5 BEST PRACTICES

This chapter showcases best practices for planning high-capacity transit, with a focus on the Orange County context. It includes the following three sections:

- **High-Capacity and Rapid Transit Modes.** This section defines *transit mode*, and describes the characteristics associated with four forms of high-capacity modes: light rail transit, streetcar, bus rapid transit (BRT), and express bus.
- **Access and Land Use for High-Capacity and Rapid Transit.** High-capacity transit requires a supportive built environment. This section explains and explores how to develop three concepts associated with a transit-supportive built environment: complete streets, multimodal access, and transit-oriented development.
- **Transit Funding.** This section outlines funding sources at the federal, state, county, and local level, as well as alternative funding sources like the private sector and public-private partnerships.

Ultimately, this chapter will help identify high-capacity transit modes that may be suitable for Orange County and examine how these modes have been successfully implemented elsewhere.

Key Points

The following key points are critical when considering different transit modes:

- Each mode consists of four elements: (1) right-of-way design and management, (2) stop design, (3) service model and operating plan, and (4) vehicle type. Each element can have a varying impact on performance outcomes such as speed, reliability, capacity, and rider comfort.
- Modes should not be too narrowly defined. Rather, each mode represents a spectrum of characteristics.
- Some characteristics are necessary for (or typical to) certain modes. Others are more-or-less independent of mode.
- Many elements are interdependent, resulting in complex relationships that must be considered carefully in local decision-making processes.

HIGH-CAPACITY AND RAPID TRANSIT MODES

The capacity and speed of transit are both highly dependent on the transit mode. This section first sets out to define and categorize transit modes, and subsequently compares five modes of high-capacity rapid transit.

Defining a Transit Mode

A transit mode consists of four elements: right-of-way design and management, stop or station design and access requirements, a service model or operating plan, and vehicle type. Figure 5-1 provides examples of each element.

Figure 5-1 Elements of a Transit Mode

Transit Mode Element	Examples
Right-of-way design and management	Route alignments, dedicated lanes, grade separation, signal priority
Stop design and access requirements	Stop design, stop amenities, real-time vehicle information, prepaid boarding zones
Service model/ operating plan	Vehicle frequency, interlining
Vehicle type	Bus, light rail train, streetcar

A transit mode is not the same thing as a transit vehicle. Misunderstanding transit modes can result in a misguided focus on vehicle selection.[1] This can lead to two problematic outcomes: (1) selecting an unsuitable mode, or (2) selecting a suitable mode, but neglecting to account for elements beyond vehicles (e.g., right-of-way, stops/stations, and service).

Rather, planning for high-capacity transit should be based on a set of desired outcomes that can be tied to measurable performance, such as better passenger comfort, higher capacity, more reliable service, faster travel time, or increased frequency of service. Vehicle selection is one concern among many.

[1] Further adding to the confusion: a mode and vehicle share the same name (e.g., streetcar) and identical vehicles can be used for different modes (e.g., BRT and local bus service).

Categorizing Modes

This section outlines the modes included in (and excluded from) the OC Transit Vision, as well as the non-vehicle elements of a mode. It also discusses the relationship between modes and performance outcomes.

Modes included in this analysis

This analysis of best practices includes five types of modes: express bus, bus rapid transit, streetcar, rapid streetcar (or tram), and light rail transit. These five modes can be described as follows.

Figure 5-2 Modes Included in this Analysis

Mode	Description
 Express bus	Like all bus modes, express bus service can be provided by different types of buses (including buses powered by various fuel sources as well as buses of different sizes, interior configurations, and comfort levels). However, express bus is differentiated from other modes of bus service by its service model and, in many cases, by right-of-way requirements. Express buses make few stops, generally operating from point-to-point rather than along a corridor. Routes are also typically longer than local- or limited-stop bus routes (or streetcar lines), and nonstop segments are often located along freeways, or at least major arterial streets. These routes sometime take advantage of managed lanes on freeways. Stops tend to be curbside or at park-and-ride lots. OCTA operates eight express bus routes (not including Routes 57X,64X, and Bravo!, which are more properly described as “limited-stop” routes, or routes that are not non-stop but have a limited number of stops).
 Rapid bus (Bravo!)	Rapid bus features some, but not all of the features of bus rapid transit (see below). At a minimum, it features a limited number of stops, making service faster and more reliable. It may also include custom branding, transit priority at traffic signals and other features.
 Bus rapid transit (BRT)	BRT is a bus service where a majority of the line operates in a separated right-of-way dedicated for public transportation use during peak periods and includes features that emulate the services provided by rail fixed guideway public transportation systems, including: defined stations; transit signal priority; high-frequency bidirectional services for a substantial part of weekdays and weekend days, pre-board ticketing, platform level boarding, and separate branding.

Mode	Description
 Streetcar	Streetcar vehicles are small railcars (slightly larger than a 60-foot articulated bus) that generally are not coupled to form trains. Streetcar typically operates in mixed traffic, without any priority at signals, and makes curbside stops. Streetcar lines are relatively short, and services usually run often and make stops every few blocks. In terms of mobility, a streetcar may be no better than a local bus, and significantly slower than a rapid bus. However, streetcars provide a smoother ride than most buses, and have been shown to attract adjacent development, which can improve access by bringing destinations closer together.
 Rapid streetcar	Rapid streetcar is not a mode familiar to many Americans, although the term might be used to describe many European "tram" systems. The rapid streetcar concept illustrates the danger of defining modes too narrowly: it can be thought of as a hybrid of streetcar and light rail, and may be appropriate in very specific contexts. Indeed, the western segment of the OC Streetcar between Santa Ana and Garden Grove, which will operate in an off-street right-of-way (the old Pacific Electric right-of-way) with widely spaced stops, might fit the definition of rapid streetcar. Rapid streetcar can combine the modestly designed stops of a typical streetcar project and willingness to incorporate some single-track segments (which limit capacity, but lower cost) with a longer alignment and coupled trains.
 Light rail	Light rail vehicles are somewhat larger than streetcars (80 to 90 feet long), and are typically coupled to form trains. They are also faster, with top speeds around 65 miles per hour, compared to 45 miles per hour for streetcars. Their greater speed and capacity make them an attractive choice for longer trunk routes, and stations are often a mile or more apart. Light rail vehicles often operate in their own off-street right-of-way, although they can and sometimes do run in the street. Light rail can be designed with varying service goals, taking on different service attributes depending on the market to be served. For example, the Los Angeles County Metro Rail's Green Line, which operates largely in the median of the Century (Interstate 105) Freeway, is entirely grade-separated, resembling a somewhat lower-capacity—but equally rapid—heavy-rail or "metro" line. Conversely, Muni light rail in San Francisco serves local in-city trips at slower speeds and with much shorter stop spacing. Here much of the system operates on city streets as there is less need for grade separation to achieve the high speeds needed to provide competitive travel times over long distances between cities.

In addition to the high-capacity transit modes described above, which will be considered for major corridors as part of the OC Transit Vision, the Vision will also explore opportunities for new on-demand transportation services in lower-demand areas, similar to those offered by transportation network companies such as Uber and Lyft.

Modes not included in this analysis

Neither additional **commuter rail** (Metrolink) nor **heavy rail** (Los Angeles Metro Rail Red and Purple lines) are included in this analysis. They are unlikely candidates for local use in Orange County, in the case of commuter rail because it would require new off-street railroad right-of-way, which is unavailable, and in the case of heavy rail because that mode is very high capacity, very expensive, and only appropriate in dense urban areas of very high transit demand.

Non-vehicle elements of a mode

All modes of transit can be categorized using three non-vehicle elements: right-of-way design and management; stop/station design; and service model/operating plan.

- **Right-of-way design and management.** Transit modes are often associated with corridor characteristics or market contexts; for example, streetcars are strongly identified with walkable urban neighborhoods, while light rail is viewed as a more regional solution. Faster modes, such as light rail and express bus, are considered more appropriate for longer alignments. Similarly, rapid streetcar represents an acknowledgement that streetcar vehicles—which are typically associated with local-stop service[2]—may be appropriate in certain light rail corridors. The vehicle would not change, stops might not be more elaborate, and some elements of right-of-way design might not change—for example, there could be some segments in traffic lanes—however, other components would, including greater use of dedicated right-of-way and signal priority at intersections.
- **Stop design and access requirements.** Stop spacing has an important impact on speed for any vehicle type. For example, express bus is faster than local or limited-stop service not because of higher-speed vehicles, but because of its operational model of point-to-point rather than linear service. Similarly, prepaid boarding zones can be used with almost any vehicle type and can reduce dwell times at stops. This in turn improves average speed and reliability.
- **Service model and operating plan.** Operations can have an impact on capacity, by increasing frequency for any given vehicle type.

Relationship between performance and mode elements

The four elements of a mode relate to each other and to performance outcomes (e.g., passenger comfort, capacity, frequency, reliability, speed) in ways that can be quite complex.

For example, overall capacity is a function of both vehicle size and the number of vehicles (i.e., frequency). Frequency, in turn, is a function of various factors including demand, operating cost, right-of-way, and stop design. These are each affected to a certain extent by the type of vehicle.

Certain performance outcomes are more related to vehicle type than others. On one hand, outcomes associated with capacity and rider comfort are closely related to vehicle type. With respect to capacity, for example, a multicar light rail train may carry hundreds of passengers,

[2] Streetcars are more commonly associated with local service in North America.

several times as many as a 40-foot bus. With respect to comfort, passengers tend to view rail travel as more pleasant than bus.

On the other hand, outcomes associated with speed and reliability—while related to vehicle type in some ways—are more closely associated with right-of-way and stop/station considerations. For example, an express bus with no intermediate stops and a dedicated freeway lane may travel more quickly than light rail service with typical stop spacing.

Indeed, one of the strongest arguments made by proponents of bus rapid transit is that service design, right-of-way design and management, and stop design are each largely independent of vehicle type. For example, the following elements can be applied to buses, streetcars, or light rail vehicles:

- Limited stop spacing
- Segregation of the right-of-way to reduce conflicts with other vehicles (using design strategies ranging from part-time transit-only lanes to a fully grade-separated guideway)
- Right-of-way management to reduce other sources of delay (including transit priority at traffic signals)
- Stop design to reduce dwell time, or time spent at stops (including level and all-door, prepaid boarding)

Categorizing modes can assist local discussions regarding major transit investments. However, even when the definition of a mode is correctly understood, modes can be too narrowly defined. This can result in neglecting more important considerations of service quality. Ultimately, modes should be understood as spectrums of characteristics rather than well-defined categories.

Comparing Modes

Following are more detailed descriptions of high-capacity and rapid transit modes that may be recommended for use in Orange County as part of this study. Note that these descriptions are based on typical applications, and that some elements may not be inherent to that mode.

Light Rail Transit

Light rail transit (LRT) is a medium- to high-capacity mode that can operate in a variety of rights-of-way, from off-street rail lines to traffic lanes on city streets. This flexibility is due to the use of overhead wires for electrical power rather than a grade-level third rail such as that used in heavy-rail systems, which requires complete grade separation. Light rail vehicles are typically combined into two- to four-car "consists" (trains). Each car can accommodate 150 to 220 riders, resulting in much higher capacity than buses or single-car streetcars.

Figure 5-3 LRT in San Diego

Light rail stations are usually spaced a half-mile or more apart to allow trains to reach higher speeds, but are sometimes spaced more closely, particularly where light rail operates on-street in urban environments such as Downtown Long Beach. Stations can range from relatively simple stops with shelters to larger, place-making platforms featuring public art, secure bike lockers, bike-share docks, neighborhood or regional maps, and other amenities. Most stations do, however, feature ticket vending machines for off-board fare payment, allowing passengers to quickly board using all doors. Modern light rail systems also feature level or near-level boarding using either high platforms or low-floor vehicles. Like other urban rail modes, light rail service typically operates relatively frequently, every 15 minutes or better throughout the day, seven days a week.

Capital costs for light rail projects vary greatly depending on factors such as the level of grade separation: laying tracks on a street costs significantly less than building a viaduct or digging a subway. In general, light rail costs more than streetcars (partly due to the greater excavation required to provide deeper track foundations) but less than heavy rail lines. The most recent light rail projects completed in Los Angeles County—the Gold Line Foothill Extension and Phase Two of the Expo Line to Santa Monica—cost approximately $65 million and $140 million per mile.

Light rail systems are found throughout the southwestern United States, in Los Angeles County, San Diego, Silicon Valley, San Francisco, Phoenix, Salt Lake City, and Denver. Light rail was the mode proposed for OCTA's CenterLine project in the 1990s.

Streetcar

Figure 5-4 OC Streetcar

Source: OCTA

Streetcars are rail vehicles that are somewhat smaller and slower than light rail vehicles and are usually not coupled together to form trains. They may be either modern low-floor streetcars providing easy access for wheelchairs and strollers, or historic cars (either authentic or replica) with high floors requiring wheelchair ramps at stops. Like light rail, streetcars are powered by overhead wires. In North America, streetcar lines are usually shorter than light rail lines and generally run in mixed traffic. Stop spacing more closely resembles a local bus route than a light rail line. Stops themselves often are located on sidewalks, requiring them to be smaller and simpler than light rail stations, although they may have ticket vending or validating machines allowing prepaid boarding.

Despite their limited speed and reliability advantages over buses—streetcar lines can actually be slower and less reliable than bus rapid transit lines (see next section)—streetcars have become enormously popular in North American cities. They tend to attract somewhat more riders than a comparable bus line, are cheaper and easier to build than light rail lines, and have been proven to attract transit-oriented development and support walkable neighborhoods, making them as much an economic development tool as a mobility tool.

Despite their typical design in North America, streetcars do not necessarily have to make frequent stops, or operate in mixed traffic—and indeed, the planned OC Streetcar between Santa Ana and Garden Grove will operate off-street (in the old Pacific Electric right-of-way) and make relatively few stops in its western segment, making it more of a rapid streetcar as described earlier in this chapter.

Typical differences between streetcar and light rail lines are shown in Figure 5-5.

Figure 5-5 Typical Differences between Streetcar and Light Rail

Service Element	Streetcar	Light Rail
Vehicles	Modern or historic streetcar	Modern light rail vehicle
Train length	1 car	2-4 cars
Line Length	Shorter	Longer
Running Way	Mixed traffic	Dedicated right-of way
Fare Collection	On platform or on vehicle	On platform
Stations	Short platforms; limited amenities	Longer platforms; robust amenities
Station Spacing	2 to 3 blocks	½ to 1 mile
Speed	Slower	Faster
Development Benefits	Along line	Around stations

Bus Rapid Transit

Bus rapid transit (BRT) is a relatively new mode for U.S. transit systems; its use began in Latin America in the 1970s but has only recently become common in North America. The exact definition of BRT is a subject of debate, but it might be described as "buses behaving like trains." (under federal definitions, the majority of a BRT route must be "fixed guideway," or feature dedicated bus lanes). BRT is, essentially, an effort to take all of the things that people like about trains—the speed, the reliability, the convenience and comfort—and apply them to buses.

Figure 5-6 sBX Green Line in San Bernardino

While rail modes are based largely on vehicle—light rail, streetcars, heavy rail, or commuter rail—BRT is not really about the vehicle. Instead it's a toolbox of improvements that can be applied to vehicles, stops, rights-of-way, and operating plans to provide better service. Because there is such a wide range of potential improvements, BRT projects can take many forms, depending on which tools are used. Some of the most common tools are described below:

- **Limited stop spacing.** BRT routes typically feature stop spacing similar to that of light rail: a half-mile or mile apart in many cases. This allows for faster and more reliable service. Placing stops at the busiest locations (including transfer points), can keep most riders close to their bus stop.
- **Bus-only rights-of-way.** This is one of the defining features of what is sometimes called "full" BRT, as opposed to "partial" BRT, "BRT lite," or simply "rapid bus." In a full BRT

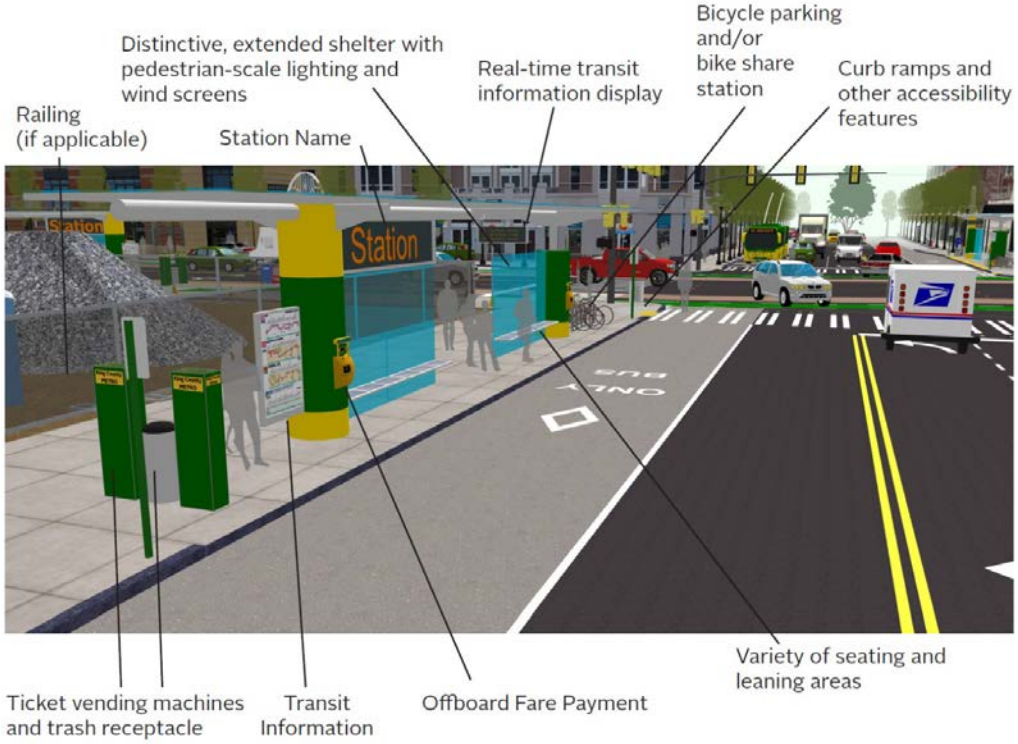
system, buses are partially or fully separated from traffic to further improve speed and reliability. Separation can take many forms:

- a fully grade-separated elevated or underground right-of-way
- a busway with intersections
- transit-only lanes on city streets, typically in the center median to separate buses from right-turning autos
- business access and transit (BAT) lanes shared with cars turning right or accessing parking spaces
- queue jump bypass lanes at traffic signals, either bus-only or shared with right-turning cars

One of the most appealing things about BRT is its flexibility—while trains always require tracks, BRT lines can include segments with bus-only right-of-way and others in which buses mix with traffic. This can, however, lead to watered down projects that have lower costs and impacts but also drastically reduced effectiveness.

- **Other transit-priority treatments.** In addition to fewer stops and bus-only right-of-way, buses can be made faster and more reliable using technology such as transit-priority signals that sense approaching buses and hold the green light a few seconds longer (or, in rare cases, that turn a red light green).
- **Station-like stops.** Full BRT stops are more like light rail stations than local bus stops, with amenities including real-time arrival information, maps, and ticket vending machines for prepaid boarding. Stops may also have raised platforms to enable level or near-level boarding. Together, prepaid boarding and level boarding can greatly speed up the loading and unloading process, further improving speed and reliability.

Figure 5-7 Elements of a Typical BRT Station



- **High-capacity vehicles.** While some BRT lines deploy regular 40-foot coaches, many use 60-foot articulated vehicles that have an open seating configuration with more standing room and overall capacity. Sixty-foot vehicles may have three or even four doors to speed loading and unloading, and in rare cases, doors are located on both sides of the vehicle, allowing for stops on either side of the street. The latter is typically found where there are median- or center-running bus lanes with bidirectional center-island platforms.
- **Custom branding.** Light rail vehicles and streetcars are highly visible, partly due to the vehicles themselves, but also because they run on clearly visible tracks with overhead wires. Since BRT lacks these distinctive elements, transit agencies employ custom branding to distinguish BRT from local buses and to raise awareness of BRT's improved service. This branding can be applied not only to vehicles and stops, but to websites, marketing materials, and all of BRT's public-facing physical or digital elements. Increasingly, bus lanes are painted—often bright red—to differentiate them from regular traffic lanes and further increase visibility.
- **Higher levels of service.** Like light rail or streetcar lines, BRT lines are typically frequent, although less robust lines may not be available evenings or weekends. Thanks to the measures described above, BRT is also more reliable than regular bus lines. Real-time arrival information displayed at stops and on smartphone apps can further reduce both actual and perceived wait times, while features such as level boarding (eliminating the need to climb stairs or mechanically raise platforms) and larger vehicles make BRT more comfortable. Service can further be improved using operational techniques such as headway-based scheduling, which simply schedules buses to arrive every 10 or 12 minutes rather than at than at an exact time. Such scheduling is made possible by frequencies of

less than 15 minutes, eliminating the need for riders to consult a schedule before heading to the bus stop.

BRT provides greater flexibility than rail in other ways. One major advantage is that buses can operate as BRT for part of their routes and as regular local or express service in other segments (in outlying areas, for example). This, in turn, can allow many regular bus routes to take advantage of BRT improvements once they enter a busway or bus lanes, leveraging the BRT investment and extending the reach of enhanced service.

Another advantage of BRT is its lower cost. Depending on which tools are used, BRT can cost anywhere from a few hundred thousand dollars a mile for basic service to many millions of dollars to more closely resemble light rail. All else being equal, however, BRT will always cost less than rail, since tracks and overhead wires are not required. Moreover, BRT lines have consistently increased ridership substantially over the local bus lines they replaced, resulting in high cost-benefit ratios and return on investment.

For these reasons, partial and full BRT is becoming increasingly common in North America. Rapid bus lines in Southern California include OCTA's Bravo! and Los Angeles County's Metro Rapid (both rapid bus services). Full BRT examples include the Metro Orange Line in the San Fernando Valley (featuring a dedicated busway); and Omnitrans' sbX service in San Bernardino (featuring bus-only lanes).

Figure 5-8 Regular Bus vs. Rapid Bus vs. Bus Rapid Transit

Source: Nelson\Nygaard

Express Bus

Express bus service is, as its name suggests, faster than local bus service. While BRT uses a suite of tools to provide a faster service, express buses are faster for two simple reasons: they make fewer stops and they generally operate in high speed rights-of-way. Designed to serve commuters, express buses typically operate only during weekday rush hours. Stops are at regular bus stops or at park-and-rides. Vehicles range from regular buses to Greyhound-like over-the-road coaches with more comfortable high-back seating.

Figure 5-9 Sound Transit Freeway Express

Source: Flickr user Atomic Taco

To increase speed, express bus routes often operate on highways. They sometimes operate in high-occupancy vehicle (HOV) lanes, although doing so may require merging across multiple lanes to make stops. In some cases, express buses solve this problem by running on the shoulder; this has been standard in the Minneapolis/St. Paul area for decades, and is used on a limited basis in the San Francisco Bay Area. Alternately, stops can be built in the median of the freeway, typically connected to park-and-ride facilities using pedestrian bridges; this configuration is used in the Seattle area. A third option is to use bus-only "slip ramps" to access stops beside the freeway without having to travel over city streets; this approach is used in the Denver area. Freeway express routes with median stops or slip ramps are sometimes referred to as "freeway BRT," since they make use of bus-only infrastructure.

OCTA currently operates eight express bus routes, several with long freeway segments. Of all high-capacity transit modes, express bus routes are the cheapest to implement, as they require limited infrastructure. However, because they are designed for specific types of trips (e.g., commutes to work), they are of limited utility for people taking trips outside of the standard peak hours. The exception to these lower costs is unidirectional services operating only during peak periods; they are relatively expensive to operate, as they must deadhead back to their starting point in the reverse direction.

ACCESS AND LAND USE FOR HIGH-CAPACITY AND RAPID TRANSIT

Transit service and infrastructure do not exist in isolation; rather, they are part of a larger, multimodal transportation system. The extent to which transit is effectively integrated with other elements of the system goes a long way toward determining its success.

As discussed in Chapter 5, transit and land use are strongly interrelated. This chapter discusses both transit access and transit-oriented development in more detail.

Complete Streets

Complete streets are designed and operated to safely accommodate people of all ages and abilities. This principle holds true regardless of activity:

- Walking, bicycling, or riding public transit

- Driving or riding in motor vehicles, including taxis and other shared mobility services
- Operating freight or delivery vehicles

Complete streets support transit access and operations, as every transit trip starts with a trip by some other mode. Most transit passengers are pedestrians first, others access transit by bike, and others park a car or are dropped off at a transit stop. Complete streets provide safe walking and bicycling facilities and support the safe and efficient operation of transit, including high quality bus stops and passenger facilities, transit priority treatments, and other design elements that prioritize moving people over moving cars.

The National Complete Streets Coalition describes incomplete streets as “a hindrance to [transit] riders” and to “good service.” Poor design slows service and discourages people from riding transit. Even though most transit riders begin their trips on foot, there is often a disconnect between road planning and transit planning. In many cases, this leaves transit riders waiting without shelter on a patch of dirt, and often along a high-traffic street with no sidewalks or safe crossings.

In contrast, complete streets make transit safe, convenient, and comfortable. The Coalition notes, “complete streets policies help create the safe and comfortable bus stops and smooth predictable transit trips that help make public transportation an attractive option.”

Benefits of Complete Streets

Complete streets ensure safe and convenient access to public transit for all people. Complete streets include safe and comfortable bus stops and smooth, predictable transit trips that help make transit an attractive travel option. Although the addition or improvement of sidewalks and bikeways are often the biggest physical changes necessary to build a complete street, true complete streets projects also enhance transit service. Major transit benefits of complete streets include the following:

- Improve transit speed and on-time performance by reducing the amount of time buses are stuck in traffic
- Improve access and safety for riders by enhancing first-/last-mile connections to transit services
- Provide space along the street for comfortable transit stops or stations with amenities
- Encourage mixed-use, transit-oriented development that can increase the demand for transit
- Promote economic development by making it easy to cross the street, walk to shops, and bicycle to work
- Improve safety for all people by reducing motor vehicle speeds, intersection crossing distances, and potential conflicts and collisions

Examples of Complete Streets

A truly complete street must accommodate the access, mobility, and safety needs of all travelers. For example, a bus stop located far from a safe crossing can put transit riders in danger. Similarly, a sidewalk without curb ramps is useless to someone in a wheelchair. A road with heavy freight traffic must have sufficiently wide lanes and intersections designed to accommodate turning trucks. Accessibility and mobility for automobile drivers and passengers must also be considered in planning for complete streets, as many changes made to better accommodate non-auto modes of transportation will also improve conditions for personal vehicles. Ensuring that streets are designed and operated to safely accommodate all these interests requires that multiple agencies and stakeholders work together, with a clear and consistent set of priorities.

Figure 5-10 Concept for a Complete Street in Santa Ana

Cities and counties around the country—small and large, rural and urban—have been building complete streets to improve comfort, convenience, and safety, and to increase people's ability to travel by a variety of modes. The photos below illustrate complete streets projects in various contexts.

Figure 5-11 Complete Streets in Kirkland, Washington (Before and After)

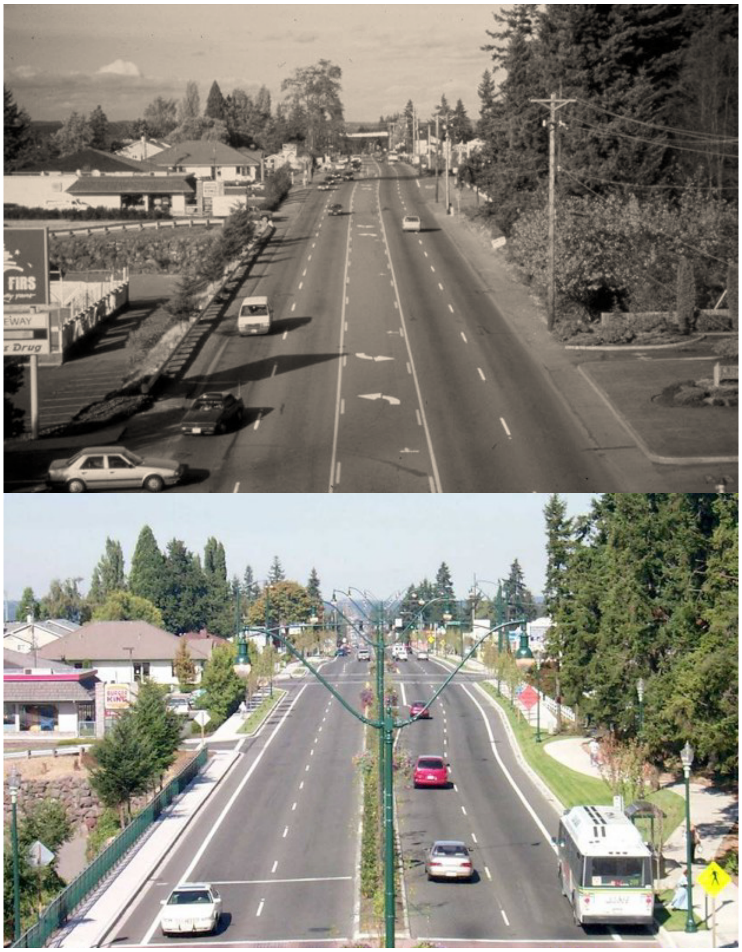


Figure 5-12 Complete Street in Lee County, Florida

When constructed, the LCCSI will transform auto-oriented roads into complete streets that serve all users, as in this rendering of one of the LCCSI projects on Colonial Boulevard, providing new walking and bicycling infrastructure, transit amenities, and wayfinding.

Best Practice: Training and Implementation

Chicago, IL

The City of Chicago adopted a Complete Streets policy in October 2006. To help staff understand and implement the policy, the Chicago Department of Transportation worked with the Chicago Metropolitan Agency for Planning to sponsor a series of training sessions for city planners, engineers, and project managers. Several hundred people participated in four two-day workshops, resulting in a greater awareness of Complete Streets issues and increasing understanding of potential design considerations.

In 2013, Chicago published its Complete Streets Design Guidelines, another implementation tool to help staff operationalize Complete Streets in all phases of a project including planning, design, construction, and maintenance.

Source: Complete Streets: Best Policy and Implementation Practices, Chapter 5, 2013.

Process for Developing Complete Streets

There are four steps to ensure the successful implementation of complete streets:

1. Adopt a complete streets policy
2. Change your practices to implement the policy
3. Follow those new practices and design context-sensitive complete streets
4. Monitor the performance of complete streets projects to ensure they work

Step 1: Policy Development

Complete streets start with a strong, locally-driven policy statement, making explicit the intent to safely accommodate all people in decisions related to street design and operation. A clear policy statement provides guidance for planners, engineers, and community members and can also provide necessary political and institutional momentum for implementation. According to the National Complete Streets Coalition, a comprehensive complete streets policy incorporates the following elements:

- Specifies that "all users" includes pedestrians, bicyclists, and transit passengers of all ages and abilities, as well as trucks, buses, and automobiles
- Applies to new and retrofit projects (including design, planning, maintenance, and operations) for all roads
- Makes any exceptions specific, requiring both clear procedures and high-level approval
- Encourages street connectivity and aims to create a comprehensive, integrated, connected network for all modes
- Directs the use of the latest and best design criteria and guidelines while recognizing the need for flexibility
- Directs that solutions will complement the context of the community
- Establishes performance standards
- Includes specific next steps for implementation of the policy

Orange County has its own recently adopted complete streets policy—the Orange County Complete Streets Initiative—developed by the Orange County Council of Governments.

Step 2: Implementation

Once a strong complete streets policy is in place, the next step is to ensure it moves from paper into practice. An implementation plan is necessary to identify documents and processes that must be changed, assign responsibility for making such changes, and define specific desired outcomes of policy implementation.

One of the biggest challenges is changing "business as usual" practices in transportation budgeting, programming, and street planning, design, and operations. Implementation plans can help guide planners and engineers through new procedures and ways of thinking. Some communities have used procedural training to empower agency staff and ensure they understand how to apply the new policies, practices, and procedures in their work.

Step 3: Designing Complete Streets

Accommodating safe access along and across all streets for people traveling by all modes of transportation can be achieved with a variety of different types of design treatments and street operations. An effective complete streets design is sensitive to community context. Clear guidance for context-appropriate application of complete streets principles can allay fears that "complete streets" will mean inappropriately wide roads in quiet neighborhoods or miles of costly, little-used sidewalks in rural areas. The table below (Figure 5-11) highlights a selection of complete streets treatments that can facilitate access and mobility for people walking, cycling, or riding transit.

Ultimately, a context-sensitive approach to complete streets planning and design can create a comprehensive, integrated, connected network for all modes that recognizes the need for flexibility in balancing community needs.

Complete streets guidance for Orange County can be found in the OCCOG Complete Streets Initiative Design Handbook.

Figure 5-13 Transit-Supportive Complete Streets Design Treatments

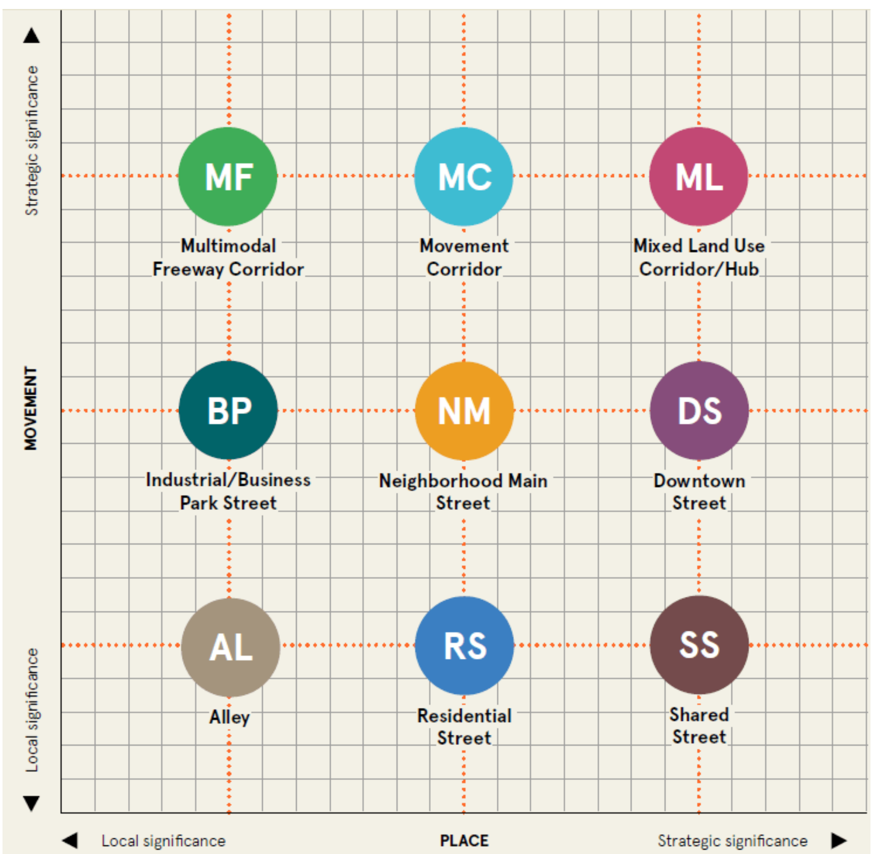
Transit-Supportive Complete Streets Design Treatments		
 Right Sizing Arterial and Collector Streets ▪ Conversion from 4 to 3 lanes; allows addition of center turn lane, bikeways ▪ Improves safety by reducing pedestrian crossing distance and reducing potential conflicts ▪ Appropriate and can maintain vehicle street capacity up to 25,000 vehicles per day	 Median Refuge ▪ Enables safer pedestrian crossing, with shorter crossing distances	 Curb Extensions ▪ Supports safer pedestrian crossings ▪ Provides space for high-capacity bus stops/shelters ▪ Enables more efficient in-lane bus stops
 High Quality Bus Stops and Stations ▪ Spacious and set back from sidewalks to maintain pedestrian walkway ▪ Amenities, including shelters, benches, line and system maps, trash bins, and real-time bus arrival information	 Transit-Only/BAT/HOV Lanes ▪ Maintains speed and reliability on corridors with high frequency service and transit priority ▪ Business Access and Transit (BAT) lanes are dedicated to buses and right-turning traffic ▪ High Occupancy Vehicle (HOV) lanes are viable on some arterials	 Transit Stop Islands ▪ Transit stop/waiting area located in travelway, with bikeway located between transit stop and the curb ▪ Completes the street on corridors with separated bikeways and frequent transit service ▪ Eliminates bus/bike conflict near stops

Step 4: Monitoring Progress

Progress monitoring and adaptation are necessary to ensure effective and consistent implementation of complete streets policies across all agencies and all types of streets. Some communities use quantitative and qualitative performance indicators to gauge how a particular street, street segment, or the entire street system is working. There are several approaches:

- Performance measures can be used for needs assessment to identify problems in the system and to assess their relative severity. For example, in Roanoke, Virginia, planners developed a scoring system for major streets that takes into account safety, connectivity, and design, as well as the presence of street trees, stormwater and drainage issues, and the availability of sufficient right-of-way to accommodate all modes.
- A related approach is to develop a classification system that assesses a street's appropriateness for complete streets treatments. The street typology or categorization system developed for the OCCOG Complete Streets Design Handbook is shown in Figure 5-12. For each street type, a distinct design approach is recommended.
- Finally, some places have developed a comprehensive monitoring system that tracks a suite of performance indicators for the transportation system on a regular basis. For example, Redmond, Washington, uses a Mobility Report Card with over 15 indicators to spot trends and track progress toward goals.

Figure 5-14 OCCOG Street Categorization System

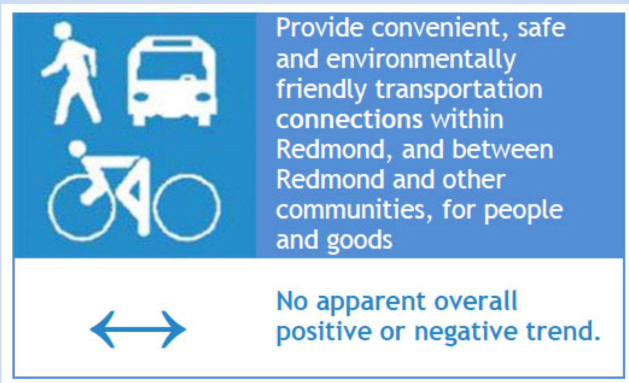


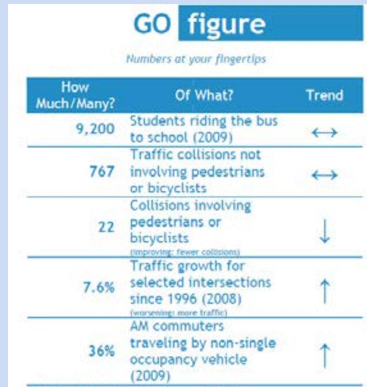
Source: OCCOG

Best Practice: Complete Streets Standards and Indicators

Redmond, WA

In September 2007, Redmond became the third community in the Central Puget Sound Region to adopt a Complete Streets ordinance. The ordinance codified the steps Redmond had already taken in its comprehensive plan and transportation master plan (TMP) to create a balanced, multimodal transportation network. Redmond is a suburban-style community that is using Complete Streets to build support among constituents and elected officials.





GO figure

Numbers at your fingertips

How Much/Many?	Of What?	Trend
9,200	Students riding the bus to school (2009)	↔
767	Traffic collisions not involving pedestrians or bicyclists	↔
22	Collisions involving pedestrians or bicyclists (improving: fewer collisions)	↓
7.6%	Traffic growth for selected intersections since 1996 (2008) (worsening: more traffic)	↑
36%	AM commuters traveling by non-single occupancy vehicle (2009)	↑

In the TMP, Redmond created a mobility report card measuring a variety of indicators: concurrency (between land development and transportation system capacity); a.m. mode share; school bus ridership; public transportation travel time and service frequency; average weekday boardings on public transportation; service hour targets for local public transportation; p.m. peak-hour vehicle miles traveled; average traffic growth by transportation management district; percentage of pedestrian environment designed to "supportive" standards; completion of the bicycle network; number of vehicle, pedestrian, and bicyclist collisions; and status of the Three-Year Priority Action Plan. This information is used to evaluate the performance of each mode, including transit.

Source: Chapter 5 of Complete Streets: Best Policy and Implementation Practices, 2013.

Multimodal Access

Every transit trip starts and ends with a trip by another mode. Providing safe, convenient, and comfortable access to transit stops and stations is fundamental to serving existing transit customers and attracting new riders. Seamless and integrated pedestrian, bicycle, drop-off, and parking infrastructure supports all forms of multimodal transportation, including walking, biking, car sharing, carpooling, and park-and-ride facilities.

Current conditions in parts of Orange County make access to transit a challenge for many people. Wide roadways with no pedestrian crossings, limited sidewalks, and a lack of bicycle infrastructure can make it difficult for people to reach transit.

By working with municipal partners to improve connections and access to transit for people of all ages and abilities traveling by all modes of transportation, OCTA can help increase transit ridership and make transit a more attractive choice for more people.

Types of Access to Transit

There are five primary ways people access transit:

1. Connecting/transferring from other transit routes
2. Walking (including using a mobility device, such as a wheelchair)
3. Bicycling
4. Getting dropped off (either by a partner, family member, friend, taxi, or TNC vehicle); and
5. Driving and parking a vehicle.

In addition, mobility hubs at transit stations and transfer centers provide additional connectivity options, such as car sharing and enhanced bike stations featuring amenities such as bike repair and rentals, secure parking (lockers or staffed valet), and bike-share pods. This section focuses on walking, biking, pick-up/drop-off, and park-and-rides.

Pedestrian Access

A good pedestrian environment is an essential foundation for good access to public transit. As such, it is critical for attracting new riders, increasing ridership among existing passengers, and improving the overall travel experience. The quality of the pedestrian environment is often a deciding factor in choosing whether or not to take transit, especially for those with other options.

Figure 5-15 High-Quality Pedestrian Environment (Lowell, Massachusetts)

Source: Nelson\Nygaard

Pedestrian access to transit refers to the extent to which the pedestrian environment, amenities, and infrastructure support people in accessing transit services. Well-designed, pedestrian-oriented infrastructure increases the safety, comfort, and enjoyment of the entire transit trip. Gaps in the sidewalk network, stops along high-speed roads, and insufficient waiting areas all contribute to less attractive transit facilities and can deter transit riders.

Bicycle Access

The quality of bicycle amenities, facilities, and the environment affect access to transit. Improving bicycle access to transit supports existing ridership levels and attracts new transit passengers by providing additional connectivity to other modes and enhancing the overall travel experience. Targeted coordination of policies, programs, and implementation among agencies and private entities is required to successfully integrate these modes of travel. Bicycle access strategies include safe travel conditions to access transit via on-street facilities or trails, stop amenities such as bike parking, and integration with transit vehicles.

Figure 5-16 Bus/Bike Integration (Seattle)

Source: Nelson\Nygaard

Passenger Pick-up and Drop-off ("Kiss-and-Ride")

Many railway stations and airports feature an area in which cars can drop off and pick up passengers. These "kiss-and-ride" facilities allow drivers to stop and wait, instead of using longer-term parking associated with park-and-ride facilities. A passenger drop-off at a transit stop or station is another important way that people access transit. Especially in cases where people cannot reach a transit stop on foot or by bike, a family member, friend, or carpool might help to make that connection. Ensuring that transit stops and stations have safe, convenient, and well-marked areas for drop-offs is important and can be accomplished through station and stop design, including wayfinding.

Park-and-Ride

Park-and-ride lots are parking lots or parking garages used by transit riders or carpoolers. Park-and-rides are primarily used by traditional commuters who park in the morning, board a transit vehicle, and return in the evening. Park-and-rides can be served by a single route or by multiple routes. Carpoolers and vanpoolers may also use park-and-ride lots to meet and start their trip. Park-and-ride lots might be owned by the transit agency, or the agency might have an agreement with a private operator to allow transit customers to use the lot.

Figure 5-17 OCTA Park-and-Ride

The Importance of Connections

Regardless of the mode of transportation a person uses to access a transit stop or station, the connection must be safe, convenient, and legible.

- **Safe.** Safe connections are those that do not put people on foot or on bike in danger of collision with a motor vehicle. This means providing the right facilities, both along the roadway and across it. Safe connections are also those that make people feel secure, with good lighting both at transit stops and along the way to the stop. This can also mean providing secure bicycle parking at stops and stations so that passengers aren't worried about their bicycle getting stolen while they are on their transit trip.
- **Convenient.** People must find their multimodal connections to transit convenient, otherwise they are unlikely to use transit if other options are available. For example, if a person has to walk five blocks out of their way to reach a signal in order to cross the street to the transit station, they are less likely to walk to the transit station. And if people who want to use a park-and-ride facility can't find the lot or don't know which spaces are available for transit riders, they are likely to just stay in the car rather than trying to use transit for part of their trip.
- **Legible.** When multiple modes come together, it is important that everyone can easily find the areas they need to use and access. Wayfinding is important for improving pedestrian and bicycle access to transit stops and stations, but good signage at the stop is equally important. Someone being dropped off at a transit station should be able to tell very easily where they can get out of the vehicle and then reach their bus. And a commuter using a park-and-ride lot should be able to quickly identify where they should park so they don't get a ticket during the day.

Pedestrian Connections

Pedestrian infrastructure includes an array of amenities and improvements, such as wide and textured sidewalks, level boarding features, curb ramps, benches, lighting, building overhangs, travel information, wayfinding signage, and bus shelters. When well designed, these types of pedestrian infrastructure can help to increase the safety, comfort, and enjoyment of the entire transit trip and promote access to transit. The quality of the pedestrian environment is also influenced by the presence of street trees and landscaping, active retail uses at street level, outdoor café seating, and public art.

By requiring that transit facilities, infrastructure, and equipment be accessible to all people, the Americans with Disabilities Act (ADA) ensures that a certain baseline of accessibility must be met. However, many cities and transit authorities are working together to provide higher quality pedestrian amenities and greater levels of accessibility than required by ADA to create transit-supportive environments.

Cities have found by focusing on pedestrian improvements at transit facilities and beyond can be an effective way to increase transit ridership. Studies report improving pedestrian conditions can decrease the frequency of short automobile trips and increase transit mode share. Research by the Transit Cooperative Research Program (TCRP) found many pedestrians are willing to walk between one-half and one mile to access transit. Walkable communities also provide public health benefits by increasing physical activity.

Designing Streets for Pedestrians

Examples of infrastructure and amenities that can help to improve pedestrian access to transit are described below. Not every transit stop or station needs all of these improvements to be accessible; however, a sidewalk or walking path and a safe crossing are critical for all types of stops and stations.

- **Wide Sidewalks.** Continuous sidewalks should be at least 4 feet wide and seamlessly connected to the sidewalk network in the area. A wide and accessible sidewalk network should be complete within a half-mile of every transit stop and station.
- **Curb Extensions.** Streets that have on-street parking typically have a required set-back from an intersection to increase visibility. This "dead space" at the intersection can be rededicated to expand the pedestrian realm and reduce crossing distance. Curb extensions also improve pedestrian and motorist sightlines at intersections and help manage vehicle turn speeds.
- **Pedestrian Refuges.** Refuges should be used where there is higher volume automobile traffic or higher speeds and in wide intersection crossings (e.g., 6 to 8 lane arterial). Examples include pedestrian refuge islands, medians, bollard or planter protection, on-demand push button pedestrian crossing lights, and curb extensions and bulb-outs.
- **Well-Marked Crossings.** Transitions and street crossings should be well-marked and preferably include high-visibility and/or raised crossings (also known as speed tables) that prioritize pedestrians. Raised crossings are better for people walking and rolling and also serve as a traffic calming measure.
- **Traffic Signals.** All signals should have a pedestrian countdown and, if necessary, a push-button to allow a pedestrian to request a crossing. Pedestrian-only crossing phases, as used in scramble (diagonal) crosswalks, at very busy locations—such as downtown—allow pedestrians to cross an intersection in any direction. Leading pedestrian intervals give pedestrians a few seconds of "head start" to claim the crosswalk ahead of turning traffic.

Best Practices in Pedestrian Access and Connections

Pedestrian Scramble (Orange, CA)

Curb Extension, Signal, Ramp, and Landscaping (Indianapolis, IN)

Pedestrian Refuge (Tucson, AZ)

Best Practices in Pedestrian Access and Connections

Marked and Signed Crossing to Transit Stop (Atlanta, GA)

Accessible Crossing (West Windsor, NJ)

- **Traffic Calming.** Vertical and horizontal traffic calming can greatly improve the quality of the pedestrian environment. These features include road diets, speed bumps, speed tables, raised intersections, diagonal diverters, chicanes, traffic circles, shared streets and other measures designed to discourage speeding by encouraging or requiring drivers to slow down.
- **Universal Design and Accessibility.** Intersections should provide facilities that can safely move people of all ages and abilities across the street. Design elements like curb ramps, level landings and gutter seams, visible and audible signals, smooth surfaces, accessible push buttons (or default WALK phases), and signs that help pedestrians navigate intersections should be integrated into intersection design.
- **Lighting.** Well lit crosswalks and sidewalks provide increased safety and security. In areas with many pedestrians, lighting at the pedestrian scale should be considered to better light sidewalks and walkways.
- **Wayfinding.** Street signs, maps, and unique area treatments—such as historical displays and public art—help pedestrians orient themselves and create interest and comfort. Streetscapes that are inherently easy to navigate invite travel by foot and make driver and pedestrian behavior more predictable and safer.
- **Land Use, Landscaping, and Amenities.** The environment beyond the street is also important to provide a comfortable and inviting pedestrian environment. Street trees and landscaping are another element of a walkable environment. Especially in warmer climates, such as Orange County, adding trees reduces the urban heat island effect and makes walking to transit stops and waiting for transit far more pleasant. Amenities include benches and drinking fountains, street-fronting doorways and windows, and buildings designed with pedestrians in mind, including spaces for street-level retail, varied façades, and interesting architectural features.

Bicycle Connections

Connecting bicycle riders with transit routes significantly increases the geographic area that transit can serve. In many cases, bus stops are located further than the one-half to one-mile distance from home that most people are willing to walk to a bus stop. Bicyclists are willing to ride two to three miles to access transit, making bicycle access an effective way to extend the range of first-/last-mile connections to transit.[3]

Transit agencies are finding bicyclists are more willing to take transit when the systems provide bicycle amenities and market their services directly to them. The Portland Bureau of Transportation's Bicycle Program estimates providing improved access for bicyclists increases the capture area of transit investments twelve-fold. Working together, transit agencies and local jurisdictions that develop a comprehensive approach to improving bicycling conditions and amenities can attract additional transit riders at relatively minimal cost.

There are a number of street design features that cities can use to improve cycling safety and comfort, including bicycle lanes, bicycle boulevards, cycle tracks, improved crossing treatments, signage, and traffic calming features. Bicycle parking and end-of-trip facilities, such as lockers and showers, are also important to bicycle riders. Roadway design features geared toward pedestrians—such as lighting, shelters, wayfinding, and road diets—also support bicycle access to transit stops. Studies have found that neighborhoods with high degrees of walking have

Best Practices in Bicycle Access and Connections

Bicycle Wayfinding at Transit Station (San Francisco, CA)


"Floating" Bus Stop and Protected Cycle Track (Los Angeles, CA)

Metro Bikeshare (Los Angeles, CA)

[3] "Guidelines for Providing Access to Public Transportation Stations," Appendix B Assessment of Evaluation Tools, September 2011 http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_153AppendixB.pdf

higher levels of bicycling and transit use than those that don't.[4]

Designing Streets for Cyclists

Examples of infrastructure and amenities that can help improve bicycle access to transit are described below.

Best Practices in Bicycle Access and Connections

Two-Way Cycle Track (Washington, DC)

- **Bicycle Boulevards.** Bicycle boulevards are low-traffic streets that have been optimized for use by cyclists. A variety of traffic calming elements and signage are used to reduce car volumes and speeds, fostering a safe bicycling environment. Bicycle boulevards often include features that allow cyclists to continue through intersections, while cars are forced to turn, thereby reducing traffic volumes while allowing cyclists to proceed unimpeded. Bike boulevards may use sharrows or shared-lane markings that communicate the presence of bicyclists to drivers.
- **Bicycle Lanes and Boxes.** Bicycle lanes are another technique to provide dedicated space in the street for cyclists and to increase driver awareness to the presence of cyclists. Increasingly, cities are using colored pavement treatments to designate bike lanes, either by coloring the beginning of the lane or the entire lane. Colored lanes discourage drivers from entering the portion of the right-of-way dedicated for cyclists. Colored markings can also be used at key spots such as at intersections and turn zones where cars need to cross a bike lane. Bike boxes allow bicyclists to wait ahead of vehicular traffic at an intersection, which provides additional visibility and keeps cyclists out of the path of right-turning vehicles.
- **Cycle Tracks and Protected Bicycle Lanes.** Cycle tracks are bicycle lanes that are physically separated from traffic but are located in the roadway. Cycle tracks are increasingly common throughout the United States, with many cities taking a staggered approach to implementation by using pilot projects to test their designs. They provide a buffer from traffic that creates a much greater level of comfort and sense of protection for cyclists. Cycle track facilities are either paired one-way facilities on each side of the street, or wider, two-way facilities on one side of the street.

[4] Ibid.

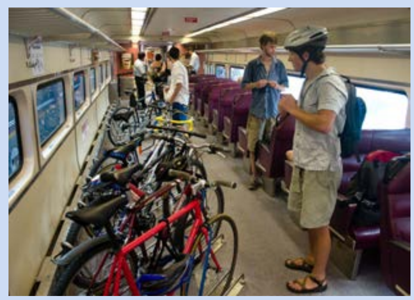
Connecting Bicycles and Transit Vehicles, Stops, and Stations

Using a bicycle to access transit provides the rider greater range and flexibility. While space on transit vehicles is often limited, having access to a bicycle at each end of the transit trip improves transit usability. Once cyclists reach a transit stop or station, they are typically faced with a decision to store their bicycle or bring it with them on transit. For many, weather protected and secure parking provides confidence that the bike is safe for an extended time is a critical design feature. Some riders also want or need to bring their bike on the transit trip to complete the other end of the journey. If a traveler is uncertain about the presence of bike parking facilities at the station or whether transit can accommodate their bike on board, they are less likely to choose a bike-to-transit journey.

- **Bicycles Racks on Vehicles.** Most transit agencies provide external bike racks on buses, typically in the front of the bus; OCTA provides dual bicycle racks on the front of each bus. These racks flip up against the bus when they are not carrying bikes. OCTA is moving towards implementing three-position bike racks. Bikes are only allowed onboard OCTA buses on the last trip of the day when the rack is full. Most transit buses don't have onboard space for bicycles given narrow aisles, but bus rapid transit vehicles may have more room to accommodate bicycles. In Washington state, Community Transit's SWIFT BRT vehicles have three doors, and bicycles can be rolled onto the bus and stored in onboard bike racks. Installation of onboard racks protects other riders by securing bikes, provides a more comfortable ride, and results in shorter dwell times at stops.
- **Bike Parking.** Providing bicycle parking at transit facilities is a critical element in achieving high levels of bicycle access to transit. Parking that is convenient, secure, weather-protected, and plentiful provides a measure of predictability and comfort for those who want to travel by both bike and transit. In Portland, TriMet's Bike and Ride facilities offer secure, enclosed bike parking that is accessed with a BikeLink keycard. In Long Beach, the BikeStation offers secure, staffed bike parking along with other amenities such as repair services, transit information, and electric vehicle recharging.

Best Practices in Bicycle Access and Connections

Bikes on Bus (Nashville, TN)



Bikes on Commuter Rail (Boston, MA)

Bike Hut (Santa Ana, CA)

Bike Lockers at DART Station (Dallas, TX)

- **End-of-Trip Facilities.** Weather—be it too hot, too cold, too humid, or too rainy—is a frequently cited reason people chose not to cycle. However, the problem is often not the lack of willingness to cycle in inclement weather, but the condition people end up in after biking through heat or rain. Developing facilities that allow people to store bikes out of the weather and to shower and change at workplaces can help overcome this barrier.

Kiss-and-Ride Zones

Kiss and ride is the term of art for a transit passenger drop-off zone. This activity typically occurs as close to the stop or station entrance as possible, with most drop-offs requiring only a few seconds. A designated kiss-and-ride location (such as a pullout) may not be necessary except for very busy transit facilities. However, at the other end of the commute, drivers often wait for arriving trains or buses for up to 15 or 20 minutes, potentially congesting station entrances and parking lots. Train stations especially can experience significant activity during peak hours, so planning for waiting vehicles is important.

Most major transit stations have some type of designated passenger drop-off and pick-up zone, although each agency and municipality handles such access needs differently. Metrolink stations in Orange County typically include kiss-and-ride zones.

Designing Kiss-and-Ride Areas

Kiss-and-ride areas include facilities for passenger drop-offs and pick-ups by automobile, as well as spaces for short-term parking. Considerations for designing kiss-and-ride areas are described below:

- A curbside lane for a taxi stand, private shuttle buses, and automobiles should be located closer to the station entrance than short-term parking, ideally within 600 feet of the entrance.
- Separate modes whenever possible. Kiss-and-ride vehicular traffic should not be routed through park-and-ride areas or vice versa. Pedestrian and bicycle access to the station should not be impeded by a kiss-and-ride area.
- Design to maximize vehicle turnover, facilitate traffic flow, and avoid traffic conflicts. The area should typically be designed for one-way traffic flow and allow for recirculation.
- For optimum function, the facility should have a direct visual connection with the station entrance, so a driver waiting in an automobile can quickly locate their passenger exiting the station.
- Design a facility that is convenient for both pedestrians and automobiles. Neither transit riders nor motorists and taxis will use inconvenient, congested, or remote kiss-and-rides. They will find another location near the station entrance, a location that may cause undesirable conflicts with other traffic, including transit.

Park-and-Ride Facilities

Park-and-rides are ideal for communities where a large number of drivers travel to a limited number of concentrated areas (such as downtowns, civic centers, or office parks). Park-and-rides reduce demand for parking in these areas, decrease roadway congestion, and decrease the operational costs of providing transit service to dispersed residential communities on the edges of urbanized areas.

Park-and-rides work well at attracting riders who have other travel options and people who primarily use automobiles to access transit. These facilities are best located away from urban cores and in lower density areas (four to five dwelling units per net acre).[5] OCTA has a number of park-and-ride facilities throughout the county. These are described in the "Facilities" section of Chapter 3.

Designing Park-and-Rides

For a park-and-ride facility to maximize the number of riders it will attract, it must be conveniently located and easy to find, provide adequate parking, and feel safe and secure.

- **Convenient Location.** Park-and-rides should be located close to freeways and arterial roads to provide easy access for passengers and transit vehicles alike. If a passenger has to travel out of his or her way to reach a park-and-ride lot, the likelihood of that person using transit significantly decreases. A park-and-ride lot located along a person's natural path of travel is another encouragement to park the car and try the transit service.
- **Easy to Find.** A park-and-ride facility should be designated on a transit or route map, with a specific address whenever possible. The facility should be well signed, making it easy to identify the proper place to park and the right place to wait for the bus.

Best Practices in Bicycle Access and Connections

Dedicated Park-and-Ride Facility (Contra Costa, CA)

High Quality Shelters at Park-and-Ride (Cummings, GA)

Accessible Features at Park-and-Ride Lot (Gallatin, TN)

[5] TCRP Report 165. Transit Capacity and Quality of Service Manual, Third Edition. 2013.

Particularly with shared-use lots, it must be easy for transit riders to understand which spaces are for their use.

- **Adequate Parking.** Whether a shared-use facility or a dedicated facility, a park-and-ride must have adequate space. If a person attempts to use a park-and-ride and consistently finds it full, he or she will likely stop attempting to ride transit, vanpool, or carpool. If space is limited and all transit customers cannot be accommodated, park-and-ride facilities may need to charge for parking or consider a permit program.
- **Safe and Secure.** Shelters and amenities should protect passengers from the elements. Lighting of transit facilities and the full parking area helps passengers feel secure. Park-and-ride users need to feel confident their personal vehicles will be secure.

Transit-Oriented Development

Transit demand is strongly related to development patterns and, in particular, development density. In areas with denser development and more people and employees, transit can be provided in close proximity to many people. Combined with a good pedestrian environment, transit can become very convenient and well used.

Transit-oriented development (TOD) is land development located near transit stations or stops that includes a mixture of housing, office, retail, and sometimes other amenities integrated into a walkable neighborhood. TOD leverages the access transit provides to regional destinations and focuses development in close proximity to those places.

At its most basic, TOD is a mixed-use community that encourages people to live near transit and reduces their dependence on driving. The most effective TOD is located less than a half-mile (roughly 10 minute) walk from a transit stop or station. TOD strives to give people choices in how they travel, minimizing the impact of traffic in their lives and creating a sense of community and place.

The characteristics of TOD are represented in the graphic below; putting these principles into practice can help to create transit-supportive communities that integrate transportation and development. TOD features vibrant streetscapes, pedestrian-oriented buildings, and land use characteristics that make it convenient and safe to walk, bike, and use public transit.

Figure 5-18 Eight Principles for Transit-Oriented Development

Source: Institute for Transportation & Development Policy (ITDP)

TOD Benefits

The primary goal of transit-oriented development in most communities is to build upon transit investments by creating development that supports ridership. However, TOD also provides a number of secondary benefits to transit agencies, communities located close to transit, and the larger metropolitan region. Some of the benefits of TOD include the following:

Figure 5-19 Transit-Oriented Development (Salt Lake City)

- More sustainable and efficient use of land, energy, and resources
- Increased transit ridership and fare revenue
- Potential for added real estate value created through increased or sustained property values where transit investments have occurred
- Reduced household driving and, thus, lower regional congestion and transportation expenditures
- Improvements to air quality and reduced greenhouse gas emissions due to fewer miles driven
- Walkable communities that accommodate healthier and active lifestyles
- Improved access to jobs and economic opportunity for low-income people and working families
- Concentrated development and activity that allows for community reinvestment

To achieve these benefits, development must be truly transit-oriented rather than just transit-adjacent. The differences between these two types of development are described below.

Figure 5-20 "Transit-Oriented" vs. "Transit-Adjacent" Development

Transit-Oriented Development	Transit-Adjacent Development
▪ Grid street pattern ▪ Higher densities ▪ Limited surface parking and efficient parking management ▪ Pedestrian- and bicycle-oriented design ▪ Mixed housing types, including multifamily ▪ Horizontal (side-by-side) and vertical (within the same building) mixed use ▪ Office and retail, particularly on main streets	▪ Suburban street pattern which are non-grid, disconnected including cul-de-sacs ▪ Lower densities ▪ Dominance of surface parking ▪ Limited pedestrian and cycling access ▪ Mainly single-family homes ▪ Segregated land uses ▪ Gas stations, car dealerships, drive-through stores and other automobile-focused land uses

Source: John Renne (2009), "Measuring the Success of Transit Oriented Development," in Transit Oriented Development: Making It Happen, Carey Curtis, John Renne and Luca Bertolini (Eds.) Ashgate (www.ashgate.com), pp. 241-255.

Characteristics of Transit-Oriented Development

A successful transit-oriented development reinforces both the community and the transit system. There are six factors that influence transit demand—the "6 Ds"—and these are integral parts of TODs. Creating a mix of uses within a development promotes activity throughout the day and into the evening. This, in turn, promotes the most efficient use of the transit system: travel in both directions, throughout the day.

Figure 5-21 The "6 Ds" of Transit Demand

6D Factor	Principle
Destinations	Align major destinations along reasonably direct corridors served by frequent transit
Distance	Provide an interconnected system of pedestrian routes so that people can conveniently access transit
Density	Concentrate higher densities close to frequent transit stops and stations and multimodal nodes
Diversity	Provide a rich mix of pedestrian-friendly uses to support street-level activity throughout the day and night
Design	Design high-quality pedestrian-friendly spaces that connect people seamlessly to transit
Demand Management	Provide attractive alternatives to driving by managing parking, providing incentives not to drive, and/or providing programs to help educate people about driving alternatives

Rendering from City of Santa Ana Harbor Mixed-Use Transit Corridor

Source: City of Santa Ana

TOD in Orange County

TOD has recently become increasingly common in Orange County, in areas including Downtown Santa Ana and Anaheim's Platinum Triangle.


Apartments Near Fullerton Transportation Center

Source: Driver Urban

Santa Ana's Harbor Mixed Use Corridor Specific Plan identifies opportunities for urban and transit-oriented mixed-use development and more affordable housing along key transit corridors such as Harbor Boulevard. The plan is intended to promote a vision of Harbor Boulevard as a place for people and a place for connections, including new high-quality transit service that connects people with local and regional job centers, Downtown Santa Ana, and other shopping and recreation destinations. The guiding principles of the plan are:

- Expanded development opportunities that respond to transit investments
- A variety of safe and efficient travel choices
- Economic vitality and new opportunities for businesses and residents
- Create a sense of place
- Community health and wellness

Anaheim's Platinum Triangle blends diverse employment and residential development with major attractions to create an important destination in the heart of Orange County. Urban development, guided by The Platinum Triangle Master Land Use Plan, is bringing high-density, mixed-use, office, restaurant, and residential projects to replace older industrial developments. Many different modes of transportation provide access to and within the Platinum Triangle, including a network of pedestrian-friendly local streets, bikeways, ARTIC (Anaheim Regional Transportation Intermodal Center), ART (Anaheim Resort Transit), and OCTA buses. The Platinum Triangle is supported by a Community Facilities District that helps to finance public infrastructure improvements.

Apartments in Platinum Triangle

Source: Avalon Communities

The "T" in TOD: High-Quality Transit Service

The type of transit that serves a transit-oriented development is less important than the quality of service provided. TOD is often found at subway stations—such as those in Atlanta, Chicago, and San Francisco—where riding transit is relatively easy and convenient. But TOD is also increasingly common around other forms of transit, such as light rail, commuter rail, bus stops, and ferry terminals. The key to this growth in TOD is ensuring the development is centered on high-quality transit service.

High-quality transit service is transit that runs 15 minutes or better during peak hours and at least every 20 minutes during off-peak periods, with service provided throughout the day, every day of the week. These frequencies are the level at which a person can generally expect to arrive at the transit station or stop, without knowing the schedule in advance, and only wait a few minutes for a bus or train.

Station and Stop Design

High-quality transit service found in conjunction with TOD is characterized by stops or stations that provide enhanced waiting areas and amenities for passengers. The transit station can function as a major stop for through service or as a transit center for several transit routes that terminate at the TOD.

The relationship between existing buildings, streets, and sidewalks to the transit station should be easy to navigate and provide direct paths. If needed, visual cues and placemaking can be used to orient people and show the way. Direct, attractive connections designed according to universally accessible design standards—without barriers or dead ends—should be provided.

Best Practice: Active Station Area Planning

Eastside Village, Plano, TX

Helping anchor the rebirth of Downtown Plano, Eastside Village is a $17.7 million high-density mixed-use project fronting directly onto Dallas Area Rapid Transit's (DART) light rail station plaza. The 3.6-acre, 245,000-square foot project features 234 apartment units and 15,000 square feet of ground floor retail. The three- and four-story building wraps around a 351-space parking structure. Eastside Village was the first major step to achieve the city's vision to "transform downtown into a compact, mixed-use, urban center consistent with the principles of new urbanism and transit-oriented design to enhance the community's quality of life and provide a model for sustainable development within a maturing suburban city."

The City of Plano provided the leadership to make the project happen. They advocated for the station location, saw an opportunity to marry development with the DART light rail platform, assembled the site, offered it for development, leased the land to the private developer, paid for public infrastructure and streetscape improvements, increased the allowable density, and waived fees.

Mix of Uses

A range of active land uses located close to the station entrance or transit stop will promote activity within the station area. Higher intensity development (such as office or residential buildings) with active ground floor uses (such as shops or restaurants) clustered within a short walk of station entries helps to promote transit ridership and create vibrant transit-oriented places. Generally, the highest density of buildings is located closest to the transit, with density stepping down farther away from the transit service. Many places have found locating employment closest to transit provides the greatest boost to ridership. A general rule is that for every 100 feet from the station, the share of office workers using transit drops by about one percent.

Special Types of TOD

Joint Development

Joint development is a form of TOD that is often project specific, taking place on, above, or adjacent to transit agency property. The most common joint development arrangements are ground leases and operation-cost sharing. Most often, joint development occurs at rail stations surrounded by a mix of office, commercial, and institutional land uses. However, examples of public-private joint ventures can be found among bus-only systems as well, normally in the form of intermodal transfer hubs joined with commercial and retail space at downtown bus terminals.

TOD Corridors

Many transit-oriented developments are centered around a specific station area or node of activity. However, TOD is increasingly being used as a viable corridor development strategy. As the examples below demonstrate, TOD can stretch over dozens of blocks, particularly around high-capacity corridors:

Figure 5-22 Hiawatha Corridor TOD (Minneapolis)

Source: Corridors of Opportunity

- **Houston.** The city of Houston anticipates several TODs will take form once the Main Street Corridor light rail system is completed.
- **Raleigh-Durham.** Triangle Transit Authority is planning several TODs along the axis connecting Downtown Durham to Downtown Raleigh. Town centers designed around rail stops are planned for the Cary, 9th Street/East Campus, and Alston Avenue stations.
- **Minneapolis.** The city and the Metropolitan Council have joined forces to prepare TOD plans for four station areas along the Hiawatha Corridor.

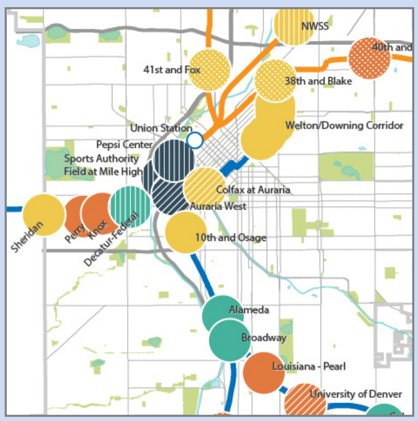
TOD Implementation Tools

Transit-oriented development should begin with an understanding of the types of stations and land uses along transit corridors in the system. Most often, the public sector takes the primary leadership role to advance TOD and then works with the private sector to commit to specific development projects. Public leadership is needed while a station area is being developed as well as throughout the life of the project.

Once a vision or policy is established, transit agencies and municipalities can use different strategies to implement TOD. Some of the most common are station typologies, station-area planning backed by appropriate zoning, policy incentives and regulations, TOD overlay zones, and transit real estate development departments.

Station Typologies

Some communities have found it helpful to identify the characteristics in their community that lead to successful TOD implementation and to proactively identify TOD-supportive station areas. Other communities have developed station typologies or different types of station areas that share similar characteristics. These similarities can help planners, residents, and elected officials quickly and easily understand what to expect in terms of the character, role, and function of each place.



TOD in Denver

Denver classifies each station area into one of five context types based on characteristics commonly found in places served by rail transit. The typologies provide a snapshot of aspirational character, set expectations for development, and establish a level of magnitude for possible investments.

For example, Reconnecting America's TOD guidance suggests eight typologies for transit stations:

- **Regional Center.** Regional downtowns with primary economic and cultural activities, often characterized by a dense mix of housing, employment, retail, and entertainment that cater to the regional market.
- **Urban Center.** The same mix of uses as a regional center, usually at slightly lower densities and intensities than in regional centers. Destinations draw residents from surrounding neighborhoods.
- **Suburban Center.** A suburban version of the urban center, likewise at lower intensities than regional centers.
- **Transit Town Center.** Local centers of economic and community activity that are less intense than either urban or suburban centers. They attract fewer residents from the rest of the region.
- **Urban Neighborhood.** Primarily high- to moderate-density residential areas mixed with local-serving retail. Well connected to regional centers and urban centers.
- **Transit Neighborhood.** Primarily residential areas that are served by rail or high frequency bus lines that connect at one location.

- **Special Use/Employment District.** A low- to moderate-density area, often focused around a major institution, university, or stadium.
- **Mixed-Use Corridor.** A focus of economic and community activity without a distinct center. These corridors are typically characterized by a mix of moderate-density buildings that house services, retail, employment, and civic or cultural institutions. Many were developed along streetcar lines.

Station-Area Planning

Every station area faces unique challenges requiring specially tailored strategies. Developing conceptual or specific plans for the areas around transit stations or stops lays out the basics—including zoning, design standards, parking requirements, and street connectivity—that will be needed for successful TOD. Detailed station-area plans help leverage the potential of TOD, particularly when there are significant development opportunities. Station plans often reflect the desired density, parking requirements, and land uses, sometimes even before the transit is in place:

Figure 5-23 Fruitvale Station Village (Oakland, California)

- **Sacramento.** The Sacramento Area Council of Governments defines a Transit Priority Area as an area within a half-mile of high-quality transit that provides or will provide at least 15-minute frequency service during peak hours by 2035.
- **San Diego.** The San Diego Association of Governments defines a high-quality transit area as a "generally a walkable transit village or corridor, with a minimum density of 20 dwelling units/acre, within a half-mile of a well-serviced transit stop with 15-minute or less service frequency during peak commute hours."

TOD Overlay Zones

Most local governments control permissible land uses, building setbacks, parking requirements, and allowable densities through zoning. Some communities have created *TOD Overlay Zones* that modify, eliminate, or add regulations to the base zoning around transit stations or in designated TOD-amenable areas. Overlays provide for effective land-use control that promotes transit-supportive developments without increasing regulatory complexity. An overlay district can also secure land for future transit and transit-oriented development. For example, the city of Seattle's interim overlay district prohibits automobile-oriented uses and lowers parking standards within a quarter-mile of proposed light rail stations, preserving future TOD opportunities.

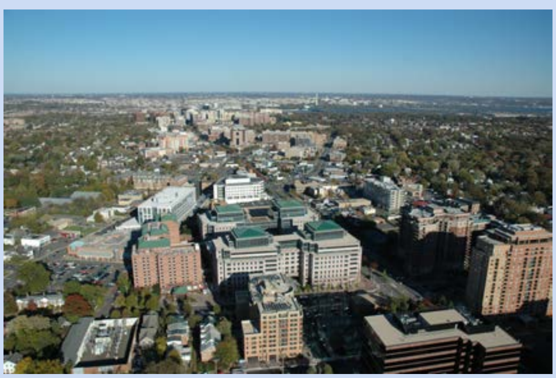
Transit Real Estate Expertise

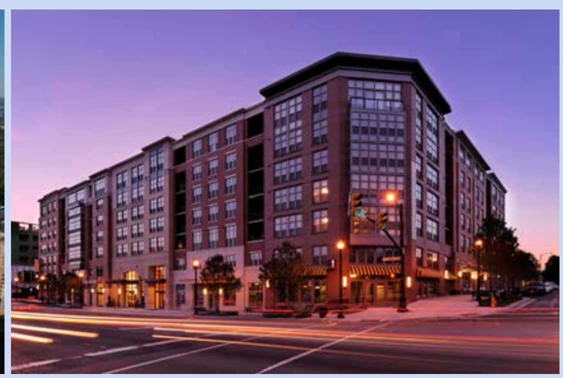
Transit agencies are vital to TOD since they control where, when, and even if rail and bus services are operated. And when it comes to joint development, transit agencies are at the front line of implementation, especially when agency-owned land and air rights are to be leased or sold. With TOD providing such benefits to transit, some large agencies have set up in-house real estate departments with dedicated staff to negotiate joint development deals and planners assigned to oversee TOD. Other transit agencies have part-time staff or consultants who focus on land use matters around stations and stops. Still others routinely review development proposals early in the process to ensure they are transit supportive. They also work with city planning departments and neighborhood groups on an ongoing basis as part of both short- and long-range transit planning.

Case Study: Rosslyn-Ballston Corridor

Arlington County, VA

The Rosslyn-Ballston Corridor is arguably the best TOD success story in the United States. Located directly across the Potomac River from Washington, D.C., Arlington County has become an increasingly popular place to live, work, and shop due in part to high-density development along the Rosslyn-Ballston corridor. Before development began, Arlington County adopted a General Land Use Plan to concentrate dense, mixed-use development. More detailed sector plans—which specify land use and zoning as well as urban design, transportation, and open space guidelines for the area a quarter-mile from each of the five stations in the corridor—ensure a distinct sense of community at each station. In addition to the countywide and station-area plans, specific enabling zoning bylaw language regarding density and setback configurations, circulation systems, and zoning classifications were changed. Developments that complied with these classifications could proceed through an expedited review process. The ability of complying developers to create TODs as-of-right was particularly important, for it meant that they could line up capital, secure loans, incur up-front costs, and phase in construction without the fear of local government "changing its mind."





Today, the roughly two square-mile Rosslyn-Ballston Corridor has mixed-use, infill development focused at five Metro stations, and density tapers down to residential neighborhoods. As of 2004, the corridor had over 21 million square feet of office, retail, and commercial space, more than 3,000 hotel rooms, and almost 25,000 residences, creating vibrant "urban villages" where people live, shop, work, and play using transit, pedestrian walkways, bicycles, or cars. The stations along the corridor have captured 26% of the residents and 37% of the jobs on just 8% of the county's land area. The station area boasts one of the highest percentages of transit use in the Washington, D.C. region with 39% of residents commuting to work on transit.

Source: City of Winnipeg TOD Handbook

TRANSIT FUNDING

The OC Transit Vision will recommend new transit projects, potentially including rail and bus rapid transit lines with significant capital costs, which may require funding from a variety of sources. Following are brief summaries of potential capital funding sources, including existing sources used in Orange County. Note that the funding context may change over time; state funding sources have evolved dramatically in recent years.

Federal Sources

On December 4, 2015, the Fixing America's Surface Transportation (FAST) Act (Pub. L. No. 114-94) was signed into law—the first federal law in over a decade to provide long-term funding certainty for surface transportation infrastructure planning and investment. The FAST Act authorizes $305 billion over fiscal years 2016 through 2020 for highway and motor vehicle safety, public transportation, motor carrier safety, hazardous materials safety, rail, and research, technology, and statistics programs. The following sections highlight a number of federal programs that could be used to support transit service in Orange County.

The Federal Transit Administration (FTA) administers the **Section 5309 Capital Investment Grant (CIG) Program.** This program is the primary source of federal funding for major fixed-guideway transit capital investments, such as new and expanded rapid rail, commuter rail, light rail, streetcar, and bus rapid transit. This discretionary program requires projects to proceed through a multi-step, multi-year process to be eligible for funding with FTA evaluation and rating required at various points in the process. The first step is called Project Development, the second Engineering, and the third a Full Funding Grant Agreement for construction.

There are four categories of eligible projects under the FTA Section 5309 program: New Starts, Small Starts, Core Capacity, and Programs of Interrelated Projects. The program can fund up to 60 percent of total project costs for New Starts projects, and up to 80 percent of Small Starts, Core Capacity, and Programs of Interrelated Projects.

- **New Starts** projects are new fixed-guideway projects or extensions to existing fixed-guideway systems with a total estimated capital cost of $300 million or more that are seeking $100 million or more in Section 5309 CIG program funds.
- **Small Starts** projects are new fixed guideway projects, extensions to existing fixed-guideway systems, or corridor-based bus rapid transit projects with a total estimated capital cost of less than $300 million that are seeking less than $100 million in Section 5309 CIG program funds.
- **Core Capacity** projects are substantial corridor-based capital investments in existing fixed-guideway systems that increase capacity by not less than 10 percent in corridors that are at capacity today or will be in five years. Core capacity projects may not include elements designed to maintain a state of good repair.
- **Programs of Interrelated Projects** are comprised of any combination of two or more New Starts, Small Starts, or Core Capacity projects. The projects in the program must have logical connectivity to one another and all must begin construction within a reasonable timeframe.

FTA Section 5307 Urbanized Area Formula Grants provide transit capital and operating assistance and transportation-related planning in urbanized areas of 50,000 residents or more. Eligible purposes include the following:

- Planning, engineering design, and evaluation of transit projects and other technical transportation-related studies
- Capital investments in bus and bus-related activities such as replacement of buses, overhaul of buses, and rebuilding of buses
- Crime prevention and security equipment
- Construction of maintenance and passenger facilities
- Capital investments in new and existing fixed guideway systems including rolling stock, overhaul and rebuilding of vehicles, track, signals, communications, and computer hardware and software
- All preventive maintenance
- Some Americans with Disabilities Act complementary paratransit service costs

FTA Section 5307 funds can be used for up to 80 percent of capital expenses, and up to 90 percent of the cost of vehicle-related equipment attributable to compliance with the Americans with Disabilities Act and the Clean Air Act, and for projects or portions of projects related to bicycles.

For large urbanized areas with populations of 200,000 or more, such as Orange County, funds are apportioned and flow directly to a local designated recipient. These funds are allocated to areas with populations of 200,000 and more, based on a combination of bus revenue vehicle miles, bus passenger miles, fixed guideway revenue vehicle miles, and fixed guideway route miles as well as population and population density. Thus, as OCTA expands services, the amount of Section 5307 funds that it receives may increase. (However, since local funds are distributed by formula among agencies in Los Angeles, San Bernardino, and Riverside counties, it is difficult to know whether funds will increase without knowing the federal government's budget and other agencies' service level and performance.)

In the Los Angeles-Long Beach-Santa Ana urbanized area, which includes all of Orange County, SCAG is the designated recipient and allocates funds to OCTA. OCTA uses these funds largely for preventative maintenance and paratransit purposes.

FTA Section 5310 Enhanced Mobility of Seniors and Individuals with Disabilities funds may be used for paratransit capital and operating costs as well as for other projects that serve the special transportation needs of seniors and individuals with disabilities, including projects to improve access to fixed-route transit. These funds are apportioned to states for rural and small urban areas and designated recipients chosen by the governor of the state for large urban areas or to state or local governmental entities that operate a public transportation service. The federal share is 80 percent for capital projects, and 50 percent for operating assistance.

FTA Section 5337 State of Good Repair is a newer funding program dedicated to repair and upgrade of existing rail systems. Funding may be used for projects that maintain, rehabilitate, and replace capital assets, as well as projects that implement transit asset management plans. OCTA has been allocated Section 5337 funding for Metrolink.

FTA Section 5339 Bus and Bus Facilities program provides capital assistance for new and replacement buses, related equipment, and facilities. Eligible bus expenses include purchasing buses for fleet and service expansion, purchasing replacement vehicles, bus rebuilds, and bus preventive maintenance. Eligible facilities include bus maintenance and administrative facilities, transfer facilities, bus malls, transportation centers, intermodal terminals, park-and-ride stations, and passenger amenities such as shelters and bus stop signs. Eligible equipment includes accessory and miscellaneous equipment such as mobile radio units, supervisory vehicles, fare boxes, computers, and shop and garage equipment. OCTA uses Section 5339 funds for these purposes, and as the agency's service expands will likely be able to leverage more of these funds.

Two discretionary components were added the program in the FAST Act, a national bus and bus facilities competitive program based on asset age and condition, and a low or no emissions bus deployment program. In addition, grantees may use up to 0.5% of their 5339 allocation on Workforce Development activities.

The **Federal Highway Administration (FHWA) Surface Transportation Block Grant Program** is a flexible funding source for many types of transportation projects, including a set-aside specifically for walking, bicycling, and enhancement projects. The program allows state departments of transportation to shift some of these funds to transit projects, moving funds into one or more of the FTA funding programs described above.

The **FHWA Congestion Mitigation and Air Quality Improvement Program** (CMAQ) provides funding to state transportation departments to reduce congestion and improve air quality. Areas eligible for investment include those that do not meet the National Ambient Air Quality Standards (nonattainment areas) and former nonattainment areas that are now in compliance (maintenance areas). Eligible activities under CMAQ include transit system capital expansion and improvements that are projected to realize an increase in ridership; travel demand management strategies and shared ride services; pedestrian and bicycle facilities; and promotional activities that encourage bicycle commuting.

Funds are distributed by state transportation departments based on an area's population by county and the severity of its ozone and carbon monoxide problems within the nonattainment or maintenance area, with greater weight given to areas that are both carbon monoxide and ozone nonattainment/maintenance areas. There are funding set-asides for State Planning and Research and PM2.5 nonattainment or maintenance areas.

Transportation Investment Generating Economic Recovery (TIGER) is a discretionary U.S. Department of Transportation grant program that allows the agency to invest in road, rail, transit, and port projects. Funding varies annually based on congressional allocations, and grants are awarded on a competitive basis.

The **Transportation Infrastructure Finance and Innovation Act (TIFIA)** provides federal secured loans, loan guarantees, and lines of credit to national and regionally-significant surface transportation projects, including bus and rail transit. The program is designed to fill market gaps and leverage substantial private match (or co-development) funds by providing supplemental debt financing. The amount of a TIFIA line of credit cannot exceed 33 percent of the total capital cost of a project; TIFIA loans cannot exceed 49 percent of the total project cost. The loans are backed by federal revenues.

As a general rule, to receive TIFIA credit assistance under the FAST Act, a project must have costs that equal or exceed either $50 million or one-third of the most recently completed fiscal year's formula apportionments for the state in which the project is located. However, transit-oriented development and local infrastructure projects that are sponsored by a local government for a project on a locally-owned facility need only cost $10 million.

The Railroad Rehabilitation and Improvement Financing (RRIF) program provides direct federal loans and loan guarantees to finance the development of railroad infrastructure. The FAST Act contains several provisions intended to streamline the loan approval process, increase access to the program, and fund a wider array of projects. It also makes transit-oriented development elements of passenger rail station projects eligible for RRIF.

State Sources

Cap and Trade Funds. The California State Transportation Agency distributes proceeds from the state's Cap-and-Trade Program, established under AB32, the Global Warming Solutions Act. Cap-and-Trade grants are distributed on both a formula basis (the Low Carbon Transit Operations Program, or LCTOP) as well as on a competitive basis (through the Transit and Intercity Rail Capital and Affordable Housing and Sustainable Communities Programs). The agency auctions off permits to emit greenhouse gases on a quarterly basis. Proceeds have varied widely, so the amount of funding available through the program is unpredictable. In 2016, $390 million was awarded statewide to a variety of transit-related capital projects and transit operators, including Metrolink, the Pacific Surfliner, and Bravo! Route 560. Programs funded by Cap-and-Trade revenues must provide benefits to disadvantaged communities.

State Infrastructure Bank. Public transit projects are eligible for loans, lines of credit, and other capital funding support from the California Infrastructure and Economic Development Bank. A number of projects in Orange County have been partly funded through this source, including the Segerstrom Center for the Arts, which received a $42 million 501(c)(3) tax-exempt loan in June 2016.

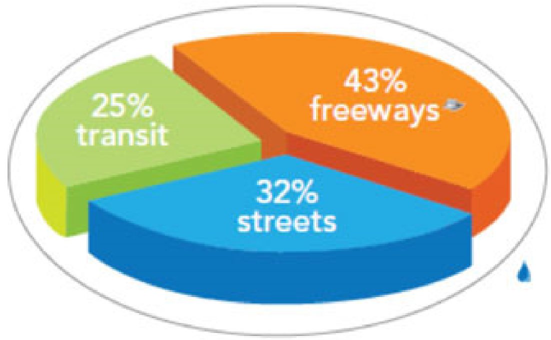
The **Transportation Development Act (TDA)** provides two major sources of funding for public transportation: the Local Transportation Fund (LTF) and the State Transit Assistance fund (STA). LTF is derived from a quarter-cent of the general sales tax collected statewide and STA is derived from the statewide sales tax on diesel fuel. LTF is the most critical funding source for OCTA bus service as it funds approximately 50 percent of operating funds ($161 million in fiscal year 2016-2017). OCTA expects to receive approximately $17.2 million in STA in fiscal year 2016-2017.

State Transportation Improvement Program (STIP) formula-based revenues from the state's excise tax on gasoline are allocated primarily to road projects, but may be used for projects eligible for funding under Article XIX of the State Constitution, including fixed-guideway transit capital projects.

County and Local Sources

Local Sales Taxes. Orange County is a *self-help* county under California law, or a county with a share of its local sales tax dedicated to transportation operations and capital funding. The most recent renewal of Measure M passed in 2006, and will remain in effect through 2042. Sales-tax measures require two-thirds approval from voters. Measure M is likely to remain Orange County's primary source of local funding for transit capital projects.

Figure 5-24 Measure M Allocations



A total of 5% of M2 Freeway Program funds is allocated to the Freeway Environmental Mitigation Program
A total of 2% of the overall M2 Program funds is allocated to the Environmental Cleanup Program

Parcel Taxes. Parcel taxes are common tools used by California cities to raise money for specific projects in an era when general property tax rates cannot be raised because of Proposition 13. Parcel taxes can be bonded to accelerate projects and can be used for both capital and operating funding. The distinction between a parcel tax and a property levy within a district is that a parcel tax is citywide and requires a two-thirds vote of residents. The majority of successful parcel taxes in California are for schools, libraries, and other projects of citywide importance.

Motor Vehicle Fuel/Gas Taxes. In California, the state charges an excise tax on fuel sales, a portion of which it distributes to local transportation projects. Cities, in turn, charge sales taxes on gasoline. Under California law, counties may also add their own fuel taxes.

Vehicle Registration Fees and Excise Taxes. In California, cities may levy vehicle registration fees. Existing examples include the following:

- Orange County charges a $1 fee for motorist services.
- In the Bay Area, the city of Alameda charges a vehicle registration fee of $10 per year, 25 percent of which is dedicated to transit.
- San Francisco charges a $10 annual fee that is used for transportation improvements, including transit.

Real Estate Transaction Fees. In a few cases, real estate transaction fees are used to fund transit:

- Virginia has a deed-recording fee that that ranges from $21 to $54 that is used to support local bond issues for transit projects.
- Florida charges a real estate documentary tax of $0.70 per $100 of the transaction value, 10 percent of which is used to match federal New Starts funds.

Community Facilities District. A Mello Roos Community Facilities District (CFD) is a tool available for assessing a property tax levy on properties that benefit from a local facility. Funds raised through a community facilities district may be used for capital, loan repayment, or as operating funds to support a local project.

Developer Fees and Agreements. Among California cities, San Francisco currently levies impact fees on new development as a condition of approval, while Oakland is currently completing a nexus study as a precursor to establishing fees of its own.

Real Estate Transfer Fees. A real estate transfer fee is paid by property buyers at the time of transaction. Local fees can be increased only with a two-thirds supermajority of voters. Given the trend of increasing real estate costs in coastal California communities (including Orange County), the amounts generated by such fees are likely to continue to increase over time.

Rental Car and Hotel Taxes. Rental car and hotel taxes tend to be more acceptable to voters than other types of taxes, as they fall largely on non-residents. In an area with a large tourism sector such as Orange County, these types of taxes represent a substantial source of potential funding.

Commercial Parking Taxes. Many cities charge a commercial parking tax: the cities of San Francisco and Seattle, for example, have commercial parking tax rates of 25 percent and 12.5 percent, respectively. In those examples, portions of the revenue stream are allocated for major capital projects, with an emphasis on multimodal projects that reduce the demand for parking expansion. There is no statutory limit to the tax and it can be used for a wide variety of transportation projects and programs, including bonding to pay for capital projects.

Commercial parking tax funds are subject to competing priorities, including general fund uses. However, depending on the rate they have the potential to provide needed capital and operating funds.

Parking Benefit Districts. In a parking benefit district, municipalities spend a portion of parking meter revenue collected in the district on local priorities. Parking revenues can also be bonded to accelerate a capital project. The city of Pasadena has employed this funding mechanism in its Old Town district.

General Obligation Voter-Approved Bonds. Voter approval would be required to levy an assessment on real property, payable by property owners. Such *Unlimited Tax GO bonds* must be approved by a majority of voters, and can be used for capital projects. Bonds are usually raised against a specific asset or revenue source. Voters are generally more supportive of bonding more than taxing.

City General Funds. City general funds are composed of a number of funding sources, such as property tax revenues, sales tax revenues, fees, and fines. Cities may elect to fund a portion of a local transit project's capital or operating needs from their general funds. Because any allocation from the general fund would compete directly with other citywide needs, this is a resource that can be difficult to tap for transit projects.

Other Local Sources. A wide variety of other taxes and fees are less commonly used for transit:

- **Alcoholic Drinks in Bars.** Allegheny County, Pennsylvania (Pittsburgh) levies a 10 percent tax on poured drinks in restaurants and bars.
- **Payroll Taxes.** A few jurisdictions levy payroll taxes for transit. One example is the state of Oregon, which levies a payroll tax on employers in areas served by TriMet (Portland) and Lane Transit District.
- **Tolls.** Bridge or high occupancy toll (HOT) lane tolls are another potential source of transit funding. Bridge tolls are a major source of transit funding in the Bay Area, and Metro operates two HOT lanes in Los Angeles County that help fund transportation projects. In

Orange County, the 91 Express Lanes are owned and operated by OCTA. New transit projects in this corridor are eligible for excess toll revenues. Transit may also be an eligible use of excess funds for the upcoming I-405 managed lane project.

Private Sources

Community Benefit District/Business Improvement District (CBD/BID). CBD/BID formation requires the support of property owners who agree to a special assessment on their property tax in exchange for benefits the city would not otherwise provide. In California, a CBD currently lasts up to 10 years and ultimately requires a simple majority to implement. Funding for a transit project could come from an expansion, extension, or reallocation of these funds, subject to a vote of the membership.

Funds from a CBD can be used for both capital and operating purposes, and can be bonded to accelerate project delivery. Expenditures are guided by a management plan detailing how collected funds can be used.

Note that while CBD/BID funding of streetcar projects is relatively common, CBDs are generally not formed in support of bus projects. It is unlikely that both a CFD and CBD would be implemented in the same area, since they are both tools for generating a property tax levy in a confined area.

Value Capture. The concept of value capture is based on the anticipated development and commercial activity a transit investment is projected to spur over a reasonable period of time. Economic and land development will result in added value along the project segment, generating incremental property taxes and other fees that may be used for transit. There are numerous mechanisms, such as different kinds of assessment districts, for carrying out value capture.

Naming Rights. For streetcar projects in particular, sponsorship of stops and vehicles is a common source of funding. Stop sponsorships, which brand the panels at shelters, have been sold in many cities implementing streetcar or shuttle projects. Some systems, such as Tampa's TECO Trolley, have also sold naming rights for the entire system. This practice builds on the more standard practice of selling advertising at stations and on vehicles and allows stations to remain ad-free while still generating revenue.

Public-Private Sources

Public-Private Partnerships (P3s)

P3s are an increasingly common way to finance, construct, and operate transportation infrastructure. In a P3, the sponsoring agency partners with a private firm or firms to reduce the risk of cost and schedule overruns (as the private partner agrees to deliver the project on a fixed schedule, for a fixed price). The partnership reduces initial costs, as the private partner typically contributes part of the capital cost. It also reduces lifecycle costs by taking advantage of private-sector efficiencies: the partnering firm may be unencumbered by regulations that apply to public agencies, such as Buy America requirements, or by political pressure to add unnecessary elements to projects.

Depending on how the P3 is structured, the private partner may take on (with public oversight) various roles that would typically be the responsibility of the sponsoring agency. For example, in a design-build-finance-operate-maintain (DBFOM) arrangement, the private partner would design, build, finance, operate, and maintain the project. Such arrangements are common internationally, including in Canada, and are often used for toll roads in the United States, including in Orange County. They are increasingly common for transit projects, including a $2.2 billion commuter rail project in Denver, a light rail project in Maryland, and streetcar projects in Washington, D.C., and Detroit.

Congress has encouraged more widespread application of P3s to transit projects, yet there are challenges with implementation in many cases. While often criticized for perceived privatization of public assets, P3s are typically structured so that the public maintains ownership and control over assets and key aspects of operations, such as service levels and fares. Private partners are also typically subject to performance standards. However, P3s may ultimately cost taxpayers more over the long term.

Moreover, sponsoring agencies accustomed to traditional contracting processes may be unprepared for the special requirements associated with a P3, from both a legal and administrative perspective.[6] Finally, private partners will only invest on the expectation of a return. Future projects pursuing P3 arrangements would require much more detailed financial and revenue forecasting analysis.

SUMMARY

An important purpose of this OC Transit Vision will be to develop recommendations for new high-capacity transit lines in high-demand corridors. This will require careful, comprehensive thinking about transit modes—including design of the right-of-way, stops/stations, service, and vehicles—and it will also require thorough thinking about related elements needed to make transit successful, including access to transit and land uses around transit stops and stations. Finally, it will require realistic thinking about potential funding options.

[6] Federal Highway Administration guidance on P3s can be found here: http://www.fhwa.dot.gov/ipd/p3/default.aspx