to help with air quality and improve biodiversity.

   Sustainable drainage techniques should be installed to manage stormwater run-off within landscape.

   Large scale art features are useful at key interchanges for identity and legibility.

Proposed situation


3.
1.
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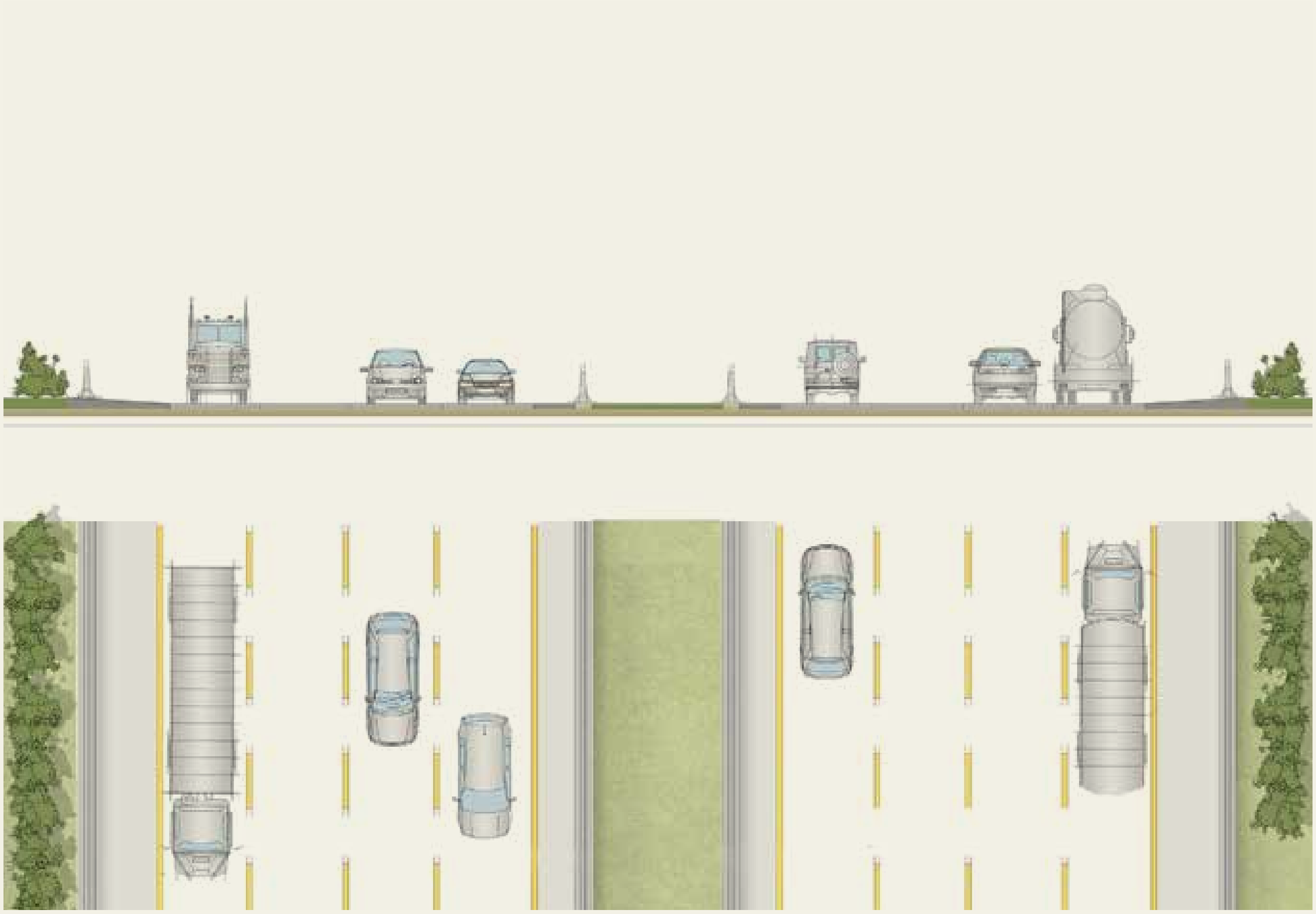
Auto priority

Pedestrian	LOW
Bicycle	LOW
Transit	LOW
Parking	LOW
Auto	HIGH

Key considerations

- Maintain movement of automobiles to enable efficient transportation links across the county
- Provide crossing points and facilities for other modes of transportation at intersections
- Include bridges or underpasses to cross freeway, positioned at places that provide connectivity to the wider pedestrian and bicycle networks

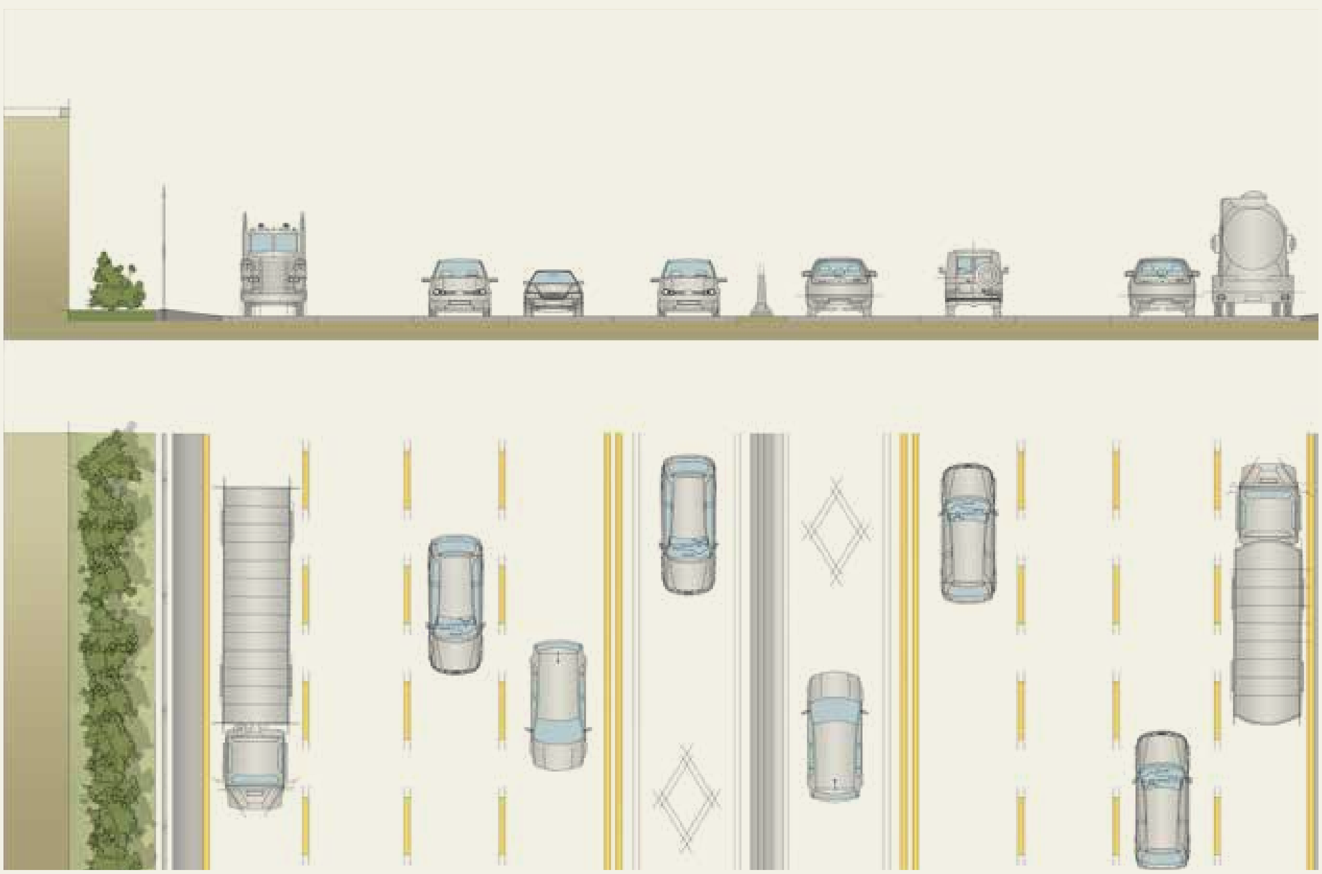


Auto with HOV priority

Key considerations

- Where wide central reserves exist, reallocate to HOV (High-Occupancy Vehicle) lanes
- Where wide central reserves do not exist and/or there is potential to reduce lane widths and space allocated to single occupancy autos, reallocate space to HOV lanes

Pedestrian	LOW
Bicycle	LOW
Transit	LOW
P	LOW
Auto	HIGH

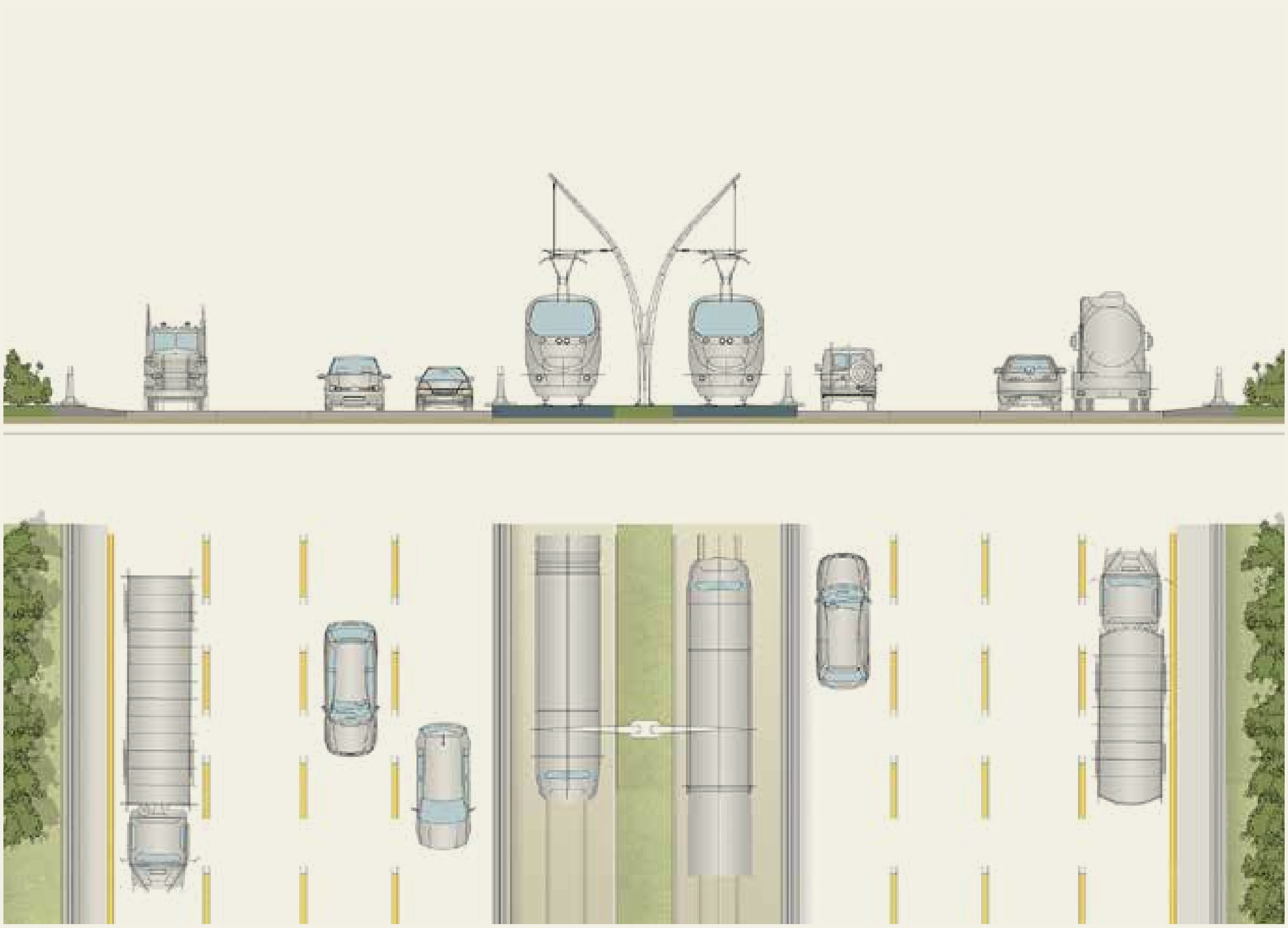


Auto with transit priority

	LOW
	LOW
	HIGH
P	LOW
	HIGH

Key considerations

- Transit and automobile network should operate in synergy providing cross-county links
- Where wide central reserves exist, reallocate space to a fixed guideway transit service such as LRT and BRT
- Where wide central reserves do not exist and/or there is potential to reduce lane widths and space allocated to single occupancy autos, reallocate space to HOV lanes
- Transit facilities should be adequately connected to the pedestrian network to increase usability

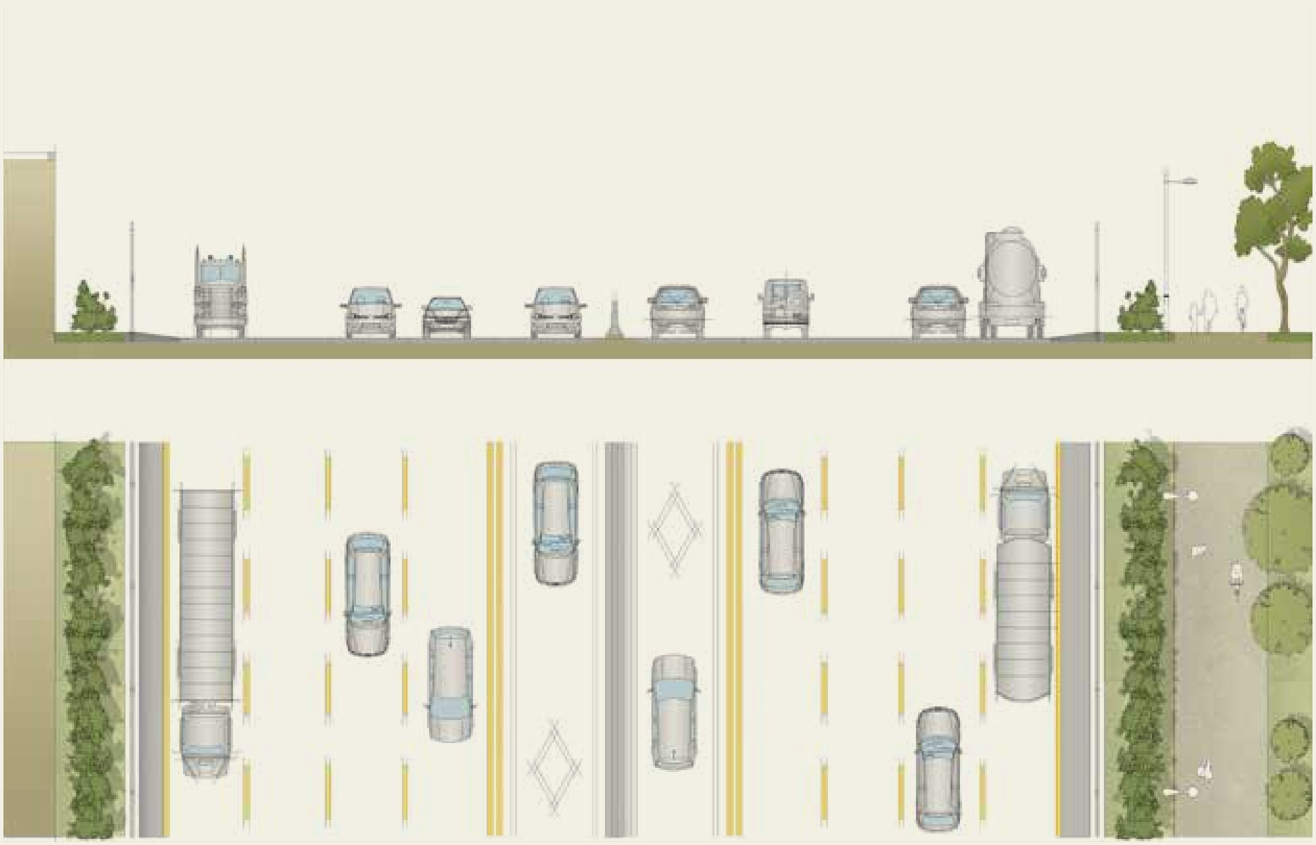


Auto with active transportation priority

Pedestrian	MEDIUM
Bicycle	MEDIUM
Transit	LOW
Parking	LOW
Auto	HIGH

Key considerations

- Where space exists on one, or both sides of freeway, introduce pedestrian and bicycle trails
- Use sound attenuation walls or bunds to mitigate the impact of traffic noise
- Trails should be connected to wider pedestrian and bicycle network either side of the freeway
- Provide crossing points either over or under freeway at regular intervals
- Enhance facilities for active transportation modes at existing crossings



MC

Movement Corridor

Movement corridors are high volume traffic environments, often part of the arterial road network. Although the surrounding land uses may differ, the common feature is that they tend to be physically separated from the road either behind a landscape zone or by sound barriers. They can be distinctive places due to the inclusion of wide areas of planting in the central median and/or along the sides of the roadway. They can also run through rural and park landscapes.

Existing situation

The illustration below shows a typical movement corridor with multiple, wide travel lanes for moving high volumes of traffic.

Typically there is no on-street parking, however, transit stops may be present.

Intersections tend to be further apart than on smaller scale roads, and pedestrian crossings are typically only provided at intersections, making crossing between areas convoluted.

Sidewalks are generally present, often set back behind a landscape strip or easement.

Many movement corridors have class II bikeway facilities already installed, however, bicyclists may not feel they are adequately protected from automobile traffic due to high speeds.

Landscape areas have lawn and planting that consume a lot of water to upkeep.

Identify this street type: p.26

Recommendations

Pedestrian and bicycle facilities

1. Ensure sidewalks are the recommended comfortable width and are set within the landscape or with a buffer separating them from the roadway for protection.

Bicycle facilities

2. Bikeways should be buffered from traffic or provided off-road (see cross-sections for variants).

   Bicycle boxes can help cyclists wanting to turn at intersections.

Vehicle facilities

3. Travel lane width can be reduced to encourage slower speeds and improved traffic safety.

   On transit routes, bus priority lanes can be provided.

Curbside management

4. On-street parking is not typically provided in movement corridors, and transit stops should be marked.

Intersections/crossings

5. Intersections should have crosswalks on all approaches.

   Mid-block crossings can be used to connect into wider pedestrian and bicycle network and access key destinations (e.g. schools).

6. Bikeway markings provided across intersections help provide continuity for cyclists and maintain driver awareness of bicycles.

Furnishing

7. Street lighting should illuminate pedestrian and bicycle facilities.

8. Transit stops on key corridors should have shelter, seating, a trash can, lighting, and route information.

Landscape and urban design

9. High quality landscape provides character.

   The use of shade trees along sidewalks makes them more comfortable for pedestrians and cyclists in the heat.

   Drought-tolerant planting and sustainable drainage systems for stormwater will help reduce irrigation needs.

Proposed situation

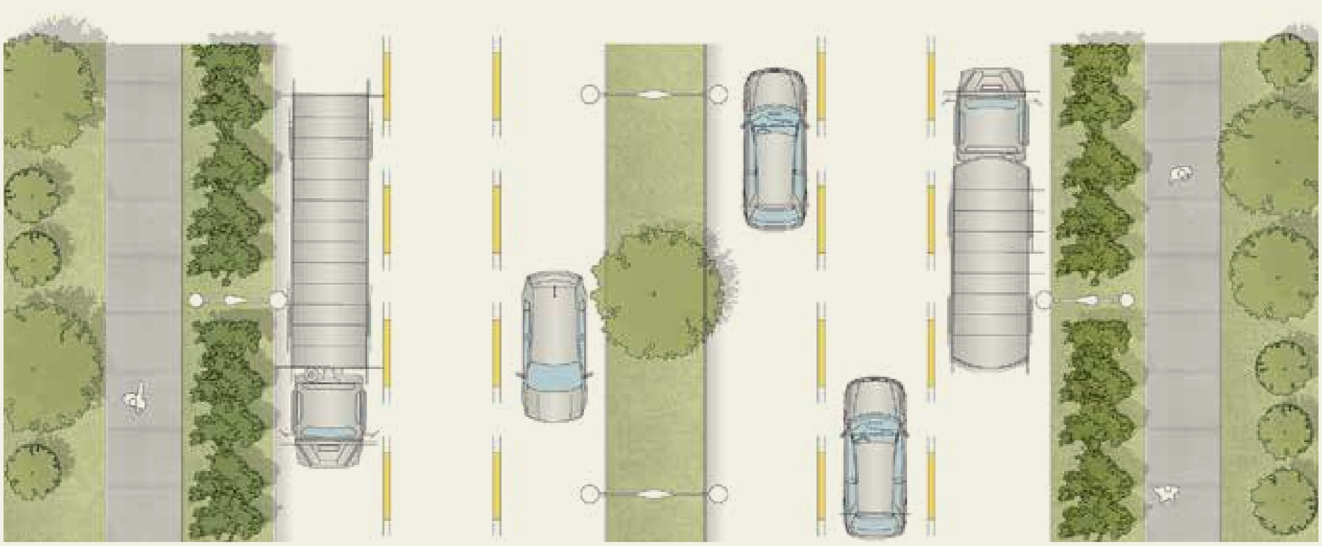

6.
4.
3.
9.
5.
1.
8.
2.
7.

Auto priority

Pedestrian	MEDIUM
Bike	LOW
Transit	MEDIUM
Parking	LOW
Auto	HIGH

Key considerations

- Capacity for auto movement to be maintained
- Potential demand for walking to transit, between adjacent developments and to local facilities, as well as recreational walking
- Provision of transportation stop facilities when on transit network
- Off road protected bike network
- Street trees and planting used to create distinctive urban avenues
- Planted strips alongside sidewalks buffer pedestrians from traffic

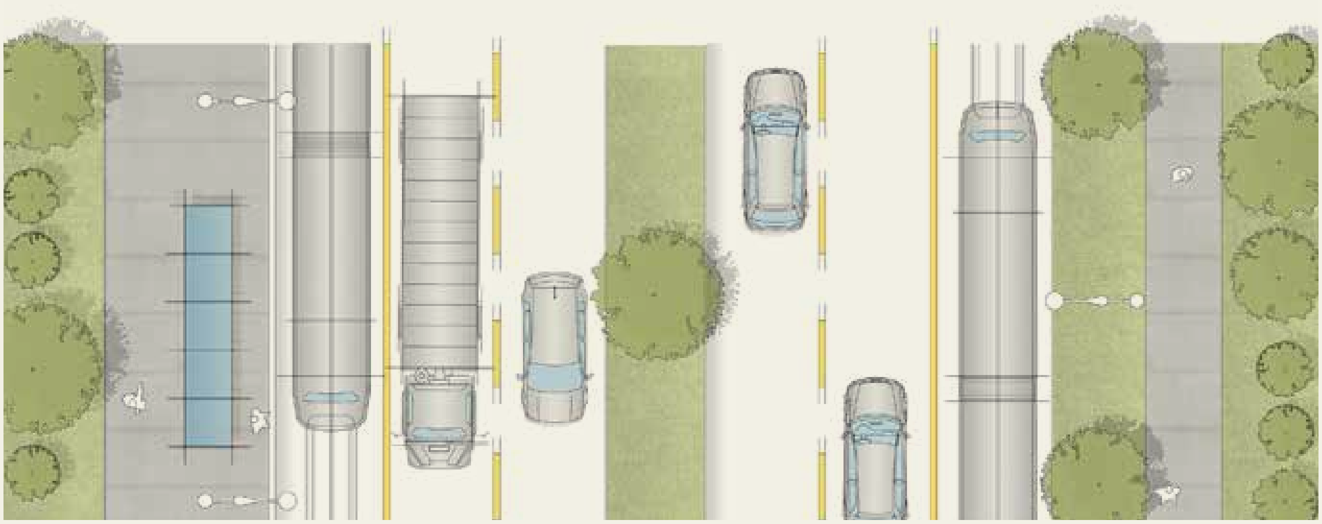


Fixed transit priority (side running)

Pedestrian	MEDIUM
Cycling	LOW
Transit	HIGH
Parking	LOW
Vehicle	MEDIUM

Key considerations

- Fixed route for transit streetcar in dedicated curb lane in both directions (alternative to streetcar could be BRT or bus priority lanes)
- Capacity for auto movement potentially reduced
- Demand for walking to transit, between adjacent developments and to local facilities
- Enhanced facilities at transit stops
- Off road protected bike network - where space allows potential to share sidewalk with pedestrians
- No on-street parking
- Street trees and planting used to create distinctive urban avenues
- Planted strips alongside sidewalks buffer pedestrians from traffic

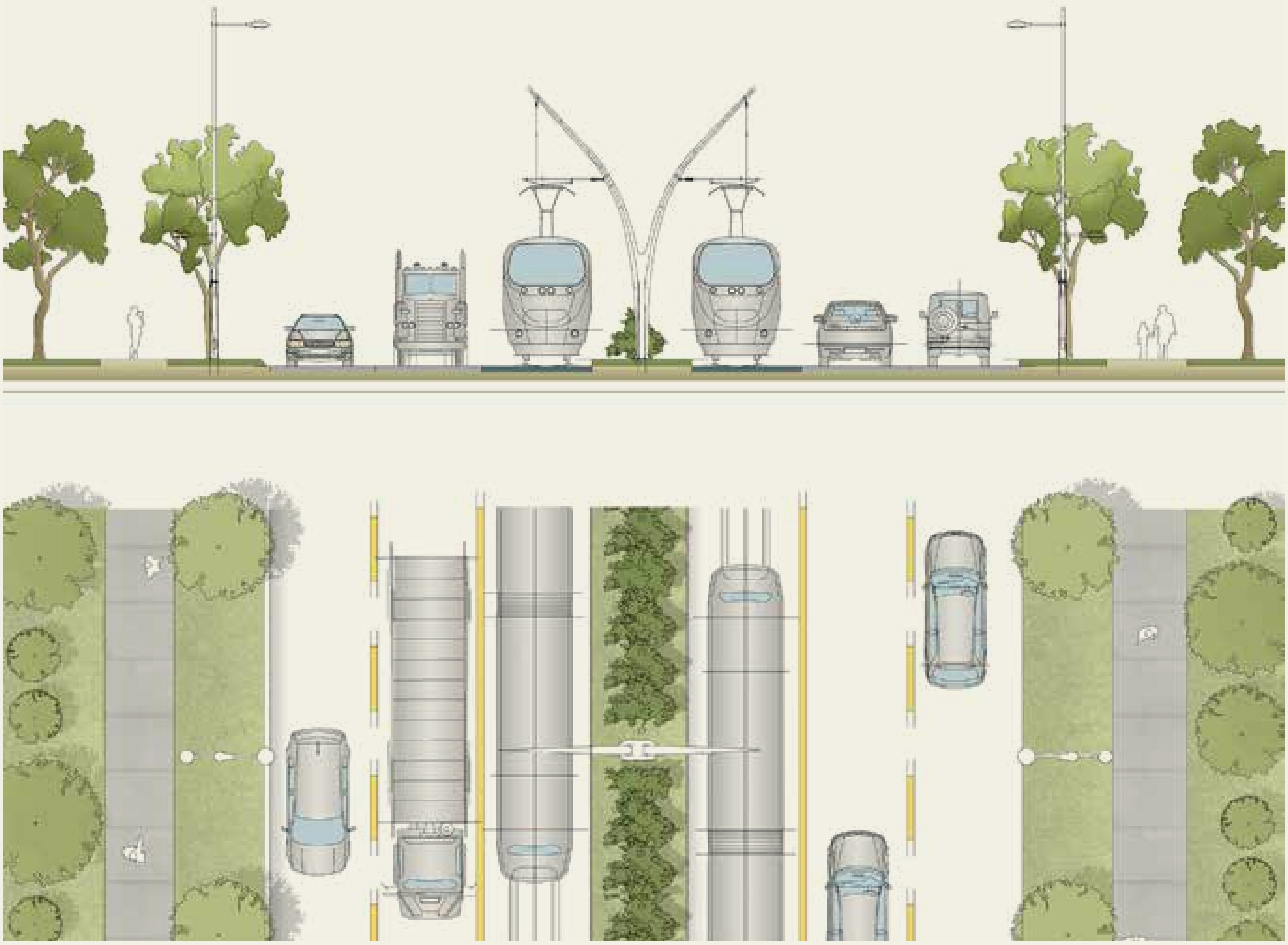


Fixed transit priority (center running)

Pedestrian	MEDIUM
Bicycle	LOW
Transit	HIGH
Parking	LOW
Auto	MEDIUM

Key considerations

- Fixed route for transit streetcar in central reservation (alternative to streetcar could be BRT or bus priority lanes)
- Capacity for auto movement potentially reduced
- Demand for walking to transit, between adjacent developments and to local facilities
- Enhanced facilities at transit stops
- Off road protected bike network - where space allows potential to share sidewalk with pedestrians
- No on-street parking
- Street trees and planting used to create distinctive urban avenues
- Planted strips alongside sidewalks buffer pedestrians from traffic

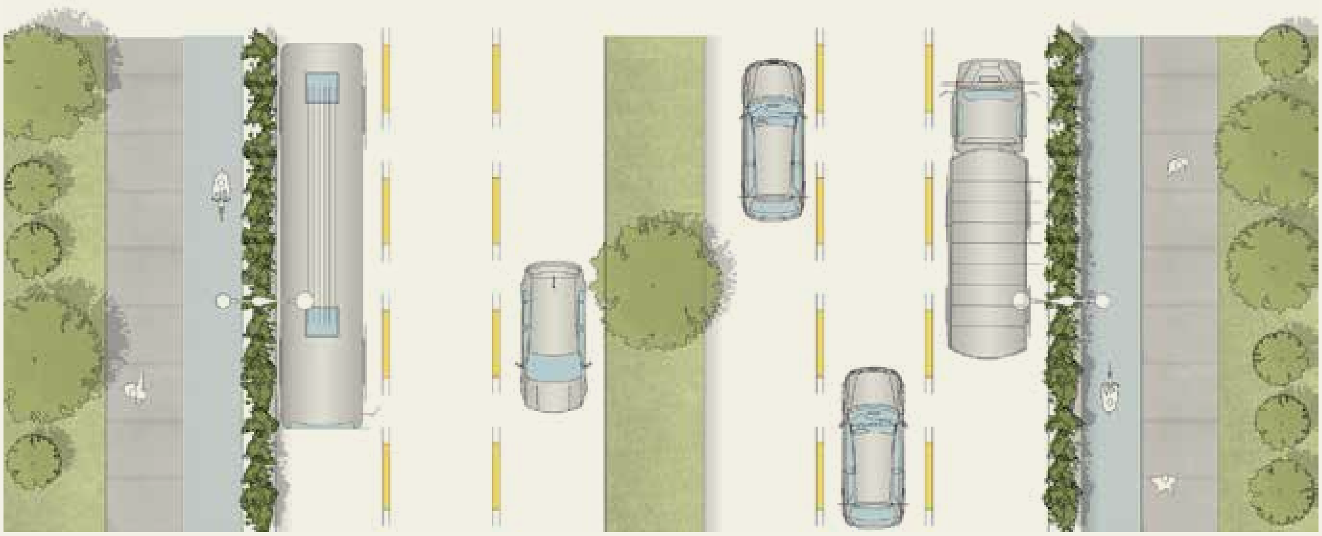


Auto with bike priority

Key considerations

- Capacity for auto movement maintained
- Space available within landscape areas for off road bike trail connected to wider bike network
- Demand for walking to transit, between adjacent developments and to local facilities
- Enhanced facilities at transit stops
- No on-street parking

MEDIUM
HIGH
MEDIUM
LOW
HIGH



Road diet

Pedestrian	MEDIUM
Bicycle	MEDIUM
Transit	MEDIUM
P	LOW
Auto	HIGH

Key considerations

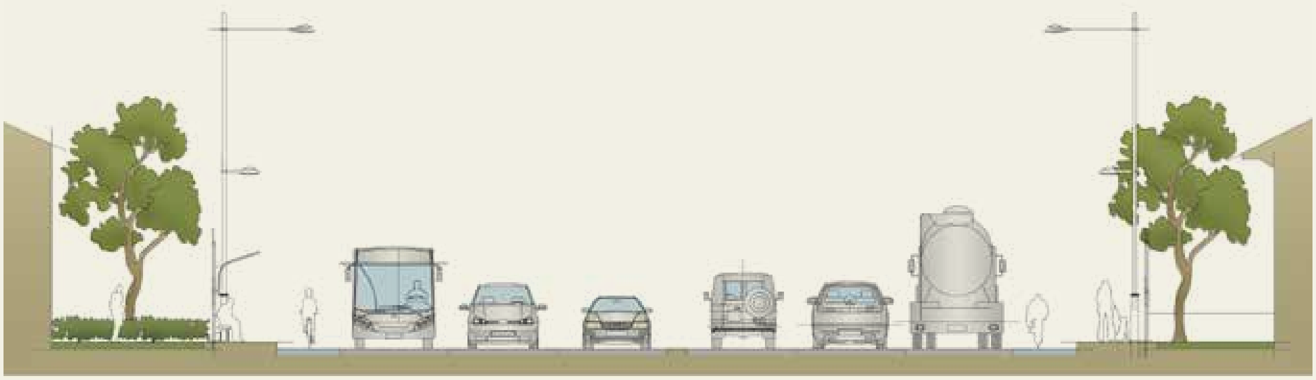
- Capacity for auto movement maintained
- On-street protected bike network
- Space available by reducing width of travel lanes and/or minor changes to curb alignments to create protected bike lane
- Demand for walking to transit, between adjacent developments and to local facilities
- Enhanced facilities at transit stops
- No on-street parking

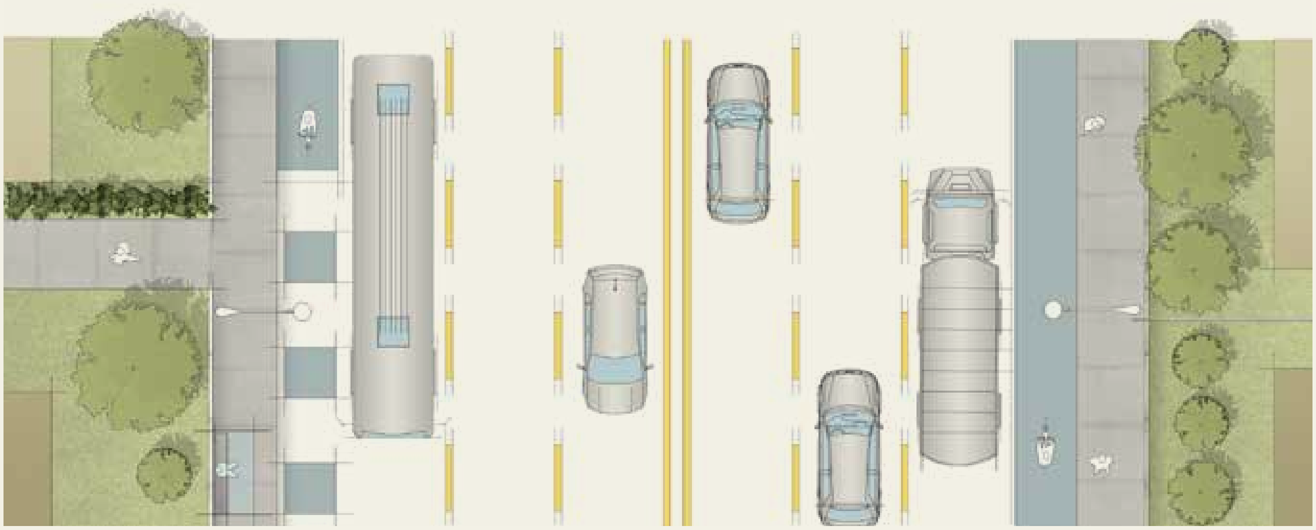
Auto priority with bike lane

Pedestrian	MEDIUM
Bike	MEDIUM
Transit	MEDIUM
Parking	LOW
Auto	HIGH

Key considerations

- Capacity for auto movement maintained
- On-street bike network
- Space available by reducing width of travel lanes and/or minor changes to curb alignments to create bike lane
- Demand for walking to transit, between adjacent developments and to local facilities
- Enhanced facilities at transit stops
- No on-street parking
- Sound wall to mitigate impact of noise



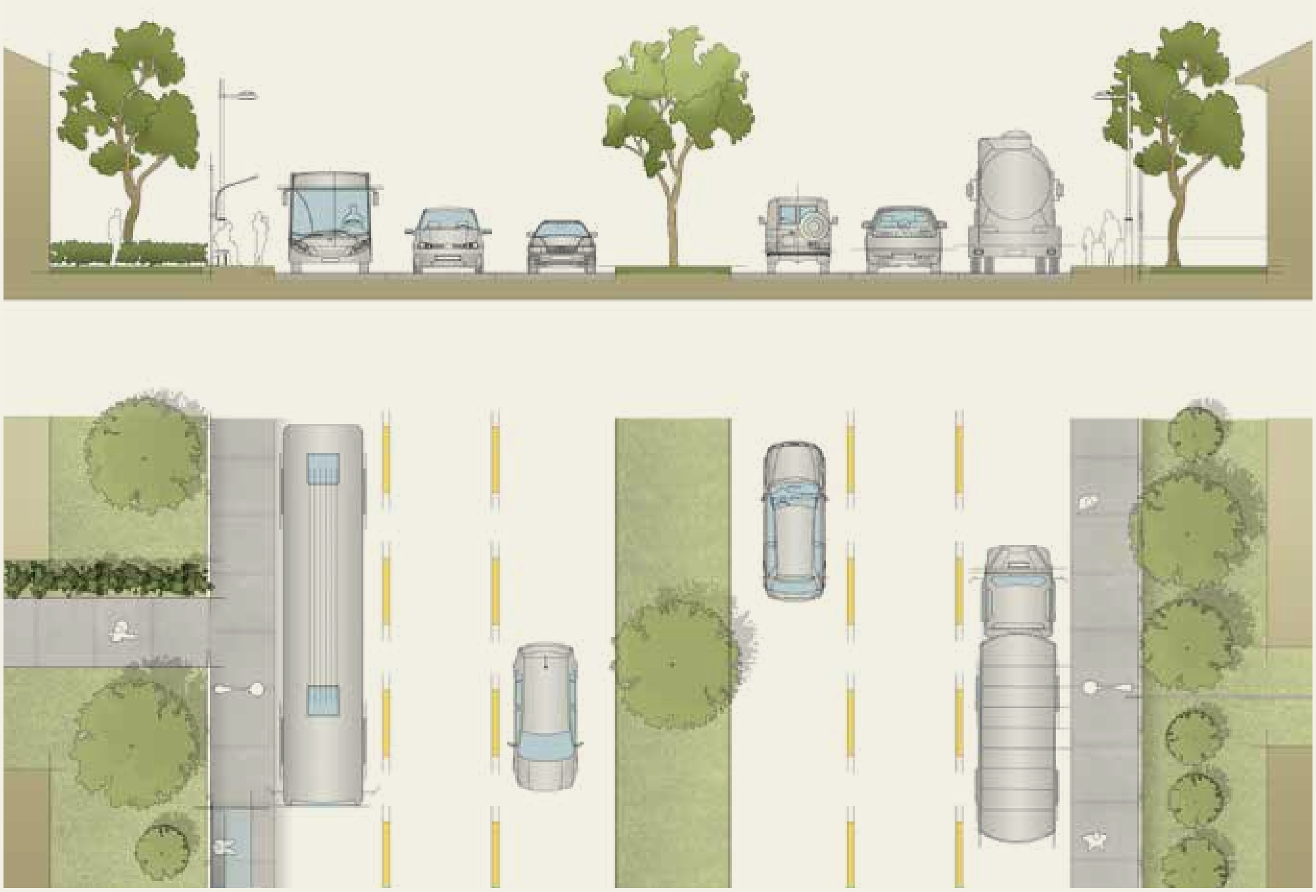


Auto priority

	MEDIUM
	LOW
	MEDIUM
	LOW
	HIGH

Key considerations

- Capacity for auto movement to be maintained
- Potential demand for walking to transit, between adjacent developments and to local facilities
- Provision of enhanced transportation stop facilities when on transit network
- Off road protected bike network
- No on-street parking
- Sound wall to mitigate impact of noise



Auto priority with center bike lane

	MEDIUM
	HIGH
	MEDIUM
	LOW
	HIGH

Key considerations

- Capacity for auto movement to be maintained
- Potential demand for walking to transit, between adjacent developments and to local facilities
- Provision of enhanced transportation stop facilities when on transit network
- Space exists within center of road to create protected bi-directional bike lane with shade and lighting
- No on-street parking

Active transportation priority

Pedestrian	MEDIUM
Bicycle	HIGH
Transit	MEDIUM
Parking	LOW
Auto	MEDIUM

Key considerations

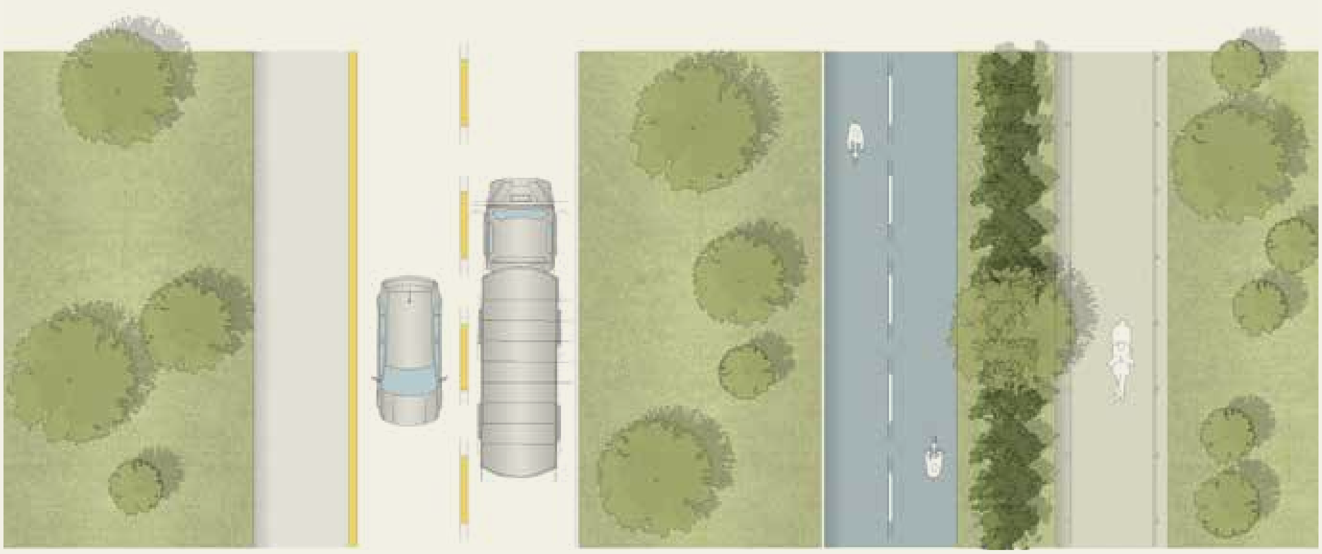
- Capacity for auto movement can be reduced
- On street bike network
- Space available by reducing number and or width of travel lanes and / or minor changes to curb alignments to create protected bike lane
- Demand for walking to transit, between adjacent developments and to local facilities
- Enhanced facilities at transit stops
- No on-street parking

Auto with horse trail priority

Key considerations

- Capacity for auto movement to be maintained
- Demand for recreational trails / facilities
- Space available for separated trails
- Connected to the bicycle network
- No on-street parking

	HIGH
	LOW
	HIGH
	LOW
P	LOW
	HIGH



ML

Mixed Land Use Corridor/Hub

Mixed land use corridors/hubs are typical of many areas in Orange County. They are part of the strategic road network and carry high volumes of traffic, however, they also present a mix of uses including retail/commercial, plus other business uses in shopping centers or large strip malls. Some of them also incorporate residential in the form of multi-occupancy dwellings. This usage attracts activity from across a wide area and makes these streets destinations in their own right.

Existing situation

The illustration below shows a typical mixed land use corridor/hub with multiple, wide travel lanes for moving high volumes of traffic.

Adjacent buildings often have off-street parking areas or structures, however, there may also be on-street parking.

Many of these corridors are also important transit routes, but waiting for a bus is not pleasant due to the lack of shelter and seating.

Pedestrian crossings are typically only provided at intersections, which may be some distance apart, making pedestrian and bicycle movements convoluted.

Sidewalks are generally present, but pedestrians may feel threatened by traffic if they are immediately adjacent to the curb, as they often are.

Walking can also be uncomfortable in the heat due to the lack of trees to provide shade.

Provision of bicycle facilities is variable.

Identify this street type: p.28

Recommendations

Pedestrian and bicycle facilities

1. Sidewalks should be wide enough to maintain a comfortable pedestrian clear zone, and incorporate a planted buffer strip to the rear of the curb.

Bicycle facilities

2. Bikeways should be physically separated from traffic (see cross-sections for variants).
3. Bicycle boxes can help cyclists wanting to turn at intersections.

Vehicle facilities

4. Travel lanes can be reduced to maintain a steady traffic while allowing provision of bicycle lanes and a central median.

Curbside management

5. On-street parking is not provided in the illustrated example, but may be present (see cross-sections).

   Transit stops should be marked on street. Where a bikeway is present, include a mixing zone or a floating stop (see B3 Technical Guidance) to enable transit users to board.

Intersections/crossings

6. Crosswalks on all intersection approaches.
7. Mid-block crosswalks should be used to improve access across the corridor, linking into wider pedestrian and bicycle networks and at key destinations (e.g. schools).
8. Bikeway markings across intersections help provide continuity for cyclists and increase driver awareness of bicycles.

Furnishing

9. Lighting should illuminate the sidewalk and the road.
10. All transit stops on high quality corridors should have shelters, with seating, a trash can, lighting, and transit information.

Landscape and urban design

11. Shade trees along sidewalks makes them more comfortable for pedestrians on hot day.
12. Buffer planting provides a barrier between traffic and pedestrians.

Proposed situation


7.
2.
4.
12.
11.
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10.
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1.
3.
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Auto priority with on street parking

Pedestrian	MEDIUM
Cycle	LOW
Transit	MEDIUM
Parking	MEDIUM
Auto	HIGH

Key considerations

- Capacity for auto movement to be maintained with accommodation of left turn lane(s) - no central landscaped central reservation
- High demand for on-street parking due to lack of existing and off street parking facilities
- Potential demand for walking to transit, between adjacent developments and to local facilities
- Provision of transportation stop facilities when on transit network
- Bicycle network on parallel street or off road

Auto priority with active transportation

Pedestrian	HIGH
Bicycle	MEDIUM
Transit	MEDIUM
P	LOW
Auto	HIGH

Key considerations

- Capacity for auto movement to be maintained with accommodation of left turn lane(s)
- No demand for on-street parking and/or adequate off street parking facilities provided
- On-road bicycle network
- Space available by reducing width of travel lanes and/or minor changes to curb alignments to create bicycle lane
- Demand for walking to transit, between adjacent developments and to local facilities
- Demand for transit with provision of transportation stop facilities

Balanced movement priorities

Pedestrian	HIGH
Bike	MEDIUM
Transit	MEDIUM
Parking	MEDIUM
Auto	MEDIUM

Key considerations

- Capacity for auto movement to be maintained within two lanes with central reserve
- High demand for on-street parking due to lack of existing and off street parking facilities
- On-road bike network
- Space is made available by reducing width of travel lanes and / or minor changes to curb alignments to create a bike lane
- Where space allows add a buffer strip
- Demand for walking to transit, between adjacent developments and to local facilities
- Demand for transit with provision of transportation stop facilities

Pedestrian and bicycle priority

Pedestrian	HIGH
Bicycle	HIGH
Transit	MEDIUM
Parking	LOW
Vehicle	MEDIUM

Key considerations

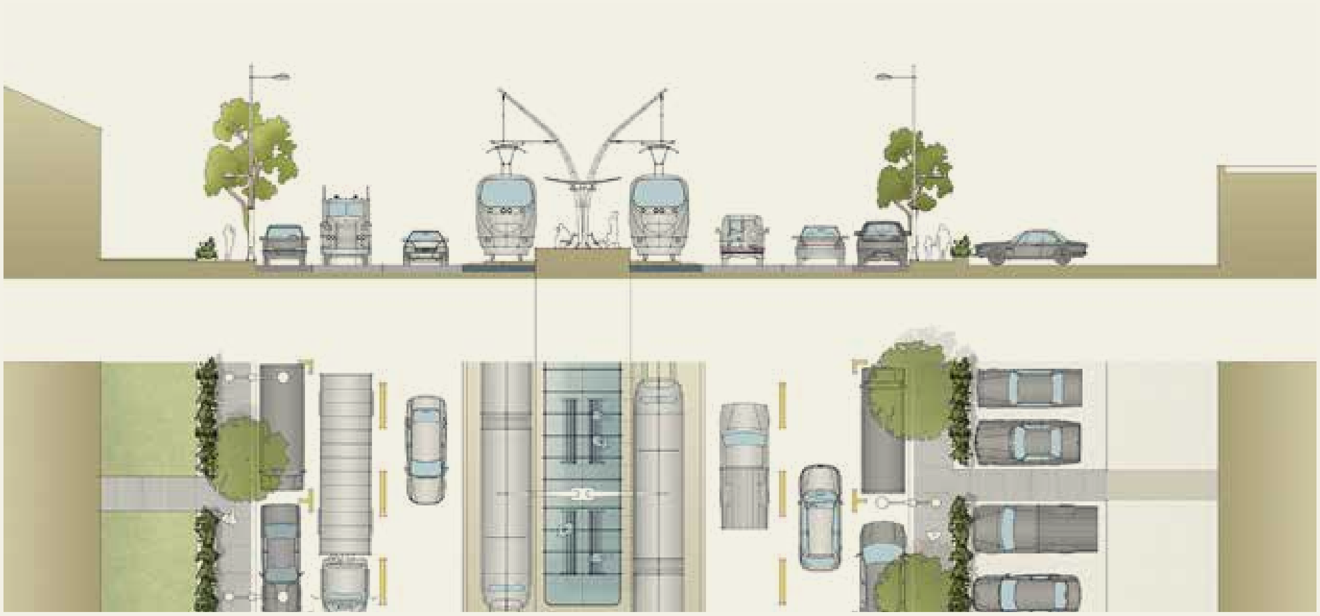
- Capacity for auto movement to be maintained within two lanes with central reserve
- No demand for on-street parking and / or adequate off street parking facilities provided
- On-road bike network
- Space available within landscape areas and / or by reducing travel lane width / curb alignment for a separated on street bicycle facility connected to wider bike network
- High demand for walking to transit, between adjacent developments and to local facilities
- Demand for transit with provision of transportation stop facilities

Auto priority with on street parking and transit

Pedestrian	MEDIUM
Cycling	LOW
Transit	MEDIUM
Parking	LOW
Auto	HIGH

Key considerations

- Capacity for auto movement to be maintained with accommodation of left turn lane(s) - no central landscaped central reservation
- High demand for on-street parking due to lack of existing and off-street parking facilities
- Potential demand for walking to transit, between adjacent developments and to local facilities
- Provision of transportation stop facilities when on transit network
- Bicycle network on parallel street or off road

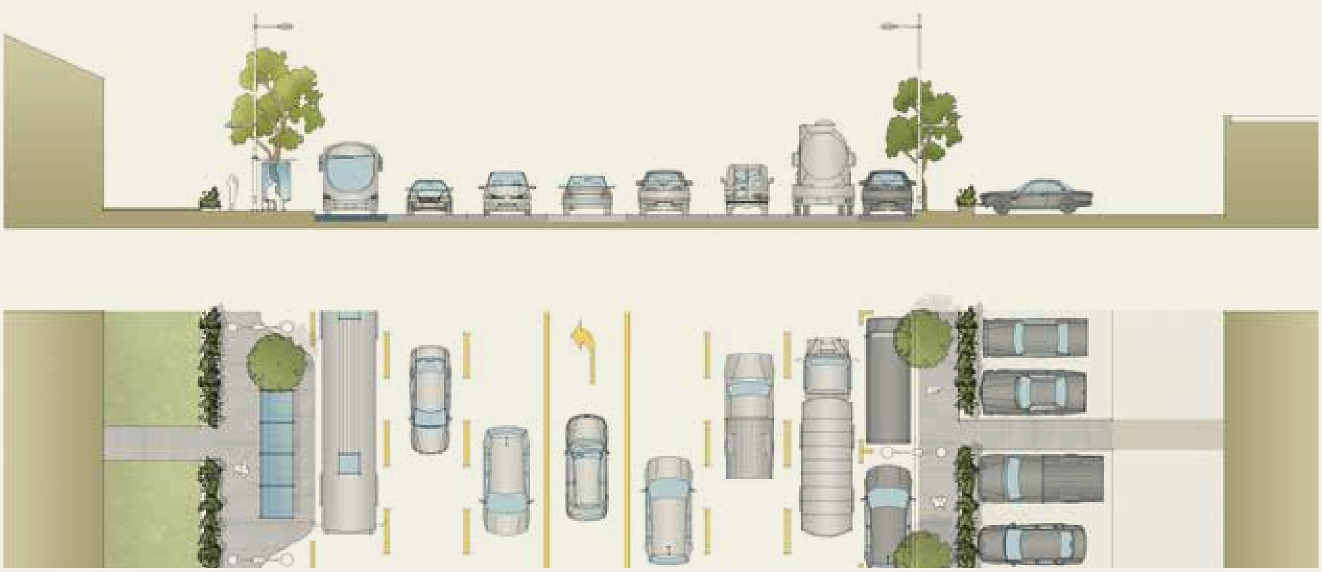


Priority for dedicated transit ROW with on street parking

Pedestrian	MEDIUM
Bicycle	LOW
Transit	HIGH
Parking	MEDIUM
Auto	MEDIUM

Key considerations

- High demand for dedicated ROW for transit in central reserve or reallocated center lanes
- Transit dedicated ROW could be streetcar/light rail, BRT/bus priority or center running bike lanes
- Capacity for auto movement reduced to accommodate transit
- High demand for on-street parking due to lack of off street parking facilities
- Demand for walking to transit, between adjacent developments and to local facilities
- Provision of transportation stop facilities when on transit network
- Bicycle network on parallel street or off road



BP

Industrial/Business Park Street

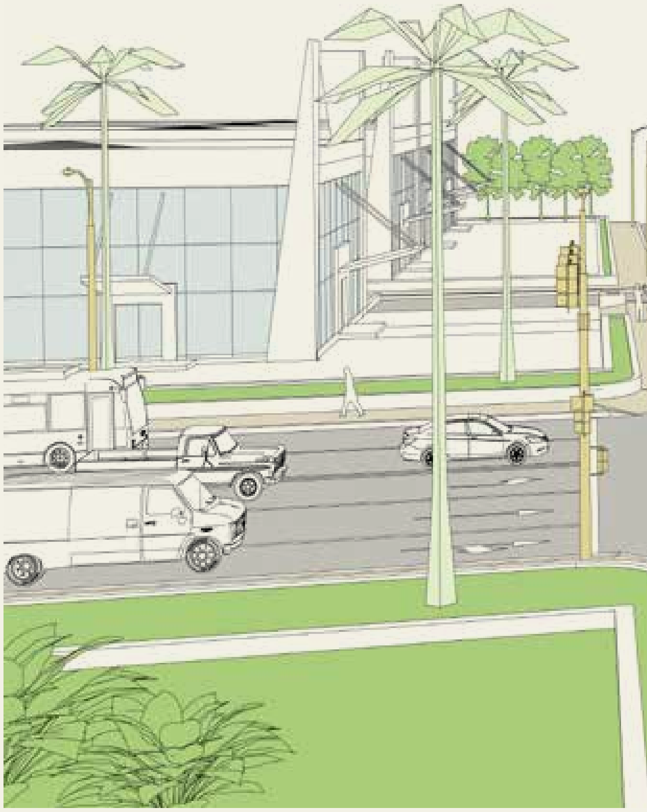
Industrial or business park streets are those serving industrial zones, which typically have large buildings set back from the road behind parking and landscaped areas. The streets are designed for automobile and truck priority and are largely used by traffic accessing specific businesses located in the area.

Existing conditions

The illustration below shows a typical street in an industrial / business area with wide travel lanes.

Adjacent buildings will typically have off-street parking areas or structures.

These streets are often served by transit, but waiting for a bus is not pleasant due to the lack of shelter and seating.



Pedestrian crosswalks are typically only provided at intersections, which may be some distance apart and make walking convoluted.

Sidewalks are usually present but may be missing from sections. Also, connections from the sidewalk to individual buildings may be missing, and access roads into sites often do not have sidewalks.

Walking can also be uncomfortable in the heat due to the lack of trees to providing shade.

Typically there are no facilities for cyclists.

Identify this street type: p.30

Recommendations

Pedestrian facilities

1. Sidewalks should be provided on both sides of the road and be at least minimum width.

2. They should connect to adjacent development to avoid walking in the parking lot access road.

Bicycle facilities

3. Bikeways should be buffered from traffic.

Vehicle facilities

4. Width of travel lanes can be reduced to maintain a steady traffic flow and allow provision of bicycle lanes, however, it is important to ensure that widths are adequate for larger vehicles, especially for when they turn to access properties.

Curbside management

On-street parking is not provided in the illustrated example, but may be present in some industrial areas where off-street parking is more limited (see cross-sections).

5. Transit stops should be marked on street. Where a bikeway is present, a mixing zone or a floating stop (see see B3 Technical Guidance) can be used to enable transit users to board.

Intersections/crossings

6. Intersections should have crosswalks on all approaches. Safety islands should be incorporated.

Mid-block crossings should be provided, where appropriate to access local destinations and transit stops.

Furnishing

7. Street lighting should include pedestrian-focused lamps to light sidewalks.

8. All transit stops should have shelters, with seating, a trash can, lighting, and transit information.

Landscape and urban design

9. Shade trees along sidewalks makes them more comfortable for pedestrians on hot days.

10. Bio-retention swales in median strips and buffer planting can be used instead of impervious surfaces.

Proposed situation


7.
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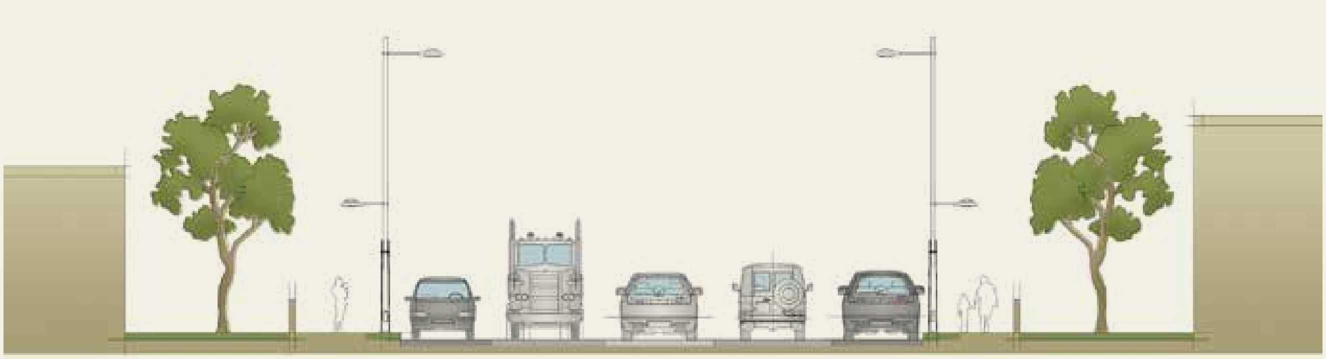
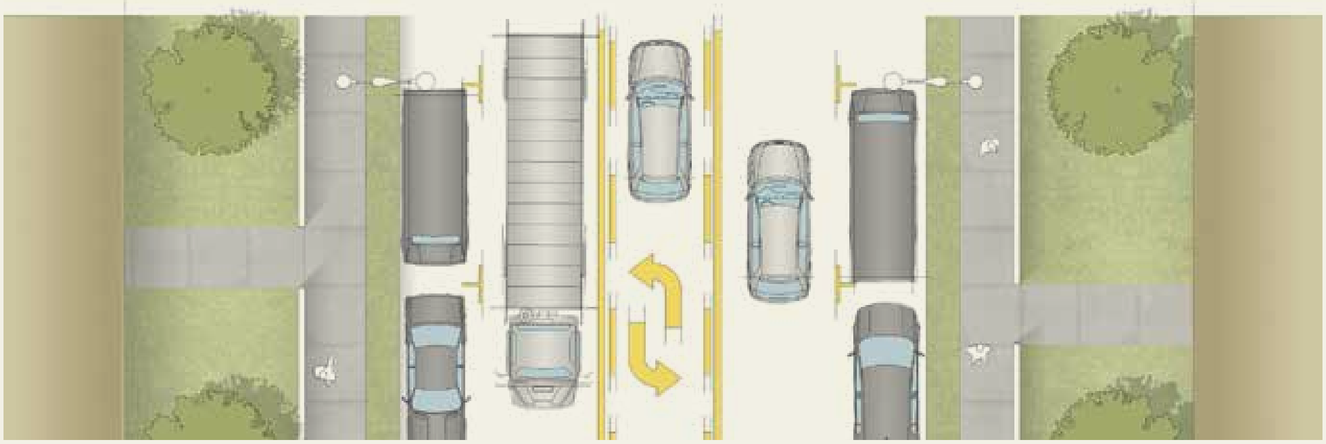
Auto priority

Walking	MEDIUM
Cycling	LOW
Transit	MEDIUM
Parking	LOW
Auto	HIGH

Key considerations

- High demand for on-street parking due to lack of existing and off-street parking facilities
- Capacity for auto circulation and access to be maintained
- Key transit route and bicycle network off road or on a parallel street
- Potential demand for walking to transit, between adjacent developments and to local facilities



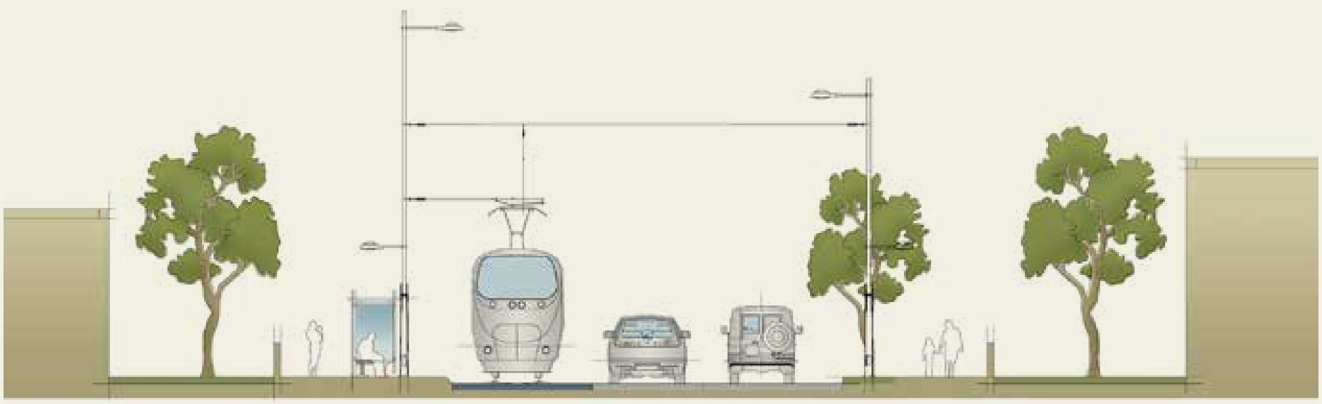


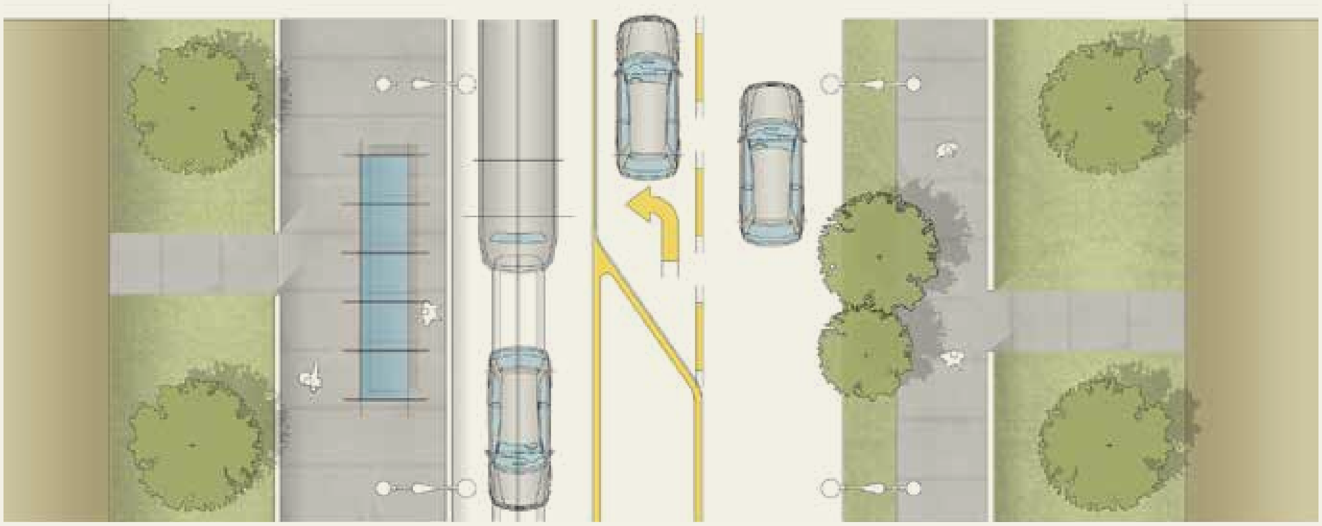
Transit priority

Pedestrian	HIGH
Bicycle	LOW
Transit	HIGH
Parking	LOW
Auto	LOW

Key considerations

- Fixed route for transit streetcar
- High demand for walking to transit, between adjacent developments and to local facilities
- Capacity to reduce space allocation for auto circulation and access
- Low demand for on-street parking and/or adequate off- street parking facilities provided
- Bicycle network on parallel streets or off road



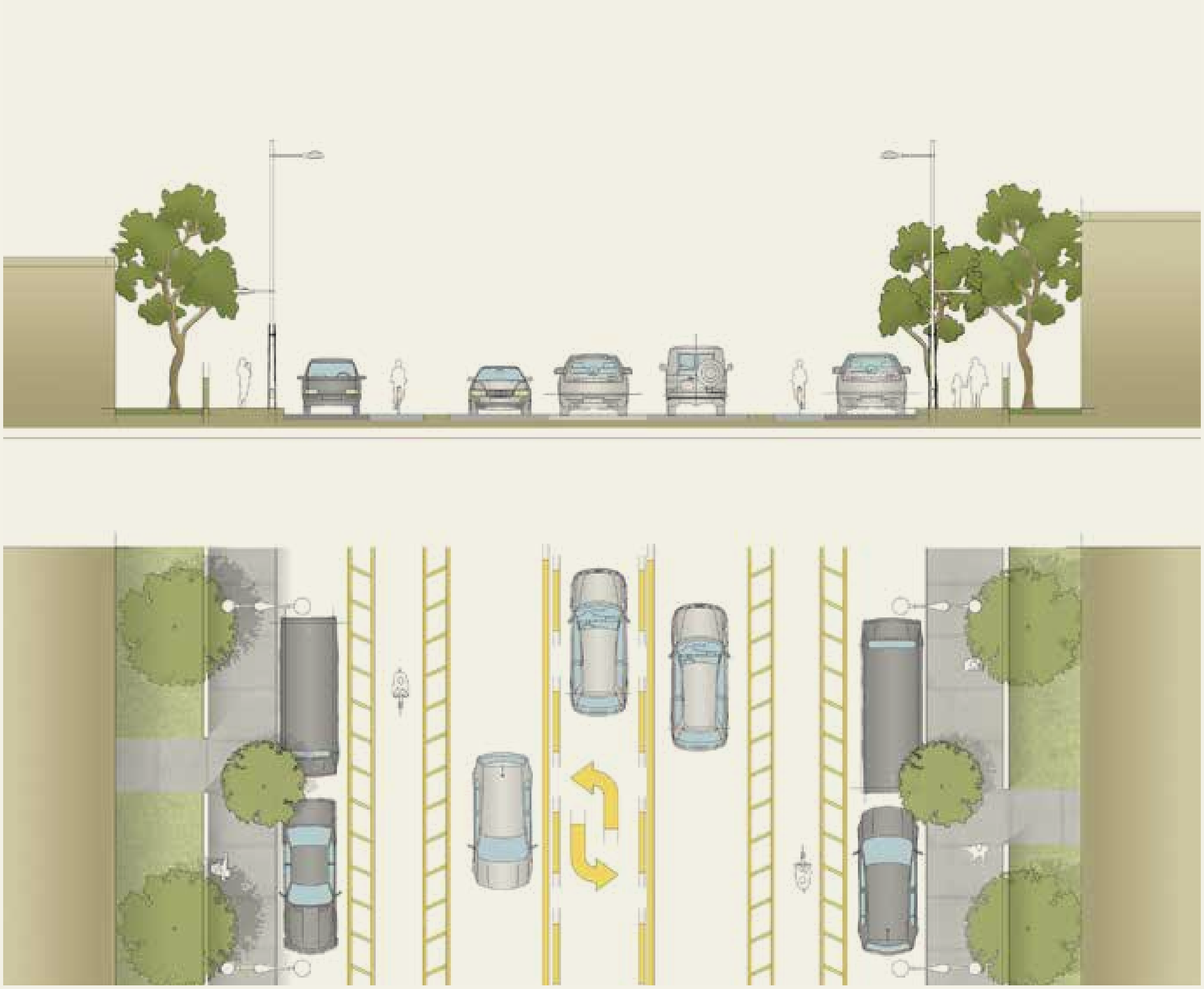


Pedestrian and bicycle priority with parking

Pedestrian	HIGH
Bicycle	HIGH
Transit	LOW
Parking	MEDIUM
Auto	MEDIUM

Key considerations

- On-street buffered bicycle network
- High demand for on-street parking due to lack of existing and off street parking facilities
- High potential demand for walking to transit, between adjacent developments and to local facilities
- Capacity to reduce space allocation for auto circulation and access

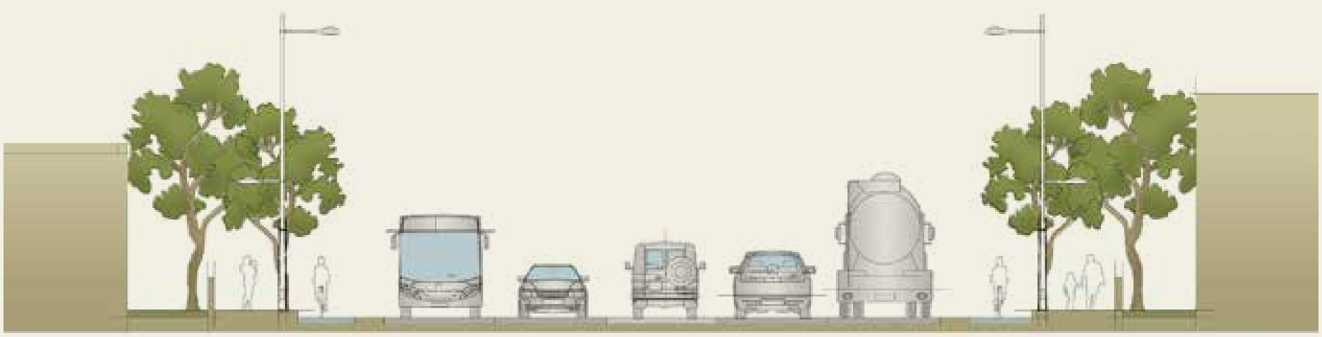


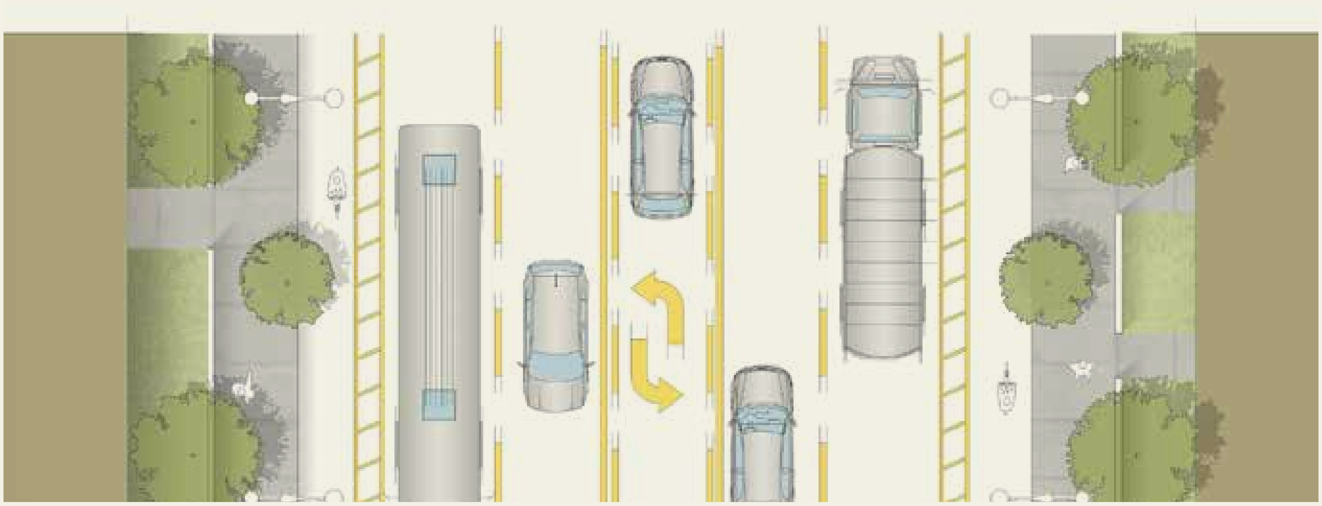
Pedestrian and bicycle priority with auto

Key considerations

- On-street buffered bicycle network
- Capacity for auto circulation and access to be maintained
- Low demand for on-street parking and/or adequate off -street parking facilities provided
- High potential demand for walking to transit, between adjacent developments and to local facilities

Pedestrian	HIGH
Bicycle	HIGH
Transit	MEDIUM
Parking	LOW
Auto	HIGH



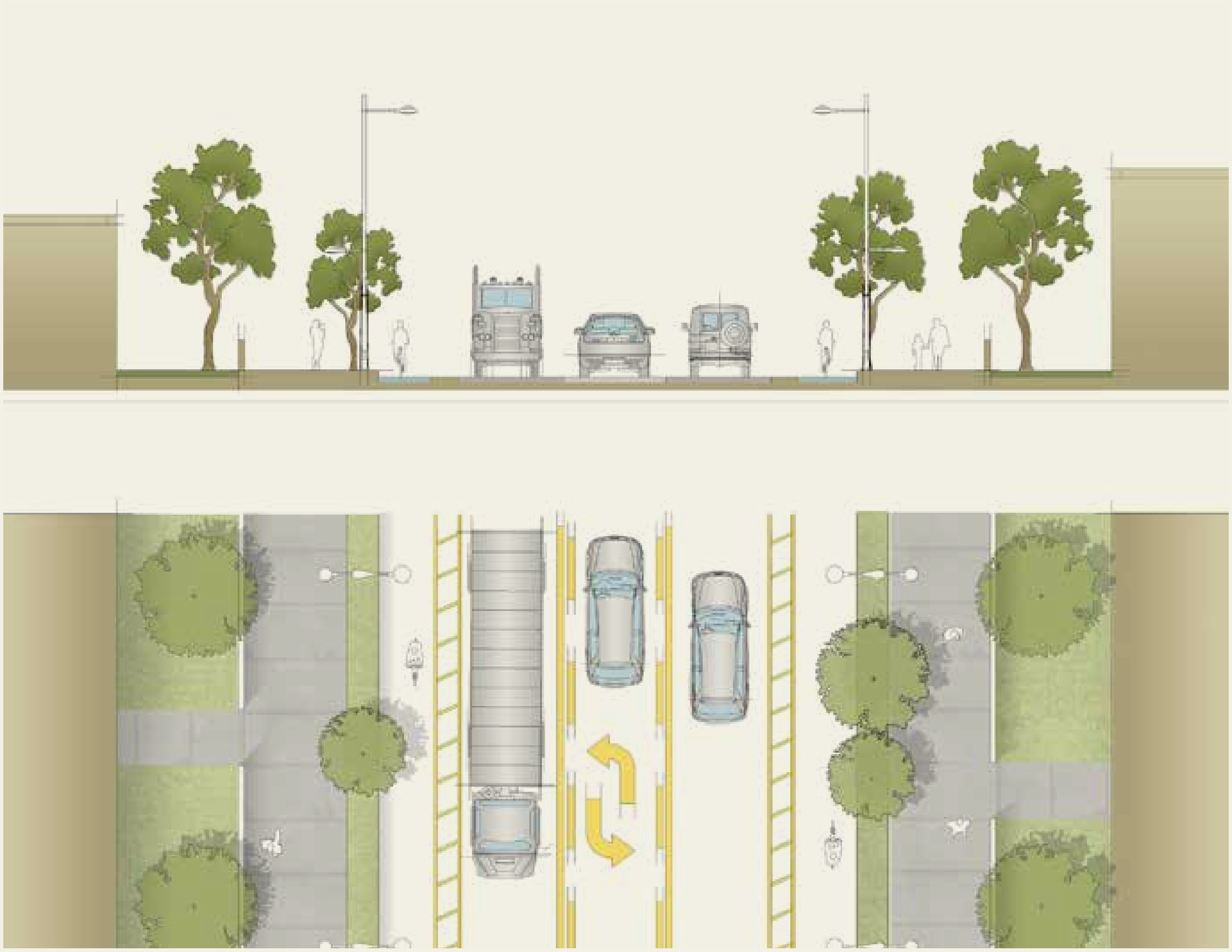


Road diet

Key considerations

- On-street bicycle network
- Capacity to reduce space allocation for auto circulation and access
- Low demand for on-street parking and / or adequate off-street parking facilities provided
- High potential demand for walking to transit, between adjacent developments and to local facilities

Pedestrian	HIGH
Bicycle	HIGH
Transit	LOW
P	LOW
Auto	MEDIUM



Neighborhood Main Street

A neighborhood main street is a mixed use main street which attracts people from across a neighborhood or city. Streets are typically designed for a mix of transportation modes including pedestrian and sometimes bicycle movement. Buildings are usually two to three stories in scale and positioned on the edge of the sidewalk. This type may include small neighborhood street malls with parking in front. Uses include shops, restaurants, workplaces, and recreation facilities.

Existing conditions

The illustration below shows a typical neighborhood main street with two lanes of traffic and on-street parking.

Pedestrian crossings are located at intersections, and block sizes are generally smaller on these streets, thereby providing more frequent crossing points.

Sidewalks are present and buildings front directly onto them. There may be seating alongside the frontage associated with adjacent uses.

Typically there are no facilities for cyclists.

Street tree planting may be limited due to space between sidewalk and building façade for canopy to develop.

Identify this street type: p.32

Recommendations

Pedestrian facilities

1. Maintain a comfortable sidewalk width, sufficient for a clear pedestrian movement zone plus seating for cafes and / or other street furniture.

Bicycle facilities

2. Bikeways should be buffered from parking.

Vehicle facilities

3. Reduce width of travel lanes to maintain slow and steady speeds and allow provision of bicycle lanes.

Curbside management

4. On-street parking should be maintained, however, consider changing it to back-in angle parking. This helps maintain a slower speed environment.

5. Parklets can replace parking in selected locations to provide additional seating and amenity.

   If transit facilities are present (see cross-sections), then provide curb bulb-outs and a high quality waiting environment with shelter, seating, trash can, lighting, and transit information.

Intersections/crossings

6. Intersections should have marked crossings on all arms. Use curb extensions (bulb-outs) to shorten crossing distances.

   If blocks are long, then provide mid-block crossing points.

Furnishing

7. Street lighting should include pedestrian-focused lamps to light sidewalks.

   All transit stops should have shelters, with seating, a trash can, lighting, and transit information.

Landscape and urban design

8. Shade trees along sidewalks make them more comfortable for pedestrians on hot days.

9. Distinctive planting can be used to slow traffic and provide amenity for street users while also promoting a sense of local identity.

Proposed situation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Auto priority

Pedestrian	HIGH
Bicycle	LOW
Transit	LOW
Parking	MEDIUM
Auto	HIGH

Key considerations

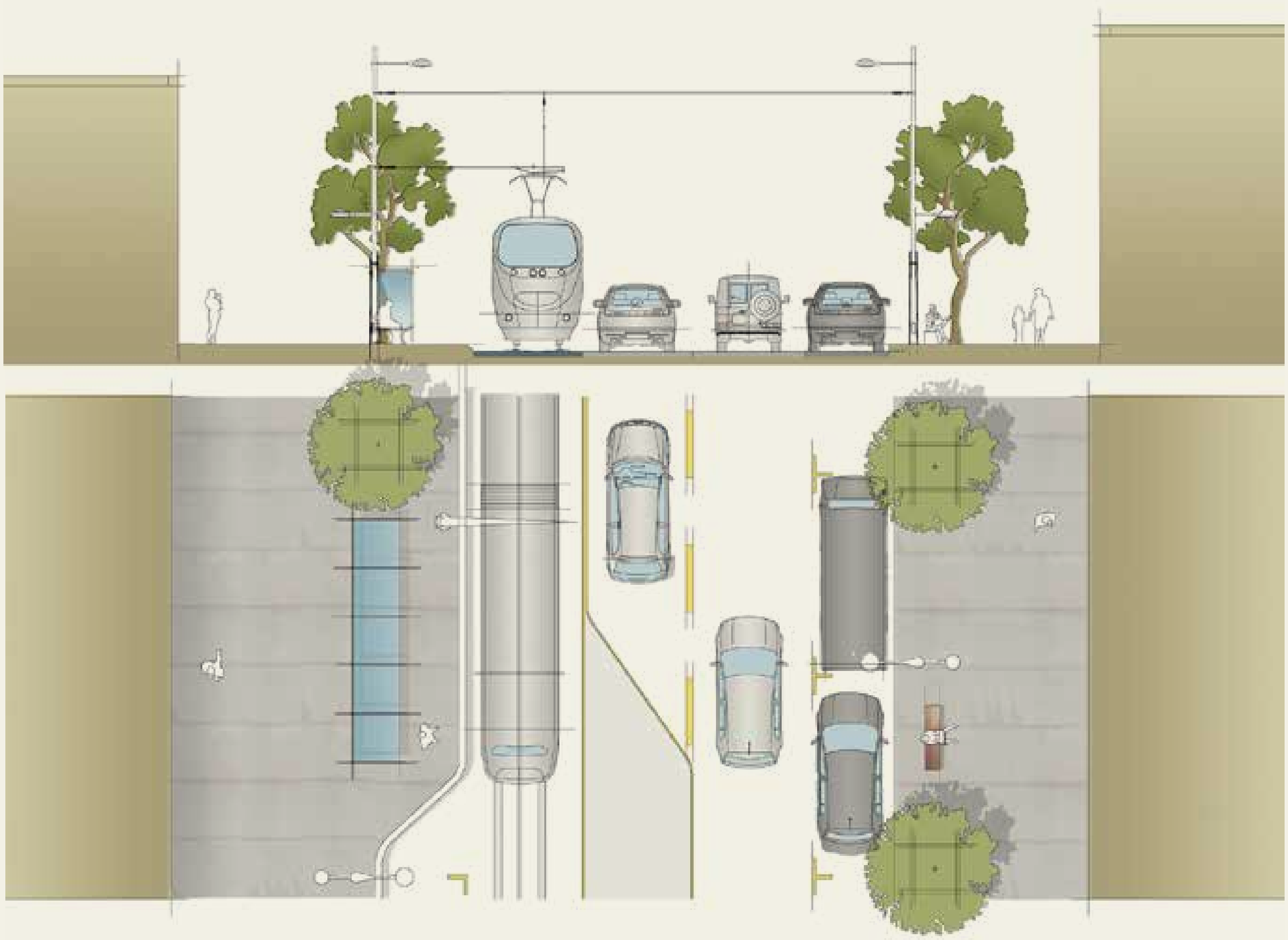
- High demand for walking and strolling along Main Street
- High demand for short-term on-street parking to access local businesses
- Capacity for auto circulation and access to be maintained
- Capacity to incorporate transit facilities if demand exists
- Bicycle network on parallel streets

Transit priority

Pedestrian	HIGH
Bicycle	LOW
Transit	HIGH
Parking	MEDIUM
Auto	MEDIUM

Key considerations

- Fixed route for streetcar transit in one direction
- High demand for walking and strolling along Main Street, as well as access to transit
- Capacity to reduce space allocation for auto circulation and access - autos to share lane with streetcar
- Bicycle network on parallel streets
- Demand for short-term on-street parking to access local businesses

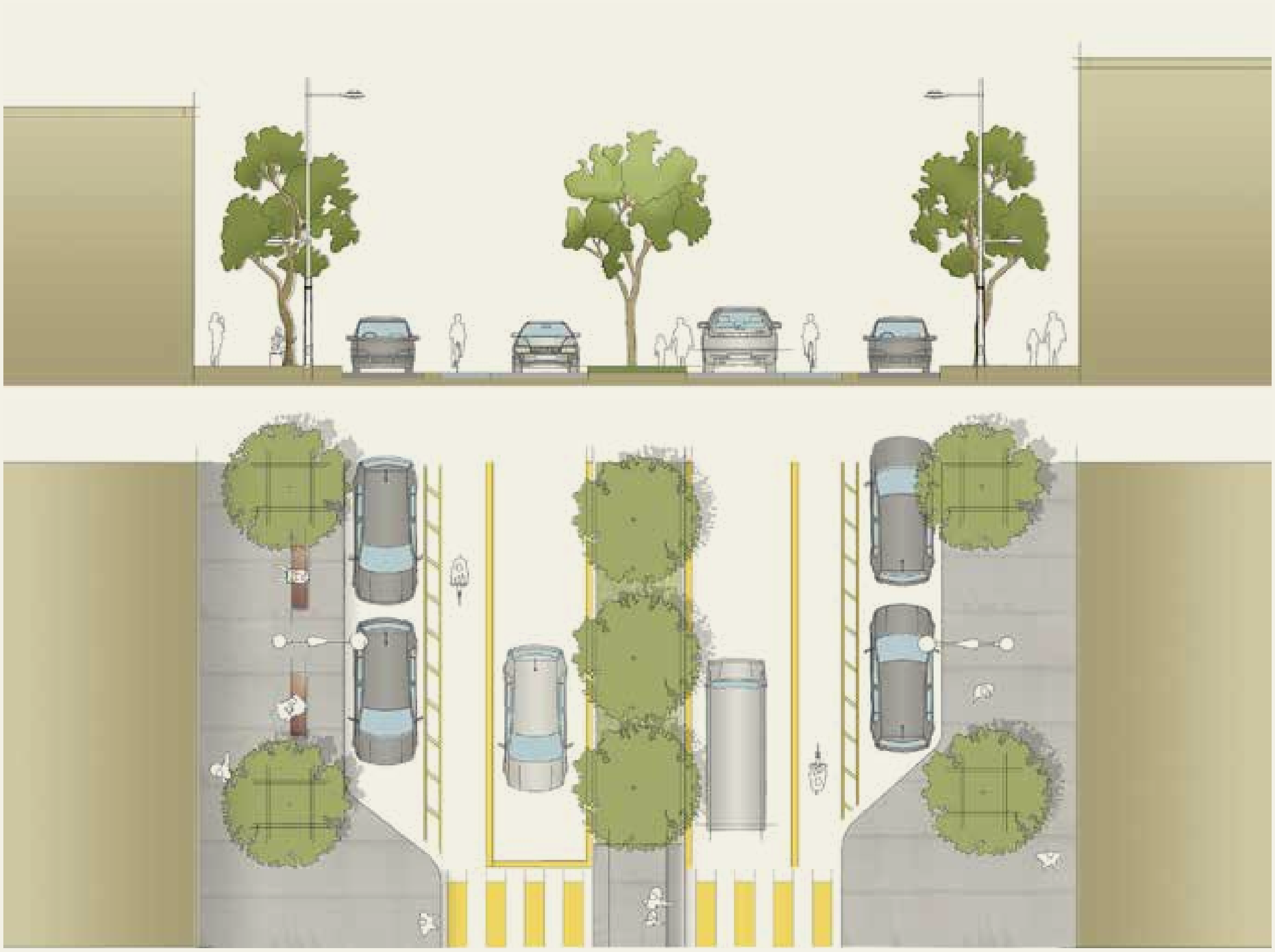


Pedestrian and bicycle priority

Pedestrian	HIGH
Bicycle	HIGH
Transit	LOW
P	MEDIUM
Auto	MEDIUM

Key considerations

- High demand for walking and strolling along Main Street, as well crossing between both sides of the street
- On-street bicycle network
- High demand for short-term on-street parking to access local businesses
- Capacity to reduce space allocation for auto circulation and access
- Off-street transit network



DS

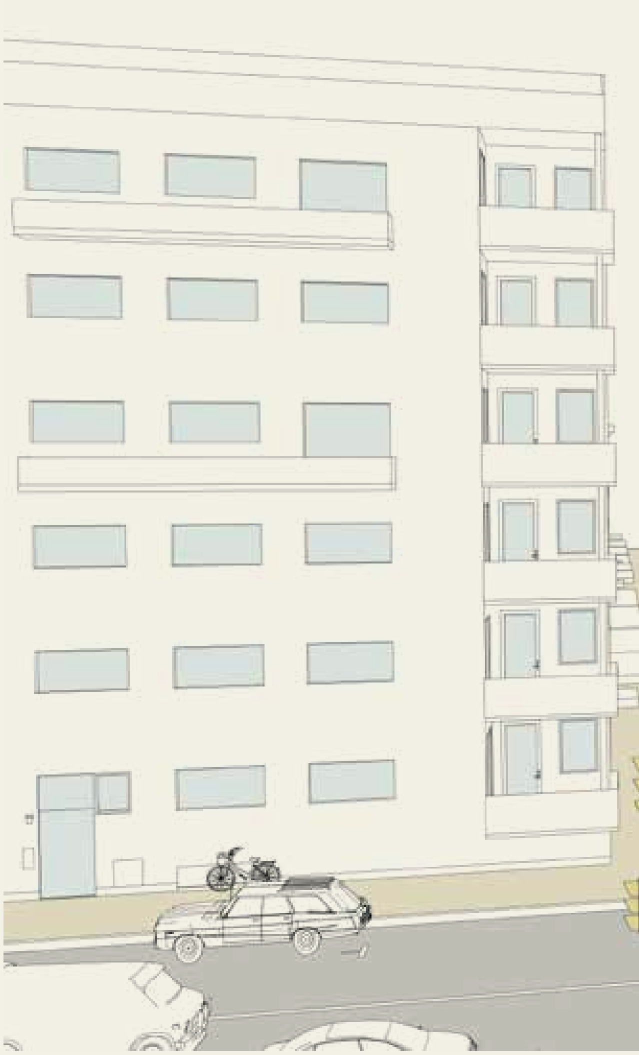
Downtown Street

A downtown street is one in the heart of a high density or urban downtown area, typically attracting visitors and workers from across the city and the County, with a significant amount of sidewalk activity. Streets are already designed for a mix of transportation modes including pedestrian and transit, and often bicycle movement. Buildings are often larger in scale and positioned at the back of a wide sidewalk. Uses include shops, workplaces, and recreation facilities.

Existing conditions

The illustration below shows a typical downtown street with four lanes of traffic and on-street parking.

Downtown streets are often served by transit, however, passenger waiting areas may lack shelters, seating, and transit or local area information.



Pedestrian crossings tend to be located at intersections only.

Sidewalks can be wide, though are not always. Buildings may front directly onto them, or may be set back behind a private strip of landscape or parking.

Typically there are no facilities for cyclists.

Limited tree planting due to a lack of space on sidewalk for the tree canopy to develop.

Identify this street type: p.34

Recommendations

Pedestrian facilities

1. Maintain wide sidewalks with a clear pedestrian zone, and a street furniture / planting zone alongside the curb to buffer pedestrians from traffic.

Bicycle facilities

2. Bikeways should be buffered from parking and protected from travel lanes with a curb or other physical separator unless parking is present.

Vehicle facilities

3. Width of travel lanes should be reduced to maintain lower speeds more appropriate to the multimodal environment speeds and allow provision of bicycle lanes.

Curbside management

4. Parklets can replace parking in selected locations to provide additional seating and amenity.
5. On-street parking could be maintained and can be set behind curb-extensions.
6. Transit stops should be marked on street. A mixing zone or a floating stop enables transit users to board across a bikeway.

Intersections/crossings

7. Intersections should have marked crossings on all arms. Different surfacing can more strongly indicate crossings, and curb extensions (bulb-outs) shorten crossing distances.
8. If blocks are long then mid-block crossing points should be provided.
9. Raised crossings can be used to give pedestrians priority on side roads.

Furnishing

10. Street lighting should include pedestrian-focused lamps to light sidewalks.
11. On key routes, transit stops should have shelters with seating, a trash can, lighting, and transit information.

Landscape and urban design

12. Shade trees along sidewalks make them more comfortable for pedestrians on hot days.

    A coordinated approach to planting and high quality street furniture can promote local identity.

Proposed situation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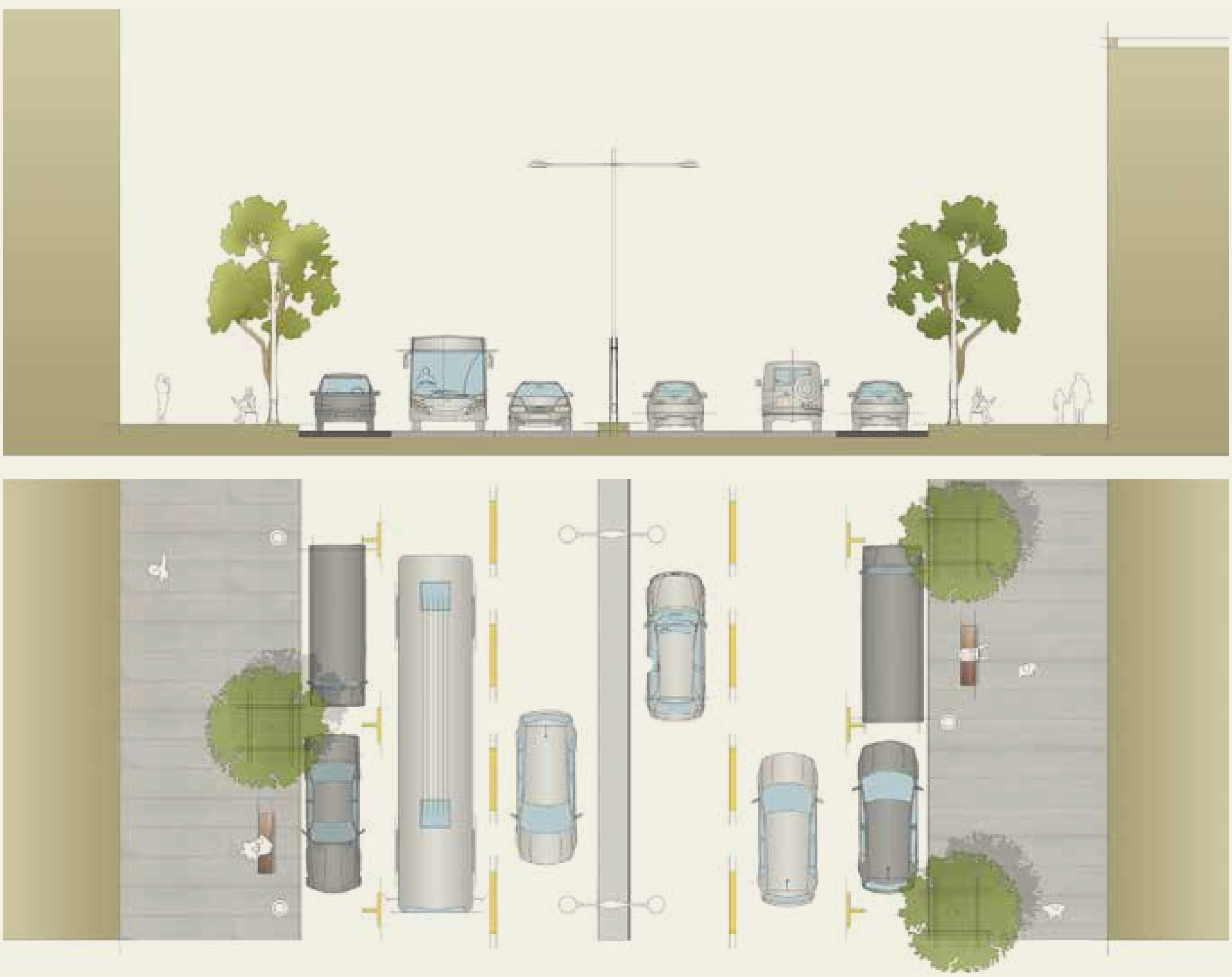
12.

Auto priority

- HIGH
- LOW
- MEDIUM
- MEDIUM
- HIGH

Key considerations

- High demand for walking along street
- High demand for short-term on street parking to access local businesses
- Capacity for auto circulation and access to be maintained
- Capacity to incorporate transit facilities
- Bicycle networks are provided on parallel streets

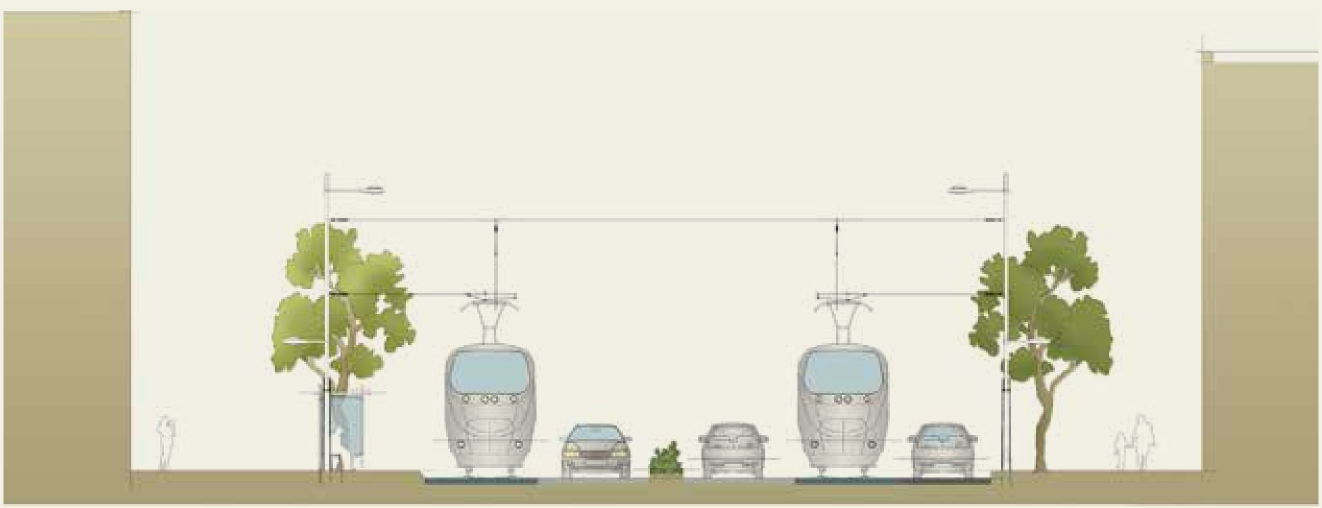


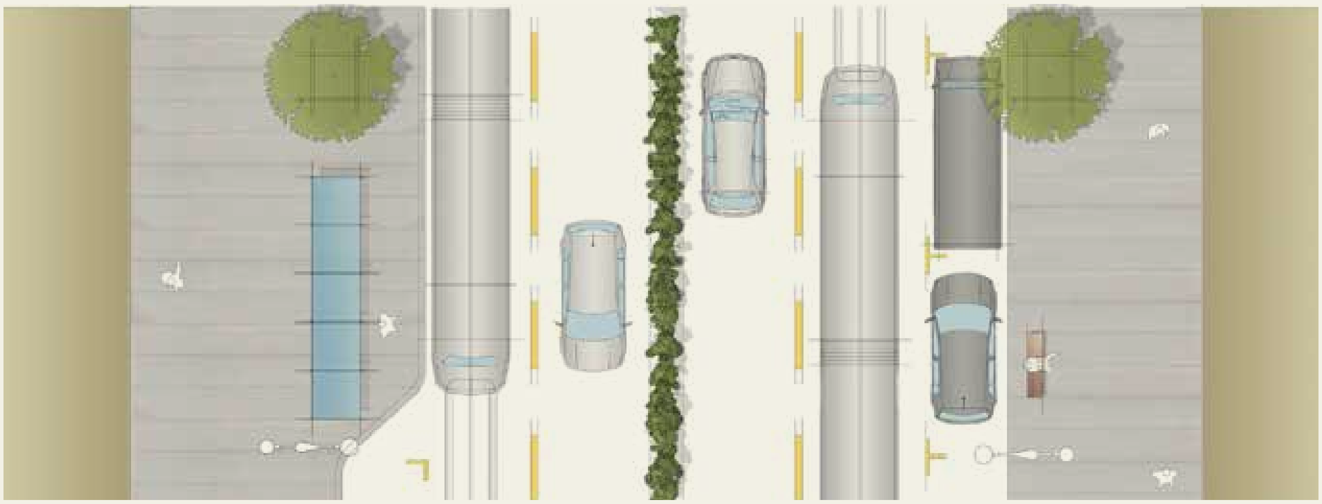
Transit priority

Pedestrian	HIGH
Bicycle	LOW
Transit	HIGH
Parking	MEDIUM
Auto	MEDIUM

Key considerations

- Fixed route for streetcar transit in both directions
- High demand for walking and strolling along street, as well as access to transit
- Bicycle networks are provided on parallel streets
- Demand for short-term on-street parking to access local businesses
- Capacity to reduce space allocation for auto circulation and access - autos to share lane with streetcar



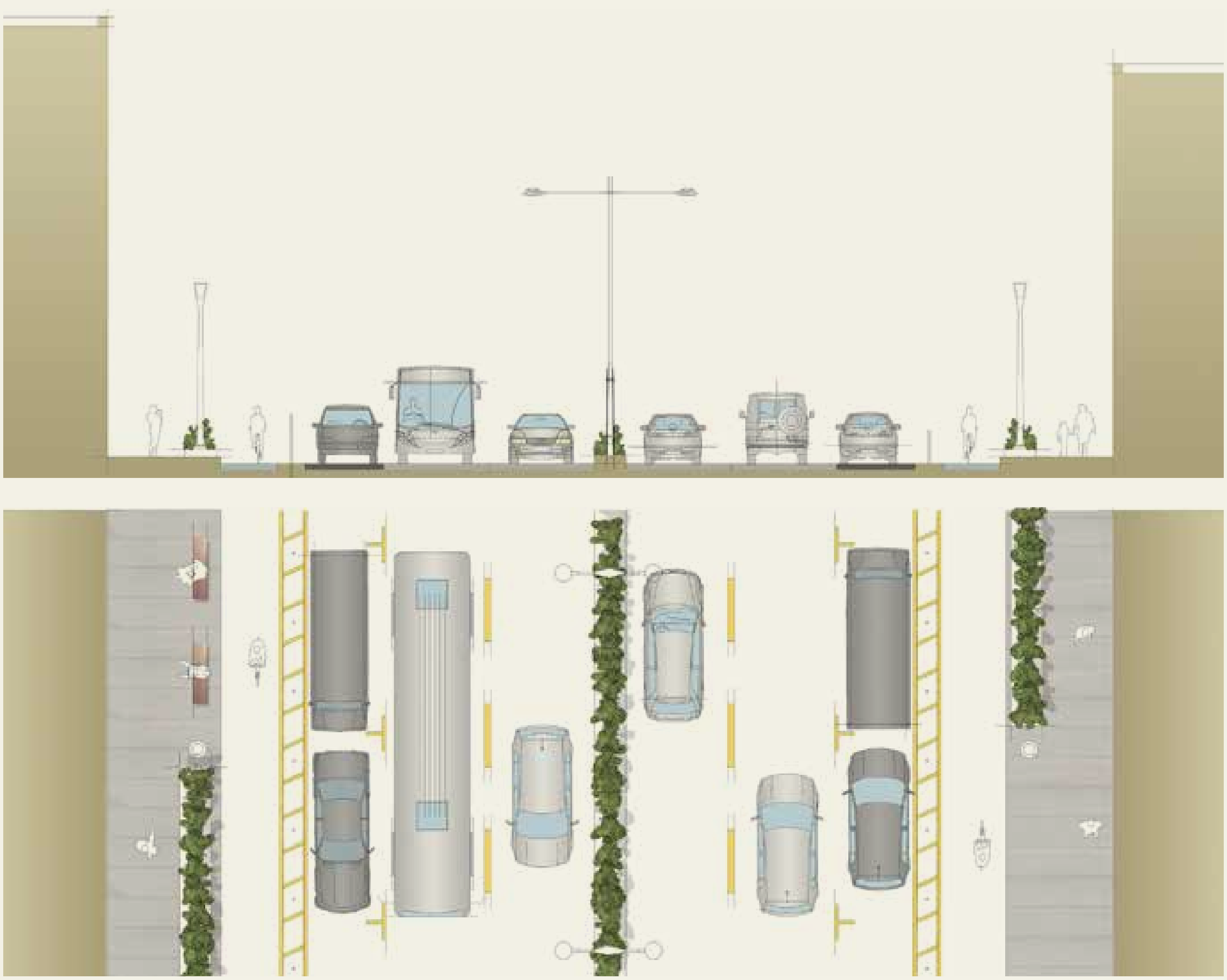


Pedestrian and bicycle priority

	HIGH
	HIGH
	MEDIUM
P	MEDIUM
	HIGH

Key considerations

- High demand for walking along street
- On-street bicycle network
- High demand for short-term on-street parking to access local businesses
- Capacity to maintain space allocation for auto circulation and access
- Capacity to incorporate transit facilities

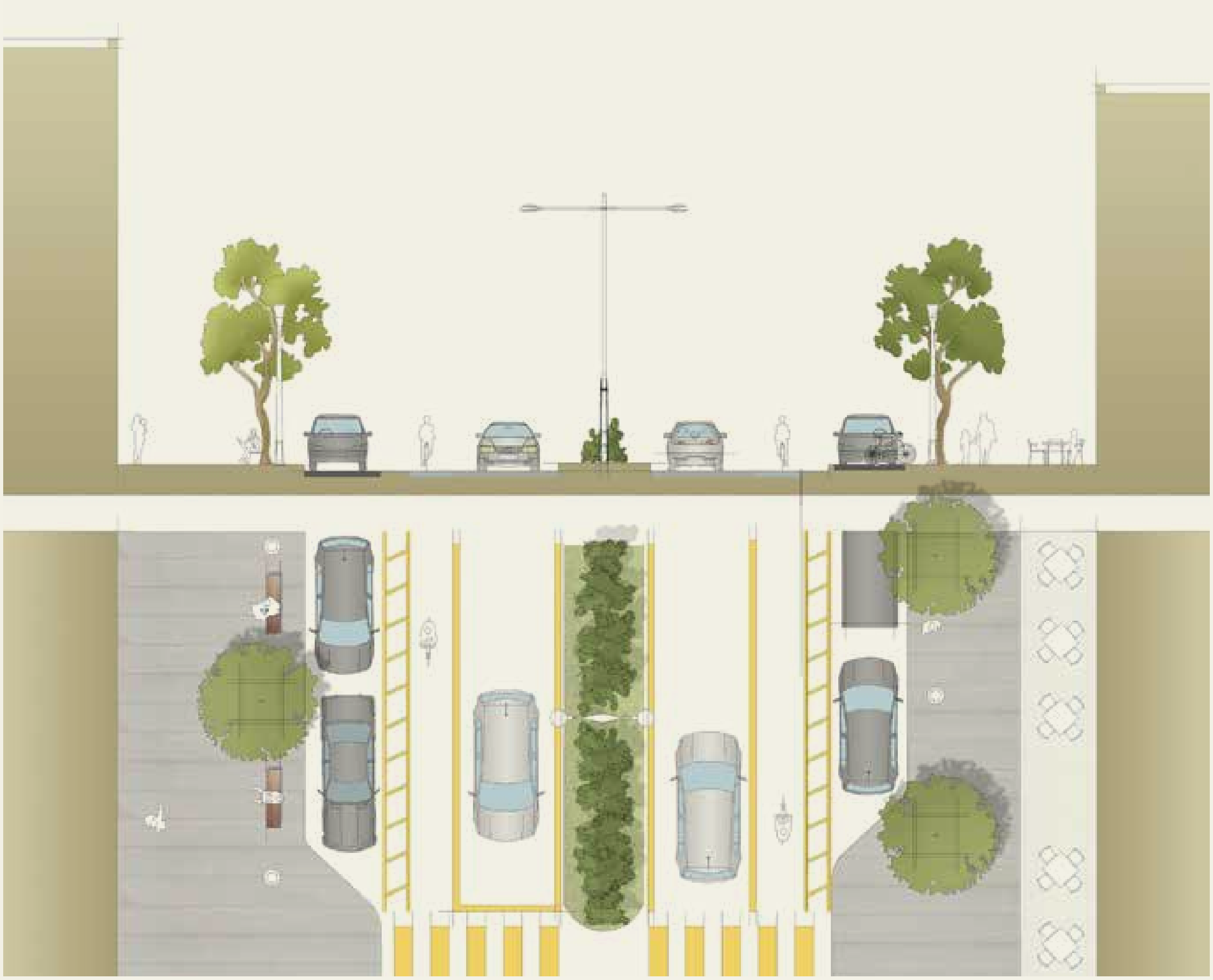


Road diet

Key considerations

- High demand for walking and strolling street, and crossing between both sides of the street
- On-street bicycle network
- High demand for short-term on-street parking to access local businesses
- Capacity to reduce space allocation for auto circulation and access

Pedestrian	HIGH
Bicycle	HIGH
Transit	LOW
Parking	MEDIUM
Auto	LOW



AL

Alley

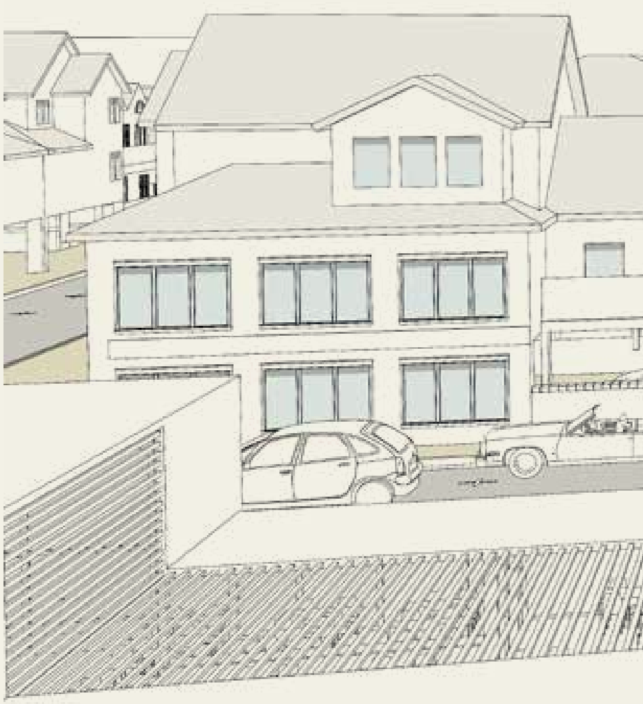
Alleys are local streets which provide rear access to buildings. They are common in some of the coastal communities in Orange County, generally in residential areas, though they sometimes serve commercial buildings as well. Traffic is low in terms of volume and speed, and is primarily associated with access to residential garages, servicing garbage trucks and ensuring emergency access.

Existing conditions

The illustration below shows a typical alley, with a single pavement surface and no lane markings.

There are no sidewalks or bicycle facilities; given low volume and speed of traffic, these streets are shared between all users.

Informal on-street parking may take be present, however, most of the parking tends to be off-street either within garages or in driveways.



Identify this street type: p.36

Recommendations

Pedestrian facilities

1. In residential alleys, maintain as shared surface, with no sidewalks. Ramps and curb cuts should be provided at entrance from side streets.

2. In commercial contexts, consider closing to traffic and making pedestrianized.

Bicycle facilities

No specific bicycle facilities are required, however, surfacing in residential alleys should be continuous and even to facilitate access to buildings.

Vehicle facilities

3. Ramped access to residential access lanes can keep vehicle speeds low.

4. In commercial contexts, emergency vehicle access can be facilitated with removable bollards.

Curbside management

5. Access to garages and off-street parking should be maintained. Curb extensions can prevent side street parking from obstructing lane entrance.

6. Planting on access lanes should not obstruct vehicle access, especially emergency and service vehicles.

Intersections/crossings

7. Entrance crossovers should be finished in the same material as adjoining sidewalks and at the same level.

8. Marked crosswalks over side roads are not required, but curb extensions can shorten crossing distances.

Furnishing

9. Minimum lighting for residential lanes should be maintained. Additional pedestrian lighting should be provided in commercial alleys.

Landscape and urban design

10. Pervious paving materials can be used to absorb stormwater run-off. Where appropriate, pocket planting can be provided with small trees.

11. High quality street furniture can be used in commercial alleys to promote local identity.

Proposed situation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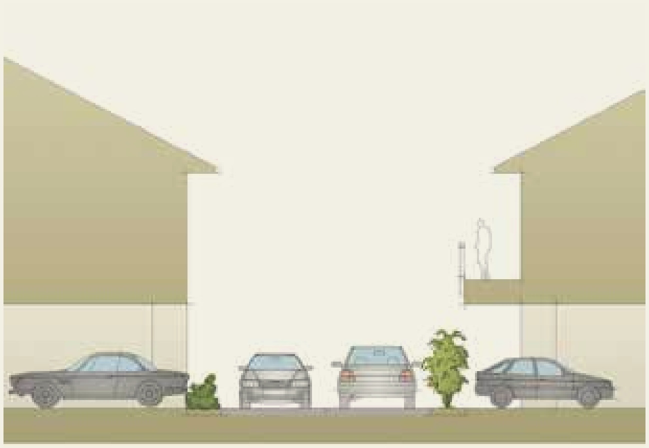
11.

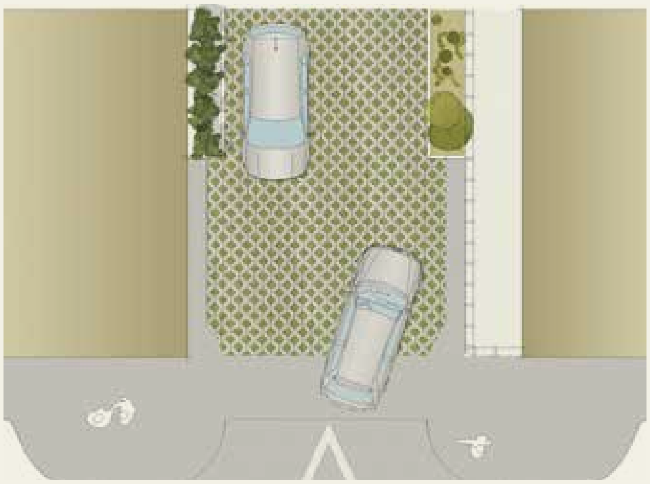
Auto priority

Pedestrian	MEDIUM
Cycling	MEDIUM
Transit	LOW
Parking	LOW
Auto	HIGH

Key considerations

- High demand for access along alley for parking, servicing, delivery and emergency vehicles
- Low demand for on-street parking
- Low vehicle speed
- Pedestrians and cyclists to share alley with autos



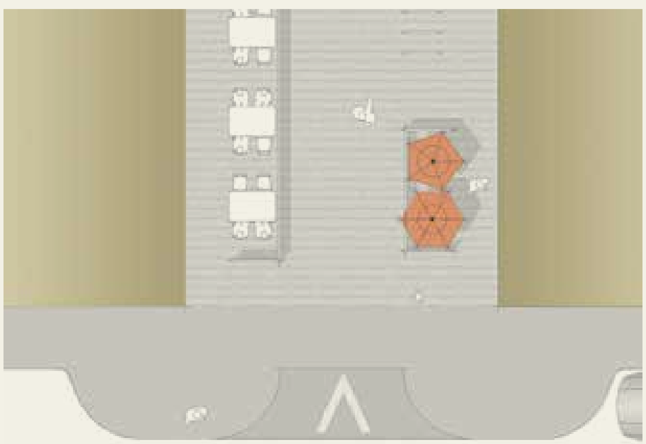


Pedestrian priority

Pedestrian	HIGH
Bicycle	MEDIUM
Transit	LOW
Parking	LOW
Car	LOW

Key considerations

- High demand for walking and strolling along alley
- High space demand for alternative uses, such as outdoor seating areas for cafes, bars, and restaurants
- Controlled access for servicing, delivery and emergency vehicles
- No demand for on-street parking
- Bicycle network on parallel street



Residential Street

Residential streets are those that serve primarily residential land uses, either single family or multi-occupancy housing. They may also serve local schools and community facilities. These streets provide a local access function and traffic volumes are low to moderate. Vehicle access is directly from the street to the driveways of buildings.

Existing conditions

The illustration below shows a typical residential street, with a two-lane carriageway and informal on-street parking. In residential areas with multi-occupancy homes there are higher levels of on-street parking especially in older neighborhoods where off-street parking may not be provided.

Sidewalks are present in the example shown, but this is not always the case. Often, there is a landscape strip with planting.

Crosswalks are typically not marked, though through the program safe routes to school in certain neighborhoods helps to facilitate the markings of school crossings.

Bicycle facilities are typically not present.

Identify this street type: p.38

Recommendations

Pedestrian facilities

1. Maintain a comfortable sidewalk width where already provided.

Bicycle facilities

2. Introduce sharrows to alert other road users to bicycles on recognized routes.

   Bicycle parking in the sidewalk may be appropriate at some locations, for instance, near to schools or other community facilities.

Vehicle facilities

3. Build-outs, planting and marked crossings all help to visually reduce the roadway and calm traffic.

Curbside management

4. Informal on-street parking can be maintained or formalized in high demand areas.

Intersections/crossings

5. Have clearly marked stop or yield lines. Mark out pedestrian crosswalks on all arms on routes to key intersections, such as schools.

   Provide pedestrian safety islands at busy locations and on school routes.

6. Consider curb extensions to slow traffic and shorten crossing distances.

7. Ensure curb ramps are provided at every corner.

Furnishing

8. Street lighting should be sufficient to illuminate the roadway as well as sidewalks.

Landscape and urban design

9. Use shade trees in the sidewalk to keep them cool and comfortable for walking.

10. Where appropriate, introduce bio-swales and pocket planting in landscape strip / easement. These should be planted with drought-resistant plants.

Proposed situation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Balanced access priority

Key considerations

- Demand for walking along street to access neighbors, transit, local services, and community facilities
- Capacity for auto circulation and access to be maintained
- Demand for on-street parking
- Low vehicle speed
- Cyclists to share street with autos

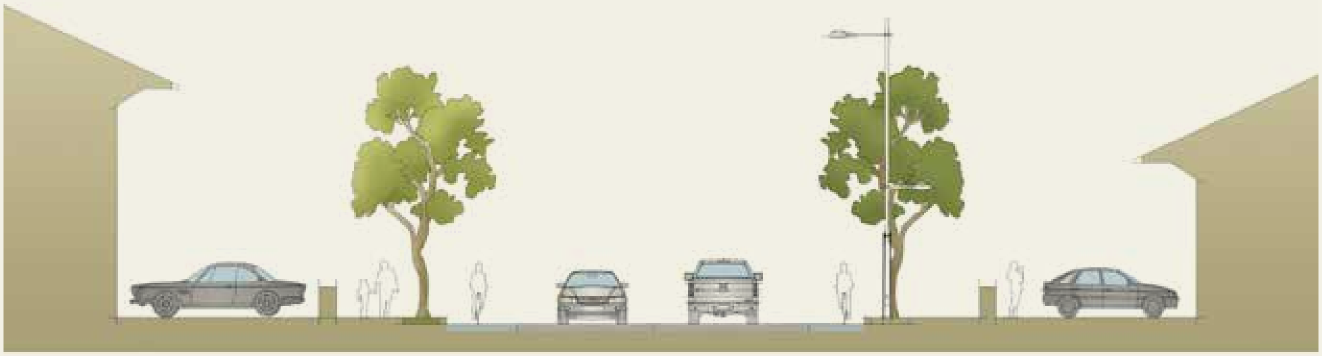
Pedestrian	HIGH
Bicycle	MEDIUM
Transit	LOW
P	MEDIUM
Auto	MEDIUM

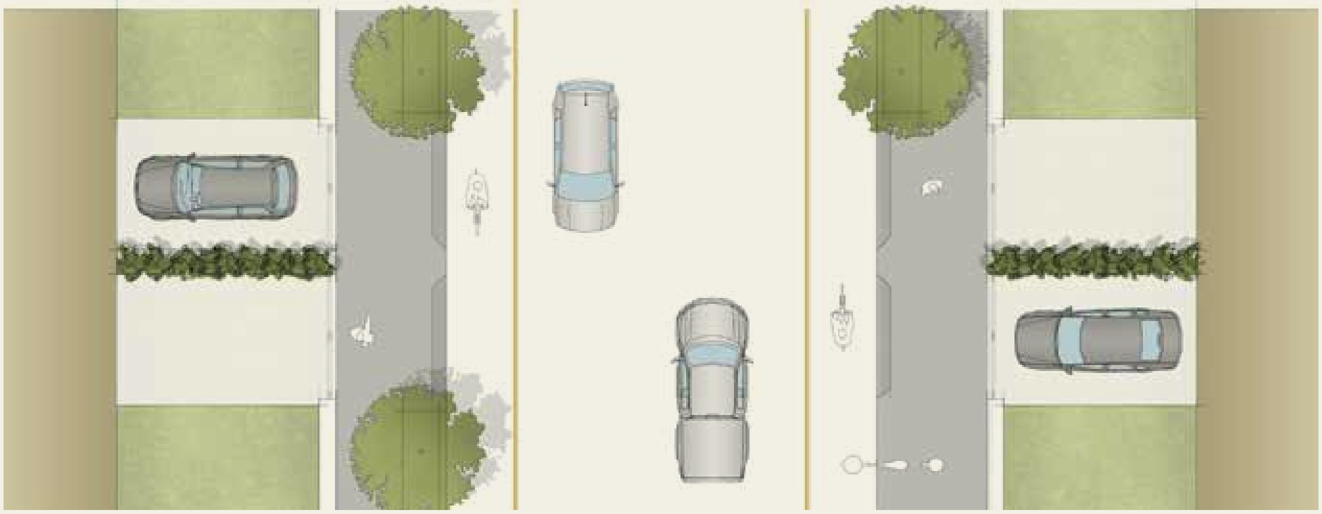
Bicycle priority

Key considerations

- Demand for walking along street to access neighbors, transit, local services, and community facilities
- On-street bicycle network
- No demand for on-street parking
- Capacity for auto circulation and access to be maintained

Pedestrian	HIGH
Bicycle	HIGH
Transit	LOW
Parking	LOW
Auto	MEDIUM



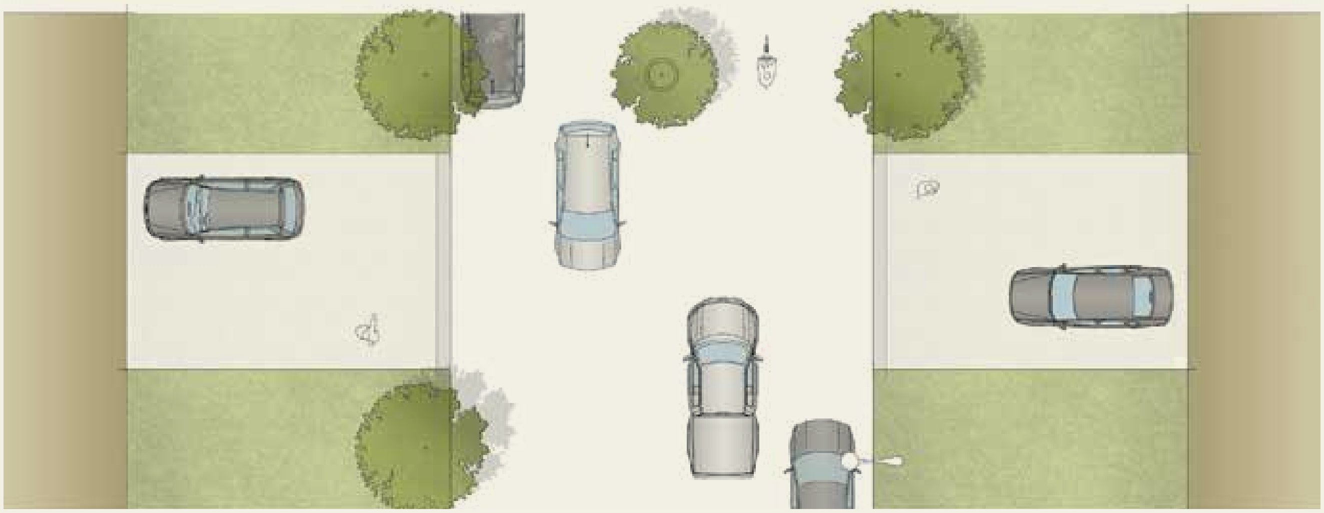


Low speed access priority

Key considerations

- Auto circulation and access to be maintained
- Very low vehicle speeds enabled by traffic calming
- Demand for on-street parking
- No demand for dedicated sidewalks
- Pedestrians and cyclists to share street with autos

Pedestrian	MEDIUM
Bicycle	MEDIUM
Transit	LOW
P	MEDIUM
Auto	LOW



SS

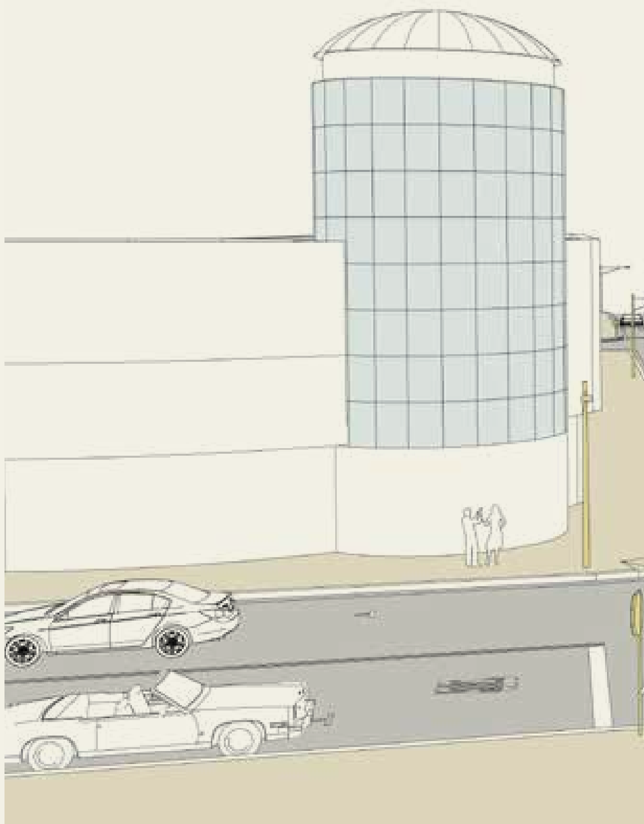
Shared Street

A shared street is a busy, mixed use street in the heart of a district center which typically attracts visitors and workers from across the city and the County. These are streets with low movement functions (low volumes of automobile traffic that are also slow moving), and lots of people walking or biking. Land uses tend to be shops, bars, and restaurants. Sometimes these streets are fully closed to traffic and used for events.

Existing conditions

The illustration below shows a typical street which could become a shared street, with one lane of traffic in each direction plus on-street parking.

Traffic tends to be local access only; these streets are not significant through-routes.



Buildings tend to front directly onto sidewalks, with shops and restaurants generating activity at ground level.

Typically there are no facilities for bicyclists.

Identify this street type: p.40

Recommendations

Vehicle facilities

1. The street should be designed to function as a shared space, using narrow lanes, planting, and special surfacing to encourage drivers to drive slowly and be alert to bicycles and pedestrians.

   The street can be designated as a special 'shared zone' to reduce the need for road markings and signage.

Pedestrian facilities

2. Ensure wide sidewalks are provided that allow for a clear pedestrian movement zone.
3. Provide space for sidewalk restaurant seating, generating activity and interest. Additional space for restaurant seating can be provided by replacing some on-street parking spots with parklets.

Bicycle facilities

4. The street should be designed for low speeds so all vehicles share safely, without the need for special bicycle facilities. Bicycle parking should be provided at appropriate locations.

Curbside management

5. Some on-street parking can continue to be provided, however it should be visually broken up with curb extensions and tree planting.

Intersections/crossings

6. Intersections can be raised to sidewalk level and surfaced in special materials to promote pedestrian priority and reduce vehicle speed.
7. Curb extensions should be used to slow traffic and shorten crossing distances.

Furnishing

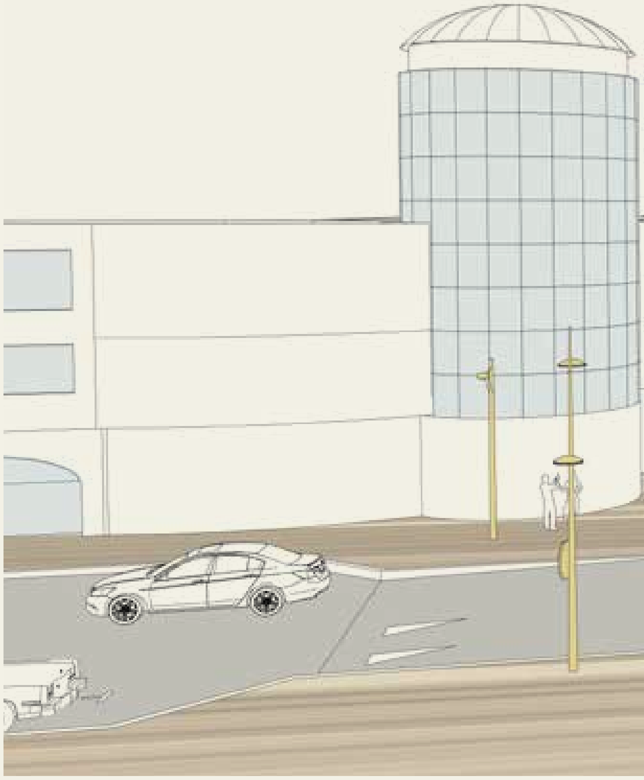
8. High quality furniture and design elements should be used that add distinctiveness to the place.
9. Pedestrian-focused street lighting should be provided.

Landscape and urban design

10. Use shade trees in the sidewalk to keep them cool and comfortable for walking.
11. Seating should be positioned adjacent to street trees and planting where pedestrians can sit in the shade.

    Where appropriate, introduce bio-swales and pocket planting in the landscape strip and at corners. These should be planted with drought-resistant plants.

Proposed situation

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Pedestrian priority

Pedestrian	HIGH
Bicycle	MEDIUM
Transit	LOW
Parking	LOW
Car	LOW

Key considerations

- High demand for walking and strolling along street
- High space demand for alternative uses, such as outdoor seating areas for cafes, bars and restaurants
- Low demand for auto access
- No on-street parking
- Low vehicle speeds achieved through design
- Bicycles can share the street with other modes of transportation, formal bicycle networks on parallel streets
- Potential to restrict vehicle access

Servicing priority

Pedestrian	HIGH
Bicycle	MEDIUM
Transit	LOW
Parking	MEDIUM
Vehicle	LOW

Key considerations

- High demand for walking and strolling along street
- Demand for alternative uses, such as outdoor seating areas for cafes, bars and restaurants
- Demand for auto access, on-street parking and delivery bays
- Low vehicle speeds achieved through design
- Bicycles can share the street with other modes of transportation, formal bicycle networks on parallel streets
- Potential to restrict vehicle access

B3

Technical Guidance

This Technical Guidance chapter has been developed to provide insight on the various components that make up Complete Streets; the design elements that make up or are contained within the right of way such as intersections, bikeways, parking and tree planting.

The following pages provide important information to guide the design and implementation of these Complete Streets components. They do not provide full technical designs; for such information, reference should be made to existing manuals and standards that apply in Orange County (see Chapter B5 for resources). The intention of this chapter is instead to provide an overview of the components and the key design considerations of each of the common elements found in Complete Streets.

Introduction

The design process for a specific street should start with the identification of the OCCSI street type, as explained on pages 22-23 of chapter A1 Vision. Each street type has its own set of typical characteristics.

Once the street type has been identified, the street should also be considered in terms of its place in the layered network, as explained on pages 44-47 of chapter A1 Vision. The layered network informs the modal priorities that should be applied. For example if a particular street is a critical part of the overall transit network it may be designed to prioritize transit movement, or if a street is part of the MPAH the maintenance of automobile movement may be a high priority.

By identifying modal priorities in this way, it means that variants of street types can be considered. Chapter B2 Street Types illustrates a selection of cross-sections for each of the OCCSI street types. Each of these cross-sections addresses a different mix of modal priorities and helps determine what should be included in the subsequent design. This approach will prompt thinking about the number and width of traffic lanes, relative width of sidewalks, and provision (or not) of bikeways, transit lanes, parking etc.

At this point, a street design strategy should be developed based on the mix of modal priorities required (explained on the next two pages). The street design strategy establishes an overall approach to geometry, layout and placement of street elements. A table is provided on pages 172-173 that illustrates the typical street design components and highlights how important these are for the nine OCCSI street types. The remainder of this chapter then explains the detail of the street design components.

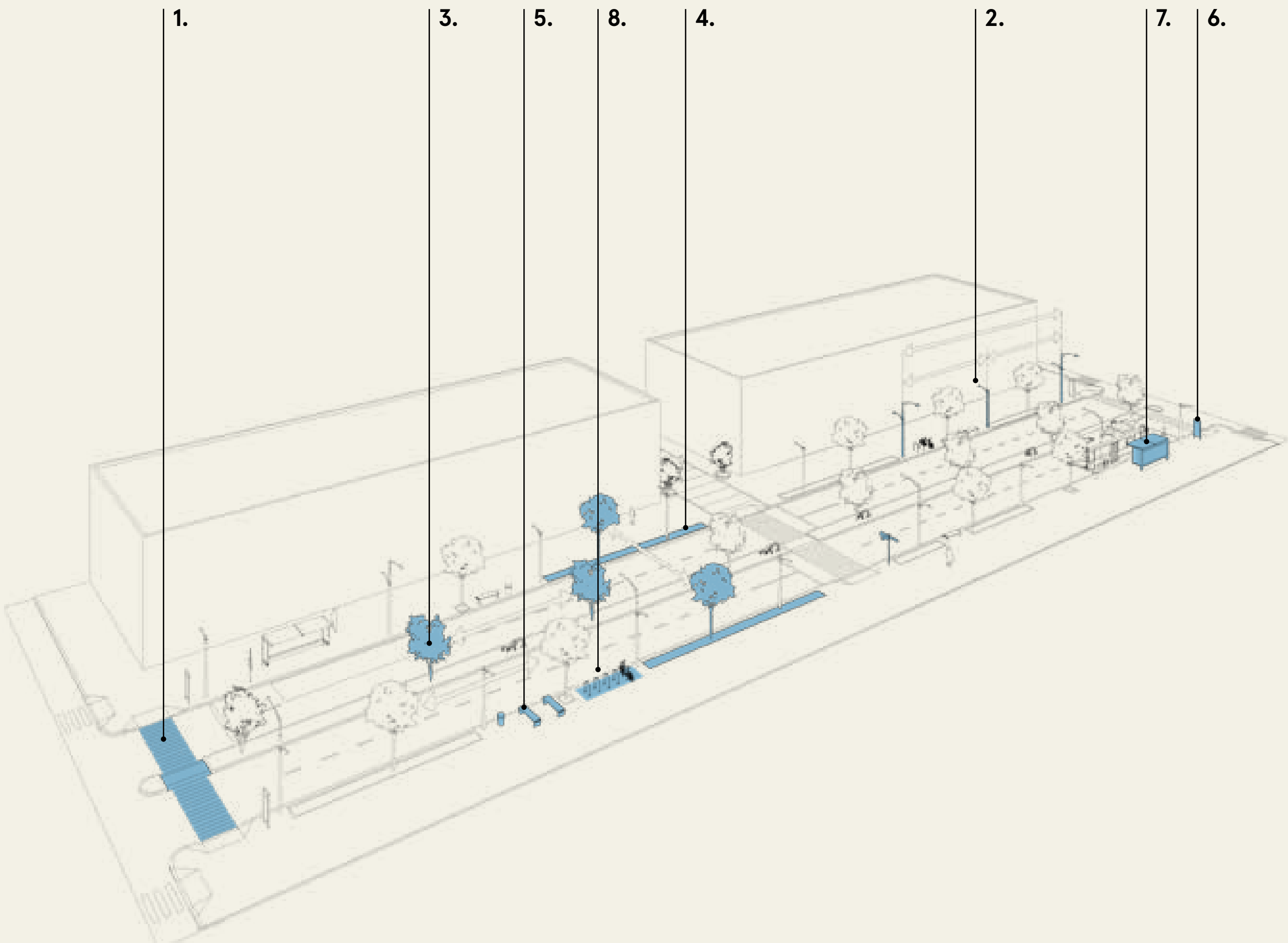
Street design strategy

The design of a street must take into consideration the specific technical requirements of the various individual elements within the street – as described in the following pages – however, the starting point for a street design must be an overall design strategy for street geometry, layout, and placement of items within it.

Elements of a street design strategy

1. Crossings	Frequency and alignment of crossings, to respond to desire lines.
2. Street lighting	Street lighting for the roadway and the sidewalk; scale of lighting that relates to the scale of the street; spacing of lighting columns; position within the sidewalk zone.
3. Street trees	Spacing, positioning, and frequency of trees, taking account of mature size of appropriate species in relation to buildings, visibility of traffic control infrastructure, ability to shade the sidewalk, and drought resistance.
4. Planting	Planted strips in the sidewalk alongside the curb help buffer pedestrians from traffic, and can also help with sustainable drainage.
5. Seating	Placement to provide regular rest points, to take advantage of shade, and avoid obstructing pedestrian movement.
6. Wayfinding	Locating signage at intersections and key decision points, clearly visible to pedestrians, without obstructing pedestrian movement.
7. Transit	Positioning on either the near or far side of intersections, with shelters and seating to provide a comfortable waiting environment and adequate circulation, boarding and alighting space.
8. Bicycle infrastructure	Type, number and position of bicycle parking facilities to keep them clear of pedestrian movement but making sure they are visible and accessible.

FIGURE B3.1: STREET DESIGN STRATEGY



Design component by street type

FIGURE B3.2: STREET DESIGN STRATEGY

MPAH categories:	Multimodal Freeway Corridor (MF)	Movement Corridor (MC)	Mixed Land Use Corridor/Hub (ML)	Industrial/Business Park Street (BP)	Neighborhood Main Street (NM)	Downtown Street (DS)	Alley (AL)	Residential Street (RS)	Shared Street (SS)
Sidewalk zones		low	medium	medium	high	high	low	high	high
Sidewalk infrastructure	low	medium	medium	medium	high	high	low	high	high
Universal access	medium	medium	medium	medium	high	high		high	high
Functional lighting	low	medium	medium	medium	high	high	low	medium	high
Feature lighting	high	medium	medium	low	high	high	low	medium	high
Street furniture	low	low	medium	medium	high	high	low	medium	high
Utilities	high	medium	medium	medium	high	high	low	high	high
Waste collection							high	high	
Wayfinding	high	medium	medium	low	high	high	low	medium	high
Bicycles and non-automobile components									
Bikeways Class I	medium	medium						medium	
Bikeways Class II		medium	medium	medium	medium	medium		low	
Bikeways Class III					medium	medium		medium	
Bikeways Class VI		high	high	high	low	medium			
Bicycle Infrastructure		high	high	high	high	high		low	
Recreational Trails	medium	high							
Equestrian Trails	medium	high							
LSV + NEVs	medium	high			medium				
Roadway components									
Lane Widths	high	high	high	medium	medium	high	low	medium	low
Road Diet		medium	high	medium	high	high		low	
Chokers/Pinchpoints					high	medium		high	
Chicanes					medium			high	
Center Island Narrowing		high	high	medium	medium	high		low	
Speed Hump							medium	high	
Speed Table					high	medium		medium	
Raised Crosswalk					high	medium		medium	
Traffic Control Devices	high	high	high	medium	medium	high	low	low	low
Transit components									
Transit Stops		low	medium	medium	medium	medium		low	
Transit Lanes	medium	medium	medium	medium		medium			

Relative importance

- high
- medium
- low

MPAH categories:	Multimodal Freeway Corridor (MF)	Movement Corridor (MC)	Mixed Land Use Corridor/Hub (ML)	Industrial/Business Park Street (BP)	Neighborhood Main Street (NM)	Downtown Street (DS)	Alley (AL)	Residential Street (RS)	Shared Street (SS)
Curbside management									
Driveways		low	high	high	high	high	low	high	low
Angled Parking				low	high	low		low	high
Reverse in angled Parking					high	low		low	high
Parallel Parking		low	high	medium	high	high	low	high	high
Intersection components									
Left turn lane	high	high	high	high	medium	high			
Right turn lane	high	high	medium	low		low			
Corner radii	high	high	high	high	high	high	high	medium	high
Visibility / sight distance	high	high	high	high	high	high	medium	high	high
Traffic Signals	high	high	high	medium	medium	high		low	low
Traffic Circle					high			high	low
Roundabout				medium	medium			high	
Raised Tables					high	medium	low	medium	high
Bulb outs					high	high	low	high	medium
Marked Crosswalks at Intersections	high	high	high	medium	high	high		low	
Midblock Crossings		high	high	medium	medium	high		low	
Pedestrian overcrossing and underpass	high	medium	medium						
Vehicle underpass and overhead structures	high	low	low						
Place-making									
Plazas			low		medium	high			medium
Pocket Parks		low	low	low	high	high	low	low	medium
Reclaimed Roadway Space		low	medium	medium	high	high		high	
Shared Spaces					medium	high	high	medium	high
Parklets					medium	high			
Open Streets		low	low	low	high	high			high
Public Art	low	medium	medium	low	high	high	low	low	high
Crime Prevention	low	medium	high	medium	high	high	medium	high	high
Landscape and ecology									
Street Trees	low	high	medium	medium	high	high	low	high	medium
Buffer Planting	high	high	medium	medium				medium	
Traffic Calming Planting		medium	medium	medium	high	high		high	low
Feature Planting					high	high		medium	high
Bio-retention Swales	high	high	high	medium					
Raingardens			medium		high	high		medium	medium
Flow through planters					medium	medium	medium	high	medium
Permeable surfaces							high		medium

Relative importance

- high
- medium
- low

Pedestrian environment components

The pedestrian environment is the component of a street which often does not meet user needs adequately. It is also the zone used by people with the widest variety of capabilities, from the very young to older populations, and also by people with mobility or sensory impairments. It is thus the zone which perhaps requires the greatest attention to design in order to balance user needs and provide for safe and comfortable movement.

The pedestrian environment encompasses a variety of elements including sidewalks, specific facilities for users with disabilities, transit stops, signs, lighting, street furniture, and other walkway related infrastructure. The design and placement of such elements impacts on how pleasant and easy the pedestrian experience is.

The pedestrian environment encompasses a variety of elements including sidewalks, specific facilities for users with disabilities, transit stops, signs, lighting, street furniture, and other walkway related infrastructure

Sidewalk zones

Sidewalk design impacts the ability for pedestrians to move about easily and safely. When no consideration is given to sidewalk provisions, the result is sidewalks that are often too narrow, obstructed by poles and other elements, or simply non-existent. Complete Streets seek to provide sidewalks that encourage walking and accommodate pedestrians of all ages and all physical abilities. Good sidewalk design contributes to the wider connectivity of a community, integrating transit networks, and improving the walkability of a street network.

When thinking about the functionality of a sidewalk, one must consider its location and use. This includes the volume of people and the activities they undertake on the sidewalk (e.g. walking, jogging, waiting for transit, sitting outside a café, etc.). This will be different for individual street types, as an example a downtown street will have more sidewalk activity and warrant a wider sidewalk than a residential street.

Sidewalks should be considered in terms of different zones, which are described on the following pages.

Frontage zone

The frontage zone is the section of the sidewalk located immediately adjacent to the building frontage or property boundary. The frontage zone extends from the face of the adjacent building to the sidewalk clear zone. This zone effectively functions as an extension of the building and may spread into the public right-of-way, for example with entryways and doors where people come and go, or sidewalk cafes and sandwich boards outside commercial premises. In streets where buildings are set back from the sidewalk such as single family residential neighborhoods, or business park environments, the frontage zone is more typically landscape or surfacing which extends from the building to the property boundary, immediately adjoining the public right-of-way. In all cases it is important that the elements in the frontage zone do not impinge on the pedestrian through-zone.

Pedestrian through-zone

The pedestrian through-zone is the primary, accessible walking area that runs parallel to the street and provides continuous connections from the public right-of-way to building and property entry points, parking areas, and transit stops. It is specifically reserved for pedestrians, and should be well-lit and meet ADA guidelines. Typically, it should be 5–7 feet wide in residential settings and 8–12 feet wide in downtown or commercial areas. It should also be free of any physical obstructions and provide a continuous, consistent surface.

The pedestrian through-zone is the primary, accessible walking area that runs parallel to the street and provides continuous connections from the public right-of-way to building and property entry points, parking areas, and transit stops

Street furniture/buffer zone

The street furniture/buffer zone is defined as the section of the sidewalk between the curb and the pedestrian through-zone that provides separation and protection from moving vehicular traffic. It provides space for the placement and organization of various street elements, such as landscaping, street furniture, and utilities (both above and below ground).

Where parking adjoins this zone it also creates space to allow clearance from vehicles, doors to be opened, and drivers to access the sidewalk. Typical elements that may be included in this zone are lamp posts, sign posts, benches, newspaper kiosks, utility poles, trees, planters, parking meters, and bicycle parking.

In lower density residential streets, street furniture is likely to be more limited (e.g. lamp posts and utilities) and the street furniture/buffer zone may have grass and planting instead. In neighborhood main streets and downtown streets there are likely to be more items – as well as many more pedestrians - and therefore it is important to align them in this area and avoid encroaching on the through-zone.

Downtown Street

Frontage zone	Pedestrian through-zone	Street furniture/buffer zone

Residential Street: High density

Frontage zone	Pedestrian through-zone	Street furniture/buffer zone

The pedestrian through-zone is specifically reserved for pedestrians, and should be well-lit and meet ADA guidelines. It should also be free of any physical obstructions and provide a continuous, consistent surface

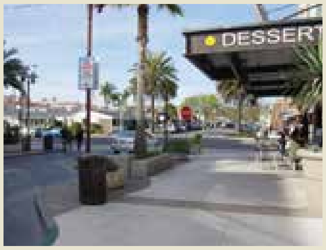
Residential Street: Low density

In lower density residential streets, street furniture is likely to be more limited (e.g. lamp posts and utilities) and the street furniture/buffer zone may have grass and planting instead

Case Studies
Sidewalk Zones

A street furniture/buffer zone, a pedestrian through zone and frontage zone, East 3rd Street, Tustin

A pedestrian through zone and street furniture/buffer zone with planting, Santa Ana



A street furniture/buffer zone, a pedestrian through zone and frontage zone, Huntington Beach

Key design considerations

Comfortable pedestrian through-zone	All sidewalks must contain an adequate and comfortable pedestrian through-zone as a minimum; the appropriate width of this zone should be decided first, and then other zones planned around it.
Zone widths	The width of the different zones should be determined by considering the street type and the expected volumes of pedestrian movement, plus any other pedestrian activity (e.g. workers, shoppers, etc.). In residential streets or industrial/business park streets, the buffer/street furniture/curb zone may be narrow, sufficient to accommodate lamp posts, sign posts, and utilities. In downtown or neighborhood main streets, this area may be wider to accommodate additional items such as tree planting, seating, and trash cans.
Connecting sidewalks	Sidewalks should connect into adjoining facilities via the frontage zone, such as directly to building entrances, or to footpaths on private property. They should also provide connections to facilitate adjacent curbside activity, such as providing areas for vehicle drivers to get in and out of cars when parked, or transit waiting areas.
Minimum standard sidewalk width	The Caltrans Highway Design Manual recommends a minimum standard sidewalk width of 8 feet between a curb and a building in main street place types.[1] In other instances, 6 feet is standard when contiguous to a curb or 5 feet when separated by a planting strip. Usually, local agency sidewalk standards will require greater widths, which can provide better accessibility. Minimum width may not be enough to satisfy the actual need if a certain width is necessary to maintain an acceptable Level of Service for pedestrians.

Further Information

AASHTO - A Policy on Geometric Design of Highways and Streets. 2001.

AASHTO - Guide for the Planning, Design, and Operation of Pedestrian Facilities, 1st Edition. 2004.

Caltrans - Highway Design Manual. 2014.

California Building Standards Commission - California Fire Code. 2013.

ITE - Designing Walkable Urban Thoroughfares: A Context Sensitive Approach 2010.

NACTO - Urban Street Design Guide. 2013.

1. Caltrans. Chapter 100 Basic Design Policies. Highway Design Manual. 2014, pp. 100-7. http://bit.ly/22ocFKC

Sidewalk infrastructure

Appropriate sidewalk infrastructure is a fundamental component of a Complete Streets network. Getting the design of sidewalks right is essential to ensuring walkability. It can also be used to enhance identity of a local place, or create a hierarchy of spaces within the street environment, for example defining through-zones for pedestrians versus areas of café seating.

Key design considerations

Stability and slip resistance	It is critical for a sidewalk to accommodate all types of pedestrians. Soft and loose materials make it difficult for wheelchairs and pushchairs to gain traction, making movement difficult. Consideration should also be given to the condition of surfaces in all weather conditions and surfaces that become slippery when wet should be avoided.
Sidewalk gradient and crossfall	The gradient of a sidewalk cannot be specified as it follows the gradient of the adjacent street; however, consideration can be put into any changes in gradient and sidewalk cross slope. The ADA Accessibility Guidelines identifies a maximum cross slope of 1:50.[2]
Surface level	A change in surface level along a footpath may be considered a trip hazard. Surfacing should be laid on a stable base away from tree roots to minimize any movement of the footpath. Regular inspection and grinding of concrete will be required to maintain a level surface. Attention should be paid to the interface between the sidewalk, service covers, and drainage grates. Tree root protection should be installed where appropriate.
Visual consistency	Surface materials should be consistent along a street to convey a clear, continuous route. Strong differences in tone or color of surface materials should be avoided within the pedestrian through-zone along a route, as this may hinder visually impaired users, who may confuse a surface tonal change with a difference in level. However tactile surfaces and contrasting colors can be useful to differentiate other sidewalk zones such as the frontage or street furniture/curb/buffer zones, or to help denote special places such as a town square.
Urban cooling	In Orange County's climate, surfacing with high reflectivity properties (albedo) should be used to keep sidewalks cooler and more comfortable.

2. United States Department of Justice. 406 Curb Ramps. 2010. Washington : s.n., 2010 ADA Standards for Accessible Design. http://1.usa.gov/1Nk8F6P

Good practice

West Center Street Promenade, Anaheim

East 4th Street, Santa Ana

Further Information

Caltrans - Highway Design Manual. 2014.

US. Department of Justice - ADA Standards for Accessible Design. 2010.

Universal access

The American's with Disabilities Act (ADA) sets out requirements for disabled access within the built environment. This is important not just for local residents; as a region with increasingly popular tourist attractions and a location for major businesses, it is important for Orange County's out-of-town guests as well. There is a National policy, and several State and local policies (as explained in B5 Resources), regarding accessibility for all that requires adequate and reasonable access for the safe and convenient movement of persons with disabilities. These considerations are not just about disabled access however; they are about providing a more inclusive environment that can be used by all.

There are various considerations that apply to promote an inclusive environment in addition to the sidewalk zone arrangements discussed previously. These factors apply not only to sidewalks, but also public spaces, intersections, and transit stops. In-depth guidance is provided in other documents and is not reproduced here, however the key elements to be considered are summarized in the adjacent table.

Key design considerations

Detectable warning strips (Truncated Domes)	The addition of non-slip or textured surfaces across curbs that are constructed or replaced at pedestrian crosswalks can provide warning or bring to attention a change in the pedestrian environment for the vision impaired.
Curb ramps/ curb cuts	On new construction, two curb ramps should be installed at each corner. Curb ramps should have a minimum width of 36 inches and a maximum slope of 1:20 to make movement between streets easier for the mobility impaired.[3] Transitions to the street that have a grade less than 5 percent are also known as blended transitions.
Signal activation	At new signalized pedestrian crossings, advanced pedestrian signals (APS) shall be provided and activated by a push button. A visual and audible signal shall clearly indicate which direction the walk interval is related to for the vision and hearing impaired. This may be achieved by an alternating audible signal, an audible signal and light from the opposite side of the crossing, or via a speech message.
Bulb-out (Curb Extension)	This extension of the curb line in a bulb-like rounding radius is incorporated into curb ramps to shorten the crossing distance for pedestrians as they travel through an intersection.
Landing	A minimum sized landing, usually 4 feet by 4 feet, is required at the top of a ramp (with a 2 percent maximum grade), so that wheelchair users can maintain stability while turning.

3. United States Department of Justice. 406 Curb Ramps. 2010. Washington : s.n., 2010 ADA Standards for Accessible Design. http://1.usa.gov/1Nk8F6Pgov/1Nk8F6P

Good practice

Detectable warning strip Ridge Valley, Irvine

Curb ramps and detectable warning strips, Newport Boulevard, Costa Mesa

Further Information

- Caltrans - Highway Design Manual. 2014.
- Caltrans - Design Information Bulletin (DIB) 82-05, Pedestrian Accessibility Guidelines for Highways Projects. 2013.
- US. Department of Justice - ADA Standards for Accessible Design. 2010.

Lighting

Street lighting can fulfill both a functional role and be also used as a streetscape enhancing feature.

In purely functional terms, lighting should enable the safe and secure use of streets in areas that are poorly lit by natural light, and in all areas outside of daylight hours. When designing functional lighting it is critical to identify who the primary user is and ensure that appropriately scaled street lamp poles and fittings are installed to achieve a level of illumination that makes the user feel secure in that space. In many Orange County streets, the focus is on illumination of the roadway only. Pedestrian-focused lighting should be installed in streets with high levels of pedestrian activity, or streets where pedestrian activity should be better provided for.

Functional lighting can also add to a sense of place in a neighborhood, through the use of distinctive or decorative posts and lamps.

Feature lighting can also be used to create identity and increase the attractiveness of a street. While feature lighting may also be functional, it is usually designed to highlight key features of a space such as planters or a tree, or to illuminate a landmark building.

Key design considerations

Scale of the lights	Light fixtures should be chosen specific to the type of infrastructure they are required to illuminate, and will be reflected in the height of the street lamp. Pedestrian-focused lights are generally lower (around 15 feet), while roadway-focused lights are higher (between 25 to 40 feet).
Spacing of lights	Spacing of light fixtures is determined by the primary role of the light and the light output that is to be achieved. Optical lighting technology allows street light design to be calculated to ensure an even light level is produced across an area while minimizing light pollution. Light optics are also important to consider in a residential area.
Lamp type	For many years metal halide (MH) or high pressure sodium (HPS) lamps have been used for street lighting, resulting in high energy consumption and low light output. LED lamps are more efficient to operate and produce more illumination. LEDs have a higher initial cost, but can last up to four times longer than a HPS lamp.
Color temperature	Affects the ambiance of the street. A white light distributes more luminance than a yellow light, making streets brighter and more like daylight. This provides better visibility for all users. It also enhances facial recognition so can improve security for pedestrians. Studies have shown people prefer white light.
Color rendering index	The ability of a light source to reveal colors. This affects ambiance and is critical in areas that rely on CCTV for security. A higher color rendering index results in sharper CCTV images with more colors and detail.
Smart management	Light efficiency is largely determined by the selection of street lamp but can be improved through technology to manage the light system. Street lamps may be fitted with a daylight sensor to ensure they are only operational when the light levels drop to a certain level or they may have a dimming control that allows them to run at a lower output during the early hours of the morning. Movement sensors can be attached so lights only come on when a pedestrian or vehicle is detected. Individual solar panels can also be attached to street lamps to power them.
Adding character	The location of street lamp poles can be used to create a visual rhythm along a street and define the street edge. The choice of poles and lamps can also help with place-making objectives. In addition posts can incorporate banners and other decorative elements.
Positioning	Street lamps should be positioned within the street furniture zone of a sidewalk. In locations where there is a requirement for both pedestrian and roadway lighting, existing street lamps should be retrofitted to accommodate both fittings and minimize sidewalk clutter. Alternatively street lights can be located within a central median.

Good practice

Character lighting for the street and the sidewalk, Ridge Valley, Irvine

Solar powered street lights on Longfellow Street, Santa Monica

Further Information

AASHTO - Guide for the Planning, Design, and Operation of Pedestrian Facilities, 1st Edition. 2004.

Caltrans - Main Street, California. 2013

Street furniture

Street furniture encompasses a variety of street elements than can be used to enhance the functionality of a street, and its use as a public space. Uniformity in the design and application of a street furniture palette can contribute to a sense of place and unique identity.

Street furniture may include seating, bicycle parking, trash cans, recycling bins, newspaper racks, bollards, parking meters/pay stations, handrails and railings, and signage. The choice of street furniture items should relate to the uses and users of the particular street. For example in a neighborhood main street, furniture may include many of the items listed above, placed regularly along a street. In a business park street, furniture items may be more limited and less frequently provided (e.g. trash cans and seating at bus stops).

Careful consideration of the placement of street furniture is required. Street furniture must be accessible in areas where there are concentrations of pedestrian activity but it must not restrict the through-zone of the sidewalk.

Key design considerations

Seating	• Should be located where people are likely to congregate or wait, and also at regular intervals to provide rest points. • The seat should be situated under shade, where people can comfortably rest. • Should be oriented toward points of interest. This may be overlooking a vista, street activity, or towards another seating area to encourage socializing. • Should be ergonomically designed to be comfortable and accessible for all users. This includes the provision of back rests and arm rests on a percentage of benches. • Can be part of a street furniture scheme that is consistent throughout an area and contributes to the sense of place.
Trash cans and recycling bins	• Should be situated in the street furniture zone of a sidewalk in areas where there is high activity (e.g. street corners, transit stops, public/event spaces). • They should be clearly visible and identifiable as trash cans/recycling bins. • They should be provided at regular intervals to ensure use. • It should be simple for items to be put into the receptacle and for the rubbish to be removed regularly. They should be positioned such that pedestrians can easily reach them, but also be readily emptied by waste service providers. • Capacity of the trash can/recycling bin will affect the number required along a street. There is a balance between providing enough trash cans to prevent littering and too many trash cans that create street clutter. • Trash cans should be designed to prevent animals accessing contents.
Bollards	• Should be used sparingly, and only where absolutely necessary to separate pedestrians and other non-motorized traffic from vehicles, or to define pedestrian spaces. If used to define pedestrian spaces, consideration should be given to alternative design solutions such as strategic positioning of planters or street furniture to prevent vehicle incursion. • Should not inhibit the movement pedestrians or cyclists. The minimum clearance around a bollard should be 36 inches to allow wheelchairs and pushchairs to pass by.[4] • They should be consistent in appearance and contribute to the overall street furniture scheme.

Key design considerations

Handrails and railings

- Are used primarily for safety and to assist mobility and therefore should comply with Section 505 of the ADA Standards.[5]
- Railings should be used selectively for safety reasons, e.g. on the sidewalk outside school entrances to provide protection for students. Avoid over-use to prevent cluttering sidewalks and constricting pedestrian movement.
- Should be coherent across a street furniture scheme and be used where necessary for safety in balance with keeping the pedestrian space free of clutter.

Bicycle parking

- Bicycle racks are critical in facilitating bicycling. It should be as easy, or easier, to park a bicycle as a car. While the majority of bicycle racks should be provided in off-street parking facilities and in bicycle corrals in the curbside parking lane (where applicable), convenient parking should also be provided along the sidewalk.
- Bicycle parking should be secure as possible and convenient to encourage cycling as a mode of transportation. Racks should be should be visible and accessible from adjacent cycling infrastructure. Increased visibility around the bicycle parking also increases the security of the bicycles while they are parked.
- Shelter or huts should be provided wherever possible to protect bicycles from the sun and weather.
- Racks should be located within the furniture zone as close to the entrance of a destination as possible. This means there may be several smaller bicycle parking zones along one length of road increasing the opportunities for cyclists.
- Number of racks should relate to projected demand for bicycle parking.

Good practice

Street furniture, Dana Point

Street furniture, Seal Beach

Bollards, Downtown Santa Ana

Further Information

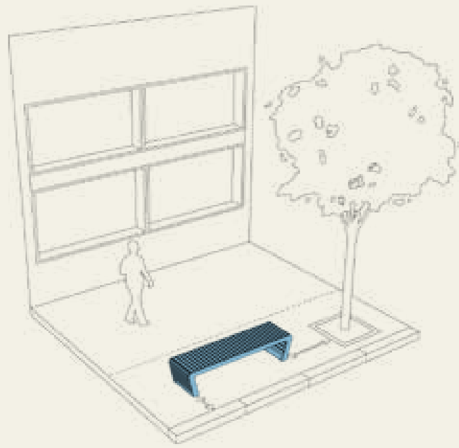
Caltrans - Main Street California. 2013.

ITE - Designing Walkable Urban Thoroughfares: A Context Sensitive Approach. 2010.

4. United States Department of Justice. 406 Curb Ramps. 2010. Washington : s.n., 2010 ADA Standards for Accessible Design. http://1.usa.gov/1Nk8F6P
5. United States Department of Justice. 505 Handrails. 2010 ADA Standards for Accessible Design. Washington : s.n., 2010. http://1.usa.gov/1qiJaxn

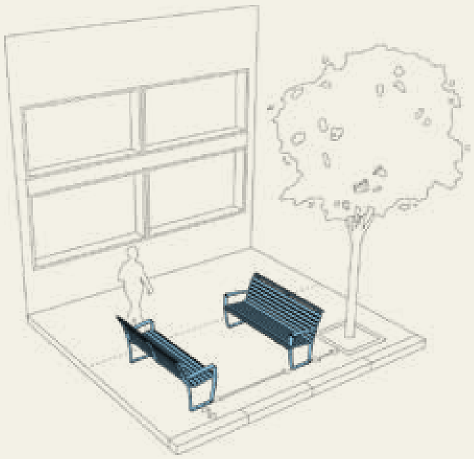
Seating

Seating for narrow sidewalks
In narrow sidewalks seating should be parallel with the curb but placed away from the curb edge for safety and comfort.

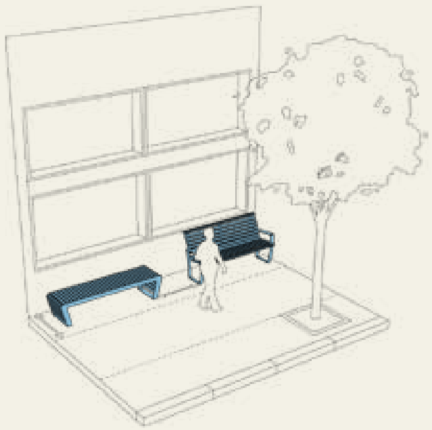


Alternative seating for narrow sidewalks
Individual seats in pairs or groups are an alternative to bench seating, and can be arranged to allow conversation.

Seating for wide sidewalks
Where sidewalks are wide, benches can be perpendicular to the street and facing, to encourage social interaction.



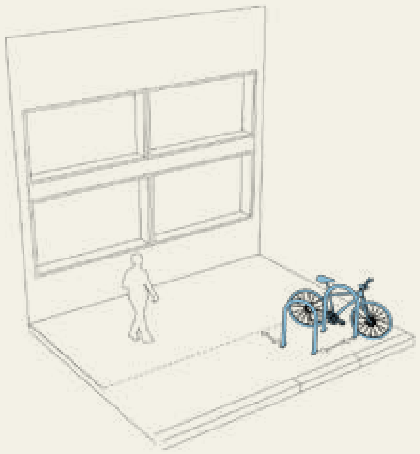
Alternative seating for wide sidewalks
Seating can also be placed in the frontage zone, where there is space. Users can then enjoy the street scene.



Bicycle parking

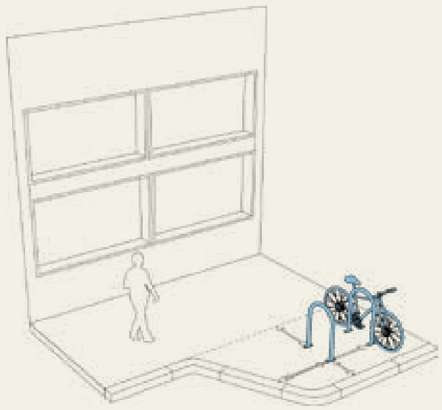
Bicycle racks

Arrange bicycle racks so that the wheels of parked bicycles do not obstruct pedestrians or overhang the curb. They should be spaced to allow bicycles to park on each side. Angled alignment is useful where sidewalks are of moderate width.



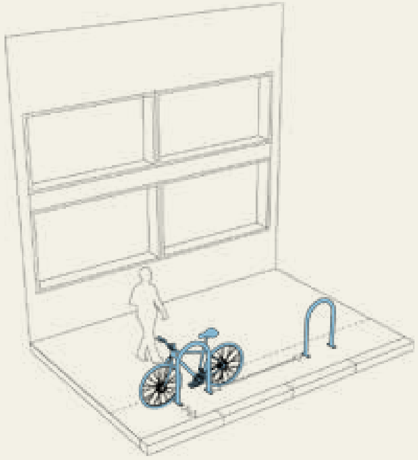
Perpendicular bicycle racks

Perpendicular racks can be used in wide sidewalks or in bulb-outs.



Parallel bicycle racks

Parallel racks can be used in narrow sidewalks. Ensure they are spaced so that bicyclists have enough room to maneuver in and out.



Utilities / infrastructure

Infrastructure includes utilities related to power, sewerage, water, and telecommunications. These are usually located within the street environment and various elements related to this are likely to be present within the sidewalk.

Key design considerations

Location of existing infrastructure	Street redevelopment projects should consider the location of existing infrastructure, both above and below ground, and ensure that there is provision for maintenance and access requirements in the new design.
Below ground	Where possible, infrastructure should be provided below ground to avoid the need for poles and other equipment cluttering the sidewalk zone. It is imperative to ensure that manhole covers to access utilities are clearly visible, and accessible, including allowances for access with special equipment if need be.
Above ground equipment	Above ground equipment such as fire hydrants and utility boxes should be sited away from the pedestrian through-zone to avoid creating obstructions and decrease potential hazards but located in accordance with local regulations (see below).

Good practice

Fire hydrants installed outside the pedestrian through-zone. Jamboree Road, Irvine

Further Information

- AASHTO - Guide for the Planning, Design, and Operation of Pedestrian Facilities, 1st Edition. 2004.
- AASHTO - Roadside Design Guide, 2011
- California Building Standards Commission. California Fire Code. 2013.
- State of California - Public Utilities Code

Waste collection

Most residential streets in Orange County have curbside waste collection. This should be allowed for when designing sidewalk zones.

Key design considerations

Allocation of space	Allocation of space within the buffer/street furniture/curb zone to adequately accommodate trash cans and recycling bins when these are put out for collection.
Positioning	Positioning to ensure ready access from roadway by waste collection vehicles.

Waste collection in an alley, Tustin

Curbside waste collection, Huntington Beach

Curbside waste collection, Tustin

Wayfinding

A wayfinding system assists in aiding people to navigate unfamiliar environments, helping them find their way to key destinations, and explore the local area. A successful wayfinding system can encourage more active lifestyles, help people feel more confident in navigating when walking and using bicycles, and in turn support local businesses with additional foot traffic. A wayfinding system is usually communicated through the development of a signage and information system that includes mapping.

The first step to creating a wayfinding system is understanding the area, who the system is for (the users), where are they coming from and going to (origins and destinations), how they are doing so (walking or cycling), and what information they need to help them do so. Once this has been established, key decision points can be identified. These are locations where information is critical to navigation, either in the form of signs or maps. They include arrival points (e.g. outside of a station or large parking lot) and complex decision points (e.g. intersections).

The routes that will be supported by wayfinding signs should be the simplest ones, even if these might not be the quickest or the most scenic routes. Directing people along simpler routes can reduce cognitive load and anxiety resulting from the sense of being lost. This results in greater trust in the wayfinding system, which is critical to its success.

By promoting the simplest routes, the wayfinding system helps people develop a basic understanding of the area. Maps of the local area complement this point-to-point navigation by reinforcing landmarks (highlighted on the map) and by revealing a greater level of detail and information beyond the immediate location. Once a basic understanding has been established, return visitors may be able to develop a more complex understanding of the site by creating their own mental map, which enables them to explore the area more freely, and chose their own route.

Wayfinding signage is useful for both pedestrians and bicyclists, although the information needs differ slightly. For example, the distance between destinations for bicyclists are usually greater than those a pedestrian would walk, and therefore the signs and maps need to reflect this.

Typical types of wayfinding signage include:

- Information totems/kiosks (containing location information, possibly directional information and mapping)
- Directional signs
- Local area maps (centered on the location of the map and displayed either "north up" or, the increasingly more popular, "heads up")

Key principles for wayfinding can be found on the next page.

Good practice

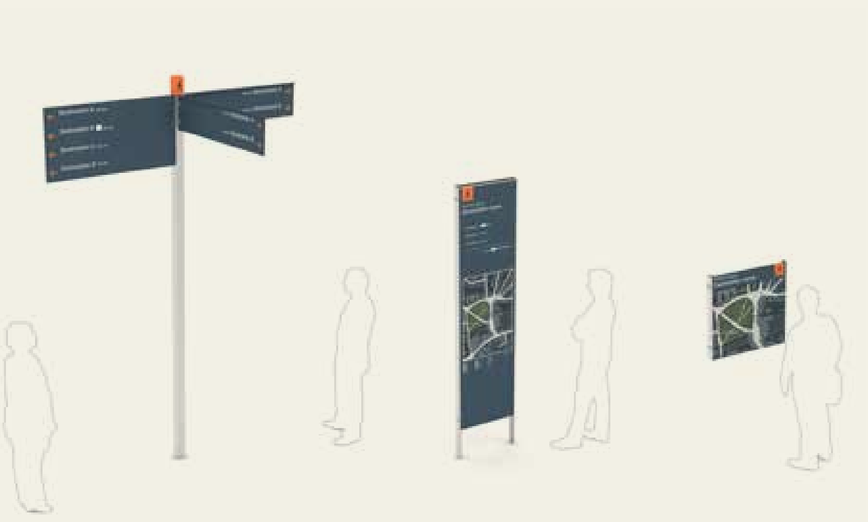
Wayfinding totem with location information, directional information and mapping, New York City
Source: New York City Department of Transportation, via Flickr https://www.flickr.com/photos/nycstreets/9128110429

Further Information

Society of Environmental Graphic Design (SEGD) - What is Wayfinding? http://bit.ly/1LOf1tD

Key design considerations

Continuity	Where wayfinding signs are provided, they need to form continuous routes in order to create a useful system which is especially important for those unfamiliar with an area.
Simplicity	A clear destination hierarchy and easy to understand signs will ensure that people are not overloaded with information. This applies to both amount of information and visual simplicity derived from graphic elements (color, typeface, and size).
Progressive disclosure	Information should be delivered progressively, as people move closer to a destination, more detailed local information should be provided. If too much information is provided in one place, it can be confusing in addition to creating visual clutter.
Predictability	Information should be positioned in a consistent manner, enabling people to predict where the next piece of information will be found. Implementation of complete routes are more beneficial than scattered interventions.
Heads-up mapping	The recommended format for mapping on-street is to orientate the map to the users' view, i.e. 'heads-up'. This allows the user to immediately position themselves in their environment through using key landmarks and street names.



A 'family' of different wayfinding elements

Case Study
Toronto Wayfinding

The City of Toronto developed a multimodal wayfinding strategy called TO360 to encourage walking in Toronto, including implementation of a family of wayfinding components. The aim of the strategy is to provide the city with a consistent wayfinding system across environments and transportation modes, including, for example, transitioning to street level from the underground PATH network and Subway system and providing trusted data for third party app developers. It also aims to influence the city's urban design to support intuitive wayfinding and facilitate natural movement addressing physical and perceptual barriers to walking. The system is also designed to enable project partners to adopt these principles for their own schemes—utilizing naming, hierarchies, color coding, look and feel and other conventions. The first tranche of wayfinding signs have been successfully installed in the downtown area.

Bicycles and non-automobile components

Bikeway design, another potential component of a Complete Street, varies as determined by the roadway type and surrounding land uses, similarly to pedestrian infrastructure. Bikeways must be considered not as standalone pieces of infrastructure, but as part of a complete bicycle network, including consideration of intersection facilities.

Technical guidance on bicycle facilities is covered in-depth in other design documents. This section provides an overview of types of facilities. For more detailed guidance please refer to documents listed under Further Information.

Cyclists, Harvard Avenue, Irvine

Bikeways

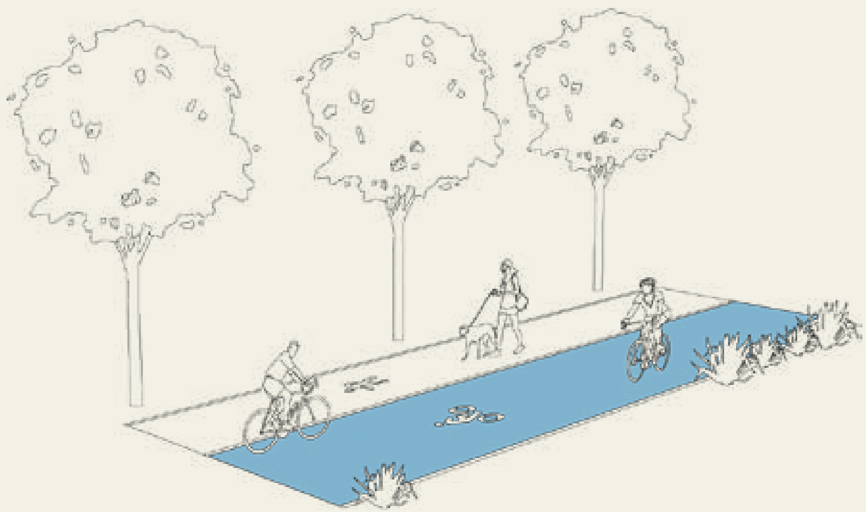
The California Streets and Highways Code (Sections 890-892) provides legislation to establish a bicycle transportation system.[6] It stresses the importance of the design of a bicycle system that can achieve the functional commuting needs of employees, students, shoppers, and others in a safe and accommodating manner. Within the code is an explanation of the four classes of bicycle facilities, described below. It is essential to note that the designation of bikeways as Class I, II, III and IV should not be construed as a hierarchy of bikeways; each class of bikeway has its appropriate application.

Bikeway Type	Description	Street Characteristics	Facility User Comfort Level
Class I	Provides a completely separated right of way for the exclusive use of bicycles separated from pedestrians with cross-flow minimized.	High-speed thoroughfare	High
Class II	Provides a striped lane for one-way bike travel on a street or highway adjacent to auto travel lanes.	Mid- to low-speed corridor	Medium
Class III	Provides for shared use with pedestrian or motor vehicle traffic.	Lower-speed local street (no higher than 35 mph)	Medium to Low
Class IV	Provides a right-of-way designated exclusively for bicycle travel adjacent to a roadway, protected from vehicular traffic.	Mid-speed corridor	High

6. California State Legislature. Article 3. California Bicycle Transportation Act Section 890-892. California Street and Highways Code. 1935. http://bit.ly/1XquXcR

Class I Bikeway: Bicycle Path

- Provides a completely separated right-of-way for the exclusive use of bicycles separated from pedestrians with cross flows minimized.
- The design standards for minimum paved width on a travel way for a two-way bicycle path shall be 8 feet, but 10 feet is preferred. The minimum paved width for a one-way bicycle path shall be 5 feet.[7]
- For use in corridors not served by streets and highways, or where wide right-of-way exists.
- Bicycle paths should offer opportunities not provided by the road system. They can provide recreational opportunities, or unimpeded, long distance routes if cross flow of vehicles and pedestrian conflicts are minimized.

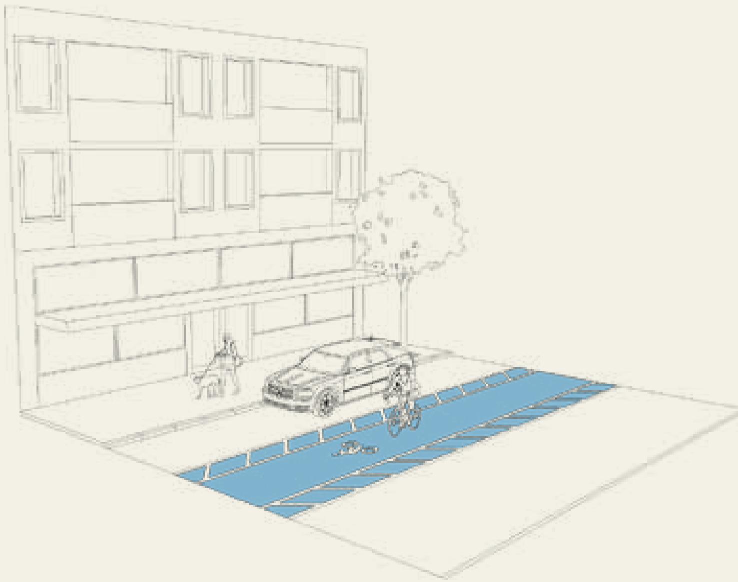


Mountains to the Sea Trail and Bikeway

7. Caltrans. Chapter 300 Geometric Cross Section. Highway Design Manual. 2015, pp. 300-1. http://bit.ly/1SbkOm9

Class II Bikeway: Bicycle Lane

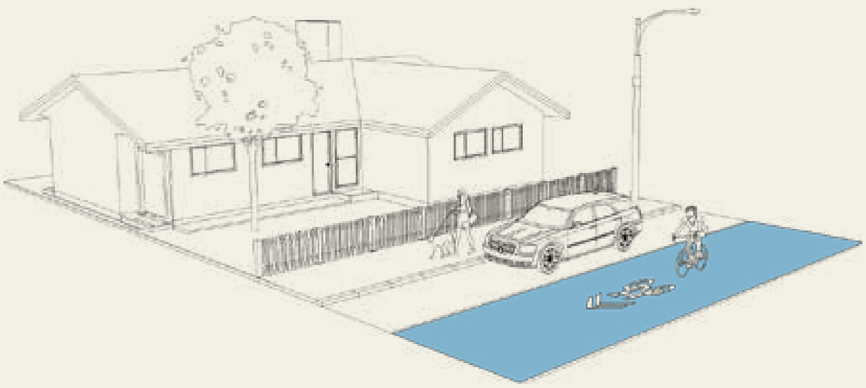
- Provides a striped lane for one-way bicycle travel along a street or highway.
- Minimum Class II bicycle lane width shall be over 4 feet, unless there are exceptions based on the surrounding road environment. 7 foot bicycle lanes are preferred and additional width is desirable if high traffic volumes, speeds and/or high parking turnover exists.
- Bicycle lanes are established along streets in corridors where there is significant bicycle demand, and where there are distinct needs that can be served by them.
- Bicycle lanes are intended to delineate the right of way assigned to bicyclists and motorists and to provide more predictable movements by each. This can be achieved with line marking or pavement surfacing.
- Another important reason for constructing bicycle lanes is to better accommodate bicyclists through corridors where insufficient room exists for safe bicycling on existing streets. This can be accomplished by reducing the number of lanes, reducing lane width, or prohibiting parking on given streets in order to delineate bicycle lanes.



San Miguel Drive, Newport Beach

Class III Bikeway: Bicycle Route – (Sharrow)

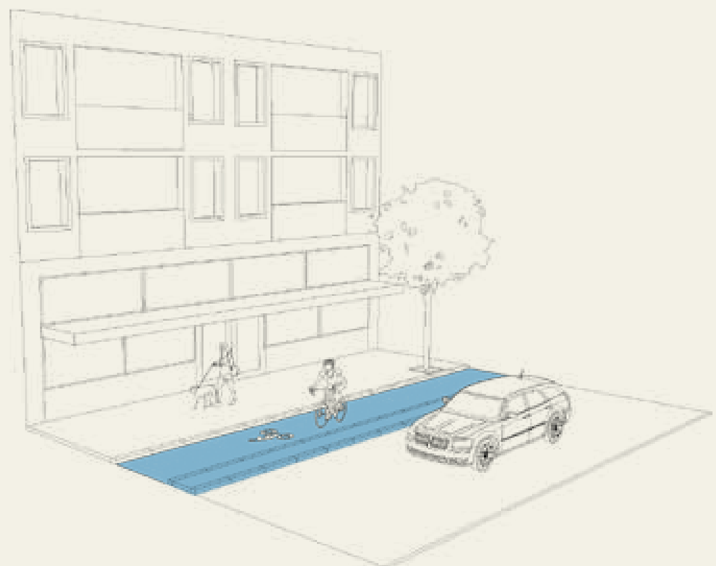
- Provides for shared use with motor vehicle traffic.
- Design standards include placing bicycle route signs along roadways and/or adding shared roadway markings along the route.
- As with bicycle lanes, designation of bicycle routes should indicate to bicyclists that there are particular advantages to using these routes as compared with alternative routes. This means that responsible agencies have taken actions to assure that these routes are suitable as shared routes and will be maintained in a manner consistent with the needs of bicyclists. This will usually be determined by the number of vehicles per day that use the street and the speed designation.



Sharrow, Cypress Drive, Laguna Beach

Class IV Bikeway: Separated on-street facility

- On-street bicycle facility that provides physical separation between cars and bikes. This physical separation makes them particularly well suited for kids, families, and seniors by increasing safety and comfort by minimizing the potential for auto interactions.
- The physical separation can be accomplished in a variety of techniques such as planters, concrete, or even parked cars.



Separated on-street cycle facility along 3rd and Broadway between Alamitos and Golden, Long Beach

Local streets

In addition to the four facility types described above, local streets without any bikeway designation can also help to complete the bicycle network. These are streets that are fully adequate for safe and efficient bicycle travel, where signing and pavement marking for bicycle use may be unnecessary due to low level of vehicle throughput and/or relatively low vehicle speeds, which enable bicycle travel to be accommodated with vehicle travel.

Cycling on residential streets

Bicycle Infrastructure

Other bicycle infrastructure should be used to support a cohesive and safe network for bike users. Particular elements that can be included in Complete Streets includes:

Intersection Markings
In order to provide safer intersection crossing for bicyclists markings can be painted or installed on roadways

- Bike Boxes - Designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of waiting traffic during the red signal phase.
- Two-stage turn queue boxes - Offer bicyclists a safe way to make left turns at multi-lane signalized or unsignalized intersections from a right side cycle track or bike lane, or right turns from a left side cycle track or bike lane.

Bicycle Signals
Make crossing intersections safer for bicyclists by clarifying when to enter an intersection and by restricting conflicting vehicle movements. Bicycle signals are traditional three lens signal heads with green-yellow and red bicycle stenciled lenses.

Bike Racks/Storage
Bicycles can be locked or stored in many different ways, including simple bicycle racks provided along the street, or more protective bike storage containers that fully enclose and lock up the bicycle while the user changes modes.

For specific design considerations on when and how to use these specific features refer to documents listed under Further Information.

Further Information

- AASHTO - Guide for the Development of Bicycle Facilities, 4th Edition, 2012
- Caltrans - Highway Design Manual. 2014
- Caltrans - Complete Intersections: A Guide to Reconstructing Intersections and Interchanges for Bicyclists and Pedestrians 2010
- CROW - Design Manual for Bicycle Traffic, 2007
- ITE – Recommended Practices on Accommodating Pedestrians and Bicyclists at Interchanges, 2014
- NACTO - Urban Bikeway Design Guide. 2014.
- State of California - California Streets and Highways Code (Sections 890-892)


Bicycle storage Santa Ana Station

Bicycle trail wayfinding signage


Bicycle storage Santa Ana Station

Bicycle signal at intersection, Harvard Boulevard

Trails

There may be certain connections for bicyclists, pedestrians, and low speed vehicles that cannot be accommodated within the roadway. Trails can be developed to create connections along freeways, or adjacent to major arterials where there is open space. In rural settings, multi-use trails can be provided in place of sidewalks. Trail segments provide links to important destinations such as golf courses, fields, nature centers, nature preserves, schools, work, shopping areas, restaurants, and recreational areas.

Trail design criteria are intended to enhance public welfare, improve safety, minimize maintenance, and avoid environmental impacts. There are several different trail types, each defined by a set of standards. Widths are developed to accommodate a range of users, with wider trails required for areas with multiple user types and high volumes of users. Trails are commonly organized into the following types:

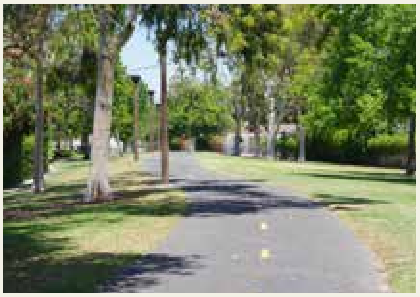
Recreational trail types
Soft or firm surface trails found in open spaces. These include:

- Nature trails that are between 2-4 feet.
- Recreational trails that are between 4-8 feet.
- Utility roadbeds are the widest recreational trail at 8-14 feet.

Active transportation trails
Usually found near roads and are covered with firm to hard surfaces. These include:

- Roadside trails that are between 5-12 feet wide.
- Connector trails that are 4-8 feet.
- Paved multi-use trails (also referenced to earlier as Class I bikeways) that are between 8-16 feet.

When designing trails, attention must be given to the trail users, coinciding easements, adjacent landowner privacy, view sheds, the existing environmental conditions, and overall circulation plan for the area.



Neighborhood connector trail East Adams Street, Santa Ana

San Diego Creek Trail, Irvine

Oso Creek Trail, Mission Viejo

Key design considerations

Control points	Identifying control points that are favorable for trail construction (such as scenic vistas, ridgelines, light vegetation, well-draining soils, good trail access) and avoiding areas that inhibit trail construction (such as wet area, sensitive wildlife habitats, unstable soils, unsafe road crossings).
Grade	Understanding how the grade of a trail is an important factor in determining the length, level of difficulty, appropriate user types, and drainage and maintenance requirements.
Surface infrastructure	The choice of materials as appropriate to the trail type and the cross slope along the width of the trail, and performance criteria as based on the movement of wheeled bikes, strollers and wheelchairs, as well as price, longevity, and aesthetics.
ADA compliance	ADA compliance on portions of a trail where damage to the natural, historical, or cultural requirements would not occur, including an accessible pathway, parking lot, and trailhead access points.
Connectivity	Connectivity between the trail and the wider pedestrian network. Trails should link to sidewalks. Trail entry and exit points should also be near to crosswalks or other road crossing facilities (e.g. overpasses) as appropriate.
Access	Providing clear access from other transportation modes. For local trails this might mean ensuring a clear line of sight from a nearby transit stop, supplemented with directional signage. For more significant trails trailheads should incorporate car parking. Bicycle parking facilities should also be provided at key locations served by the trail.
Signage	Signage and wayfinding information to denote the trail entrances, and also provide information on the route itself and access to local attractions/destinations.

Bicycle, equestrian and pedestrian trail, Santa Ana

Beach trail, Newport Beach

San Clemente pedestrian beach trail

Case Study
OC Loop

The OC Loop is a vision for 66 mile continuous connection of bicycle and pedestrian trails through seventeen jurisdictions in Orange County. The loop is designed to connect the existing 46 miles of bikeway made up of the Santa Ana River Bikeway, the Coastal Bikeway, the San Gabriel River Bikeway and the Coyote Creek Bikeway. The loop aims to create a loop where people aged eight to eighty feel safe traveling to and from local facilities and improve the quality of life for Orange County residents.

A feasibility study, funded by the SCAG sustainability program, was carried out in 2014 to establish design concepts and costs required to close the gaps and complete the OC Loop. The study includes a design guide for trail facilities and makes recommendations for the treatment of major crossings, alignment, surfaces, gradients and landscaping.

Further Information

Caltrans – Highway Design Manual. 2014

FHWA – Equestrian Design Guidebook for Trails, Trailheads, and Campgrounds

NACTO – Urban Street Design Guide. 2013

Equestrian Trails

Designing and maintaining easily accessible, integrated horse trails is essential for equestrian communities. Equestrian trails may be segregated, or part of a multi-use trail.

Key design considerations

Multi-use trail width	A recommended minimum of 10 feet for multi-use trails; however, where heavy use is anticipated, a 12-14-foot width is recommended.[7]
Urban trail width	In the case of urban equestrian trails it may be more appropriate to provide a separate trail parallel to the sidewalk that is at least 5 feet wide and surfaced with a soft tread material such as sawdust or dirt as to not injure a horse's hooves.
Vertical clearance	Vertical clearance from trees, signage, and overhead structures should be at least 10 feet high to enable the horse and rider to pass safely.
Signage	Adequate signage should be provided to alert trail users to the different modes of transportation and right of way priority.
Facilities	Additional facilities should include equine parking, hitching posts, mounting blocks, and water provisions for horses.
Crossing	Where the trail transects a signalized crossing, an equine crossing signal should be provided at least 5 feet from ground level.

7. FHWA. Equestrian Design Guidebook for Trails, Trailheads and Campgrounds http://1.usa.gov/1SvpvkD

Equestrian trail, Yorba Linda.

Equestrian crossing, Carbon Canyon Road

Equestrian trail, Carbon Canyon Road

Further Information

AASHTO - A Policy on Design Standards – Interstate System, 5th Edition, 2005

Caltrans - Highway Design Manual. 2014

FHWA- Equestrian Design Guidebook for Trails, Trailheads, and Campgrounds

Low Speed Vehicles (LSV) and Neighborhood Electric Vehicles (NEV)

LSV's and NEV's (such as golf carts) are a convenient, low cost, environmentally friendly alternative to the traditional automobile. In 1998, the National Highway Traffic Safety Administration (NHTSA) created a new class of vehicle to include LSV's and NEV's and permitted the on-road use of the vehicles.[8] In California, they are permitted on roads with a posted speed limit of 35mph or less, although local jurisdictions may have varying regulations regarding speed and operational limitations.

Key design considerations

Low speed roads	On low speed roads where the posted speed is 20mph or less, LSV's and NEV's are allowed to mix with traffic as all vehicles will be travelling at the same speed. Adequate signage should be installed to alert drivers to LSV's and NEV's.
Moderate speed roads	On roads where the posted speed is 30-35mph, a travel lane of at least seven feet should be provided for lower speed vehicles to share, including bicycles. Intersections should accommodate all modes of transportation safely.
High speed roads	Where the posted travel speed is over 35mph, an alternative segregated route should be provided to encourage LSV's and NEV's as a mode of transportation. If this path is to be shared by pedestrians and cyclists the width should accommodate a separate 4ft lane for pedestrians.
Federal trails and walkways	Federal law prohibits the use of LSV's and NEV's on federally funded trails and pedestrian walkways as they present a hazard to cyclists and pedestrians.[9]
Legislative action	To allow LSV or NEV facilities a legislative action is typically required for the local agency to implement the facility and the agency must complete a LSV or NEV Master Plan.

8. National Highway Traffic Safety Authority. 49 CFR part 571 Federal Motor Vehicle Safety Standards, Low Speed Vehicles. Notices and Final Rules: Low Speed Vehicles. June 17, 1998. http://1.usa.gov/1qJpX98
9. Renaissance Planning Group. Policy and Design Considerations for Accommodating Low Speed Vehicles and Golf Carts. Washington : AARP Public Policy Institute, 2011. http://bit.ly/1Xqwakt

Neighborhood Electric Vehicle, Laguna Woods


Neighborhood Electric Vehicle, Seal Beach

Further Information

WRCOG - 4-City Neighborhood Electric Vehicle Transportation Plan, 2010

Roadway components

For several decades, streets have been designed with the automobile in mind. With Complete Streets, the emphasis is on designing for all modes. This does not mean that roadway functionality needs to be impacted. Well-designed Complete Streets can maintain a sufficient level of service to car users, while also increasing safety for all users and enjoyment by other users where appropriate.

Lane widths

Lane widths have an impact on both travel speed and vehicle capacity. Historically, lane widths have been based on standards, which are then interpreted by localities to adapt to their own cities' and town's needs. After decades of wider and faster roadways, the trend has shifted toward narrower lanes. As seen below, the most recent versions of engineering and design manuals have decreased lane and roadway width recommendations. Reducing travel lane widths helps to reduce travel speeds, and may also help free up space to provide other facilities, such as bicycle lanes, or wider sidewalks. Research shows that narrower travel lanes do not result in increased crash rates.

It is important to consider the presence of heavy vehicles when designing travel lane widths that are less than 12 feet. If heavy vehicles such as trucks, transit, or emergency vehicles are going to be using specific road segments, the design must be able to incorporate their size. Vehicle size will determine the corner radii to be used at intersections. Typically, in an urban setting where lane widths are narrower, tighter radii will be used to slow turning speeds and increasing safety for pedestrians. While this increases the walkability of the street, designers need to ensure larger vehicles can still maneuver safely and create a balance for all modes of transportation. Likewise, shoulder widths are an important consideration for roadways. Generally, the larger the number of lanes, the wider the shoulder will be due to the higher traffic flow volumes and vehicle speeds.

Several prominent design guides give advice on lane widths that provide good references for Complete Street retrofits or construction. The maximum recommended lane width is 12 feet, but 10 feet is the emphasized width for safe urban and walkable areas. Widths lower than 10 feet are also acceptable in some circumstances. Other lane width considerations must be accounted for to ensure appropriate emergency access for first responders. Typically, this requires a 20-foot minimum roadway cross-section to ensure that fire engines can access key areas.

Some key design standards and recommendations for street widths that vary based on the OCCSI street type can be found below. The sources of this information have been included in the reference box.

Several of design manuals have specific guidance in regards to street width recommendations:

- **The California Highway Design Manual:** For conventional State highways with posted speeds less than or equal to 40 mph and truck volumes less than 250 per lane, minimum lane width shall be 11 feet (otherwise, 12 feet is recommended).[10]
- **AASHTO:** For urban areas, lane widths may vary from 10 to 12 feet for arterials.[11] For lower speed, lower volume rural roads, and highways with little or no truck traffic, lane widths as low as 9 feet may be acceptable. Lane widths substantially less than 12 feet are considered adequate for a wide range of volume, speed, and other conditions.
- **ITE CSS for Urban Thoroughfares:** On the lower-speed urban thoroughfares with target speeds of 35 mph or less, a range of lane widths from 10 to 12 feet on arterials and 10 to 11 feet on collectors is appropriate.[12]
- **NACTO Urban Street Design Guide:** Lane width should be considered within the overall assemblage of the street. Travel lane widths of 10 feet generally provide adequate safety in urban denser settings while discouraging speeding. Cities may choose to use 11-foot lanes on designated truck and bus routes (one 11-foot lane per direction) or adjacent to lanes in the opposing direction. Lanes greater than 11 feet should not be used as they may cause unintended speeding and assume valuable right of way at the expense of other modes. [13]

Further Information

- AASHTO - A Policy on Geometric Design of Highways and Streets, 2001
- AASHTO - A Policy on Design Standards – Interstate System, 5th Edition, 2005
- Caltrans - Highway Design Manual. 2014
- ITE – Designing Walkable Urban Thoroughfares: A Context Sensitive Approach, 2010
- NACTO – Urban Street Design Guide. 2013

10. Caltrans. Chapter 300 Geometric Cross Section. Highway Design Manual. 2015, pp. 300-1. http://bit.ly/1SbkOm9
11. AASHTO. Geometric Design of Highways and Streets. Washington D.C : s.n., 2004. p. xliii. http://bit.ly/1TQzJyY
12. Institute of Transportation Engineers. Designing Walkable Urban Thoroughfares: A context Sensitive Approach. Washington D.C : s.n., 2010. p. 136. http://bit.ly/1vXqXrs
13. National Association of City Transportation Officials. Urban Street Design Guide. New York : Island Press, 2013. p. 33. 978-1-61091-494-9. http://bit.ly/1TQzJyY

Recommended lane widths based on street type

MF

Multimodal Freeway Corridor

- 12 ft

MC

Movement Corridor

- 11ft on roads with target speed of 40mph or less
- 12 ft on higher speed roads

ML

Mixed Land Use Corridor/Hub

- 11ft on roads with target speed of 40mph or less
- 12 ft on higher speed roads

BP

Industrial/Business Park Street

- 11ft on roads with target speed of 40mph or less
- 12 ft on higher speed roads

NM

Neighborhood Main Street

- 10-11 ft wide
- 11ft if designated truck or bus route

DS

Downtown Street

- 10ft wide
- 11ft if designated truck or bus route

AL

Alley

- No lane markings, however need to ensure minimum roadway cross-section of 20ft for emergency access

RS

Residential Street

- 10 feet where lane markings present
- If no lane markings, ensure minimum roadway cross-section of 20ft for emergency access

SS

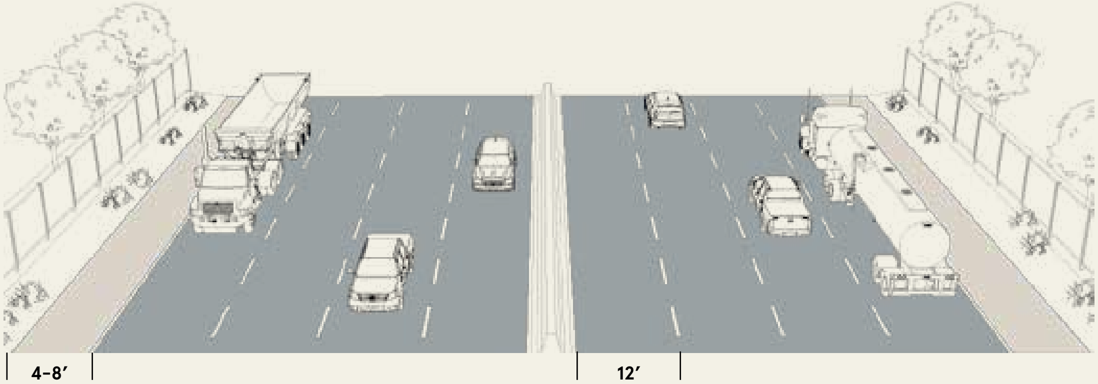
Shared Street

- No lane markings, however need to ensure minimum roadway cross-section of 20ft for emergency access

MF Multimodal Freeway Corridor lane widths

Shoulder:
4-8 foot

All travel lanes:
12 foot

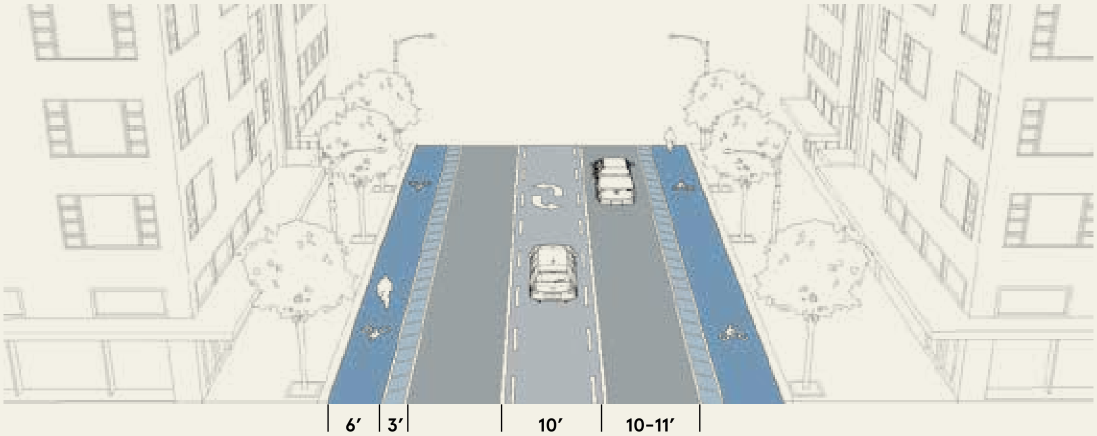


NM Neighborhood Main Street lane widths

Bicycle lane:
6 foot +3 foot buffer

Turning lane:
10 foot

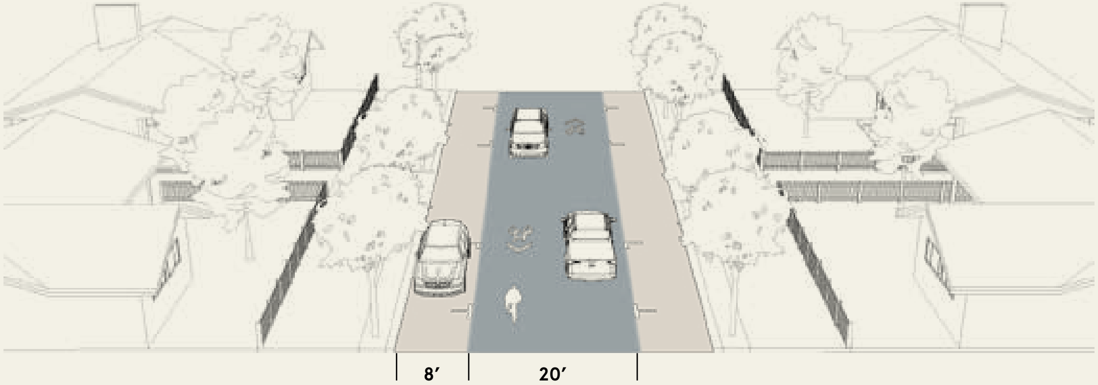
Travel lane:
10-11 foot



RS Residential Street lane widths

Parking:
8 foot

Two way travel lane:
20 foot



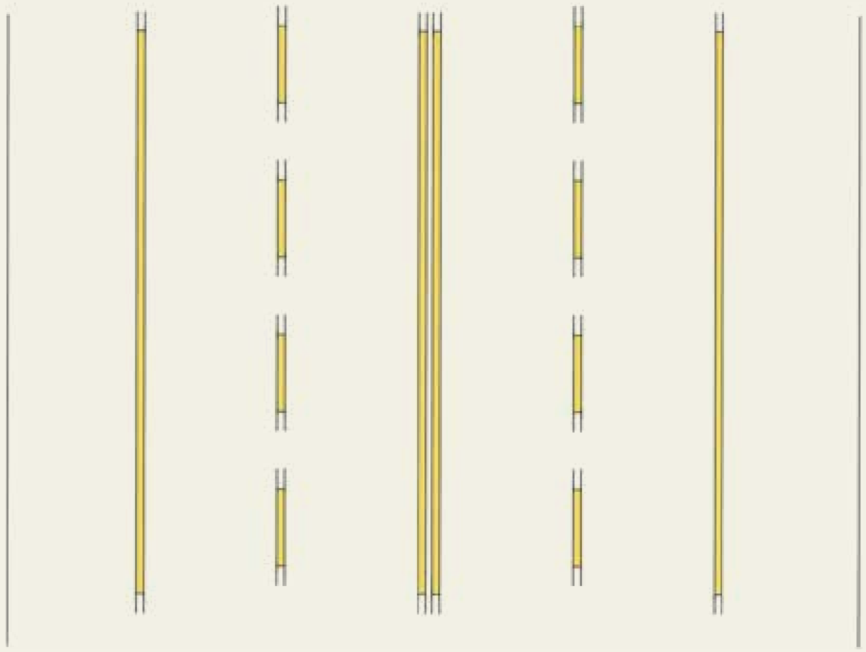
Road Diet

Road Diets take multi-lane undivided roads and transform them into a roadway with fewer through lanes and one center turn lane. Often this is a conversion of a four-lane, undivided road into three lane road (one being the turn lane), and the addition of bicycle lanes on either side.

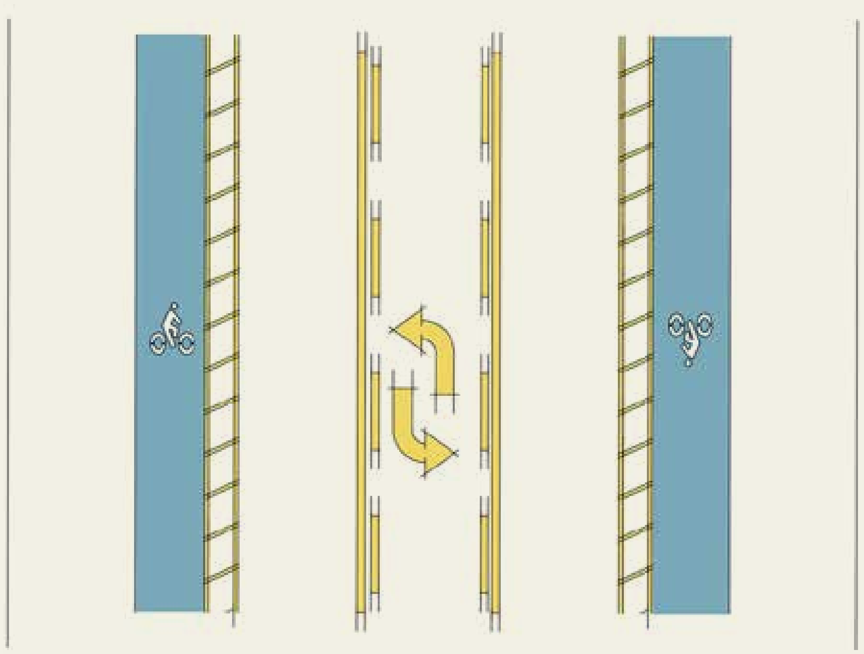
A Road Diet improves safety by including a protected left-turn lane for mid-block left-turning motorists, reducing crossing distances for pedestrians, and reducing travel speeds so that crash severity is decreased. Additionally, a Road Diet provides an opportunity to allocate excess roadway width to other purposes, including wider sidewalks, bicycle lanes, on-street parking, transit stops, or a planted central median. The provision of a center turning lane also helps mitigate the queues that form behind turning traffic.

The Federal Highways Association published the Road Diet Informational Guide in 2014[14] to assist local authorities, engineers, and road designers through the process of determining where Road Diets are appropriate. To determine if a road diet is appropriate, designers should identify what they are trying to achieve, this will impact on the configuration of road diet chosen.

When considering a road diet, the existing street and context should be taken into account.



Four lane road before a road diet



Three lane road with bicycle lanes after a road diet

14. Knapp, Keith, et al., et al. Road Diet Informational Guide. s.l. : Federal Highway Administration, 2014. http://1.usa.gov/1wgJcpo

Key design considerations

Average Daily Traffic volumes	The FHWA suggests road diets are appropriate for roadways with an Annual Daily Traffic (ADT) volume of 20,000 of less.
Peak hour and peak direction	A road diet is feasible when there is less than 750 vehicles per hour per day. A road diet increases the queue length at intersections, and if at peak hour the congestion builds up, it can affect adjacent intersections.
Speed	Posted speed limits should be appropriate for the surrounding land use. A road diet can successfully reduce the speed differential on roads and calm traffic in busy neighborhoods.
Existing Movement	The existing behavior of vehicles on the stretch of road proposed for a road diet may suggest if a road diet is appropriate. Investigating turning vehicle volumes and patterns may identify potential conflicts with a two-way left turn configuration. In some cases, roads will already be functioning as a de-facto road diet with left turning vehicles in the inside lane and through traffic in the outer lanes.
Surrounding Context	Consideration should be given to the surrounding road network and land use. Like most traffic calming interventions, road diets can cause a diversion of traffic to parallel routes and may impact local businesses and residents. Consultation with stakeholders will raise any opposition prior to implementation.
Road Users	Vehicles that stop often will block traffic flow if pullouts are not accommodated for within the road diet design. Consider transit, mail delivery, trash collection and agricultural vehicles.

Case Study
Gilbert Street Improvements

North Gilbert Street between Katella Avenue and W. Ball Road, is a one-mile connector within Anaheim used by local residential traffic, a commercial area, and several schools. Previously, it comprised four travel lanes with left turn lanes at major intersections to accommodate turning vehicles, and no dedicated left turn lanes at intermediate intersections. The east side had designated parking, that obstructed the sidewalk. The street had over 118 collisions with 79 injuries and three fatalities over the past decade.

The project provided safety enhancements and traffic calming. A road diet took four lanes down to two travel lanes and one turn lane. Sidewalks were extended and made ADA-compliant, with new curbs and gutters, better signage, upgraded intersection signals, and safer pedestrian crosswalks. Because of its success, Orange County is looking to identify other Complete Street locations in need of similar safety and accessibility features.

Key design considerations

U-turns	Reduction of lanes / lane width may impact on the ability of vehicles to make U-turns at intersections due to the tighter turning circle. Consider whether the ability to make a U-turn is required and the effects of banning the maneuver at certain locations.
Bicycle Lanes	The road diet environment complements the introduction of bicycle lanes and may be a suitable solution to complete gaps in a bicycle network. Pedestrians – Road diets support pedestrian activity by calming traffic, improving sidewalk facilities and introducing refuge islands for midblock crossings.
Pedestrians	Road diets support pedestrian activity by calming traffic, improving sidewalk facilities and introducing refuge islands for midblock crossings.
Parking and driveways	Flow of traffic in a road diet is impacted by vehicles pulling out from parking and driveways. How frequently this occurs will determine if a road diet is suitable.
Intersections and at grade rail crossings	Road diet intersections should be appropriately designed to meet the alignment and profile of the approaching streets. Transit priority lanes and turning lanes may be required to maintain traffic flow. Crossing facilities for pedestrian and bicyclists will improve safety at the intersection. Grade separation and signal coordination should also be considered to improve the efficiency of a road diet.
Landscaping and stormwater management	A road diet is an opportunity to introduce street trees, plants, and stormwater management interventions into the corridor.

Case Study
Road Diet: Broadway, Costa Mesa

Planted bulb-outs at intersections and central median narrowing have been implemented along Broadway in Costa Mesa to slow traffic and provide protection for bicyclists at intersections.

Center-Turn Lanes

A center turn lane (also known as Two-way left-turn lane [TWLTL]) is located in the middle of a two-way street and is marked on both sides by two painted lines. The inner line is broken and the outer line is solid. The center lane is often used to provide a deceleration and storage lane for left-turning vehicles, typically used for vehicles making midblock left turns. This provides for more flexible use of the left turn lane compared to separate left turn lanes that have fixed tapers and pocket storage lengths.

Key design considerations

Traffic speeds and turning levels	This type of operation works best where the speed on the road is between 25 to 45 mph, there are small left-turn traffic volumes, and on roads with closely spaced driveways. In most places, TWLTLs are typically found on urban streets that have a single through lane in each direction, although some jurisdictions have two to three lanes in each direction.
Dimensions	The center turn lane width can be as small as 11 feet, although 14 feet is preferred.
Markings	The opposing white left turn arrows should be spaced between 8-16 feet apart and repeated approximately every 300 ft.
Pavement	Textures, coloring, and other features can be added with a TWLTL to increase their visibility and functionality.
Pedestrians and bicyclists	The crossing movements of pedestrians and bicyclists should also be considered in designing center turn lanes, with a potential need for refuge areas in between the through lanes.

Further Information

- AASHTO - A Policy on Geometric Design of Highways and Streets, 2001
- AASHTO - Roadside Design Guide, 2011
- Caltrans - Highway Design Manual. 2014

Traffic calming

Traffic calming is any measure that is designed to slow down auto – and potentially bicycle – traffic. It can also be used to dissuade traffic from a particular route and therefore help cut through volumes. Lower speeds and less traffic means less severe collisions and increased pedestrian and bicycle traffic. This help improve street safety, local amenity and overall livability of a neighborhood.

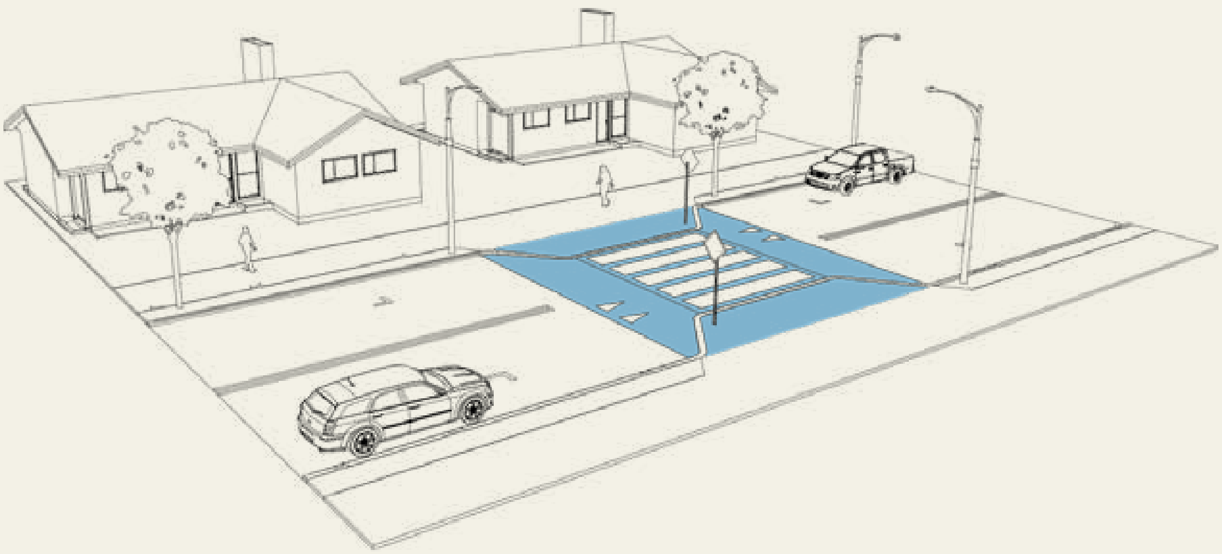
Traffic calming is typically applied to existing roads, and may involve changes in street alignment (vertical and / or horizontal), installation of barriers, or other physical measures to reduce traffic speeds and/or cut-through volumes.

Typical infrastructural components that calm traffic include: curb extensions, speed humps and cushions, speed tables, median narrowing, raised crosswalks and traffic circles. In order to get traffic calming measures implemented, a structured process driven by local policy helps to ensure success.

Horizontal infrastructure
These improvements physically narrow the available roadway space for vehicles in order to slow traffic. They can also help pedestrians by providing additional areas for refuge or to wait, and by providing shorter crossing distances. Extended sidewalk areas can also be used for planting and street furniture. Key design types are set out below and on the following pages.

- **Chokers/Pinchpoints:** These are curb extensions at midblock locations that narrow the roadway space by widening the sidewalk or planting strip. If marked as crosswalks, they are also known as safe crosses. Two-lane chokers leave the street cross section with two lanes that are narrower than the normal cross section. One-lane chokers narrow the width to allow travel in only one direction at a time, operating similarly to one-lane bridges. They are good for areas with substantial speed problems and where is no shortage of on-street parking.
- **Chicanes:** Chicanes are curb extensions that are staggered on alternate sides of the street to the other, forcing drivers to deviate from a linear movement in a S shaped maneuver. Chicanes can also be created by alternating on-street parking, either diagonal or parallel, between one side of the street and the other. Each parking bay can be created either by restriping the roadway or by installing raised, landscaping islands at the ends of each parking bay. They are good for locations where speed is a problem but noise associated with speed humps or related measures would be unacceptable.
- **Center-Island Narrowings:** A raised island located along the centerline of a street that narrow the travel lanes at that location. Center island narrowings are often landscaped to provide visual amenity. Placed at the entrance to a neighborhood, and sometimes combined with textured pavement, they are often called "gateway islands." When fitted with a gap to allow pedestrians to walk through at a crosswalk, they can also be considered "pedestrian refuges." Center island narrowings help reduce traffic at entrances to residential areas, and on wide streets where pedestrians need to cross.

Choker/pinchpoint incorporating a crosswalk and raised table



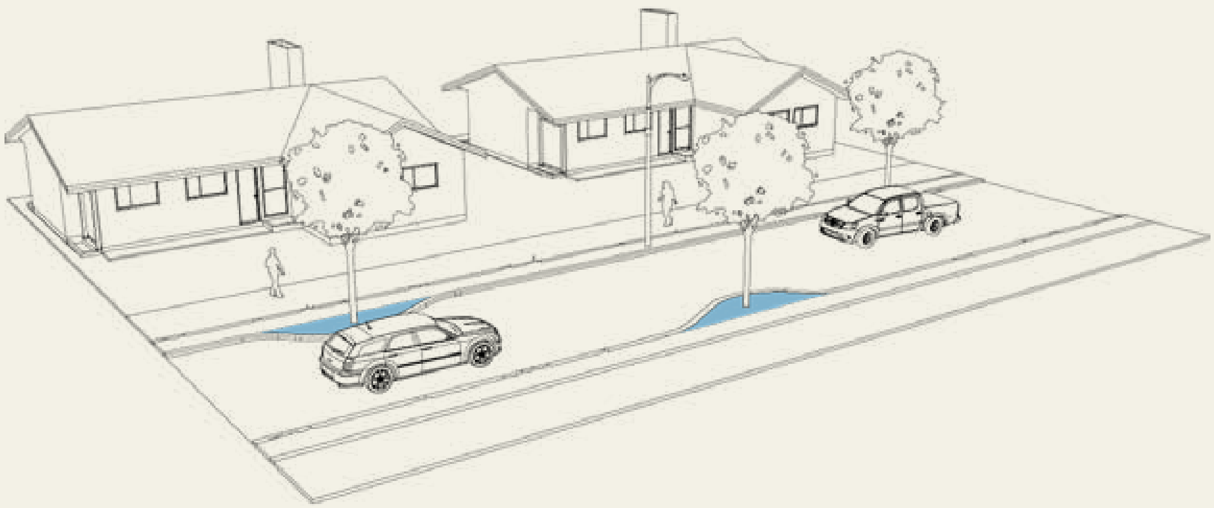
Key design considerations

Roadway width	Sufficient width needs be available at the choker so that it is easily negotiable by large vehicles (such as fire trucks).
Amenity	If designed well, they can have positive aesthetic value and contribute to local amenity and place-making, e.g. using planting or introducing artwork.
Bicycle access	They may require bicyclists to briefly merge with vehicular traffic.
Parking	Installation may be dependent on the removal of some on-street parking.
Drainage	Consider the impact on drainage. Curb realignment can be costly if drainage changes are required.

Good practice

Choker/pinchpoint in Seal Beach

Chicanes incorporating tree planting



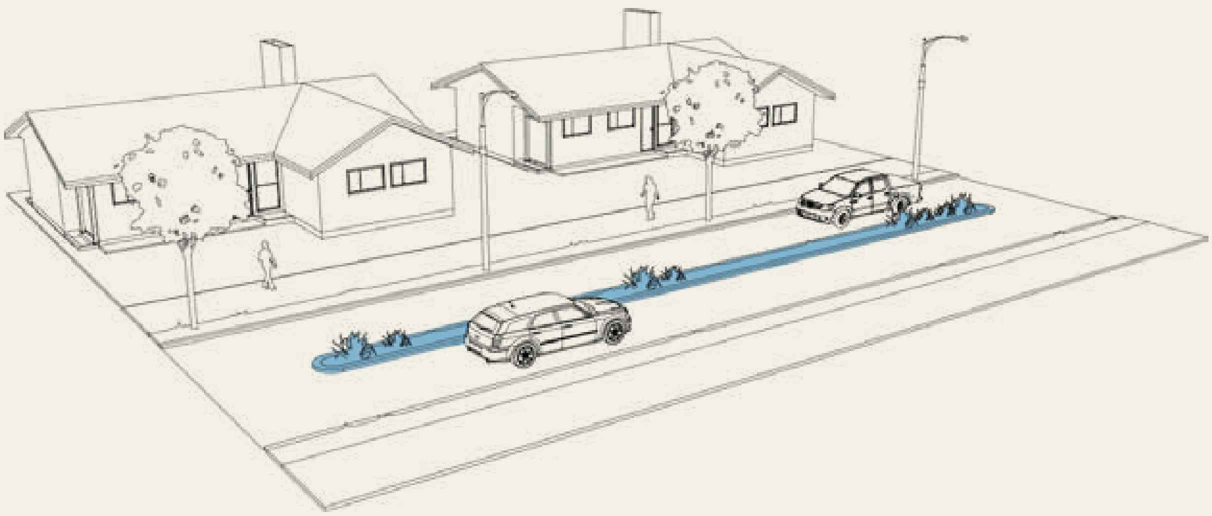
Key design considerations

Visibility	Chicanes discourage high speeds by forcing horizontal deflection by traffic. To do this they must be clearly visible to drivers on the approach so they can slow down and maneuver accordingly. They must be aligned so that drivers have time to react safely and continue travel in the appropriate part of the roadway.

Good practice

Chicane in Yorba Linda

Center island with planting



Key design considerations

Pedestrian movement	Center islands can increase pedestrian safety by reducing crossing distance, and also providing a safe refuge point to stop midway when crossing the road. This is particularly important for disabled people, or others who may require more time to cross a road. If the island is accessible to pedestrians then it needs to be sufficiently wide (e.g. 6 feet) to allow pedestrians to comfortably wait within the island.
Lighting	If the island is accessible to pedestrians, then care needs to be taken that it is well illuminated by street lighting so that drivers can see pedestrians crossing.
Maintenance	Unlike chokers and chicanes access to the narrowing is from the center of the road. If planted, care needs to be taken that it can be easily accessed by maintenance staff to ensure upkeep.

Good practice

Center island in Costa Mesa

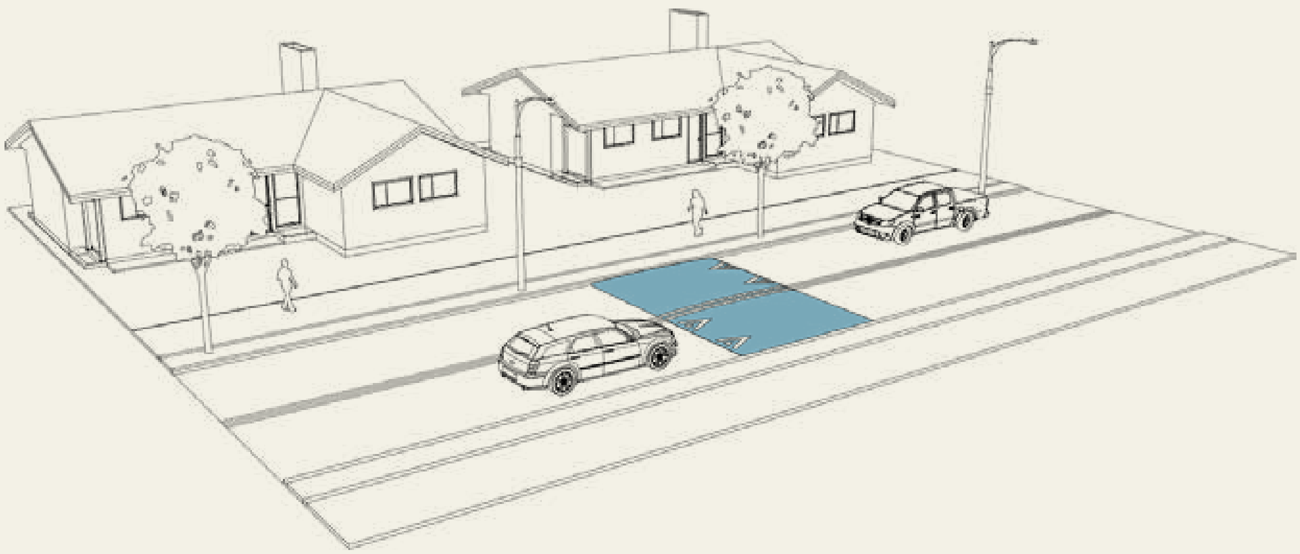
Vertical infrastructure
This type of traffic calming incorporates raised surface treatments designed to slow traffic. These are typically used in downtown and neighborhood streets where the speed limit is less than 30mph. Design types are set out below:

- **Speed humps** – Rounded, raised areas placed across the roadway. They are generally 10 to 14 feet long (in the direction of travel), making them distinct from the shorter "speed bumps" found in many parking lots, and are 3 to 4 inches high. The profile of a speed hump can be circular, parabolic, or sinusoidal. They are often tapered as they reach the curb on each end to allow unimpeded drainage. Speed humps are good for locations where very low speeds are desired and reasonable, and noise and fumes are not a major concern.
- **Speed tables** – Flat-topped speed humps installed in midblock locations, and often constructed with brick or other textured materials on the flat section. Speed tables are typically long enough for the entire wheelbase of a passenger car to rest on the flat section. The brick or other textured materials improve the appearance of speed tables, draw attention to them, and may enhance safety and speed-reduction.
- **Raised crosswalks** – Raised crosswalks are speed tables outfitted with crosswalk markings and signage to channelize pedestrian crossings, providing pedestrians with a level street crossing. Also, by raising the level of the crossing, pedestrians are more visible to approaching motorists. Raised crosswalks are good for locations where pedestrian crossings occur at haphazard locations and vehicle speeds are excessive. Key design considerations include many of the ones listed above for speed tables.

Good practice

Speed hump in Santa Ana

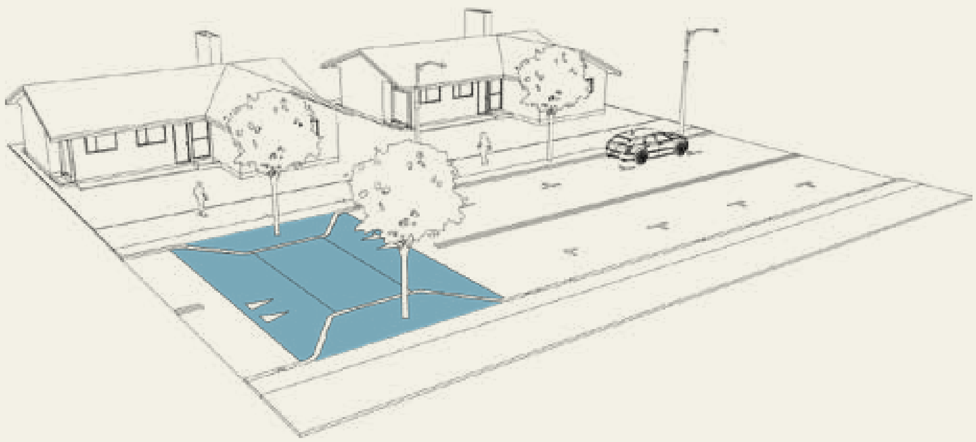
Speed humps



Key design considerations

Cost	Speed humps are relatively inexpensive to implement.
Bicycle movement	Bicycles can cross speed humps, however not all are comfortable to ride over. If designed appropriately sinusoidal humps are most comfortable for bicyclists.
Public transit	Speed humps are not considered suitable for bus routes.
Large vehicles	They force large vehicles, including emergency vehicles and those with rigid suspensions, to travel at slower speeds. The impact on emergency vehicle (such as fire trucks) travel times needs to be carefully considered.
Noise	Speed humps can have localized noise impacts, most notably from larger vehicles braking, and the sound of the tires going over the hump.
Drainage	If designed appropriately speed humps have no impact on drainage.

Speed tables



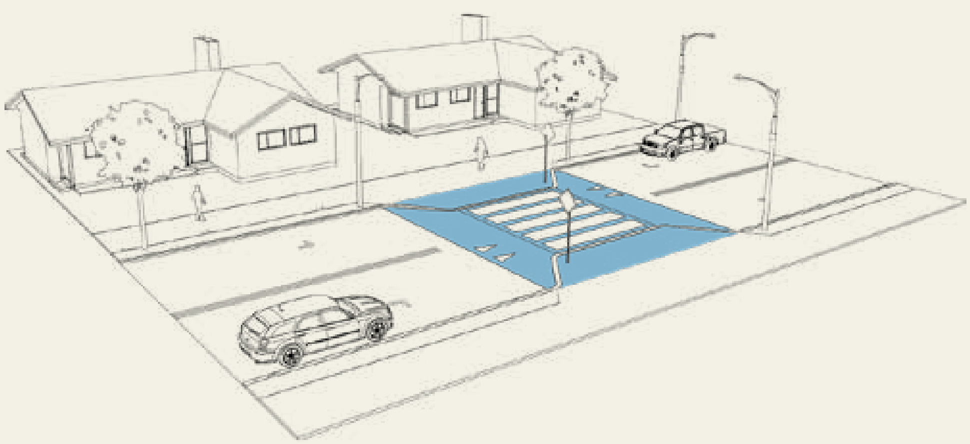
Key design considerations

Bicycle movement	Speed tables are move comfortable for bicyclists to ride over.
Public transit	Speed tables are easier for buses to negotiate than humps, however they should not be used on roads with high numbers of buses as the table is likely to deteriorate more quickly than it would with general traffic.
Large vehicles	Speed tables are easier for large vehicles to negotiate, including emergency vehicles.
Amenity	Textured materials can be used on the top of the speed table. The use of a different material in the roadway can encourage drivers to slow down. It can also help improve visual amenity, particularly if used in conjunction with other streetscape enhancement measures. Such materials do however add to the cost of the infrastructure.
Drainage	Drainage needs to be carefully considered so that stormwater does not flow onto the sidewalk. Drainage changes may be required which can make the intervention more expensive.
Noise	Speed tables can increase noise from vehicles passing over them, particularly if it includes a textured surface.

Good practice

Main Street, Huntington Beach Art Center; although not a speed table, sections of raised roadway such as this can provide similar traffic calming benefits

Raised crosswalk combined with a choker/pinchpoint



Key design considerations

Visibility	The crosswalk increases visibility and the potential for a vehicle to yield to a pedestrian. Clear line of sight must be maintained for drivers towards the crossing point; this can be achieved by restricting parking in advance of the crosswalk, and ensuring there are no trees obstructing the view from a reasonable distance.
Alignment	The crosswalk should be placed to align with the main route pedestrians wish to take, especially where the crossing is placed midblock.
Width	The width of the crosswalk should relate to anticipated flow of pedestrians using the space to ensure adequate comfort. The ramp of the raised crosswalk should be located away from the marked crosswalk part of the surface.
Distance	If the crossing is long, then medians or safety island can be used to create a 2-stage crossing, to make it more comfortable for less able-bodied pedestrians.

Good practice

Although not raised, this mid-block crossing in Fullerton outside the City Hall features curb build-outs and different surface material

Further Information

AASHTO - A Policy on Geometric Design of Highways and Streets, 2001

APA - U.S. Traffic Calming Manual, 2009

NACTO – Urban Street Design Guide. 2013

Traffic Control Devices

Traffic control devices promote highway safety and efficiency by providing for the orderly movement of all road users on all street typologies. Caltrans has adopted the California Manual on Uniform Traffic Control Devices (CA MUTCD).[15] This is a state supplement to the Federal Highways Administration's (FHWA) National Manual on Uniform Streets. The manual describes the basic principles that govern the design and use of traffic control devices on streets in California and should be referred to when designing the street environment.

Traffic control devices include:

- Signs
- Barricades
- Gates
- Markings
- Highway Traffic Signals

The manual puts emphasis on highway safety from a vehicle perspective and should be the first reference when implementing traffic control devices. However, a Complete Streets approach should also consider how the design, placement, operation, and maintenance of traffic control devices impact different transportation modes in the street environment.

Traffic control devices, Irvine, showing how excessive signage and signage at low levels can create hinder visibility between road users

Sign indicating access to the I55, Costa Mesa; the signage is positioned so it is clearly visible for drivers, but high enough for pedestrians to pass under, and the posts are positioned so that the sidewalk is relatively unobstructed

15. Caltrans. California Manual on Uniform Traffic Control Devices. Sacramento : s.n., 2014 Edition. http://bit.ly/1Ls04Ni

Key design considerations

Positioning	Traffic control devices should be appropriately positioned with respect to the situation which it applies. For example, regulatory signs, warning signs, and guide signs serve different purposes and should be positioned to reflect this. In a case where all three signs apply, regulatory and warning signs should take precedence because the location and information is critical for users. In all situations care must be taken to locate devices and ensure they are at an appropriate height so that they do not obscure sightlines between pedestrians, cyclists, drivers and other road users. E.g. in the image on the adjacent page the number, position and height of the signs all serve to obscure pedestrians waiting to cross from oncoming vehicles.
Visibility and legibility	Visibility and legibility of traffic control devices can be affected by the environment that they are situated within. Traveling speed, street layout, lighting may impact how users interpret the traffic control device and should be taken into account when positioning in the street environment to ensure users have adequate time to respond in all conditions. For example, the font size on a sign for cyclists could be smaller than that on a sign for vehicles because they are traveling at a slower speed and have longer to interpret the sign.
Consistency	Traffic control devices should be designed, placed, and operated in a uniform and consistent manner to assist with identification.
Avoid clutter	Any unnecessary traffic control devices should be removed to prevent confusion and maintain a clear, concise network of traffic control devices.
Standardization	In practice, standardization of traffic control devices cannot always be attained. The CA MUTCD offers examples of typical locations and installations for traffic control devices in varying situations. With multi-modal transportation there is an increasing demand for various traffic control devices and a standard road layout is less common. It is critical that traffic control devices are not detrimental to different modes and function as a cohesive system.

Further Information

- California Department of Motor Vehicles – 2015 Vehicle Code
- Caltrans – California Manual on Uniform Traffic Control Devices (CA MUTCD) 2014
- FHWA - Manual for Uniform Traffic Control Devices (MUTCD) 2009

Intersection components

Intersection design is a critical aspect of street design, being the point where different movements by different transportation modes converge. Getting this right helps enable safe movement for all users, and can also help to improve the quality of the public realm. This section explores key components of intersection design, including aspects of intersection geometry, traffic signals, and types of crossing facilities.

The starting point for design of an intersection as part of a Complete Streets project is to observe and assess how the intersection is being used and consider how the intersection could be used in the future (if the movement and / or place context is likely to change). This will enable the right decisions to be made on intersection design that best benefit all users. By using treatments that reduce the speed of motorized vehicles at intersections, while maintaining operation efficiency, and also reducing crossing distances for pedestrians and bicyclists, an intersection can become much more inclusive and comfortable for all.

Intersection geometry

Left-turn lanes

A left-turn lane is an auxiliary lane for the storage or speed change of left-turning vehicles that is located at the left of a one-directional roadway typically within a median or divisional island. Left-turning vehicles account for a high number of total collisions at intersections as they can encounter safety problems from several sources of conflict, such as: bicyclists, opposing through traffic, through traffic in the same direction, and crossing traffic. The desirability of exclusive left-turn lanes cannot be overemphasized for safety, especially on roadways with high vehicle speeds. Inefficiencies in operations may be evident on divided highways where left-turn lanes are not provided.

Key design considerations

Offset turn lanes	On streets with wider medians, the use of offset left-turn lanes is encouraged. Opposing left-turn lanes that are offset or shifted as far to the left as possible helps improve visibility of opposing through traffic. On roads where 100 or more cars are making left-turns an hour, a signal is typically provided to serve the demand. At 300+ left-turns per hour, a second left-turn lane is typically needed.
U-turns	Vehicles U-turning at intersections can conflict with pedestrians crossing the road, or waiting in a refuge island. To reduce conflict at busy intersections consider banning U-turns. Where U-turns are allowed add a safety island 'nose' that extends past the crossing to protect pedestrians from turning vehicles.
Lane widths	The average left-turn lane is 10-12 feet wide. Roadways with a single median should have a median width of at least 10 feet, though medians as wide as 20 ft. can be provided. It is important that the receiving leg of an intersection also has adequate lane width to accommodate the turning lanes.
Guidance	Pavement markings, contrasting texture, signs, and physical infrastructure may be used to guide turning movements.
Bicycles	Where bicycle left-turns are common, a left-turn-only bicycle lane can be considered to increase the safety of all intersection users. Additionally, California requires that signal timing be implemented to support turning speeds for cyclists at intersections. Where there are multiple traffic lanes a two-stage turn queue box can be added; these enable bicyclists to make left turns from a marked area on the right side of the intersection.
Signal timing	As the number of turning lanes increase, so too does the roadway width, and pedestrian crossing length and signal timing needs to be considered and adjusted to provide a safe and quality environment for all users.
Balancing modes	The designer should consider all users of the system when deciding to implement exclusive left-turn lanes. Trade-offs between vehicle movement efficiency and vehicle safety should be considered in context with increased pedestrian crossing distances and increased pedestrian exposure.
Restricted movements	An alternative to introducing protected phasing is to restrict left turns entirely or for specific times of the day when risk of collision is highest.

Right-turn lanes
Channelized right turn lanes with pedestrian refuge islands (so called `pork chop´ islands) at intersections should be avoided where possible in Complete Streets. They increase the size of the intersection, the pedestrian crossing distance and the risk of collision between motorists turning and pedestrians crossing. However, where there are heavy volumes of right turning a right-turn lane may be necessary.

Advantages	Disadvantages
Can help maintain traffic flow by improving signal timing and overall operations of an intersection.	Slip lanes can create turning radii that encourage drivers to speed when making the turn.
If applied appropriately it can balance the need for larger turning radii with pedestrian safety and mobility goals.	Increases crossing distance and may dissuade pedestrians from using the intersection.
Provides a safe place for pedestrians to wait when they do not have sufficient time for full crossing movement.	Visually impaired uses may find the accessible pedestrian way difficult to follow.
If applied appropriately, it can improve visibility for drivers.	Places an added obstruction in the roadway, which may impact on maintenance.
	May require additional land for roadway.
	'Right hook' conflicts between turning vehicles and bicyclists going ahead.

Key design considerations

Geometry	Ensure the angle of the turn is sufficient to reduce turning speeds, and improve the visibility of pedestrians crossing, and vehicles ahead by the driver making the turn.
Crosswalk	Place a striped and signed crosswalk across the right turn lane to the pedestrian island. It should be positioned so that drivers have enough space between the crosswalk and the traffic on the cross-street to wait and yield, without obstructing the pedestrians.
Yield	Sign the slip lane for traffic to yield to pedestrians.
Cycle facilities	Avoid using 'pork chop' islands; use a combined bike lane/ turn lane instead, with a bike lane on the inside portion of a dedicated motor vehicle turn lane. Shared lane markings or conventional bicycle stencils with a dashed line can delineate the space for bicyclists and motorists within the shared lane. Include signage advising motorists and bicyclists of proper lane positioning.

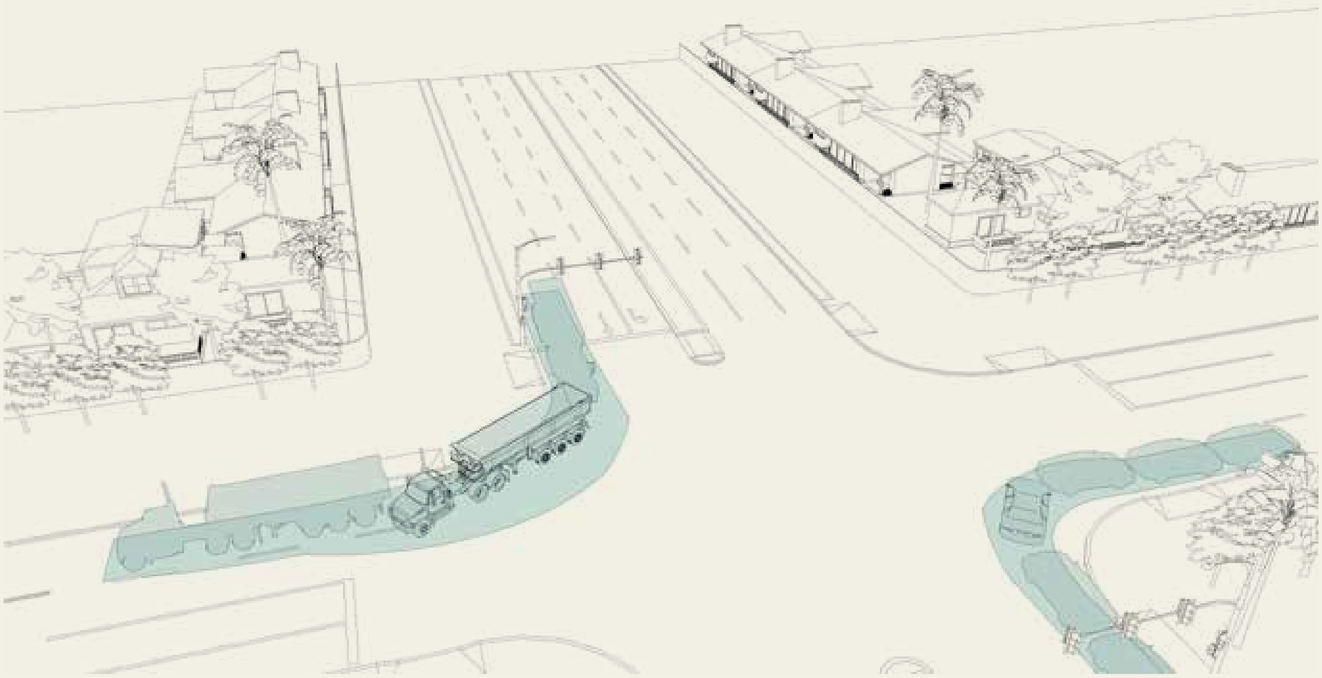
Corner radii
Corner radii directly impact vehicle turning speeds and pedestrian safety. Minimizing the size of a corner radius is critical to creating compact intersections with slower, safer turning speeds. Smaller radii also benefit pedestrians by increasing the size of waiting areas, allowing greater flexibility in placement of curb ramps, and reducing pedestrian crossing distances.

Standard curb radii are 10–15 feet, however it is possible to use corner radii that are much smaller, and in urban settings, smaller corner radii are preferred to limit speeds. In these locations corner radii exceeding 15 feet should be the exception and not the norm. Larger streets may need to accommodate large vehicles turning. Ensure the curb radius allows this, but consider setting back stop lines to avoid sacrificing sidewalk space.

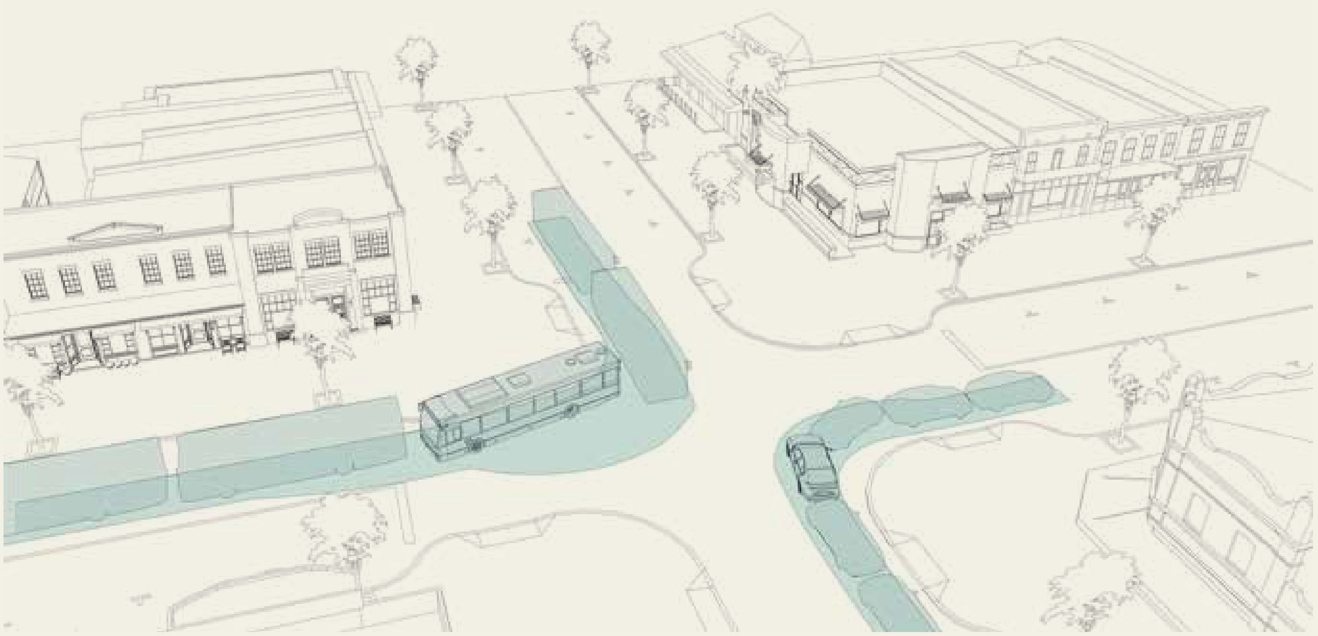
Key design considerations

Pedestrian comfort	Corner designs must balance the needs and safety of both pedestrians and vehicles. The size of the corner and length of the crosswalk are related; smaller radii reduce crosswalk length, taking pedestrians less time to cross, and reducing exposure risk. Smaller radii also provide more pedestrian waiting space, making walking more comfortable in busy areas.
Effective turning radius	The design of the actual curb radius should be based on the elements that create the effective radius, which must accommodate design vehicle's turning radius. The selection of design vehicle should be based on the vehicles typically using the intersection, considering relative volumes and frequencies of larger vehicles such as trucks and buses.
Larger vehicles	Smaller curb radii may be more difficult for larger vehicles to negotiated, however on-street parking or bicycle lanes may provide the larger effective radii to accommodate the appropriate design vehicle while avoiding unnecessary widening of the intersection. Stop line striping can also be set back on destination streets to enable large vehicles to make the turn by encroaching into adjacent roadway space.
Vehicle speeds	Turning speeds should be limited to 15 mph or less.

Turning radius on a Movement Corridor



Turning radius on a Neighborhood Main Street



Visibility/sight distance
Visibility and sight distance are parameters which relate to the inherent safety of intersections, as well as driveways, and other potential conflict points between vehicles and other users. Intersection design should facilitate eye contact between street users to increase attention paid to other transportation modes and share the space appropriately.

Key design considerations

Vehicle speed	Designers should proactively lower speeds near conflict points to ensure that sightlines are adequate and movements predictable, rather than widening the intersection or removing sightline obstacles.
Sight triangles	Wide sight triangles for stopping and approach distances may help create visibility, but they may also cause cars to speed up. If this is likely then traffic controls or calming measures can be used on the approach to help ensure low speeds on the approach and reduce risk of conflict. In determining the sight distance triangle for a given intersection then the target speed rather than the design speed should be used.
Fixed objects	An object in the roadway or on the sidewalk (e.g. a tree, building, sign or street furniture) may be deemed to obstruct sightlines for vehicles in a given intersection and pose a safety hazard. These should not be removed, without firstly considering other safety-mitigation measures, such as reducing vehicle speeds, increased visibility through curb extensions or changes to geometry, or adding waning signs. If not other solution can be found the item may have to be removed or relocated.
Traffic control devices	Traffic control devices must be unobstructed and clearly visible.
Parking	Parking should be removed on the approach to the intersection to ensure clear sight lines.

Traffic Signals

Signalized intersections are a major component of street design because they affect all modes of transportation by governing the time allotted to each mode Signal timing is an essential tool, not just for the movement of traffic, but also for a safer environment that supports walking, bicycling, public transportation, and economic vitality. Signal timing that provides insufficient time for crossing the street is unpleasant for pedestrians and may discourage walking, and this needs to be balanced with the need to ensure that delays to traffic do not provoke traffic violations or risky maneuvers.

Key design considerations

Signal cycle lengths	Short signal cycle lengths can help minimize delay in a complex street network environment, reducing wait times in all directions and creating crossing opportunities for pedestrians at closer intervals. Short cycle lengths of 60–90 seconds are ideal for urban areas. Avoid simultaneously adding multiple turn lanes and increasing turn phase intervals where possible.
Signal priority tools	Use of tools such as leading pedestrian intervals, synchronized signals for bicycles, or transit signal priority along corridors can help with established or desired modal priority.
Pedestrian countdown	Pedestrian countdown signals create a more predictable crossing environment and give adequate warning to pedestrians attempting to cross a roadway.
Fixed-time signals	These are the rule in urban areas for reasons of regularity, network organization, predictability, and reducing unnecessary delay. They also provide consistency for pedestrians wishing to cross.
Peak and off-peak timing	Signal timing should take into account different volumes of peak and off peak time periods. Timings can be adjusted to meet different levels of activity through the day.
Crosswalks	All legs of signalized intersections must have marked crosswalks unless pedestrians are prohibited from the roadway or section thereof, or if there is physically no pedestrian access on either corner and no likelihood that access can be provided.

Traffic signals at the intersection of Avocado Avenue and San Miguel Drive

Traffic signals at the intersection of Broadway and Newport Boulevard, Costa Mesa

Further Information

- AASHTO - A Policy on Geometric Design of Highways and Streets, 2001
- Caltrans – California Manual on Uniform Traffic Control Devices (CA MUTCD) 2014
- Caltrans - Complete Intersections: A Guide to Reconstructing Intersections and Interchanges for Bicyclists and Pedestrians 2010
- FHWA - Manual for Uniform Traffic Control Devices (MUTCD) 2009
- FHWA - Signalized Intersections: An Informational Guide, 2013

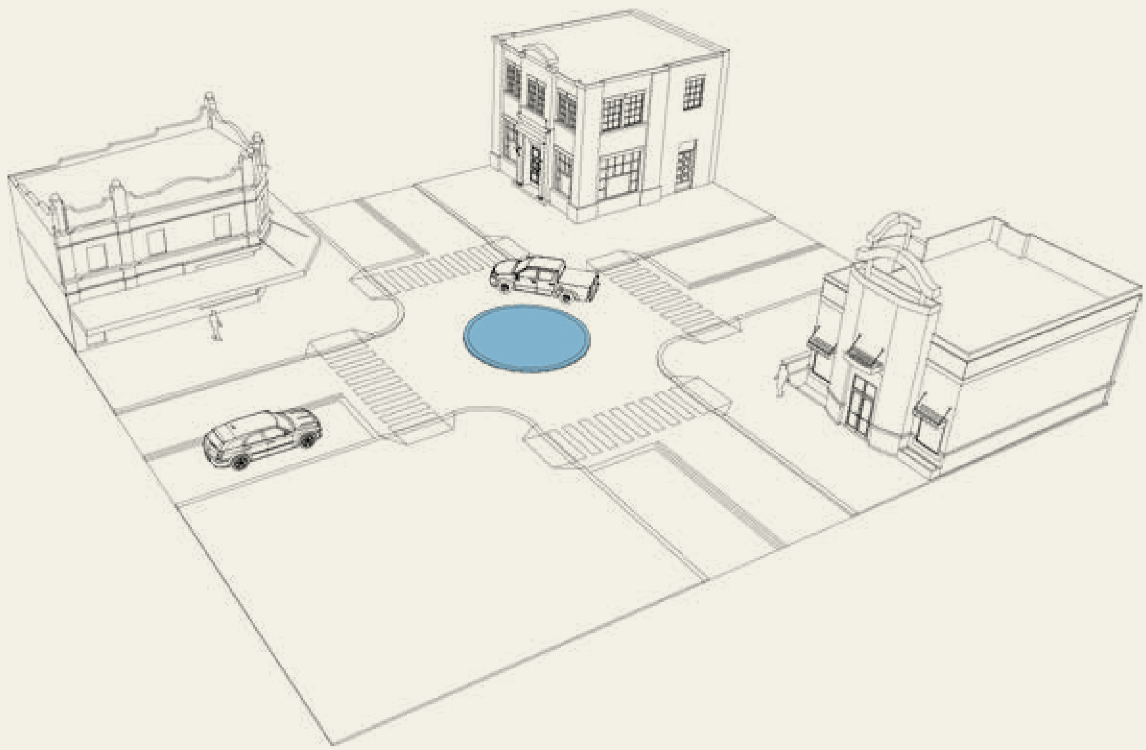
Traffic Circles

Traffic circles are small roundabouts which take the form of raised islands, placed in intersections, around which traffic circulates. They are good for calming intersections, especially within neighborhoods, where large vehicle traffic is not a major concern but speed, volume, and safety are problems. They are very effective in moderating speeds whilst efficiently moving vehicles through an intersection, thereby improving safety and also helping to reduce emissions.

Key design considerations

Speed	Designs should consider the speed of the roadway. They are not suitable for high speed roads.
Larger vehicles	Careful attention needs to be paid to the available lane width and turning radius for large vehicles (such as fire trucks), to ensure they are able to circumnavigate the infrastructure. Mountable curbs can be used on corners for areas where large trucks or vehicles require access in constrained spaces.
Pedestrian movement	Crosswalks should be marked on all arms to clarify where pedestrians should cross and that they have priority. They should be aligned as close as possible to the pedestrian desire line along the surrounding sidewalks, to avoid pedestrians having to make significant deviations. Ensure that the circulating lane does not encroach on the crosswalks. ADA-compliant ramps and deflector strips should be provided.
Bicycle movement	Sharrows or intersection-crossing markings should be used to help guide bicyclists through the intersection.
Amenity	Circles are ideal locations for art or planting schemes, and they can be form a gateway treatment for the neighborhood, however they must be placed and maintained so as not to obstruct visibility.
Stormwater	Circles can be designed with planting that captures stormwater run-off (see section on Stormwater Management for further details).
Signage	Regulatory signage or other means of warning drivers should be provided to remind traffic to circulate counterclockwise.

Traffic circle



Traffic circle at Vista and Park, Long Beach

Traffic circle South Melrose Street, Anaheim

Traffic circle East Wilshire Avenue, Fullerton

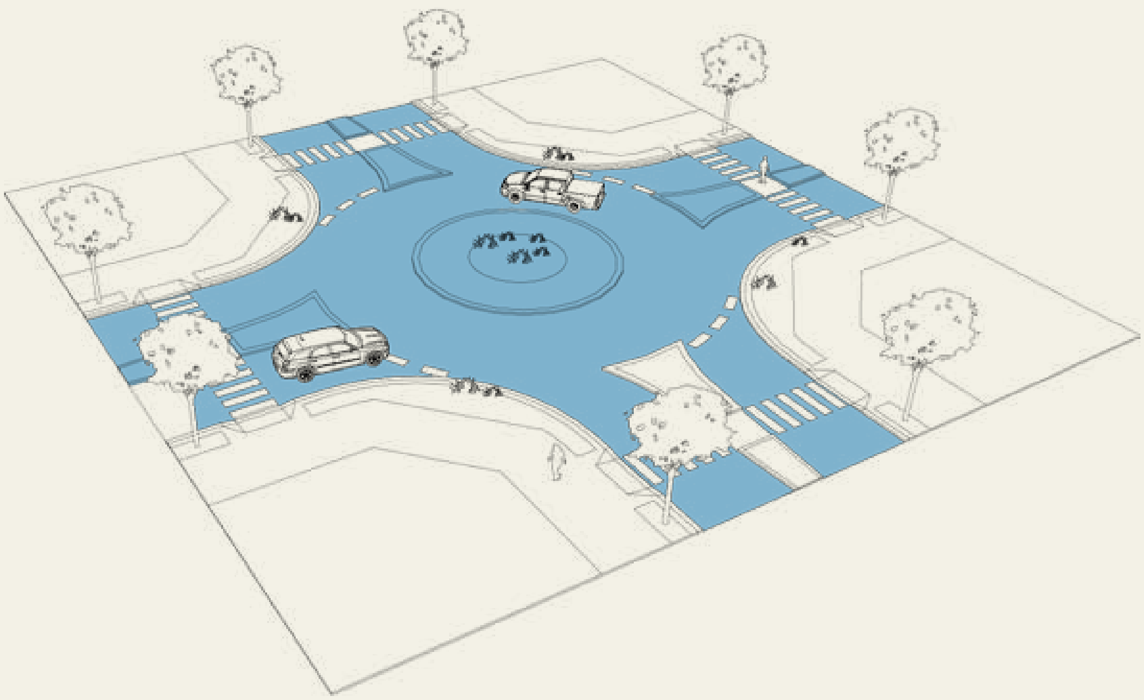
Roundabouts

Roundabouts are larger than traffic circles. They work in the same fashion with traffic circulating counterclockwise around a center island, but they are used on higher volume streets. Roundabouts create a balanced right-of -way at intersections requiring road users to proceed through the intersection with caution, stopping or yielding for any oncoming traffic. These can be enhanced with planting to improve amenity and calm traffic. They offer most benefit at locations with a history of accidents and at intersections where queues need to be minimized. They offer enhanced safety compared to traffic signals, and are less expensive to operate.

Key design considerations:

Size	Roundabout dimensions should be kept to the minimum safe diameter for a slow speed. Overly large roundabouts (especially multi lane types) should be avoided as they are more difficult for pedestrians and bicyclists to negotiate.
Sight distance	The roundabout must maintain clear sight distances to the left for drivers entering the roundabout, so that they are aware of oncoming vehicles and bicycles, and to the right when exiting the roundabout.
Parking	Installation of a roundabout may require the elimination of some on-street parking on the approaches and exits to maintain adequate visibility.
Pedestrian movement	Crosswalks should be marked on all arms to clarify where pedestrians should cross and that they have priority. Due to their size, crosswalks will naturally be set further back than at a standard intersection, however a balance needs to be achieved between setting them back for safety, and creating long walking distances for pedestrians.
Bicycle movement	Large roundabouts pose problems for cyclists, so aim to keep the roundabout as compact as possible. If space allows, Class 1 bikeways can be provided in the sidewalk zone around the roundabout to provide a safe, separate route for bicyclists. If this is not possible then the roundabout should be designed to maintain single lane approaches and exits with a width that enables bicyclists to ride in visible and prominent position in the traffic lane when they enter and exit the facility. Bicycle lanes should not be provided within the roundabout itself.
Amenity	Like traffic circles, roundabouts are ideal locations for art or planting schemes, and they can be form a gateway treatment for the neighborhood. As they are large they offer more scope for inventive landscape treatments and place-making.
Stormwater	As for traffic circles, the planted area of a roundabout offers scope to capture stormwater run-off (see section on Stormwater Management for further details).
Signage	Regulatory signage or other means of warning drivers should be provided to remind traffic to circulate counterclockwise and yield to traffic already circulating in the roundabout.

Roundabout



Sienna Parkway roundabout, Ladera Ranch

Ridge Valley roundabout, Irvine

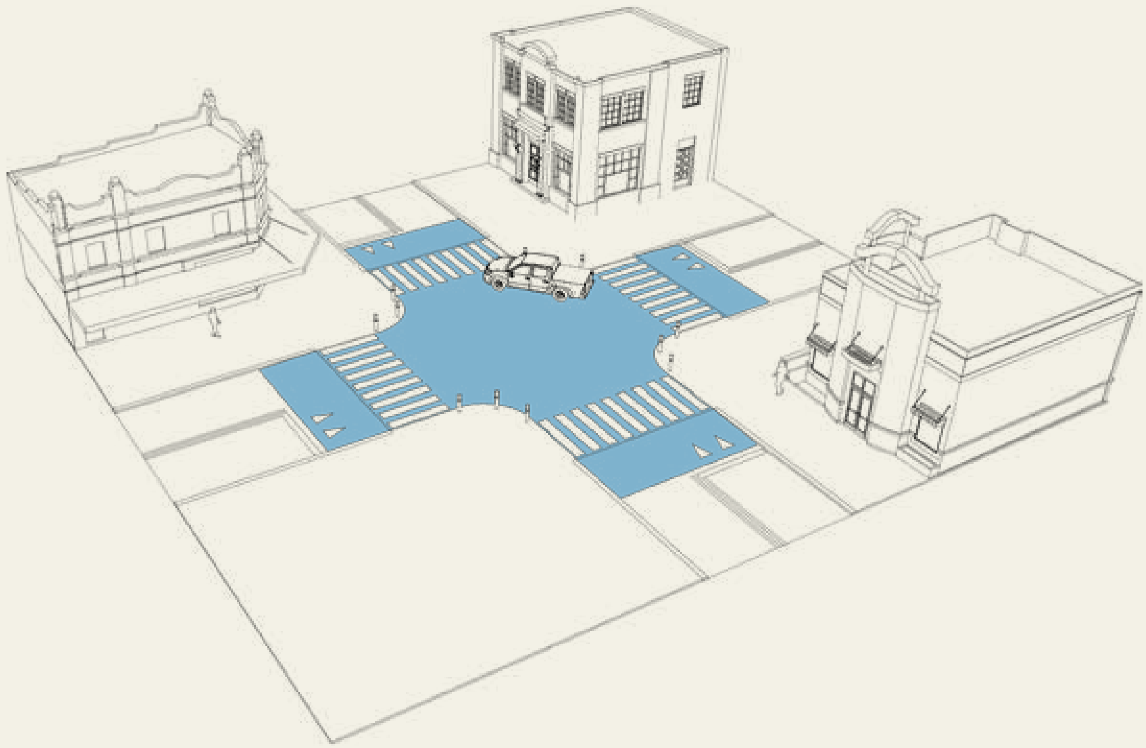
Raised Tables

Raised tables at intersections lift the level of the roadway to be flush with the sidewalk. They are similar to speed tables, but applied to the whole intersection. This creates a public space with slow speed crossings where vehicles are encouraged to yield for pedestrians. They can be of particular benefit to people with mobility and visual impairments as they remove vertical transitions.

Key design considerations:

Crosswalks	The whole intersection is raised to be flush with the sidewalk which ensures that drivers traverse the space slowly. Crosswalks do not need to be marked if all surfaces are at-grade; pedestrians can cross as they wish.
ADA access	The flush surface can aid disabled people, however can must be taken to use ADA-compliant features such as ramps and detector strips. In addition use of visually and texturally contrasting materials in the roadway and the sidewalk help visually impaired users distinguish between the two surface areas.
Defining corners	Strategically placed street furniture, stone / concrete blocks, or bollards are all items which can be used to help define the corners of the sidewalks where they meet the flush roadway surface.
Drainage	Careful consideration of drainage is required given the flush surface. Water should be directed away from the intersection to drainage basins, ensuring that it does not result in sidewalk flooding. Where appropriate stormwater planting can be used to help capture rainfall.
Larger vehicles	Careful attention needs to be paid to access for large vehicle access (such as fire trucks); the design speed must be considered when designing approach ramps.
Surface materials	Roadway materials should be robust and hard-wearing, and care should be taken when using special surface materials. Some types of pavers may not withstand heavy vehicle movements, and shift caused by vehicles turning the corners.

Raised table intersection treatment



Raised table at the intersection of Main Street and 6th Street, Huntington Beach

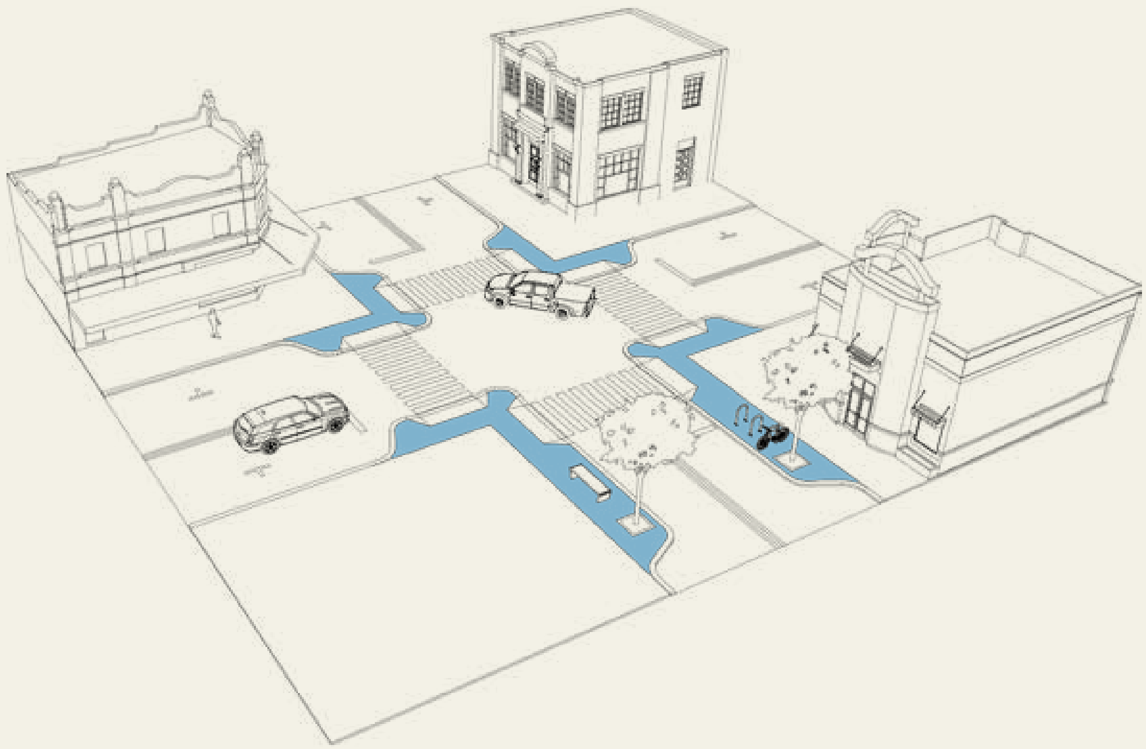
Bulb-outs

Bulb-outs, also known as curb extensions or neckdowns, are extended areas of sidewalk at intersections corners. They can help slow traffic speed on the approach to an intersection and when turning the corner. They improve visibility of crosswalks to traffic, and provide additional waiting space for pedestrians to queue. They also help restrict cars from parking too close to the crosswalk area, and the space can be used to provide additional sidewalk amenities or planting.

Key design considerations

Locations	Bulb-outs are only appropriate on intersections where there is parking present, or other curbside uses deflect motor vehicle traffic. They are particularly useful in locations where pedestrian traffic is high, or where there are known pedestrian safety issues.
Bulb-out dimensions	The bulb-out should be at least as long as the width of the crosswalk, with the curvature of the extension starting after the crosswalk area. The typical width of the bulb-out is the approximate width of a parked car.
Parking	Longer curb extensions can be used to restrict parking on the approach / exit of an intersection. This improves visibility between drivers and pedestrians, and facilitates amenity improvements. Keeping parking clear of intersections also aids emergency vehicles negotiating the intersection.
Roadway width	Sufficient roadway width needs be available at the intersection so that it is easily negotiable by large vehicles (such as fire trucks). Where an extension conflicts with turning movements, consider reducing the width or length of the extension; a small extension is still of benefit. The bulb-out should not reduce a travel lane or bicycle lane to an unsafe width.
Pedestrian movement	Direct pedestrian movement should be maintained across intersections, and crosswalks should be aligned to pedestrian desire lines on either side.
Amenity	The additional sidewalk space provided by a bulb-out can have positive aesthetic value and contribute to local amenity and place-making. For example, it can be used to introduce planting, seating, bicycle parking, or a parklet.
Drainage	Consider the impact on drainage. Curb realignment can be costly if drainage changes are required.

Bulb-out



Bulb-out on the corner of North Glassell Street and Maple Avenue, Orange Plaza

Bulb-out in Laguna Beach

Bulb-out on the corner of Orange Avenue and 2nd Street, At Last Cafe, Long Beach

Crossings

The level of protection desired by pedestrian's increases as traffic speeds and volumes increases. Where vehicle speeds and volumes are high, signalized crossings create a safer walking environment. Where anticipated pedestrian traffic is low or intermittent, or where vehicle volumes are lower and pedestrian crossings shorter, designers may consider the use of non-signalized crossing treatments.

The design of crossings should respond to pedestrian behavior and demand, but can also influence it. The alignment, frequency, grade, and width of crossings all affect walkability and have the potential to increase numbers of people walking in a neighborhood.

Key design considerations

Traffic volume and speed –	On streets with low volume (<3,000 ADT), low speeds (<25 mph), and few lanes (1–2), marked crosswalks are not always necessary at the intersections (but are always recommended near schools, parks, senior centers, transit stops, and hospitals). On streets with higher volume (>3,000 ADT), higher speeds (>25 mph), or more lanes (2+), marked crosswalks should be the norm at intersections.
Grade	Pedestrian crossings should be at grade except in instances where they are crossing limited access highways (see section on Pedestrian Over-Crossings and Underpasses).
All legs	All legs of intersections should have marked crosswalks unless pedestrians are prohibited from the roadway or section thereof, or if there is physically no pedestrian access on either corner and no likelihood that access can be provided.
Signal phasing	Signals should be phased to allow an adequate time for pedestrians to cross from one sidewalk to the other in a single cycle, making allowance for slower walking speeds of disabled users, seniors, children etc.
Crossing alignment	The alignment of the crosswalk should be as close as possible with the pedestrian through zone of the sidewalk to avoid inconvenient deviations from direction of travel. It should also correspond to the driver's field of vision so that pedestrians are clearly visible on the approach and when turning the corner.
Crossing distance	Crossing distances should be kept as short as possible using a compact intersection geometry, tight corner radii, bulb-outs, and medians.
Crossing width	Crossings should be at least as wide as the pedestrian through zone of the corresponding sidewalk. In areas of high pedestrian activity crosswalks may be wider to accommodate for the higher number of people.

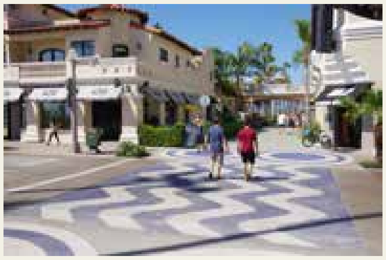
Key design considerations (continued)

Safety islands	A pedestrian safety island reduces the exposure time experienced by a pedestrian in the intersection. They are generally applied at locations where speeds and volumes make crossings prohibitive, or where three or more lanes of traffic make pedestrians feel exposed or unsafe in the intersection. They are especially beneficial to less mobile pedestrians by providing them with a protected area to wait for the signals to change if they are unable to cross in a single cycle. Pedestrian safety islands should be at least 6 feet wide, but have a preferred width of 8–10 feet.
Channelized turning islands	Known as 'porkchop' islands, these should be avoided as the increase pedestrian crossing time and distance, and turning traffic often fails to yield to pedestrians.
Crossing markings	These alert road users of a pedestrian crossing point. High visibility ladder, zebra, and continental crosswalk markings are preferable to standard parallel or dashed pavement markings. All signalized crossings should be striped to reinforce yielding of vehicles turning during a green signal phase. Striping should be as wide or wider than the sidewalk it connects to provide adequate space for pedestrians passing in different directions. Special surfacing may also be used to highlight the crossing point.
ADA access	Crossings should be ADA compliant with curb cuts, appropriately graded ramps, and detectable warning strips.
Lighting	Street lighting should be considered carefully so that crosswalks are well-illuminated.
Traffic calming	Crossings can be combined with traffic calming features such as raised tables, bulb outs and pinch points to slow vehicle speeds and increase pedestrian safety.
Warning devices	Warning signs, flashing lights and beacons can be used at crossings to increase drivers' awareness of pedestrians. FHWA MUTCD can provide further guidance on appropriate measure for each crossing.
Scramble crossings	Scramble crossings provide crosswalks on the diagonal of an intersection as well as all four legs. The crossing stops all vehicle movement and allows pedestrians to safely cross the intersection in all directions, including diagonally, at once. They should be considered for signalized intersections where there is high pedestrian activity.
Shading	Consider shading, especially where there are long cycle times at busy intersections. Adjacent tree shading or specific shade structure.

Signalized crossing with shading at the intersection of South Brea Boulevard and East Birch Street

Multi-colored crossing to improve visibility at the intersection of Broadway and Cherry, Long Beach

Scramble crossing at the intersection of Glassell and Palm, Orange



Special surfacing to highlight crossing, Main Street, Balboa Village, Newport Beach

Midblock Crossings

Design considerations for midblock crossings are similar to those at intersections. Additional considerations include:

Key design considerations

Location	Midblock crossings should be implemented in areas where there is significant pedestrian activity that may generate a desire cross the street away from an intersection. Such places may have been overlooked during planning streets, and generate unsafe or unpredictable behavior. Typical locations include transit stops, schools, supermarkets, parks, trailheads, and leisure attractions.
Crossing type	A midblock crossing can be a sign posted pedestrian crossing or a signalized crossing. Non-signalized crossing points on roads with high volumes and speeds of traffic should be marked with lines and /or different surface materials. Less busy roads such as residential streets can have mid-block crossings that simply comprise bulb-outs with curb cuts and sign-posts to indicate a crossing point.
Visibility	Parking and landscaping should be restricted on the approach to the crossing to make pedestrians and cars clearly visible to each other. The crosswalk should also be clearly marked to make drivers aware, and well-lit by street lighting or specific lighting for the facility.
ADA access	As for all crossings, midblock crossings should have curb cuts, appropriately graded ramps and detectable warning strips.

Further Information

AASHTO - A Policy on Design Standards – Interstate System, 5th Edition, 2005

California Department of Motor Vehicles – 2015 Vehicle Code

Caltrans - Highway Design Manual. 2014

FHWA - Roundabouts Informational Guide, 2000

NACTO – Urban Street Design Guide. 2013

Midblock crossing with bulb-outs, Avenida Del Mar, San Clemente

Signalized midblock crossing with bulb-outs, Fullerton

CASE STUDY

HAWK crossing

A HAWK crossing is a High intensity activated crosswalk that was develop to assist pedestrians at crossings on major arterials with high-speeds. At a HAWK crossing, drivers receive multiple cues to emphasize the potential presence of a pedestrian. These cues include a unique configuration of the HAWK beacon (two red lenses over a single yellow lens), high-visibility crosswalk markings (ladder-style markings as opposed to only two transverse white lines), a stop bar approximately 50 feet from the crosswalk, 8-inch solid lane lines between through travel lanes, signs that can be illuminated and read "CROSSWALK,"

http://1.usa.gov/23V6sf7

HAWK crossing installed by Caltrans outside the Laguna College of Art and Design on Laguna Canyon Road.

Pedestrian / Bicycle Over-crossings and Underpasses

Pedestrian and bicycle networks should be at grade wherever possible to facilitate connectivity, however there are instances where at-grade solutions are not possible. For instance rail lines and freeway corridors both form barriers to routes and can isolate neighborhoods within the urban fabric. Also the priority in some high volume and high speed streets will always be to maintain vehicular mobility. In these places over-crossings or underpasses should be considered to ensure communities have adequately connected pedestrian and cycle routes. However it is important to keep in mind that these should be the exception rather than the norm.

The following table compares advantages of both at-grade crossings and over/underpasses in connecting networks.

Pedestrian bridge over San Miguel Drive, Newport Beach

Pedestrian bridge over Crown Valley Parkway, Ladera Ranch

Design consideration	At-grade crossing	Overcrossing / underpass
Traffic flow	Slows and stops traffic flow. This is useful in maintaining lower speeds for more urban streets, however may not be appropriate for higher speed roads that provide strategic connections.	Maintains continual traffic flow by keeping transportation modes separate.
User conflict	Introduces a risk of conflict with vehicle to pedestrians and bicyclists while crossing, although this can be mitigated through good design.	Eliminates all risk of conflict with vehicles while crossing. Barriers should be installed at overcrossings to prevent objects from falling onto vehicles.
Personal security	Sense of security incorporated with street level integration and natural surveillance from frontages and / or passing vehicles.	Separation of crossing from street level decreases sense of security. Underpasses can feel especially threatening due to the enclosed space, and should be carefully designed to provide visibility of approach and exit with adequate lighting.
Pedestrian convenience	Highly convenient for pedestrians as directly connected to the sidewalk, and with relatively short crossing distance.	Inconvenient for pedestrians as requires a level change and usually results in a longer distance being traveled. Must accommodate ADA accessibility guidelines via a ramp or elevator.
Land take	Existing roadway and sidewalk space can usually be retrofitted to adequately accommodate pedestrian and cyclist facilities.	Likely to require additional land to achieve level change.
Cost	Depending on crossing type selected, the infrastructure costs to implement are relatively low.	Construction of new infrastructure requires substantial funding whether included in initial designs or retrofitted.

Vehicle Underpasses and Overhead Structures

Highways and freeways are designed for the efficient and safe movement of vehicles. Vehicle underpass and overhead structures support this model by removing intersections and enabling a continuous flow of traffic, thus reducing congestion. A Complete Streets approach acknowledges the critical function of underpass and overhead structures but seeks to integrate other transportation modes in and around the structure, and improve their amenity. This is easier to achieve if all transportation modes are considered and incorporated into the design stage, ensuring that adequate facilities can be provided within the allocated space. Retrofitting of existing underpasses and overhead structures poses more of a challenge, however is possible.

Key design considerations

Dimensions	Minimum widths and vertical clearance for structures are determined by the corridor type and the vehicles . Design manuals can help to outline the advantages of implementing overhead highways at railroad crossings.[16]
Roadway space	A road diet may be required to create additional space for pedestrians and bicyclists within the existing corridor, or alternatively for an overhead structure, clip-on lanes may be considered.
Air and light	Air circulation and lighting within underpass structures should be considered to ensure pedestrians and bicyclists feel comfortable and safe. In some cases, a new fit for purpose, parallel structure may be a better solution in providing a connection.

16. Caltrans. Chapter 200 Geometric Design and Structure Standards. Highways Design manual. 2014, pp. 200-38. http://bit.ly/22oqjNE

Pacific Coast Highway, Santa Ana River crossing

Pedestrian and bicycle underpass under railway, on Dale near Buena Park station

Transit components

Transit design is a component of roadway width design, but also contains technical elements that are not found on non-transit supported roads. Transit stops and right-of-way designations change how the street looks and functions.

Transit design starts at a network scale. A successful transit network should be accessible and given that people are willing to walk about half a mile to a destination, a well-designed transit network would have a stop located within this radius from important locations. A transit network should also offer multiple transition points to increase the viable destinations for users. Increasing the accessibility of residents, workers, and visitors through various transit corridors and routes can be used to promote development in different areas.

Transit Types

Transit design relates to the type of transit servicing an area, whether it is a streetcar, high-frequency bus, local bus, or other form. The table below defines the various types of transit that could be implemented within a Complete Street.

Rail Station, Buena Park

Streetcar Station, Long Beach

Transit Type	Definition
Local Bus	Bus service operating at a fixed frequency that serves designated stops along a fixed route. Fares are collected onboard by the bus operator. Local bus service usually operates in mixed-flow lanes on urban thoroughfares. The typical average operating speed is low and is dependent on the operating speed of the urban thoroughfare.
Rapid Bus	Bus service similar to local bus serves designated stops along fixed route but with fewer stops than local service. Commuter express is a type of rapid bus. Fares are collected onboard by the bus operator. Rapid bus service usually operates along mixed-flow lanes on urban thoroughfares. Rapid buses may operate only during peak travel periods along peak directions. Some rapid bus systems use transit priority signal systems to improve headways, and queue jump lanes to bypass congestion at intersections.
Bus Rapid Transit (BRT)	Enhanced bus service that operates within its own right of way or designated lanes along the urban thoroughfares. BRT may utilize off-board fare collection to minimize boarding delays. BRT stops are typically spaced one mile apart and operate with high-frequency headways. The average speed of BRT is higher than that of rapid bus. BRT buses and stations are branded to distinguish them from local bus services. Stations frequently have more passenger amenities than typical bus stops. BRT systems use transit priority signal systems to improve headways, and queue jump lanes to bypass congestion at intersections.
Streetcar/Light Rail Transit (LRT)	Streetcars and LRT are fixed guideway transit systems. Streetcars (or trolleys) are electrically powered vehicles that may share the street with other modes of transportation and operate in mixed-flow lanes. LRT is typically electrical powered rail cars within exclusive rights of way in thoroughfare medians but may also operate in mixed-flow lanes. LRT is provided with traffic signal prioritization at intersections and requires special signal phasing to reduce conflicts. LRT utilizes off-board fare collection at transit stations. Transit stations, whether on the median or edges of thoroughfares, may require substantial right of way.

Transit Lanes for Buses

For multi-lane roadways where transit is present, such as in Complete Streets, a wider transit travel lane is required, with the wider lane designated to the outside lane (curbside or next to parking) or to center lanes (usually bus-only lanes).

- Modern buses can be 10.5 feet wide from mirror to mirror and require a minimum 11-foot-wide lane on roadways with 30 to 35 mph target speeds.
- Wider curb lanes, between 13 to 15 feet for short distances, should only be used to help buses negotiate bus stops and help trucks and buses negotiate right turns without encroaching into adjacent or opposing travel lanes.
- Transit lanes can be center or side running, and as a result, stops can be located on either the right lane side or left lane side of traffic flow.
- Stops on the left side of traffic flow (within the median) need to include adequate crossing infrastructure to connect the station to pedestrian or parking areas and may require special transit vehicles with left-side loading doors.

Transit-only (Dedicated Right-of-Way) lanes, utilized in several different parts of Southern California, make for faster travel and ensure that buses are never delayed due to mixed traffic congestion. The design of these routes is important to ensuring the safety of all street users, particularly at intersections and other crossings. Necessary enhancements to provide desired quality of service may include transit signal priority and transit-only lanes. In some circumstances a shared lane may be used where bus routes overlay bicycle routes, minimizing the interaction, cyclists have with vehicles except buses and promoting the use of an alternative transportation mode.

Dedicated bus only lanes, Long Beach

Transit Stops/Stations

User comfort is a critical component of a successful transit network and should be taken into account when designing transit stops. Designers should consider how the stop is accessed, length of time users will spend waiting, environmental conditions they will be waiting in, availability of up to date timetable information, and visual corridors towards approaching transit. If a transit network is comfortable and convenient it is more likely to be utilized.

Stop design is determined by many factors including, frequency, reliability, span of service, and the built environment along the route.

- Local transit routes have more frequently placed stops along routes. A stop is a location where a transit vehicles stops to allow passengers to board and alight. A stop, at a minimum, is identified by a sign but may have some passenger amenities such as benches and shelters (see design considerations below).
- Facilities for express service modes or rail transit are more spread out along a route, and take the form of a "station", or more elaborate transit stop with substantial passenger amenities. This may include facilities such as ticket offices, restrooms, or other services. Stations may accommodate multiple vehicles or have integrated intermodal facilities.

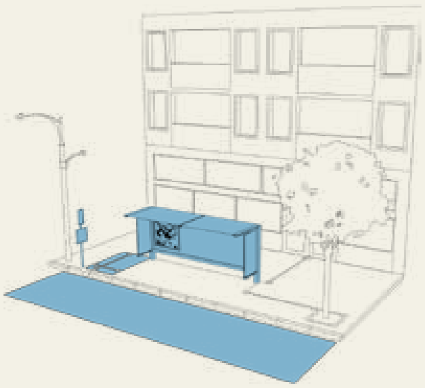
Stops for local transit routes are generally located in the buffer / street furniture / curb zone of the sidewalk. They may also be located on curb extensions and 'floating islands'. In all cases they should be designed to provide adequate space for people who are waiting without crowding the pedestrian through-zone. Transit stops should also be welcoming, comfortable, and fully accessible.

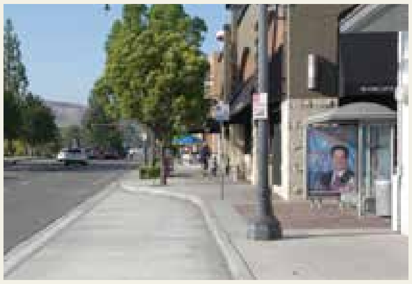
Bus shelter at ARTIC Transit Hub, Anaheim.

Connecting bus information is displayed at the Metrolink station in Orange

Schedule information is displayed at a bus stop in Sandpointe Santa Ana

Bus stop shelters
Bus shelters should be provided at key stops, aligned in relation to the curb, sidewalk zones and other street components to provide a clear, accessible boarding/alighting zone. Route information, maps and bus timetables should be incorporated into the shelter and signpost.





Bus stop with shelter including seat and trash can, Brea

Bus stop bench
At locations with fewer passengers shelters may be omitted, however seating should be provided, aligned to allow a clear, accessible boarding/alighting zone. Lighting should be provided nearby near to increase personal security of transit users after dark.

Bench and trash can at bus stop, Fullerton

Key design considerations

Visibility	All transit stops should be provided with a sign post or other marker to clearly identify it as a place to board transit. This should designed and located to be clearly visible by pedestrians from along and across the street.
Schedule information	All transit stops should include schedule information for travelers. This can be incorporated into the post of the transit stop sign, or into the shelter (where provided). In addition, provide real-time transit arrival information at key stops.
Additional information	Wherever possible additional information should be provided at the stop (e.g. incorporated into the shelter), such as a map of the wider transit network, map of the local area, information on service changes, etc.
Surfacing	The waiting area should be paved and an accessible path provided between the sidewalk and the door of the transit vehicle.
Seating	Wherever possible, a seating area should be provided for waiting passengers.
Shelter	At busy stops and key places, a bus stop shelter should also be added for comfort and protection from weather. These stops should also include local area maps and wayfinding information.
ADA access	All transit stops should be fully ADA accessible for passengers. To facilitate access for people with disabilities the transit stop should have a firm boarding and alighting pad (60″ wide by 98″ length perpendicular to the road edge) as a minimum. The slope perpendicular to the road edge shall not exceed a 1:48 gradient. Where a bus shelter is present the clear floor or ground space should be at least 30″ by 48″ to accommodate wheel chair maneuvering.[17]
Lighting	Stops should be illuminated to enhance personal security at night. Stops with shelters can integrate lighting. Locate stops without shelters near to street lighting.
Boarding zone	Transit boarding zones require at least 90-160 feet. Depending on the route and the roadway, these should be designed as stopping areas within the curbside travel lane, or using a bus bulb-out area if there is parking either side. Inset bus bays should be avoided as they can cause buses to be delayed getting out of the bus bay while they wait for a gap in passing traffic.
First/last mile	Introduce measures to encourage walking and bicycling to transit stops. E.g. bicycle parking, wayfinding information for bicyclists and pedestrians, bikeways and sidewalks that connect to the transit stop, or a bike share scheme for larger stations.

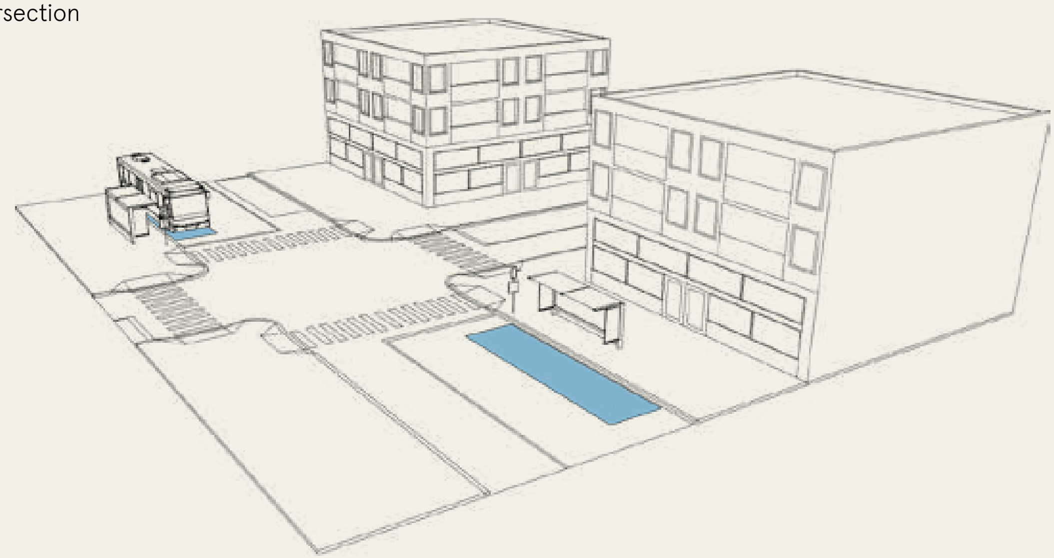
17. United States Department of Justice. 810 Transportation Facilities. 2010 ADA Standards for Accessible Design. Washington : s.n., 2010. http://1.usa.gov/1SZ6LNj

Transit stops

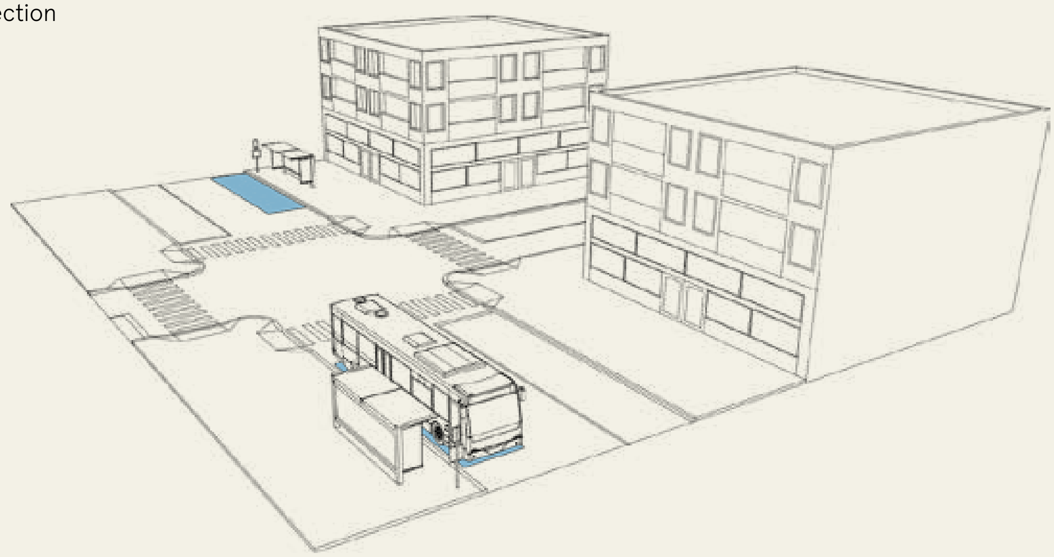
Transit stops can be positioned on the near or far side of intersections. The table below sets out some of the key considerations in relation to bus stop locations in relation to intersections.

Bus stop location	Advantages	Disadvantages	When to Implement
Near side of intersection	• Minimizes interferences when traffic is heavy on the far side. • Allows pedestrians to access buses closest to crosswalk. • Results in width of intersection being available for driver to pull away from curb. • Eliminates potential of double stopping. • Allows passengers to board and alight while bus is stopped at red light. • Provides driver opportunity to look for oncoming traffic.	• Increases conflicts with right-turning vehicles. • May result in stopped buses obscuring curbside traffic control devices and crossing pedestrians. • May cause sight distance to be obscured for cross vehicles stopped to the right of the bus. • May block the through lane. • Increases sight distance problem for crossing pedestrians.	• In circumstances where the accumulation of buses at a far-side stop would spill over into the intersection and additional length is not available. • At complex intersections with dual right- or left-turn lanes. • On two-lane thoroughfares where vehicles cannot pass a stopped bus.
Far side of intersection	• Minimizes conflict with right turning vehicles. • Provides additional right turn capacity. • Minimizes sight distance problems. • Encourages pedestrians to cross behind the bus. • Creates shorter deceleration distances for buses since bus can use intersection to decelerate. • Bus drivers able to take advantage of gaps in traffic flow that are created at signalized intersections.	• Stopped bus may block intersection. • May obscure sight distance for crossing vehicles. • May increase sight distance problems for crossing pedestrians. • Can cause bus to stop far side after stopping for red light (if signal priority not in use). • May increase rear-end accidents since drivers do not expect bus to stop twice. • Could result in traffic queued into intersection when bus is stopped in travel lane.	• When the route alignment requires a left turn. • If there is a high volume of right turns at an intersection or when the transit route turns right at an intersection. • Thoroughfares with multiple lanes where vehicular traffic may pass uncontrolled around the bus.

Bus stop near
General location of bus stop
on near side of intersection



Bus stop far
General location of bus stop
on far side of intersection



CASE STUDY
OCTA Bus 360 Initiative

Since 2008 Orange County Transportation Authority (OCTA) has seen a 30% decline in bus passengers. In response to this OCTA has conducted a study to discover ways to reverse this trend and meet the transportation needs of Orange County residents. This study is the OC Bus 360° initiative that will add, increase reduce and/or eliminate bus services to improve the networks efficiency and effectiveness. During 2016 OCTA will roll out a new modernized bus fleet, journey planner and real time bus information service. They are proposing to increase services and frequency in high demand areas and introduce Xpress routes with limited stop services. OCTA are also distributing pocket friendly OC Bus Ride Guides in four different languages to provide residents and visitors with all the information they need to plan, pay and ride the bus increasing the accessibility of bus services.

Image source: www.octa.net

Further Information

- AASHTO - Guide for Geometric Design of Transit Facilities on Highways and Streets, 1st Edition, 2014
- Caltrans - Bus Rapid Transit: A Handbook for Partners, 2007
- Caltrans - Smart Mobility Framework, 2010
- ITE - Designing Walkable Urban Thoroughfares: A Context Sensitive Approach, 2010
- NACTO – Urban Street Design Guide. 2013
- OCTA - Bus Stop Safety and Design Guidelines. March 2004.

Curbside management

Curbside management relates to vehicles stopping adjacent to the curb, such as for parking or loading purposes. It also relates to vehicular access between the roadway and adjacent areas, via driveways. These elements require careful consideration as they are places where vehicles slow down and stop, and therefore where there is potential for conflict with other moving vehicles, as well as pedestrians and bicyclists.

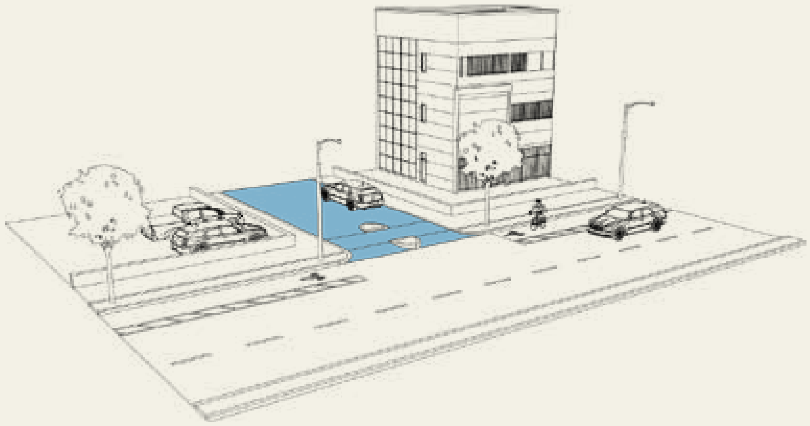
Driveways

Driveways are a main access point for most land-uses in Orange County. The design and use of driveways impacts both the roadway and sidewalk. The land use of the property that the driveway serves will determine the size of the driveway and its frequency of use. For example, the driveway to a parking structure will differ to that of a residential property.

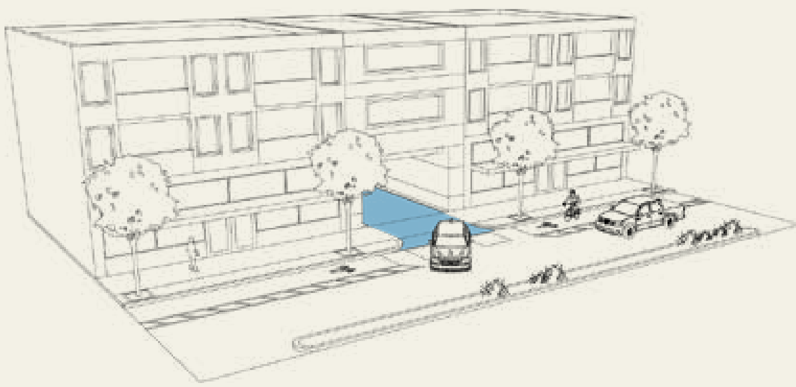
Key design considerations

Vehicle movement	How the road layout will impact the way vehicles move between the driveway and roadway. For example there may be situations where left turns are prohibited to reduce risk of conflict with other traffic.
Width	The width of the driveway should relate to the level of throughput and likely vehicle use. Driveways that are used frequently may require separate in and out lanes. However, driveway width should be kept to a minimum to keep pedestrian crossing distances short.
Sidewalk delineation	The sidewalk should be clearly delineated across the driveway and maintain the grade, slope and material of the adjacent sidewalk on either side of the driveway.
Visibility	Street furniture and planting should be set back from the driveway to improve driver's visibility as they enter and exit.
Slope	Driveway slopes should not be located in pedestrian through-zone. If the volume of pedestrians is high, vehicles should be able to safely yield to pedestrians as they are entering the driveway. This is enhanced with a flush sidewalk.
Space	Sufficient space should be provided within the property boundary to ensure that vehicles can park on the driveway without the overhanging or encroaching into the sidewalk.
Consolidation of driveways	Try to reduce the number of separate driveways required by consolidating driveways wherever possible (i.e. one driveway to serve several properties). This will help reduce the risk of conflict between turning vehicles and pedestrians moving along the sidewalk.

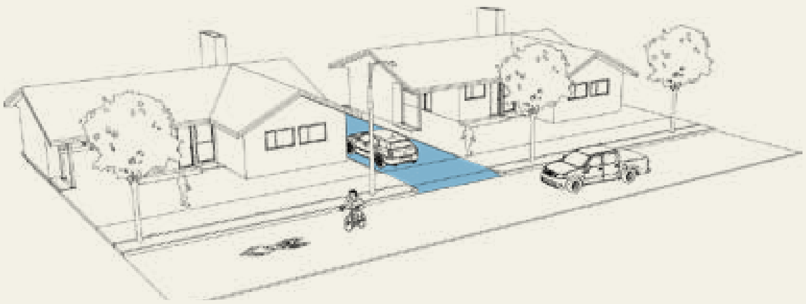
Industrial driveway
Busy driveways may require separate lanes, with pedestrian safety island. A raised entry treatment ensures drivers slow down and helps pedestrians cross smoothly.



Neighborhood driveway
Sidewalk surface should extend across the mouth of the driveway.



Residential driveway
Residential driveways should be sized so that vehicles do not obstruct the sidewalk when parked.



Parking

On-street parking design is affected by the width of the roadway and is an important component of a Complete Street. There is a balance to be achieved between providing enough parking spaces for people to be able to easily access destinations and having too many parking spaces that are not utilized. Maintaining a lower level of parking in conjunction with improved pedestrian, bicycle and public transit facilities can also help encourage people to use different transportation modes.

Key design considerations

Vehicles	The types of vehicles that will be parking in that location, whether parking is required for any larger or longer vehicles, if electric charging points need to be integrated into the space, whether on-street loading needs to be incorporated into the space etc.
Context	The built environment context, such as whether the parking locations are in retail, civic, business, or residential areas. Each will have varying parking requirements.
Distribution	How to mix and distribute long and short-term parking designations, the allocation for disabled parking and other specific parking requirements, integration of loading zones.
Roadway	The environment surrounding the parking spaces. If there is a bicycle lane or mixed-flow lane adjacent to the planned parking location, angled parking may not be appropriate due to the restricted visibility of bicycles behind vehicles when reversing.
Dimensions	The dimensions required to accommodate vehicle types and provide safe pedestrian access to and from the vehicle, as well as provisions for door swing buffers if appropriate.

Angled parking, Huntington Beach

Parking layouts
The parking layouts that are most typical for a Complete Street are:

- Parallel spaces
- Angled parking
- Back-in angled parking

Each layout presents their own individual advantages and disadvantages and impacts other transportation modes differently. The table sets out the key considerations in relation to different types of parking.

In situations where re-design is not feasible, jurisdictions should consider the management of the existing parking facilities. Depending on location, parking may only be utilized at certain hours of the day or there may be demand only at certain times during the year. For example, a travel lane may become curbside parking during off-peak hours. There is also increasing demand for parklets, in underutilized parking areas (see Place-making section of this chapter).

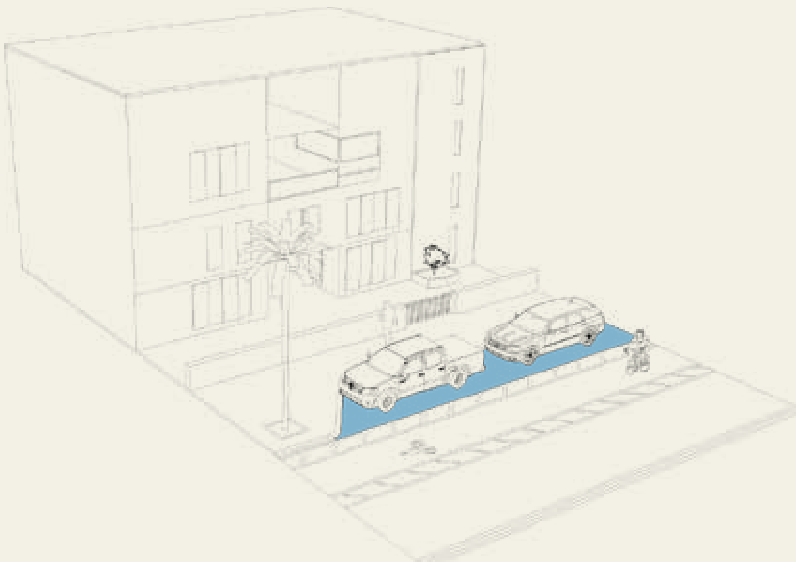
Parking type	Street Types	Advantages	Disadvantages
Parallel	Mixed Land Use Corridor/Hub, Industrial/Business Park Street, Downtown Street, Neighborhood Main Street, Residential Street, Shared Street, Alley.	Takes less space which reduces overall street width.	Can lead to "dooring" incidents with bicyclists and other vehicles.
Angled	Downtown Street, Neighborhood Main Street, Residential Street, Shared Street.	Increases the parking supply and narrows the lanes, easy to get into.	Sight distance limitations associated with backing up against oncoming traffic. Poor visibility for identifying bicyclists and pedestrians.
Back-in angled	Downtown Street, Neighborhood Main Street, Residential Street, Shared Street.	Better sight lines, eliminates door zone, safer loading/ unloading.	Directs emissions towards sidewalks, cars can hang into pedestrian space unless wheel stop bars introduced.

Further Information

Caltrans - Highway Design Manual, 2014

NACTO – Urban Street Design Guide. 2013

Parallel parking
Parallel parking takes less roadway space, however should have a buffer to protect bicyclists if a bikeway is present.



Angled parking
Angled parking increases parking supply and can help calm traffic, however creates poor visibility of bicyclists by drivers.

Back-in angled parking
Back-in angled parking improves visibility, however can affect pedestrian space due exhaust emissions and vehicles overhanging the sidewalk.

Back-in Angled Parking, San Clemente


Angled parking Main Street, Yorba Linda

Place-making

Place-making is the planning, design and management of public spaces for people. It encompasses a variety of types of public spaces including plazas or pocket parks that are adjacent to the street but have a direct relationship with it. It also relates to informal public spaces that are contained within the street environment itself, such as parklets, shared streets, and areas of roadway that have been reclaimed for other uses. Place-making can also include the temporary use of street space for events, such as for open streets, or play streets. Successful place-making can contribute to community amenity by providing spaces for people to use and enjoy for leisure and recreation. It can also help reinforce community identity through reference to local culture, history and aspirations.

Plazas and pocket parks

Plazas are formal public spaces in a city where people gather to partake in a wide variety of activities, such as meeting friends or attending a community event, or simply to stop and sit a while.

They are important to civic life and city events. They can take a variety of forms and dimensions. They are typically hard landscaped areas that adjoin the sidewalk in the frontage zone, designed with seating, planting, and often public art and feature lighting.

Pocket parks are small and less formal areas of open space that adjoin the sidewalk. They are typically located in the frontage zone, where land has been re-purposed to provide a public space. They are visually or physically connected to the sidewalk and provide additional green space, play areas for children, gardens for community planting, or other public amenities.

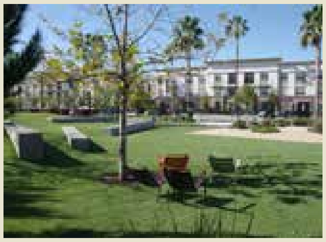
Plazas and pocket parks have similar design considerations, the main differences being scale and formality. Plazas are larger civic spaces. Pocket parks are smaller more incidental spaces.

Key design considerations

Pedestrian activity	Plazas and pocket spaces should be located in streets with high pedestrian activity throughout the day, such as near transit hubs, or alongside attractors such as shopping areas, leisure facilities, schools, or important cultural institutions.
Crossings	Crossings should be provided that correspond to the entrance of the park or plaza.
Transit stops	Where transit is present and the plaza is a significant destination, stops should be positioned near to the entrance.
Bicycle parking	Bicycle parking facilities should be provided on the sidewalk adjacent to the entrance of the space. Alternatively these facilities can be incorporated within the entrance area of the plaza / pocket space, depending on its size. If the space is locked at night then consider the parking should be located outside of the enclosed area to allow general use at all times of the day.
Transition and gateway area	The transition between the sidewalk and the plaza should be as seamless and open as possible, to make it inviting and easy to enter. It should be designed to provide a sense of arrival into the space, e.g. through gateway features, artwork, or other design treatments, however care should be taken to maintain a clear pedestrian movement zone alongside the entrance.
Visibility	Good visibility should be maintained into the plaza from the sidewalk to enhance sense of personal security and also draw people in.
Lighting	The relationship between the park entrance and adjacent sidewalk lighting should be considered carefully. Additional lighting at the entrance area may be required to highlight the park, and enhance personal security.
Roadway treatment	Roadway surface treatments or special features such as bulb-outs or central medians can be used on the adjacent road to delineate a slow zone next to the public space or draw attention to it.

CASE STUDY
Farmer's Park, Anaheim

This public space in the heart of the downtown Anaheim area provides an attractive informal green area. The design deliberately blurs the boundary between the street and the space so that it feels open and inviting. Different landscape treatments in the sidewalk adjacent to the space help to announce the presence of the space to passersby and also contribute to the visual amenity of the street. Seating, both formal and informal, along the edge of the space is useful for people walking along the street.



Farmer's Park, Anaheim

Key design considerations (continued)

Identity	The plaza or pocket park should be designed with attention to the elements that provide it with a strong identity, and that also visually relate to its physical and community context. This may include art or other design elements such as water features. In the context of the street environment consideration can be given to extending this identity into the adjoining sidewalk or street, through use of special materials, furniture or planting. This promotes visibility of the space along the street and enhances its presence in the wider area.
Elements of interest/activity	A plaza or pocket park will typically contain smaller places or elements within it that provide interest and generate activity. This could include for instance a café, a bandstand for performances, a playground, or a space for a vendor cart. Consideration should be given to incorporating some of these elements near the entrance to the space so that they contribute to vitality and interest on the street as well as within the space.
Seating	Seating is an integral part of any public space, and consideration should be given to seating within the sidewalk alongside the space so that passers-by can benefit.
Planting	Planting and landscape features are vital to the character and visual interest of the space, as well as providing shade and the possibility of stormwater management where appropriate (see separate section on landscape and ecology). The landscaping approach can extend to the sidewalk zone, and inform design choices for the roadway (e.g. for central median strips) so that the park visually extends across the street.


Public space, Irvine Spectrum Center


Plaza, Tustin


Veterans Memorial Park, Stanton

Further Information

NACTO – Urban Street Design Guide. 2013

Project for Public Spaces - 10 Principles for Successful Squares. http://bit.ly/1Q2VW8x

Reclaimed roadway space

A Complete Streets approach to street design can incorporate the re-purposing of existing underutilized roadway space into public space. This can be achieved through a variety of means. For example intersections can be reconfigured, either permanently or temporarily, as mini-plazas through painting / use of different surfacing materials, and introduction of planters and seating. At the larger scale entire streets can be closed to traffic to create pedestrian-only zones with comprehensive landscaping treatment. In all cases the reclamation and re-purposing of roadway space can take the form of interim interventions or long-term permanent redesign.

These types of solutions can be sought when:

- A local jurisdiction, community organization, or business association identifies an unmet demand for public space.
- An underutilized street or street segment has low vehicle traffic and high pedestrian demand (either now, or in the future, due to land use or development changes).
- Adjoining land uses can generate activity within the space (e.g. seating for cafes), or something which generates activity can be sited within the space.
- Traffic and movement requirements can be met, including all safety and operational issues associated with the street.

A pocket space at an intersection in Laguna Beach

CASE STUDY
Intersection Repair

In Portland, Oregon, a community organization called City Repair Project transforms ordinary intersections into vibrant public spaces. Working with communities and volunteers to paint giant murals onto intersections. These are quick and cost effective interventions involving the local community in reclaiming streets as shared public spaces. The mural turns the intersection into both a gathering place and a point of pride for the neighborhood, and it ultimately helps in calming traffic and making streets safer.

In 2011, a large-scale example of Intersection Repair took place at Holman and 8th in Portland, with a mural incorporating aspects of native wildlife as well as imagery from a favorite local activity–biking. The weekend-long painting event attracted over 100 participants and helped forge strong ties among neighbors.

Intersection repair, Portland
Source: John Luton, via Flickr
www.flickr.com/photos/luton/3545809943

Key design considerations

Definition	The space should be defined with a strong boundary to communicate to all what is roadway and what is pedestrian space. This can be done using striping and large fixed objects such as planters or stone blocks. Bollards can also be used but strategically located street furniture, planters, or other landscape items are preferable as they provide amenity value.
Vehicle encroachment	Reinforce corners and other areas subject to encroachment by turning vehicles with heavy objects.
Servicing	Legally prohibit vehicles from entering the space, but ensure consideration is given as to how to service adjoining land uses if the reclamation involves loss of parking and loading bays.
Emergency access	Make allowances for emergency vehicle access into the space if required.
Crossings	Reconfigure or provide new pedestrian crossings to facilitate access to the space. These should be aligned to correspond to the most direct route which pedestrians will wish to take.
Pedestrian route	Ensure a clear and unobstructed pedestrian route is provided through the space, that corresponds to the most direct path to access crossings or key destinations.
ADA	ADA-compliant features should be included for both interim and permanent solutions, to ensure the space is universally accessible.
Seating	Provide ample seating, with a mix of seating types to accommodate the needs of different users. Movable, individual chairs should form part of the mix, allowing people to position them as they like. Fixed individual seats are also useful and more popular than benches with solo visitors, however these are best provided in groups of two or more. Older people often prefer seats with backs and arms, while younger visitors are often happy to take advantage of informal seating opportunities such as steps and planters.
Weather	Introduce elements to make the space comfortable for use throughout the year, including, for example, permanent structures that provide shade/protection from rain, as well as movable umbrellas or canopies.
Planting	Shade trees, planting and water features can also be introduced to help reduce urban heat effects and provide character and visual interest.
Lighting	Provide adequate lighting for use at all times of the day, taking into account the relationship with adjacent street lighting.
Bicycle parking	Include bicycle parking within, or near to, the space.

Key design considerations

Public art	Art installations, either temporary or permanent can help enliven the space and generate a sense of community ownership (see section below on public art).
Carts and stalls	If appropriate to the context, locations for movable vending carts or stalls should be considered as part of the design in order to maintain good visibility and clear paths for pedestrians. The potential for supplying power or water to the cart / stall must be considered from the outset, as well as options for storage of equipment.
Flexible use	Larger spaces should allow for flexibility of use for different times of the day, week and year. For instance a clear area could be maintained that can be programmed for performances or events at times when pedestrian activity is greatest.
Drainage	Consider drainage; sites should have minimal cross slope or be designed to meet drainage requirements. Sustainable drainage techniques (see section below on stormwater management) can be used to help meet drainage needs.

CASE STUDY
Spurgeon Street, Santa Ana

A section of this street has been converted into a linear pedestrian mall. It maintains a wide, clear space in the middle for pedestrian movement, with café seating areas alongside the building frontages on either side. A fountain in the middle provides a focal point. Trees provide shade and visual amenity. Crossings at either end provide direct access for pedestrians. Businesses are serviced via adjoining streets and alleys.

Further Information

NACTO – Urban Street Design Guide. 2013

Shared spaces

Shared spaces are streets that are designed be a place in their own right, and also designed and managed to allow traffic to be fully integrated with other human activity, not separated from it. The concept of shared space is based on the blurring of the boundaries between what is designated as pedestrian space and what is vehicle space. In doing so the intention is to make all users of the space aware of each other, and for drivers to adapt their behavior and drive slowly and carefully in the space, giving priority to pedestrians. The philosophy behind this is self-regulation, rather than mandating behavior. This approach is widely adopted in Europe and increasingly in North American cities (see case studies on this page).

The successful implementation of a shared space design approach means drivers, bicyclists and pedestrians are encouraged to be more alert and take fewer liberties. By enhancing the 'place' value it also means that more people are attracted to walk and spend time in the area. This leads to more interaction, more eye contact between different road users, and more measured decision-making which ultimately leads to slower speeds, more considerate behavior, and fewer traffic collisions.

Before implementing a shared space careful consideration should be given to whether it is appropriate for the particular street.

The key parameters are:

- **Vehicle flow:** Shared spaces are only appropriate in places with low volumes of vehicles.
- **Vehicle speed:** A design speed of no more than 20 mph is desirable, and preferably less than 15mph.
- **Pedestrian activity:** Shared space is most appropriate where pedestrian activity is already high, or is likely to be high in the future (e.g. following development).

CASE STUDY
Longfellow Street, Santa Monica

Longfellow Street in Santa Monica runs parallel to the busy Lincoln Boulevard retail corridor and adjoins Ozone Park. The existing street was too narrow to successfully accommodate sidewalks, on-street parking, and contraflow traffic lanes.

The redeveloped 14 foot wide flush roadway is shared by pedestrians, cyclists and vehicles and functions as a yield street. Intersections and crossings are highlighted using contrasting block pavers. Detectable Warning Strips are used across the entrance to the street to alert drivers to the new shared street environment. Native and drought resistant planters filter the streets storm water runoff and structure the street, framing the on street parking bays. Pedestrian scaled, solar powered LED lighting illuminates the street to enhance security at all hours of the day.

Key design considerations

Look and feel	Make the street look and feel different to the norm. The design needs to be distinctive enough that it is made clear to drivers that they are not the dominant transportation mode. Introduce design features that require drivers to maintain slow speeds, increase awareness, and make conscious decisions on how they should negotiate the space.
Reallocate space	Review and reallocate space within the whole of the street. Identify the minimum space required for vehicle movement and parking (if applicable) then allocate the remainder for pedestrian movement and other pedestrian activities.
Sidewalk vs. roadway	Typically there is no clear differentiation between sidewalk and roadway; this is achieved by removing curbs, and raising the roadway to create a level surface, or having a curb that is very low (e.g. one inch or less).
Structuring elements	Most shared spaces retain some elements to structure and guide different transportation modes. Generally pedestrians will walk alongside the building line, and drivers travel in the central part of the street. Street trees and furniture such as planters and seating can be arranged in a way to reinforce pedestrian comfort and also maintain low vehicle speeds.
Traffic calming	Static elements (trees, street furniture etc.) can be used to reduce forward visibility or require deflection of the vehicle path.
Surfacing	Consistent surfacing across the street, from frontage zone to frontage zone, can be used to create a distinctive and attractive place which also blurs the boundaries of pedestrian versus vehicular areas, and helps encourage slow vehicle speeds. Roadway materials must be robust enough for vehicle overrunning.
Sustainable drainage	Shared surfaces can support the use of sustainable drainage infrastructure through the integration of raingardens and use of special pervious surfaces.
Minimize signage	Signage and striping should be minimal. Where absolutely necessary attempts should be made to incorporate signage on lamp posts or items of street furniture, to avoid visual clutter.
Character	It is essential that the design seeks to make the street a public space; landscape and streetscape treatments should enhance the character and distinctiveness of the area and make it a welcoming and attractive place for people to spend time in.

CASE STUDY
Wilshire Ave, Fullerton

East Wilshire Avenue in Fullerton is an example of a shared street. Curbs have been removed from the section of street between Pomona Ave and Harbor Boulevard extending the downtown plaza across the street to create one public open space.

Gateway features at each end of the street denote the street as a special area. The use of consistent paving across the surface of the space blurs the boundaries between designated pedestrian space and vehicle space. Drainage channels along each side of the street also double as visual guides for vehicles. Street trees and pedestrian-scaled lighting add character to the street and reinforce comfortable pedestrian movement along the building line of the street. During the summer months the shared street is closed to traffic for a market that is facilitated by the shared surface.

Parklets

A parklet is a space created by converting on-street parking spaces (typically between one and three spaces) into a temporary public space. A parklet can be used as an extension to the sidewalk buffer/street furniture/curb zone or as an outdoor dining area for local bars and restaurants. They are often installed in places where the sidewalk is congested due to volumes of pedestrians, or where there is a desire to extend typical sidewalk activities into the street.

The creation of a parklets is typically driven by local businesses and communities who in partnership with local jurisdictions seek to actively reclaim the roadway space for local use. In agreement with the jurisdiction the partners determine the location, program and components of the parklet in return for the use of the street space.

Although the installation of a parklet may become permanent it should be constructed in such a way that it does not affect the existing curb and road surfacing and can therefore be removed easily. The temporary nature of the parklet often encourages more affordable design solutions that 'stand-alone' and can be transferred to another location.

The guidance below outlines key considerations and should be used to assist in the design and construction of a parklet.

Key design considerations

Program	
Land use	Land use adjacent to the parklet will influence the program of activity for the space. Parklets are often used in neighborhood main and busy downtown streets with café activity to allow the provision of traditional sidewalk café style seating where existing sidewalk provisions may be inadequate. However they can be used in other land use areas which attract large numbers of people, such as educational or transit facilities. In these situations they can provide a more informal public space for general rather than commercial use.
Activity period	The design of the parklet should accommodate use by all members of the public at all times of the day. If the primary occupation of the parklet is café furniture, some permanent furniture should be incorporated to ensure the parklet can be used out of hours.
Location	
Speed	Parklets should be proposed on streets where the posted traffic speed is less than 25mph. The footprint of the parklet should be setback from adjacent parking spaces and traffic lanes to create a buffer zone from moving vehicles. This may be reduced in the case of an adjacent cycle lane. Wheel stops, soft hit posts and surface markings can be used to emphasize the buffer zone.
Adjacent movement	The parklet should be situated so that it safely positioned in relation to vehicles turning at intersection corners and driveways. It should also be a safe distance from transit stops and specialized parking designations.
Infrastructure	Identifying the existing infrastructure in the location of the proposed parklet is critical to maintain access to utility covers.
Access	The levels of existing cross slope and running slope along the street needs to be taken into account to ensure the parklet is accessible and free draining.
Existing conditions	Existing street conditions should be assessed to identify any risks and opportunities. There may be existing shade trees or street lighting on the street that could enhance the amenity of the parklet.

Key design considerations (continued)

Components	
Platform	The platform may be composed of several components or one solid mass. The interface between the platform and the ground should be considered to ensure the parklet does not impede the existing street drainage and debris does not accumulate beneath the platform.
Surface	The surfacing of the parklet should create a solid platform that is flush with the adjacent footpath and meet ADA requirements.
Furniture	Parklet furnishings may include seating, planting and bicycle parking. The furnishings could be moveable or permanently fixed to the parklet structure. The design for furnishings should be driven by the intended program for the parklet.
Perimeter barrier	For safety the parklet should have a perimeter barrier on the street-facing edges. The height and loadings of this structure will be determined by the context of the parklet. Raised planters and seating can be incorporated into the barrier to improve the amenity.
Management	
Funding	Funding, maintenance and management of the parklet will need to be outlined in each parklet respective partnership agreement. In most cases the local business partner will cover design and construction costs and the public liability insurance as an investment towards improving their business turnover.
Maintenance	The design of the parklet should minimize any maintenance requirements this includes trash and debris removal, planting maintenance and surface cleaning.

CASE STUDY
Park & Read Anaheim

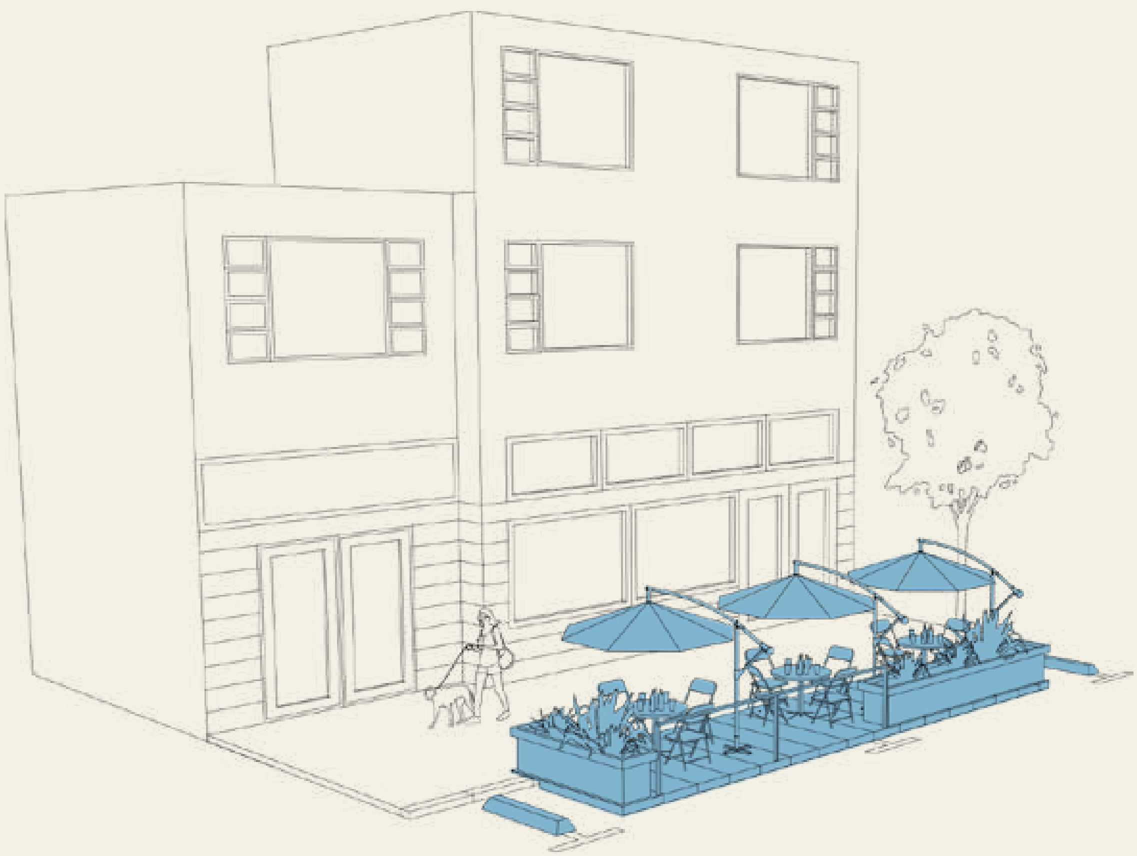
In 2013 Anaheim's first parklet was opened on Center St. Promenade. Named Park & Read the parklet offers a mini neighborhood library exchange with comfortable seating beneath the street's palm trees.

The parklet sits on what were three angled car parking bays. It is composed of a timber surface deck, freestanding planters, umbrellas, tables and chairs and a small painted trellis fence that creates a barrier on the street facing edges. In one of the parking bays sits a caravan that functions as the library and can be locked up after hours.

Further Information

NACTO – Urban Street Design Guide. 2013

Parklet
Parklet designed to replace two parking spaces, with movable furnishings for flexible use by local businesses.



Berlin Parklet, Long Beach

Lola's Parklet, Long Beach

Open Streets and other street events

Open Streets initiatives temporarily close streets to automobile traffic, so that they can be programmed for other uses - walking, bicycling, dancing, playing, socializing etc. Open streets share some basic characteristics—temporary car-free streets, community involvement— with block parties or street fairs, but the core objectives are fundamentally different. Open Streets are typically part of a broader city or organizational effort to encourage sustained physical activity, increase community engagement, and build support for the provision of broader transportation choices.

There are various organizational and funding models for Open Streets (see references on this page for further information); they can involve a mix of public, non-profit, and private organizations, either working on their own or in partnership. Typically however they involve collaboration between both public and private organizations within the community to organize, finance and implement the event.

There are various other temporary street events that can take place, such as street markets, fairs, festivals, marathons, parades, block parties etc. Surf City Nights in Huntington Beach is an example of a regular street event. Although such events are not Open Streets as such, have similar design considerations.

Key design considerations

Site and facilities	Communities of all types and sizes can engage in street events, both as organizers and as attendees. Understanding the community and their likely engagement with a street event will inform the identification of a specific site, and the facilities required.
Route type and length	For Open Street events where there is an active transportation element consideration of route type and length should be based on the population and likely number of attendees, the area required to host the event, the surrounding environment, the funding available for the event and any political/public limitations that there may be. Examples of route types identified by the Open Streets Initiative include Neighborhood Linear, Loop, Arm and Loop, Multi-Neighborhood Linear, Regional Linear.
Setting	For Open Street events the route setting is relative to the activity the event is promoting. Settings identified by the Open Streets Initiative include Park, Parkway, Residential Neighborhood, Neighborhood Center, and Downtown. A variety of settings creates visual interest along the route. Ideally a route should also run through different areas to help spread economic benefits. For example an event that involves a downtown or neighborhood main street will bring income to local businesses.
Program	Traditionally biking and walking are the foundation of Open Street events but the initiative has developed from solely promoting physical activity to encouraging community engagement and challenging the way streets are used as public spaces. Any street-based event can be designed to include an array of social, play, wellness and educational activities, providing more and varied benefits across the community.
Frequency	The frequency of events can vary, depending on the relevant program. Considerations include seasons and local weather conditions, as well as relationship to other events in the community.
Logistics	As with any public event there are various logistical considerations that will need to guide planning and running streets events. These include permits, staffing, communications, barricades, emergency access, location and type of activity points, temporary signage, waste management, vendors etc. See further information box for more detail on these in relation to Open Streets specifically.

Brea Downtown Jazz Festival


Surf City Nights Huntington Beach

CASE STUDY
Street events in Orange County

There are various street events in Orange County, including:

- Orange County Marathon
- SOMOs – Santa Ana's Sunday on Main Open Streets
- Re:Imagine Garden Grove
- Costa Mesa Cattle Drive
- Villa Park Boat Parade
- Surf City Nights in Huntington Beach (see photo)
- Brea Downtown Jazz Festival (see photo)

Further Information

The Open Streets Project is a partnership between the Alliance of Biking & Walking and The Street Plans Collaborative that aims to share information on open streets best practice and encourage the movement across America. http://bit.ly/1VVtYDN

Alliance for Biking & Walking - Open Streets Guide. http://bit.ly/1W6YMBE

Public art

Public art contributes to place-making by providing visual interest and adding character to the street. It can help unify an area through a particular theme, provide a focal point within a public space, act as a landmark to aid wayfinding, or create a gateway to a neighborhood. Successful public art is site specific and relevant to the local place and its community. Public art can be situated in various areas and locations but in all cases it should be positioned with care in relation to other street environment elements, the adjoining buildings, and flows of people and vehicles.

Key design considerations:

Planning	Plan for installation of public art during the planning and design phase of a project so that it is closely integrated with other streetscape elements.
Locating	As for streetscape elements the piece (if it is to be installed in the sidewalk) should be located within the street furniture or frontage zones, so that it does not obstruct pedestrian flows. There should also be ample space around the piece for people to stop and engage with it without compromising the sidewalk pedestrian zone.
Visibility	Public art that is located outside of the street environment but that is visible from the street (e.g. in an adjacent park or plaza) should be taken into account when designing a street. Visibility of such items can contribute to the identity of the street environment as well as navigation.
Integration	Public art can be incorporated into infrastructure and streetscape elements. E.g. it can be installed on transit shelters, utility boxes, or trash cans. Street furniture items can also be designed as pieces of public art themselves.
Role	Art can be educational in regards to the history and culture of a place, it can also provide wayfinding information, or it can be simply be playful.
Trails	Installation of a 'trail' of art elements can encourage people to explore the area, and help encourage cycling.
Maintenance	Public art requires careful consideration of maintenance; this should be incorporated into overall street maintenance programs.
ADA	All public art should meet ADA standards and maintain mobility within the street.

Sculpture installed at Newport Beach Civic Center Park

Art incorporated into street furniture along Center Street, Anaheim

CASE STUDY

Newport Beach - McFadden Square Centennial Legacy Project

In 2008 the McFadden Square Centennial Project was unveiled. It includes a walking path that traces the history of Newport Beach with markers of significant events. A bronze sphere is the focal point with words and scenes depicting the history of Newport Beach on its surface.

CASE STUDY

Utility Box – Santa Ana

The City of Santa Ana's Utility Cabinet Art Program commissions local emerging artists to design and decorate utility cabinets across the city. The initiative aims to camouflage the boxes in creative and fun ways and encourage innovative public art across the city.

Crime prevention

Crime prevention through environmental design (CPTED) is a multi-disciplinary approach to deterring criminal behavior through environmental design. The principles of CPTED include territoriality, surveillance, access control, activity support, image management and target hardening.

Key design considerations

Public vs. private space	Create definition between public and private space and acceptable patterns of usage. Expressing ownership of property can deter potential trespassers thus increasing security. Within the street environment territoriality can be defined using fencing, surfacing and signage.
Access control	Access control is about reducing the opportunity for crime by managing accessibility to an area, whether it be allowing or restricting activity. The method of access control is site specific; in some cases restricting access at certain hours of the day may be the most effective way to manage crime. It may be that if access on one route is restricted increased traffic on another route improves surveillance of the street.
Surveillance	Surveillance, informal or natural, increases security of streets as crime is less likely to occur if there is a chance the offender will be seen by others, or apprehended. When designing streets consider physical elements that may impact visibility and natural surveillance on the street, such as lighting, landscaping and proximity to buildings. Crime is less likely to occur in well lit, open areas with high pedestrian activity. Surveillance may also include CCTV cameras. Even artwork or images that convey a sense of surveillance (such as a mural with eyes - see photo to the right) can help deter crime.
Activity	Activity support is about the design of streets that encourages pedestrian activity which in turn supports a reduced crime rate; for example in locations sufficient lighting provision to enable pedestrian activity and improved safety during hours of darkness.
Management	Image management is the consideration of the 'look and feel' of a place through upkeep and maintenance of streets and their context. Street environments that are in poor condition or vandalized can attract crime or anti-social behavior, and also impact on sense of personal security and perception of crime.
Target hardening	Target hardening aims to make it more difficult for offenders to carry out crimes. For example in this could include selection of durable materials that restrict opportunities for vandalism and graffiti, and ensuring that hiding places / blind spots are designed out of the street environment.

"Eyes on the street" – A mural in the Santa Ana Artists Village

Housing in South Melrose Street, Anaheim with doors and windows addressing the street to provide natural surveillance and activity, and low walls to define public vs private areas

CASE STUDY

The CPTED principles were applied throughout the design process for the Portola Springs development in Irvine, designed by the Irvine Co. urban planning team. Windows and wall levels are designed to a height that enables surveillance on the street. Street trees and vegetation are regularly trimmed to eliminate blind sports and encourage visual permeability.

(OC Register. Irvine discourages crime by design. http://bit.ly/1Y7Mo25)

Pathway, Portola Springs.

Further Information

Cozens, P. – Crime prevention through environmental design (CPTED): A review and modern bibliography. 2005)

Landscape and ecology

Orange County ecology

Orange County is part of the California Coastal Chaparral Forest and scrub ecological zone. Its ecoregions are composed of plant species that can establish and sustain habitats in Orange County with minimal requirements for maintenance and irrigation. Not all of these species will be appropriate for streets, however consideration should be given to where they might be suitable instead of exotics. They should be used to inform sustainable planting solutions within roadway environments, where appropriate.

The three ecoregions of Orange County are:

- **California coastal sage and chaparral:** This is a diverse and globally rare habitat type occurring in coastal terraces and foothills at elevations below 1000 meters (m), interspersed with chamise chaparral, oak woodland, grasslands, and salt marsh. This habitat type is characterized by low, aromatic and drought-deciduous shrublands of Black Sage (Salvia mellifera), White Sage (Salvia apiana), Munz's Sage (Salvia munzii), California Sage (Artemisia californica), California Buckwheat (Eriogonum fasciculatum), California Brittlebush (Encelia californica), Toyon (Heteromeles arbutifolia), Lemonade Berry (Rhus integrifolia), and a diverse assemblage of other shrubs, herbaceous plants, cacti and succulents.[18]
- **California interior chaparral and woodlands:** This is characterized by grasslands, chaparral shrublands, open oak savannas, oak woodlands, serpentine communities, closed-cone pine forests, pockets of montane conifer forests, wetlands, salt marsh, and riparian forests.[19]
- **California montane chaparral and woodlands:** This consists of a complex mosaic of coastal sage scrub, lower chaparral dominated by chamise, upper chaparral dominated by manzanita, desert chaparral, Piñon-juniper woodland, oak woodlands, closed-cone pine forests, yellow pine forests, sugar pine-white fir forests, lodgepole pine forests, and alpine habitats. The prevalence of drought-adapted scrub species.[20]

Newport Bay Estuary

Coastal sage scrub planting, Newport Beach Civic Center

18. World Wildlife Fund. Western North America: Southwestern United States into northwestern Mexico. World Wildlife Fund. http://wwf.to/1Q2VXcp
19. World Wildlife Fund. California interior chaparral and woodlands. World Wildlife Fund. http://wwf.to/1qiSqBN
20. World Wildlife Fund.. California montane chaparral and woodlands. World Wildlife Fund. http://wwf.to/1SsIdJt

Street trees

Complete Streets can help enhance the natural environment through inclusion of street trees and planting to create green streets. Green streets help support the ecology of Orange County and provide amenity value Street trees are an important part of green streets, and can fulfill a number of specific functions, namely:

- **Traffic Calming:** The placement of street trees can help with traffic calming. The vertical element of the trees lining the curb reduces the visual width of the roadway and helps to reduce speed. Trees can also be used to interrupt forward visibility at corners, chicanes and median strips forcing drivers to slow and pay more attention to the roadway.
- **Amenity:** Street trees contribute to amenity by contributing to environments that people want to live, work and play in through general greening of the street as well as providing shade for sidewalks, trails and seating areas
- **Character and identity**: The type, location, arrangement and spacing of trees can all be used to contribute to the identity or character of a specific place. Trees can be used to frame, enclose and accentuate spaces. They can also be used to provide a rhythm and linearity along a route. These elements contribute to sense of place.
- **Environmental Benefits:** Street trees play a significant role in local environments by helping absorb greenhouse gases, mitigating noise and air pollution, reducing heat island effects, and providing ecological connections for wildlife habitat.

When planting street trees a hierarchy of needs should be established to determine the best species for the site. While all street trees will fulfill each function to a degree, some species will perform better in different street typologies. For example species that provide shade and amenity in a neighborhood street will be different to the species that could be planted on the edge of a freeway to mitigate noise.

To maximize the benefits of investment in a street tree network care must be applied right through the tree's life cycle. It is much more efficient to successfully plant and establish healthy street trees than replenish / replace neglected trees.

Street trees create a buffer for the footpath, Laguna Woods

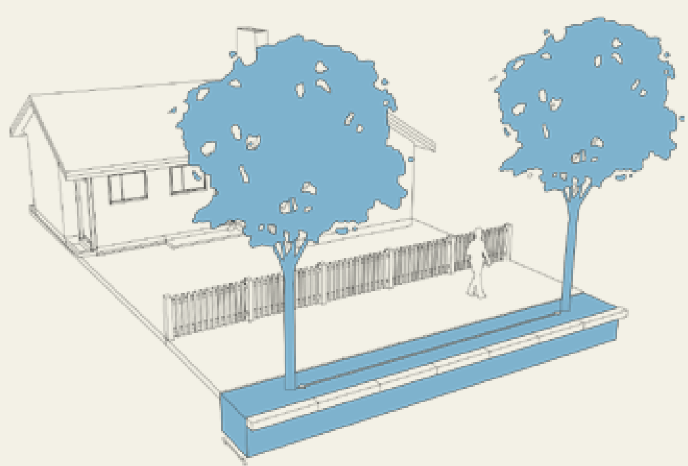
Jacaranda trees enhance the character of the French District in Anaheim.

Key design considerations

Species	Choose a tree species that will succeed in the sites environmental conditions. This will substantially increase its chance of survival.
Space for roots	Provide enough space for the tree to set down and establish a root system. This will increase the tree's resilience to drought and storm events. Typically a healthy trees root system will reflect the size of its crown. Consider what the adjacent surfacing might be and what set back this will have from the tree trunk. Ensure the roots will be able to access enough water. Acknowledge that the root system will grow and allow for this with tree root protection. This will also minimize the risk of the roots up-lifting the sidewalk. Different methods can be use for the root environment, including open tree trenches, covered tree trenches, tree pits, and raised tree beds.
Mature size	Imagine what form the mature tree will take and consider any clashes with structures and adjacent land uses. While a tree form can be trained it is much more sustainable to choose a species with an appropriate crown shape for the location. As a general rule street trees with a minimum clear stem height of 8-10 feet will provide shade but not inhibit accessibility or visibility for street users.
Spacing	Spacing of trees relates to their intended function, as well as the type of tree and its optimal growing conditions. Trees spaced evenly along a street in an avenue style will create continuity and create a particular character for the street. They can also contribute to traffic calming and provide general amenity. In deciding spacing the scale of the street and adjacent buildings must be considered, as well as the size of the crown of the mature tree. Clusters or groves of trees in open planting areas can be used at selected locations along a street to present a different character to evenly spaced avenue-style planting. This provide selected focal points. In conjunction with seating this approach can provide shaded mini-public spaces where people can spend time.
Maintenance	Implementing a maintenance plan for the tree network is critical. This will need to take into account the need for high levels of maintenance while the trees become established. Over time maintenance can be reduced to annual disease inspection and pruning. In the longer term tree thinning (removal) may be required to ensure sightlines are maintained along the street. The maintenance plan must take into account the need for access by special vehicles or other maintenance equipment from the roadway and potentially from the sidewalk.

Tree pits
Trees planted in sidewalks require tree pits that are sufficient for healthy root growth. Trees should be spaced and positioned based on the crown size of a mature specimen.

Tree trench in buffer strip
In residential areas trees can be planted in a buffer strip between the roadway and sidewalks, spaced to accommodate future growth.



Urban planting

Other forms of urban planting can further support delivery of green streets. This includes; buffer planting, traffic calming planting and feature planting:

- **Buffer planting:** This is used to create a physical barrier between modes of transportation (e.g. the roadway and the sidewalk), and between transportation corridors and adjacent land uses. Alongside major road corridors such as multi-modal freeway corridors, buffer planting presents an opportunity for planting endemic species and contributing to the County's biodiversity, as well as erosion control.
- **Traffic calming planting**: This is used to create visual and/or physical barriers to slow vehicles. While traffic calming is the primary goal of such planting, it also contributes to the amenity of the neighborhood. Common locations for this type of planting would be in curb extensions, chicanes, central medians and between parking bays.
- **Feature planting:** This improves visual amenity and creates character. It is often the feature planting that people will remember most about a place. Typical examples of this may be sidewalk landscaping, raised or hanging planters and green walls. This type of planting typically requires a high level of maintenance and depending on type, location and species may require re-planting annually.

Key design considerations

Climatic conditions	The site's climatic conditions will determine the types of plant species that will prosper. Exposure to sun, wind and water will be site specific and should be assessed prior to planting. Where possible native plants should be planted as they are more likely to be accustomed to the conditions, however their ability to withstand pollutants from the adjacent roadway will need to be taken into account.
Soil conditions	Soil conditions will also relate to the plant species chosen; consider the specific requirement for drainage and nutrients. Usually traffic calming and feature planting will use imported soils that can be engineered to meet specific plant requirements.
Space	Area available for planting. Certain plant species may be more prosperous in larger planting areas where they have more space and companion plants.
Proximity to transportation	Proximity to street users. Some plant species are more resistant to trampling or vehicle emissions and are therefore more appropriate for curb extensions and central medians.
Desired effect	Desired effect of planting. Introduced species may be used in feature planting areas where they will receive regular maintenance.
Visibility	Visibility. Within a street environment it is critical to ensure that the density, height or position of planting does not introduce safety risks, such as by obscuring pedestrians wishing to cross the road.
Life span	Life span of the planted area. Feature planting may consist of annuals or perennials that are regularly replaced.
Maintenance	Maintenance of planting, including any special access requirements for maintenance staff and vehicles.

Buffer planting, Costa Mesa

Traffic calming planting in Dana Point which uses recycled water for irrigation

Sustainable drainage

Urban planting can play a vital role in sustainable management of water. Detaining and filtering stormwater run-off improves water quality, replenishes groundwater resources and minimizes the capacity required of infrastructure. Types of stormwater management facilities include:

- **Bio-retention swales:** These are large, shallow landscaped areas designed to slow and filter run off. These are usually implemented along transportation corridors or within large parking lots and have raised stormwater outlets to ensure there is no flood potential.
- **Raingardens:** These are deeper than swales and are designed to detain and infiltrate large volumes of water. These are typically formed from concrete in more urban built up areas and are engineered to manage a specific quantity of water. The majority of stormwater will discharge through drainage at the bottom of the swale although there should be an outlet at ground level for the provision of flood events.
- **Flow-through planters**: These are used to intercept and absorb stormwater run-off prior to entering stormwater infrastructure. This also reduces the requirement for irrigation.
- **Permeable surfaces:** These reduce the amount of stormwater run-off through direct absorption. There are different varieties of permeable surfacing that can be used in different scenarios where traffic flows and load requirements are lower than usual. Permeable surfacing is often used in car parks and alleyways.

Key design considerations

Location	Location of the intervention. Surrounding land uses should support the appropriate stormwater management intervention.
Ground conditions	Existing ground conditions should be free-draining. If they are not they should be replaced.
Size	The size of the area available for detaining water relative to the catchment area of run off. The intervention may require supplementary infrastructure to guarantee drainage in a storm event.
Plant species	Species of plants chosen should be hardy enough to endure seasonal drought and inundation of water. Different plants will be appropriate for different interventions relative to the quantity of water captured.
Maintenance	Any foreseeable maintenance requirements. Pebble mulch will help filter rubbish and debris and help to keep the form of the intervention.

Flow-through planter ARTIC center, Anaheim

Vegetated rock swale Bristol Street, Santa Ana

Further Information

LIDC - Green Streets Municipal Handbook, 2008

State of California Department of Water Resources – Urban Drought Guidebook, 2008

B4

Implementation

This Implementation chapter is intended to help jurisdictions with some of the practicalities of delivering streets that are more complete.

The following pages provide a description of typical project types, the key process considerations that apply to retrofit projects in particular, and an overview of the typical process for delivery of a Complete Streets project.

An overview of typical costs for various Complete Street elements is provided, for each of the nine street types. These are presented as unit cost ranges based on local experience.

A design review checklist is also referenced. This is provided as a separate document for download, to help jurisdictional staff review street improvement or development projects and prompt thinking about how well the proposed designs address Complete Street principles.

Project types and implementation processes

Complete Street projects typically fall into two types: street improvement/ retrofit projects, and development-related new build projects. This document can be used for either project type, however as many areas of Orange County are already built out it is envisaged that it will mostly be used for retrofit projects.

Street improvement/retrofit projects
These are typically public projects, initiated by a jurisdiction or other public agency to improve an existing street. They are primarily focused on changes within the public right-of-way. Depending on their scope and objectives these projects can include, for example:

- Roadway reconstruction projects
- Utility replacement projects
- Modal improvement projects (e.g. transit, or bicycle routes)
- Maintenance projects (e.g. street resurfacing and restriping)

A Complete Streets approach can be applied to all of these project types. Roadway reconstruction projects are usually large enough to provide the opportunity for more comprehensive implementation of Complete Streets elements, for example changing number and width of lanes, adding bicycle facilities, widening sidewalks, and introducing new features such as tree planting, crosswalks, lighting etc.

Utility replacement projects are initiated when replacement of water, sewer, power or telecommunications infrastructure is required. In these instances large areas of roadway may be dug up and replaced, often covering multiple blocks. This type of project provides an opportunity to incorporate Complete Street elements as part of the reinstatement of the roadway, often at little additional cost to the project.

Modal improvement projects are those where a need has been identified to provide or upgrade a facility for a specific mode, such as a new transit route, or a bikeway. These types of projects themselves help make a street more complete. Additionally they are opportunities to introduce other Complete Street elements as part of the design process.

Maintenance projects are routine management of existing streets within their current roadway configurations. This typically includes street resurfacing and restriping, but could also cover maintenance of lighting, planting, traffic control devices etc. Depending on the scope of the program consideration can be given to incorporating complete street elements, for example making changes to lane configuration, or adjusting timings of traffic signals for pedestrian crossings.

A Complete Streets approach can be applied to roadway reconstruction projects, utility replacement projects, modal improvement projects and maintenance projects

Development-related projects
These are typically projects initiated by a property owner or developer, relating to the development of one or more plots or parcels of land. These projects could include:

- Projects on existing streets where the developer wishes to upgrade or amend the right-of-way adjacent to the development site
- Large-scale masterplanning projects where the developer is designing new streets and neighborhoods within the development site

Where a project is on an existing street, the development plan may trigger a need to work through the relevant jurisdictions planning process to ensure adequate right-of-way dedication. This presents an opportunity to incorporate Complete Street elements into the design.

For larger scale projects such as area-wide masterplans the streets within the development area may be developed according to the developer's own design code, and privately managed following construction. There is an opportunity for jurisdictions and agencies to influence the design of these streets through the development process and help ensure they are complete. Indeed many developers recognize the benefits that a Complete Streets approach can bring to their developments economically.

Implementation processes
Before embarking on a Complete Streets project there are various aspects that need to be taken into consideration, and which inform the design process, delivery program, and also subsequent maintenance. Some of these aspects are particularly important for retrofit projects, where existing constraints need to be taken into consideration, and public outreach must be robustly integrated into the process to inform the design. The diagram on the next page summarizes the typical process and factors involved. Some of the key challenges are:

- **Site constraints:** For retrofit projects there will be existing factors which need to be adequately understood before design development, e.g. limits of right-of-way, location of existing utilities, local environmental constraints, access requirements of adjacent land uses etc. A full site appraisal should be done to understand constraints before any design or planning is undertaken.
- **Joint conditions:** The need to meet specific requirements of various agencies who jointly have jurisdiction over or have requirements relating to roadway design for the specific site. E.g. where design of a road requires approval from both the OCTA and the city. Early discussions with all agencies who have an interest or approval role are essential to understand what conditions will need to be met and inform the design development process.
- **Approval timelines:** Approvals for street improvements may involve more than one department in a jurisdiction, and as noted above, more than one agency. Adequate time must be allowed to gain all necessary approvals in addition to those for design development and public outreach. Ultimately the overall program for project delivery may be significant, e.g. several years.
- **Public and stakeholder involvement**: Outreach is a critical part of any design project in order to gain inputs from the local community, keep them informed of progress, and gain their support. Outreach must be adequately planned from the outset and integrated into the design process. The type tools used to deliver the outreach program are various, but should be designed with the specific audience in mind, and encourage engagement.

FIGURE B4.1: TYPICAL COMPLETE STREETS IMPLEMENTATION PROCESS

Step	Stage	Activities	Public involvement
Step 1	**Project initiation and planning**	• Identify project • Review context, needs and priorities • Assess feasibility • Agree scope	**Public involvement** Neighborhood, business and advocacy groups propose projects for consideration
	Funding	• Initial cost estimate • Identify funding sources and secure	
Step 2	**Concept design**	• Develop vision • Develop conceptual design options • Undertake site surveys • Evaluate design options (including Design Review Checklist) • Select preferred option • Update cost estimate • Initial maintenance plan	**Public involvement** Public outreach to inform vision, develop concepts and select from options
Step 3	**Engineering design**	• Develop preliminary design • Review preliminary design (including Design Review Checklist) • Develop final design • Update maintenance plan	**Public involvement** Meetings with community and affected property owners to review design details
Step 4	**Construction**	• Construction procurement and management	**Public involvement** Community liaison during construction
Step 5	**Review and evaluation**	• Review scheme post-construction • Ongoing evaluation against success criteria	**Public involvement** Community provide feedback
Step 6	**Maintenance**	• Ongoing maintenance	**Public involvement** Local residents and business participate in some aspects of maintenance

Design review checklist

An OCCSI Design Review Checklist is available for jurisdiction staff to use. It is intended to help them evaluate projects that relate to street design, review how 'complete' the existing and proposed street is, and from this identify ways to improve the design.

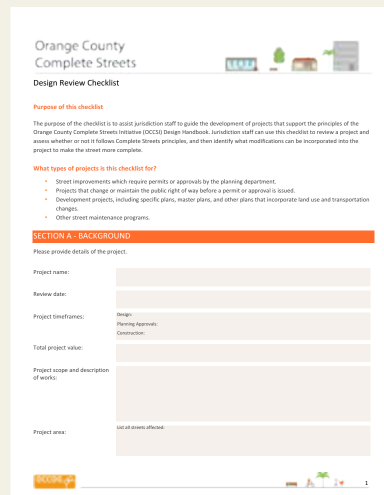
The checklist has been created as a separate file that can be downloaded and filled in as appropriate for individual projects. It can be downloaded from:

www.occog.com/complete-streets

The checklist can be used for any type of project involving street design or re-design, for example:

- Street improvements which require permits or approvals by the planning department.
- Projects that change or maintain the public right of way before a permit or approval is issued.
- Development projects, including specific plans, master plans, and other plans that incorporate land use and transportation changes.
- Other street maintenance programs.

The Design Review Checklist is for jurisdiction staff to evaluate projects that relate to street design and help identify ways to make the street more complete


Orange County
Complete Streets

Design Review Checklist

Purpose of this checklist

The purpose of the checklist is to assist jurisdiction staff to guide the development of projects that support the principles of the Orange County Complete Streets Initiative (OCCSI) Design Handbook. Jurisdiction staff can use this checklist to review a project and assess whether or not it follows Complete Streets principles, and then identify what modifications can be incorporated into the project to make the street more complete.

What types of projects is this checklist for?

- Street improvements which require permits or approvals by the planning department.
- Projects that change or maintain the public right of way before a permit or approval is issued.
- Development projects, including specific plans, master plans, and other plans that incorporate land use and transportation changes.
- Other street maintenance programs.

SECTION A - BACKGROUND

Please provide details of the project.

Project name:	
Review date:	
Project timeframes:	Design: Planning Approvals: Construction:
Total project value:	
Project scope and description of works:	
Project area:	List all streets affected:

1

Capital and maintenance costs

Despite a common misconception that Complete Streets cost more to build than 'incomplete' streets, this is not necessarily the case if careful planning encouraged by Complete Street policies help jurisdictions find cost effective measures that can be accomplished at little or no extra cost over a period of time.

Introduction
As discussed in the preceding section there are many approaches to implementing Complete Street improvements on existing streets as well as incorporating elements into new developments or roadway plans. As a result, the costs of implementing Complete Streets elements are also extremely variable. Interventions can range from new paint on roadways to major physical enhancements. For this reason, the cost of Complete Street improvements can also range from hundreds to millions of dollars. Simple improvements can include restriping roadways to be more inclusive for all modes, and when this is coupled with regular road maintenance, the implementation of such a Complete Street element has minimal extra costs. For a more dramatic improvement, such as one that includes a full retrofit or reconstruction of an intersection, costs will be much greater.

Interventions can range from new paint on roadways to major physical enhancements. For this reason, the cost of Complete Street improvements can also range from hundreds to millions of dollars

Integrating with city planning and operations
Integrating Complete Street principles into all planning policies and processes helps to encourage awareness across jurisdictional departments of the need to take a Complete Streets approach so that any efforts related to street planning, design and maintenance are complementary to achieving a Complete Streets vision.

Major retrofitting of an existing road to incorporate pedestrian, bicycle or transit amenities is often much more expensive than having incorporated those upgrades into the original project design. By integrating Complete Streets considerations into planning processes all elements of a road are considered—and then planned and constructed—at the same time. This can reduce the overall amount of money that jurisdictions spend on road infrastructure.

As most of Orange County is built out, many Complete Streets projects will be retrofit projects, however there are also ways or achieving Complete Streets without full retrofitting. For instance, Complete Streets can be incorporated into routine and required infrastructure projects such as utility upgrades, or the installation of traffic signals. This can help optimize resources and leverage opportunities to improve streets that already have construction or maintenance works planned.

Working within existing budgets
Complete Streets can often be achieved within the context of existing transportation budgets; and the approach can sometimes save money. It is important to understand that Complete Streets are not only about the implementation of iconic multimodal downtown boulevards, but also about small and routine tasks such as restriping or updating signal timings to benefit pedestrians crossing the road. Such projects may not attract so much attention as high profile schemes but over time many small and low cost improvements can, when designed and constructed with due care and attention to detail, create a more comfortable and safer street environment.

With limited funding there a number of changes that can be made to existing streets to make them more "complete", such as:

- restriping to reallocate un-used road space to pedestrian plazas using temporary furniture and planting;
- restriping to narrow travel lanes and provide space for bike lanes;
- removing curbside parking to provide space for bike lanes;
- realigning parallel parking bays on excessively wide streets to angled parking;
- restriping crosswalks to become more visible and distinctive; and
- changing signal timings to favor pedestrians and cyclists.

When simple improvements that make streets more encompassing for all modes are coupled with regular road maintenance, the implementation of such a Complete Street element has minimal extra costs.

With more funds available more costly interventions can be undertaken, such as:

- adding pedestrian countdown signals
- installing refuge islands, medians and curb extensions
- adding curb cuts
- adding mid-block crossings
- reallocation of individual parking bays to parklets areas or bicycle storage hangers
- adding shade trees along sidewalks
- installing a wayfinding system
- enhancing transit shelters with transit and area information
- providing seats, bins and bike racks
- providing better street lighting
- installing detectable warning strips

For a more dramatic improvement, such as one that includes the complete restructuring of an intersection, or the realignment of curb lines, repaving and introduction off street furniture, the costs will be much greater.

CASE STUDY
CALTRANS

Caltrans believes that front-end policy, planning, and project revisions to reflect Complete Streets have minimal cost impacts. Former Deputy Director for Planning and Modal Programs Gregg Albright, who oversaw much of the early work, wrote in a letter to Barbara McCann, May 20, 2008, "Generally, when a project has been scoped properly, as integral to a balanced and fiscally sound transportation system... complete streets facilities should not be treated as additional costs to a project."

(National Complete Streets Coalition. It's a Safe Decision: Complete Streets in California. 2012. http://bit.ly/1RSM1US)

"When we talk about Complete Streets, we aren't necessarily talking about expensive widening projects or major redesigns of our roadways. These concepts can often be applied to existing streets by simply re-thinking how we approach traffic flow and how we accommodate all modes of transportation." – Phil Broyles, Director of Public Works, Springfield, Missouri

(National Complete Streets Coalition. Costs of Complete Streets: What we are learning from state and local governments. http://bit.ly/1TOzvlY)

Obtaining funding for specific projects – grants and tax measures

Grants from different levels of government can help fund new Complete Streets or particular elements of a Complete Street vision. Some projects are also eligible for grants from multiple sources. However grant funding is often competitive and requires the allocation of resources to make a bid, plus the emphasis and priority of funding streams changes over time making. Examples include:

- **The Comprehensive Transportation Funding Programs (CTFP)** represents a collection of competitive grant programs offered to local agencies to assist in funding street improvements, transit expansion, and even environmental mitigation projects. The CTFP is comprised primarily of M2 funds, but can also include state/federal funding sources such as the Regional Surface Transportation Program (RSTP) and supplemental State-Local Partnership Program (SLPP) funds.
- **Orange County cities and the OCTA have secured $21 million of new funding for active transportation**. These funds come from the Statewide Active Transportation Program, the Metropolitan Planning Organization (MPO) Active Transportation Program, and OCTA Bicycle Corridor Improvement Program (BCIP).

Complete Streets schemes can make transportation projects more popular and garner more support for transportation funding through grants in certain communities, especially where there is a balanced approach to sharing the available space in the right-of-way between all modes of movement.

Complete Street projects can also be funded through Local Sales tax measures, which relay on a majority support of the local community. For example:

- **Measure M** is Orange County's half-cent transportation sales tax. Voters renewed the sales tax for transportation improvements in 2006 for another 30 years. Until January 28, 2016 funds were given to Project T, which had a capital investment emphasis. After that date, the balance was reallocated to Project U to cover a shortfall in the Senior and Disabled Fare Stabilization Program and Project R, which funds the ongoing operation of Metrolink service in Orange County. Project U has an operational emphasis and Project R has a mix of capital and operations elements. All of these have the potential to be used for Complete Streets improvements.

Grants from different levels of government can help fund new Complete Streets or particular elements of a Complete Street vision

Working with developers

As noted in the preceding section, developer-led projects are an important means of delivering Complete Streets in a community. This requires developers being 'on board' with Complete Streets objectives, however many developers now recognize the benefits that Complete Streets can bring to their projects.

Implementing Complete Streets in new developments presents an opportunity to have the developer contribute financially or through provision in-kind. Working with developers it is possible for Complete Streets principles to be incorporated into a master planned community, transit-orientated development or areas of block renewal. In such situations traffic circles, medians with trees, bike lanes and wide sidewalks can be incorporated from early stages of design, with little or no additional cost.

Developer's value certainty in project costs, and as long as they know which Complete Streets elements to incorporate into their costs ahead of time, they are likely to support inclusion. Most of the time, developers will gladly build smaller; more complete streets, because large car-centric roads are very costly.

Holding temporary events

Holding temporary events on the streets of Orange County is an increasingly common occurrence. These can include Open Street initiatives for activities such as walking, jogging, bicycling, dancing and social activities, or street fairs, block parties, parades and sports such as marathons or triathlons. In all cases the existing streets are temporarily closed to traffic. Such events are relatively low-cost to deliver, and do not require any permanent changes to the design of the street.

The funding of temporary events can either be from state or city sources, commercial sponsorship or a combination of both. There are several 'models' for Open Streets Initiatives. In 2012, 45 percent of Open Streets initiatives were organized publicly, and 52 percent were funded by a public-private partnership.[1] Examples include:

- In Los Angeles, the Metro Board of Directors allocated $3.75 million for car-free events.
- Funding for similar, but smaller, events in Orange County comes from various sources including City Council, but most use outside sources, such as state and federal grants, and sponsorship deals.

CASE STUDY
OPEN STREETS

A record eight Open Streets events featuring car-free streets were held in Minneapolis in 2015, and featured three first-time corridors and the first loop circuit. City departments absorbed an estimated $194,007 to put on the events. That spending covers such city costs as signs to control detoured traffic, providing extra police. The estimated city cost is budgeted at an average $24,250 per event.

(Brandt, Steve. StarTribune. "Record eight Open Streets on tap for 2015". 2015. http://strib.mn/1rCXp1h)

1 Alliance for Biking & Walking (Alliance) and The Street Plans Collaborative (Street Plans). The Open Streets Guide. 2012. http://bit.ly/1RCN5j0

MF

Multimodal Freeway Corridor

The costs associated with retrofitting Complete Street solutions along and across existing Multimodal Freeway Corridors will be large, whether they be the introduction of a fixed transit route down the central reserve or the redesign of on- and off-ramp intersections to facilitate safer pedestrian and bicycle crossings.

Lower cost elements can include the development of parallel trails where land is available alongside the freeway. This is a relatively straightforward measure which can help extend the existing pedestrian and bicycle network.

A more significant intervention is the addition of pedestrian and bicycle bridges and subway crossings, to provide alternative crossings to existing road bridges or underpasses as well as reconnecting severed communities.

Future designs for Freeway Corridors should take account of the increasing demand for active transportation so that road bridges and underpasses crossing the freeway include the provision of adequately sized bike lanes and sidewalks.

1 Provision for bicycles and pedestrians

Lane realignment:
$1M / mile

Line marking:
$3-4 / LF

Mill and re-surface roadway:
$200,000+ / mile

Bridge Widening:
$170-190 / ft²

2 Soundwall

$2.4M / mile

3 Central median reserve

LRT:
$48-55M / mile

HOV Lane:
$2.5-2.8M / mile

4 Traffic control devices

Electronic Variable Message Sign:
$50,000-150,000 each

Concrete jersey barriers:
$650-800 each

5 Intersection realignment

Intersection realignment to assist bicycle and pedestrian crossing:
$3M+

6 Pedestrian and bicycle overbridge

$1,100-1,400 / LF

7 Landscaped area

$100-120 / ft^2

8 Trails

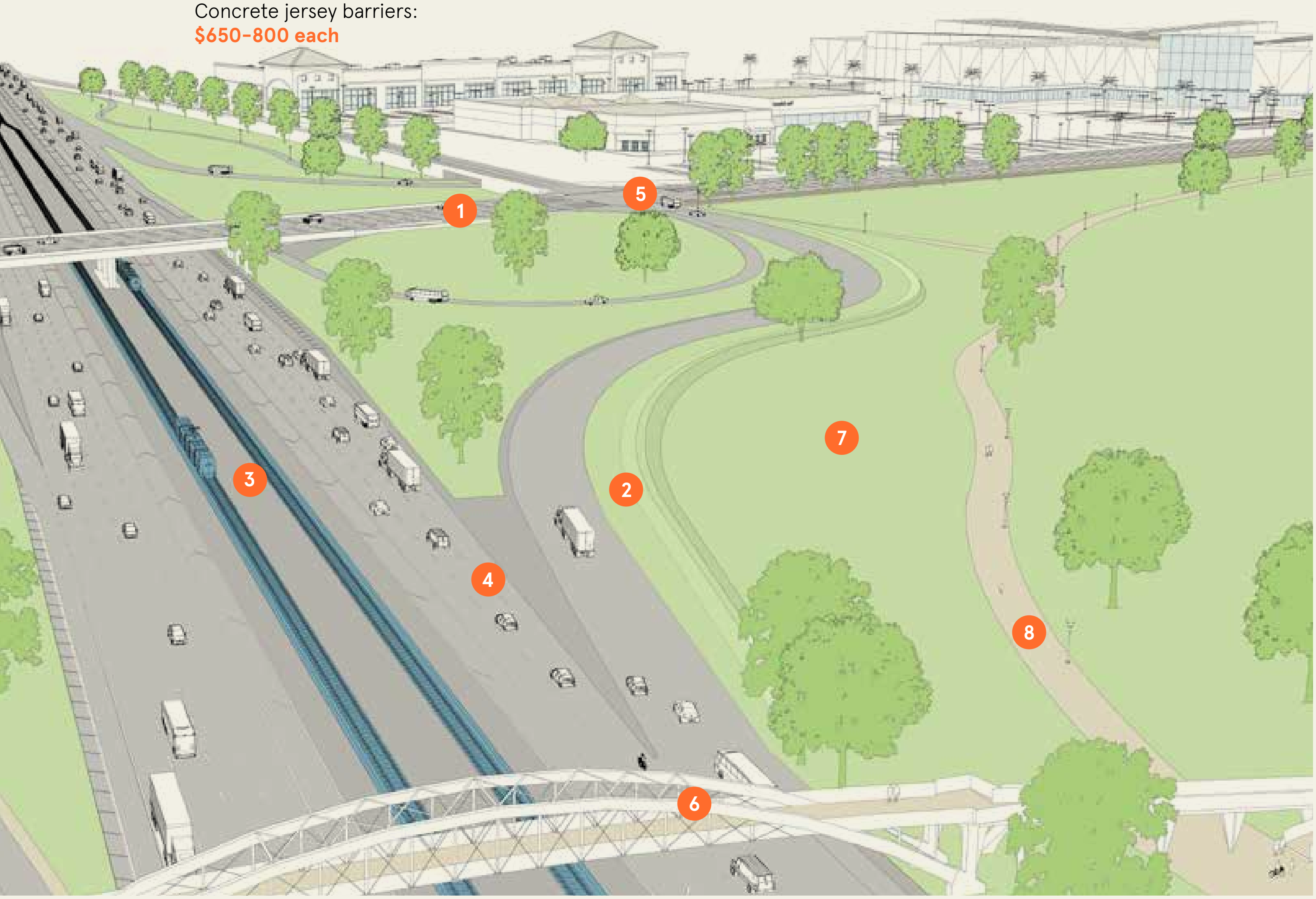
Recreational trail:
$2.5-4 / LF

Shared path:
$220-250 / LF

Equestrian trail:
$15-25 / LF

Lighting:
$1,450-1,650 / LF

Wayfinding fingerpost:
$1,600-1,850 / LF



MC

Movement Corridor

With auto priority as the principle feature of Movement Corridors Complete Street costs will largely be associated with enhancing crossings facilities for pedestrians and bicyclists across the corridor as well as for their movement along it. The level of investment will be dependent on the level of auto priority and the space available to accommodate alternatives modes of travel.

High vehicle numbers and high speeds may necessitate the provision of pedestrian and bicycle bridges, as well as the provision of Class I bikeways. Where speeds and vehicle numbers are lower surface crossings at intersections could be enhanced and mid block crossings provided. On street bikeways (Class II or IV) could also be provided.

In north Orange County where these corridors are typically narrower and more built up than in South Orange County the opportunities to provide enhanced facilities and for pedestrians and bicyclists are more limited. Small-scale interventions to improve sidewalk surfacing and street furniture, transit facilities, crossings and street lighting may be all that can be achieved. Where auto priority is less there may be the opportunity to remove traffic lanes and provide more space for pedestrians and bikes.

1 Bicycle marking at intersections

Dotted line extension:
$2.50-4 / LF

Two stage turn queue box:
$2,600-2,900 each

2 Bus Stop

Signpost:
$190-220 each

Shelter:
$23,000-26,500 each

Bench:
$600-750 each

Bin:
$650-800 each

3 Bikeway

Roadmarking:
Line $3-4 / LF

Buffer strip 3ft wide:
$26-31 / LF

Colored surfacing:
$4-7 / LF

4 Center island narrowing

New concrete curb:
$25-40 / LF

Soil:
$2-4 / ft³

Planting:
$22 / ft²

5 Pedestrian refuge island

Crossing island:
$4,500+ each

New curb:
$40-55 / LF

Concrete pavement:
$15-25 / ft²

Detectable warning strip:
$42 / ft²

6 Realign lane widths

Line marking:
$3-4 / LF

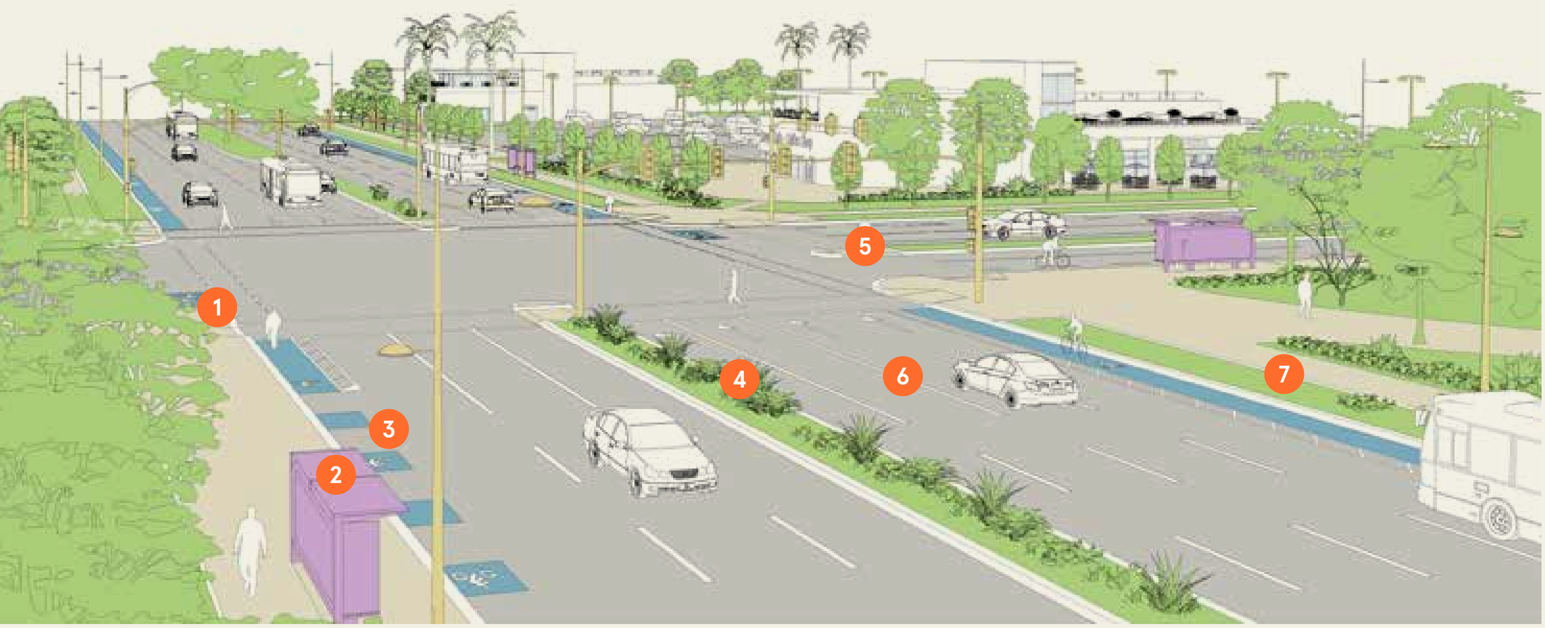
7 Planted buffer strip

New concrete curb:
$25-40 / LF

Soil:
$2-4 / ft³

Planting:
$20-25 / ft²

Street tree:
16 foot height $1,200-1,800 each



ML

Mixed Land Use Corridor/ Hub

The increasing importance of these road corridors as places and destinations means that larger numbers of pedestrians and bicyclists can be expected, and that greater levels of investment will be required to create a safe and comfortable environment for all. Investment in enhanced crossing facilities, at intersections and at regular intervals along large blocks, will make it easier for people to move between destinations on either side of the road without necessarily resorting to driving short distances. Provision of shade trees, street lighting and other street furniture are other costs that should be factored in to achieve a street that is more complete. The higher level of activity and the fact that these are important destinations may warrant use of higher cost materials and street furnishings.

1 Wayfinding totem

$3,500-5,000 each

2 Planted buffer strip

New concrete curb:
$25-40 / LF

Soil:
$2-4 / ft^3

Planting:
$20-25 / ft^2

Street tree:
20 foot height $1,200 - 1,800 each

3 Bikeway

Line marking:
$3-4 / LF

Raised buffer strip:
$26-31 / LF

Colored surfacing:
$4-7 / LF

4 Crosswalk marking at intersections

Standard:
$4-6 / ft²

Striped:
$10-15 / LF

High Visibility:
$25-40 / LF

5 Realign lane widths

Line marking:
$3-4 / LF

6 Pedestrian refuge island

Crossing island:
$4,500+

New curb:
$45 / LF

Concrete pavement:
$18 / ft2

Detectable warning strip:
$42 / ft2

7 Bus Stops

Signpost:
$190-220 each

Shelter:
$23,000-26,500 each

Bench:
$600-750 each

Bin:
$650-800 each

8 Traffic signals

New signals:
$425,000-500,000 each pole

Add pedestrian signalization:
$950-1100

Add bicycle signalization:
$2,100-2,400

Reconfigure signal timings:
$30,000+

9 Curb ramp

Drop curb:
$20-25 / LF

Concrete pavement:
$15-25 / ft²

Detectable warning strip:
$40-45 / ft²

10 Bicycle marking at intersections

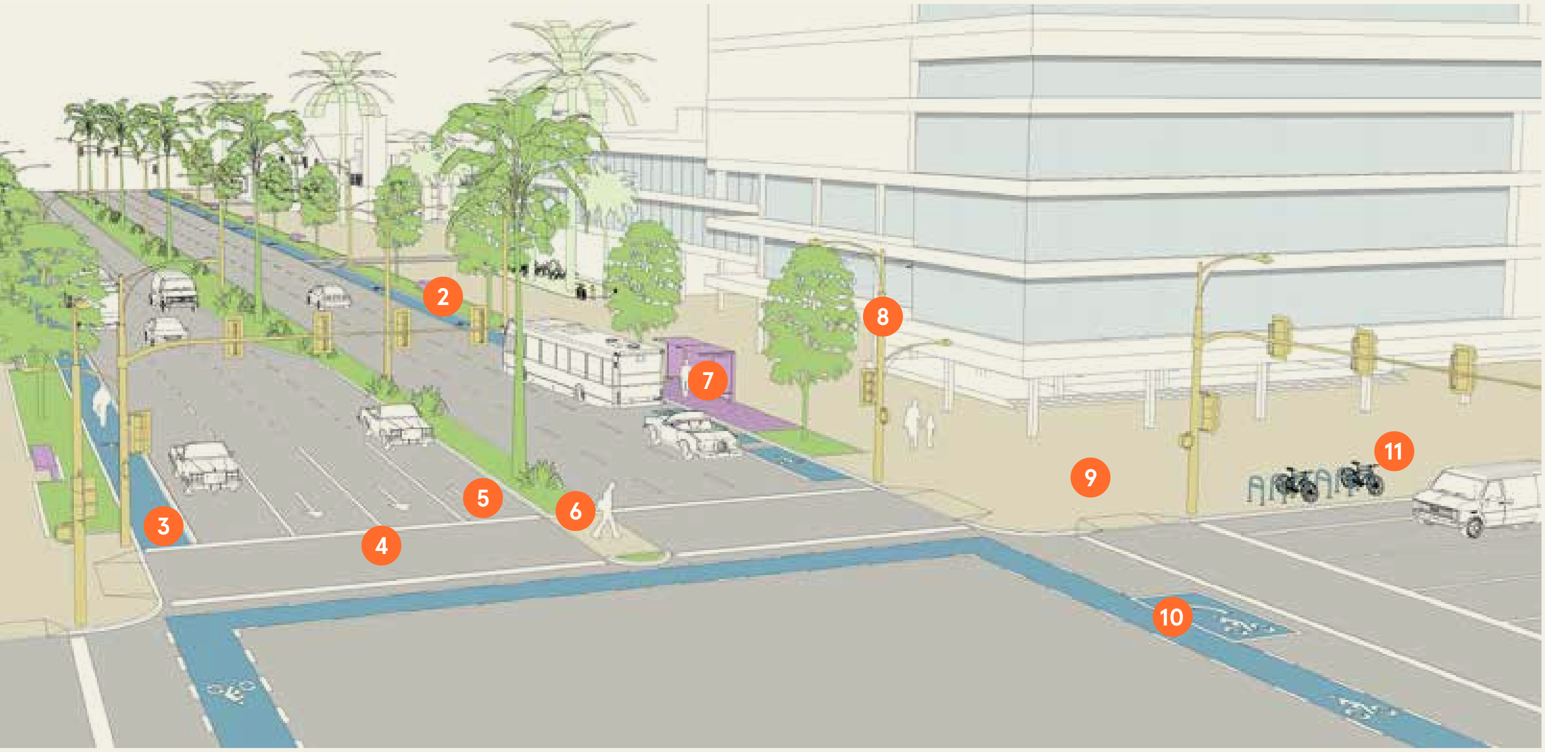
Line marking:
$3-4 / LF

Colored surfacing:
$4-7 / LF

Two stage turn queue box:
$2,600-2,900 each

11 Bicycle stand

$150-250 each



BP

Industrial/ Business Park Street

Within Industrial and Business Park areas the priority will typically be to ensure continued access for commercial vehicles and auto-based trips by workers. Investment in the provision of sidewalks where they are missing will help facilitate walking, and provision of bikeways will help facilitate cycling. A focus of expenditure should be on routes to and from transit stops - where enhanced waiting facilities could be provided - as well as routes to and from local 'lunch-time' destinations. This may require changes to key intersections to improve crossing facilities for pedestrians and bicyclists. The use of lower cost functional materials and street furniture are likely to be a feature of such streets, though in certain areas the investment in higher quality materials may be justifiable.

1 Bus stop

Signpost:
$190-220 each

Shelter:
$23,000-26,500 each

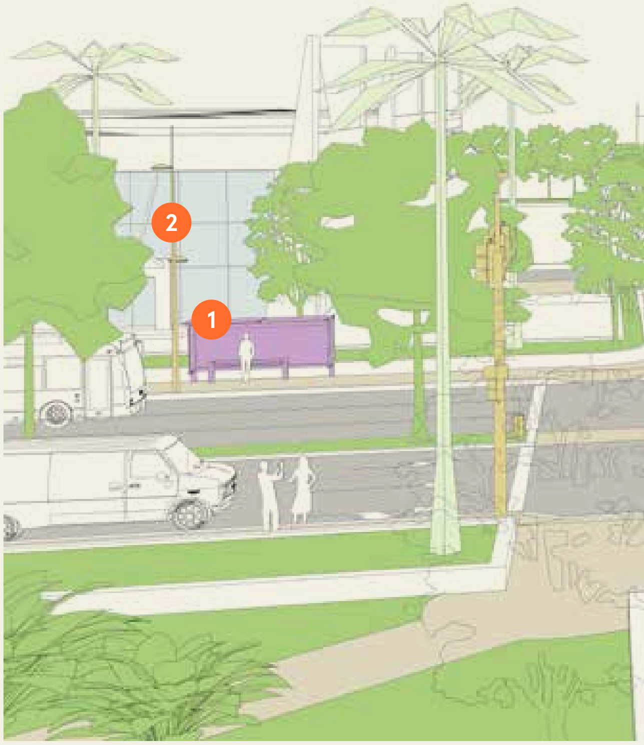
Bench:
$600-750 each

Bin:
$650-800 each

2 New streetlights

New streetlights:
$4,500-5,500 each

Retrofit streetlights to include pedestrian scale:
$300-400 each



3 Curb ramp

Drop curb:
$20-25 / LF

Concrete pavement:
$15-25 / ft^2

Detectable warning strip:
$40-45 / ft^2

4 Center island narrowing

New concrete curb:
$25-40 / LF

Soil:
$2-4 / ft^3

Planting:
$20-25 / ft^2

5 Pedestrian refuge island

New curb:
$40-55 / LF

Surfacing:
concrete $15-25 / ft^2

Detectable warning strip:
$40-45 / ft^2

6 Bicycle marking at intersections

Line marking:
$3-4 / LF

Two stage turn queue box:
$2,600-2,900 each

7 Wayfinding fingerpost

$1,600-1,800 each

8 Transit only lane

Lane conversion:
11 ft width, $2.7-2.9M / mile

Signposts:
$280-350 each

9 Bikeway

Roadmarking line:
$3-4 / LF

Buffer strip 3ft wide:
$26-31 / LF

Colored surfacing:
$4-7 / LF

NM

Neighborhood Main Street

As key destinations within the communities across Orange County these streets face the pressures of multiple users, presenting some of the greatest opportunities, and challenges, for the implementation of Complete Streets. Design solutions must balance the competing demands for pedestrian space, parking, and access. To achieve this curb realignment and reconfiguration of parking layouts to improve walkability may be required. Enhanced crossings to improve connectivity and accessibility across the street may also be implemented.

Investment in high quality materials and street furniture can reflect the local character and help create local distinctiveness. Shade trees, seating, improved lighting and the provision of facilities for bicyclists are all elements that should be considered to improve the attractiveness of Neighborhood Main Streets.

1 Street furniture

Bench:
$600-750 each

Trash can:
$650-800 each

Combined trash and recycling:
$1,900-2,200

2 Lighting

Feature pedestrian lighting:
$1,400-1,650 each

New streetlight:
$4,750-6,000 each

3 Angled parking

Curb realignment:
$13-16 / LF

Roadmarking:
$8-10 per parking space

Asphalt:
$3-4 / ft^2

4 Bicycle stand

$150-250 each

5 Raised treepit

Raised planter:
$1,000+ each

Soil:
$3-4 / ft²

Tree:
13 foot height $950-1,100 each

6 Street tree

Geotextiles:
$2.50-$4.00 / ft²

Soil:
$3-4 / ft³

Irrigation:
$1.00-$2.50 / ft²

Root protection:
$2,500-3,000 each

Tree:
20 foot height $1,300-1,600 each

7 Bikeway

Roadmarking line:
$3-4 / LF

Buffer strip 3ft wide:
$26-31 / LF

Colored surfacing:
$4-7 / LF

8 Curb ramp

Drop curb:
$20-25 / LF

Concrete pavement:
$15-25 / ft²

Detectable warning strip:
$40-45 / ft²

9 Warning sign on post:

$285-350 each

10 Bulb-out:

$9,500-11,000 each

11 Raised table

Raised table:
$3,800-4,500 / ft²

Roadmarking:
$3-4 / LF

Concrete pavement:
$15-25 / ft²

Asphalt:
$3-4 / ft²

12 Widen sidewalk

New concrete curb:
$25-20 / LF

Curb realignment:
$13-16 / LF

Concrete pavement:
$15-25 / ft²

Block paving:
$5-10/ft²

DS

Downtown Street

Downtown Streets are clustered around the key urban centers within Orange County, such as Santa Ana and Anaheim, where buildings front directly onto the sidewalk and buildings are typically higher (e.g. above three stories) than those found in other areas of Orange County. High concentrations of pedestrians and the increased provision of transit options is a feature of such streets, as is the need to allow for auto and servicing access. Like Neighborhood Streets design solutions must balance these competing demands but there is likely to be a greater need to redesign these streets to accommodate the increased levels of pedestrian use. Enhanced crossings to improve connectivity and accessibility between either side of the street could be implemented.

Investment in high quality and distinctive paving materials, street furniture, lighting and street tree planting are often a feature of such streets, with wayfinding systems implemented to help local residents and visitors find their way around the downtown area. Space for outdoor cafés can either be provided permanently by extending sidewalks or temporarily by installing licensed parklets. There is also likely to be a demand for improving bicycle access by providing bicycle lanes and separated on street facilities, with bicycle storage facilities provided at key destinations.

1 Parklet

Construction: **$55,000-70,000 each**

2 Bulb-out

$9,500-11,000 each

3 Bikeway

Roadmarking line: **$3-4 / LF**
Buffer strip 3ft wide: **$26-31 / LF**
Colored surfacing: **$4-7 / LF**

4 Mid-block crossing

Concrete pavement: **$15-25 / ft^2**
Line marking: **$3-4 / LF**
Signage: **$150+ each**
Lights/beacons: **$3,500+ each**

5 Street furniture

Bench: **$600-750 each**
Trash can: **$650-800 each**
Combined trash and recycling: **$1,900-2,200 each**
Bicycle stand: **$150-250 each**

6 Parallel parking

Curb realignment: **$13-16 / LF**
Roadmarking: **$8-10 per parking space**
Asphalt: **$3-4 / ft²**

7 Floating bus stop

Curb realignment: **$13-16 / LF**
Concrete pavement: **$15-25 / ft²**
Signpost: **$190-220 each**
Shelter: **$23,000-26,500 each**
Bench: **$600-750 each**
Bin: **$650-800 each**

8 Street tree

Geotextiles: **$2.50-4.00 / ft²**
Soil: **$5 / ft³**
Irrigation: **$1.00-2.50 / ft²**
Root protection: **$3,000 each**
Tree: **20 foot height $1,300-$1,600 each**

9 Widen sidewalk

New concrete curb: **$25-20 / LF**
Curb realignment: **$13-16 / LF**
Concrete pavement: **$15-25 / ft²**
Block paving: **$5-10/ ft²**

10 Curb ramp

Drop curb: **$20-25 / LF**
Concrete pavement: **$15-25 / ft²**
Detectable warning strip: **$40-45 / ft²**

11 Traffic signals

New signals: **$425,000-500,000 each pole**
Add pedestrian signalization: **$950**
Add bicycle signalization: **$2,100**
Reconfigure signal timings: **$30,000+**

12 Crosswalk marking at intersections

Standard: **$4-6 / LF**
Striped: **$10-15 / LF**
High visibility: **$25-40 / LF**

13 Raised table

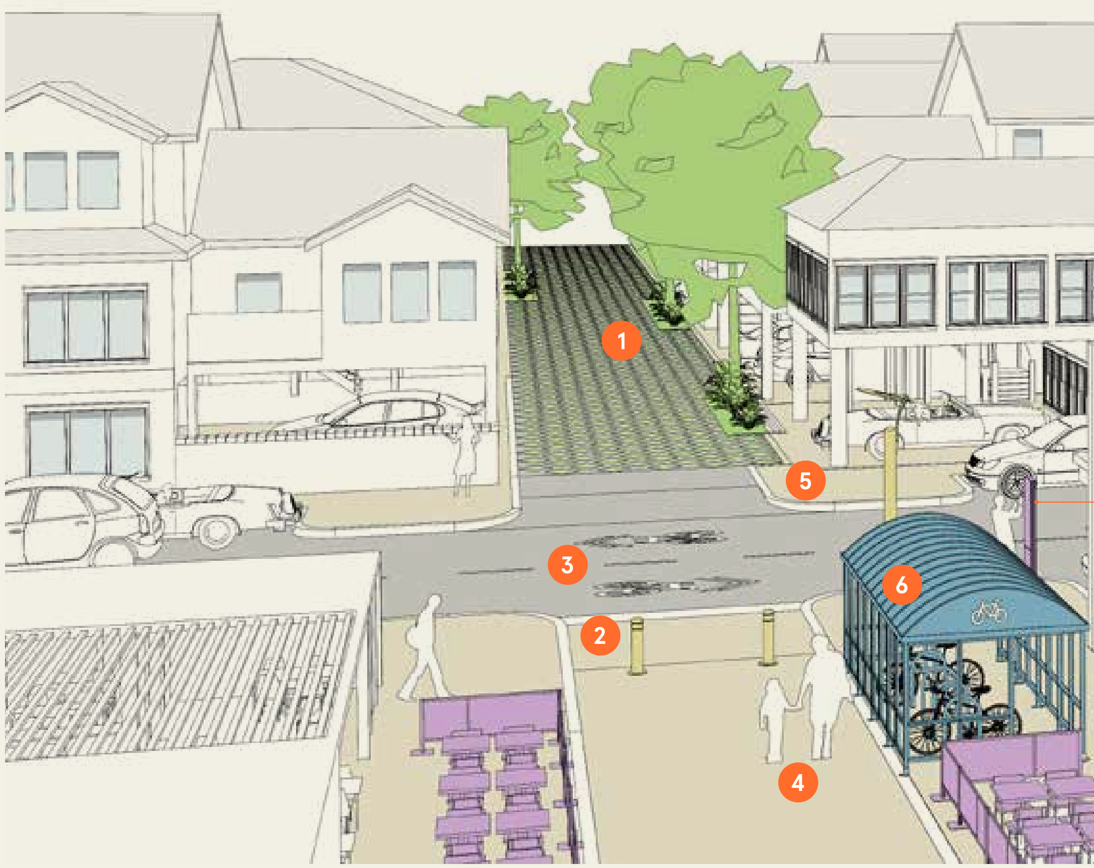
Raised table: **$3,800-4,500 / ft²**
Roadmarking: **$3-4 / LF**
Concrete pavement: **$15-20 / ft²**
Asphalt: **$3-4 / ft²**

AL

Alley

Within the majority of residential, commercial and industrial areas alleys fulfill a very functional role and expenditure on improvements is likely to be limited. The use of permeable paving could be considered in new developments but are unlikely to be retrofitted into existing alleys due to cost. Investments in maintaining a clutter-free and good quality pavement surface will be a priority, with the use of lower cost functional materials with minimal street furniture likely.

In neighborhood and downtown centers alleys could be transformed into places for people to enjoy, especially where adjacent land uses facilitate the active use of the outdoor space for cafes and dining. In such situations investment in high quality paving materials, street furniture, lighting and planting may be appropriate. Allowance must also be made for increased maintenance of these areas.



1 Permeable paving:

$8-15 / ft²

2 Bollards

Bollards:
$500+ each

Bollards removable:
$600-650 each

3 Bikeway

Shared lane marking:
$4-6 / LF

Signage:
$145-160 each

4 Shared street:

Raised road surface:
$14.40-17.05 / ft²

Concrete pavement:
$15-25 / ft²

5 Bulb-out

$9,500-11,000 each

6 Covered cycle storage

Shed:
$10,000+ each

Cycle locker:
$950-1,100 each

Cycle stand:
$150-250 each

7 Wayfinding totem:

$3,500-5,000 each

8 Feature pedestrian lighting

$1,400-1,650 each

RS

Residential Street

Within residential areas investment in Complete Street strategies to reduce vehicle speeds, create safe route to schools and to create livable outdoor spaces are likely priorities. Improving the quality and quality of sidewalks and crossings will improve accessibility within a community and access to local destinations and transit. Opportunities may also exist on wide residential streets to implement road diets and reallocate roadway space to bulb outs, pinch points and areas of sustainable planting. The high levels of on street parking in certain communities may necessitate the introduction of parking management to ensure safe access for pedestrians and bicyclists is maintained. Facilities for bicyclists will generally be focused on the provision of sharrows along quieter residential streets with bicycle lanes reserved for key routes along busier residential streets.

1 Traffic calming

Speed hump:
$1,900-2,200 each

Traffic circle:
$4,500-6,000 each

2 Planted buffer strip

New concrete curb:
$25-40 / LF

Soil:
$3-4 / ft^3

Planting:
$20-25 / ft^2

Street tree:
20 foot height $1,300-1,600 each

3 Bikeway

Shared lane marking:
$4-6 / LF

Signage:
$145-160 each

4 Bench

$600-750 each

5 Bulb-out

$9,500-11,000 each

6 Crosswalk marking at intersections

Standard:
$4-6 / LF

Striped:
$10-15 / LF

High visibility:
$25-40 / LF

7 Curb ramp

Drop curb:
$20-25 / LF

Concrete pavement:
$15-25 / ft^2

Detectable warning strip:
$40-45 / ft^2

8 Feature pedestrian lighting

$1,400-1,650 each

SS

Shared Street

Shared streets currently exist in a limited number of locations across Orange County where traditional street design has been revised to create places where the distinction between auto and pedestrian space is less. Pedestrian numbers are typically high and vehicle speeds very low, enabling people and cars to 'share' the street.

The implementation of shared streets typically requires higher levels of investment as existing curb lines will need to be removed, drainage adjusted and underground services potentially relocated and or protected. The use of more distinctive, and high quality, paving materials and street furniture is a feature of such streets, especially as they are often used to make drivers aware that they are entering a 'special' place that they share with pedestrians and bicyclists.

1 Special surfacing

Block paving:
$5-10 / ft^2

Colored concrete:
$18-25 / ft^2

Resin bound gravel:
$7-10 / ft^2

2 Special features

Kiosk:
$10,000+ each

Public art:
$5,000+ per item

3 Raised intersection

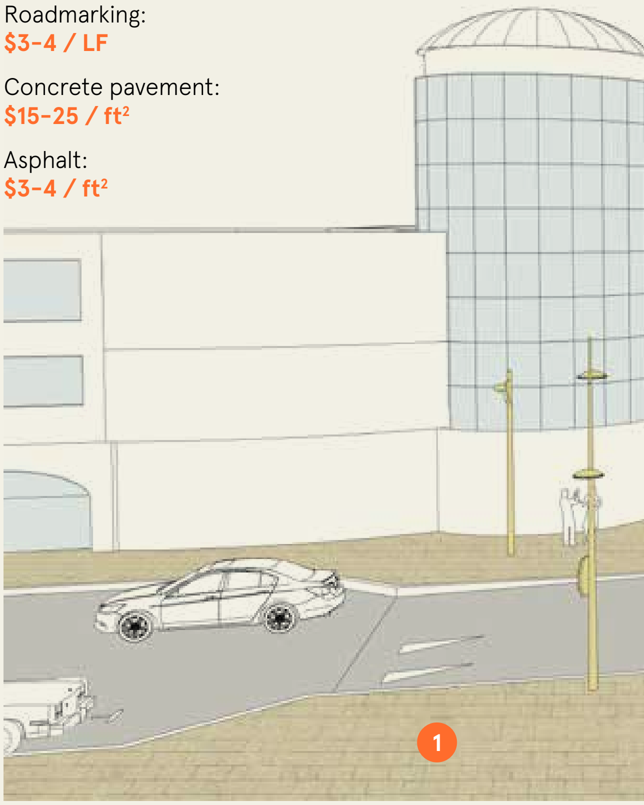
Raised intersection:
$11,800-13,750 each

Block paving:
$5-10/ ft^2

Roadmarking:
$3-4 / LF

Concrete pavement:
$15-25 / ft^2

Asphalt:
$3-4 / ft^2



4 Wayfinding totem:

$3,500-5,000 each

5 Raised treepit

Raised planter:
$1,000+ each

Soil:
$2-4 / ft³

Tree:
13 foot height $950-1,100 each

Built-in bench:
$750-850 each

6 Open Street event/market

Traffic management:
$5,000+

7 Feature pedestrian lighting

$1,400-1,650 each

8 Bulb-out and ramp

Bulb-out:
$9,500-11,000 each

Concrete pavement:
$15-25 / ft²

Asphalt:
$3-4 / ft²

9 Warning sign on post

$285-350 each

10 Parallel parking

Curb realignment:
$13-16 / LF

Road marking:
$8-10 per parking space

Asphalt:
$3-4 / ft²

Typical costings

This table presents some of the more commonly implemented Complete Street improvements and the typical order of costs associated with each. These costs are to be used as a guide only. Each Complete Street project will need to be costed individually to take account of local conditions and constraints.

Complete Street Improvement	Cost ($USD)	
Curb Ramp		
Concrete pavement	**15-25**	ft^2
Detectable warning strip	**40-45**	ft^2
Drop Curb	**20-25**	LF
Bicycle		
Painted buffer strip 3ft wide	**26-31**	LF
Raised buffer strip 1ft wide	**3-8**	LF
Bicycle dotted line marking extension	**2.50-4**	LF
Bicycle lane colored surfacing	**4-7**	LF
Painted roadmarking line	**3-4**	LF
Bicycle storage shed	**10,000+**	each
Bicycle stand	**150-250**	each
Bicycle two stage turn queue box	**2,600-2,900**	each
Bicycle locker	**950-1,100**	each
Bus Stop		
Bench	**600-700**	each
Bin	**650-800**	each
Shelter	**23,000-26,500**	each
Signpost	**190-220**	each
Lighting		
Feature pedestrian light	**1,450-1,650**	each
New feature streetlights (Neighborhood Main Street)	**16,000**	each
New streetlights (Industrial Business Park)	**450,000**	each
New streetlight	**4,750-6,000**	each
Retrofit streetlights to include pedestrian scale	**300-400**	each
Line Marking		
Bicycle buffer strip 3ft wide	**26-31**	LF
Crosswalk marking high visibility	**25-40**	LF
Crosswalk marking standard	**4-6**	ft^2
Crosswalk marking striped	**10-15**	LF
Line marking	**3-4**	LF
Line marking at intersection	**3-4**	LF
Parallel parking space	**8-10**	each space
Angled parking space	**8-10**	each space
Bicycle shared lane marking	**4-6**	LF
Shared lane Signage	**145-160**	each

Complete Street Improvement	Cost ($USD)	
Planting		
Freeway landscaped area	**100 -120**	ft^2
Geotextiles	**2.50-4**	ft^2
Irrigation	**1-2.50**	ft^2
Planting	**20-25**	ft^2
Raised planter	**1,000+**	each
Root protection	**2,500-3,000**	each
Soil	**3-5**	ft^3
Tree 13 ft height	**950-1,100**	each
Tree 20 ft height	**1,300-1,600**	each
Placemaking		
Public art	**5,000+**	each
Open Street / other event traffic management	**5,000+**	each
Kiosk	**10,000+**	each
Parklet Construction	**55,000-70,000**	each
Wayfinding totem	**3,500-5,000**	each
Roadway Conversion		
Bridge widening	**170-190**	ft^2
Pedestrian and bicycle overbridge	**1,100-1,400**	LF
Intersection realignment	**3,000,000+**	each
Lane conversion: 11 ft width	**2.6-2.9M**	mile
Lane realignment	**1,000,000+**	mile
HOV Lane	**2.6-2.8M**	mile
LRT	**48-55M**	mile
Crossing island	**4,500+**	each
Raised crosswalk	**3,800-4,500**	each
Raised table	**3,800-4,500**	each
Raised intersection	**11,800-13,750**	each
Speed hump	**1,900-2,200**	each
Traffic circle	**4,500-6,000**	each
Signage		
Electronic Variable Message Sign	**50,000-150,000**	each
Transit lane signposts	**280-350**	each
Mid-block crossing lights/beacons	**3,500+**	each
Mid-block crossing signage	**150+**	each
Wayfinding fingerpost	**1,600-1,850**	each
Wayfinding totem	**3,500-5,000**	each

Complete Street Improvement	Cost ($USD)	
Surfacing		
New concrete curb	**25-35**	LF
New curb	**40-55**	LF
Drop curb	**20-25**	LF
Curb realignment	**13-16**	LF
Asphalt	**3-4**	ft^2
Block paving	**5-10**	ft^2
Concrete pavement	**15-25**	ft^2
Colored concrete	**18-25**	ft^2
Resin bound gravel	**7-10**	ft^2
Permeable paving	**8-15**	ft^2
Mill and re-surface roadway	**200,000+**	mile
Street Furniture		
Bench	**600-750**	each
Bicycle Stand	**150-200**	each
Bollards	**500+**	each
Bollards removable	**600-650**	each
Trash can	**600-850**	each
Combined trash and recycling	**1,900-2,200**	each
Concrete jersey barriers	**650-800**	each
Kiosk	**10,000+**	each
Soundwall	**2.3-2.6M**	mile
Traffic Signals		
Add bicycle signalization	**2,100-2,400**	each
Add pedestrian signalization	**950-1,100**	each
New signals	**425,000-500,000**	each pole
Reconfigure signal timings	**30,000+**	each
Trails		
Equestrian trail	**15-25+**	LF
Trail light	**1,450-1,650**	each
Recreational trail	**2.50-4**	LF
Shared path	**220-250**	LF
Wayfinding fingerpost	**1,600-1,850**	each

Case studies

Movement Corridor

Orange, California
The two-mile Coyote Creek Class I Bikeway is a $1.5 million project that is an extension of the existing bikeway to the north and one of the missing links in the 66-mile OC Loop. This fully-paved, signed, and striped bikeway runs between Malvern Avenue/La Mirada Boulevard and Hillsborough Drive and includes ADA accessibility, direct access to Behringer Athletic Facility, and sustainable water quality features such as a vegetated swale.

Anaheim, California
The ARTIC to West Anaheim 4th District Bikeway Connector Project is 3.77 miles of Class II bicycle lanes and 4.19 miles of Class III sharrows along a continuous corridor totalling 7.96 miles. This runs from Ball Road and Magnolia Avenue along to the ARTIC regional transportation hub and the Santa Ana River Trail and is estimated to cost $400,000.

Mixed Land Use Corridor/Hub

San Diego, California
Coming in at just $4,500, a project at the 50th and University Avenue intersection enhanced safety and calmed traffic through the application of paint and the installation of a few bollards.

Newport Beach, California
On-Street bicycle lanes on the Eastbluff Drive/Ford Road project will widen the south side of Eastbluff Drive at Jamboree Road and modify the roadway striping to install an on-street bicycle lane on Eastbluff Drive and Ford Road from Vista Del Oro to MacArthur Boulevard. Estimated Project Cost: $308,000.

Huntington Beach, California
This project is converting Utica Avenue from Beach Boulevard to Main Street into a bicycle boulevard. Several street features are proposed to be incorporated to achieve the goal of reducing motor vehicle traffic speeds to be more consistent with sharing the lane with cyclists and to better accommodate pedestrians. The enhancements consist of: street bicycle access only through Utica Avenue just west of Lake Street where it is currently closed to vehicular traffic, bicycle related signage and striping, traffic signal installation at Lake Street and Utica Avenue, traffic signal modification at Main Street and Utica Avenue, curb extensions at the intersection corners of Utica Avenue and Delaware Street, ADA compliant curb ramps, and sidewalk improvements along Utica Avenue. The total project cost is estimated to be $1,162,260.

Santa Ana, California
The construction of a new traffic signal at the intersection of Raitt Street and Adams Street is estimated to cost $376,325. The installation of a Class II bikeway on First Street and on Newhope Street scheduled to cost $151,800 and $113,300, respectively. This collection of improvements will help to create better streets throughout Santa Ana and as a whole cost the city around $641,500.

Santa Ana, California
The Chestnut Avenue Class II Bikeway from Standard Avenue to Grand Avenue is estimated to cost $430,000.

Santa Ana, California
The installation of Class II bicycle lanes on Newhope Street from First Street to McFadden Avenue, Civic Center Drive from Bristol Street to Broadway, and Grand Avenue from Twenty-first Street to Fairhaven Avenue is projected to cost $214,000,000. The proposed bicycle lanes are consistent with the City's Bicycle Master Plan and will extend and connect to existing and planned bicycle paths.

San Diego, California
The addition of a midblock crossing cost only $20,000 but it provided residents in a lower-income neighborhood safe access to their only park. The City added a mid-block street crossing with a wide, high-visibility crosswalk and a pedestrian refuge island. The bright, white painted stripes help change the image of the street and draw attention to pedestrians that may be crossing. The project made a huge difference calming traffic for two blocks, giving a whole neighborhood better access to its park.

Other improvements that supplement Complete Street efforts over a number of street types include:

San Jan Capistrano, California
Gap closures at six locations throughout the City to provide a continuous bikeway, costing an estimated $550,000.

Costa Mesa, California
The 19th Street Bicycle Trail will run along West 19th Street beginning at Placentia Avenue and run through Talbert Regional Park before connecting to the bicycle path that runs along the Santa Ana River. The path includes segments of multipurpose trail, Class I bicycle trail, and Class II bicycle lanes. It is estimated to cost around $1.7 million.

Redding, California
On a recent reconstruction project, the city invested in low-cost treatments to improve pedestrian safety and comfort: six curb extensions and two refuge islands. The total cost of these elements was $40,000, and represented just 13 percent of the overall project budget.

Santa Monica, California
To improve safe pedestrian and bicycle access to forthcoming light rail stations, the City of Santa Monica was funded $650,000 from the U.S. Department of Housing and Urban Development through its competitive Sustainable Communities Challenge grants program.

B5

Resources

Needs and aspirations of Orange County

The OCCSI aims to meet the specific needs and aspirations of Orange County communities. It has been informed by a significant amount of background work, which is summarized in the OCCSI Comprehensive Needs Assessment Survey report (September 2015).

Document review

A comprehensive review of documents was undertaken including documents from State agencies (Caltrans and California Coastal Commission), County agencies (OCTA) and jurisdictions (the County of Orange and 34 cities of Orange County).

Analysis of the General Plans of all Orange County jurisdictions showed that eight of the jurisdictions had already updated their General Plan in accord with the Act and referenced Complete Streets, and a further seven are in the process of updating their General Plan. This means that more than half of the 35 jurisdictions of Orange County could use the OCCSI guidance to help develop Complete Streets policies.

Only Laguna Beach has a stand-alone Complete Streets plan; the Enhanced Mobility and Complete Streets Transition Plan (2015); however, Aliso Viejo is also considering the development of a Complete Streets Master Plan for their jurisdiction.

A number of jurisdictions have comprehensive plans for specific areas, and/or other documents such as bicycle masterplan, which are not titled Complete Streets but integrate a Complete Streets approach with design guidelines and principles.

A benchmarking exercise of the existing Complete Streets policies against best practice principles developed by the National Complete Streets Coalition showed that policies in Orange County jurisdictions were good at:

- Including a vision statement about why Complete Streets are important.
- Referring to all road users.
- Referencing, in various ways, the need for comprehensive and integrated networks to improve connectivity.

However areas where policies needed improvement were:

- Making reference to all types of projects subject to the policy, from design, planning, construction, maintenance and operations of new and existing streets.
- Providing detail on the role of other transportation agencies in the application of the policy.
- Setting out specific next steps to implement the policy.
- Including performance standards with measurable outcomes.

Public Outreach

Three public workshops were held between June 16 and 17, 2015 and were hosted by agencies in different regions of Orange County: north, south, and central communities. The workshops were to introduce communities and local stakeholders to the OCCSI project and encourage them to share their views which would inform future street designs in Orange County. In order to accommodate community members who could not attend the workshop, a set of webpages for the project were created on the OCCOG website to provide information and enable comments.

Participants identified 17 locations, including specific streets and intersections that they believe are examples or have elements of Complete Streets designs, or are locations that are problematic and should be redesigned.

Key messages from the outreach were that:

- A Complete Street in an Orange County community should address the needs of, in ranked order: pedestrians, bicycles, and bus/rail users.
- When asked to `like' or `dislike' street design elements, those that were most positively received were for bicycle, transit, and pedestrian treatments.
- No street design elements were wholly disliked, but central median planting received the most `dislikes'. Some negative responses were also received in relation to parking bay and curb extension treatments, and road diets.

Needs Assessment Survey

A Needs Assessment Survey was undertaken with the 35 jurisdictions in order to supplement the document review with first-hand information and comments. Each of the 35 jurisdictions responded, thereby achieving a response rate of 100%. This showed that:

Support for implementing Complete Streets in OC
There is interest and willingness to implement Complete Streets in Orange County; jurisdictions said that they were interested (59% of respondents) or somewhat interested (41%).

Familiarity with Complete Streets
There is a high level of familiarity with Complete Streets, with only 6% of respondents unsure about what the term means. Jurisdictions and inclusion of Complete Streets principles

Complete Streets concepts and principles are already being applied in Orange County, almost half of jurisdictions said they are a typical part of their project development. Four cities (Anaheim, Irvine, Mission Viejo, and Rancho Santa Margarita) indicated that more than ten roads have already been improved using a Complete Streets approach.

Jurisdictions yet to adopt specific Complete Streets policy
Despite the application of a Complete Streets approach to projects, 75% of respondents had yet to adopt a specific Complete Streets policy. The primary reason for a lack of a policy was the need to incorporate this in the comprehensive update of the jurisdiction's General Plan. Many jurisdictions indicated that this will be complete within the next 12 months.

Top benefits of Complete Streets
The main benefit of Complete Streets identified by most jurisdictions was improved mobility for children, young people, and older adults. Three further benefits identified were encouraging active modes of transportation, improving road safety, and improving access and mobility for people with disabilities.

Barriers to implementing Complete Streets in OC
The primary barrier to identifying Complete Streets in Orange County is seen as limitations in public funding, with 93% of jurisdictions citing this as a barrier. Other key barriers selected included a lack of staff, a lack of private investment, and a lack of information or technical expertise.

Organizations

National

The American Planning Association (APA)
APA is an independent, not-for-profit educational organization that provides leadership in the development of vital communities by advocating excellence in community planning, promoting education and citizen empowerment, and providing the tools and support necessary to meet the challenges of growth and change.

http://bit.ly/1WI4pVU

American Association of State Highway and Transportation Officials (AASHTO)
AASHTO is a nonprofit represents all five transportation modes: air, highways, public transportation, rail, and water. Its primary goal is to foster the development, operation, and maintenance of an integrated national transportation system.

As the voice of transportation, AASHTO works to educate the public and key decision makers about the critical role that transportation plays in securing a good quality of life and sound economy for our nation. AASHTO serves as a liaison between state departments of transportation and the Federal government. AASHTO is an international leader in setting technical standards for all phases of highway system development. Standards are issued for design, construction of highways and bridges, materials, and many other technical areas.

http://bit.ly/1Uysgaq

American Public Transportation Association (APTA)
APTA Is a non-profit association dedicated to supporting a multi-modal lifestyle that allows mobility to all Americans. The organization serves as an advocate for the advancement of public transportation programs and intitiatives in the United States.

http://bit.ly/1HGBCuJ

Federal Highway Administration (FHWA)
FHWA is an agency within the US Department of Transportation that supports State and local governments in the design, construction and maintenance of the nation's highway system and various federal owned lands.

Several initiatives include:
- The Bicycle & Pedestrian Program
- The Pedestrian and Bicycle Information Center

http://1.usa.gov/1W79zf8

Institute of Traffic Engineers (ITE)
The ITE is an international educational and scientific association of transportation professionals who are responsible for meeting mobility and safety needs. ITE facilitates the application of technology and scientific principles to research, planning, functional design, implementation, operation, policy development and management for any mode of ground transportation.

http://bit.ly/21wd7HI

National Association of City Transportation Officials (NACTO)

NACTO is a non-profit association that represents large cities on transportation issues of local, regional and national significance. NACTO is committed to raising the state of the practice for street design and transportation by building a common vision, sharing data, peer-to-peer exchange in workshops and conferences, and regular communication among member cities.

http://bit.ly/1x6JK05

National Complete Streets Coalition

Promotes the development and implementation of policies and professional practices that ensure streets are safe for people of all ages and abilities, balance the needs of different modes, and support local land uses, economies, cultures, and natural environments.

http://bit.ly/1qj3SZc

The Surface Transportation Policy Project

The Surface Transportation Policy Project is a diverse, nationwide coalition working to ensure safer communities and smarter transportation choices that enhance the economy, improve public health, promote social equity, and protect the environment. In addition, STPP manages two on-going initiatives: the OneRail Coalition and the National Park Service (NPS) Transportation Project.

http://bit.ly/1WI5FZh

The Pedestrian and Bicycle Information Center (PBIC)

PBIC is a national clearinghouse for information about health and safety, engineering, advocacy, education, enforcement, access, and mobility for pedestrians (including transit users) and bicyclists. The PBIC serves anyone interested in pedestrian and bicycle issues, including planners, engineers, private citizens, advocates, educators, police enforcement, and the health community.

http://bit.ly/24xtbuv

State

State of California Department of Transportation (Caltrans)

Caltrans is responsible for providing a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability. Caltrans manages more than 50,000 miles of California's highway and freeway lanes, provides inter-city rail services, permits more than 400 public-use airports and special-use hospital heliports, and works with local agencies.

http://bit.ly/1BnKcrb

California Coastal Commission

The Commission is an independent, quasi-judicial state agency. In partnership with coastal cities and counties the Coastal Commission plans and regulates the use of land and water in the coastal zone. Development activities, which are broadly defined by the Coastal Act to include (among others) construction of buildings, divisions of land, and activities that change the intensity of use of land or public access to coastal waters, generally require a coastal permit from either the Coastal Commission or the local government.

http://bit.ly/1T12PiA

Regional

Southern California Association of Governments (SCAG)
SCAG is a designated Metropolitan Planning Organization (MPO) that voluntarily convenes as a forum to address regional issues. SCAG is the nation's largest MPO, representing six counties, 191 cities and more than 18 million residents. SCAG undertakes a variety of planning and policy initiatives to encourage a more sustainable Southern California now and in the future. The agency develops long-range regional transportation plans including sustainable communities strategy and growth forecast components, regional transportation improvement programs, regional housing needs allocations and a portion of the South Coast Air Quality management plans.

http://bit.ly/1NjLmQh

County

Orange County Transport Authority (OCTA)
OCTA is responsible for the managements of transit and transport developments in Orange County. Key OCTA programs and initiatives that have been referenced throughout this document include:

- Congestion Management Program
- OCTA Strategic Plan
- Measure M
- OC Loop
- OC Streetcar
- OC Bus 360

http://bit.ly/1VU9eeI

Orange County Council of Governments (OCCOG)
OCCOG is a voluntary agency established to serve as Orange County's sub-regional planning organization. In partnership with the Southern California Association of Governments (SCAG), OCCOG leads the development of Orange County's required planning documents so the county can compete for state and federal funding. OCCOG represent Orange County on mandated and nonmandated regional planning activities, to provide a vehicle for Members to engage cooperatively on such activities, and to conduct studies and projects designed to improve and coordinate common governmental responsibilities and services on an area-wide and regional basis.

http://bit.ly/26SN7Kw

References

	LEGISLATION	STANDARDS	POLICY AND PLANS
NATIONAL	HR 2071 - Safe Streets Act 2015 S.933 - Americans with Disabilities Act 1990 HR 2 - Surface Mining Control and Reclamation Act	FHWA - Manual for Uniform Traffic Control Devices (MUTCD) 2009 US Depeartment of Justice - ADA Standards for Accessible Design. 2010.	N/A
STATE	AB 32 - Global Warming Solutions Act 2006 AB 976 - California Coastal Act 2013 AB 939 California Integrated Waste Management Act 1989 AB 1358 California Complete Streets Act 2008 SB 375 - Sustainable Communities and Climate Protection Act 2008 SB 743 Environmental quality: transit oriented infill projects, judicial review streamlining for environmental leadership development projects, and entertainment and sports center in the City of Sacramento. 2014	California Department of Motor Vehicles – 2015 Vehicle Code California Building Standards Commision. California Fire Code. 2013. Caltrans – California Manual on Uniform Traffic Control Devices (CA MUTCD) 2014 Caltrans – Design Information Bulletin (DIB 82-05) Pedestrian Accessiblity Guidelines for Highways Projects. 2013 Caltrans - Highway Design Manual. 2014 State of California - Public Utilities Code State of California - California Streets and Highways Code	Caltrans - Complete Streets Implementation Action Plan 2.0 2014-2017 Caltrans - Corridor System Management Plan (CSMP) Caltrans Memorandum: Design Flexibility in Multimodal Design, 2014 Deputy Directive 64-R2: Complete Streets - Integrating the Transportation System, 2014
REGIONAL	N/A	N/A	Regional Transportation Plan/ Sustainable Communities Strategy (RTP/SCS) 2016
COUNTY			OCCOG and OCTA - Orange County Sustainable Communities Strategy (OC SCS), 2011 OCTA - Regional Bikeways Planning, 2011 OCTA - Commuter Bikeways Strategic Plan, 2009 OCTA - Strategic Plan, 2014 – 2019 OCTA - Long Range Transportation Plan, 2014
LOCAL	N/A	N/A	Laguna Beach Enhanced Mobility and Complete Streets, 2015 Santa Ana Downtown/Transit Zone Complete Streets Plan, 2014 Bicycle Master Plans (Anaheim, Costa Mesa, Dana Point, Fullerton, Garden Grove – In Development, Huntington Beach, Irvine, La Habra – In Development, Newport Beach, Orange, San Clemente, Santa Ana, Westminster – In Development)
OTHER	Air Quality Endangered Species Laws Water Quality Wetlands Protection	N/A	OCCOG and OCTA - Orange County Sustainable Communities Strategy (OC SCS), 2011 OCTA - Regional Bikeways Planning, 2011 OCTA - Commuter Bikeways Strategic Plan, 2009 OCTA - Strategic Plan, 2014 – 2019 OCTA - Long Range Transportation Plan, 2014

	PROGRAMS	INITIATIVES	DESIGN GUIDANCE
NATIONAL	Partnerships to Improve Community Health (PICH) formally Healthy Communities Program (HCP) Safe Routes to School The Bicycle and Pedestrian Program	Green Streets Open Streets Play Streets Smart Growth America Towards Zero Deaths (FHWA) Transit-oriented Communities Vision Zero	AASHTO - A Policy on Design Standards – Interstate System, 5th Edition, 2005 AASHTO - A Policy on Geometric Design of Highways and Streets, 6th Edition, 2011 AASHTO - Guide for the Development of Bicycle Facilities, 4th Edition, 2012 AASHTO - Guide for Geometric Design of Transit Facilities on Highways and Streets, 1st Edition, 2014 AASHTO - Guide for the Planning, Design, and Operation of Pedestrian Facilities, 2004 AASHTO - Roadside Design Guide, 2011 APA - U.S. Traffic Calming Manual, 2009 FHWA- Equestrian Design Guidebook for Trails, Trailheads, and Campgrounds FHWA - Roundabouts Informational Guide, 2000 FHWA - Signalized Intersections: An Informational Guide, 2013 ITE – Designing Walkable Urban Thoroughfares: A Context Sensitive Approach, 2010 ITE – Recommended Practices on Accommodating Pedestrians and Bicyclists at Interchanges, 2014 LIDC - Green Streets Municipal Handbook, 2008 NACTO – Urban Bikeway Design Guide. 2014 NACTO – Urban Street Design Guide. 2013
STATE	Caltrans - Active Transportation Planning Program (ATP), 2013 Caltrans - Safe Routes to School CCC - Local Coastal Program	N/A	Caltrans - Bus Rapid Transit: A Handbook for Partners, 2007 Caltrans - Complete Intersections: A Guide to Reconstructing Intersections and Interchanges for Bicyclists and Pedestrians 2010 Caltrans – Main Street California, 2013 Caltrans – Smart Mobility Framework, 2010
REGIONAL	N/A	N/A	N/A
COUNTY	OCTA - Congestion Management Program (CMP) 1992	N/A	OCTA - Master plan of Arterial Highways (MPAH) 1956
LOCAL	N/A	N/A	N/A
OTHER	N/A	N/A	CROW - Design Manual for Bicycle Traffic, 2007 (Dutch publication) WRCOG - 4-City Neighborhood Electric Vehicle Transportation Plan, 2010

Legislation

National

HR 2071 – Safe Streets Act 2015: This bill, currently being reviewed in the House of Representatives, calls upon all states and Metropolitan Planning Organizations to adopt Safe Streets policies for federally funded projects within two years. Such policies would apply to new construction and roadway improvement projects. The Act will help ensure that effective practice and proven safety measures become federal guidelines.

http://1.usa.gov/1HaXRDE

S.933 – Americans with Disabilities Act 1990: This bill prohibits discrimination against people with disabilities in employment, transportation, public accommodation, communications, and governmental activities. In compliance with the act the ADA Standards for Accessible Design set minimum requirements for newly designed and constructed or altered State and local government facilities, public accommodations/ infrastructure, and commercial facilities to be readily accessible to and usable by individuals with disabilities.

http://1.usa.gov/1rTZ5Up

HR 2 – Surface Mining Control and Reclamation Act: SMCRA requires that local governments address mineral recovery activities at two levels: through direct regulation of mining operations (including reclamation) and through planning policies that harmonize the mineral resource needs of the state and region with the maintenance of local environmental quality.

http://1.usa.gov/1rU0WIZ

State

AB 32 – Global Warming Solutions Act 2006: AB 32 establishes a comprehensive program to reduce greenhouse gas emissions to combat climate change. The bill requires the California Air Resources Board (CARB) to develop regulations to reduce greenhouse gas emissions to 1990 levels by 2020.

http://bit.ly/1d7gp99

AB 976 – California Coastal Act 2013: Requires each community within the coastal zone to prepare a local coastal program (LCP), including a coastal land use plan. A LCP consists of a coastal land use plan, (i.e., portions of a city's or county's general plan), zoning ordinance, zoning district maps, and where required, other programs necessary to implement the Coastal Act. This was enacted to "protect, maintain, and, where feasible, enhance and restore the overall quality of the coastal zone environment and its natural and artificial resources."

http://bit.ly/1TtG2X1

AB 939 California Integrated Waste Management Act 1989: Requires each city or county to prepare a Countywide Integrated Waste Management Plan (CIWMP) promoting the policies of the Act and establishing local waste management policies to be adopted cooperatively by the county and its cities.

http://bit.ly/1hywi2b

AB 1358 California Complete Streets Act 2008: Requires the circulation element of General Plans to address the transportation system from a multi-modal perspective. Update is required upon any substantive revision to this element. The bill states that streets, roads, and highways must "meet the needs of all users in a manner suitable to the rural, suburban, or urban context of the general plan."

http://bit.ly/1X8pxFw

SB 375 – Sustainable Communities and Climate Protection Act 2008: provides incentives for cities and developers to bring housing and jobs closer together and to improve public transit. The goal behind SB 375 is to reduce automobile commuting trips and thus help meet the statewide targets for reducing greenhouse gas emissions set by AB 32.

http://bit.ly/1T1dwSm

SB 743 Environmental Quality: Transit oriented infill projects 2014: This imposes several amendments to the California Environmental Quality Act for projects located in areas served by transit. Fundamentally it changes the traditional transportation impact analysis conducted as part of the CEQA process. It eliminates measures such as auto delay, level of service (LOS) and other vehicle-based measures of capacity in many parts of California replacing them with other measurements such as vehicle miles traveled (VMT) to determine impacts.

The criteria listed below to determine the significance of transportation impacts are still under review and have yet to be officially updated. However, VMT and safety are the key metrics being proposed in the guidelines for determining CEQA impacts:

- Vehicle miles traveled and land use projects: generally considered the most appropriate measure of transportation impacts
- Induced travel and transportation projects: focuses on impacts that result from certain transportation projects. Specifically, research indicates that adding new traffic lanes in areas subject to congestion tends to lead to more people driving further distances
- Safety: Lead agencies should consider whether a project may cause substantially unsafe conditions for various roadway users. The potential safety concern must be one that affects many people, not just an individual
- Methodology: clarifies that analysis of a project's vehicle miles traveled is subject to the rule of reason. In other words, a lead agency would not be expected to trace every possible trip associated with a project down to the last mile. Also recognizes the role for both models and professional judgment in estimating vehicle miles traveled

http://bit.ly/23oZnxH

Other

A number of state and federal statutes and regulatory programs can have a direct bearing on a jurisdiction's general plan and need to be considered in any general plan process. These include:

Air Quality: Cities and counties have an opportunity to address air quality issues in their general plans, development and zoning ordinances, circulation systems, and other local programs. Especially important is the inclusion of strategies that are beneficial to air quality in the land use and circulation elements of the general plan.

Endangered Species Laws:
The requirements of the various endangered species laws affect general plans in two ways. First, the plan should include objectives, policies, principles, plan proposals, and standards to address the preservation and protection of any endangered, threatened, or candidate species.

Water Quality: Water quality is an issue that is required to be addressed in the conservation element. Water quality may also be addressed in an optional water element. Local general plans should incorporate water quality policies from regional plans to the extent that they are relevant.

Wetlands Protection: As a long-term plan for the physical development of the community, a general plan should reflect the value and importance of wetlands and their associated habitat. Policies should address the preservation and protection of wetlands through the conservation and open space elements or as a limitation on development in the land use element.

Standards

National

FHWA – Manual for Uniform Traffic Control Devices (MUTCD) 2009: The MUTCD is a compilation of national standards for all traffic control devices, including road markings, highway signs, and traffic signals. States must adopt the 2009 National MUTCD as their legal state standard for traffic control devices.

http://1.usa.gov/21wyzwj

US Deepartment of Justice - ADA Standards 2010: ADA standards set minimum requirements for newly designed and constructed or altered State and local government facilities, public accommodations/infrastructure, and commercial facilities to be readily accessible to and usable by individuals with disabilities.

http://1.usa.gov/18LcW5e

State

California Department of Motor Vehicles – 2015 Vehicle Code: This is a legislative document outlining the California State traffic laws published by the Department of Motor Vehicles. The vehicle code prescribes the legal responsibilities and behavior of users within the street environment.

http://bit.ly/1rUeSCF

California Building Standards Commission - Fire Code 2013: The California Fire Code regulates minimum fire safety requirements for new and existing buildings, facilities, storage, and processes. As a subsection of the California Building Standards Code, it addresses fire prevention, fire protection, life safety and safe storage, and use of hazardous materials in new and existing buildings, facilities, and processes. It also establishes requirements helpful in aiding the design of safe streets and roadways. A city or county may establish more restrictive standards that are reasonably necessary because of local climatic, geological, or topographical conditions.

http://bit.ly/1PkHfS6

State of California - Public Utilities Code: The Public Utilities Code is the highest law in the state and the legislature has unlimited authority to regulate public utilities under the Code. Its provisions override any conflicting provision of the State Constitution which deals with the subject of regulation of public utilities.

http://1.usa.gov/21wyzwj

Caltrans – California Manual on Uniform Traffic Control Devices (CA MUTCD) 2014: This statewide compulsory document is tiered from the FHWA MUTCD. It provides uniform standards and specifications for all official traffic control devices in California. The requirements of this document help to provide a safe, sustainable, integrated, and efficient transportation system that enhances California's economy and livability. The standards within the document are mandatory and no deviations from the criteria are allowed. This document ensures that all traffic control devices implemented within Orange County's Complete Streets will be uniform and guarantees better safety and mobility for all users.

http://bit.ly/1Oe7uX1

Caltrans – Design Information Bulletin (DIB 82-05) 2013: This DIB has been written to provide general design guidance on how to comply with the various Federal laws and State codes on pedestrian accessibility for public use. The accessibility requirements typically associated with projects constructed in public rights-of-way have been presented in this DIB as "accessibility design standards" only to facilitate Caltrans processes and procedures. It is not the intent of this DIB to discuss all of the various compulsory Federal laws and State codes that apply to making buildings and public facilities accessible.

http://bit.ly/1jgY4ks

Caltrans – Highway Design Manual: This advisory manual establishes uniform policies and procedures to carry out the state highway design functions of the California Department of Transportation. Many agencies tier local guidance from this manual. Deviations from the manual are allowed because these are standards and not requirements. Chapter 1000 is dedicated to Bicycle Transportation Design, which provides helpful information for the implementation of Complete Street infrastructure across Orange County. It provides material on design standards for Class I, II, & III bicycle facilities. Assembly Bill 1193 directs Caltrans to update the standards to incorporate Class IV facilities.

http://bit.ly/1SMp89T

Policy and Plans

State

Caltrans – Complete Streets Implementation Action Plan 2.0, 2014-2017: Describes the current California Complete Streets policy framework and provides an overview of Caltrans' continued Complete Streets efforts. This document lays out the structure for monitoring, reporting, and overcoming barriers to further integrate Complete Streets into all Caltrans functions and processes.

http://bit.ly/1NjPzn0

Caltrans – Corridor System Management Plan (CSMP): A CSMP is a comprehensive, integrated management plan that includes all travel modes in a defined corridor—highways and freeways, parallel and connecting roadways, public transit (bus, bus rapid transit, light rail, intercity rail) and bikeways, along with intelligent transportation technologies, which include ramp metering, coordinated traffic signals, changeable message signs for traveler information, incident management, bus/carpool lanes, and car/vanpool programs, and transit strategies. Each CSMP identifies current management strategies, existing travel conditions and mobility challenges, corridor performance management, planning management strategies, and capital improvements.

http://bit.ly/1Oe8tXp

Caltrans Memorandum: Design Flexibility in Multimodal Design, 2014: This memorandum states that, along the State Highway system, users of the transportation system should be in balance with other values and "a one-size-fits-all design philosophy is not Department policy." This policy also recognizes that local governments need leeway to design with flexibility especially when planning for Complete Streets.

http://bit.ly/21wDi0W

Deputy Directive 64-R2: Complete Streets – Integrating the Transportation System, 2014: Is an administrative update of the State's Complete Streets policy signed in October 2014. DD-64-R2 requires a Complete Streets Implementation Action Plan (CSIAP) be developed and implemented. The Action Plan describes the current California Department of Transportation (Caltrans) Complete Streets policy framework and to provide an overview of Caltrans' continued Complete Streets efforts.

http://bit.ly/24xJAiD

Regional

SCAG – Regional Transportation Plan Sustainable Communities Strategy (RTP/SCS), 2016: This document is required by state and federal law, and includes programs to better maintain, operate, and expand transportation. The plan guides the region's transportation investments for a 25-year period and is updated every 4-5 years. The primary goal of the RTP is increasing mobility for the region's residents and visitors. More recently, a greater emphasis has been placed on sustainability and integrated planning. The guidance is determined by projections of growth in population and jobs and the subsequent change in travel demand.

The vision for the latest plan encompasses three principles that collectively work as the key to the region's future mobility, economy, and sustainability. As alluded to in that vision is the Sustainable Communities Strategy (SCS), a newly required element of the Regional Transportation Plan (RTP). The SCS integrates land use and transportation strategies to achieve ARB emissions reduction targets. As such, Complete Streets assist in supporting the SCS as Complete Streets generally reduce VMT.

http://bit.ly/1NkxfW1

County

OCCOG and OCTA - Orange County Sustainable Communities Strategy (OC SCS), 2011: Central to the OC SCS are strategies identified to reduce GHG emissions. The document highlights efforts being undertaken by many Orange County jurisdictions, agencies, and groups to link transportation and land uses through a variety of processes and an array of progressive measures.

The OC SCS outlines these efforts as sustainability strategies, including both land use-related strategies and transportation system improvements. This document makes reference to complete streets and the amendments to MPAH.

http://bit.ly/1Oe9mis

OCTA - Regional Bikeways Planning, 2011: OCTA supports bicycle transportation as a viable commute alternative as bikeways and improved bicycle facilities will make a positive contribution to Orange County's goal of a balanced transportation system. A comprehensive and complete bicycle network will greatly benefit both Orange County residents and visitors. The regional bikeways plan is being completed district-by-district within the County.

http://bit.ly/1rUjqsJ

OCTA - Commuter Bikeways Strategic Plan, 2009: The intent of this document is to encourage the enhancement of Orange County's regional bikeways network, in order to make bicycle commuting a more viable and attractive travel option.

The plan identifies approximately 116 miles of priority bikeway projects to be delivered through plans and programs from across the County, however does not provide policy or design guidance.

http://bit.ly/26TffgL

OCTA - Strategic Plan, 2014 – 2019: The OCTA Strategic Plan takes a comprehensive, forward-looking approach to address Orange County's transportation needs during the next five years. The Strategic Plan sets forth the principles that guide OCTA's decisions and provides strategies to achieve our goals. The plan addresses both key external and internal driving forces that influence or have the potential to affect OCTA's vision, mission, values, goals, and objectives.

http://bit.ly/24qCz6M

OCTA - Long Range Transportation Plan (LRTP), 2014: This document identifies Moulton Parkway for Complete Streets improvements. It also notes that OCTA is facilitating a comprehensive, multimodal study of Pacific Coast Highway through the eight local agencies along the Orange County coast. This study will be context sensitive, will consider complete streets, and will lead to recommendations that support and encourage safe multimodal transportation along one of the heaviest traveled commuter and recreational routes in Orange County.

http://bit.ly/1rnGWNU

Local

Laguna Beach Enhanced Mobility and Complete Streets, 2015; Outlines a long-term vision for a city-wide transportation network that is pedestrian and bicycle friendly, reduces traffic congestion, and provides frequent and reliable transit service for residents and visitors. The plan specifically focuses on creating a balanced, multi-modal transportation network that meets the needs of all street users.

http://bit.ly/23p6F4P

Santa Ana Downtown/Transit Zone Complete Streets Plan, 2014: Intended to create a more walkable, bikeable, vibrant, and healthy environment in Santa Ana's Downtown. The plan will capitalize on existing investments, identify opportunities for new investments, and serve as an example to nearby cities with transit oriented development.

http://bit.ly/1W8X9nN

Bicycle Master Plans: Stand-alone bicycle plans are adopted to guide jurisdictions' bikeway planning, meet commuting needs, harmonize bikeway and recreational systems, and secure funding. Cities with bicycle-specific master plans are:

- Anaheim
- Costa Mesa
- Dana Point
- Fullerton
- Garden Grove – In Development
- Huntington Beach
- Irvine
- La Habra – In Development
- Newport Beach
- Orange
- San Clemente
- Santa Ana
- Westminster – In Development

Programs

National

Partnerships to Improve Community Health (PICH): PICH formerly Healthy Communities Program (HCP) – is a 3-year initiative that supports implementation of evidence-based strategies to improve the health of communities and reduce the prevalence of chronic disease. Promoting a multi-sectoral coalition to implement sustainable changes in communities where people live, learn, work, and play.These efforts address key factors that raise the risk of disease, including physical inactivity, which can be combated through the implementation of active transportation networks within Complete Streets.

http://1.usa.gov/1K1PFLc

The Bicycle and Pedestrian Program: (FHWA Office of Human Environment) promotes safe, comfortable, and convenient walking and bicycling for people of all ages and abilities. The program supports pedestrian and bicycle transportation through funding, policy guidance, program management, and resource development.

http://1.usa.gov/1QS8yzC

Safe Routes to School (SRTS): Empowers communities to make walking and bicycling to school a safe and routine activity. The National Center for Safe Routes to School is centralized resource of information on successful Safe Routes to School programs, strategies and State specific information.

In July 2012, Congress passed a new transportation bill: Moving Ahead for Progress in the 21st Century (MAP-21). With this bill, Safe Routes to School (SRTS) activities will be eligible to compete for funding alongside other programs, including the Transportation Enhancements program and Recreational Trails program, as part of a new program called Transportation Alternatives.

The SRTS program also runs at the State level. In California, Safe Routes to School funding has been integrated with the State's Bicycle Transportation Account (BTA) to form the Active Transportation Program (ATP) funding program.

http://bit.ly/1zMPrjt

State

Caltrans – Active Transportation Planning Program (ATP), 2013: The ATP consolidates existing federal and state transportation programs into a single program with a focus to make California a national leader in active transportation. The purpose of the program is to encourage increased use of active modes of transportation. This is done through the achievement of several goals such as increasing the proportion of trips accomplished by biking and walking, increasing safety and mobility for non-motorized users, and ensuring that disadvantaged communities fully share in the benefits of the program as well.

http://bit.ly/1zBtliB

Caltrans – Safe Routes to School: Safe Routes to School's goal is to increase the number of children who walk or bicycle to school by funding projects that remove the barriers that currently prevent them from doing so. These barriers include lack of infrastructure, unsafe infrastructure, and lack of programs that promote walking and bicycling through education/encouragement programs aimed at children, parents, and the community.

There are two separate Safe Routes to School Programs administered by Caltrans, one is a State-legislated program eligible to cities and counties, and the other is a Federal Program eligible to state, local, regional agencies, and Native American Tribes experienced in meeting federal transportation requirements. This is now part of the ATP program.

http://bit.ly/1Ba46cJ

Initiatives

County

OCTA – Congestion Management Program (CMP) 1992: Since the CMP became effective with the passage of Proposition 111 in 1990, it has forged new ground in linking transportation, land use, and air quality decisions together. CMP also contributes to federal Congestion Management Process requirements, which is a systematic and regionally-accepted approach for managing congestion.

http://bit.ly/1rnLi7H

CCC – Local Coastal Programs (LCPs): Are the means of implementation for policies under the Coastal Act. The programs basic planning tools used by local governments to guide development in the coastal zone, in partnership with the Coastal Commission. LCPs contain the ground rules for future development and protection of coastal resources. To ensure that coastal resources are effectively protected in light of changing circumstances, such as new information and changing development pressures and impacts, the Commission is required to review each certified LCP at least once every five years.
http://bit.ly/1NjRgkd

National

Green Streets: Green Streets intiative is led by the Low Impact Development Center and supports the integration of grey and green infrastructure into the street environment. The goal of green streets is to provide source control of stormwater, limit its transport and pollutant conveyance to the collection system, and provide environmentally enhanced roads.Many elements of street design, construction, and operation can work in favor of achieving both Complete Streets that work for all travelers and `green' streets that serve environmental sustainability. Reduction of water usage for irrigation is an important part of this in California, and should be pursued through use of drought tolerant species and changes to irrigation techniques.

http://bit.ly/1X8w9n3

Open Streets: Open Street initiatives temporarily close streets to automobile traffic, so that people may use them for walking, bicycling, dancing, playing, and socializing. The intiative is driven by The Open Streets Project an advocacy group led by The Street Plans Collaborative. The goal of the project is to share information about open streets and increase the number, size, and frequency of initiatives occurring across North America.

http://bit.ly/1VVtYDN

Play Streets: Play Streets are when a specific street (or streets) is temporarily closed to traffic and opened for the community, creating an area where kids can play and be active. The Play Streets initiative offers an impactful way to encourage more physical activity, particularly in neighborhoods that often lack open space. The convenience of the Play Streets concept is that it is flexible and allows each locality to mold it to its own needs and resources.
http://bit.ly/1SNVygE

Smart Growth America: This movement was launched by the National Complete Streets Coalition and promotes the development and implementation of policies and professional practices that ensure streets are safe for people of all ages and abilities, balance the needs of different modes, and support local land uses, economies, cultures, and natural environments.

http://bit.ly/1k1Dbr5

Towards Zero Deaths: FHWA is committed to the vision of eliminating fatalities and serious injuries on our Nation's roadways. The Toward Zero Deaths (TZD) vision is a way of clearly and succinctly describing how an organization, or an individual, is going to approach safety – even one death on our transportation system is unacceptable. TZD uses a data-driven, interdisciplinary approach that FHWA has been promoting for many years. The TZD approach targets areas for improvement and employs proven countermeasures, integrating application of education, enforcement, engineering, and emergency medical and trauma services (the "4Es"). A combination of strategies from different focus areas are necessary to achieve the TZD vision.

http://bit.ly/1ruI9Dk

Transit-Oriented Communities (TOC): TOC (also known as Transit-oriented Development) has gained momentum in recent decades as new construction is increasingly being located near transit and implemented in a walkable, mixed-use fashion. While more popular than ever, it still takes work to bring together business and political leaders to collaborate and move projects forward. Advocacy groups and planning institutions can promote successful projects to encourage the advancement of the next wave of new development. This results in the creation of more vibrant and livable communities that are successful both financially and from a quality of life perspective. The Transit Oriented Development Institute is a national planning initiative to promote and accelerate the roll-out of walkable, mixed-use communities around rail stations.

http://bit.ly/1X8ww16

Vision Zero: Vision Zero is an initiative that started in Sweden and is gaining momentum across the U.S. A significant number of jurisdictions have signed up to the principles and developed Vision Zero plans, including San Diego, Los Angeles and San Francisco, as well as other cities across the country. It is an innovative approach to thinking about road safety based on two principles: firstly that traffic deaths and severe injuries are preventable and unacceptable; and that a multidisciplinary approach is required to address these problems. It is based on the simple fact that roads need to keep us moving, but humans make mistakes, and therefore roads should be designed to protect all road users at all times. Vision Zero places the main burden for safety on system design instead of road users. Complete Streets directly relate to this approach by providing for all modes for all ages and all abilities.

http://bit.ly/1lBGJhL

A significant number of jurisdictions have signed up to the principles and developed Vision Zero plans, including San Diego, Los Angeles and San Francisco, as well as other cities across the country.

http://visionzero.lacity.org/

http://visionzerosf.org/

Design Guidance

National

APA – U.S. Traffic Calming Manual, 2009: A comprehensive how-to manual for traffic calming in the United States. Planners and engineers can look to this manual for guidance on the appropriate use, design, and signing and marking of traffic-calming measures. For local officials, developers, and community associations, it is an introduction to the goals and tactics of traffic calming. This book contains principles that have been modified by many local jurisdictions to match local priorities and preferences. Standardization is key to the success of traffic-calming initiatives, and this book explains the processes, tools, and design needed to create a standard traffic-calming program.

http://bit.ly/26Tor4B

AASHTO – A Policy on Design Standards – Interstate System, 5th Edition, 2005: Topics of this report include design traffic, right-of-way, geometric controls and criteria, cross section elements, interchanges, bridges, and other structures. It is meant to complement two other documents: A Policy on Geometric Design of Highways and Streets and Standard Specifications for Highway Bridges. This document relates to design of important Complete Street elements such as right-of-ways.

http://bit.ly/21wLYUV

AASHTO – A Policy on Geometric Design of Highways and Streets, 6th Edition, 2011: This document provides guidance to highway engineers and designers who strive to make design solutions that meet the needs of highway users while also maintaining the integrity of the environment. Design guidelines are included for freeways, arterials, collectors, and local roads, in both urban and rural locations, paralleling the functional classification used in highway planning.

http://bit.ly/1TQzJyY

AASHTO – Guide for the Development of Bicycle Facilities, 4th Edition, 2012: This guide provides information on how to accommodate bicycle travel and operations in most riding environments. It presents guidelines for transportation facilities that will help meet the needs of bicyclists and other highway users. Flexibility is key in encouraging designs that are sensitive to local context and incorporate the needs of bicyclists, pedestrians, and motorists. Certain sections do provide suggested minimum dimensions. These are recommended only where further deviation from desirable values could increase crash frequency or severity. The intent is to provide guidance to designers and planners by referencing a recommended range of design values and describing alternative design approaches. As Orange County develops bikeway designs, this document will provide clear instruction for safe and successful bike facility construction.

http://bit.ly/1WIx3WQ

AASHTO – Guide for Geometric Design of Transit Facilities on Highways and Streets, 1st Edition, 2014: Provides a comprehensive reference of the current practice in the geometric design of transit facilities on streets and highways, including local buses, express buses, and bus rapid transit operating in mixed traffic, bus lanes, and high-occupancy vehicle lanes, as well as bus-only roads within street and freeway environments. Also included in the document is discussion on streetcars and LRT infrastructure running in both mixed traffic and transit lanes, and within medians along arterial roadways. These guidelines are based on a review of relevant AASHTO, TRB, and ITE documents, as well as design reports provided by various transit agencies. The report is designed for use by public agencies, practitioners, and developers in need of basic information about planning, locating, sizing, designing, and implementing transit facilities along roadways. Orange County can use this document as they include transit facilities within their Complete Street designs.

http://bit.ly/1SYBiLE

AASHTO – Guide for the Planning, Design, and Operation of Pedestrian Facilities, 2004: The purpose of this guide is to provide direction on the planning, design, and operation of pedestrian facilities along streets and highways. It focuses on identifying effective measures for accommodating pedestrians on public rights-of-way, which vary among roadway and facility types. The primary audiences for this manual are planners, roadway designers, and transportation engineers, whether at the state or local level, the majority of whom make decisions on a daily basis that affect pedestrians. This guide also recognizes the profound effect that land use planning and site design have on pedestrian mobility and addresses these topics as well. Pedestrian inclusion is a large consideration when designing Complete Streets and this guide will aid Orange County in accommodating this important non-motorized mode of transportation.

http://bit.ly/1VJUuQE

AASHTO – Roadside Design Guide, 2011: Presents a synthesis of current information and operating practices related to roadside safety. The guide is intended to be used as a resource document from which individual highway agencies can develop standards and policies. It focuses on safety treatments that can minimize the likelihood of serious injuries when a motorist leaves the roadway. This guide was written for use by design engineers and professionals involved in roadside safety and is considered a significant tool that combines current research with practical experience.

http://bit.ly/1SYBryB

FHWA – Equestrian Design Guidebook for Trails, Trailheads, and Campgrounds: This guidebook provides guidelines for architects engineers and planners who are designing and developing recreation environments for equestrians. In particular the guidelines include planning a trail, desiging horse trails, designing horse trail elements and design of recreational sites associated with horse trails. The guidelines are set out as such so that each jurisdiction has the ability to adapt the information and design guidelines and apply them to local conditions.

http://1.usa.gov/1SvpvkD

FHWA – Roundabouts Informational Guide, 2000: This national guide provides a comprehensive source of information on modern roundabouts, from small mini-roundabouts to large freeway interchange roundabouts. The guide has been structured and written to address the needs of a wide range of readers, including the general public, policy-makers, transportation planners, operations and safety analysts, and conceptual and detailed designers. It provides general information and planning-level analysis techniques, includes evaluation procedures for assessing operational and safety performance, and also design guidelines. Input from transportation practitioners and researchers from around the world was used in developing the guide. This book covers the needs of all travel modes and provides design guidance for incorporating these needs into final plans, which will prove helpful when Orange County implements Complete Street infrastructure that includes roundabouts.

http://1.usa.gov/1NjTX5w

FHWA – Signalized Intersections: An Informational Guide, 2013: This document serves as an introduction to and guide for evaluating the safety, design, and operation of signalized intersections. It provides tools to deliver better balanced solutions for all transportation modes. The treatments in this guide range from low-cost measures such as improvements to signal timing and signing, to high-cost measures such as intersection reconstruction or grade separation. While some treatments apply only to higher volume intersections, much of this guide is applicable to signalized intersections of all volume levels.

http://1.usa.gov/24vHAHy

ITE – Designing Walkable Urban Thoroughfares: A Context Sensitive Approach, 2010: This report has been developed in response to widespread interest for improving both mobility choices and community character through a commitment to creating and enhancing walkable communities. Orange County can use the concepts and principles in this report to ensure that users, the community, and other key factors are considered in the planning and design processes when developing walkable urban thoroughfares. While the concepts and principles of context sensitive solutions (CSS) are applicable to all types of transportation facilities, this report focuses on applying the concepts and principles in the planning and design of urban thoroughfares—facilities commonly designated by the conventional functional classifications of arterials and collectors. The principles of CSS promote a collaborative, multidisciplinary process that involves stakeholders in planning and designing transportation facilities that are inclusive for all.

http://bit.ly/1TKI9rZ

ITE – Recommended Practices on Accommodating Pedestrians and Bicyclists at Interchanges, 2014: Addresses concerns regarding pedestrian and bicyclist safety at interchanges as a key barrier to increasing the walk and bike mode shares in our transportation networks. The document provides design guidelines for improving safety and accessibility for pedestrians and bicyclists at interchanges. The advisory guidelines identify specific dimensions, safety features, signing, pavement markings, design geometries, and other treatments. These best practices are intended to provide insight into future updates of statewide or federal highway design manuals.

http://bit.ly/1TmcOsL

LIDC – Green Streets Municipal Handbook: was prepared by the Low Impact Development Center and evaluates programs and policies that have been used to successfully integrate green infrastructure into roads and right-of-ways. The handbook explores various green street interventions and identifies potential implementation hurdles jurisdictionas may encounter while introducing green infrastructure in transportation applications.

http://1.usa.gov/21wOtqu

NACTO – Urban Bikeway Design Guide: Document is based on experiences and best practices from the best cycling cities in the world. This edition has been developed to build upon the fast-changing state of the practice for bicycle planning at the local level. The guide offers substantive guidance for cities seeking to improve bicycle transportation in places where competing demands for the use of the right-of-way present unique challenges. Most importantly, the guide helps practitioners make good decisions about urban bikeway design as an indispensable tool every planner must have for their daily transportation design work.

http://bit.ly/1WojgnV

NACTO – Urban Street Design Guide: Describes how streets of every size can be reimagined and reoriented to prioritize safe driving, transit, biking, walking, and public activity. The guide emphasizes the core principle that urban streets are public places and have a larger role to play in communities than solely being conduits for traffic. Case studies from around the country show how to implement best practices, and also provide guidance for customizing design applications to a city's unique needs. The report identifies five goals that create a framework for world-class street design, and by elaborating on these fundamental principles the guide offers substantive direction for cities seeking to improve street design to create more inclusive, multi-modal urban environments.

http://bit.ly/1SHdNJ5

State

Caltrans – Bus Rapid Transit: A Handbook for Partners, 2007: This document describes the policy and role of the California Department of Transportation (Caltrans) in supporting the development of Bus Rapid Transit (BRT) projects and technology as well as strengthen partnerships, expedite project delivery, and improve the performance of California's transportation system. This report strives to inform Caltrans staff and others what elements constitute a BRT system, while addressing Caltrans' role with its partners considering BRT features as an alternative on the State Highway System. This document is intended for use by Caltrans professionals, elected officials, local jurisdictions, transit operating and planning agencies, and the general public to understand Caltrans' role in BRT development, both on and off the State Highway System.

http://bit.ly/1R2skdB

Caltrans – Complete Intersections: A Guide to Reconstructing Intersections and Interchanges for Bicyclists and Pedestrians, 2010: The material in this Guide supports several Caltrans and State of California plans and policies requiring improvement in conditions for pedestrians and bicyclists. It is a comprehensive guide that identifies actions to improve the safety and mobility for bicyclists and pedestrians at intersections and interchanges. Through the implementation of the guide, Orange County can become an example for the nation in developing a transportation system that is sustainable for all users.

http://bit.ly/24xSf4K

Caltrans – Main Street California, 2013: Main Street California is a guide for improving community and transportation vitality. The document includes four sections: Main Streets Principles, Planning Main Streets, Designing Main Streets, and Sustainable Main Streets. Within the first section are guidance principles that can help maximize the number of livability, sustainability, and multimodal benefits that main streets can provide for communities and the state. The rest of the document helps the reader locate information about standards and procedures described in the Caltrans Highway Design Manual (HDM), the California Manual on Uniform Traffic Control Devices (California MUTCD), and the Project Development Procedures Manual (PDPM). The planning, design, maintenance and operational concepts discussed in the document are conceptually compatible with already established traffic engineering and design practices, policies, and standards within the state.

http://bit.ly/1Ny89nY

Caltrans – Smart Mobility Framework, 2010: This planning framework helps guide and assess how well plans, programs, and projects meet the definition of "smart mobility." It is to be used to guide development of products as well as assess how well products meet "smart mobility" principles and criteria. Ideally, the framework can be applied to various levels of plans, programs, or projects (e.g., Regional Transportation and Blueprint Plans, General Plans, corridor plans, specific development proposals, etc.) and in all parts of the state (i.e., urban, suburban, and rural). The goal of smart mobility is to "move people and freight while also enhancing California's economic, environmental, and human resources by emphasizing convenient and safe multi-modal travel, speed suitability, accessibility, management of the circulation network, and efficient use of land.

http://bit.ly/1LLPziW

State of California Department of Water Resources – Urban Drought Guidebook, 2008: Managing water shortages involves using programs to temporarily reduce demand and find alternate water to temporarily increase supply. This guide helps water managers facing water shortages by showing them how to use tried and true methods of the past as well as making use of new tools and methods. The guidebook discusses water shortage management programs that belong in water shortage contingency plans. The focus of the guide is to provide a step-by-step process to anticipate and respond to water shortages.

http://bit.ly/1rw7o8x

County

OCTA – Master Plan of Arterial Highways Guidelines (MPAH), 1956: The guidance document was established in 1956 to ensure that a regional arterial highway network would be planned, developed, and preserved, in order to supplement the County's developing freeway system. It is continuously updated to reflect changing development and traffic patterns. Today, it defines a countywide circulation system in response to existing and planned land uses. In order to be eligible for certain funding sources, including Measure M2, a jurisdictions "General Plan circulation element must be consistent with the MPAH. Local agencies may freely determine whether to maintain consistency with the MPAH or not.

http://bit.ly/1WIAzAI

OCTA – Bus Stop Safety and Design Guidelines, 2004: These guidelines provide local jurisdictions with a set of suggested design criteria that should be considered when designing and placing transit facilities. They are to be used as a resource to provide comfortable and convenient high quality facilities at bus stop locations, while considering the operational needs of the Authority, the requirements of the Americans with Disabilities Act (ADA), and public safety.

http://bit.ly/1VKWZCr

Complete Street Application

Other

CROW, Design Manual for Bicycle Traffic, 2007 (Dutch publication): Describes the steps required to achieve the bicycle's rightful position within the traffic system and, where possible, to strengthen it.

http://bit.ly/1TtMxJs

Western Riverside Council of Governments (WRCOG) - 4-City Neighborhood Electric Vehicle Transportation Plan, 2010: This plan is an example of a multi-jurisdiction transportation planning approach to leverage existing and future public street networks for maximum transportation benefit. The plan identifies low speed connectors and potential NEV/bike lane backbone facilities within and between several cities in Riverside County. It provides the necessary tools for local jurisdiction plan adoption and may be used as a template for other communities contemplating similar transportation network enhancements.

http://bit.ly/1X8Ahnd

General Plans: Each city and county in California must prepare a comprehensive, long term general plan to guide its future. The compulsory document contains an overview of seven important elements that shape a city/county: Land Use, Circulation, Housing, Conservation, Open Space, Noise, and Safety. New legislation requires any update or revision to the circulation element of the general plan to include plans for a balanced, multimodal transportation network that meets the needs of all users of streets, roads, and highways. This includes motorists, pedestrians, bicyclists, children, persons with disabilities, seniors, movers of commercial goods, and users of public transportation, in a manner that is suitable to the rural, suburban, or urban context of the general plan.

In General Plans, Complete Streets are typically addressed through policy and through street typologies (or street designations). Also, consistent with ITE guidance, General Plans are a prime location for the development of a layered network approach, where clear mode priorities can be established for each street.

Specific Plans: The purpose of this document is to clarify the uncertainties of a specific plan such as what it is, how it functions, and its relationship to the implementation of a general plan. The document also provides new and innovative examples of specific plans and their use. The information contained in this document is meant to provide direction and references to planning practitioners for the development of specific plans. Interested individuals and other participants involved in local land use planning may also find it useful.

Specific plans require specifics related to infrastructure, which include roadway cross-sections and other details about the project area. Complete Streets are typically implemented at a cross-section planning level in these plans.

Private Development Applications: The process for private land development varies depending on location but generally begins with an application to get the project approved for construction. These applications are normally reviewed by a specified department within the city or town. Depending on the type, size, and location of a project, approval may then be granted by the Community Development Department, the Planning Commission and/or the City Council.

Local agencies can assist in working with developers to implement Complete Streets. This is typically done through the entitlement process, by which staff can request developers to implement Complete Streets as part of their application/site plan, through mitigation requirements, through fee programs, or through other development exactions.

Implementation Plan: An implementation plan can identify documents and processes that need to be changed, assign responsibility for who will be making such changes, and name specific documents or processes that should be created as part of Complete Streets implementation. In order to back up its Complete Streets policy with action, several cities have established steering committees to focus on policy development, establish Complete Streets design manuals, encourage community involvement, spearhead educational campaigns, and work with city police officers to ensure that traffic enforcement is in alignment with the policy goals. Caltrans decided to create an implementation plan, overseen by a high-level steering committee that engaged all 12 of the department's districts and created specific next steps.

Glossary

A

Accessibility: A term describing the degree to which something is accessible by as many people as possible regardless of physical ability or income level. In transportation design, accessibility is often used to focus on people with disabilities and their right of access to thoroughfares, buildings and public transportation. Accessibility also refers to transportation facilities that comply with Public Rights-of-Way Accessibility Guidelines related to ADA.

Access Management: Access management is defined as the management of potential interference between through-traffic and traffic entering, leaving, and crossing a major street. (Based on: Designing Walkable Urban Thoroughfares: A Context Sensitive Approach)

Active Transportation: Active transportation is travel powered by human energy. Walking and biking are the most common means of active transportation. To encourage more walking and biking, communities must create active transportation systems—seamless networks of accessible trails, sidewalks, and on-road Bicycle facilities.

Accessible Pedestrian Signal (APS): Accessible Pedestrian Signal and pedestrian pushbutton is a device that communicates crosswalk signals in non-visual formats – audible tones and vibro-tactile surfaces.

Advanced Pedestrian Signals: Also known as Leading Pedestrian Interval (LPI) gives pedestrians an advanced walk signal before motorists get a green signal.

Americans with Disabilities Act (ADA): The Americans with Disabilities Act of 1990 gives civil rights protections to individuals with disabilities similar to those provided to individuals on the basis of race, color, sex, national origin, age, and religion. It guarantees equal opportunity for individuals with disabilities in public accommodations, employment, transportation, State and local government services, and telecommunications.

Amenities: Positive elements which contribute to the overall characteristic of an area such as street benches, tables, trees, etc.

Arterial Roads: Arterial roads are designed as high-capacity urban roads that connect smaller local roads with larger ones. They are often a community's transportation backbone, connecting many destinations and neighborhoods. Automobile traffic generally travels at high speeds and facilities for travelers by foot, bicycle, or public transit are afterthoughts. Most pedestrian injuries and fatalities occur on these roads.

Average Daily Traffic (ADT): ADT or occasionally Annual Average Daily Traffic (AADT) is the average volume of traffic on a highway or road each day. This is usually calculated by dividing the total amount of traffic annually by 365 days.

B

Barrier-free: A design characteristic that maximizes accessibility for people with physical or cognitive difficulties.

Bicycle Boulevard: A bicycle boulevard is a roadway that motorists may use, but that prioritizes bicycle traffic through the use of various treatments. Through motor vehicle traffic is discouraged by periodically diverting it off the street. Remaining traffic is slowed to approximately the same speed as bicyclists. Stop signs and signals on the bicycle boulevard are limited to the greatest extent possible, except where they aid bicyclists in crossing busy streets. The bicycle level of service may be further enhanced through the use of directional signage and other amenities. The development of a bicycle boulevard may include the alteration of intersection controls, the installation of signage, stencils, or other treatments that facilitate bicycling. Bicycle boulevards are most effective when several treatments are used in combination.

Bicycle Lane: A portion of the roadway which has been designated by striping, signing and pavement marking for the preferential or exclusive use by bicyclists. Bicycle lanes make the movements of both motorists and bicyclists more predictable and as with other bicycle facilities there are advantages to all road users in striping them on the roadway.

Bicycle Plans: A community's vision to make bicycling an integral part of daily life. A plan recommends projects, programs and policies to encourage use of this practical, non-polluting and affordable mode of transportation. Two common overall goals of a bicycle plan:

- To increase bicycle use, so that 5 percent of all trips less than five miles are by bicycle.
- To reduce the number of bicycle injuries by 50 percent from current levels.

Bicycle Route: A roadway or path that has been identified by signing as a preferred Bicycle route. Reasons for designating such routes include:

- Continuity between bicycle lanes, trails or other bicycle facilities
- Marking a common route for bicyclists through a high demand corridor
- Directing cyclists to low volume roads or those with a paved shoulder
- Directing cyclists to particular destinations (e.g. park, school or commercial district)

Bicycle Share: Bicycles available for rent over short periods of time.

Bio-retention Swale: A bio-retention swale is a landscaped feature designed to capture, retain, filter and convey storm water runoff.

Bollards: Bollards are vertical posts often arranged in a line to separate automobile traffic from people on foot or riding bicycles. They may also be used to prevent parking on sidewalks, to demarcate special bus-only lanes, and to manage and calm traffic flow. Sometimes other objects, such as planters, are used as bollards. They may be fixed—permanent—or flexible—movable or able to bend and return to their original position.

Buffer or Planting Strip: An undeveloped or landscaped area separating sidewalks from roadways.

Bulb-out or Curb Extensions: Bulb-outs, also known as curb extensions, are a relatively simple way to transform overly wide streets into ones where people feel more comfortable walking and driving. They can bring down the speed of cars making right turns, add visual emphasis to important pedestrian crossings, and make it easier for people in cars and people on foot to see each other. Curb extensions are commonly used at intersections, but are also helpful at midblock crossings and other locations. Sometimes the added area is landscaped and used to filter storm water.

Bus Lane: A traffic lane for public bus transportation only.

C

Capacity (roadway): Maximum hourly rate at which vehicles can reasonably be expected to pass a given point given roadway, traffic and control conditions.

Car Sharing: Vehicles available for rent over short periods of time.

CCTV: Closed circuit television system used for remote video monitoring in streets.

Chicane: A series of offset curb extensions or bulb outs mid-block that narrow the roadway and slow traffic forcing it to follow the curved roadway.

Crime Prevention Through Environmental Design (CPTED): CPTED is an initiative that aims to deter criminal behavior through environmental design.

Crosswalk: Is a designated street crossing point. A raised crosswalk lifts the level of the crosswalk to that of the sidewalk, encouraging drivers to slow and providing a level crossing for pedestrians.

Color Rendering Index: Measures the ability of a light source to accurately render all frequencies of the color spectrum. This is particularly important in areas that are reliant on CCTV surveillance for security.

Color Temperature: Describes the color characteristic of light usually warm (yellow light) or cool (white light).

Community Livability: Refers to the environmental and social quality of an area as perceived by residents, employees, customers and visitors, including safety and health, local environmental conditions, quality of social interactions, opportunities for recreation and entertainment, aesthetics and existence of unique cultural and environmental resources.

Complete Streets Elements: A toolkit of design features that can be used to improve safety, comfort and efficiency for a variety of roadway users, and can also make a street more attractive and improve ecological functions.

Context Sensitive Solutions (CSS): Context sensitive solutions (CSS) is a collaborative, interdisciplinary approach that involves all stakeholders to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic and environmental resources, while maintaining safety and mobility. CSS is an approach that considers the total context within which a transportation improvement project will exist.

Corridor: A transportation pathway that provides for the movement of people and goods between and within activity centers. A corridor encompasses single or multiple transportation routes or facilities (such as thoroughfares, public transit, railroads, highways, Bicycleways, etc.), the adjacent land uses and the connecting network of streets.

Countdown Pedestrian Signal: Countdown pedestrian signals are a combination of traditional pedestrian signals that direct people on foot as to when they may and may not cross a street and an added display that shows the number of seconds remaining to safely cross. They are easily understood by all age groups and increase the feeling of safety while also being simple and inexpensive to install.

Cross Section: The organization of space within the right-of-way of a street, including vehicle travel lanes, pedestrian realm, local access lanes, bicycle lanes, and the median.

Curb Ramp or Curb Cut: A ramp providing a smooth transition between sidewalk and street that complies with the American with Disabilities Act (ADA) standards.

D

Density: The number of dwelling units, square yards of floor space or people per acre of land.

Desire Line: A desire line is an informal path that pedestrians follow. It is often the shortest route or most easily navigated route to a destination.

Detectable Warning Strip: A standardized tactile surface that is required as part of the ADA standards to warn visually impaired people of hazards. These are commonly located at transit stops and level changes such as curb ramps, public stairways building entrances and pedestrian crossings.

Ergonomic Design: Design of equipment and furniture that fits the human body and its cognitive abilities.

F

Floating Bus Stop: Floating Bus stops are bumped out islands that accommodate a bikeway between the bus stop and the sidewalk.

Flow-through Planter: Are used to intercept and absorb storm water run-off prior to entering storm water infrastructure.

Frontage Zone: The frontage zone is the zone of activity on the sidewalk between the property line and the pedestrian through zone.

G

Goods Movement: The transportation of goods (such as freight) by road, rail or air.

Grade Separation: A method of aligning an intersection at different grades so that traffic flow will not be disrupted.

Greenways: Linear corridors of land that connect key resources and open space within a region. Open spaces are blocks of land that are generally self-contained with limited connections or linkages to other areas. A greenways network includes greenways as well as hubs of specifically identified natural resources or open space and man made features or destinations that influence the development of the development of the linear greenway corridor.

H

Heads-up Map: A heads-up map is a wayfinding map that is aligned with the direction the user is facing.

High Occupancy Vehicle (HOV) Lane: A lane dedicated exclusively to vehicles carrying more than one person.

Human Scale: How humans perceive the size of their surroundings and their comfort with the elements of the natural and built environment relative to their own size. In urban areas, human scale represents features and characteristics of buildings that can be observed within a short distance and at the speed of a pedestrian, and sites and districts that are walkable. In contrast, auto scale represents a built environment where buildings, sites, signs, etc. are designed to be observed and reached at the speed of an automobile.

Head-out Angled Parking: Head-out angled parking is a type of on-street parking where cars are backed into diagonal spaces. This maximizes use of the roadway, accommodates more vehicles than traditional parallel parking, and is a simpler maneuver for drivers as well. Head-out angled parking is useful in narrowing the overall width of a roadway to promote compliance with speed limits. On-street parking in general also provides a buffer between people who are walking and automobile traffic, creating a more pleasant pedestrian environment.

High Occupancy Vehicle (HOV): Vehicles that can carry more than two persons. Examples of high occupancy vehicles are a bus, vanpool, and carpool.

L

Land Use (see also zoning): The actual use occupying or purpose for each parcel of land (e.g. industrial, commercial, residential).

Level of Service (LOS): An indicator of the quality of operating conditions that is typically applied to roadways to indicate the ratio of vehicle demand to roadway capacity and resulting delay.

Link: The role of the street in serving as a facility for the movement of people through the corridor.

Local Roads: Streets with a low level of traffic mobility and a high level of land access, serving residential, commercial and industrial areas.

Low Speed Vehicle (LSV): An LSV is a legal class of vehicle four wheeled vehicles capable of travelling at speeds up to 25mph.

M

Marked Crosswalk: Areas on the street (delineated by paint, brick, etc.) indicating where pedestrians should cross the road.

Master or Comprehensive Development Plan: A policy-based document that provides the vision of a community, but does not or cannot regulate properties or land use. It dictates public policy in terms of transportation, utilities, land use, recreation, and housing over a large geographical areas and a long-term time horizon.

Median: Medians are raised areas within a roadway that separate op¬posing lanes of traffic. They may feature decorative landscape, trees, or other barriers. Pedestrians may use medians as a safe place to stop when crossing streets. In some designs, medians can help to decrease vehicle speeds to the desired level.

Median Tip Extension: Median tip extensions are painted or raised areas at the ends of medians to provide additional space for pedestrians to pause while crossing the street, shorten overall crossing distances, and improve alignment of travel lanes.

Mid-block Crosswalks: Crosswalks in the middle of a street block rather than an intersection.

Mixed-use Development: An appropriate combination of multiple uses (e.g. residential, commercial, community, leisure), inside a single structure or place within a neighborhood, where a variety of different living activities (live, work, shop, and play) are in close proximity (walking distance) to most residents.

Modal Priorities: A ranking of transportation modes order to identify which mode should be given higher consideration in decisions concerning physical design and operations.

Mode Share: The proportion of people that use each of the various modes of transportation in relation to the total number. Also describes the process of allocating the proportion of people using modes. (Source: Transit Glossary)

Mode Shift: The shift away from single occupant vehicle use and dependency to a greater variety of transportation modes.

Multi-Modal: Refers to the availability of transportation options within a system or corridor whether it be walking, bicycling, driving, or transit.

Multi-Modal Level of Service (MMLOS): MMLOS is a rating system that is used to broadly assess the travel experiences for pedestrians, bicycles, automobiles, transit and trucks along a specified corridor or location.

N

NACTO (National Association of City Transportation Officials - see also Resources): NACTO is an association of sixteen of the largest US cities which have a mission to provide interaction with other cities to share best practices, while also providing a forum for a unified voice in US transportation policy.

Neighborhood Electric Vehicle (NEV): Battery powered vehicles that are designed for small trips within the neighborhood. Usually these fall under the Low Speed Vehicle Classification.

Non-Motorized Transportation: Existing infrastructure for non-motorized transportation, including sidewalks, Bicycle lanes, mixed-use paths, public transportation (buses, subways, light-rail), and Bicycle routes.

O

Open Space: Plazas, street openings, etc. to create a vibrant public realm.

Open Streets: Is an initiative that temporarily closes streets to automobile traffic to encourage the use of streets as public space.

Overpasses/underpasses: A street crossing separating pedestrians from motor vehicle traffic (e.g. bridge or tunnel).

P

Parklet: A parklet is a space created by converting on street parking spaces into a temporary public space.

Peak Hour: That one-hour period during which the maximum amount of travel occurs. Generally, there is a morning peak and an afternoon peak and traffic assignments may be made for each period, if desired.

Pedestrian Through Zone: The part of the street cross section designed to accommodate people walking along a street for a range of purposes including, access to uses and transit stops, moving from one neighborhood or district to another, and strolling or recreating. Design elements within a pedestrian realm can include sidewalks, landscaping, street trees, and building frontage.

Pedestrian Through-Zone: The pedestrian through zone is the section of sidewalk that should remain clear to support comfortable pedestrian movement. This zone must meet the ADA accessibility standards.

Permeable Surface: Permeable surface is a ground treatment that allows storm water to pass through the surface and infiltrate the ground reducing storm water runoff into infrastructure.

Placemaking: A holistic and community-based approach to the development and revitalization of cities and neighborhoods. Placemaking creates unique places with lasting value that are compact, mixed use, and pedestrian and transit-oriented, and that have a strong civic character.

Policy: A high-level overall plan to embrace general goals and acceptable procedures, especially of a governmental body. Policy guides actions and decisions toward those that are most likely to achieve a desired outcome.

Plaza: Plazas are formal public spaces in a city where people gather to partake in a wide variety of activities. They are important to civic life and city events.

Pocket Park: Pocket parks are small and less formal areas of open space that adjoin the sidewalk. They are typically located in the frontage zone, where land has been re-purposed to provide a public space.

Public Transportation/Transit: A shared passenger transportation service which is available for use by the general public and may include buses, trolleys, trams and trains, rapid transit (metro/subways/undergrounds etc.), and ferries.

R

Raingarden: Raingardens detain and infiltrate large volumes of water. These are typically engineered to manage a specific quantity of storm water runoff.

Raised Medians, Crossing Islands and Mid-Block Crossings: The area between opposing lanes of traffic which provide pedestrians with a safe place to wait while crossing a street.

Real-time Transit Information: Provides transit users with up to date information on transit schedules and geographic information. This should be provided at transit stops or may be available through mobile phone applications.

Road Diet: Road diets (also known as conversions or rechannelizations) are often employed on overly wide roads that have too many travel lanes for the level of automobile traffic and are often unsafe for people traveling by bicycle or on foot. Travel lanes are removed or narrowed to create on-road space for bicycle lanes, center turn lanes, or on-street parking. They may be removed or narrowed to free right-of-way for wider sidewalks and medians. Most commonly, road diets transform a four-lane, bidirectional roadway into a three-lane road with one travel lane in each direction, a center turn lane or median, and dual bicycle lanes.

Road Hierarchy: A system in which streets and highways are grouped into classes (by speed, volume, type, jurisdiction) according to the character of service they intend to provide.

Roundabout: A roundabout is a type of circular intersection designed to balance the flow of traffic around the roundabout. The entrance of a roundabout is flared with a splitter island deflecting vehicles around roundabout in one direction, maintaining the movement. Entering the roundabout vehicles must yield to on-coming vehicles.

S

Safety: A condition of being safe, free from danger, risk, or injury. In traffic engineering, safety involves reducing the occurrences of crashes, reducing the severity of crashes, improving crash survivability, developing programmatic safety programs and applying appropriate design elements in transportation improvement projects. (Source: Designing Walkable Urban Thoroughfares: A Context Sensitive Approach)

Safe Routes to School: An initiative that conducts projects to improve safety and accessibility and reduce traffic and air pollution in the vicinity of schools.

Scramble Crossing: A pedestrian crossing system that allows pedestrians to cross in every direction.

Security (Personal): The real or perceived sense of personal security including being protected from criminal activity such as assault, theft and vandalism.

Shared Space: Shared spaces are streets that are designed to allow traffic to be fully integrated with pedestrians. This is achieved by removing curbs and using a consistent surface material across the street.

Shared Use Path: A facility for active transportation modes (including walking, jogging, cycling and skating) which is generally constructed to a wider asphalt standard but may be concrete or granular.

Sharrow: A special symbol that denotes where a bicyclist should ride (usually in conjunction with a wider outside lane of 14 or 15 feet) without delineating a striped Bicycle lane.

Sidewalk: A paved walkway that allows pedestrians to walk along, but separated from, the roadway.

Sight Distance: Distance that a driver can see ahead in order to observe and successfully react to a hazard, obstruction, decision point, or maneuver; both an issue when a vehicle is traveling along a street and when entering a street where the "sight triangle" defines an area within which a driver needs to look in order to see approaching vehicles and safely enter the street.

Signal Prioritization: Computer-based traffic signal control system that monitors traffic conditions and selects appropriate signal timing strategies.

Smart Growth: Invests time, attention, and resources into restoring community and vitality to center cities and older suburbs. New smart growth is more town-centered, is transit and pedestrian oriented, and has a greater mix of housing, commercial and retail uses. It also preserves open space and many other environmental amenities.

Speed Cushion: A speed cushion is a speed hump that has wheel cut-outs to allow large vehicles to pass unaffected by the traffic calming device.

Speed Hump: Is a parabolic vertical traffic calming device intended to slow vehicles speed. The size of a speed hump is determined by the posted speed limit and target speed reduction.

Speed Limit: The legally-defined maximum speed of vehicles on a road.

Speed Management: Processes and techniques to mitigate excessive traffic speeds.

Speed Table: A speed table is a wider speed hump that fits the entire wheel base of a vehicle to reduce its traffic speed. Often these are used at intersections and midblock crossings.

Streetcar: A streetcar is a mode of transit that travels on rails within the street environment. Streetcars are also known as light rail or trams.

Street Type: Defines a street, taking into consideration the land use context, relationship of buildings to the street and the number of travel lanes, volume, type and speed of traffic.

Streetscape: All the elements that make up the physical environment of a street and define its character including the roadway, sidewalk, building setbacks, height and style. Also paving treatments, trees, lighting, pedestrian amenities and street furniture.

T

Temporary Walkways: Provide pedestrians with designated routes along a construction site when sidewalks and other pedestrian travel ways have been closed.

Totem: A totem is a vertical wayfinding device that is positioned at decision points within the street environment.

Traffic Calming: Physical changes (e.g. roundabouts, road diets, speed bumps, lane narrowing, tree placement at road edge, speed reduction) to a street to encourage drivers to drive slowly or to discourage cut-through traffic.

Traffic Circle: A traffic circle is used as a traffic calming measure at intersections to slow vehicles and balance priority on streets with low volumes of traffic. A traffic circle can be retrofitted into existing intersections. Usually vehicles must stop before proceeding through the traffic circle.

Traffic Island: A traffic island is a raised section within the central median that acts as a traffic calming device but also as a refuge for pedestrians crossing the street.

Traffic Sign: An official device or signage that gives a specific message, either by words or symbols, to the public.

Traffic Signal: A visual signal to control the flow of traffic. Pedestrian signals let pedestrians know when they have priority and warn drivers to stop/yield for pedestrians. There are varying kinds of signals.

Transit Oriented Development (TOD): The creation of compact, walkable communities centered around high quality transit systems. Residential and commercial districts designed to maximize access by public transit and non-motorized transportation, with good connectivity, mixed-use, parking management and other design features that facilitate public transit use and maximize overall accessibility.

Transportation Corridor: An interconnected transportation pathway that provides for the movement of people and goods between and within activity centers. A corridor encompasses single or multiple transportation routes or facilities (such as thoroughfares, public transit, railroads, highways, Bicycleways, etc.), the adjacent land uses and the connecting network of streets.

U

Universal Design: The design of buildings, streets, services, transportation systems and public spaces to accommodate the widest range of potential users – by removing barriers for those with mobility, visual and hearing impairments and other special needs.

Utilities: Utilities are services and associated infrastructure that are provided for public use, for example telecommunications, electricity, gas, water and sewage.

V

VPHPD: A Vehicle Per Hour Per Day (VPHPD) count is used to calculate the average daily traffic volumes.

W

Walkability: Streets and places designed or reconstructed to provide safe and comfortable facilities for pedestrians, and are safe and easy to cross for people of all ages and abilities. Walkable streets and places provide a comfortable, attractive and efficient environment for the pedestrian including an appropriate separation from passing traffic, adequate width of roadside to accommodate necessary functions, pedestrian-scaled lighting, well-marked crossing, protection from the elements (e.g. street trees for shade, awnings, or arcades to block rain), direct connections to destinations in a relatively compact area, facilities such as benches, attractive places to gather or rest such as plazas and visually interesting elements (e.g. urban design, streetscapes, architecture of adjacent buildings).

Wayfinding: Signage that will assist travelers in walking to local destinations.

Wide Shoulders: In urban areas, paved shoulders are not normally provided on major roads. A wider outside (or curbside) lane allows a motorist to safely pass a cyclist while remaining in the same lane and this can be a significant benefit and improvement for cyclists, especially more experienced riders. A wider outside lane also helps trucks, buses, and vehicles turning onto the major road from a driveway or wide street.

Z

Zoning: Dividing an area into zones or sections reserved for different purposes such as residence, business, and manufacturing.

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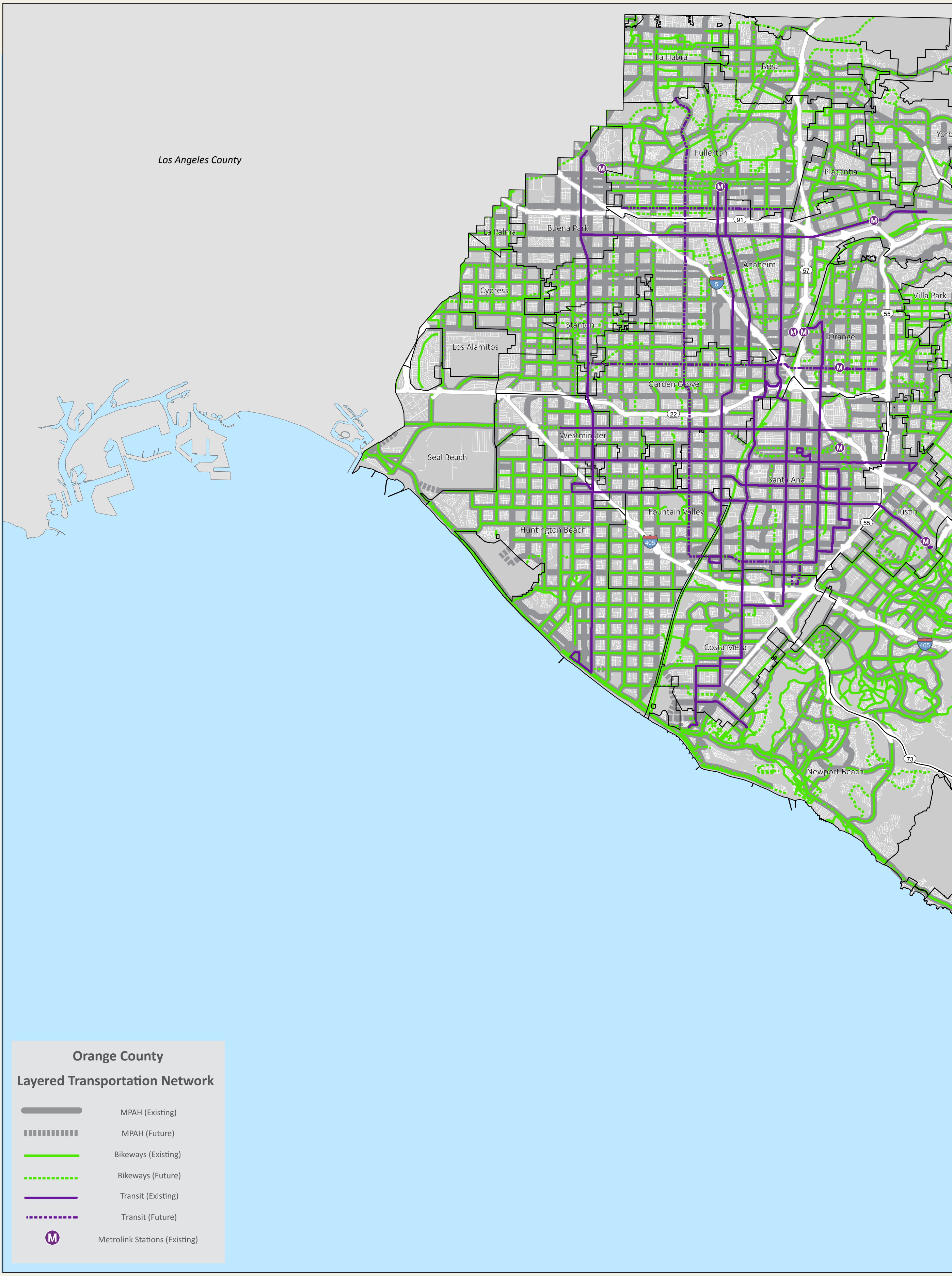
Appendix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Huntington Beach
Costa Mesa
Newport Beach
Orange County
Layered Transportation Network
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Bikeways (Existing)
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Transit (Existing)
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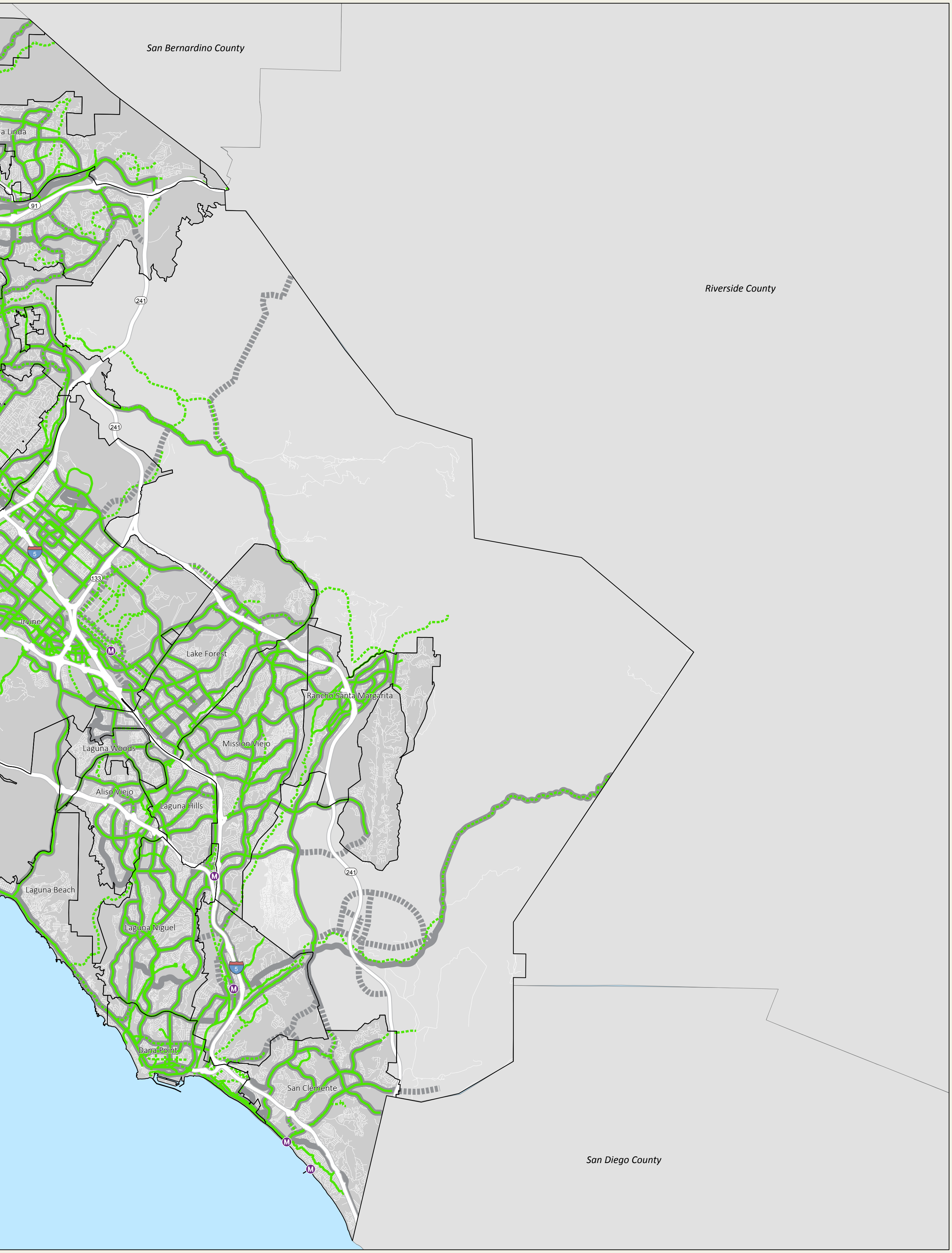
Metrolink Stations (Existing)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91
241
133
5