OC TRANSIT VISION

Draft Transit Investment Framework

April 2017

OC TransitVISION

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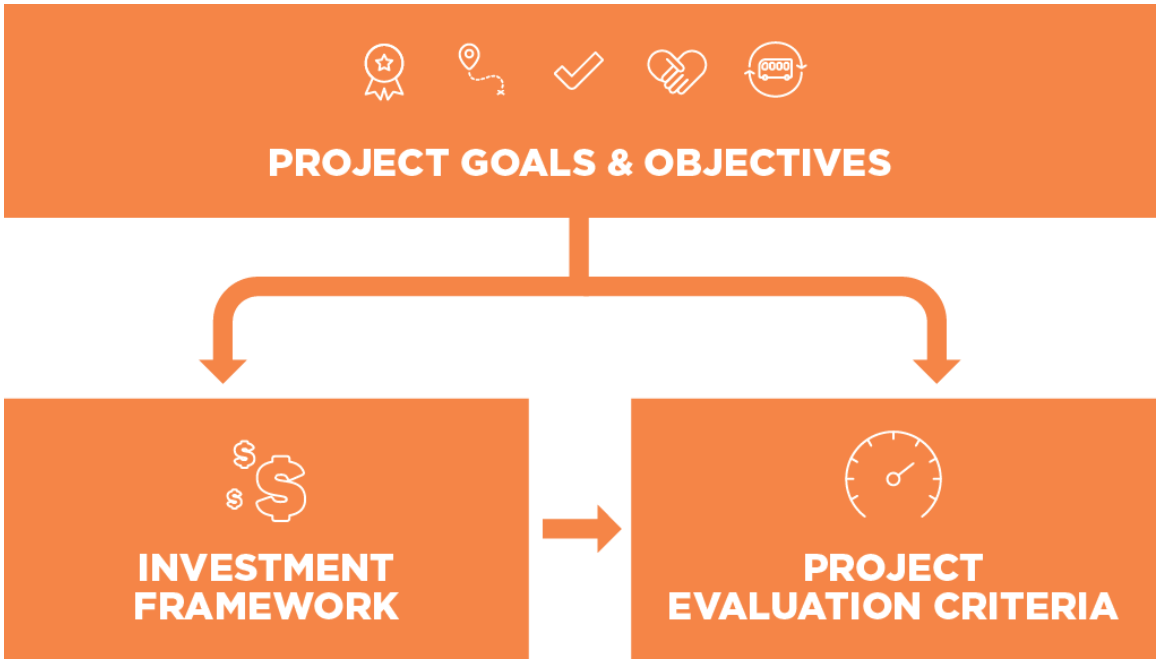
1 INTRODUCTION

This document proposes a Transit Investment Framework for use by OCTA and partner agencies. The primary purposes of the Transit Investment Framework are to provide guidance:

- **For OCTA** to use in its decision-making processes to allocate fixed-route bus operations and bus and rail capital resources; and
- **For Orange County cities and other agencies** to use in developing transit-supportive land use, street design, and other transportation policies.

The draft Transit Investment Framework is based on the OC Transit Vision goals and objectives and provides a basis for the OC Transit Vision project evaluation criteria (to be developed in the following phase of the project).

Figure 1-1 Relationship of OC Transit Vision Elements



This document includes the following sections:

- A brief summary of **best practices and principles** in the design of transit service and transit-supportive transportation networks and land uses (which serves as a basis for the following guidelines);
- Proposed **guidelines for use in making decisions about future investments and allocating operating resources** for fixed-route bus service; and

- Proposed **guidelines for use in evaluating future capital investments** in bus and rail service as well as access to service.

The document also includes two appendices:

- Proposed OC Transit Vision project evaluation criteria; and
- Case studies of transit capital project prioritization processes used by OCTA peer agencies.

The OCTA Transit Investment Framework's proposed principles and guidelines incorporate industry standards, state and federal discretionary grant program evaluation criteria, and research into existing policies adopted by OCTA and peer agencies, including the Los Angeles County Metropolitan Transportation Authority (Los Angeles Metro), the King County (Washington) Department of Transportation Metro Transit Division (King County Metro), and the South Coast British Columbia Transportation Authority (TransLink).

OC Transit Vision Goals and Objectives

Figure 1-2 and Figure 1-3 present the OC Transit Vision goals and objectives, on which the draft Transit Investment Framework is based.

Figure 1-2 OC Transit Vision Goals and Objectives (Page 1 of 2)

VISION, GOALS, AND OBJECTIVES

VISION

Provide compelling and competitive transit service that expands transportation choices for current riders, attracts new riders, and equitably supports immediate and long-term mobility in Orange County

GOALS

Enhance

Make it more desirable to take transit

Reliability and competitiveness

- Provide convenient service that appeals to a broad cross-section of Orange County residents
- Make transit travel times in key corridors competitive with the auto
- Improve the reliability of transit trips
- Provide longer hours of service and more weekend service (span, frequency, and routes)
- Develop a network of high-capacity or premium services such as bus rapid transit, light rail, and streetcar to provide attractive transit service and support local land use

Frequency

- Develop a Frequent Service Network that provides frequent (15-minutes or better), all-day service from early morning to late night in major corridors and to major destinations

Quality

- Improve service quality in the highest-demand transit markets
- Develop services tailored to the needs of specific markets

Affordability

- Provide affordable transit choices for Orange County residents

Facility Design and Passenger Comfort

- Provide a comfortable and safe environment for transit passengers
- Improve access to, and the quality of, transit stops and stations

Connect

Connect Orange County's people and places with effective transit

Local and Regional Connections

- Expand service to currently unserved areas of Orange County that have sufficient transit demand and to emerging areas to support new development
- Improve connections to major attractions and destinations
- Improve access to jobs and services to improve economic opportunities for Orange County residents
- Improve transit connections with surrounding counties to develop a stronger regional system

Integration

- Integrate transit services with other complementary modes
- Develop new partnerships and improved service models to better serve markets where fixed-route service is impractical

Multimodal Access and First/Last Mile Connections

- Create great places where modes connect to facilitate seamless integration of Orange County's pedestrian, bicycle, and transit networks
- Strengthen multimodal connections and make it safe and easy to access transit
- Enhance partnerships with shared mobility providers
- Participate in efforts to make streets more complete and transit-friendly

Figure 1-3 OC Transit Vision Goals and Objectives (Page 2 of 2)

GOALS AND OBJECTIVES

Simplify
Make transit easier to use and more convenient

Legibility
- Provide service that is easy for people to understand and use
- Make it easier for customers to plan door-to-door trips with a seamless menu of travel options among transit services, operators, and other transportation modes
- Take advantage of new technologies to simplify interactions with customers, including fare payment

Education and Information
- Educate Orange County residents, workers, and visitors about available transit services
- Continue to provide transit and mobility information that is readily available, attractive, and easy to understand
- Make real-time schedule information extensively available

Collaborate
Make Orange County a more attractive place to live, work, and visit by providing transit service that supports community priorities

Economy and Development
- Support economic development, including the development patterns envisioned in local, county, and regional plans
- Support the vitality of the county's downtowns, local centers, neighborhoods, and job centers

Environment
- Provide transit services that relieve congestion, improve air quality, and reduce greenhouse gas emissions
- Use transit as a way to enhance healthy, complete communities and compact, livable neighborhoods

Equity
- Use transit to create a transportation system responsive to the needs of people for whom transit is a necessity (e.g., youth, older adults, people with disabilities, low income populations, people without autos)
- Improve the accessibility of transit for older adults and people with disabilities to support their ability to live independent lives
- Develop a sustainable model for paratransit service to provide mobility and independence

Sustain
Create a system that is resilient over the long term

Ridership and Perception
- Get more people riding transit
- Retain existing customers and make it easier for them to take additional trips using transit
- Improve public perception of transit in Orange County

Productivity
- Focus service in areas where it can be most effective
- Develop cost-effective and productive transit services and programs

Funding
- Develop reliable and predictable revenue streams that grow with Orange County's economy
- Invest public resources in a financially responsible manner
- Identify and pursue opportunities for new funding sources, including leveraging private funds

Performance Monitoring
- Continue to monitor performance measures and adjust service and implementation plans as necessary

Partnerships
- Develop services that achieve a high level of public support
- Strengthen existing partnerships, continue to build partnerships, and work closely with communities and businesses
- Develop new partnerships and service models to better serve markets where traditional fixed-route transit is impractical

Flexibility
- Plan for investments in a way that allows OCTA to respond and adapt to changes in the environment for transit

2 TRANSIT AND TRANSIT-SUPPORTIVE DESIGN PRINCIPLES

This chapter provides an introduction to best practices and principles in the design of transit service and transit-supportive transportation networks and land uses. As part of a later phase of the OC Transit Vision, the project team will develop a more detailed guide to transit-supportive policies often adopted by cities, including parking and transportation demand management (TDM) policies as well as land use and other transportation policies.

TRANSIT DESIGN PRINCIPLES

In order for cities to attract and support high-quality transit service, decision-makers must first understand what makes service "high quality." With this baseline understanding, it becomes easier to understand how transit interacts with, fits into, and should be supported by its surrounding context.

High-quality transit service is:

- **fast** – or at least competitive with driving;
- **frequent** – offering both shorter waits and more choice in departure times;
- **reliable** – offering services that arrive when expected;
- **connected** – to other transit lines and travel modes;
- **comfortable** – at stops, stations,and on-board vehicles;
- **convenient** – in terms of frequency, access, and other factors such as fare payment;
- **legible** – easy to understand, even for new customers;
- **safe** – providing a sense of personal security at stops, stations, and on-board vehicles;
- **accessible** – for all people, including those with mobility challenges;
- **dignified** – sending a message to riders that they are valued customers; and
- **available** – when you need it, and going where you need it.

In order to support the characteristics of high-quality service, transit designers try to follow a handful of simple rules (Figure 2-1):

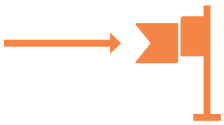
Figure 2-1 Rules for High-Quality Transit Service

Be direct.

Ideally, transit routes should avoid time-consuming turns and deviations and go in straight lines, making them both faster and easier to understand and remember.

Serve a variety of destinations.

The most efficient and cost-effective routes are useful to a variety of people, at different times of day.



Terminate at strong anchors.

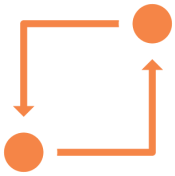
When there are major demand generators at both ends of the route, buses or trains are rarely empty.

Avoid duplication.

Rather than having routes operate on parallel streets less than a half-mile apart, have them overlap so that more frequent service can be provided in the combined segment.

Avoid routes that are too long.

The longer the route, the more exposed it is to delay; reliability may suffer.



Balance demand in each direction.

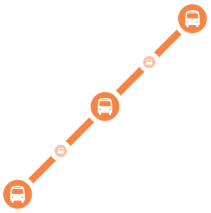
Routes are also more cost-effective when they carry roughly the same number of passengers each way, rather than, for example, carrying a full load of commuters in one direction, then running empty in the other.

Operate in rights-of-way that minimize delay.

This could include transit-only lanes, streets with transit signal priority, or simply streets on which there are not too many conflicts with other modes.

Minimize transfer penalties.

Transfers are sometimes necessary, even desirable from a network design perspective; however, they should be made as seamless as possible, both spatially and in terms of delay.

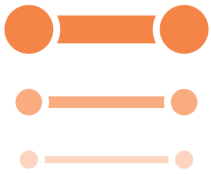


In locating stops, balance speed and access.

Stops should be far apart to minimize delay, but close enough to provide reasonable access for those with mobility challenges. They should also be as close as reasonably possible to destinations, connecting routes and access points such as crosswalks, bike lanes, and park-and-ride lots. Customers will walk further to better transit.

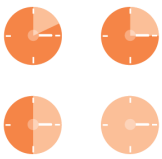
Provide a high-quality waiting environment.

Stops should be comfortable, safe, dignified, and provide important information.



Match service levels to demand.

While comfortable stops and stations are important, providing "walk-up" frequencies of 15 minutes or less enables people to avoid consulting a schedule and supports spontaneous trips. Very frequent should be provided where demand supports the investment.



Make schedules easy to remember.

Ideally, routes should operate on "clockface" headways, such as every 10, 15, or 30 minutes.

The reality of transit service design is that these rules often conflict. Because resources are limited, transit operators must make difficult decisions about how, where, and when to provide service. It is not always possible to achieve all of the objectives above. It is easier, however, when the surrounding context is supportive.

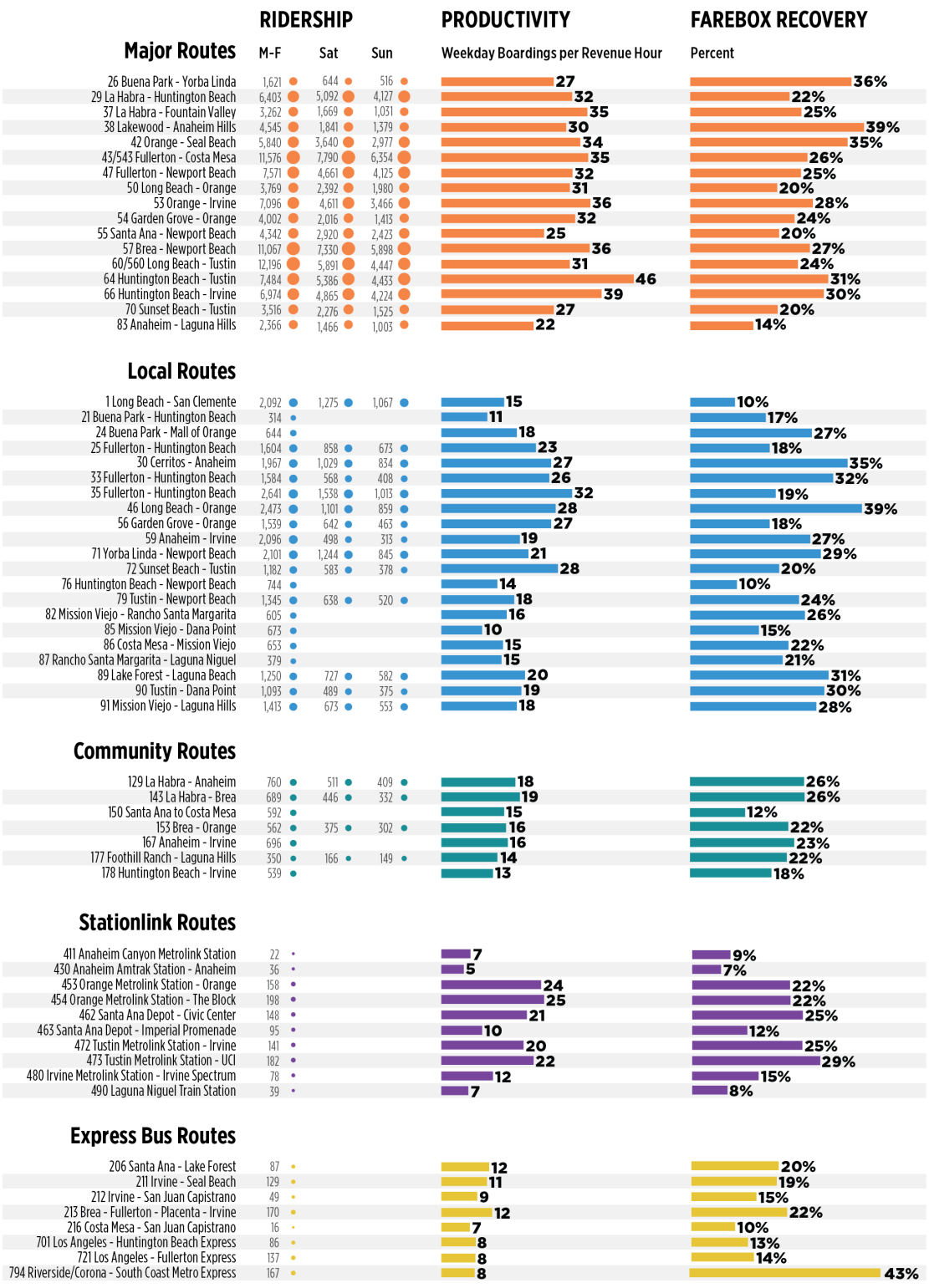
A final best practice in transit design is to define categories or types of transit service to reflect the functions of different routes and varied needs of transit riders. OCTA currently defines the several categories of fixed-route bus service, and one additional category ("Major") has been identified for purposes of analysis as part of this study[1]:

- ***Major:*** These routes operate every 15 minutes or better during peak times, with the exception of Routes 42 and 83. Major routes operate seven days a week throughout the day. Together, the Major routes form a grid on arterial streets throughout the highest transit propensity portions of the OC Bus service area, primarily in northern parts of the county. Bravo! limited-stop services are included in this category. These routes carry more than 75 percent of the system's riders.
- ***Local:*** Local routes operate on arterials within the grid created by the Major routes, but at lower frequencies. Local routes also operate in parts of Orange County with lower transit demand. Most Local routes operate seven days per week, however some operate on weekdays only. Local routes carry about 20 percent of the system ridership and are less productive than Major routes, averaging about 20 boardings per revenue hour.
- ***Community:*** Community routes provide service to connect pockets of transit demand with major destinations and offer local circulation. Routes tend to be less direct than Local routes due to service design focused on serving neighborhoods and destinations off the arterial grid. Half of Community routes operate seven days per week while half operate on weekdays only. Community routes carry less than three percent of OC Bus ridership, averaging 15 boardings per revenue hour. They have the second-highest farebox recovery of any route category (23 percent). City-operated shuttles funded by Measure M Project V in La Habra, Westminster, and Mission Viejo fall into this category.
- ***Stationlink:*** Stationlink routes are rail feeder services designed to connect Metrolink stations to nearby employment destinations. One or more Stationlink routes serves all Metrolink stations in Orange County except Buena Park, Fullerton, San Juan Capistrano, and San Clemente. These routes have relatively short alignments, with schedules tied to Metrolink arrivals and departures. They operate during weekday peak hours only, in the peak direction, from the station to destinations in the morning and the reverse in the evening. These routes carry less than one percent of OC Bus ridership and have similar productivity to Community routes, averaging 16 boardings per revenue hour. Some routes operated by the City of Irvine and Anaheim Transportation Network fall into this category as well.
- ***Express:*** Express bus service operates on weekdays only at peak times and connects riders over long distances to destinations within and outside of Orange County, often using freeways to access destinations. Express routes carry less than one percent of OC Bus ridership and average nine boardings per revenue hour, the least of any route category. Express routes have 20 percent farebox recovery.

[1] OCTA also defines "Bus Rapid Transit/Limited" routes separately; here, they are included with "Major" routes.

Figure 2-2 shows Fiscal Year 2016 performance in major categories of routes in each OCTA service category.

Figure 2-2 OCTA Bus Routes by Category



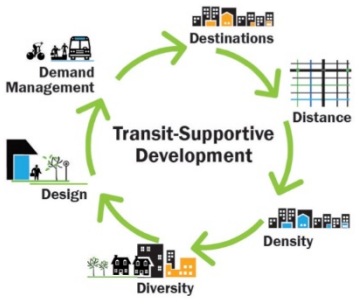
TRANSIT-SUPPORTIVE DESIGN PRINCIPLES

As part of the OC Transit Vision, OCTA will develop a detailed guide to transit-supportive policies that cities may adopt. This section summarizes key elements of transit-supportive design, which will inform the future policy development: the "6 Ds," complete streets, multimodal access to transit, and transit-oriented development. Each of these is described in greater detail in the State of OC Transit Report.

The "6 Ds"

Population and employment density, land use diversity, urban design, regional destinations, and distance to quality transit are key factors influencing transit demand. Demand management (pricing, incentives, and other information-based programs) is also an important factor. Referred to as the "6Ds," these factors influence both transit demand and transit success in Orange County. Figure 2-3 provides additional information about each.

Figure 2-3 "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	

Complete Streets

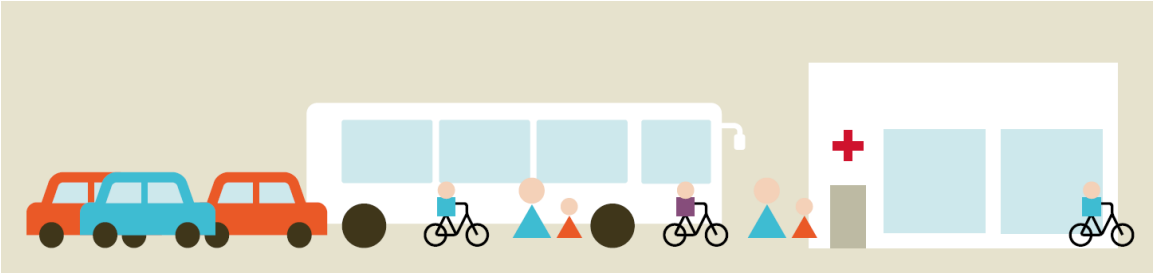
Orange County has taken important steps to begin implementing complete streets throughout the county, including publication of Orange County Council of Government's (OCCOG) Complete Streets Initiative Design Handbook and Funding Toolkit. Complete streets are designed and operated to safely accommodate people of all ages and abilities whether they are walking, bicycling, or riding public transit; driving or riding in motor vehicles, including taxis and other shared mobility services; or 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.

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 can 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

Figure 2-4 OCCOG Complete Streets Initiative Design Handbook



The California Complete Streets Act (AB 1358) of 2008 requires the circulation element of jurisdictions' General Plans to "plan for a balanced, multimodal transportation network that meets the needs of all users of the streets, roads, and highways for safe and convenient travel in a manner that is suitable to the rural, suburban, or urban context."

Image Source: OCCOG Complete Streets Initiative Design Handbook

Multimodal Access to Transit

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

Figure 2-5 Arterial Street in Orange County

Image Source: Nelson\Nygaard

Transit-Oriented Development

Transit demand relates strongly 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. Recent state transportation funding programs and changes to state law encourage this type of development.

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.

The most effective TOD is located less than a half-mile (roughly 10 minute) walk from a transit stop or station. The characteristics of TOD are represented in the graphic in Figure 2-6; 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 2-6 Eight Principles for Transit-Oriented Development

Image Source: Institute for Transportation & Development Policy (ITDP)

3 SERVICE ALLOCATION GUIDELINES

The draft OCTA Transit Investment Framework consists of two categories: service allocation guidelines and capital investment guidelines. This section describes proposed service allocation guidelines.

Different service types and delivery models are needed to enhance mobility in Orange County. The guidelines described below should be used to help make decisions about where service types should be implemented or operated.

The service allocation guidelines for fixed-route bus operations are based on numerical targets and other factors associated with seven corridor characteristics, defined as extending one-half mile to either side of the route alignment (and including all units of analysis, such as census tracts, that are at least partly within that radius). The characteristics fall into three categories:

- **Land Use Factors**
  - Residential Density
  - Employment/College and University Student Density (combined)
  - Other Trip Generators (hospitals and medical centers, retail centers, and other major destinations)
  - Traffic Volumes
- **Equity Factors**
  - Density of Low-Income Residents
- **Access Factors**
  - Transit Connectivity (stations, transit centers and park-and-rides, and other routes)
  - Intersection Density

These seven characteristics were selected based on a peer review and assessment of their role in demand for transit service in Orange County. Notably, four of the six factors previously found by OCTA to be primary indicators of individual propensity toward transit use—per capita income, traffic volumes, intersection density, and employment density—are included. (The other factors from that analysis are alternative measures of income and employment: low-income households and total employment.)

CORRIDOR CHARACTERISTICS

Maps from the State of OC Transit Report that illustrate existing countywide patterns for each of the proposed corridor characteristics are shown in Figure 3-1 through Figure 3-11 on the following pages.

Figure 3-1 Population Density

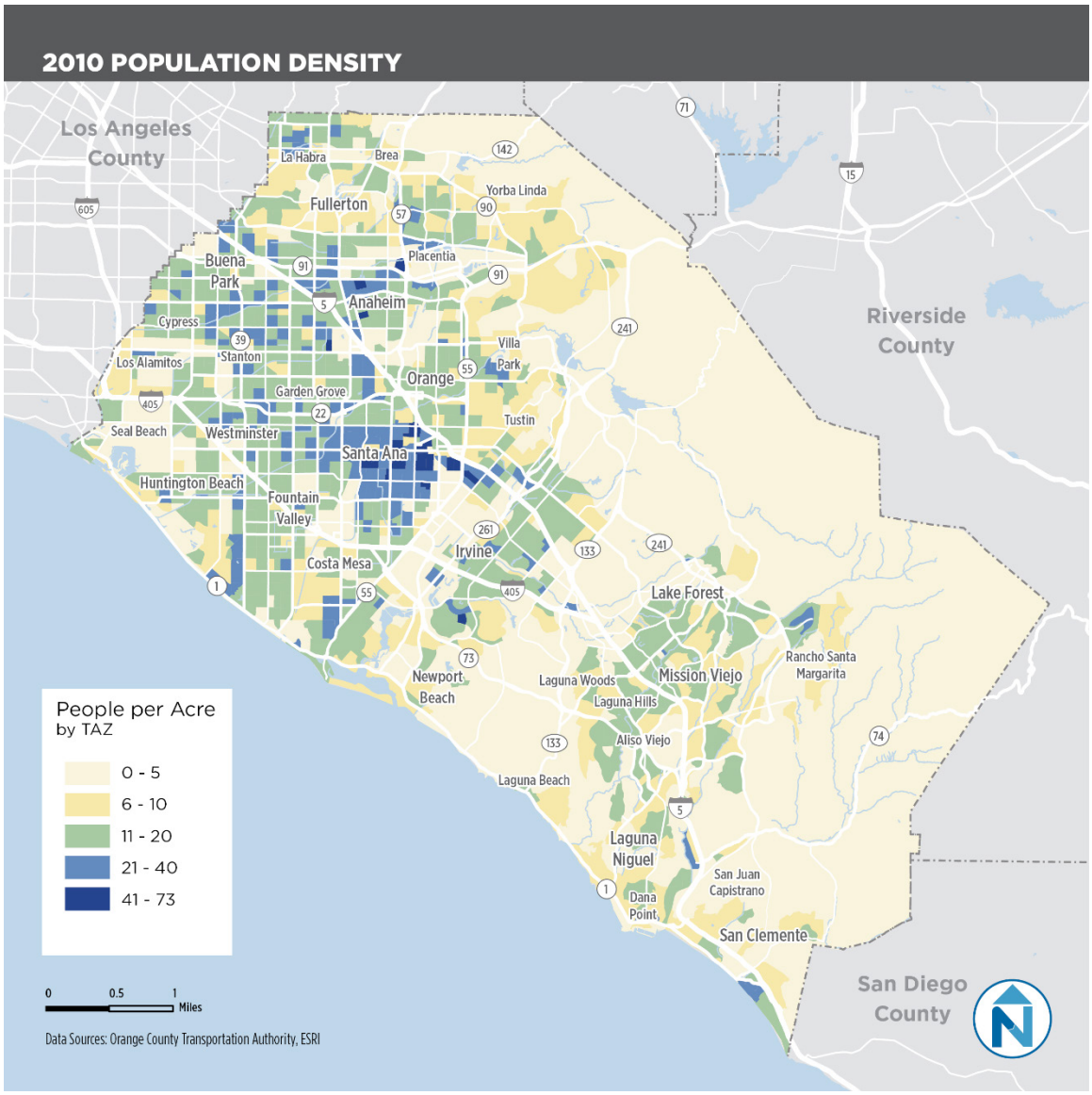


Figure 3-2 Employment Density

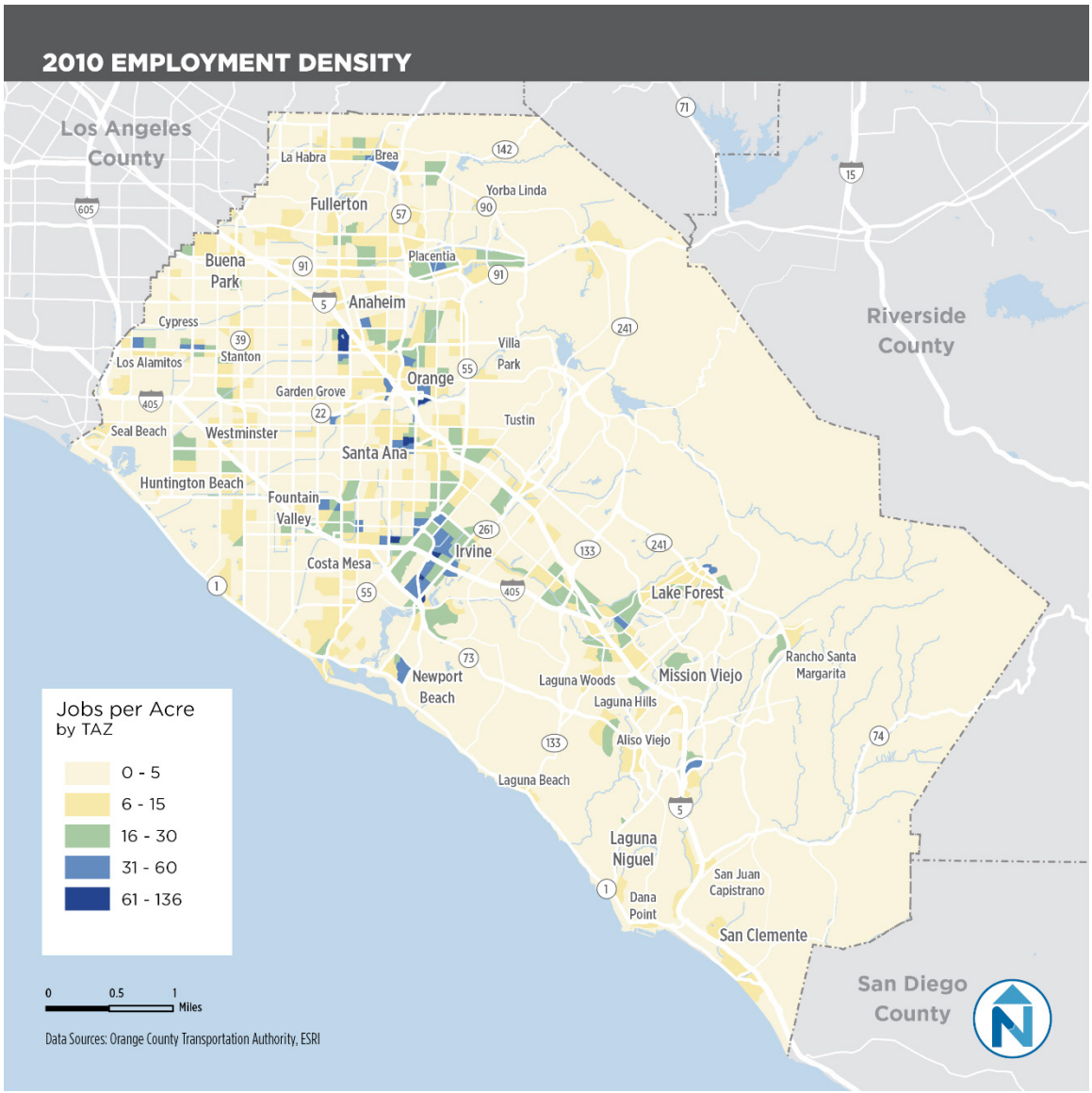


Figure 3-3 College and University Enrollment

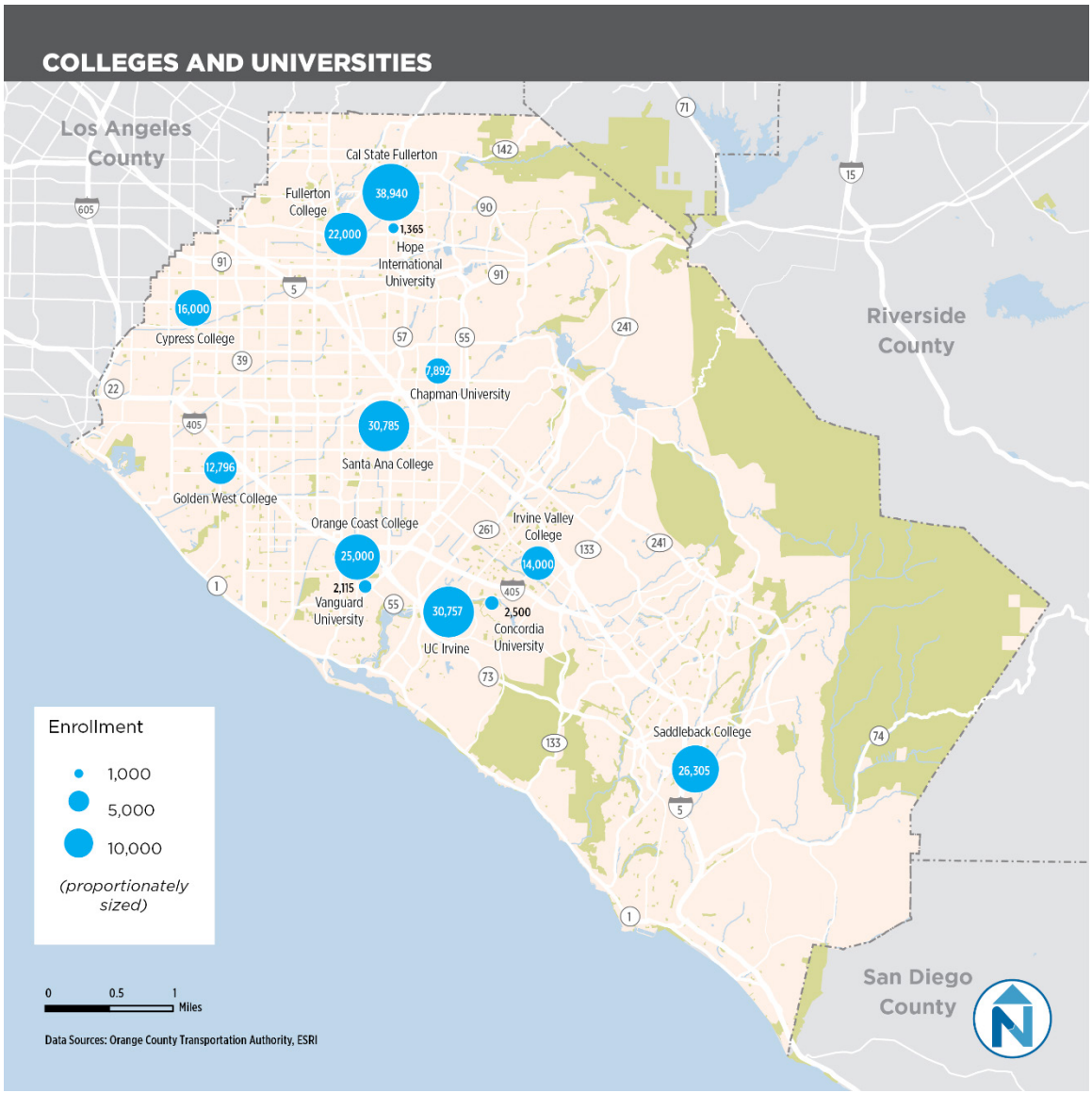


Figure 3-4 Hospitals and Medical Centers

Figure 3-5 Retail Centers

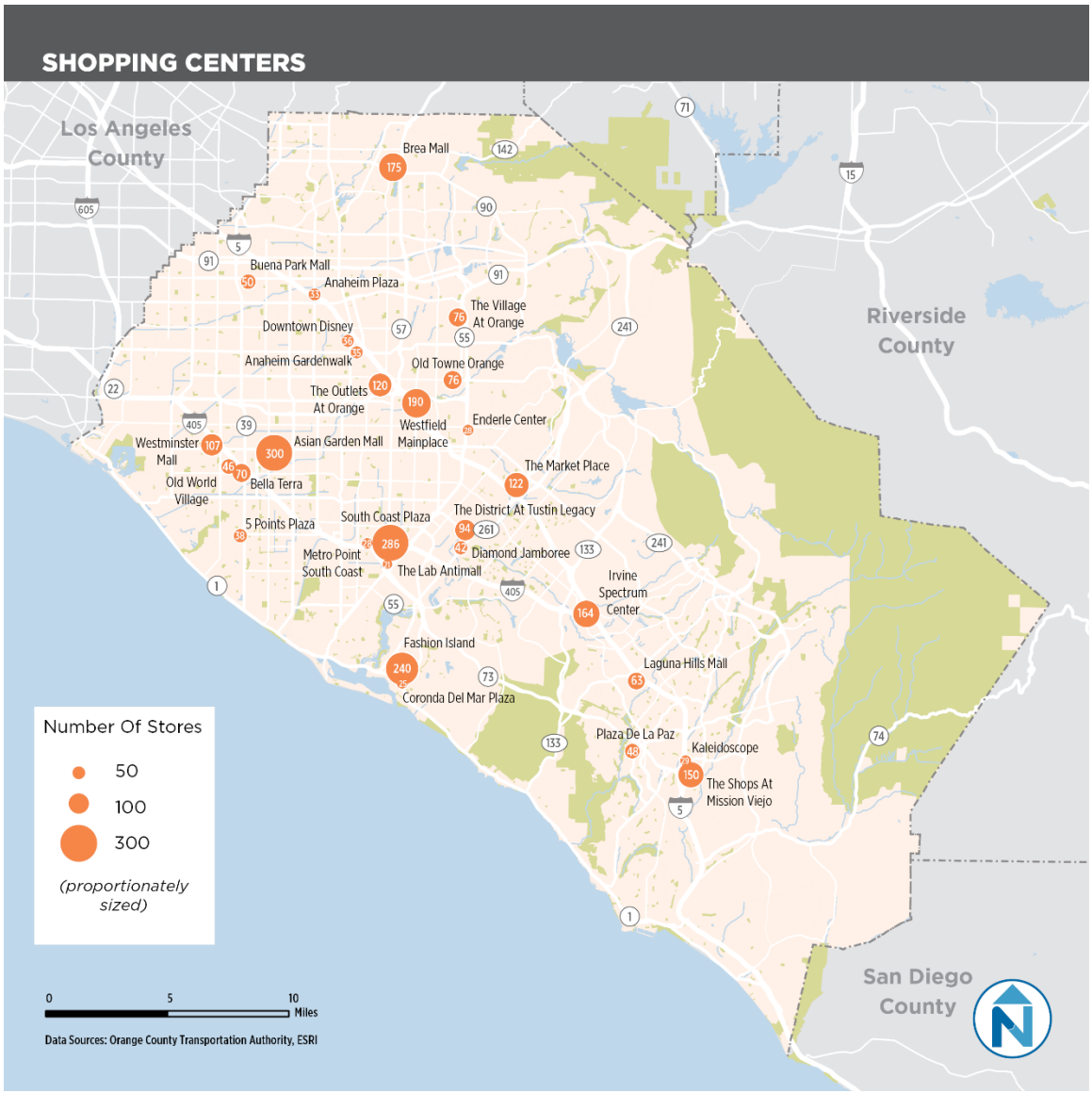


Figure 3-6 Other Major Attractors

Figure 3-7 Traffic Volumes

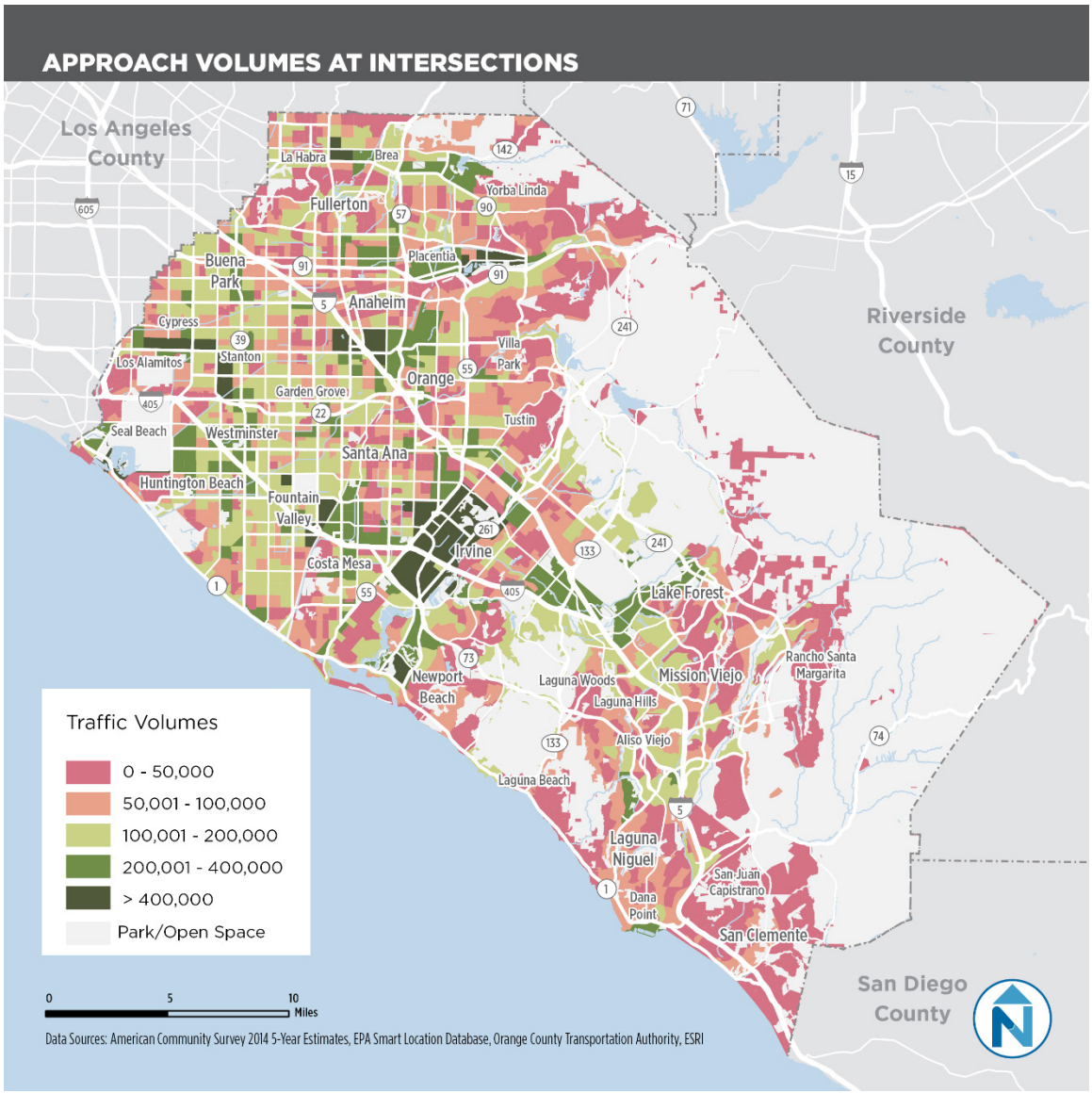


Figure 3-8 Income Less Than 150% of the Poverty Level

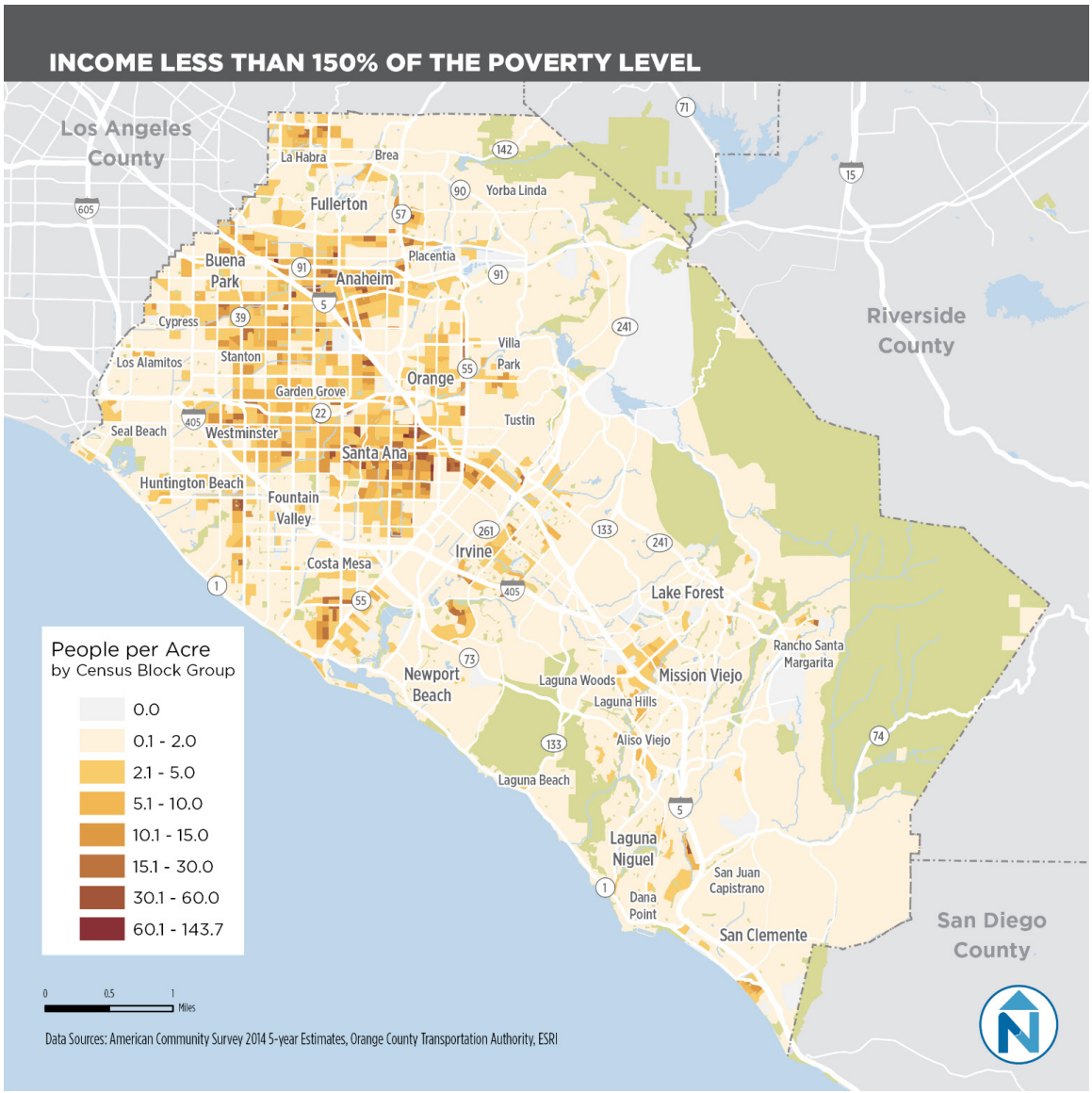


Figure 3-9 Stations, Transit Centers, and Park-and-Rides

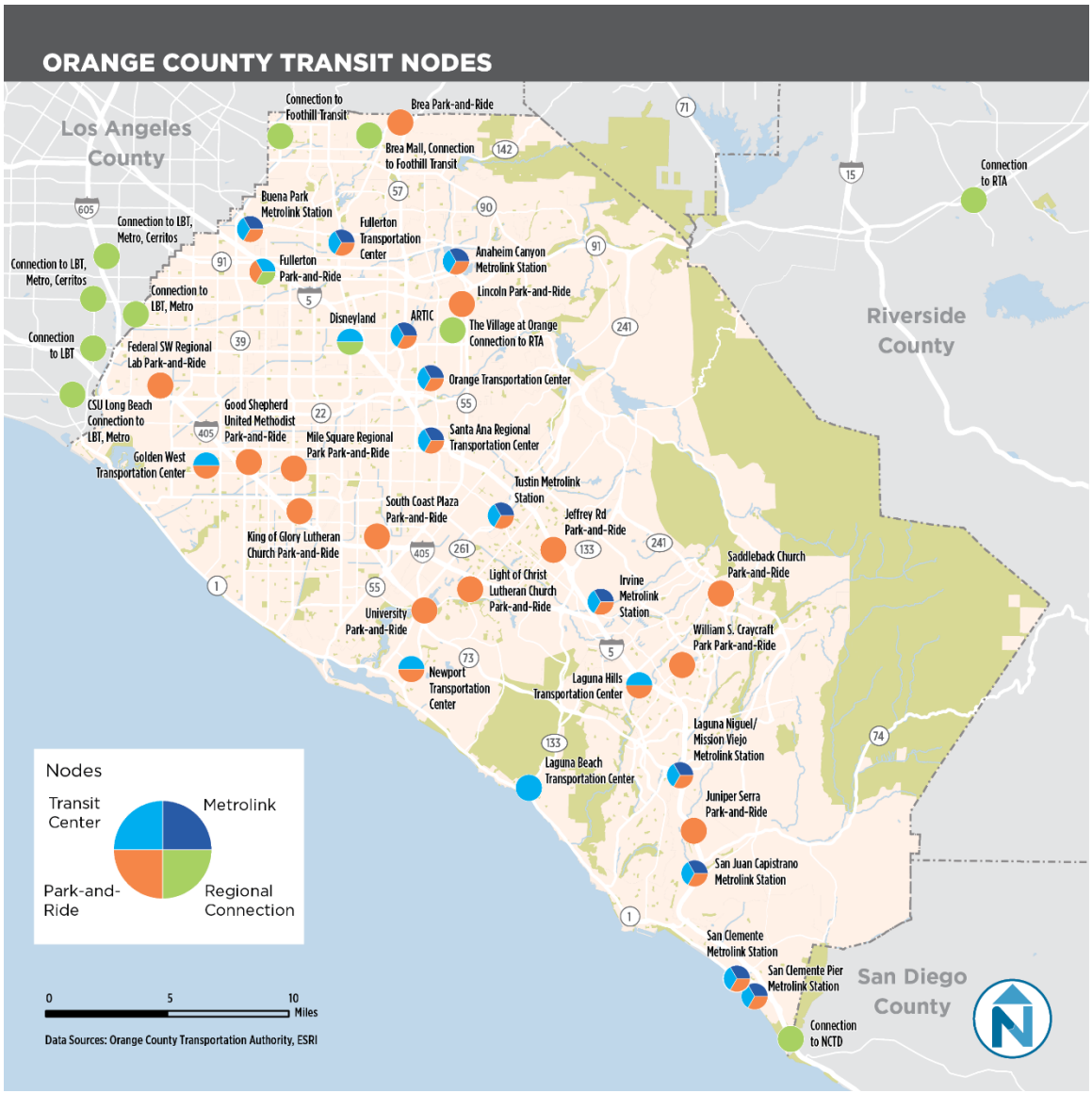


Figure 3-10 Transit Routes

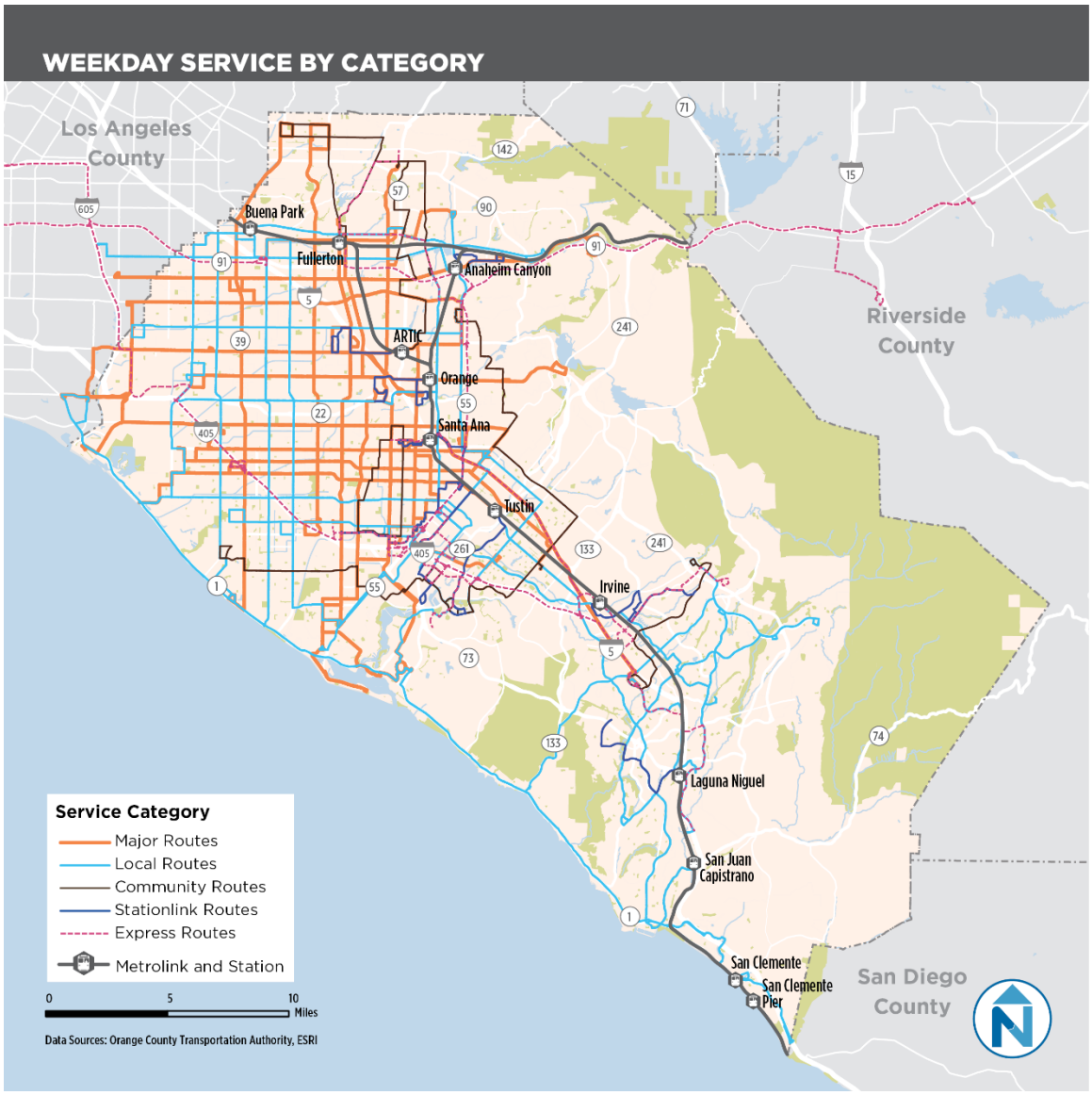
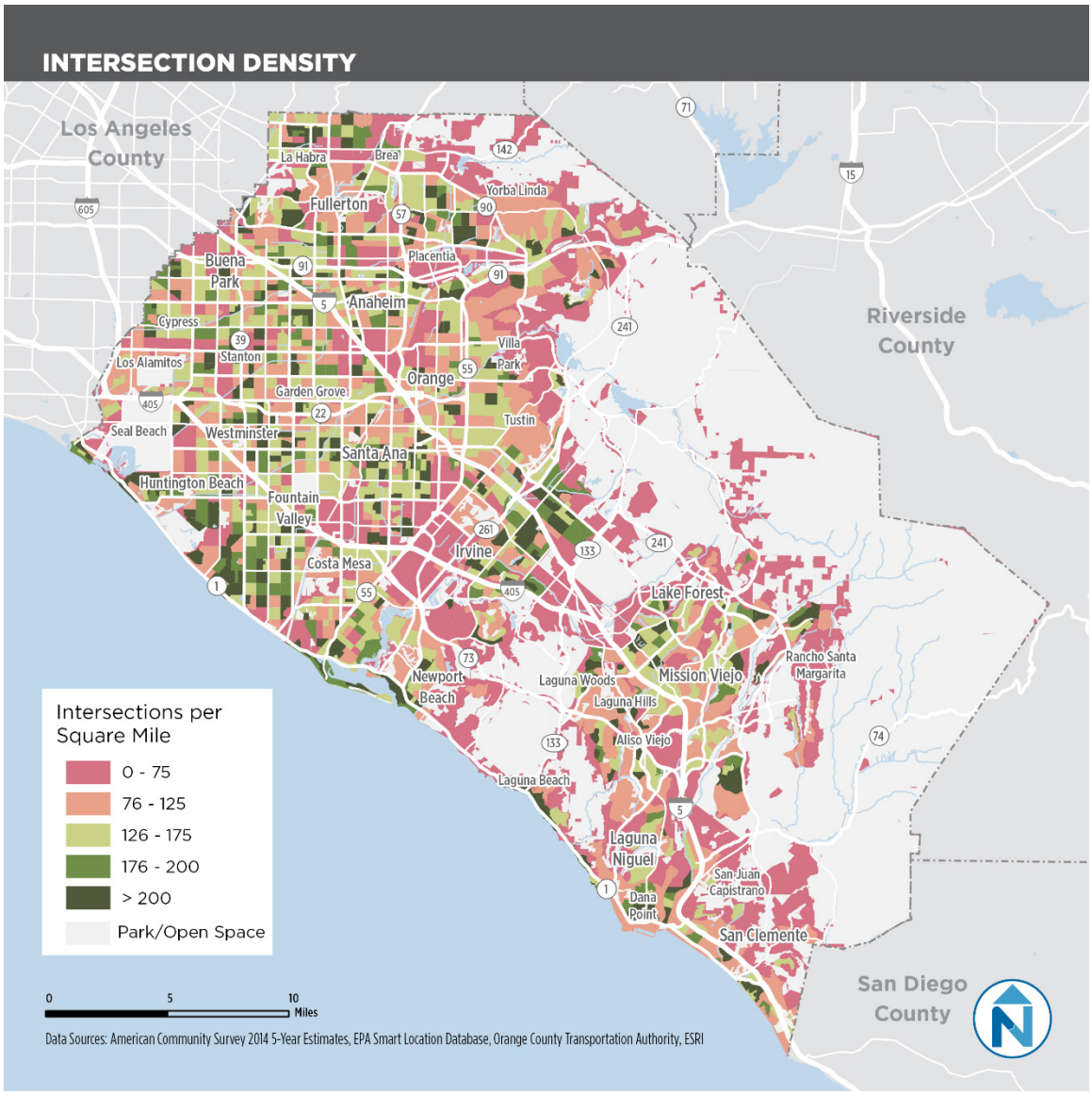


Figure 3-11 Intersection Density



SERVICE ALLOCATION GUIDELINES

Figure 3-12 through Figure 3-14 below propose fixed-route bus service allocation guidelines—in terms of service category, peak and base (midday weekday) frequencies, and span—based on the corridor characteristics.

Among existing OCTA service types, this guideline focuses on the Major Corridors, Local (Non-Major), and Community categories. Stationlink and Express routes provide specialized niche services during peak periods only, and separate guidelines for these services follow Figure 3-12.

The proposed framework also includes "other" and "no transit" categories in which alternatives to traditional OCTA fixed-route bus service, such as locally-administered Program V shuttles or general-public demand-response services, may be appropriate or where publicly funded transit service may not be appropriate due to very low demand. (Demand-response services will be further developed and defined through a subsequent task within the OC Transit Vision.)

These proposed allocation guidelines are not absolute requirements. Few corridors will have characteristics consistent with just one category, and OCTA must make service allocation decisions on the basis of other factors, including productivity, equity, and funding.

Figure 3-12 Proposed Service Allocation Guidelines

Category	Service Characteristics	Corridor Characteristics
Major	▪ *Frequency*: 15 mins or greater peak, 30 mins or greater base ▪ *Span*: 5:00am-12:00am M-F, 6am-12am weekend	▪ *Residential Density:* 10 or more persons per acre ▪ *Employment/Enrollment Density:* 8 or more jobs/college or university students per acre ▪ *Other Trip Generators:* Serves 5 or more hospitals or medical centers with 50 or more beds, retail centers with 50 or more stores, or other major destinations ▪ *Traffic Volumes:* Average combined ADT at all major intersections of more than 100,000 per corridor mile ▪ *Density of Low-Income Residents (Household Income Below 150% of Poverty Level):* 2 or more per acre ▪ *Transit Connectivity:* Connects to 2 or more Metrolink stations, transit centers, or park-and-rides, and to 5 or more Major routes ▪ *Intersection Density:* 100 or more per square mile

Category	Service Characteristics	Corridor Characteristics
Local	▪ *Frequency*: 30 mins or greater peak and base ▪ *Span*: 5:30am-8:30pm M-F, 7am-7pm weekend	▪ *Residential Density:* 5-10 persons per acre ▪ *Employment/Enrollment Density:* 4-8 jobs/college or university students per acre ▪ *Other Trip Generators:* Serves 2-5 hospitals or medical centers with 50 or more beds, retail centers with 50 or more stores, or other major destinations ▪ *Traffic Volumes:* Average combined ADT at all major intersections of less than 100,000 per corridor mile ▪ *Density of Low-Income Residents (Household Income Below 150% of Poverty Level):* 1-2 per acre ▪ *Transit Connectivity:* Connects to 1 or fewer Metrolink stations, transit centers, or park-and-rides, and 1-4 Major routes ▪ *Intersection Density:* Any
Community	▪ *Frequency*: 60 mins or greater peak and base ▪ *Span*: 5:30am-8:30pm M-F, 7am-7pm weekend	▪ *Residential Density:* Fewer than 10 persons per acre ▪ *Employment/Enrollment Density*: Fewer than 8 jobs/college or university students per acre ▪ *Other Trip Generators:* Serves 1 or more hospitals or medical centers with 50 or more beds, retail centers with 50 or more stores, or other major destinations ▪ *Traffic Volumes:* Average combined ADT at all major intersections of less than 100,000 per corridor mile ▪ *Density of Low-Income Residents (Household Income Below 150% of Poverty Level):* Any ▪ *Transit Connectivity:* Connects to 1 or fewer Metrolink stations, transit centers, or park-and-rides, and 1-4 Major routes ▪ *Intersection Density*: Any
Other	▪ *Frequency and Span*: n/a (explore alternatives to OCTA fixed-route bus service)	▪ *Residential Density:* Fewer than 5 persons per acre ▪ *Employment/Enrollment Density:* Fewer than 4 jobs/college or university students per acre ▪ *Other Trip Generators:* Any ▪ *Traffic Volumes:* Any ▪ *Density of Low-Income Residents (Household Income Below 150% of Poverty Level):* Any ▪ *Transit Connectivity*: Any ▪ *Intersection Density:* Fewer than 100 per square mile

Category	Service Characteristics	Corridor Characteristics
No Transit	▪ *Frequency and Span*: n/a (publicly funded service should not be provided)	▪ *Residential Density:* Fewer than 3 persons per acre ▪ *Employment/Enrollment Density:* Fewer than 2 jobs/college or university students per acre ▪ *Other Trip Generators:* Does not connect to hospitals or medical centers with 50 or more beds, retail centers with 50 or more stores, or other major destinations ▪ *Traffic Volumes:* Any ▪ *Density of Low-Income Residents (Household Income Below 150% of Poverty Level):* Fewer than 2 per acre ▪ *Transit Connectivity:* Does not connect to Metrolink stations, transit centers, or park-and-rides, or to Major routes ▪ *Intersection Density:* Fewer than 100 per square mile

Following are guidelines for Stationlink and Express services.

- ***Stationlink:*** Stationlink routes provide connections solely between Metrolink stations and nearby destinations such as job centers. They should operate only during peak periods, in the peak direction (from the station in the morning, and to the station in the afternoon).
- ***Express:*** Express routes serve long trips during peak periods, primarily commute trips to job centers. As they mainly serve "white-collar" commuters who own automobiles, access to these routes is primarily by auto; thus, Express routes rely on proximity to park-and-ride lots as a primary criterion for service.

Figure 3-13 Proposed Service Allocation Guidelines: Demographics and Connections

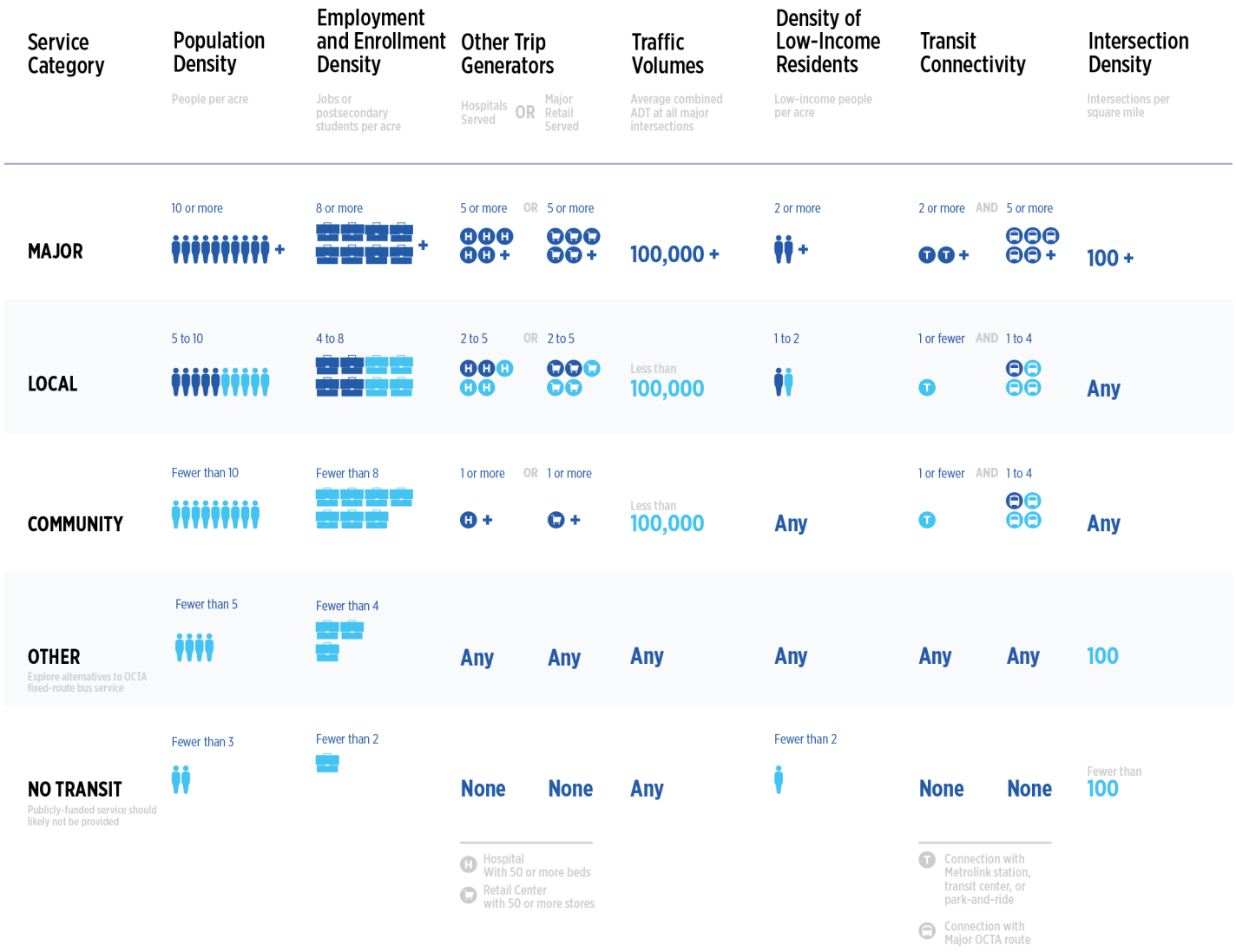


Figure 3-14 Proposed Service Allocation Guidelines: Level of Service

Service Category	Peak Frequency Buses per hour	Base Frequency Buses per hour	Weekday Span	Weekend Span
MAJOR	4+	2+	5 AM to 12 AM	6 AM TO 12 AM
LOCAL	2+	2+	5:30 AM to 8:30 PM	7 AM to 7 PM
COMMUNITY	1+	1+	5:30 AM to 8:30 PM	7 AM to 7 PM
OTHER Explore alternatives to OCTA fixed-route bus service	N/A	N/A	N/A	N/A
NO TRANSIT Publicly-funded service should likely not be provided	N/A	N/A	N/A	N/A

4 CAPITAL INVESTMENT GUIDELINES

This section describes proposed capital investment guidelines in two categories: investments in infrastructure supportive of existing bus operations, and investments in new fixed-guideway lines and stations (e.g., streetcars or bus rapid transit). These standards build on the service allocation guidelines to identify both existing corridors and potential future corridors where capital investments—in addition to potential investments in service—may be justified.

In addition to these investment guidelines, the OC Transit Vision will identify evaluation criteria for investments in transit opportunity corridors. While separate from this Transit Investment Framework, the evaluation criteria are a critical next step in the planning process and proposed measures for OC Transit Vision corridor evaluation are available in Appendix A.

BUS INVESTMENT GUIDELINES

Capital investments in existing bus service fall into three categories: 1) vehicles; 2) transit-priority improvements to the right-of-way; and 3) major improvements to stops and stations, including operational improvements as well as enhanced passenger amenities. Some of these can be implemented by OCTA; others, such as transit-priority and operational improvements, are the responsibility of Orange County cities or Caltrans and would require partnerships with those jurisdictions/agencies.

Vehicles

New vehicles may improve upon the current fleet in terms of capacity, emissions, reliability, maneuverability, comfort, and brand identity, among other factors.

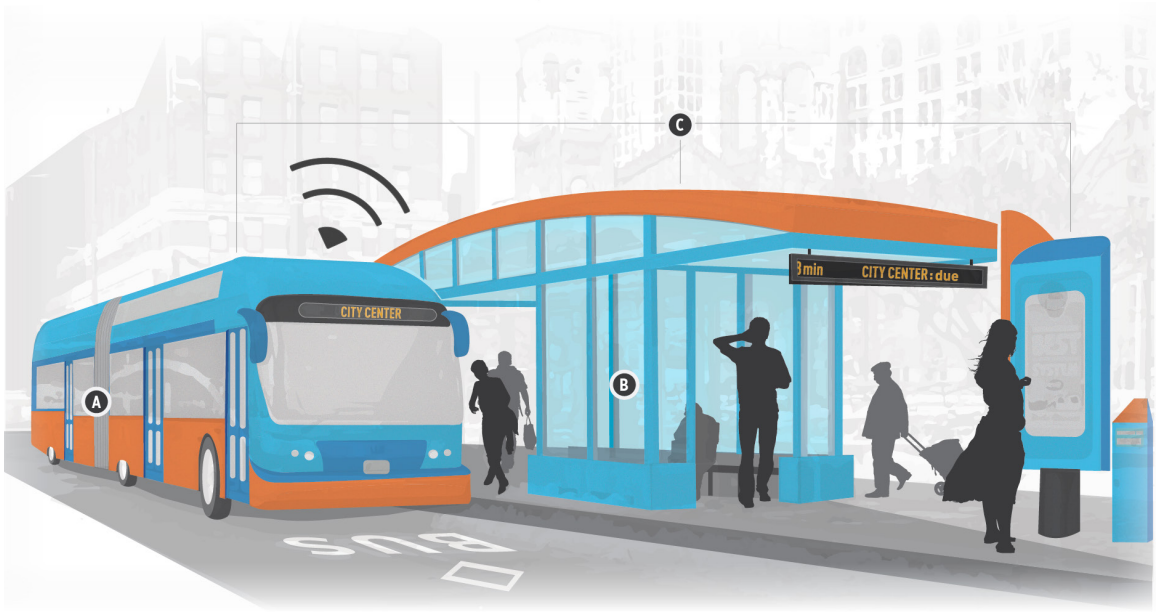
The proposed guidelines for OCTA include (items A through C correspond to labels in Figure 4-1 on the next page):

A. Vehicle capacity, and the related issue of overcrowding

B. Comfort, both aboard vehicles and while waiting at stops

C. Branding of vehicles, to enhance awareness of specialized and premium services such as bus rapid transit

Figure 4-1 OCTA Vehicle and Waiting Enhancements

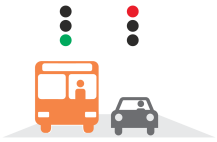


Transit-Priority Improvements

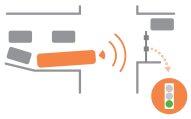
Transit-priority improvements to the right-of-way include:

- Business Access and Transit (BAT) lanes, which prohibit general-purpose traffic through travel but permit right turns and access to businesses and curbside parking; may be 24-hour lanes or peak-only lanes that revert to general-purpose use out of peak periods
- "Queue jumps" or short bus lanes at intersections (often right-turn lanes) allow buses to proceed in advance of general-purpose traffic using a transit-only advance signal phase
- Transit-priority signals
- Changes to signal timing to benefit transit operations

Business Access and Transit (BAT) Lanes



Queue Jumps



Transit-Priority Signals

Signal Timing

Stop and Station Improvements

Major improvements to stops and stations include:

- Operational improvements:
  - "Bulb-out" or curb extension stops allowing buses to stop in the travel lane, eliminating the need to merge back into traffic
  - Relocation of stops to improve operations, for example from the near to the far side of an intersection
  - Removal of parking spaces at or near stops to allow buses to access the curb or create more space to maneuver into and out of stops
  - Off-vehicle fare collection and all-door boarding

Bulb-Out Stop | Stop Relocation | Curb Management | Streamlined Fare and Boarding

- Enhanced passenger amenities such as:
  - Shelters at additional stops, and additional and/or larger shelters at the busiest stops
  - Seating at additional stops, and more seating at the busiest stops
  - Trash cans at additional stops
  - Real-time arrival information displays at stops
  - Maps, schedules, and other information at additional stops

Shelters | Seating | Waste Bins | Real-Time Information | Maps and Schedules

The proposed guidelines for capital investment in existing bus operations are linked to the service types described in the Service Allocation Guidelines. For each service type, a "high," "medium," or "low" levels of investment—defined in terms of service type—is recommended as shown in Figure 4-2.

Figure 4-2 Proposed Bus Capital Investment Guidelines

Service Type	Investment Level	Investment Types
Major	High	▪ Higher-capacity vehicles ▪ Vehicle branding (Bravo! routes only) ▪ All types of transit-priority treatments, including transit lanes ▪ Operational improvements to and enhanced amenities at stops ▪ Off-vehicle fare collection and all-door boarding
Local	Medium	▪ Signal timing improvements ▪ Enhanced passenger amenities at busier stops
Community	Low	▪ Standard bus stop
Express	Medium	▪ Comfortable vehicles designed for longer trips ▪ High-occupancy vehicle facilities on freeways and direct access ramps ▪ Enhanced passenger amenities at park-and-ride lots
Stationlink	Low	▪ Standard bus stop
Other	Low	▪ Vehicle branding (shuttles only) ▪ Technology integration

HIGH-CAPACITY TRANSIT INVESTMENT GUIDELINES

Potential investments in high-capacity modes of transit—including different types of rail as well as bus rapid transit—will be evaluated in the next phase of the OC Transit Vision. This section of the Transit Investment Framework will be updated at the conclusion of that process, based on findings from the evaluation.

In developing guidelines for investments in high-capacity transit, it is important to first understand the following:

- Rail and (to a lesser extent) bus rapid transit infrastructure requires a sizeable capital investment. High ridership is required to justify these investments, and corridors must have transit-supportive characteristics.
- Research into population and employment density thresholds for investment in high-capacity transit modes has resulted in a range of findings. However, thresholds scale with levels of investment (i.e., capital cost). This means that fully grade-separated rail modes (particularly subways) require higher thresholds than at-grade light rail or streetcars, which in turn require higher thresholds than bus rapid transit.
- High-capacity transit, also, as its name suggests, uses larger vehicles, and investment in high-capacity transit may be called for if ridership in a corridor is so high that it cannot comfortably be accommodated using standard buses, even at relatively frequent headways.
- One of the primary advantages of high-capacity transit is that a single operator can provide service to more passengers, reducing operating costs. While a 40-foot bus can only carry around 50 passengers[2], a 60-foot bus can carry 80 or more, and a 66-foot streetcar may hold more than 120 people. Light rail trains consisting of multiple railcars can carry hundreds of passengers at a time. Since labor costs are the single largest factor in transit operating costs, this can greatly reduce overall operating costs[3].
- Capital costs for U.S. bus rapid transit projects have varied widely, but transit-priority investments in bus routes like those described above are essential elements of BRT projects. Any Major corridor should be considered a candidate for some form of bus rapid transit.
- Urban rail projects like the OC Streetcar typically serve both major job centers (e.g., Downtown Santa Ana) as well as relatively dense residential areas, such as neighborhoods in the corridor to the west of downtown.
- Commuter rail lines such as Metrolink may serve a variety of contexts, but typically have major employment centers such as Downtown Los Angeles as a terminus.

Along with the above, analysis of the corridor characteristics identified in the service investment guidelines suggests that, at least for the time being, it would be difficult to make a business case for the highest levels of investment in high-capacity transit (i.e., subways) in Orange County. However, the county has characteristics comparable with peer regions that operate some form of urban rail, including light rail and streetcars, as well as bus rapid transit with exclusive lanes. In Southern California, the Los Angeles Metro Rail system includes light rail and BRT lines in

[2] This can vary depending on seating configuration and definitions of "standing room." OCTA defines a "full" 40-foot bus as carrying between 46 and 49 passengers.

[3] Higher-capacity vehicles may be more expensive to operate in other ways, such as required maintenance of rail tracks, which may offset some of the savings from improving the operator-to-passenger ratio.

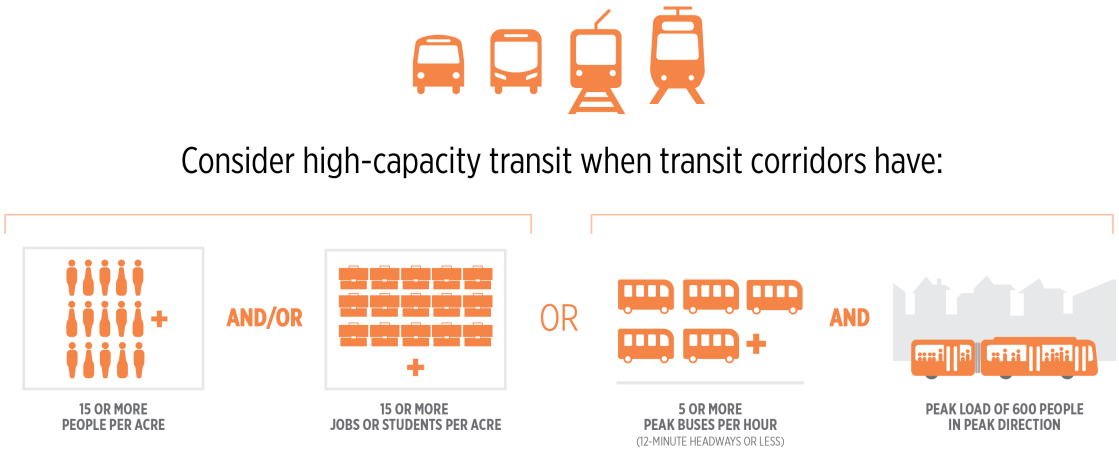
moderate-density areas such as the San Gabriel Valley (the Metro Gold Line) and San Fernando Valley (the Metro Orange Line BRT), while the San Diego Trolley system primarily serves moderately dense suburban areas. Each of these has proven popular, and light rail systems now exist in nearly every large metropolitan area in the U.S. Southwest, including Phoenix, Salt Lake City, and Denver.

In Orange County today, the busiest OC bus routes feature both high loads and, in some cases, on-time performance that could be improved by investments in high-capacity transit, including transit-priority elements. Under current OCTA standards, average peak period loads should not be greater than 130 percent of seated capacity—or 83 passengers on a 60-foot bus—and 85 percent of departures from scheduled timepoints should be no more than five minutes later than scheduled. While improving frequencies can add capacity, this can be expensive. Alternately, larger vehicles can be used to accommodate more passengers at roughly the same cost, and improving the speed of service can allow the same number of vehicles to operate more frequently. Investments in high-capacity transit, then, may pay off over the long term as service is provided more cost-effectively.

The OC Transit Vision will help to answer the question of where light rail, streetcar, BRT, or other high-capacity transit lines might make sense in Orange County. Although additional analysis will soon be underway as part of the project's corridor evaluation task, initial assessment suggests the following thresholds to be appropriate for consideration of high-capacity transit capital investments (Figure 4-3):

- Corridors with population densities greater than 15 persons per acre (9,600 residents per square mile) and/or employment densities greater than 15 employees or students per acre (9,600 jobs/students per square mile)
- Corridors in which existing service has peak load greater than 600 people in peak direction and peak headways of 12 minutes or less

Figure 4-3 Thresholds for Consideration of High-Capacity Transit

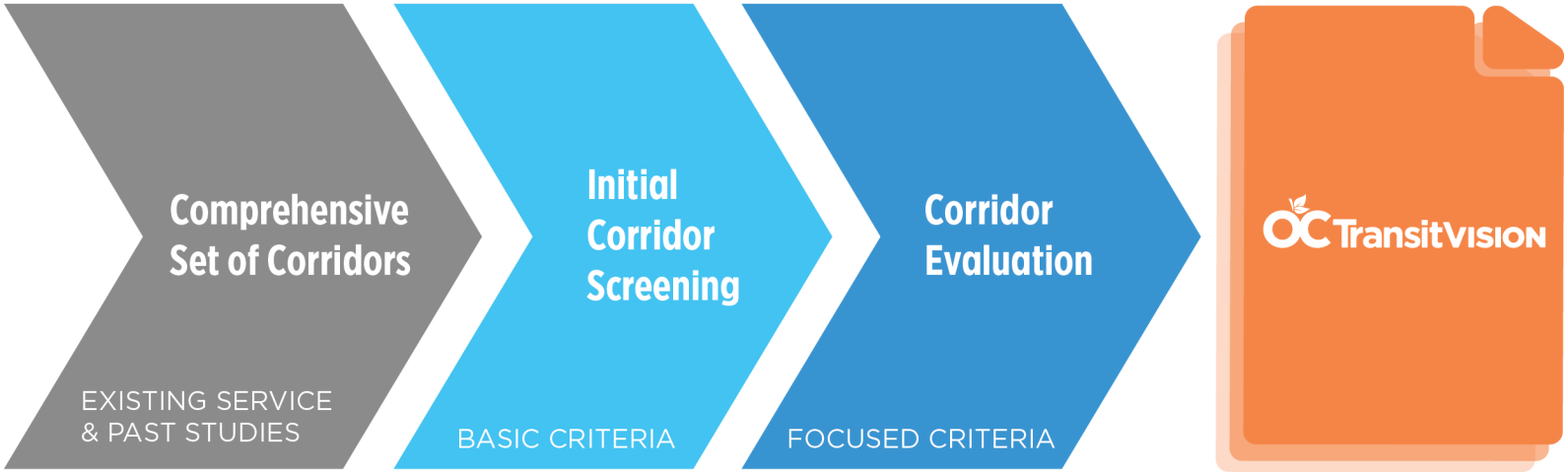


A number of Major corridors in the north-central core of Orange County appear to be at or near these thresholds. Many of the Major corridors feature other major trip generators identified in the service investment guidelines, including large retail centers, hospitals, and other destinations. The corridor screening and evaluation process described in Appendix A will provide the additional information required to determine which existing transit routes or new corridors may be appropriate for capital investments.

Appendix A CORRIDOR EVALUATION PROCESS/CRITERIA

As part of the OC Transit Vision, the project team will evaluate a range of potential transit corridors to direct future transit investments, including investments in high-capacity transit, or transit service changes to align with the plan's goals. Figure A-1 illustrates the proposed evaluation process.

Figure A-1 Corridor Evaluation Process



The initial corridor screening will analyze a comprehensive set of existing and potential transit corridors within Orange County. These corridors will be identified from sources including existing Major routes, past or planned studies by OCTA and its partner jurisdictions, and an initial assessment of the service allocation characteristics identified in Chapter 3. The initial corridor screening will evaluate this set of corridors using 19 basic transit service, demographic, and urban form criteria (see Figure A-2).

Based on the initial screening results, a subset of corridors will undergo more detailed analysis in a second corridor evaluation phase. This phase will use additional focused criteria including many related to the expected outcomes of corridor implementation (e.g., new ridership, travel speed, productivity). Results of this analysis will inform final plan recommendations and guide implementation priorities.

Figure A-2 Corridor Screening and Evaluation Criteria

Category	Measures	Screening Methodology	Evaluation Methodology
 Speed & Reliability	% of Route w/ Transit-Only ROW	--	Calculation based on conceptual design
	% of Route w/ Grade Separation	--	Calculation based on conceptual design
	Peak and Base Frequency	--	From conceptual service plan
	Average Speed	--	Input from modeling (travel time)
 Ridership/Mode Shift/VMT Reduction	Weekday Average Boardings	Boardings per corridor mile and boardings per hour	From model
	New Transit Trips	--	Projected ridership – existing ridership in corridor (from model)
	Transit Mode Share	--	From model
	Per-Capita VMT/CO2 Emissions	--	From model
 Density/Connections to Activity Centers	Population Density Within ½ Mile of Alignment	GIS analysis (Census data)	GIS analysis (Census data)
	Employment/Postsecondary Enrollment Density Within ½ Mile of Alignment	GIS analysis (Census data)	GIS analysis (Census data)
	Density of Hospital Beds/Retail Stores Within ½ Mile of Alignment	GIS analysis (available sources)	GIS analysis (available sources)
	Additional Major Destinations (e.g., Stadiums & Theme parks) Within ½ Mile of Alignment	GIS analysis (based on assessment of "destinations")	GIS analysis (based on assessment of "destinations")
	Traffic Volumes at Arterial Intersections per Corridor Mile (Within ½ Mile of Alignment)	GIS analysis (available sources)	GIS analysis (available sources)

Category	Measures	Screening Methodology	Evaluation Methodology
	% of Employment within 30-min Travel Time on Transit	--	From model
 Multimodal Connectivity	# of Connections to Metrolink Stations, Transit Centers, and Major Routes	GIS analysis (available sources)	GIS analysis (available sources)
	# of Connections to Park-and-Rides	GIS analysis (available sources)	GIS analysis (available sources)
	Intersection Density per Square Mile	GIS analysis (available sources)	GIS analysis (available sources)
	Pedestrian Network Serving Transit	WalkScore within ½ mile of corridor	WalkScore within ½ mile of corridor
	# of Connections to Existing or Planned High-Quality Bicycle Facilities (Off-Street or Protected On-Street)	--	Based on review of existing routes/plans
 Capacity	Person Throughput	--	Analysis based on vehicle capacity, conceptual service plan, and roadway capacity
 Safety	Potential for Reduction in Collision Rates and Severity	--	Qualitative assessment based on project/corridor design and # of new transit trips (as proxy for VMT reduction)
 Passenger Comfort/Amenities	Passenger Comfort	--	Qualitative assessment based on vehicle capacity, movement (e.g. lateral sway)
	System Legibility	--	Qualitative assessment based on conceptual design (e.g. visibility, alignment)
	Density of Households with Annual Incomes < $40,000	GIS analysis (Census data)	GIS analysis (Census data)

Category	Measures	Screening Methodology	Evaluation Methodology
Equity	Density of Seniors and People with Disabilities	GIS analysis (Census data)	GIS analysis (Census data)
	CalEnviroScreen Scores	Analysis based on EnviroScreen ratings for disadvantaged communities	Analysis based on EnviroScreen ratings for disadvantaged communities
Economic Development	Support for Retail Activity	Density of retail land uses within ½ mile of corridor	Qualitative assessment based on project design (e.g., turn restrictions, additional sidewalk space, parking impacts)
	Support for Transit-Oriented Development	Qualitative assessment based on research	Qualitative assessment based on research
Transit-Supportive Policy	Inclusion of Corridor in Regional and Local Transit-Oriented Plans	Qualitative assessment based on research	Qualitative assessment
	Adoption of Supportive Zoning	Qualitative assessment based on research	Qualitative assessment
Cost-Effectiveness/ Productivity	Capital Cost per Boarding	--	Analysis based on high-level capital cost estimates (based on peer review, service plan and high-level travel time estimates) + ridership from model
	Operating Cost per Boarding	--	From model
	Boardings per Revenue Hour	--	Ridership from model / revenue hours derived from operating cost estimates
	Boardings per Revenue Mile	--	Ridership from model / revenue miles derived from operating cost estimates