Upper Interstate 5 Corridor Plan

Caltrans District 12

June 2019

About Us

Caltrans District 12

The California Department of Transportation (Caltrans) is the state agency responsible for planning, designing, building, operating, and maintaining the State Highway System (SHS). For administrative purposes, Caltrans is divided into 12 district offices. Caltrans District 12 was established in 1988, with jurisdictional boundaries that cover the entirety of Orange County. The SHS in Orange County consists of three interstate freeways, six state routes, four toll roads, and seven conventional highways. There are a total of 2,066 lane-miles, including 268 lane- miles of High-Occupancy Vehicle (HOV) lanes.

System Planning

System Planning is the long-range transportation planning process for the California Department of Transportation (Caltrans). The System Planning process fulfills Caltrans' statutory responsibility as owner-operator of the SHS by evaluating existing conditions and proposing enhancements to the transportation system. System Planning is a continuous, comprehensive, and cooperative process that considers the entire transportation system, including highways, local roads, transit, freight, and active transportation. Caltrans focuses on developing a safe, sustainable, integrated, and efficient transportation system that enhances California's economy and livability.

Core System Planning products include the District System Management Plan (DSMP), Corridor System Management Plan (CSMP), Corridor Plan, and Transportation Concept Report (TCR). These documents are prepared in consultation with related Caltrans functional units and divisions, as well as external partner agencies. Early consultation and coordination facilitates a continuous process from policy and planning to project delivery and ensures that System Planning documents are consistent with other transportation plans.

Contents

Executive Summary

Interstate 5 (I-5) is a north-south controlled-access freeway that begins at the California border with Mexico and ends in Washington State at the Canadian border. Within Caltrans District 12, I-5 begins from the San Diego County line and ends at the Los Angeles County line. I-5 is the corridor that bridges San Diego, Orange and Los Angeles counties. The Upper I-5 Corridor Plan (Plan) in Orange County will focus on the portion of I-5 between Red Hill Avenue to the Los Angeles County line. I-5 is essential to the mobility, economy and quality of life in Orange County. This section is a major regional commuter and commercial corridor, carrying up to 366,000 vehicles daily that connects with major residential, commercial, educational, employment and entertainment destinations.[1] I-5 intersects with the SR 55, SR 22, SR 57, and SR 91 freeways. SR 91 is a major east-west corridor that is crucial to the movement of freight and to the commuters that work in Orange and Los Angeles Counties, as well as Riverside and San Bernardino counties. The I-5 corridor experiences congestion and long traffic delays during peak periods due to travel demand exceeding system capacity.

The Plan entails the continued cooperation with local cities along the route, as well as partner agencies such as the Orange County Transportation Authority (OCTA) and Southern California Association of Governments (SCAG). Based upon the foundation of a collaborative process, it is hoped that the demands, goals, and objectives of the stakeholders may be realized in addition to those of Caltrans. The composition of the Plan included outreach with each of the corridor cities, of which feedback was used to inform the corridor goals, recommendations, and strategies. The goals of the Plan include the enhancement of Safety, Operations, Multimobility, and Sustainability of the corridor, which were subsequently utilized to develop a set of recommendations and strategies. These recommendations and strategies were then vetted by a broad set of criteria - Safety, Mobility, Accessibility, Economic Development, Air Quality, and Ease of Implementation - to determine which improvements should be prioritized for implementation (short-, medium-, and long-term strategies).

[1] Traffic Census Program, Caltrans, 2017

In addition to considering the feedback of our local and regional partners, Caltrans also considered how factors such as innovative technologies and future transportation trends may impact the State Highway System (SHS) of tomorrow. For instance, new transportation possibilities with groundbreaking technologies and services will change travel behavior and will subsequently affect the infrastructure and support systems needed to keep Orange County mobile.

With new emerging and rapidly changing technologies, the potential impacts of technological innovations on travel behavior warrants consideration and eventual adaption.

Corridor Profile

Context and Purpose

The transportation system in California moves people and goods between home, work, school, shopping, recreation, and other destinations, and connects ports, industry, residential communities, commercial centers, educational facilities, and natural wonders.

California's transportation system includes roads and highways, public-use airports, major ports, freight systems, and transit systems. Transportation has a profound and varied impact on individuals, business, and communities, with benefits such as economic growth, greater accessibility, and transport-related physical activity, as well as consequences such as pollution, traffic congestion, and sedentary behaviors.

Corridor Planning is a multimodal transportation planning approach that recognizes that transportation needs are based on the complex geographic, demographic, economic, and social characteristics of communities. These locations are tied together by a complex system of streets, roads, highways, trails, paths, rail lines, bus corridors, and other elements that affect the convenience, safety, and accessibility of transportation choices. Increasingly, technologies such as real-time, web- and mobile-enabled trip planning and ride-sourcing services are changing how people travel. Soon, automated and connected vehicles and unmanned aerial systems such as drones are expected to transform the way that people and freight are transported.

Caltrans is committed to developing corridor plans that identify and recommend transportation strategies and improvements in coordination with our planning partners, resulting in a range of project candidates and non-project strategies that achieve Caltrans goals and objectives. These project candidates and strategies are advanced to implementation through regional planning, system planning and programming processes. The corridor plans and recommended projects strive to meet local, regional, statewide goals for a safe, sustainable, integrated, and effective transportation system that positively impacts all Californians. The plans also outline a corridor vision for improving and operating the system in a manner that achieves these goals.

System Characteristics

I-5 is a major facility within Orange County and carries international, interstate, interregional, and intraregional travel. The route is projected to experience substantial growth for goods and commuter movements. The limits for the Corridor Plan are Red Hill Avenue in the south and the Los Angeles County line in the north which totals approximately 15 miles. The corridor is primarily residential with pockets of retail, commercial, light industrial and professional office spaces.

Between SR 55 and the Los Angeles County line, there are generally four to five general purpose (GP) lanes and one High-Occupancy Vehicle (HOV) lane in each direction, with auxiliary lanes along many sections. A project to add a second HOV lane between SR 55 to SR 57 is scheduled for completion in 2021. An extra wide inside shoulder is currently striped in both directions between SR 57 and SR 91. There are 22 on-ramps and 21 off-ramps in the northbound direction and 22 on-ramps and 19 off-ramps in the southbound direction. Within the project limits, there are freeway-to-freeway connectors for GP lanes at SR 55, SR 22, SR 57, and SR 91. In addition, there are HOV direct connectors (DCs) linking I-5 to the SR 55, SR 57, and SR 91 HOV lane facilities, as well as five Direct Access Ramps (DARs) which link the HOV lanes directly to local arterials.

Much of I-5 in the project area carries over 300,000 daily vehicles.[2] The highest volume on the corridor occurs near 17th Street, just south of the SR 22 interchange. The GP lanes experience significantly more congestion than the HOV lanes, and the northbound GP lanes generally experience more delay than the southbound GP lanes.

[2] Traffic Census Program, Caltrans, 2017

Route Designations

Functional Classification	Interstate/1
National Highway System (NHS)	Eisenhower Interstate System
National Highway Freight Network (NHFN)	Primary Highway Freight System (PHFS)
Interregional Road System (IRRS)	Yes
Interregional Transportation Strategic Plan (ITSP)/Strategic Interregional Corridors	Priority Interregional Highway
Scenic Route	No

Segmentation

Segment 1

Segment 1 is approximately 3.7 miles long, begins at Red Hill Avenue (postmile (PM) 30.26) and ends at the SR 22/SR 57 interchange (PM 34). As previously mentioned, Segment 1 of the upper I-5 corridor carries the highest volume of daily vehicle trips nearby the 17th Street ramps. Jurisdictions located directly adjacent to Segment 1 include the Cities of Tustin and Santa Ana.

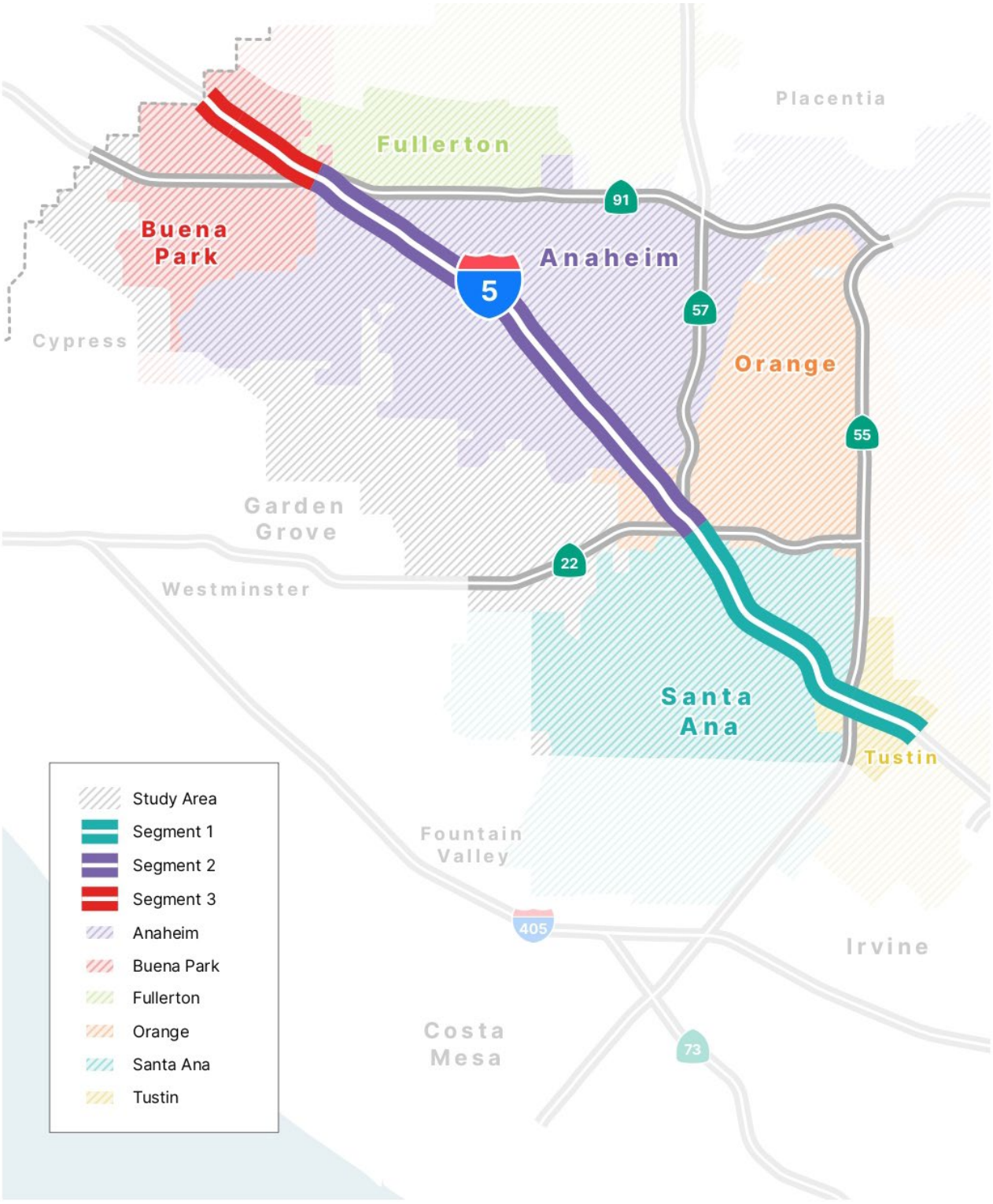
Segment 2

Segment 2 is approximately 8.1 miles long, which is the longest segment of this Corridor Plan. The segment begins at the SR 22/57 interchange (PM 34) and ends at SR 91 (PM 42.1). Jurisdictions located directly adjacent to Segment 2 include the Cities of Santa Ana, Orange, Anaheim, and Fullerton.

Segment 3

Segment 3 is approximately 2.28 miles long – beginning at SR 91 (PM 42.1) and ending at the LA County Line (PM 44.38). This segment is the most southern portion of the I-5 corridor within Orange County, of which sections are positioned below-grade. Jurisdictions located directly adjacent to Segment 3 include the Cities of Anaheim, Fullerton, and Buena Park.

Segmentation and Jurisdictions



Source: Caltrans

Parallel Alternate Roadways

I-5 traverses diagonally across Orange County in a northwest to southeast orientation. There are no roadway facilities that are directly parallel to I-5 since most other freeways and major arterials in the area are north-south and east-west routes. However, a combination of north-south and east-west routes including SR 22, SR 55, SR 57, and SR 91 can serve as alternatives to I-5 during periods of recurring and non-recurring congestion. Major north-south arterials such as Main Street, State College Boulevard, Harbor Boulevard, and Euclid Street, as well as east-west arterials such as Orangethorpe Avenue, La Palma Avenue, Lincoln Avenue, Ball Road, Katella Avenue, and Orangewood Avenue can also serve as alternative facilities to I-5.

Major Trip Generators

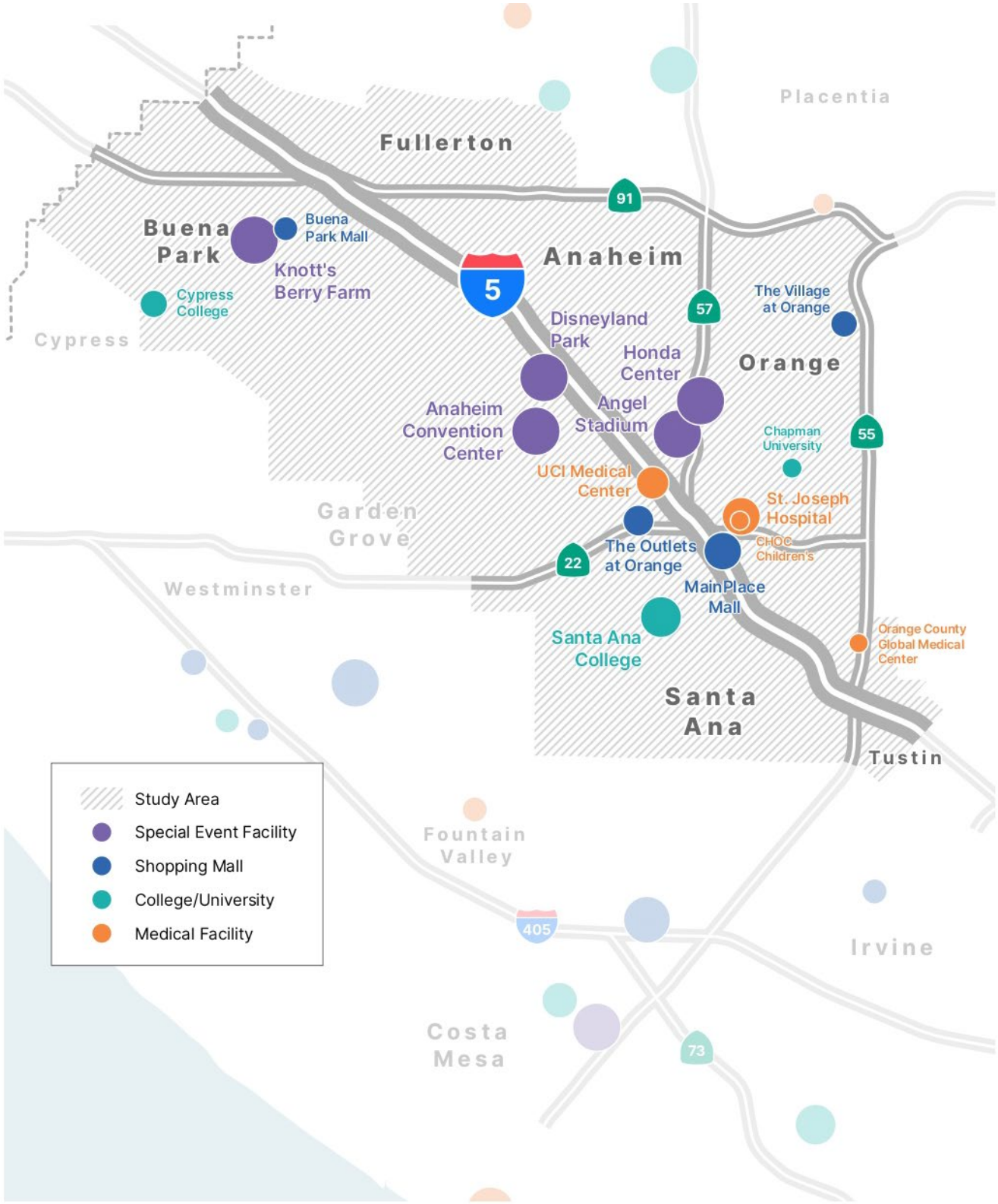
There are various facilities and institutions located along I-5 that have the potential to generate significant trips on the corridor. I-5 also serves as a major commute route for Orange County residents as well as residents from areas of Riverside and San Bernardino Counties due to the major employment centers located within central and southern Orange County.

Major shopping malls in the area include MainPlace Mall and The Outlets at Orange. Santa Ana College and Cypress College also generate many trips, and UCI Medical Center, St. Joseph Hospital, and Children's Hospital of Orange County (CHOC) are directly adjacent to I-5. In addition, the area contains the following major attractions:

- Disneyland: Second busiest amusement park in the world with annual attendance of 18.3 million.[3] It also directly employs over 20,000 people, making it Orange County's largest employer and one of the largest single-site private employers in the state.[4]
- Angels Stadium of Anaheim: Baseball stadium of the Los Angeles Angels with over 45,000 seats.[5]
- Honda Center: Hockey stadium of the Anaheim Ducks with over 18,300 seats.[6] Also hosts other events such as concerts, rodeos, basketball tournaments, and major performances.
- Knott's Berry Farm: Major amusement park with attendance of approximately four million visitors per year.[7]

[3] 2018 Theme Index and Museum Index: The Global Attractions Attendance Report, Themed Entertainment Association, 2018
[4] The Walt Disney Company, 2005
[5] MLB, 2019
[6] Honda Center, 2019
[7] OC Register, August 2018

Major Trip Generators



Source: Caltrans, OCTA

Community Characteristics

Socioeconomics

Within the jurisdiction of Caltrans District 12 is a community of 3.2 million residents that will continue to grow and increase the population density of Orange County.[8] California currently has the 6th youngest population in the nation but will surpass the national average of 37.3 years of age by 2040.[9] This is largely due to the Baby Boomer generation that is projected to make up 18 percent of the region's population that will be 65 years or older by 2040.[10] As the population of Orange County continues to follow a similar trend, Caltrans will continue to work with local and regional agencies to accommodate this group of individuals who are less likely to drive due to health limitations. This involves implementing a comprehensive and efficient multimodal transit network that incorporates the use of public transit, car sharing, and Active Transportation.

The 2013-2017 American Community Survey 5-Year Estimates for the Cities of Buena Park, Fullerton, Anaheim, Orange, Santa Ana, and Tustin indicate a few demographic trends for these cities along the corridor. The City of Buena Park has the highest median age, as well as one of the oldest populations. The City of Santa Ana has the youngest population and the largest percentage of Hispanic or Latino residents. The City of Anaheim has the largest overall population, and the City of Tustin has one of the largest percentages of minority populations. These estimates indicate that I-5 impacts a diverse population along the corridor.

Disadvantaged Communities

In 2012, Senate Bill (SB) 535 instructed the California Environmental Protection Agency (CalEPA) to develop a list of communities that are the most impacted by pollution. CalEPA defines Disadvantaged Communities (DACs) as the highest 25 percent scoring census tracts in CalEnviroScreen 3.0.[11] The California Environmental Health Screening

[8] 2013-2017 American Community Survey 5-Year Estimates, U.S. Census Bureau, 2017
[9] California Transportation Plan 2040, Caltrans, 2016
[10] SCAG 2016 RTP/SCS, 2016
[11] Designation of Disadvantaged Communities Pursuant to Senate Bill 535, California Environmental Protection Agency, 2017

Tool 3.0 (CalEnviroScreen) is a tool that identifies California communities by census tract that are disproportionately burdened by, and vulnerable to, multiple sources of pollution. Thus, per SB 535 and CalEnviroScreen, DACs are considered to be the top 25 percent of census tracts in California that are the most burdened by and vulnerable to pollution. This section of I-5 passes through numerous DACs which are mostly industrial in land use.

Environmental Justice Areas

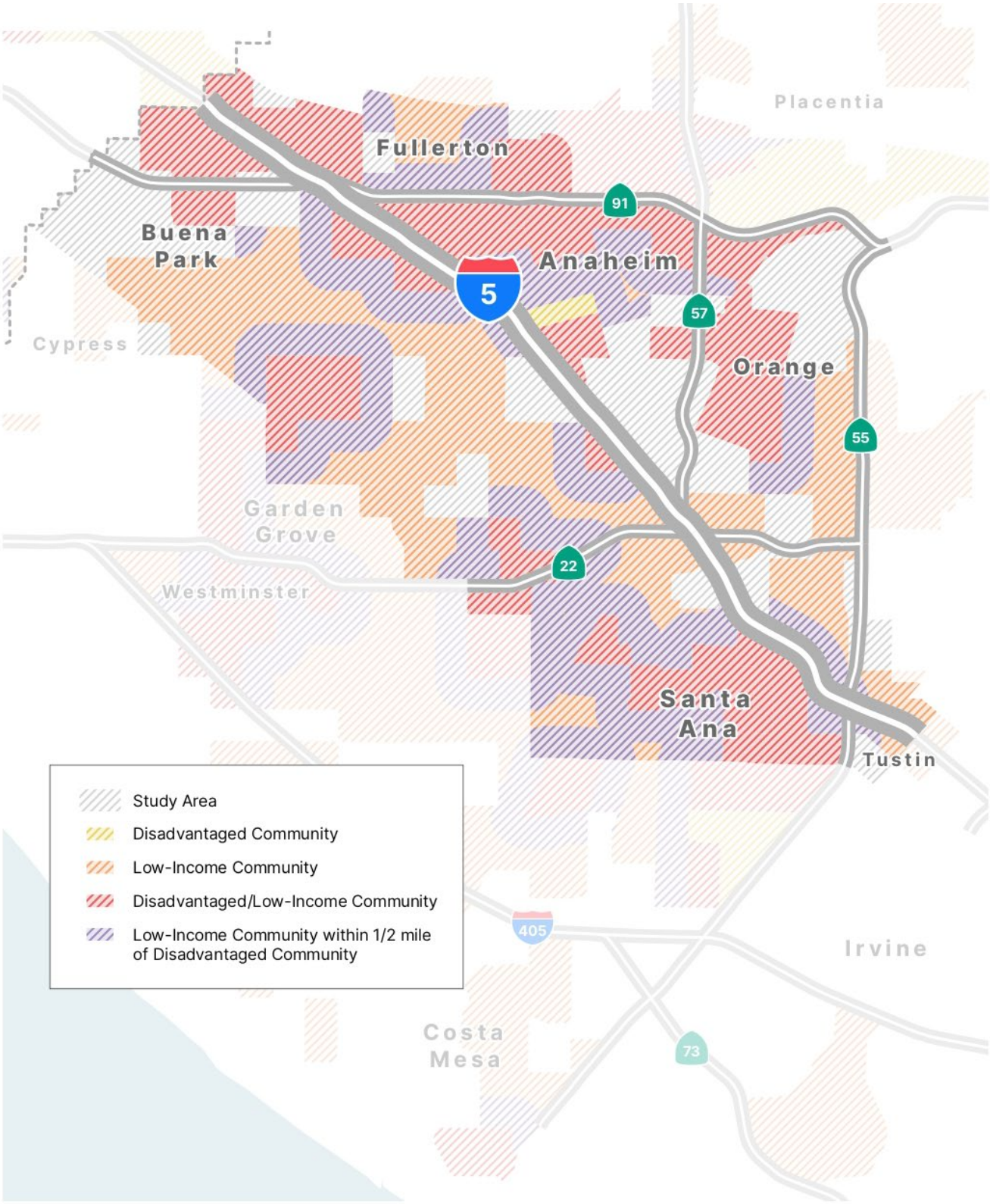
The Southern California Association of Governments (SCAG) has also developed a map that is a visual representation of communities that potentially face environmental justice challenges. These Environmental Justice Areas (EJAs) have a higher concentration of minority population OR low-income households than is seen in the SCAG region as a whole. The intent of the EJA map is to identify communities in the region that may be disproportionately impacted by environmental justice concerns, and SCAG has determined that demographics and income are indicators of these EJA communities. Many of the communities directly adjacent to and around I-5 are considered EJAs. In conjunction with the SB 535 map, this demonstrates that I-5 is a corridor that carries impacts beyond transportation, also affecting the health and well-being of vulnerable communities. These communities and their environmental justice concerns should be taken into consideration when evaluating projects along the I-5 corridor.

Statistical Summary*

Category	Anaheim	Buena Park	Fullerton	Santa Ana	Tustin	Orange County
2018 Total Population	357,084	83,995	144,214	338,247	82,344	3,221,103
2018 Population Density	7,165	7,984	6,453	12,404	7,432	4,101
2018 Median Age (Years)	34.0	35.9	35.0	31.0	34.6	37.5
2018 Hispanic	53.8%	40.0%	36.4%	77.3%	41.2%	34.2%
2018 Non-Hispanic White	25.2%	24.9%	33.0%	9.4%	30.4%	41.4%
2018 Non-Hispanic Asian	16.4%	28.7%	24.4%	11.4%	21.6%	19.5%
2018 Non-Hispanic Black	2.2%	3.2%	2.7%	0.8%	2.4%	1.6%
2018 Non-Hispanic American Indian or Alaska Native	0.1%	0.2%	0.1%	0.1%	0.5%	0.2%
2018 All Other Non-Hispanic	2.3%	3.0%	3.4%	1.0%	3.9%	3.1%
2018 Number of Households	102,034	24,146	47,023	74,483	26,855	1,037,173
2018 Average Household Size	3.5	3.4	3.0	4.5	3.0	3.1
2018 Median Household Income	$65,313	$71,005	$71,660	$57,151	$73,567	$81,851
2018 Number of Housing Units	108,222	25,052	49,430	78,052	28,118	1,094,169
2018 Homeownership Rate	44.9%	54.9%	51.6%	45.4%	48.1%	52.4%
2018 Median Existing Home Sales Price	$580,000	$572,000	$625,000	$540,000	$670,000	$725,000
2018 Drive Alone to Work	76.9%	81.6%	77.9%	73.4%	78.5%	78.6%
2018 Mean Travel Time to Work (min	28.5	30.3	29.8	25.1	24.5	27.4
2017 Number of Jobs	198,113	33,817	65,071	163,504	50,169	1,726,003
2017 Average Salary per Job	$51,259	$43,832	$49,824	$58,171	$57,263	$62,699
2018 K-12 Public School Student Enrollment	58,185	10,230	21,590	58,575	11,320	483,233

Source: SCAG Local Profiles Report 2019, 2019
**No data available for City of Orange since it is not a member of SCAG.*

Disadvantaged and Low-Income Communities



Source: Caltrans, California Air Resources Board

Public Transit

Existing Transit Service

OC Bus

OCTA currently operates 60 bus routes, including six Stationlink routes, two Bravo! limited stop routes, and six Express routes on freeways.[12] The current bus network reflects ongoing efforts to implement the OC Bus 360° route reconfiguration which seeks to improve ridership and cost-effectiveness by shifting resources from lower-demand to higher-demand corridors. This has resulted in a greater number of routes with a peak hour frequency of 15 minutes or less.

There is generally no bus service on I-5 between SR 55 and the Los Angeles County line, except for segments of Local Route 83, OC Express Route 206, and Stationlink Route 463. A combination of local routes that traverse north-south and east-west arterials, particularly Bravo! and high-frequency service, can serve as alternatives to I-5.

Metrolink

Metrolink is the primary passenger rail service provider in Orange County. It is a Joint Powers Authority (JPA) formed in 1991 with the goal of reducing congestion on freeways and improving mobility throughout the Southern California region. The overall system network currently consists of seven lines and 59 stations.[13] The Orange County (OC) Line, as well as segments of the 91/Perris Valley (91/PV) Line and Inland Empire-Orange County (IE-OC) Line, are parallel to I-5 within the study area and serve as viable alternatives to driving. Stations in the study area include Santa Ana Regional Transportation Center (SARTC), Orange, Anaheim Regional Transportation Intermodal Center (ARTIC), Fullerton, and Buena Park.

[12] OCTA, 2019
[13] Metrolink, 2019

Amtrak Pacific Surfliner

Amtrak Pacific Surfliner service operates on the 351-mile, six-county Los Angeles-San Diego-San Luis Obispo (LOSSAN) corridor, which is the second-busiest intercity passenger rail corridor in the nation.[14] The Pacific Surfliner operates on the same route as the Metrolink OC Line through Orange County but makes fewer stops. Stations in the study area include SARTC, ARTIC, and Fullerton.

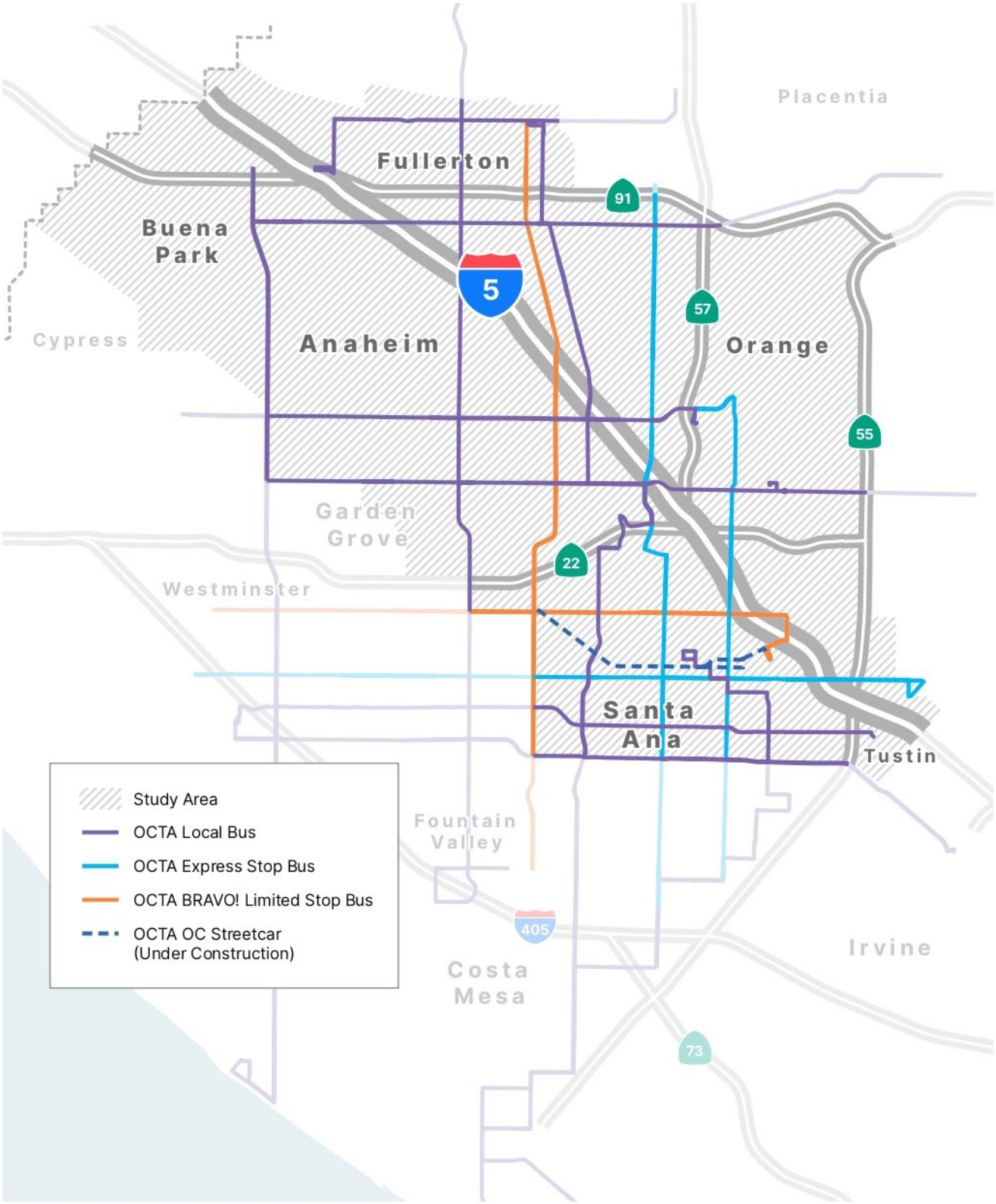
Programmed Transit Service

OC Streetcar

The OC Streetcar is a 4.2-mile route that will link SARTC to a new multimodal transit hub located at the intersection of Harbor Boulevard and Westminster Avenue in Garden Grove. It will connect the regional rail system to key employment, population, and activity centers. The OC Streetcar is currently under construction with service scheduled to begin in 2022.

[14] OCTA, 2019

High-Frequency Transit Network



Source: Caltrans, OCTA

Transit Opportunity Corridors

While OCTA operates 65 bus routes, just 19 of them carry 75 percent of riders.[15] As such, OCTA recognized that improvements to its core corridors would lead to better service for the vast majority of riders. The OC Transit Vision identified 11 Transit Opportunity Corridors (TOCs) which merit major investment in higher-quality service such as rapid streetcar or bus rapid transit (BRT). Two of these corridors, Harbor Boulevard and Bristol Street, were found to be prime candidates for near- to medium-term investment, and corridor studies are currently underway. OCTA is also conducting a Caltrans-sponsored corridor study for a freeway BRT system on I-5 and SR 55.

Central Harbor Boulevard Transit Corridor Study

Harbor Boulevard is Orange County's busiest north-south transit corridor, with an average of 12,800 weekday boardings.[16] In addition, the parallel Anaheim Boulevard/Lemon Street and Katella Avenue corridors collect an average of 9,200 and 4,200 weekday boardings, respectively.[17] The Central Harbor Boulevard Transit Corridor Study focuses on an eight-mile segment of Harbor Boulevard from Fullerton Transportation Center through the cities of Anaheim and Garden Grove to Westminster Avenue on the border of Garden Grove and Santa Ana. The study also considers connections along a parallel five- mile segment of Lemon Street and Anaheim Boulevard from Fullerton Transportation Center to Katella Avenue in Anaheim, as well as an additional 2.2-mile segment of Katella Avenue from Harbor Boulevard to ARTIC. A total of 12 alternatives, including bus, BRT, streetcar, rapid streetcar, and hybrid bus/streetcar variations, were evaluated against 24 criteria to determine alignments and modes that best meet study objectives. Rapid streetcar scored the highest in the evaluation, followed by streetcar and BRT. The next steps would likely include a detailed environmental review, public engagement, and selection of a preferred alternative.

Bristol Street Transit Corridor Study

Bristol Street is one of the highest ridership corridors in Orange County. The corridor is currently served by routes 57 (local) and 57X (limited stop), with additional routes serving major cross-streets. The area is also one of the county's densest regions, with

[15] OC Transit Vision, OCTA, 2018
[16] Central Harbor Boulevard Transit Corridor Study, OCTA, 2017
[17] Central Harbor Boulevard Transit Corridor Study, OCTA, 2017

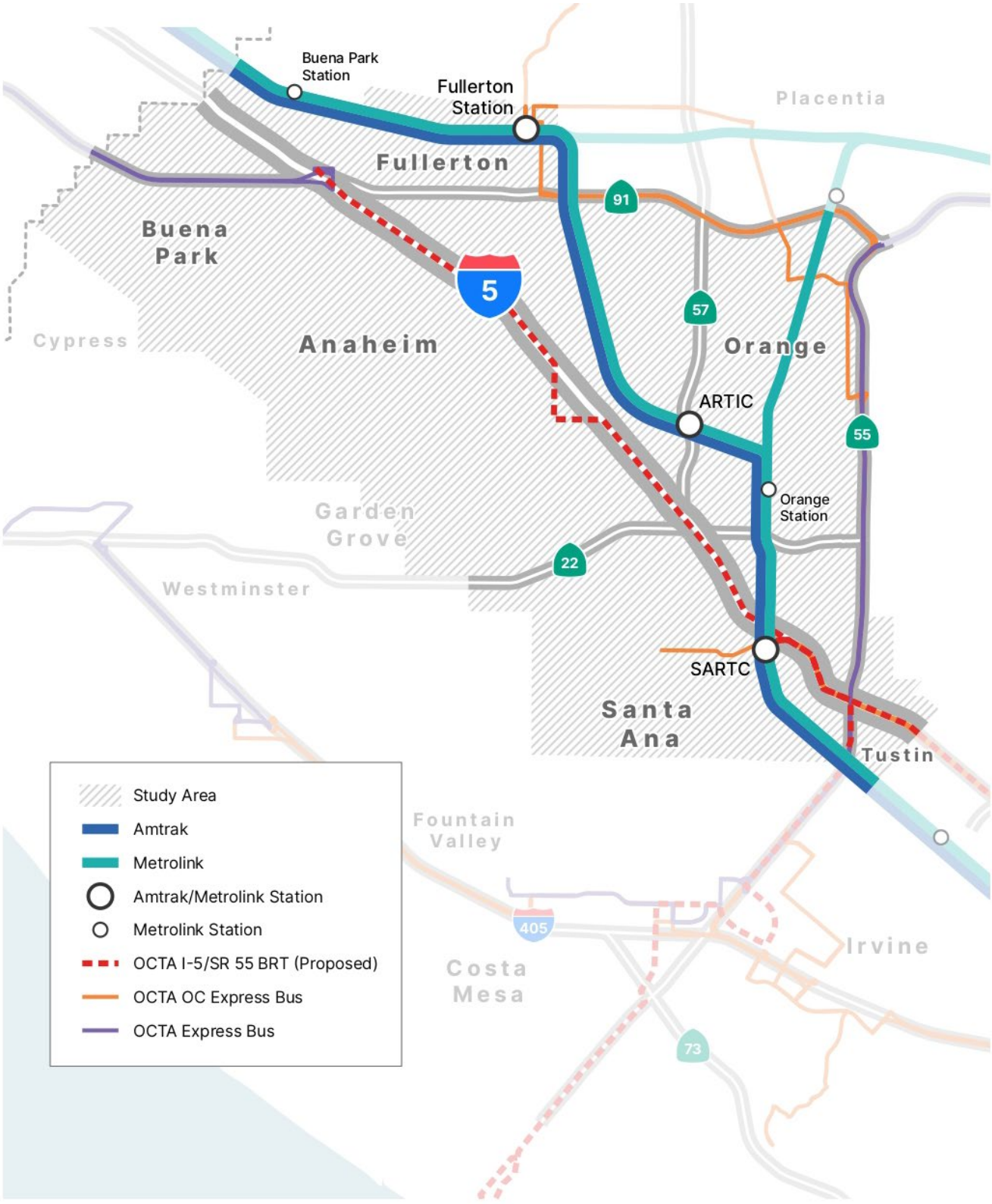
12,600 residents per square mile and 10,400 jobs per square mile.[18] The purpose of the Bristol Street Transit Corridor Study is to analyze and develop options to improve the transit corridor from north of 17th Street and Westminster Boulevard to John Wayne Airport. Most of the study area is located within the City of Santa Ana, but also includes small portions of the Cities of Costa Mesa, Newport Beach, and Irvine, as well as unincorporated Orange County. The study will consider a wide range of alternative alignments and transit technologies to identify the best performing options that have wide community support.

Freeway BRT Concept Study

OCTA's Freeway BRT Concept Study will develop a conceptual plan for two freeway BRT routes on I-5 and SR 55. Freeway BRT elements being evaluated include freeway median stations, transit-only access ramps, and integration with park and ride lots. Stations would be located to connect with key transit routes including Amtrak and Metrolink commuter rail service and with first-last mile transportation options. Conceptual stop locations for the proposed I-5 BRT route include Laguna Niguel/Mission Viejo Station, Laguna Hills Transit Center, Irvine Spectrum, Jeffrey Park and Ride, SARTC, Disneyland, and Fullerton Park and Ride, while conceptual stop locations for the proposed SR 55 BRT route include Hoag Hospital, 17th/Harbor, South Coast Plaza, John Wayne Airport, Main/McArthur, and SARTC. Unlike today's express bus service, freeway BRT routes would operate all day, in both directions, with greater frequency. The study will develop high-level ridership and cost estimates and identify short and long- term recommendations for implementation.

[18] Bristol Street Transit Corridor Study (Draft), 2019

Regional Transit Network



Source: Caltrans, OCTA

Freeway BRT Best Practices

Metro Silver Line (Los Angeles County)

The Los Angeles County Metropolitan Transportation Authority (Metro) Silver Line is a BRT service that operates on the I-10 and I-110 ExpressLanes. The ExpressLanes were created in 2012 as a part of the Congestion Reduction Demonstration Project which converted the El Monte Busway and Harbor Transitway from HOV and bus-only lanes to HOT lanes. The Silver Line, which includes the all-stop Line 910 and limited-stop Line 950X, consolidated previous express bus routes, increased service frequency, and introduced unique branding. Integral features of the BRT service include freeway median stations and traffic signal priority.

MTS Rapid (San Diego County)

The Metropolitan Transit System (MTS) has operated BRT service called Rapid on the I-15 Express Lanes since 2014 and is expanding service throughout San Diego County in collaboration with the San Diego Association of Governments (SANDAG). A key component of Rapid service is the use of integrated freeway median stations and DARs, as well as transit signal priority and dedicated transit-only lanes, to provide high-frequency, limited-stop service with increased travel time reliability. Rapid operates at frequencies of up to every 10 minutes during weekday rush hours, every 15 minutes during most non-rush hours, and every 30 minutes on weekends. Current routes that utilize the I-15 Express Lanes include Rapid Express 280, Rapid Express 290, Rapid 235, and Rapid 237.

Planned Regional Improvements

Southern California Optimized Rail Expansion Program (SCORE)

The Southern California Optimized Rail Expansion Program (SCORE) consists of $10-billion in proposed projects to improve regional rail service by 2028. CTC awarded a $6.5-million grant to Metrolink in 2017 to begin environmental and design work. SCORE includes grade separations, double tracking, and signaling improvements, as well as potential electrification of the OC Line. These improvements would facilitate increasing service to four trains per hour on the OC Line, two trains per hour on the 91/PV Line and IE-OC Line, and one train per hour on the Amtrak Pacific Surfliner at buildout.[19] Implementation of the program would provide additional traveler options and encourage

[19] Metrolink, 2018

mode shift from parallel freeways such as I-5 while reducing pollution by 51.6 million metric tons and improving goods movement.[20]

Fullerton Interlocking Improvement Project

Currently, Amtrak operates 26 trains per day, Metrolink operates 28 trains per weekday, and BNSF operates up to 65 freight trains through the Fullerton Interlocking, which is located east and west of Fullerton Station.[21] Passenger trains are frequently delayed due to conflicts with freight movements; the Fullerton Interlocking Improvement Project would allow for the separate movement of freight and passenger trains through the junction to greatly improve operational efficiency and reliability. Furthermore, reducing delays at Fullerton Interlocking would eliminate residual delays which can cascade throughout the network. The project is also critical to accommodating the increased number of passenger trains as proposed in SCORE.

[20] Metrolink, 2018
[21] BNSF Railway Company, 2018

Goods Movement

Freight on I-5

I-5 is part of the National Truck Network for the entire length in Orange County. As a key route that links Mexico with the largest cities on the west coast, I-5 carries a relatively high volume of trucks. This northern portion of I-5 from SR 55 to the Los Angeles County line carries a higher volume of trucks versus the southern portion between the San Diego County line to SR 55. From SR 55 to the Los Angeles County line, trucks comprise from four to 10 percent of the vehicles in this corridor, with the highest peak hour volume of trucks totaling 25,500 at Lincoln Avenue in Segment 2.[22] I-5 has a significant truck usage, but SR 91 has the highest percentage of truck usage. The lowest volume of trucks is near I-5/SR 91, where a high percentage of trucks divert to distribution centers. Distribution is a dominant industry in the Inland Empire.

Freight Railroads

The Burlington Northern Santa Fe (BNSF) and Union Pacific (UP) are Class I railroads which own tracks that traverse the SCAG region. The Class I railroad network is supplanted by a number of Class III railroads, which make it possible to transport domestic and international cargo to and from ports and major distribution centers.

In Orange County, BNSF tracks are parallel to SR 91, and Southern California Regional Rail Authority (SCRRA) tracks are roughly parallel to I-5 south of Fullerton. Rail operations in the region often require tracks owned by several operators to be utilized. On the LOSSAN corridor, freight and passenger rail service are provided on Amtrak, BNSF, SCRRA, and NCTD right-of-way (ROW).

Seaports

While no seaports exist within Orange County, there are several major ports in neighboring counties. The Ports of Los Angeles and Long Beach are the largest container port complex in the U.S. and eighth largest in the world. In 2018, the Port of Los Angeles handled 9.5 million twenty-foot equivalents units (TEUs) of containerized

[22] Traffic Census Program, Caltrans, 2016

cargo[23] and the Port of Long Beach handled 8.1 million TEUs[24] for a total of 17.6 million TEUs; a 225 percent increase or 43 million TEUs are projected by 2035.1 The ports are a major generator of truck traffic and have substantial impacts on SHS operations. Daily regional truck trips are projected to increase from 55,000 in 2012 to 87,000 by 2040. Investments in the infrastructure will need to be allocated to move these goods around the Southern California region.

Warehouses and Distribution Centers

The Southern California region is home to a large number of warehouses and distribution centers, including many national and regional distribution centers located in the Inland Empire. Orange County is the gateway to the Inland Empire, so with increased trade, a projected growth in freight volume will only increase truck traffic. As a result, Caltrans needs to have the allocated resources to mitigate the maintenance of the highway system.

Warehousing needs have changed significantly with the advent of e-commerce deliveries, which are generally smaller in size and require faster deployment. As a result, there will likely be a continued increase in the number of small distribution centers located closer to urban centers, as well as an increase in delivery trips fulfilled by smaller vehicles. Refinement of delivery algorithms may mitigate some of the effects of increased trips.

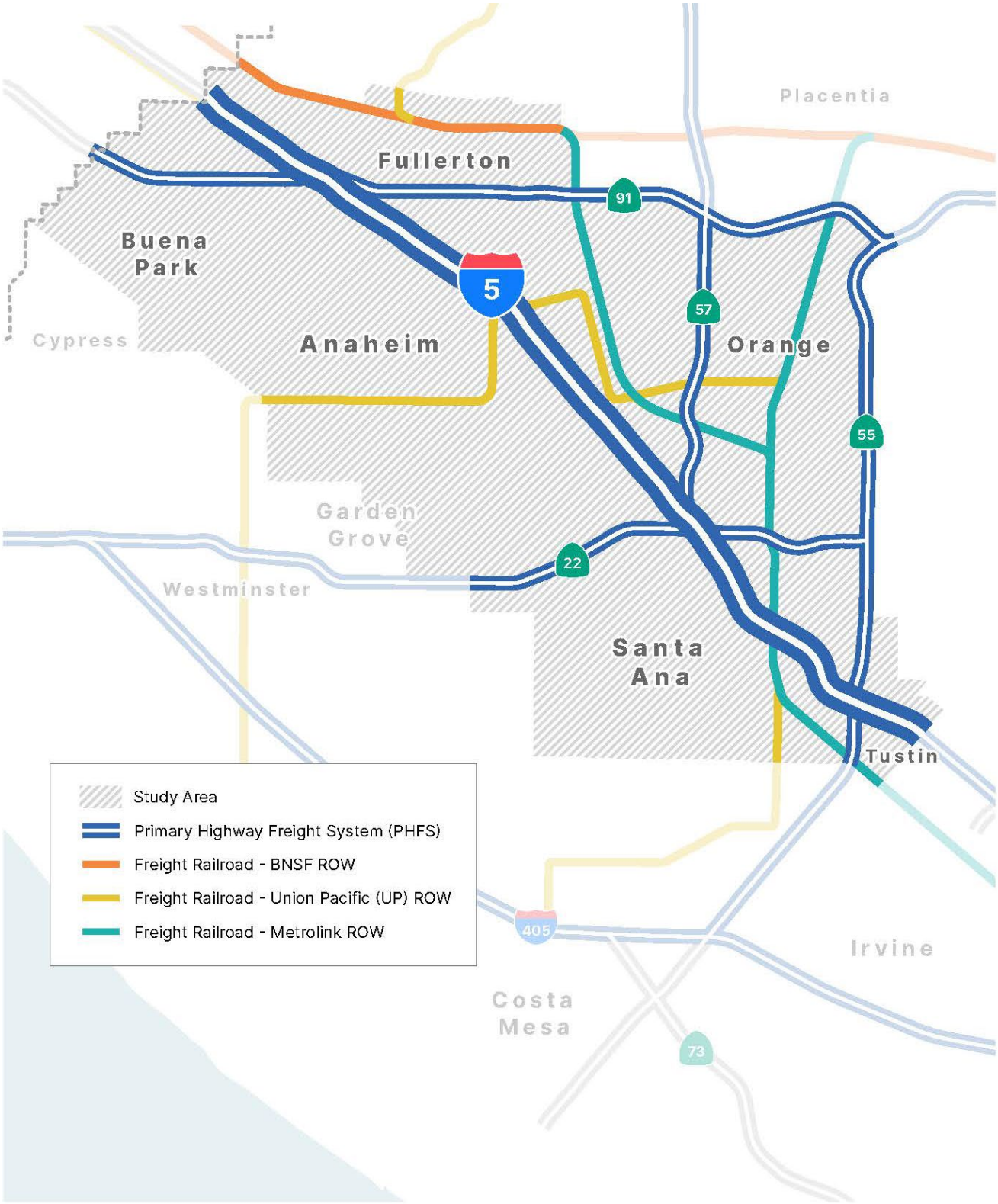
[23] Annual Container Statistics, Port of Los Angeles, 2018
[24] Yearly TEUs, Port of Long Beach, 2018

Truck Data

Segment	Location	Peak Hour Truck Volume	Percentage of Total Vehicles
1	SR 55	20,100	7%
1	SR 22/SR 57	20,100	5%
2	Chapman Ave	18,400	7%
2	Katella Ave	25,400	10%
2	Lincoln Ave	25,500	10%
3	SR 91	11,300	5%
3	SR 39	15,700	9%
3	LA County Line	13,900	8%

Source: Traffic Census Program, Caltrans, 2016

Major Freight Network



Source: Caltrans

Transportation System Management and Operations

Intelligent Transportation Systems

Transportation System Management and Operations (TSM&O) is an integrated program to optimize the performance of the existing multimodal infrastructure through the implementation of systems, services, and projects. The real-time management of the transportation network leads to benefits such as reduced travel time, fuel consumption, and emissions, as well as improved safety, reliability, and mobility. Central to TSM&O are Intelligent Transportation System (ITS) strategies, which include advanced traffic management, incident management, traveler information, Freeway Service Patrols (FSP), and coordination with other transportation stakeholders such as the California Highway Patrol (CHP), OCTA, and local entities.

ITS technologies currently deployed at District 12 include changeable message signs (CMS), Closed Circuit Televisions (CCTV), ramp meters, and loop detectors. The system architecture is mature and comprehensive, covering most of the SHS. An ITS Master Plan was completed in 2015 to assess the existing ITS inventory and identify additional opportunities for improving operations. Various components of the system will require updates in the near future, including converting CMS to LED devices, upgrading CCTVs to high definition, eliminating gaps in fiber optics lines, replacing obsolete or failing equipment, and rolling out new technologies to enable more efficient and effective operations.

Traffic Management Center

Since 2001, Caltrans District 12 has operated its own Traffic Management Center (TMC). The District 12 TMC is one of a few facilities in the country that collaborates with a 911 Public Service Answering Point and the CHP communications center. Core functions of the TMC include daily traffic management operations, incident management coordination, CCTV and CMS operations, ramp metering and signal operations, Caltrans maintenance fleet dispatch, CHP public service answering point and dispatch,

operational coordination with external agencies, and pilot programs and other research initiatives.

North Orange County ICM Project

Caltrans District 12 in partnership with local and regional agencies in the region is embarking on a groundbreaking effort to develop the North Orange County Triangle Integrated Corridor Management (ICM) program. This ground-breaking technology program will set the stage for delivering multiple projects to improve the transportation network for all modes in this highly congested region, focusing on incident and emergency management. This multi-agency partnership will jointly operate a system of advanced technologies in the North Orange County Triangle region defined by I-5, SR 57, and SR 91, as well as adjacent and crossing arterials. The North Orange County Triangle area contains the highest concentration of regionally significant trip generators in the county, resulting in severe congestion on state highways and local arterials. Focus on the management of these roadways as a system rather than as individual assets is key to developing an effective integrated management of freeway, arterial, transit, and parking systems in times of incidents and non-recurring events.

The North Orange County Triangle region experiences significant traffic impacts due to non-recurring congestion (incidents and non-recurring events), which is further exacerbated by the recurring congestion on both the freeways and local roads. According to the most recent Caltrans Mobility Performance Report, motorists within the study area experience approximately 7.4 million hours of delay annually, which makes it challenging to alleviate additional delays and safety impacts during incidents. When traffic naturally diverts around an incident, travelers often select local routes that are already at or above capacity, creating even further delays and safety issues. The stakeholders in this region envision a cooperatively managed system of advanced technologies and advanced planning to better manage naturally diverting traffic back onto the freeway mainline with the least amount of residual impact. This proactive approach will result in less traffic circulating on arterials or looking for parking to access alternative transit service.

North Orange County Triangle ICM Network

Source: Caltrans

OCTA ITS Plan Update

OCTA is currently updating its ITS Plan. The purpose of the ITS Plan is to enhance mobility in Orange County by better managing existing surface transportation infrastructure. It will guide ITS planning and deployment activities by providing potential improvement strategies for implementation in Orange County. The strategies will be evaluated with a high-level benefit-cost analysis which will inform the development of an ITS Strategic Deployment Plan. Input on ITS needs, priorities, and future plans will also be gathered in a series of meetings with project stakeholders.

Demand Management Programs and Partnerships

The purpose of Transportation Demand Management (TDM) is to reduce demand for roadway travel, particularly in single- occupancy vehicles. TDM is applied at various settings and scales, consistent with mobility and accessibility needs, and include financial, operational, and institutional measures. Examples of TDM include ridesharing and vanpool programs, educational programs and traveler information services, alternative or flexible work hours, and subsidies for alternative modes. The scope and outcomes of TDM strategies vary significantly and may be either mandatory or voluntary. In addition, some strategies address only peak demand, while others reduce total travel demand.

Several Caltrans assets, programs, and California policies function as TDM strategies, which include but are not limited to: managed lane facilities, Assembly Bill (AB) 1099, park and ride lots, and ridesharing and vanpool programs. Managed lane facilities incorporate both financial and operational measures by encouraging travel during off-peak periods or by other modes such as transit, while simultaneously improving people throughput. AB 1099, also known as the California Road Charge Pilot Program, has evaluated the feasibility of implementing a mileage-based fee structure to replace the outdated gas tax, appropriately prices roadway and environmental impacts, and disincentives trips with high Vehicle Miles Traveled (VMT). By targeting demand, TDM measures address negative impacts associated with driving, including congestion, poor air quality, and reduced public health. Lastly, park and ride lots and ridesharing programs have encouraged both California residents and Caltrans employees to shift away from single- occupancy vehicle trips and explore traveling together by carpooling.

In Orange County, Measure M funding has resulted in the creation of programs that promote TDM. OCTA administers a variety of Measure M funding programs, including the Project V – Community Based Transit/Circulators program. The Project V initiative is a competitive program for local jurisdictions to develop local bus transit services such as community-based circulators, shuttles, and bus trolleys. These community-based transit services support regional transit and other forms of public transportation, which helps reduce transportation demand on Orange County’s roadways, freeways, and highways.

Active Transportation

Supporting Policies

Deputy Directive 64-R2

Under Deputy Directive 64-R2 (2014), bicycle, pedestrian, and transit travel is facilitated by creating Complete Streets beginning early in the System Planning process and continuing through project delivery, maintenance, and operations. This requires collaboration between internal functional units as well as stakeholders.

Toward an Active California

Caltrans has developed its own bicycle and pedestrian plan called Toward an Active California (2017). One main goal of Caltrans' Strategic Management Plan (2015) is to triple bicycle, double pedestrian, and double transit trips by 2020. Thus, Toward an Active California provides recommendations and strategies to help Caltrans achieve this. Based on the recommendations in Toward an Active California, Caltrans is developing District-level bicycle and pedestrian plans that will identify active transportation needs and gaps on the SHS.

Complete Streets Elements Toolbox

Caltrans has also developed a Complete Streets Elements Toolbox (2018) that offers infrastructure recommendations and guidance for promoting Complete Streets. The Toolbox can be used in conjunction with other Caltrans documents to help agencies make decisions about the types of active transportation infrastructure that best fit the context of their projects.

Assembly Bill 32

Under Assembly Bill 32 (2006), The Global Warming Solutions Act, California set standards to improve air quality to 1990 levels by 2020. In 2016, transportation accounted for the largest percentage of greenhouse gas (GHG) emissions at 41

percent.[25] To make strides in GHG reduction, more emphasis is needed in building infrastructure that supports and encourages active transportation.

SB 375

California's local and regional governments have improved their active transportation planning efforts due in part to SB 375 (2008) and its requirement to reduce regional GHG emissions from cars. Metropolitan Planning Organizations (MPO) in California are mandated to identify measures to increase walking and bicycling in their Sustainable Communities Strategies (SCS).

Smart Mobility Framework

In Smart Mobility 2010, Caltrans initiated a Smart Mobility Framework to respond to the latest transportation challenges with new concepts and tools. Smart Mobility moves people and freight while enhancing California's economic, environmental, and human resources by emphasizing elements such as convenient and safe multimodal travel, accessibility, and efficient use of land. This document addresses the State mandate to find solutions to climate change, the need to reduce per capita vehicle miles traveled, the demand for a safe transportation system, and the commitment to advance social equity and environmental justice.

Safety

The Strategic Highway Safety Plan (SHSP) is a safety document to help reduce traffic accident fatalities and serious injuries. Consistent with Federal policies, Caltrans and many other agencies are working toward the goal of zero deaths.

As a matter of improvement, transportation agencies can address specific key areas through engineering, education, enforcement, and emergency medical response:

- Distractedness – The California Office of Traffic Safety (OTS) states that the risk of getting into a crash is three times higher for those driving distracted with a mobile device. Distractedness can also apply to pedestrians and bicyclists. Thus, drivers, pedestrians, and bicyclists should always be aware of their surroundings.
- Speed – The speed at which a pedestrian or bicyclist is hit has a large effect on their chance of survival.

[25] California Greenhouse Gas Emission Inventory - 2018 Edition, California Air Resources Board, 2018

- Impaired Driving – Driving under the influence of drugs and alcohol poses a huge risk to others, especially pedestrians and bicyclists.

Pedestrian Facilities and ADA Improvements

The safety and mobility needs of all who have legal access to the transportation system must be addressed including requirements under the Americans With Disabilities Act of 1990 (ADA). Caltrans is committed to accommodating for all modes of transportation. This includes considering pedestrian and ADA improvements, such as pedestrian-oriented LED lighting, removing obstructions from the sidewalk, adding audible pedestrian push buttons where warranted, adding truncated domes to curb ramps, ensuring good pavement/sidewalk quality, and minimizing long crossing distances for pedestrians.

Bicycle Facilities

Caltrans District 12 is working with local and regional entities to better accommodate safe bicycling and to identify opportunities to close key gaps in Orange County's bikeway infrastructure, particularly along or in close proximity to State Highways. Bicycles are prohibited on I-5. There are some bicycle facilities that intersect with or run underneath I-5, but these are routes that are not parallel to the freeway. Few alternative bicycle facilities are parallel to I-5.

Since Caltrans is limited in the improvements that can be made on non-SHS facilities, it encourages local agencies to promote bicycling by providing amenities such as bicycle parking and education, as well as encouraging first- and last-mile connections to transit. To achieve State transportation goals of tripling bicycle trips by 2020, infrastructure must be built to incorporate bicyclists of all comfort levels. To do this, distance, design, and accessibility must be taken into consideration. Thus, infrastructure improvement design should aim to appeal to the average casual riders as well as more confident riders.

Bikeway Classifications

There are four classifications of bikeways based on several roadway characteristics, such as striping, signage, posted speed, and location:

- Class I Bikeway (Bike Path): Facilities on a separate ROW from roadways and are often shared by bicyclists and pedestrians.
- Class II Bikeway (Bike Lane): On-street facilities that use roadway markings to delineate the ROW assigned to bicyclists and motorists.
- Class III Bikeway (Bike Route): Signed on-street facilities that accommodate vehicles and bicycles in the same travel lane.
- Class IV Bikeways (Separated Bikeways): On-street facilities where bicyclists are separated from vehicles by a physical barrier. Also referred to as cycle tracks or protected bicycle lanes.

Local and Regional Bikeways

Caltrans assists, guides, and collaborates with local agencies on their planned facilities. The OC Loop is a regional network of bikeways that connects multiple cities in Orange County in one scenic 66-mile loop. One of the five legs of the OC Loop is the Santa Ana River Trail, which is an existing Class I facility that crosses I-5 in the Cities of Orange and Santa Ana. It is the only bikeway in the northern portion of the I-5 corridor that intersects with the freeway. Spanning across multiple cities in Orange County and extending into Riverside County, this trail provides regional connectivity to Active Transportation users.

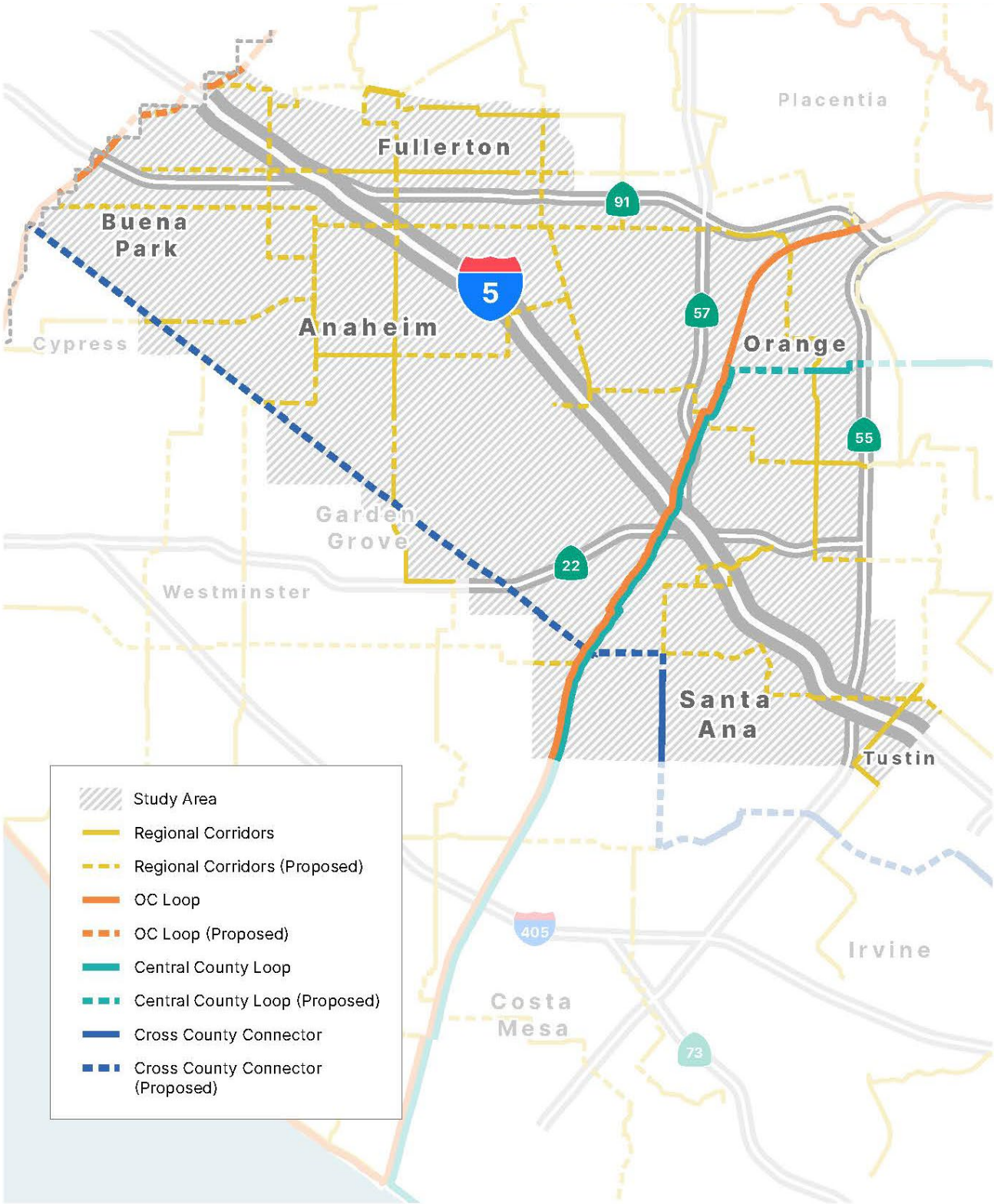
Active Transportation Program

California's Active Transportation Program (ATP) is a competitive program that provides funding to projects that promote increased use of non-motorized modes of transportation. This Caltrans-administered program also has goals of reducing GHG emissions, improving public health and safety, and providing benefits to disadvantaged communities. District 12 has funded a number of ATP projects that are in close proximity to I-5.

Caltrans Active Transportation Plans

Based on the goals outlined in Toward an Active California, Caltrans is in the process of developing active transportation plans for all 12 of its Districts. This process will also develop an overarching statewide data framework and methodology for collecting, storing, and using active transportation data. District 12 is expected to begin on its District Active Transportation Plan in 2022.

Regional Bikeway Network



Source: Caltrans, OCTA

The Way Forward

The way forward is for California to build new and improve existing infrastructure, and the State can help facilitate this by collaborating with local, regional, and partnering agencies to integrate planning at multiple levels. The State provides transportation goals in the California Transportation Plan (CTP) 2040, and these goals provide overarching guidance for regional and local planning. State legislators as well as residents recognize the need for more transportation options and are passing measures to help fund these projects such as SB 1, the Road Repair and Accountability Act of 2017 which allocates $100 million dollars towards bike and pedestrian projects.

District 12 is focused on providing improved active transportation infrastructure to shift more trips to walking, bicycling, and transit. Based on the Smart Mobility Framework place types, the land uses along I-5 are mostly suburban communities. With guidance from the Complete Streets Elements Toolbox, the District is working towards implementing contextsensitive improvements throughout the county. District 12 is also coordinating with local and regional agencies to identify opportunities to link housing development with active transportation infrastructure and promote first- and last-Mile connections to transit.

Future Trends

Trend Outlook

To most effectively serve Orange County and its residents, Caltrans must continue to strive in creating a transportation system that can respond and adapt to future shifts in travel preferences and trends. The goal is to meet the future demands of tomorrow by improving the efficiency, connectivity and effectiveness of today's transportation system. Changes in trends such as demographics, housing and land use, economic prosperity, GHG emissions and climate change, energy and technology use, and transportation funding are largely influential in the development of local, county, regional, and statewide long-range transportation plans.

Today, the future of mobility is experiencing extensive technological and sociological changes that are rapidly altering the transportation landscape. Predictions about the future of transportation are complex, nuanced, and widely debated. As depicted in Caltrans' Future of Mobility White Paper (2018), current and emerging mobility trends include connected and automated vehicles, zero-emission vehicles (ZEVs), carsharing, bike sharing, Transportation Network Companies (TNCs), equity considerations for shared mobility, alternative transit services, Public-Private Partnerships (P3s) and data sharing, information and communications technology, freight and goods movement innovation, and California's passenger rail system. Moving into the future, it is critical to consider how these mobility trends will continue to influence various demographic groups, the economy, climate change and sustainability efforts, and the overarching transportation equity and public health of Orange County communities.

Innovative Technology

Innovative technology will continue to change the way Caltrans manages the existing transportation system to maximize the utilization and efficient movement of people and goods. Statewide, the consumption of gas has been steadily falling since 1990, which can be attributed to increased vehicle efficiency, the use of alternative fuels, alternative transportation modes, new vehicle technologies, ride sharing technologies, pricing

strategies, and public transportation expansion.[26] The increased use of these innovative technologies and strategies will transform our regional and statewide transportation systems and make them increasingly fuel- and time-efficient. Currently, the automobile industry has been designing connected and autonomous driverless vehicles that can wirelessly communicate with surrounding vehicles, transportation infrastructure, and personal mobile devices. In addition, new technologies, materials, and application methods will improve the performance and integrity of our transportation systems to reduce costs in overall operation and maintenance.[27] Caltrans District 12 must take advantage of these technological advances to effectively mitigate fuel consumption and GHG emissions.

Connected and autonomous vehicles will change how transportation systems are built and maintained as they will likely enhance safety, increase roadway capacity, allow greater person throughput, reduce fuel consumption and emissions, and may allow for a faster and more efficient movement of people and goods. The subsequent reduction in human error would provide an opportunity to explore potential lane width reductions and the redistribution of existing ROW for alternative uses such as multi-purpose, freight, BRT, and/or sidewalks and bike lanes (active transportation methods restricted to conventional and rural highways). Caltrans District 12 will also consider the impact of connected and autonomous vehicles on local and regional travel patterns. The implications of such technology may have two opposite impacts. It has the potential to reduce VMT by increasing the reliability of public transportation and shared mobility, or increase VMT through induced travel by increasing the convenience and efficiency of single-occupancy vehicle trips.[28] The future of Orange County's transportation system will depend on how these technical advances are handled via complementary infrastructure development and policy implementation.

Demographics

The Millennial generation, individuals born between 1982 and 2000, have relied less on automobiles than previous generations driving 18 percent fewer miles, taking four percent fewer trips, and obtaining their driver's licenses at a later age.[29] This may be

[26] California Transportation Plan 2040, Caltrans, 2016
[27] California Transportation Plan 2040, Caltrans, 2016
[28] Future of Mobility White Paper, Caltrans, 2018
[29] California Transportation Plan 2040, Caltrans, 2016

attributed to increasing fuel prices, the economic impact of the Great Recession, post-collegiate debt, new technology in transportation and communication, environmental awareness, and a shift in land use development trends. Currently, California's Millennials under full employment status earn $35,734 annually compared to the same age group in 1980 that averaged a salary of $36,961.[30] To effectively accommodate this changing demographic, we must plan for a comprehensive and efficient multimodal transportation network that incorporates the use of public transit, shared mobility, TNCs, and active transportation.

With younger generations finding themselves less reliant upon single-occupancy vehicle use compared to previous generations, the mode-share of shared mobility and TNCs have grown rapidly since the genesis of these sectors nearly a decade prior. Currently, the two major TNCs - Uber and Lyft – operate in more than 700 and 300 cities across the United States, respectively. Within the United States, Lyft completes more than 18.7 million rides every month. A majority of these trips are completed within large metropolitan areas but are gaining in popularity in smaller cities and dense suburban or rural areas throughout California. In 2018, the United States carsharing industry amounted to a $23 billion market, and on average, carsharing members reduced VMT by 27 percent.[31] However, in some cases, members of carsharing applications decreased their use of public transit. Similar to the rapid growth of carsharing, the number of bike-sharing users grew to 28 million in 2016, and the nation's bike-sharing market is projected to grow to a $6.3 billion market by 2020.[32] The growth of the shared mobility sector has the potential to increase equitable access to transportation services as reflected in its reduced costs, flexibility, and potential to reach underserved areas.

Economic Prosperity

Since the end of the Great Recession in June 2009, the rate of unemployment and housing foreclosures have decreased as credit ratings of municipalities and the State have steadily improved. As the economy improves, Caltrans must anticipate increases in travel demand as the transportation system is largely tied to the supply of jobs and goods movement. In 2014, industries dependent on goods movement in Southern California, primarily consisting of international trade and local businesses moving goods

[30] Young Adults Then and Now, U.S. Census Bureau, 2019
[31] Future of Mobility White Paper, Caltrans, 2018
[32] Future of Mobility White Paper, Caltrans, 2018

to local customers, contributed $291 billion to the regional gross domestic product (GDP).[33] This is largely attributable to the availability of new technology such as phone applications which have facilitated immediate access to goods and services. E-commerce sales for U.S. retailers were $261 billion in 2013, an increase of 13.6 percent from 2012, compared to only a 3.8 percent growth in total sales at $4.5 trillion in 2013.

Moving forward, these industries are anticipated to grow substantially, with manufacturing projected to increase its GDP contribution 130 percent by 2040 and wholesale trade by 144 percent.[34] The growth of e-commerce has also changed the way distribution centers operate to meet the demand and expectations of today's consumers. Traditional bulk sized distributions are now trending toward accommodating e-commerce deliveries that are generally smaller in size and require faster deployment. Through an effective transportation network, Caltrans may support the regional economy by accommodating the evolving industry of freight mobility, and providing access to jobs, education and other facilities in various Orange County markets. The District 12 transportation system must strive to become increasingly sustainable, accessible, dependable, time-efficient, and cost-effective.

[33] California Transportation Plan 2040, Caltrans, 2016
[34] 2016 RTP/SCS, SCAG, 2016

Managed Lanes

Managed Lane Types

Managed lanes are used to promote carpooling and transit usage, improve travel- time reliability, reduce GHG emissions, and maximize efficiency by increasing person and vehicle throughput while reducing congestion and delay.

High-Occupancy Vehicle Lanes

The most ubiquitous form of managed lanes are HOV lanes, commonly referred to as carpool lanes. All HOV lanes in Orange County currently operate with HOV-2+ requirements for the entire day. Inherently Low Emission Vehicles with decals can also access HOV lanes.

Entry from GP lanes to HOV lanes may be continuous or limited to designated locations by differentiating pavement striping or physical barriers. There are currently over 100 centerline miles of operational HOV lanes in Orange County, constituting more than 85 percent coverage of the overall freeway network (excluding toll roads), and several projects to further increase coverage are underway or planned.[35]

High-Occupancy Toll Lanes

High-Occupancy Toll (HOT) lanes, also known as Priced Managed Lanes and often marketed as Express Lanes, are another subset of managed lanes. While the general concept of HOT lanes is similar to that of HOV lanes, HOT lanes incorporate dynamic tolling based on congestion levels in order to optimize demand. Tolls are charged or waived based on vehicle occupancy, providing incentives for single-occupancy motorists to shift some trips to off-peak times, less congested routes, or alternative modes of transportation. While no HOT lanes are currently operational in District 12, there will be two HOT lanes per direction on I-405 from SR 73 to I-605 with the completion of the 405 Express Lanes in 2023.

[35] Managed Lanes Feasibility Study, Caltrans District 12, 2017

Express Toll Lanes

Express Toll Lanes (ETL) are similar to HOT lanes, with the distinction that all vehicles are required to pay a toll, though discounts may be offered to HOVs. As with HOT lanes, ETL facilities are generally branded as Express Lanes to the general public. The 91 Express Lanes is currently the first and only ETL facility in Orange County.

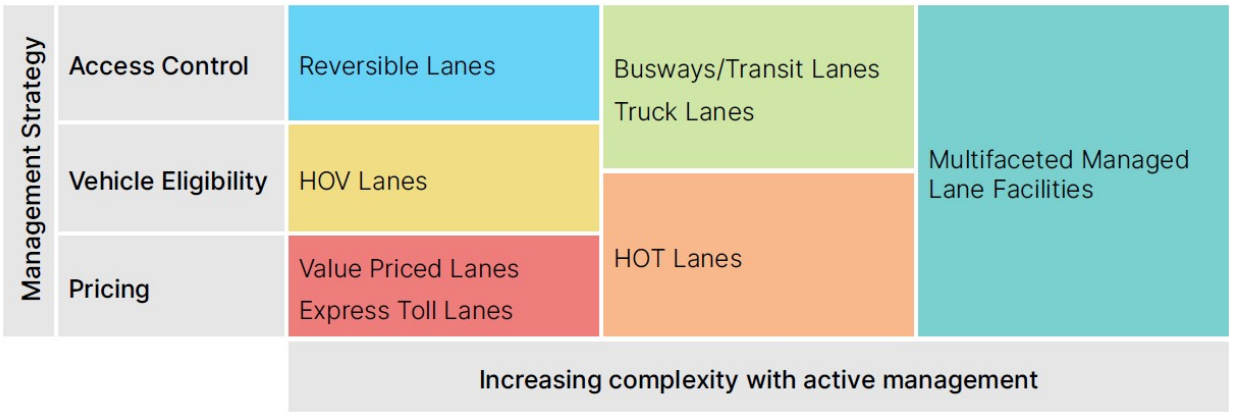
Managed Lanes Elements

Direct Access Ramps

Managed lanes elements such as DARs are an integral component of the overall managed lanes system. DARs are on-ramps or off-ramps that are restricted to vehicles in the managed lanes and offer direct connections to arterials or park and ride lots. They improve operational efficiency and safety by reducing merging and weaving movements for vehicles entering or exiting a facility and providing grade separation from mainline traffic. There are currently six DARs in Orange County, all of which are located on I-5.

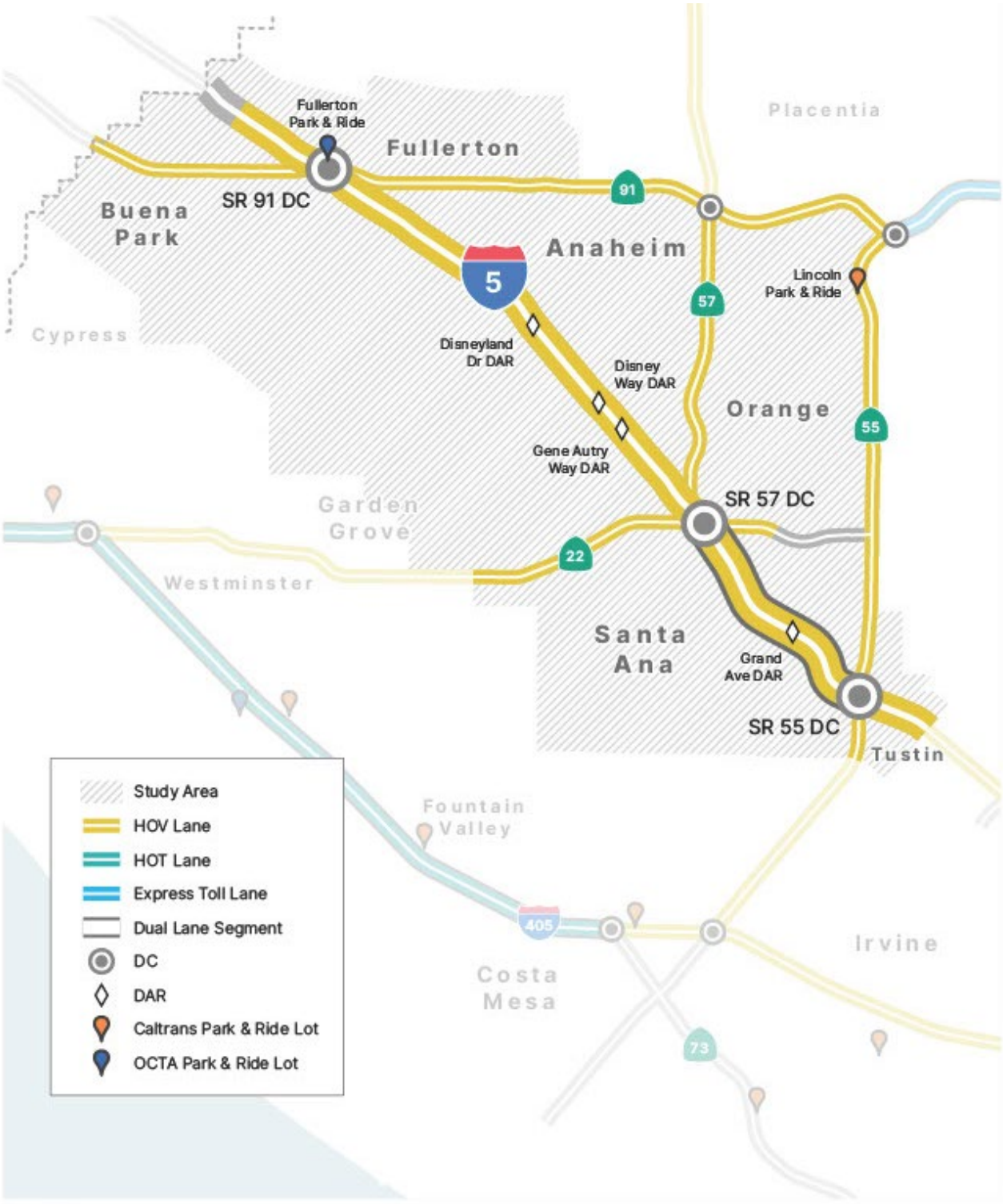
Direct ConnectorsFreeway-to-freeway DCs provide direct connections between managed lanes on different freeways. As with DARs, DCs reduce merging and weaving movements and are crucial for enhancing the effectiveness of the managed lanes network. There are currently nine DCs in District 12.

Managed Lane Applications



Source: Managed Lanes: A Primer, Federal Highway Administration, 2017

Existing Managed Lanes Network



Source: Caltrans

Park and Ride Program

The Park and Ride Program is an integral operational element of the managed lanes system. Park and ride lots encourage carpooling, vanpooling, and transit use at the point of departure in order to reduce congestion, VMT, and GHG emissions. Caltrans District 12 and OCTA are responsible for operating and managing nearly 2,300 spaces available across the county.

Fullerton Park and Ride and Lincoln and Ride are two facilities near the project area. Fullerton Park and Ride is the largest facility in Orange County with 791 spaces, while Lincoln Park and Ride was expanded to 242 spaces in 2019. Caltrans District 12 actively manages the program and seeks to open new facilities in underserved areas to complement the overall managed lanes system.

Existing I-5 Facility

There is currently one HOV lane in each direction from SR 55 to the Los Angeles County line. A project to add a second HOV lane between SR 55 to SR 57 is scheduled for completion in 2021. In addition, an extra wide inside shoulder that is currently striped in both directions between SR 57 and SR 91 could facilitate additional managed lanes on Segment 2. Within the project area, the HOV lanes are limited access with barrier separation between SR 55 to SR 57 and buffer separation from SR 57 to the Los Angeles County line. The existing barrier separation between SR 55 and SR 57 will be removed and converted to continuous access striping as part of the second HOV lane addition.

Degradation

The Federal Highway Administration (FHWA) defines degradation as a condition in which average speeds on managed lanes are less than 45 mph during the AM and PM peak hour (8 AM to 9 AM and 5 PM to 6 PM) for 10 percent or more of the time for a consecutive 180-day period. While Orange County has one of the most extensive HOV lane networks in California, demand greatly exceeds capacity, resulting in degradation on many segments.

The HOV lanes on I-5 are classified as Extremely Degraded on Segment 1 and Very Degraded on Segment 2, with the following identified as potential causes:[36]

- Peak period recurrent congestion in all lanes reduces HOV lane performance and speed
- Demand exceeds capacity
- Vehicle weaving conflict at ingress/egress locations due to congestion in the GP lanes
- Bottlenecks at SR 55 HOV DC and SR 57 HOV DC

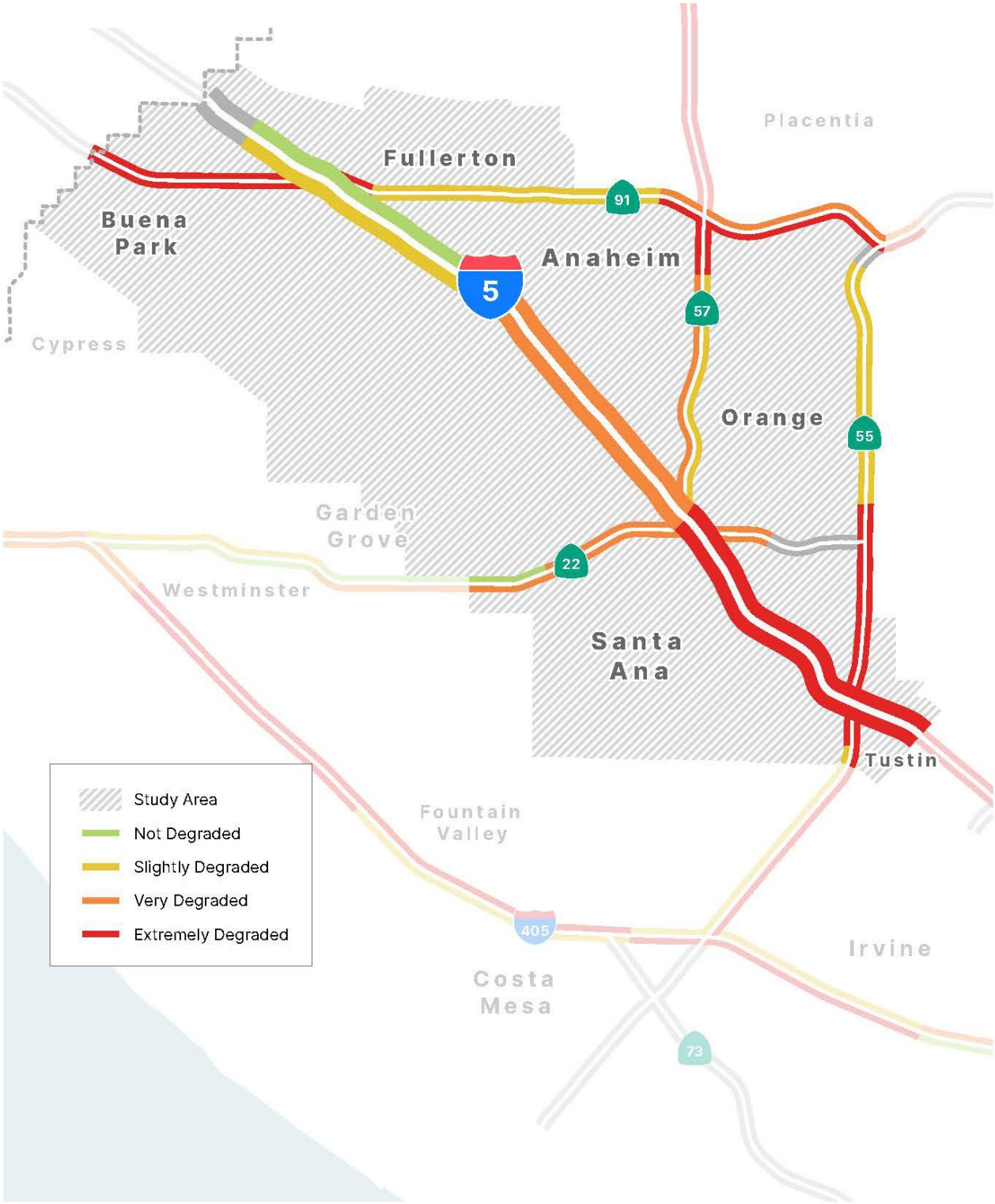
Remediation

The Fixing America's Surface Transportation (FAST) Act administered by the U.S. Department of Transportation (U.S. DOT) includes provisions related to degraded managed lanes facilities. Failure to address degradation may result in significant sanctions, including loss of federal funding. Consistent with federal regulations, Caltrans prepares and submits the California High-Occupancy Vehicle Lane Degradation Determination Report to the FHWA on an annual basis. The report outlines the causes of degradation and identifies remediation strategies to bring HOV lanes into compliance with federal regulations. Caltrans continually monitors and reports on the effectiveness of the remediation plan.

Remediation strategies include extending managed lanes to segments where no facility currently exists, converting HOV lanes to HOT lanes, restriping or widening the freeway cross-section to accommodate dual lane facilities, and constructing additional managed lanes elements. The addition of a second HOV lane between SR 55 and SR 57 in 2021 will reduce degradation in that segment. In addition, the alternatives being evaluated in the I-5 Managed Lanes PSR are remediation strategies for the entire segment between Red Hill Avenue and the Los Angeles County line.

[36] 2017 California High-Occupancy Vehicle Facilities Degradation Report and Action Plan, Caltrans, 2018

Existing Managed Lanes Degradation



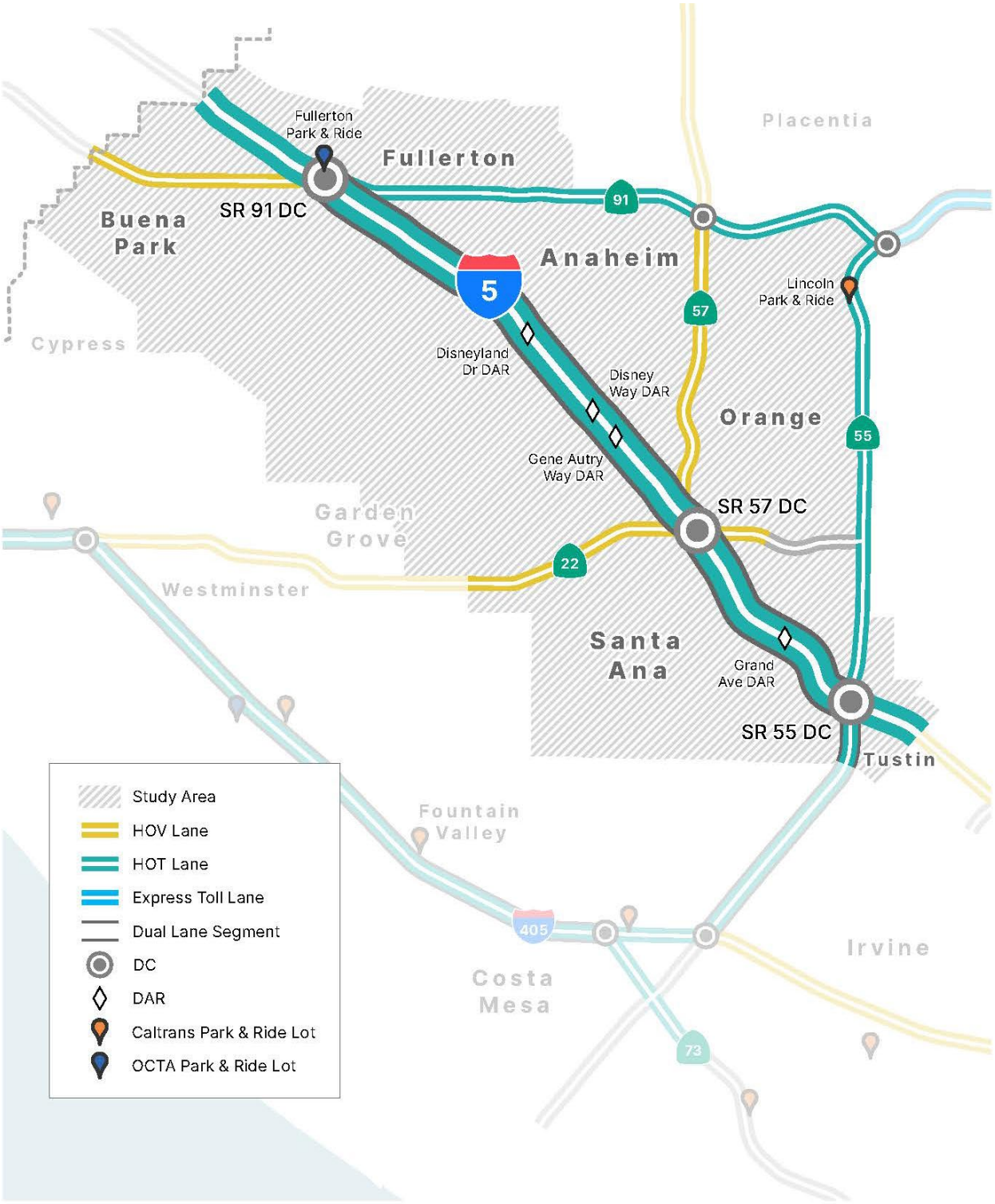
Source: Caltrans

Future Managed Lanes Vision

Various policies, legislation, and plans at the federal, state, and regional levels highlight the need to improve the speed and reliability of managed lane facilities. In particular, Caltrans is mandated by the FAST Act to address managed lanes degradation. A key remediation strategy is the conversion of HOV lanes to HOT lanes in order to provide a facility that continuously achieves free-flow speeds. Applying tolls to managed lanes provides multiple regional benefits, including congestion relief, enhanced mobility and travel-time reliability, and improved air quality.

Several managed lanes studies have been completed at District 12, including the HOV System Assessment Study, Managed Lanes Feasibility Study (MLFS), and Managed Lanes Network Study (MLNS). Caltrans also developed the Managed Lanes System Plan (MLSP) at the statewide level in accordance with Deputy Directive (DD) 43-R1. These studies collectively established the framework for implementing a countywide network of HOT lanes in Orange County. Projects to convert or add HOT lanes on select corridor segments can advance to project initiation as funding becomes available. Based on recommendations in the MLNS and MLFS which listed I-5 between SR 55 and SR 91 as a high priority corridor for implementing HOT lanes, a Project Study Report (PSR) to evaluate managed lane improvements on I-5 between Red Hill Avenue and the Los Angeles County line was initiated in 2018 with completion of the report scheduled for 2019.

Future Managed Lanes Network Vision



Source: Caltrans

I-5 Managed Lanes PSR

The PSR identifies the Purpose and Need and proposes four alternatives to improve the existing facility within the project limits. It includes the project scope, schedule, and capital and support costs for each alternative in subsequent phases. In addition, a Value Analysis (VA) Study, Traffic Feasibility Study, Concept of Operations (ConOps), and Traffic and Revenue (T&R) Study were prepared to validate the technical and financial feasibilities of the project.

Project Alternatives

The I-5 Managed Lanes PSR includes one No-Build alternative and three viable Build alternatives along the 15-mile corridor. The alternatives are evaluated based on a wide range of data and factors such as traffic performance and engineering viability. The three Build alternatives focus on the implementation of managed lanes to address the project's Purpose and Need.

- Alternative 1: No-Build alternative (includes a project currently under construction to add a second HOV lane from SR 55 to SR 22/SR 57 and remove the Main Street DAR).
- Alternative 2: One managed lane in each direction from Red Hill Avenue to SR 55, two managed lanes in each direction from SR 55 to SR 22/SR 57, and one managed lane in each direction from SR 57 to 0.2 miles south of the Los Angeles County line.

- Alternative 3: One managed lane in each direction from Red Hill Avenue to SR 55, two managed lanes in each direction from SR 55 to SR 91, and one managed lane in each direction from SR 91 to 0.2 miles south of the Los Angeles County line.
- Alternative 4: One managed lane in each direction from Red Hill Avenue to SR 55 and two managed lanes in each direction from SR 55 to 0.2 miles south of the Los Angeles County line.

Lane Configurations

	Alt 1	Alt 2	Alt 3	Alt 4
Red Hill Ave to SR 55 (Segment 1)	1 HOV	1 ML	1 ML	1 ML
SR 55 to SR 22/SR 57 (Segment 1)	2 HOV	2 ML	2 ML	2 ML
SR 22/SR 57 to SR 91 (Segment 2)	1 HOV	1 ML	2 ML	2 ML
SR 91 to LA County Line (Segment 3)	1 HOV	1 ML	1 ML	2 ML

Traffic Analysis

A Traffic Feasibility Study was prepared as part of the PSR to assess overall system performance on the I-5 corridor within the project limits. An integral component of the study is a scoring system to quantitatively compare the proposed alternatives based on travel time, vehicle hours of delay (VHD), Level of Service (LOS) performance index, and travel time reliability index. The alternatives were scored from 0 to 10 points for each performance metric to produce a composite score of 40 possible points. The corridor-wide analysis accounts for both GP lanes and managed lanes in the northbound and southbound directions for the AM and PM peak periods.

Similar scores were observed for 2035 and 2055 conditions. Alternative 1 represents the No-Build scenario and has the lowest overall score of 9.2. Alternative 2 shows slight improvements over the No-Build condition with a score of 13.8 but does not substantially reduce VHD or improve reliable travel time. In contrast, both Alternatives 3 and 4 have high overall scores of 21.9 and 23.2, respectively, demonstrating the effectiveness of the proposed improvements. The performance scores are one element

of a broader assessment, and other factors such as cost, schedule, ROW, constructability, and benefit-cost ratio will also be considered in the subsequent phase to determine a preferred alternative.

Operation Performance Score (2035)

	Alt 1	Alt 2	Alt 3	Alt 4
Travel Time Reliability Index	3.2	4.4	6.4	6.8
LOS Performance Index	2.7	3.8	5.8	6.1
VHD	2.2	4.0	5.6	6.0
Travel Time	1.1	1.6	4.1	4.3
Total	9.2	13.8	21.9	23.2

Corridor Vision

Plan Goals

Overarching goals identified by the corridor team after discussing the current and future performance assessment results are safety, efficient and reliable operations, multimodal access, and sustainability. Strategies were then developed to address these goals.

Safety

In alignment with Caltrans' goal of Safety and Health, District 12 continuously monitors the SHS in Orange County to identify areas of higher than average collision rates. These areas are investigated and recommendations are made to address and reduce the frequency and severity of traffic collisions on the system. In addition to vehicular accidents, the District provides for the safety of active transportation modes by upgrading ADA facilities and closely coordinating with local agencies to identify opportunities to improve or add infrastructure for pedestrians and bicyclists.

Operations

This segment of I-5 currently experiences various operational challenges on the freeway mainline as a result of bottlenecks, delay, and HOV degradation. The northbound peak direction occurs in the PM peak period and the southbound peak period occurs during the AM peak period. Generally, this segment of I-5 experiences the following:[37]

- Southbound GP lanes (AM peak period): extensive queueing at the SR 55 interchange. Queueing spills back to the Lincoln Avenue interchange, with speeds as low as 5 miles per hour. The queue develops early in the peak period and does not dissipate during the entire AM peak period.
- Southbound HOV lanes (AM peak period): queueing at both lane drops between the SR 22/SR 57 interchange and the SR 55 interchange. There is an upstream queue at the Brookhurst Street interchange. Most queues in the HOV lanes dissipate at around 9 AM.
- Northbound GP lanes (PM peak period): queueing between the SR 57/SR 22 interchange and Ball Road on-ramp. This queue is present for most of the study

[37] I-5 Managed Lanes Traffic Feasibility Study, Caltrans District 12, 2019

period and decreases speeds to between 20 and 25 miles per hour. Another noticeable queue develops at the Main Street on-ramp and spills back to the beginning of the study area for most of the study period.

- Northbound HOV lanes (PM peak period): similar queue patterns to the GP queues, but the worst queue is at the lane drop after the Grand Avenue on-ramp. This queue meters the upstream traffic for the entire peak period.

In order to address these issues and enhance overall mobility on this segment of the I-5 corridor, operational strategies such as priced managed lanes, TSM&O, and enhancement of park and ride lots may be considered and implemented. Caltrans District 12 recently prepared a PSR that explores alternatives that propose the implementation of managed lanes on the northern segment of I-5. Preliminary traffic forecasts for 2035 from the PSR's Traffic Feasibility Study indicate that, without intervention, a majority of the three I-5 segments will operate at LOS E or F in both the HOV and GP lanes.

Multimobility

There are currently no pedestrian or bicycle facilities on the segment of I-5 between Red Hill Avenue and the Los Angeles County line. However, pedestrians and bicyclists often may encounter challenges related to fast moving vehicular traffic and drivers' sight distance when crossing freeway on-ramps and off-ramps. Moreover, configuration of the freeway on-ramps and off-ramps as well as absence of sidewalks or crosswalks can hinder access to land uses located on opposite sides of the freeway. As owner-operator of the SHS, Caltrans is committed to expanding mobility choices by providing pedestrians and active transportation users who traverse freeway ramps with safe, efficient, and ADA-compliant facilities as funding is made available. In alignment with this, Caltrans District 12 will continue to coordinate with its partners such as OCTA and local cities to discuss opportunities for pedestrian and bicycle infrastructure improvements on Caltrans ROW.

In addition to pedestrian and non-motorized vehicles, Caltrans District 12 acknowledges the benefits of BRT routes on the highway and intends to work with OCTA to realize goals and recommendations identified in the OC Transit Vision. The report identifies the I-5 corridor from the Laguna Niguel/ Mission Viejo Station to Fullerton Park and Ride as a TOC, which will be studied further in the OCTA Freeway BRT Concept Study.

Sustainability

In alignment with Caltrans' mission and goals identified in the recent Strategic Management Plan, District 12 acknowledges its role in preserving and restoring environmental systems and fostering community health and vitality. This is accomplished through smart mobility decisions such as strategic integration of electric vehicle charging stations and/or solar panels at park and ride lots, Caltrans maintenance yards, and offices. In alignment with Director's Policy (DP) 33, Caltrans' role in supporting sustainability dovetails with its role as owner and operator of the SHS. Improving Safety, Operations, and Multimobility are all key components of upholding sustainability principles and enhancing California's ecological health and resiliency.

Scenarios and Recommendations

Scenario Evaluation

Seven scenarios were developed to achieve the Plan's goals of Safety, Operations, Multimobility, and Sustainability. Within this section, a planning-level assessment is provided for each of the scenarios and associated improvement strategies.

Existing Year

This scenario represents existing conditions at the time of this corridor plan's development.

Future Baseline

The Future Base Year Model includes projects on the financially-constrained project list in the SCAG 2016 Regional Transportation Plan/ Sustainable Communities Strategy (RTP/ SCS) and the Preferred Plan in OCTA's 2014 Long Range Transportation Plan (LRTP). Most relevant to the limits of this corridor plan is OCTA's I-5 HOV Improvement Project, which will add a second HOV lane in both directions on I-5 between SR 55 and SR 57, and remove the Main Street HOV Direct Access Ramp.

Scenario 1 – Additional HOV Capacity

Building upon the Future Baseline, Scenario 1 (S1) extends the second HOV lane from SR 57 to SR 91.

Scenario 2 – Priced Managed Lanes + Park and Ride

Scenario 2 (S2) converts the two HOV lanes established in S1 (both directions on I-5 between SR 55 and SR 91) into HOT lanes. Under this scenario, drivers that do not meet the vehicle occupancy requirements would be charged a toll to utilize the HOT lanes.

Scenario 3 – Priced Managed Lanes + Park and Ride + BRT

In addition to the two HOT lanes in both directions on I-5 between SR 55 and SR 91 from S2, Scenario 3 (S3) will include freeway BRT service as proposed in OCTA's OC Transit Vision report. According to OCTA's report, the route would run on I-5 from the Mission Viejo/Laguna Niguel Station to the Fullerton Park and Ride.

Scenario 4 – TSM&O/ICM/ITS/TDM

Solutions proposed under Scenario 4 (S4) range from CMS, CCTV, and advanced traffic management systems. Mobility detection and surveillance technologies would also allow for faster identification of response to and clearance of incidents, leading to reduced traffic delays. Other ITS methods for addressing crashes include providing advanced warnings to motorists of slow traffic ahead to alert drivers to roadway hazards such as reduced visibility or traction.

Scenario 5 – Operational Improvements

Scenario 5 (S5) includes the addition of a DC connecting the HOV facilities on I-5 with those of SR 22.

Scenario 6 – Intersection Improvements

Scenario 6 (S6) would improve the I-5 corridor by implementing active transportation and ADA improvements in high opportunity areas within the State ROW. Improvements would be prioritized through discussions with local agencies as well as with Caltrans internal functional units.

Scenario 7 – Off-System Transit Improvements

Scenario 7 (S7) projects are located outside of the SHS and include the Fullerton Interlocking Project as well as Metrolink electrification and service expansion.

Recommendations

Future socioeconomic trends of Orange County show that the population will grow to 3.5 million residents and employment will increase to almost 2 million workers by 2040.1 This growth will result in severe impacts to the movement of people and goods. As a result, Caltrans has developed a phased implementation plan with short-, medium-, and long-term strategies that seek to alleviate the impacts facing the transportation system in District 12. As depicted in the Scenario Evaluation Results, Caltrans has created broad criteria to determine which improvements should be prioritized for implementation. These criteria include Safety, Mobility, Accessibility, Economic Development, Air Quality, and Ease of Implementation. After analysis of each improvement program, District 12 has determined that the following scenario projects should be prioritized for implementation

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Scenario Evaluation Results

Criteria	Existing	Future	S1	S2	S3	S4	S5	S6	S7
Safety	High	High	High	High	High	High	High	High	High
Mobility	Low	Medium	Medium	High	High	Medium	Medium	Low	High
Accessibility	Low	Low	Low	Medium	High	Medium	Low	Medium	High
Econ. Development	Low	Low	Medium	Medium	Medium	High	Medium	Low	High
Air Quality	Low	Low	Medium	Medium	High	Medium	Low	Medium	High
Ease of Implement.	High	High	Medium	Medium	Medium	Low	Low	High	Low
Cost	High	High	High	High	Medium	Medium	Low	High	Low

Short Term – Active Transportation/ADA Improvements (S6)

Under the guidance of Deputy Directive 64-R2 (2014), Caltrans seeks to develop integrated multimodal projects in balance with community goals, plans, and values. Caltrans is committed to accommodating all modes of transportation by considering Complete Streets strategies throughout all stages of project development from the planning to construction. Cognizant of such, the Upper I-5 Corridor Plan recommends that the Short Term (one to four years) implementation strategy includes active transportation and ADA improvements to the upper I-5 corridor. S6 would improve the I-5 corridor by implementing active transportation and ADA improvements in high opportunity areas within the State ROW. Improvements would be prioritized through discussions with local agencies as well as with Caltrans internal functional units.

Caltrans is limited in the improvements that can be made on non-SHS facilities. However, Caltrans may focus on creating continuous active transportation facilities that intersect with SHS facilities by ensuring that bicycle, pedestrian, and ADA passage is considered through local intersections with Caltrans on- and off-ramps. Caltrans District 12 will continue working with local and regional agencies to better accommodate safe bicycling and pedestrian connectivity by identifying opportunities to close key gaps in Orange County's active transportation infrastructure, particularly on or near the SHS. These active transportation improvements would subsequently support any first- and last-mile connections to potential BRT services that use the SHS or nearby facilities.

In addition to active transportation improvements to Caltrans infrastructure, Caltrans also funds the ATP, which is a competitive program that provides funding that supports the development of the local active transportation network. Specifically, the ATP provides funding to projects that promote increased use of non-motorized modes of transportation, including walking and bicycling. Agencies may propose both infrastructure and non-infrastructure projects for consideration in the ATP. This Caltrans-administered program not only aims to promote active transportation, but also aims to reduce GHG emissions, improve public health and safety, and provide benefits to disadvantaged communities. Caltrans encourages local agencies to apply for funding through the ATP and provides

workshops to assist agencies in the application process.

Medium Term – TSM&O/ICM/ITS/TDM (S4)

Caltrans is striving to revamp its operation of the SHS in order to increase vehicle throughput efficiency and combat rising congestion. Caltrans is looking into innovative ways to achieve this as ROW acquisition has become more limited and expensive. One solution is the incorporation of technology with the day-to-day operation of the SHS. TSM&O and ICM are integrated programs to optimize the performance of existing infrastructure through the implementation of systems, services, and projects. The real-time management of the transportation network leads to benefits such as reduced travel time, fuel consumption, and emissions, as well as improved safety, reliability, and mobility. In the Medium Term (five to 10 years), the Upper I-5 Corridor Plan recommends improving the corridor by implementing ITS infrastructure (i.e. CMA, CCTV, ramp meters, and loop detectors) and coordinating with other transportation stakeholders such as CHP, OCTA, and local entities to implement TSM&O and ICM systems. Specifically, it is recommended that these ITS strategies are utilized to technically integrate the infrastructure of Caltrans with the partnering local and regional agencies to create a more cohesive and adaptive transportation system. However, significant challenges to completing technical integration projects include forming multi-agency partnerships, establishing a cooperatively managed system of advanced technologies, and engaging in advanced planning with partnering agencies to better manage naturally diverting traffic during incidents and non-recurring events.

Caltrans District 12, in partnership with local and regional agencies in the region, is embarking on a groundbreaking effort to develop the North Orange County Triangle ICM program. This innovative technology program will create a new standard for delivering multiple projects to improve the transportation network for all modes in this highly congested region, focusing on incident and emergency management. This multi-agency partnership will jointly operate a system of advanced technologies in the North Orange County Triangle region defined by I-5, SR 57, and SR 91, as well as adjacent and crossing arterials. The North Orange County Triangle area contains the highest concentration of regionally-significant trip generators in the county resulting in severe

congestion on state highways and local arterials. Focusing on the management of these roadways as a system rather than as individual assets is key to developing an effective integrated management of freeway, arterial, transit, and parking systems in times of incidents and non-recurring events. Caltrans recommends the implementation of the North Orange County Triangle ICM program as a component of the S4 scenario in the medium term. Integration will require coordination with multiple local and regional agencies along the selected corridor. As such, it is estimated that this would require five to 10 years until implementation would be complete. This approach will help improve Safety, Mobility, Accessibility, Economic Development, and Air Quality at a reasonable cost.

Long Term – Priced Managed Lanes/BRT (S3)

An integrated managed lanes system – inclusive of park and ride facilities and BRT services – would promote forms of transportation demand management strategies that would enhance carpooling and transit usage, improve travel-time reliability, reduce GHG emissions, and maximize efficiency by increasing person and vehicle throughput while reducing congestion and delay. Managed lanes facilities may come in various forms – HOV, HOT, and ETL – all of which are strategies to incentivize single-occupancy motorists to travel during off-peak times, carpool, or utilize alternative modes of transportation. Cognizant of such, BRT and park and ride are considered to be complementary strategies that would supplement a managed lanes system in Orange County. By providing alternative forms of transportation and park and ride facilities that would encourage carpooling, travelers in Orange County would be incentivized to shift away from single-occupancy vehicle trips and utilize these complementary strategies to reduce congestion, GHG emissions, and countywide VMT.

Priced Managed Lanes in Orange County were analyzed through the MLFS and MLNS. These studies prioritized which corridors would benefit the most from the completion of managed lanes within Orange County. The I-5 corridor (north of SR 55) ranked as one of the top corridors for priced managed lanes consideration due the significant commuter and freight traffic along the corridor. The degradation of the current HOV lane facilities on I-5 necessitates either an expansion of the facilities and/or a conversion to Priced Managed Lanes. This program will

significantly improve Safety, Mobility, Accessibility, Economic Development, Air Quality, and Ease of Implementation criteria set by Caltrans, as well as provide revenue for the maintenance, operations, and improvement of the county's SHS. The implementation of Priced Managed Lanes would work in conjunction of the ICM program and provide transit with an avenue to rapidly move through the SHS.

OCTA's Freeway BRT Concept Study will develop a conceptual plan for two freeway BRT routes on I-5 and SR 55. Freeway BRT elements being evaluated include freeway median stations, transit-only access ramps, and integration with park and ride lots. Stations would be located to connect to key transit routes including Amtrak and Metrolink commuter rail service and with first- and last- mile transportation options. Unlike today's express bus service, freeway BRT routes would operate all day, in both directions, with greater frequency. The study will develop high-level ridership and cost estimates and identify short-term and long-term recommendations for project implementation.

These recommendations aim to increase the number of individuals per vehicle, reduce the number of vehicles on the road and improve congestion. Completion of the Priced Managed Lanes and implementation of BRT will require protracted discussion and coordination between Federal, State, and Local stakeholders. Priced Managed Lanes/ BRT is the highest-rated recommendation, scoring highly in all categories determined by Caltrans.

Appendix

Climate Change

Climate Change Assessments

As part of Caltrans' ongoing efforts to plan for and address climate change concerns, all 12 districts recently completed Climate Change Vulnerability Assessments to determine climate stressors that may affect how highways are planned, designed, built, operated, and maintained.[38] For District 12, the assessment identifies temperature rise, precipitation, wildfires, sea level rise, storm surge, and cliff retreat as potential climate stressors that could impact portions of the SHS within Orange County.

The I-5 corridor is located inland and is primarily surrounded by residential and commercial development. Because of the corridor's location and surrounding land uses, it is less vulnerable to direct impacts from wildfires, sea level rise, storm surge, and cliff retreat. The most impactful stressors on the corridor are likely to be temperature rise and precipitation. Extreme temperatures could affect pavement materials, expose system users to dangerous levels of heat, damage landscaping, and lead to drought.[39] High intensity storms could overwhelm the stormwater drainage systems at low points along the corridors, and could result in flooding, structural damage, or road closures. Future projects along the corridor will need to consider potential impacts resulting from extreme weather events.

In addition to the Climate Change Vulnerability Assessments, Caltrans is focused on reducing transportation-related GHG emissions to mitigate the scale and speed of climate change. In coordination with OCTA, SCAG, and other partner agencies, Caltrans is working to reduce traffic congestion, increase active transportation, expand transit, and provide EV charging as part of a multimodal approach to addressing GHG emissions.

[38] Caltrans Climate Change Vulnerability Assessment Summary Report, Caltrans, 2019
[39] Caltrans Climate Change Vulnerability Assessment Summary Report, Caltrans, 2019

Environmental Scan

Methodology

In developing the corridor plan, a high-level analysis of environmental factors was conducted for the corridor. The Environmental Scan identifies environmental factors that may influence or be impacted by future projects along the corridor. Such factors may include coastal zones, cultural resources, visual aesthetics, geology and soils, floodplains, hazardous materials, air quality, noise, waters and wetlands, special status species, and habitat connectivity.

The analysis identified the following as environmental factors that could potentially impact or be affected by future projects along the I-5 corridor: cultural resources, visual aesthetics, floodplains, air quality, and waters and wetlands.

Cultural Resources

There are no known archaeological sites within the project area. However, there is a potential that previously unidentified cultural resources may be uncovered during future construction activities and would need to be mitigated through a monitoring program. No significant historical resources are identified along the corridor, and it would be unlikely that any projects would have an adverse effect to any significant built environment resources.

Visual Aesthetics

While I-5 is located within an urbanized area of Orange County and is not a state designated scenic highway, freeway projects can impact community quality and character, both during and after construction. Elevated freeway ramps, widenings, bridges, and noise barriers have the potential to affect the visual aesthetics of the area. In the development of any future projects, it is necessary to consider context sensitive solutions that minimize visual impacts.

Floodplain

The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) for Orange County identifies the majority of the corridor as Zone X, which is a moderate flood hazard area that includes:

- Areas that have a 0.2 percent annual chance of flood;
- Areas of 1 percent annual chance of flood with average depths of less than one foot or with drainage areas less than one square mile; and
- Areas protected by levees from the one percent annual chance.

The FIRM also indicates that the corridor crosses multiple special flood hazard areas, which are defined as areas with a one percent annual chance flood. Future projects could involve construction within the existing floodplain and could potentially create adverse hydraulic impacts or increase rainfall runoff volumes and rates.

Hazardous Materials

There is a potential presence of hazardous substances at sites along the corridor. Such sites are considered "recognized environmental conditions" (RECs), and there is a high concentration of RECs in Segment 3. These sites do not pose an immediate threat to human health or environment, but future projects could encounter or disturb hazardous materials, including petroleum products, aerially deposited lead, lead-based paint, asbestos containing materials, polychlorinated biphenyls, herbicides, pesticides, and Title 22 metals.

Air Quality

Currently, the corridor is designated as nonattainment for ozone (O3) and particulate matter (PM2.5 and PM10) under California Ambient Air Quality Standards (CAAQS). The area is in attainment for nitrogen dioxide (NO2) and carbon monoxide (CO). Future projects may have short-term and long-term air quality impacts to surrounding areas.

Waters and Wetlands

The corridor crosses several watersheds, drainages, and waterways. Most notably, I-5 crosses over the Santa Ana River, the largest watershed in Southern California. The Santa Ana River Conservancy is responsible for protection and maintenance of the waters and wetlands, along with promoting public access and recreational opportunities along the Santa Ana River. Any future work involving the bridge over the Santa Ana

River should include coordination with the U.S. Army Corps of Engineers and the Santa Ana River Conservancy to ensure impacts to natural resources and public access of the river are minimal. All projects that require work around or within any waterways would need to adhere to Best Management Practices (BMP) to minimize impacts to water quality.

Environmental Scan Summary

	Segment 1	Segment 2	Segment 3
Postmile	29.09 – 34.01	34.01 – 42.10	42.10 44.39
Limits	Red Hill Ave to SR 22/SR 57	SR 22/SR 57 to SR 91	SR 91 to LA County line
Designated Coastal Zone	No	No	No
Cultural Resources Impact	Medium	Medium	Medium
State-Designated Scenic Highway	No	No	No
Visual Impact	Medium	Medium	Medium
Geotechnical Risks	Low	Low	Low
Flood Hazard	Medium	Medium	Medium
Hazardous Materials Presence	Low	Low	Medium
Ozone/PM 2.5/PM 10 Compliance	Non-Attainment	Non-Attainment	Non-Attainment
CO Compliance	Medium Attainment/ Maintenance	Medium Attainment/ Maintenance	Medium Attainment/ Maintenance
Noise Impact	Low	Low	Low
Waters and Wetlands Presence	Medium	Medium	Medium
Special Status Species Impact	Low	Low	Low
Habitat Connectivity Impact	Low	Low	Low

Performance Data

2017 NB Peak Hour Volumes and LOS

		HOV Lanes		GP Lanes	
		AM	PM	AM	PM
Segment 1	Red Hill Ave	1,520	1,020	10,990	9,030
	Newport Ave	1,440	970	10,500	8,280
	SR 55	1,440	1,000	8,790	7,760
	1st St/4th St	1,810	1,490	8,890	7,460
	Grand Ave	1,390	1,410	8,720	7,850
	17th St	1,240	1,280	8,930	8,870
	Main St	1,430	1,550	8,990	9,340
Segment 2	SR 22/SR 57	1,080	1,330	7,610	8,560
	Chapman Ave	1,080	1,330	7,040	8,080
	State College Blvd	650	1,030	6,810	7,750
	Katella Ave/Disney Way	650	1,080	6,640	7,710
	Anaheim Blvd	740	1,350	6,960	8,600
	Harbor Blvd	740	1,300	6,440	8,040
	Ball Rd	740	1,300	6,870	8,580
	Disneyland Dr	740	1,300	7,520	9,110
	Lincoln Ave	740	1,370	7,540	8,750
	Euclid St	740	1,370	7,560	8,170
	Brookhurst St	740	1,290	7,380	7,960
	La Palma Ave	740	1,290	7,710	8,180
Segment 3	Magnolia Av/SR 91	550	1,010	7,430	7,640
	Orangethorpe Ave	550	1,010	7,840	7,900
	Auto Center Dr	550	1,010	7,080	6,710
	Beach Blvd	550	1,030	7,050	6,360

LOS A
LOS B
LOS C
LOS D
LOS E
LOS F

Source: I-5 Managed Lanes Traffic Feasibility Study, Caltrans District 12, 2019

2017 SB Peak Hour Volumes and LOS

		HOV Lanes		GP Lanes	
		AM	PM	AM	PM
Segment 1	SR 55 On-ramp	1,610	1,240	5,030	5,480
	Newport Ave Off-ramp	1,520	1,240	4,340	5,660
	SR 55 Off-ramp	1,520	1,240	6,320	7,580
	4th St/1st St	2,210	1,940	6,030	7,420
	Grand Ave	1,540	1,630	5,950	7,370
	17th St	1,540	1,630	5,600	7,170
	Main St	1,540	1,630	5,110	6,550
	SR 57 On-ramp	1,770	1,720	4,510	5,740
Segment 2	Main St	1,100	790	4,450	5,750
	SR 22 Off-ramp	1,130	820	5,520	7,490
	Chapman Ave	1,150	830	5,120	6,570
	City Dr	930	660	5,010	6,320
	Katella Ave	1,010	690	5,560	5,990
	Anaheim Blvd	1,010	690	5,740	6,230
	Harbor Blvd	920	690	5,870	6,150
	Disneyland Dr	1,260	850	6,200	6,310
	Lincoln Ave	1,400	930	6,090	5,730
	Euclid St	1,260	760	6,690	6,450
	Brookhurst St	1,260	760	6,480	6,400
	Magnolia Ave	1,260	760	5,720	5,740
	SR 91	690	520	5,540	5,210
Seg 3	Beach Blvd	750	520	4,920	4,950
	Artesia Blvd (County Line)	750	520	4,140	3,940

LOS A
LOS B
LOS C
LOS D
LOS E
LOS F

Source: I-5 Managed Lanes Traffic Feasibility Study, Caltrans District 12, 2019

2035 NB Peak Hour Volumes and LOS

		HOV Lanes		GP Lanes	
		AM	PM	AM	PM
Segment 1	Red Hill Ave	1,580	1,120	10,960	9,110
	Newport Ave	1,510	1,070	10,130	8,050
	SR 55	1,510	1,080	8,330	7,340
	1st St/4th St	1,960	1,640	8,160	7,040
	Grand Ave	1,500	1,610	7,760	7,380
	17th St	1,370	1,520	8,190	8,360
	Main St	1,370	1,500	8,340	8,800
Segment 2	SR 22/SR 57	990	1,270	7,260	8,680
	Chapman Ave	990	1,270	7,260	8,680
	State College Blvd	990	1,270	7,260	8,680
	Katella Ave/Disney Way	990	1,270	6,730	8,260
	Anaheim Blvd	530	940	6,530	7,980
	Harbor Blvd	530	980	6,450	7,990
	Ball Rd	530	980	6,450	7,990
	Disneyland Dr	640	1,340	6,770	8,930
	Lincoln Ave	650	1,320	6,330	8,500
	Euclid St	650	1,320	7,410	9,620
	Brookhurst St	660	1,400	7,470	9,080
	La Palma Ave	660	1,400	7,510	8,510
Segment 3	Magnolia Av/SR 91	660	1,330	7,380	8,390
	Orangethorpe Ave	460	1,010	7,490	8,120
	Auto Center Dr	460	1,010	7,150	7,180
	Beach Blvd	470	1,050	7,140	6,830

LOS A
LOS B
LOS C
LOS D
LOS E
LOS F

Source: I-5 Managed Lanes Traffic Feasibility Study, Caltrans District 12, 2019

2035 SB Peak Hour Volumes and LOS

		HOV Lanes		GP Lanes	
		AM	PM	AM	PM
Segment 1	SR 55 On-ramp	1,730	1,500	5,240	5,500
	Newport Ave Off-ramp	1,610	1,500	4,350	5,660
	SR 55 Off-ramp	1,610	1,500	6,350	7,580
	4th St/1st St	2,330	2,350	6,270	7,640
	Grand Ave	1,530	2,020	6,180	7,610
	17th St	1,520	2,020	5,820	7,400
	Main St	1,500	2,020	5,310	6,770
	SR 57 On-ramp	1,570	2,020	4,630	5,900
Segment 2	Main St	980	860	4,950	5,930
	SR 22 Off-ramp	1,010	860	6,000	7,720
	Chapman Ave	1,020	860	5,350	6,730
	City Dr	970	780	5,230	6,390
	Katella Ave	1,060	810	5,370	6,060
	Anaheim Blvd	1,060	810	5,510	6,300
	Harbor Blvd	930	810	5,840	6,220
	Disneyland Dr	1,290	1,000	6,150	6,380
	Lincoln Ave	1,400	1,090	6,270	5,940
	Euclid St	1,250	910	6,660	6,520
	Brookhurst St	1,200	910	6,830	6,480
	Magnolia Ave	1,200	910	6,020	5,810
	SR 91	370	620	5,830	5,270
Seg 3	Beach Blvd	240	620	5,180	5,010
	Artesia Blvd (County Line)	250	620	4,370	3,980

LOS A
LOS B
LOS C
LOS D
LOS E
LOS F

Source: I-5 Managed Lanes Traffic Feasibility Study, Caltrans District 12, 2019

2055 NB Peak Hour Volumes and LOS

		HOV Lanes		GP Lanes	
		AM	PM	AM	PM
Segment 1	Red Hill Ave	1,580	1,080	10,880	8,990
	Newport Ave	1,520	1,050	10,050	7,830
	SR 55	1,520	1,070	8,150	7,320
	1st St/4th St	1,990	1,610	8,010	7,030
	Grand Ave	1,530	1,570	7,650	7,380
	17th St	1,390	1,460	8,190	8,360
	Main St	1,390	1,480	8,340	8,810
Segment 2	SR 22/SR 57	1,010	1,230	7,340	8,310
	Chapman Ave	1,010	1,230	7,340	8,310
	State College Blvd	1,010	1,230	7,340	8,310
	Katella Ave/Disney Way	1,010	1,230	6,800	7,920
	Anaheim Blvd	540	910	6,610	7,720
	Harbor Blvd	550	950	6,570	7,860
	Ball Rd	550	950	6,570	7,860
	Disneyland Dr	660	1,330	6,900	8,800
	Lincoln Ave	670	1,320	6,460	8,420
	Euclid St	670	1,320	7,590	9,590
	Brookhurst St	670	1,410	7,670	9,040
	La Palma Ave	670	1,410	7,720	8,510
Segment 3	Magnolia Av/SR 91	680	1,340	7,610	8,480
	Orangethorpe Ave	480	1,020	7,750	8,370
	Auto Center Dr	480	1,020	7,400	7,550
	Beach Blvd	480	1,070	7,400	6,810

LOS A
LOS B
LOS C
LOS D
LOS E
LOS F

Source: I-5 Managed Lanes Traffic Feasibility Study, Caltrans District 12, 2019

2055 SB Peak Hour Volumes and LOS

		HOV Lanes		GP Lanes	
		AM	PM	AM	PM
Segment 1	SR 55 On-ramp	1,720	1,600	5,310	5,560
	Newport Ave Off-ramp	1,590	1,600	4,350	5,650
	SR 55 Off-ramp	1,590	1,600	6,340	7,570
	4th St/1st St	2,280	2,470	6,260	7,630
	Grand Ave	1,480	2,110	6,180	7,550
	17th St	1,460	2,110	5,820	7,350
	Main St	1,460	2,110	5,320	6,710
	SR 57 On-ramp	1,510	2,110	4,700	5,870
Segment 2	Main St	960	900	4,980	6,090
	SR 22 Off-ramp	980	900	5,910	8,010
	Chapman Ave	1,000	900	5,480	7,390
	City Dr	980	820	5,250	6,720
	Katella Ave	1,070	850	5,300	6,340
	Anaheim Blvd	1,070	850	5,420	6,590
	Harbor Blvd	930	850	5,670	6,510
	Disneyland Dr	1,290	1,050	5,750	6,680
	Lincoln Ave	1,400	1,140	5,930	6,210
	Euclid St	1,240	950	6,410	6,830
	Brookhurst St	1,160	950	7,370	6,780
	Magnolia Ave	1,160	950	6,300	6,080
	SR 91	320	650	6,100	5,520
Seg 3	Beach Blvd	200	650	5,420	5,240
	Artesia Blvd (County Line)	200	650	4,570	4,170

LOS A
LOS B
LOS C
LOS D
LOS E
LOS F

Source: I-5 Managed Lanes Traffic Feasibility Study, Caltrans District 12, 2019

Performance Measures

2017	Average Travel Time (min)	Average Speeds (mph)	Vehicle Miles Traveled	Vehicle Hours Delay	Percent at LOS E or F
NB GP Lanes (AM)	17	55	435,714	2,111	11%
NB GP Lanes (PM)	29	33	613,652	10,672	57%
NB HOV Lanes (AM)	14	66	52,333	94	0%
NB HOV Lanes (PM)	35	27	96,763	2,289	37%
SB GP Lanes (AM)	51	18	348,130	14,616	48%
SB GP Lanes (PM)	24	38	446,880	5,741	16%
SB HOV Lanes (AM)	35	30	69,044	1,377	29%
SB HOV Lanes (PM)	20	41	71,065	776	16%

2035	Average Travel Time (min)	Average Speeds (mph)	Vehicle Miles Traveled	Vehicle Hours Delay	Percent at LOS E or F
NB GP Lanes (AM)	19	47	430,328	3,504	19%
NB GP Lanes (PM)	33	29	617,177	13,030	68%
NB HOV Lanes (AM)	15	58	56,353	218	9%
NB HOV Lanes (PM)	51	18	102,755	4,494	53%
SB GP Lanes (AM)	49	19	364,472	14,408	51%
SB GP Lanes (PM)	23	39	451,082	5,561	16%
SB HOV Lanes (AM)	68	17	78,641	3,674	52%
SB HOV Lanes (PM)	14	63	82,373	200	16%

2055	Average Travel Time (min)	Average Speeds (mph)	Vehicle Miles Traveled	Vehicle Hours Delay	Percent at LOS E or F
NB GP Lanes (AM)	20	45	439,148	3,930	23%
NB GP Lanes (PM)	36	27	616,354	14,956	75%
NB HOV Lanes (AM)	15	58	57,328	220	10%
NB HOV Lanes (PM)	55	17	101,335	4,775	55%
SB GP Lanes (AM)	51	18	368,089	15,264	55%
SB GP Lanes (PM)	27	33	470,841	7,786	25%
SB HOV Lanes (AM)	76	15	79,371	4,121	61%
SB HOV Lanes (PM)	15	62	86,215	247	16%

Source: I-5 Managed Lanes Traffic Feasibility Study, Caltrans District 12, 2019

Caltrans D12
1750 E 4th Street, Suite 100
Santa Ana, CA 92705

https://dot.ca.gov/d12