I-5 MANAGED LANES PROJECT

(RED HILL AVE TO ORANGE / LOS ANGELES COUNTY LINE)

Counties of Orange and Los Angeles, California
Cities Irvine, Tustin, Santa Ana, Orange, Anaheim, Fullerton, Buena Park, La Mirada, and Santa Fe Springs

12-Ora-5 – PM 28.9/44.4, 26.9, 27.9, 28.4
07-LA-5 – PM 0.1, 0.3, 0.6, 1.7
12-Ora-55 – PM 7.4, 8.0, 8.7, 8.9, 9.2, 9.7 9.9, 10.2
12-Ora-57 – PM 11.0, 11.3, 11.9, 12.5, 12.7, 12.9, 13.5
12-Ora-91 – PM 0.4, 0.7, 1.1, 1.3, 1.4, 1.6, 1.8, 2.0, 2.2, 2.6, 2.8, 3.4

EA 12-0Q950

DRAFT AIR QUALITY REPORT

Prepared for

Caltrans

CALTRANS DISTRICT 12 ORANGE COUNTY

April 12, 2023

Draft Air Quality Report

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April 12, 2023

Prepared By: Ronald Brugger   Date: April 12, 2023

Ronald Brugger, Senior Air Quality Specialist
LSA Associates, Inc.
3210 El Camino Real, Suite 100
Irvine, California 92602

Approved By: Reza Aurasteh   Date: 4/18/2023

Reza Aurasteh, Ph.D., P.E., Branch Chief
Environmental Engineering
California Department of Transportation
District 12
Santa Ana, CA 92705

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Table of Contents

1. PROPOSED PROJECT DESCRIPTION 1-1

1.1 Introduction 1-1
1.2 Location and Background 1-1
1.3 Purpose and Need 1-1
1.4 Baseline and Forecasted Conditions for the No Build and Build Alternatives 1-2
1.4.1 Alternative 1 – No Build Alternative 1-2
1.4.2 Alternative 2 – Build Alternative: Modify Existing HOV 2+ Lanes to HOV 3+ Lanes 1-2
1.4.3 Alternative 3 – Build Alternative: Convert Existing HOV Lanes to Express Lanes 1-5
1.4.4 Alternative 4 – Build Alternative: Convert Existing HOV Lanes to Express Lanes and Construct Additional Express Lanes.............1-11
1.4.5 Existing Roadways and Traffic Conditions 1-16
1.4.6 Alternative 1 – No Build Alternative 1-18
1.4.7 Alternatives 2, 3, and 4 – Build Alternatives 1-18
1.4.8 Comparison of Existing/Baseline and Build Alternative Conditions 1-20
1.5 Construction Activities and Schedule...1-21

2. REGULATORY SETTING 2-1

2.1 Pollutant-Specific Overview...2-1
2.1.1 Criteria Pollutants...2-1
2.2 Regulations 2-6
2.3 Climate Change - Greenhouse Gas Emissions 2-9
2.3.1 Regulatory Setting 2-9

3. AFFECTED ENVIRONMENT 3-1

3.1 Climate, Meteorology, and Topography 3-1
3.2 Existing Air Quality 3-1
3.2.1 Criteria Pollutants and Attainment Status..3-1
3.2.2 Mobile Source Air Toxics 3-5
3.3 Greenhouse Gases and Climate Change Setting 3-5
3.3.1 GHG Inventories 3-6
3.4 Sensitive Receptors 3-9

3.5 Conformity Status 3-12
3.5.1 Regional Conformity 3-12
3.5.2 Project-Level Conformity 3-13
3.5.3 Interagency Consultation 3-13
3.6 NEPA Analysis/Requirements 3-14
3.7 CEQA Analysis/Requirements 3-14

4. ENVIRONMENTAL CONSEQUENCES 4-1
4.1 Impact Criteria 4-1
4.2 Short-Term Effects (Construction Emissions) 4-1
4.2.1 Construction Equipment, Traffic Congestion, and Fugitive Dust 4-1
4.2.2 Asbestos 4-4
4.2.3 Lead 4-4
4.3 Long-Term Effects (Operational Emissions) 4-5
4.3.1 CO Analysis 4-5
4.3.2 Particulate Matter Analysis 4-10
4.3.3 NO_2 Analysis 4-12
4.3.4 Mobile Source Air Toxics Analysis 4-12
4.3.5 Greenhouse Gas Analysis 4-15
4.4 Cumulative/Regional/Indirect Effects 4-20

5. MINIMIZATION MEASURES 5-1
5.1 Short-Term (Construction) 5-1
5.2 Long-Term (Operational) 5-1
5.3 Greenhouse Gas Reduction Strategies 5-1
5.3.1 Statewide Efforts 5-1
5.3.2 Caltrans Activities 5-2
5.3.3 Climate Action Plan for Transportation Infrastructure 5-2
5.3.4 California Transportation Plan 5-2
5.3.5 Caltrans Strategic Plan 5-3
5.3.6 Caltrans Policy Directives and Other Initiatives 5-3
5.3.7 Project-Level GHG Reduction Strategies 5-3
5.3.8 Adaptation 5-3

6. CONCLUSIONS 6-1

7. REFERENCES 7-1

List of Appendices

Appendix A. RTP and FTIP Listings for the Project and FHWA Conformity Determination

Appendix B. Interagency Consultation Documentation

Appendix C. Construction Emission Calculations

Appendix D. Summary of Existing and Forecast Travel Activities

Appendix E. Summary of Operating Emission Calculations

Appendix F. CO Flow Chart (based on the CO Protocol)

List of Figures

Figure 1-1: Project Location 1-17

Figure 2-1: Projected National MSAT Trends, 2020–2060 2-6

Figure 3-1: Map of the Air Quality Monitoring Stations near the Study Area 3-2

Figure 3-2: Predominant Wind Patterns at Mission Viejo 3-2

Figure 3-3: United States 2020 Greenhouse Gas Emissions 3-7

Figure 3-4: California 2020 Greenhouse Gas Emissions by Scoping Plan Category 3-8

Figure 3-5: Change in California GDP, Population, and GHG Emissions since 2000 3-8

Figure 3-6: Sensitive Receptor Locations 3-11

Figure 4-1: Possible Use of Traffic Operation Strategies in Reducing On-Road CO_2 Emissions 4-17

Figure 5-1: Sea Level Rise Risk 5-8

List of Tables

Table 1.1: Anticipated Impacts to On-Ramps within the Proposed Project Limits—Alternative 3 1-6

Table 1.2: Anticipated Impacts to Off-Ramps within the Proposed Project Limits—Alternative 3 1-6

Table 1.3: Anticipated Retaining Wall Impacts within the Proposed Project Limits—Alternative 3 1-7

Table 1.4: Anticipated Impacts to Utilities within the proposed Project Limits—Alternative 3 1-9

Table 1.5: Design Standards Risk Assessment—Alternative 3 1-10

Table 1.6: Anticipated Sound Wall Impacts within the Proposed Project Limits—Alternative 3 1-10

Table 1.7: Anticipated Impacts to On-Ramps within the Proposed Project Limits—Alternative 4 1-12

Table 1.8: Anticipated Impacts to Off-Ramps within the Proposed Project Limits—Alternative 4 1-13

Table 1.9: Anticipated Retaining Wall Impacts within the Proposed Project Limits—Alternative 4 1-14

Table 1.10: Anticipated Impacts to Utilities within the Proposed Project Limits—Alternative 4 1-15

Table 1.11: Design Standards Risk Assessment—Alternative 4 1-15

Table 1.12: Summary of Existing Traffic Conditions 1-21

Table 1.13: No Build I-5 Traffic Conditions 1-21

Table 1.14: I-5 Traffic Conditions for the Build Alternatives 1-22

Table 1.15: Summary of Long-Term Operational Impacts on Traffic Conditions of Existing, No Build, and Build Alternatives. 1-24

Table 1.16: Proposed Project Milestones and Dates 1-25

Table 2.2: State and Federal Criteria Air Pollutant Effects and Sources 2-4

Table 3.1: State and Federal Attainment Status of the South Coast Air Basin 3-3

Table 3.2: Air Quality Concentrations for the Past Five Years in the Project Vicinity 3-4

Table 3.3: Status of SIPs Relevant to the Project Area 3-5

Table 3.4: Mobile Source Air Toxics Measured Concentrations in the Study Area 3-6

Table 3.5: List of Sensitive Receptors and Distance from Project Limits 3-10

Table 3.6: Status of Plans Related to Regional Conformity 3-13

Table 4.1: Construction Emissions for Alternative 2 4-2

Table 4.2: Construction Emissions for Alternative 3 4-3

Table 4.3: Construction Emissions for Alternative 4 4-3

Table 4.4: Summary of Comparative Emissions Analysis 4-6

Table 4.5: Summary of ADT and Average Speeds 4-10

Table 4.6: Opening Year (2035) and Future Year (2055) MSAT Emissions 4-14

Table 4.7: Alternative 2 Construction Greenhouse Gas Emissions 4-15
Table 4.8: Alternative 3 Construction Greenhouse Gas Emissions 4-16
Table 4.9: Alternative 4 Construction Greenhouse Gas Emissions 4-16
Table 4.10: Modeled Annual GHG Emissions and Vehicle Miles Traveled by Alternative..4-18

Acronyms and Abbreviations

Abbreviation	Definition
°F	degrees Fahrenheit
AADT	annual average daily traffic
AB	Assembly Bill
ADT	average daily traffic
AQMP	Air Quality Management Plan
Basin	South Coast Air Basin
BMP	best management practice
BRT	bus rapid transit
CA MUTCD	California Manual on Uniform Traffic Control Devices
CAAA	Clean Air Act Amendments of 1990
CAAQS	California Ambient Air Quality Standards
CAFE	Corporate Average Fuel Economy Standards
CAL-CET2020	Caltrans California Construction Emissions Tools 2020
Caltrans	California Department of Transportation
CAPTI	California Action Plan for Transportation Infrastructure
CARB	California Air Resources Board
CCAA	California Clean Air Act
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CH_4	methane
CHP	California Highway Patrol
CMAQ	Congestion Mitigation Air Quality
CMS	changeable message signs
CO	carbon monoxide
CO Protocol	Transportation Project-Level Carbon Monoxide Protocol
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CSMP	Construction Site Monitoring Program
CT-EMFAC2017	Caltrans Emissions Factors Model
CTP	California Transportation Plan
DBE	disadvantaged business enterprise

Abbreviation	Definition
DPM	diesel particulate matter
EL	Express Lane
EMFAC2021	CARB Emission Factor Model Version 2021
EO	Executive Order
ETC	Electronic Toll Collection
FCAA	Federal Clean Air Act
FHWA	Federal Highway Administration
Fourth Assessment	California's Fourth Climate Change Assessment
FTA	Federal Transit Administration
FTIP	Federal Transportation Improvement Program
GDP	gross domestic product
GHG	greenhouse gas
GP	general purpose (lane)
Guidance	USEPA Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas
GWP	global warming potential
H_2S	hydrogen sulfide
HOV	high-occupancy vehicle
I	Interstate
IAC	Interagency Consultation
LED	light-emitting diode
LOS	level of service
LRTP	Long Range Transportation Plan
mi	mile(s)
ML	managed lane
MMT	million metric tons
$MMTCO_2e$	million metric tons of carbon dioxide equivalent
mph	miles per hour
MPO	metropolitan planning organization
MSAT	Mobile Source Air Toxics
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act

Abbreviation	Definition
NHTSA	National Highway Traffic Safety Administration
NO_2	nitrogen dioxide
NOA	naturally occurring asbestos
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
O_3	ozone
OCTA	Orange County Transportation Authority
OPR	Governor's Office of Planning and Research
PM	Post Mile
PM_{10}	particulate matter 10 micrometers or smaller
$PM_{2.5}$	particulate matter 2.5 micrometers or smaller
POAQC	Project of Air Quality Concern
ppb	parts per billion
ppm	parts per million
proposed Project	I-5 Managed Lanes Project (Red Hill Ave to Orange / Los Angeles County Line)
RTP/SCS	Regional Transportation Plan/Sustainable Communities Strategy
RWQCB	Regional Water Quality Control Board
Safeguarding California Plan	Safeguarding California: Reducing Climate Risk
SB	Senate Bill
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SF_6	sulfur hexafluoride
SIP	State Implementation Plan
SO_2	sulfur dioxide
SR	State Route
STP	Surface Transportation Program
SWPPP	Stormwater Pollution Prevention Plan
T&R	Traffic and Revenue
TAC	toxic air contaminant
TCM	Transportation Control Measure
TCWG	SCAG Transportation Conformity Working Group
TDM	Transportation Demand Management

Abbreviation	Definition
TIP	Transportation Improvement Program
TMP	Transportation Management Plan
TSM	Transportation System Management
USC	United States Code
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
VMT	vehicle miles traveled
VOC	volatile organic compound

1. PROPOSED PROJECT DESCRIPTION

1.1 Introduction

The California Department of Transportation (Caltrans) District 12 is proposing managed lanes (ML) improvements in both directions on Interstate 5 (I-5) (proposed Project). The improvements would modify the existing high-occupancy vehicle (HOV) lanes within the proposed Project limits to address operational deficiencies.

1.2 Location and Background

The proposed Project is located in Orange County, under the jurisdiction of the South Coast Air Quality Management District (SCAQMD) and Southern California Association of Governments (SCAG). The build alternatives are included in the 2023 Federal Transportation Improvement Program (FTIP) under ID No. ORA210604 and are proposed for funding from the COVID Relief Funds – State Transportation Improvement Program (STIP), State Highway Operation and Protection Program (SHOPP) Advance Construction (AC) - Mobility, and STIP AC Interregional Improvement Program (IIP) programs. The proposed Project is currently included in the future commitments section of SCAG's *2020–2045 Regional Transportation Plan/Sustainable Communities Strategy: A Plan for Mobility, Accessibility, Sustainability, and High Quality of Life* (2020–2045 RTP/SCS). However, the proposed Project is not captured in future regional models and efforts to incorporate the build alternatives into such models are being taken. Once updated later in 2023 the 2020–2045 RTP/SCS and the FTIP will capture the build alternatives in regional models.

The proposed Project improvement limits on I-5 extend from Red Hill Avenue (Post Mile [PM] 28.9) to the Orange/Los Angeles County line (12-ORA-5 PM 44.4), California. The Project improvements are within the cities of Irvine, Tustin, Santa Ana, Orange, Anaheim, Fullerton, Buena Park, La Mirada, and Santa Fe Springs.

1.3 Purpose and Need

The purpose of this Project is to improve the overall movement of people and goods along this section of I-5 by:

- Improving the ML network operations
- Improving mobility and trip reliability
- Maximizing person throughput by facilitating the efficient movement of bus and rideshare users
- Applying technology to help manage traffic demand

The need, or deficiency, of the Project is the existing I-5 HOV lanes between Red Hill Avenue and the Orange County/Los Angeles County line experience:

- HOV lane degradation (does not meet the federal performance standards)
- Demand exceeds existing capacity
- Operational deficiencies

1.4 Baseline and Forecasted Conditions for the No Build and Build Alternatives

Four preliminary alternatives, including three build alternatives and the No Build Alternative, are under consideration and are described below.

1.4.1 Alternative 1 – No Build Alternative

Alternative 1, the No Build Alternative, does not include improvements to the existing lane configurations for I-5. Under the No Build Alternative, no additional roadway improvements would occur. This alternative includes other projects on the financially constrained project list in the adopted SCAG 2020–2045 RTP/SCS within the proposed Project limits on I-5 and the Preferred Plan in the Orange County Transportation Authority (OCTA) 2018 Long Range Transportation Plan (LRTP) within the proposed Project limits.

1.4.2 Alternative 2 – Build Alternative: Modify Existing HOV 2+ Lanes to HOV 3+ Lanes

Alternative 2 would maintain the existing lane configurations for I-5 with a modification of the minimum HOV lane occupancy requirement from two-plus (2+) to three-plus (3+) passengers within the current HOV system in each direction between Red Hill Avenue and the Orange/Los Angeles County line. As a result of this increase in the occupancy requirement and improved trip reliability, through the TSM/TDM elements, it would promote and encourage public and private transit such as Bus Rapid Transit (BRT) and ridesharing. Under this alternative, no additional roadway improvements would occur. Additionally, two proposed park-and-ride facilities are being evaluated as part of Alternative 2 and would be constructed within the existing freeway right-of-way. Sign replacement and pavement delineation would also be implemented to meet the latest California Manual on Uniform Traffic Control Devices (CA MUTCD) standards.

1.4.2.1 Ramps

Physical modifications of the ramp geometry will not be required where the current HOV system is converted from 2+ to 3+ passengers; however, replacement of signage at direct-access ramps will be required accordingly for Alternative 2.

1.4.2.2 Impact to Structures

Alternative 2 would not impact existing structures or create new structures (e.g., bridges) as part of its proposed design.

1.4.2.3 Drainage and Water Quality

Drainage management measures would be included in Alternative 2 to address the impacts to drainage patterns associated with new construction of the park-and-ride facilities. Proposed major drainage design features would include: maintaining existing drainage flow patterns and incorporating existing drainage systems to the maximum extent practicable; providing drainage facilities that would accommodate future improvements; and providing drainage facilities to prevent and/or reduce substantial erosion or siltation on or off site.

Some of the existing systems may be abandoned or removed to accommodate construction of Alternative 2. Best Management Practices (BMPs) would be included to address stormwater requirements and treatment of the added impervious area created by Alternative 2.

1.4.2.4 Tolled Components

Alternative 2 would not include the implementation of any new tolling components as part of the proposed design.

1.4.2.5 Transportation Management Plan

Alternative 2 may be implemented in phases and/or segments and procured under one or more contracts, including the option of using design/build. Construction-related delays are anticipated during construction of Alternative 2.

In accordance with Caltrans Deputy Directive (60-R2), a Transportation Management Plan (TMP) has been prepared for Alternative 2 which includes strategies that, when implemented, would minimize Project-related construction and circulation impacts.

It is anticipated that lane closures would be required, and it may be necessary to temporarily close on/off-ramps and connectors during construction of Alternative 2.

Some of the key elements recommended in the TMP include the following: Public Information/Public Awareness Campaign; Motorist Information Strategies; Incident Management; Construction Strategies; Demand Management; and Alternate Route Strategies.

Detailed detour plans, staging plans, and traffic handling plans would also be developed during the final design phase.

1.4.2.6 Construction Staging

As no additional construction would occur with Alternative 2, there would be no stage construction impacts associated with construction activities within the freeway mainline, which are limited to signage replacement and pavement delineators along the freeway mainline. Construction staging is anticipated for the development of the park-and-ride facilities to minimize impacts to existing traffic.

Stage construction concept plans are currently being developed. Should Alternative 2 be selected as the Preferred Alternative, detailed stage construction and detour plans would be developed during final design. Detailed stage construction plans and traffic handling plans would also be developed in the final design stage.

1.4.2.7 Right-of-Way Data

Additional right-of-way (e.g., full acquisition, partial acquisition, aerial easements, temporary construction easements) is not anticipated for the construction of Alternative 2.

1.4.2.8 Utility and Other Owner Involvement

Alternative 2 is not expected to have any impacts to surrounding utilities, as there are no proposed utility relocations associated with its proposed design.

1.4.2.9 Nonstandard Design Features (Design Standards Risk Assessment)

Alternative 2 would not impact existing nonstandard design features or create new nonstandard design features as part of the proposed design.

1.4.2.10 Sound Walls

Alternative 2 would not impact any existing sound walls as part of the proposed design.

1.4.2.11 Transportation System Management/Transportation Demand Management

Alternative 2 would not implement any new Transportation System Management/Transportation Demand Management (TSM/TDM) measures or features beyond the ramp metering, changeable message signs (CMS), cameras, and traffic speed detection systems that already exist within the proposed Project limits.

1.4.2.12 Highway Planting

Existing planting and irrigation systems removed during construction of the Alternative 2 park-and-ride facilities would be replaced wherever space is available. Generally, existing vegetation in and around the park-and-ride areas would be replanted to the maximum extent practicable.

Should Alternative 2 be selected as the Preferred Alternative, planting design would be provided during the final design phase; would consider safety, maintainability, and aesthetic compatibility with adjacent urban communities; and would not deviate significantly from the existing planting theme.

1.4.2.13 Erosion Control

Alternative 2 would be required to comply with the terms and conditions in accordance with Attachment D of the *NPDES Statewide Construction General Permit* (SWRCB 2020), which includes a written site-specific Construction Site Monitoring Program (CSMP). The CSMP would include implementation of specific stormwater effluent monitoring requirements to ensure that the implemented BMPs are effective in preventing discharges from exceeding any of the water quality standards.

Erosion control measures would be implemented during construction as well as after completion of Alternative 2 construction in accordance with the requirements of the Santa Ana (Region 8) and Los Angeles (Region 4) Regional Water Quality Control Boards (RWQCBs) and the current statewide National Pollutant Discharge Elimination System (NPDES) Construction General Permit. During construction, potential construction site best management practices (BMPs), such as temporary fiber rolls, temporary mulch, drainage inlet protection, concrete washout facilities, street sweeping, and hydroseeding, would be used to minimize erosion. All finished slopes would receive replacement planting or vegetative erosion control application.

Should Alternative 2 be selected as the Preferred Alternative, specific erosion control measures and construction site BMP design would be developed during final design. Preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) would be required during construction.

1.4.3 Alternative 3 – Build Alternative: Convert Existing HOV Lanes to Express Lanes

Alternative 3 would convert the existing HOV lane to an Express Lane (EL) in each direction between Red Hill Avenue and State Route (SR) 55; convert two existing HOV lanes to ELs in each direction between SR-55 and SR-57; and convert the existing HOV lane to an EL in each direction between SR-57 and the Orange/Los Angeles County line. The typical cross-section consists of a 12-foot-wide EL, a 2- to 4-foot buffer, 12-foot-wide general-purpose (GP) lanes, 12-foot-wide auxiliary lanes, a 4- to 26-foot-wide inside shoulder, and a 10-foot-wide outside shoulder and would be provided to accommodate the EL. One 12-foot weave lane is proposed at locations of ingress or egress. Additionally, two proposed park-and-ride facilities are being evaluated as part of Alternative 3 and would be constructed within the existing freeway right-of-way. Sign replacement and pavement delineation would also be implemented to meet the latest CA MUTCD standards.

1.4.3.1 Ramps

Alternative 3 would impact several existing ramps. The affected ramps and the proposed improvements are summarized in Tables 1.1 and 1.2, below. In general, several existing ramps would be shifted to accommodate outside widening by Alternative 3. Alternative 3 is not anticipated to impact system interchanges within the proposed Project limits. Within the proposed Project limits, ramp metering is incorporated into the existing local interchange on-ramps except at the South Anaheim Boulevard northbound on-ramp. Where ramp improvements affect ramp metering, any ramp metering equipment would be reestablished. Existing ramp meters and equipment would be reused where possible.

For the majority of locations, physical modifications of the ramp geometry will not be required where the HOV direct connector is converted to an ELs connector; however, replacement of signage and addition of tolling equipment will be required accordingly. The incorporation of weave lanes required physical modifications of the ramp gore geometry where the HOV direct connector is converted to an ELs connector at the northbound Gene Autry Way off-ramp, northbound Disney Way off-ramp, southbound Gene Autry Way off-ramp, and southbound Disneyland Drive off-ramp.

Table 1.1: Anticipated Impacts to On-Ramps within the Proposed Project Limits—Alternative 3

Location		Post Mile (Approx.)	Ramp Improvements
1	NB SR-55 to NB I-5 Direct Connector	30.472	X
2	Grand Ave. SB Direct-Access On-Ramp	31.794	X
3	N. Main St. SB On-Ramp	32.953	X
4	SB SR-57 to SB I-5 Direct Connector	34.222	X
5	Gene Autry Wy. SB Direct-Access On-Ramp	35.949	X
6	Gene Autry Wy. NB Direct-Access On-Ramp	35.949	X
7	EB SR-91 to SB I-5 Direct Connector	41.928	X
8	WB SR-91 to NB I-5 Direct Connector	42.42	X
9	Auto Center Dr. NB On-Ramp	42.928	X
10	Artesia Blvd. SB On-Ramp	44.271	X
		Total Number of On-Ramp Improvements:	**10**

Notes: * Existing ramp metering to be relocated and/or upgraded to latest equipment requirements.
**Ramps metered separately before joining.

EB = eastbound
I = Interstate
NB = northbound
SB = southbound
SR = State Route
WB = westbound

Table 1.2: Anticipated Impacts to Off-Ramps within the Proposed Project Limits—Alternative 3

Location		Post Mile (Approx.)	Ramp Improvements
1	Grand Ave. NB Direct-Access Off-Ramp	31.532	X
2	Penn Wy. SB Off-Ramp	32.521	X
3	NB I-5 to NB SR-57 Direct Connector	33.433	X
4	Gene Autry Wy. NB Direct-Access Off-Ramp	35.466	X
5	Gene Autry Wy. SB Direct-Access Off-Ramp	36.309	X
6	Anaheim Blvd. NB Direct-Access Off-Ramp	36.072	X
7	Disneyland Dr. SB Direct-Access Off-Ramp	38.439	X
8	NB I-5 to WB SR-91 Direct Connector	41.909	X
9	SB I-5 to EB SR-91 Direct Connector	42.545	X
10	Beach Blvd. SB Off-Ramp	43.680	X
11	Artesia Blvd. NB Off-Ramp	43.996	X
		Total Number of Off-Ramp Improvements:	**11**

EB = eastbound
I = Interstate
NB = northbound
SB = southbound
SR = State Route
WB = westbound

1.4.3.2 Impact to Structures

Alternative 3 would not create new structures (e.g., bridges) but would impact one existing retaining wall to accommodate widening the mainline to avoid right-of-way acquisition. The affected retaining wall structure and the proposed improvements are summarized in Table 1.3.

Table 1.3: Anticipated Retaining Wall Impacts within the Proposed Project Limits—Alternative 3

Location	Post Mile	Retaining Wall Improvements		Maximum Length of Extension (Feet)
		Rebuild I / New(N)	Type	
SB I-5, North of E. 17th St.	32.521	R*	Special	793

Notes: *Retaining Wall/Sound Wall.
I = Interstate
SB = Southbound

1.4.3.3 Drainage and Water Quality

Drainage management measures would be included in Alternative 3 to address the impacts to drainage patterns associated with new construction. Proposed major drainage design features would include: maintaining existing drainage flow patterns and incorporating existing drainage systems to the maximum extent practicable; providing drainage facilities that would accommodate future improvements; and providing drainage facilities to prevent and/or reduce substantial erosion or siltation on or off site.

Some of the existing systems may be abandoned or removed to accommodate the construction of Alternative 3. For widened sections of the pavement for Alternative 3, the existing edge drains would be replaced and reconnected to the drainage system; final connection and location details would be developed in the final design phase. BMPs would be included to address stormwater requirements and treatment of the added impervious area created by Alternative 3.

1.4.3.4 Tolled Components

Toll Operations Policies

The ELs would require single-occupant vehicles to pay a toll. The objective is to open the tolled ELs with some level of HOV occupancy free to encourage rideshare and transit usage. Operational adjustments to the tolled ELs may be implemented based on demand, rates of speed, traffic volumes, and to meet financial covenants, maintenance, and operational obligations. This would be determined based on the Traffic and Revenue (T&R) analysis, input from the public, and Caltrans business rules. Caltrans has the authority to set the occupancy policy on the I-5 ELs.

Key Caltrans business rules may include, but are not limited to:

- Toll-free travel for vehicles that meet minimum vehicle occupancy requirements, motorcycles, and buses.
- Qualifying carpools would continue to be able to access the lanes without a charge; trucks, other than two-axle light-duty trucks, would not be allowed.
- Toll/transit credits would be available to frequent ELs transit riders.
- Emergency vehicles may use the ELs toll-free when responding to incidents.
- Qualifying Clean Air Vehicles would be given a toll discount.

- Equity Assistance Plan would be available to persons earning less than twice the federal poverty level.

Toll Operations and Maintenance

At this time, a process is in place to develop a formal maintenance plan as part of the Caltrans and FHWA systems engineering process. It is anticipated that Caltrans would maintain the physical infrastructure, such as pavement, striping, and median barriers, as well as perform general maintenance, such as trash and graffiti removal, paid for from toll revenues. It is anticipated that Caltrans would also manage the tolling infrastructure, while the customer service centers and other back-office support facilities would be contracted to others. However, final agreements and decisions on such responsibilities will be decided in the future phases of the project.

Toll Revenue/Pricing Structure

Time-of-day pricing and dynamic pricing methods are being analyzed for their application as part of the proposed Project. Toll rates would be set in response to vehicle demand and would be adjusted as necessary to regulate volume in the ELs to maintain traffic flow at a predetermined level of service (LOS).

The pricing structure and details would be evaluated further during final design. No tolling amount or pricing decisions have been made at this time.

Toll Collection

The I-5 ELs facility is expected to use an all-electronic toll collection system and would not accept cash or credit card payment on the facility. This would eliminate the need for customers to stop and pay tolls at traditional tollbooths. The electronic toll collection system would require customers to have pre-paid accounts with a tolling agency and mount a nonstop automated vehicle identification transponder or toll tag on the windshield of a registered vehicle. Tolls would be collected electronically by reading the transponder at highway speeds.

Toll Enforcement

Toll enforcement is an essential element of any successful EL system, ensuring that traffic laws are enforced, customers are charged the appropriate toll based on vehicle occupancy, and toll evasion is minimized. Toll enforcement would be accomplished through California Highway Patrol (CHP) patrols, electronic systems, and facility design. The CHP is anticipated to be contracted to conduct routine and supplemental enforcement services on the I-5 ELs facility, including toll infractions, HOV eligibility occupancy infractions, buffer crossing infractions, speeding and other moving violations. The Electronic Toll Collection (ETC) system is intended to identify both vehicles that do not have a transponder as well as the declared transponder switch setting. Caltrans would incorporate an infrared occupancy detection system into the EL enforcement. The CHP currently provides enforcement on all of the toll roads in southern California under several different institutional arrangements.

1.4.3.5 Transportation Management Plan

The same TMP described under Alternative 2 would be utilized as part of Alternative 3. This infrastructure is detailed in Section 1.4.2.5, above.

1.4.3.6 Construction Staging

It is anticipated that Alternative 3 would be designed and constructed in separate phases to facilitate Project delivery based on available funding. Each phase would include construction staging to minimize impacts to existing traffic. The same number of existing mainline lanes would be kept open to traffic during construction whenever feasible.

Stage construction concept plans are currently being developed. However, Alternative 3 would require ramp closures of less than 10 days to accommodate reconstruction of pavement at or near on- and off-ramps. Closures of successive on- or off-ramps would be avoided. Should Alternative 3 be selected as the Preferred Alternative, detailed stage construction and detour plans would be developed during final design. Detailed stage construction plans and traffic handling plans would also be developed in the final design stage.

1.4.3.7 Right-of-Way Data

Additional right-of-way (e.g., full acquisition, partial acquisition, aerial easements, temporary construction easements) is not anticipated for the construction of Alternative 3.

1.4.3.8 Utility and Other Owner Involvement

Underground and above-ground utility conflicts are anticipated within the proposed Project limits. The anticipated utility impacts within the proposed Project limits are summarized in Table 1.4.

Table 1.4: Anticipated Impacts to Utilities within the proposed Project Limits—Alternative 3

No.	Location	Utility Owner and/or Contact Name	Wet (W) / Dry (D)	Utility Type(s)	Utility Conflict Description	H*
1	N. Main St. SB On-Ramp	AT&T	D	Telecom	Roadway Conflict	N/A
2	North of N. State College Blvd.	PacBell	D	Telecom	Overhead Sign Conflict	N/A
3	North of N. State College Blvd.	SCE	W	Electric	Overhead Sign Conflict	N/A

Notes: H* denotes high-priority utilities based on Chapter 600 of the Caltrans Encroachment Permits Manual.
AT&T = American Telephone and Telegraph Company
Caltrans = California Department of Transportation
N/A = Not Applicable
PacBell = Pacific Bell Telephone Company
SB = Southbound
SCE = Southern California Edison

Should Alternative 3 be selected as the Preferred Alternative, a “positive location” verification would be performed during the final design phase, which would include surveying and boring the area in order to verify the depth and specific locations of underground utilities in the proposed Project vicinity that may be in close proximity to or conflict with proposed improvements as determined from as-built plans and utility company records. Relocation or addition of towers are not anticipated for the existing overhead electrical lines.

1.4.3.9 Nonstandard Design Features (Design Standards Risk Assessment)

A listing of major existing nonstandard design features for Alternative 3 is included in Table 1.5, below.

Table 1.5: Design Standards Risk Assessment—Alternative 3

No.	Design Standard	Probability of Design Exception Approval (None, Low, Medium, High)
1	201.1 (Stopping Sight Distance Standards)*	Medium/High
2	301.1 (Lane Width)*	Medium
3	302.1 (Shoulder Width)*	Medium/High
4	305.1 (Median Width Freeways and Expressways-Urban)**	High
5	305.1(3)(a) (Median Width)*	High
6	309.1(3)(a) (Horizontal Clearances for Highways)*	Medium /High
7	504.7 (Minimum Weave Length)*	High

Notes: *Boldface
**Underline

1.4.3.10 Sound Walls

Alternative 3 would impact one existing sound wall. The affected sound wall and the proposed improvements are summarized in Table 1.6.

Table 1.6: Anticipated Sound Wall Impacts within the Proposed Project Limits—Alternative 3

Location	Post Mile	Sound Wall Improvements			Maximum Length of Extension (Feet)
		Rebuild I / New (N)	Extension	Removal	
SB I-5, North of E. 17th St.	32.521	R*			793

Notes: *Retaining Wall/Sound Wall.
I = Interstate
SB = Southbound

1.4.3.11 Transportation System Management/Transportation Demand Management

TSM/TDM aims to improve traffic flow, promote travel safety, and increase transit usage and rideshare participation. The TSM/TDM measures included as part of Alternative 3 would add TSM/TDM techniques to existing features within the proposed Project limits.

The following TSM features would be incorporated into Alternative 3's proposed design:

- Ramp metering
- Intelligent Transportation Systems
- CHP observation and enforcement areas

The following TDM measures have been incorporated into Alternative 3:

- The EL use would be incentivized for carpool, transit users, and electric and clean-emissions vehicles (e.g., discounted fare, partial or full subsidized fare).
- Potential excess toll revenue would be allocated to fund projects and programs to reduce vehicle miles traveled (VMT), such as:
    - Outreach and education regarding ridesharing, transit travel, and multimodal opportunities;
    - Outreach and education regarding alternative work schedule programs and telecommuting; and
    - Construction two park-and-ride facilities.
    - Generating sustainable funding to support ongoing operations and promoting transit equity programs.
- Alternative 3 would facilitate travel for commercial buses and tourist buses to and from tourist destinations within the proposed Project area.

1.4.3.12 Highway Planting

The same erosion control features described under Alternative 2 would be included as part of Alternative 3. These are detailed in Section 1.4.2.12, above. Generally, existing vegetation in and around the interchange areas would be replanted; however, due to limited space between the freeway improvements and right-of-way, planting replacement would not always be possible along the mainline.

1.4.3.13 Erosion Control

The same erosion control features described under Alternative 2 would be included as part of Alternative 3. These are detailed in Section 1.4.2.13, above.

1.4.4 Alternative 4 – Build Alternative: Convert Existing HOV Lanes to Express Lanes and Construct Additional Express Lanes

Alternative 4 would convert the existing HOV lane to an EL in each direction between Red Hill Avenue and SR-55; convert two existing HOV lanes to ELs in each direction between SR-55 and SR-57; convert the existing HOV lane to an EL in each direction between SR-57 and the Orange/Los Angeles County line; and construct additional EL in each direction between SR-57 and SR-91. The typical cross-section consists of 12-foot-wide ELs, a 2- to 4-foot buffer, 12-foot-wide GP lanes, 12-foot-wide auxiliary lanes, a 4- to 14-foot-wide inside shoulder, and a 10-foot-wide outside shoulder and would be provided to accommodate the ELs. One 12-foot weave lane is proposed at locations of ingress or egress. Additionally, two proposed park-and-ride facilities are being evaluated as part of Alternative 4 and would be constructed within the existing freeway right-of-way. Sign replacement and pavement delineation would also be implemented to meet the latest CA MUTCD standards.

1.4.4.1 Ramps

Alternative 4 would impact some existing ramps within the proposed Project limits. The affected ramps and the proposed improvements are summarized in Tables 1.7 and 1.8, below. In general, some existing ramps would be shifted to accommodate outside widening by Alternative 4. Alternative 4 is not anticipated to impact system interchanges within the proposed Project limits. Within the proposed Project limits, ramp metering is incorporated into the existing local interchange on-ramps, except at the South Anaheim Boulevard northbound on-ramp. Where ramp improvements affect ramp metering, any ramp metering equipment would be re-established. Existing ramp meters and equipment would be reused where possible.

Table 1.7: Anticipated Impacts to On-Ramps within the Proposed Project Limits—Alternative 4

Location		Post Mile (Approx.)	Ramp Improvements
1	NB SR-55 to NB I-5 Direct Connector	30.472	X
2	Grand Ave. SB Direct-Access On-Ramp	31.794	X
3	N. Main St. SB On-Ramp	32.953	X
4	SB SR-57 to SB I-5 Direct Connector	34.222	X
5	Gene Autry Wy. SB Direct-Access On-Ramp	35.949	X
6	Gene Autry Wy. NB Direct-Access On-Ramp	35.949	X
7	W. Lincoln Ave. NB On-Ramp	38.913	X
8	EB SR-91 to SB I-5 Direct Connector	41.928	X
9	WB SR-91 to NB I-5 Direct Connector	42.42	X
10	Auto Center Dr. NB On-Ramp	42.928	X
11	Artesia Blvd. SB On-Ramp	44.271	X
Total Number of Off-Ramp Improvements:			**11**

Notes: * Existing ramp metering to be relocated and/or upgraded to latest equipment requirements.
**Ramps metered separately before joining.

EB = Eastbound
I = Interstate
NB = Northbound
SB = Southbound
SR = State Route
WB = Westbound

Table 1.8: Anticipated Impacts to Off-Ramps within the Proposed Project Limits—Alternative 4

Location		Post Mile (Approx.)	Ramp Improvements
1	Grand Ave. NB Direct-Access Off-Ramp	31.532	X
2	Penn Wy. SB Off-Ramp	32.521	X
3	NB I-5 to NB SR-57 Direct Connector	33.433	X
4	Gene Autry Wy. NB Direct-Access Off-Ramp	35.466	X
5	Gene Autry Wy. SB Direct-Access Off-Ramp	36.309	X
6	Anaheim Blvd. NB Direct-Access Off-Ramp	36.072	X
7	Disneyland Dr. SB Direct-Access Off-Ramp	38.439	X
8	Lincoln Ave. SB Off-Ramp	39.471	X
9	N. Euclid St. NB Off-Ramp	39.263	X
10	NB I-5 to WB SR-91 Direct Connector	41.909	X
11	SB I-5 to EB SR-91 Direct Connector	42.545	X
12	Beach Blvd. SB Off-Ramp	43.680	X
13	Artesia Blvd. NB Off-Ramp	43.996	X
Total Number of Off-Ramp Improvements:			**13**

EB = Eastbound
I = Interstate
NB = Northbound
SB = Southbound
SR = State Route

For the majority of locations, physical modifications of the ramp geometry would not be required where the HOV direct connector is converted to an ELs connector; however, replacement of signage and addition of tolling equipment would be required accordingly. The incorporation of weave lanes would require physical modifications at the ramp gore where the HOV direct connector is converted to an ELs connector at the following locations:

- Southbound SR-57 connector
- Northbound SR-57 connector
- Southbound Gene Autry Way on-ramp
- Northbound Gene Autry Way off-ramp
- Northbound Disney Way off-ramp
- Southbound Gene Autry Way off-ramp
- Northbound Gene Autry Way on-ramp
- Southbound Disneyland Drive off-ramp

1.4.4.2 Impact to Structures

Alternative 4 would not create new structures (e.g., bridges) but would impact existing retaining walls and create a new retaining wall. Retaining walls would be provided, where required, to minimize and avoid right-of-way acquisition. The affected retaining wall structures and the proposed improvements are summarized in Table 1.9.

Table 1.9: Anticipated Retaining Wall Impacts within the Proposed Project Limits—Alternative 4

Location	Post Mile	Retaining Wall Improvements		Maximum Length of Extension (Feet)
		Rebuild I / New(N)	Type	
SB I-5, South of E. 17th St.	32.521	R*	Special	793
Along NB I-5 to NB SR-57 Direct Connector	34.117	R	Special	479
Along SB SR-57 to SB I-5 Direct Connector	34.124	R	Special	446

Notes: *Retaining Wall/Sound Wall.
I = Interstate SB = Southbound
NB = Northbound SR = State Route

1.4.4.3 Drainage and Water Quality

The same drainage and water quality features described under Alternative 3 would be constructed as part of Alternative 4. These features are detailed in Section 1.4.3.3, above.

1.4.4.4 Tolled Components

The same tolling infrastructure described under Alternative 3 would be constructed as part of Alternative 4. This infrastructure is detailed in Section 1.4.3.4, above.

1.4.4.5 Transportation Management Plan

The same TMP described under Alternative 2 would be utilized as part of Alternative 4. This infrastructure is detailed in Section 1.4.2.5, above.

1.4.4.6 Construction Staging

Stage construction concept plans are currently being developed. However, Alternative 4 would require several 55-hour weekend closures of the SR-57 HOV connectors to accommodate construction of retaining walls, the median barrier, and concrete pavement. Should Alternative 4 be selected as the Preferred Alternative, detailed stage construction and detour plans would be developed during final design. Detailed stage construction plans and traffic handling plans would also be developed in the final design stage.

1.4.4.7 Right-of-Way Data

Additional right-of-way (e.g., full acquisition, partial acquisition, aerial easements, temporary construction easements) is not anticipated for the construction of Alternative 4.

1.4.4.8 Utility and Other Owner Involvement

Underground and above-ground utility conflicts are anticipated within the proposed Project limits. The anticipated utility impacts within the proposed Project limits are summarized in Table 1.10.

Table 1.10: Anticipated Impacts to Utilities within the Proposed Project Limits—Alternative 4

No.	Location	Utility Owner and/or Contact Name	Wet (W) / Dry (D)	Utility Type(s)	Utility Conflict Description	H*
1	N. Main St. SB On-Ramp	AT&T	D	Telecom	Roadway Conflict	N/A
2	North of N. State College Blvd.	Pacbell	D	Telecom	Overhead Sign Conflict	N/A
3	North of N State College Blvd.	SCE	W	Electric	Overhead Sign Conflict	N/A
4	N. Euclid St. NB Off-Ramp	City of Anaheim	W	Water	Roadway Conflict	N/A
5	N. Euclid St. SB	City of Anaheim	W	Water	Roadway Conflict	N/A
6	N. Euclid St. SB	Sprint	D	Telecom	Roadway Conflict	N/A
7	North of N. Euclid St. SB	Sprint	D	Telecom	Roadway Conflict	N/A

Notes: H* denotes high-priority utilities based on Chapter 600 of the Caltrans Encroachment Permits Manual.
AT&T = American Telephone and Telegraph Company
Caltrans = California Department of Transportation
N/A = Not Applicable
NB = Northbound
PacBell = Pacific Bell Telephone Company
SB = Southbound
SCE = Southern California Edison

Positive location would be performed for underground utilities in the proposed Project vicinity that may be in close proximity to or conflict with proposed improvements, as determined from as-built plans and utility company records.

Relocation or addition of towers are not anticipated for the existing overhead electrical lines.

1.4.4.9 Nonstandard Design Features (Design Standards Risk Assessment)

A listing of major existing nonstandard design features for Alternative 4 is included in Table 1.11, below.

Table 1.11: Design Standards Risk Assessment—Alternative 4

No.	Design Standard	Probability of Design Exception Approval (None, Low, Medium, High)
1	201.1 (Stopping Sight Distance Standards)*	Medium/High
2	201.7 (Decision Sight Distance)**	High
3	301.1 (Lane Width)*	Medium
4	302.1 (Shoulder Width)*	Medium/High
5	305.1 (Median Width Freeways and Expressways-Urban)**	High
6	305.1(3)(a) (Median Width)*	High
7	309.1(3)(a) (Horizontal Clearances for Highways)*	Medium/High
8	504.2(2) (Design of Freeways Entrances and Exits)**	Medium
9	504.7 (Minimum Weave Length)*	High

Notes: *Boldface
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1.4.4.10 Sound Walls

The same impacts to sound walls described under Alternative 3 would occur as part of Alternative 4. These are detailed in Section 1.4.3.10, above.

1.4.4.11 Transportation System Management/Transportation Demand Management

The same TSM/TDM measures described under Alternative 3 would also be included as part of Alternative 4. These are detailed in Section 1.4.3.11, above.

1.4.4.12 Highway Planting

The same highway planting impacts described under Alternative 3 would occur as part of Alternative 4. These are detailed in Section 1.4.3.12, above.

1.4.4.13 Erosion Control

The same erosion control impacts described under Alternative 2 would occur as part of Alternative 4. These are detailed in Section 1.4.2.13, above.

1.4.5 Existing Roadways and Traffic Conditions

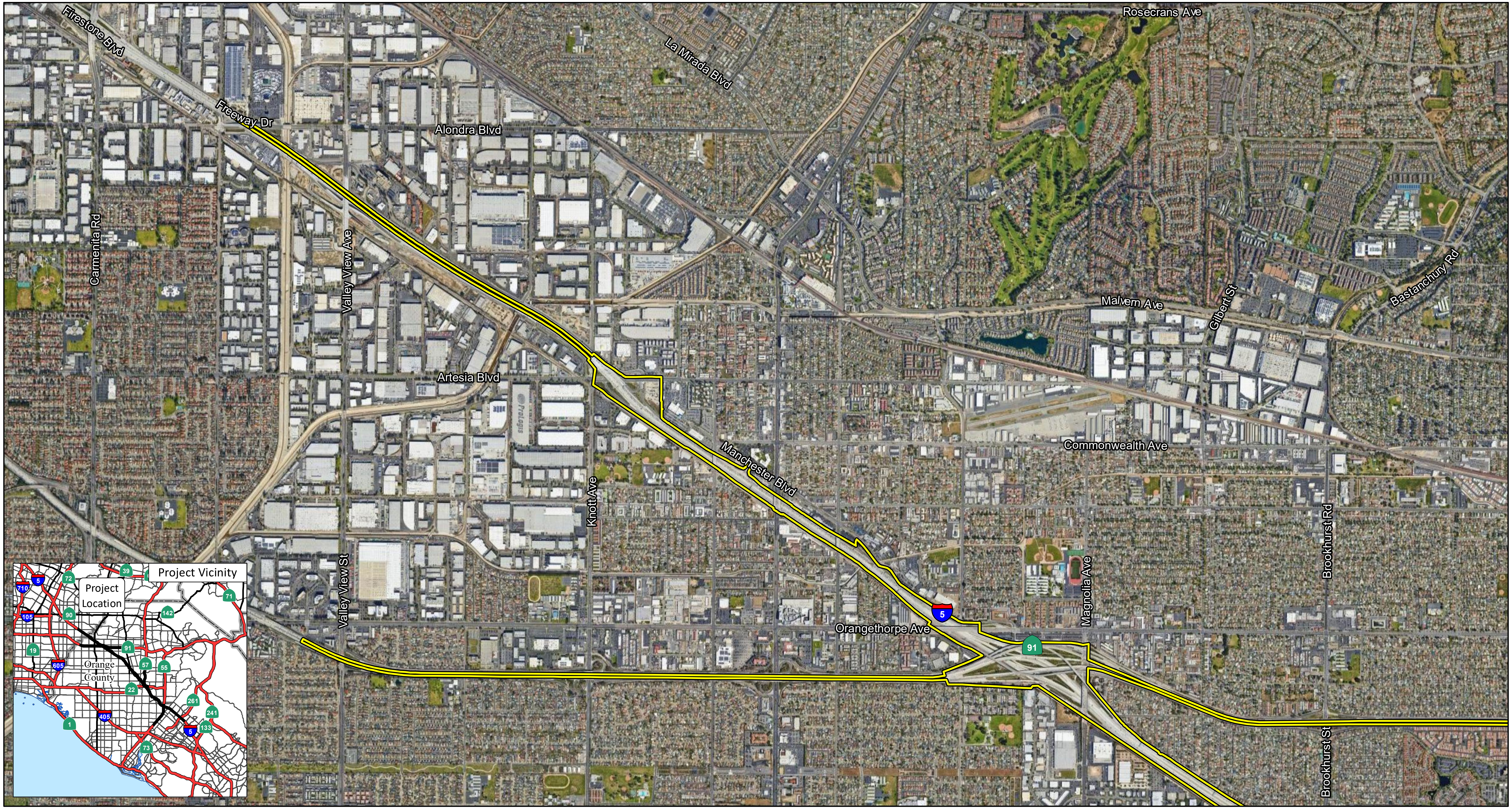
The southern Project limit is the section of I-5 that intersects with Red Hill Avenue south of SR-55 in Tustin. I-5 continues north through the cities of Santa Ana, Orange, Anaheim, Fullerton, Buena Park, La Mirada, and Santa Fe Springs, and includes three major freeway-to-freeway interchanges at SR-55, SR-22/SR-57, and SR-91, as shown on Figure 1-1. The northern Project limit is 0.5 mile north of the Orange/Los Angeles County line in La Mirada. The existing HOV direct connectors link the I-5 HOV facility with the SR-55, SR-57, and SR-91 HOV facilities. The first HOV lanes on I-5 opened in 1992 with HOV 2+ requirements and have been highly utilized. There are several HOV Direct-Access Ramps (DARs) within the Project limits at Grand Avenue, Gene Autry Way, Disney Way, and Disneyland Drive.

I-5 currently has at least one HOV lane in each direction within the Project limits that is separated with limited ingress/egress buffer openings. In mid-2021, the construction of an additional HOV lane in each direction and removal of the existing northbound and southbound DARs at Main Street was completed within the section of I-5 south of SR-55 at Red Hill Avenue and SR-57. Table 1.12 shows the existing traffic conditions for northbound and southbound I-5 traffic. See Appendix B for the full traffic data tables.

The truck percentages are based on truck traffic information from the Caltrans traffic data website for 2019 as follows:

- The daily truck percentage for Red Hill Avenue to SR-22/SR-57 is 7 percent.
- The daily truck percentage for SR-22/SR-57 to SR-91 is 8.5 percent.
- The daily truck percentage for SR-91 to Artesia Boulevard is 9.5 percent.

These truck percentages were used for all scenarios.



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Project Location

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SOURCE: Google (2022)

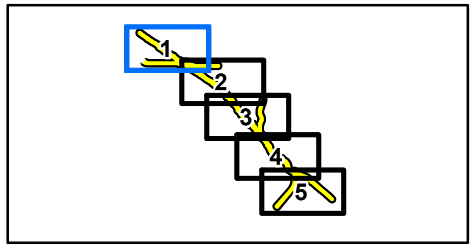

FIGURE 1-1

Sheet 1 of 5

I-5 Managed Lanes Project

(Red Hill Avenue to Orange County/Los Angeles County Line)

Project Location and Vicinity

EA No. 0Q950

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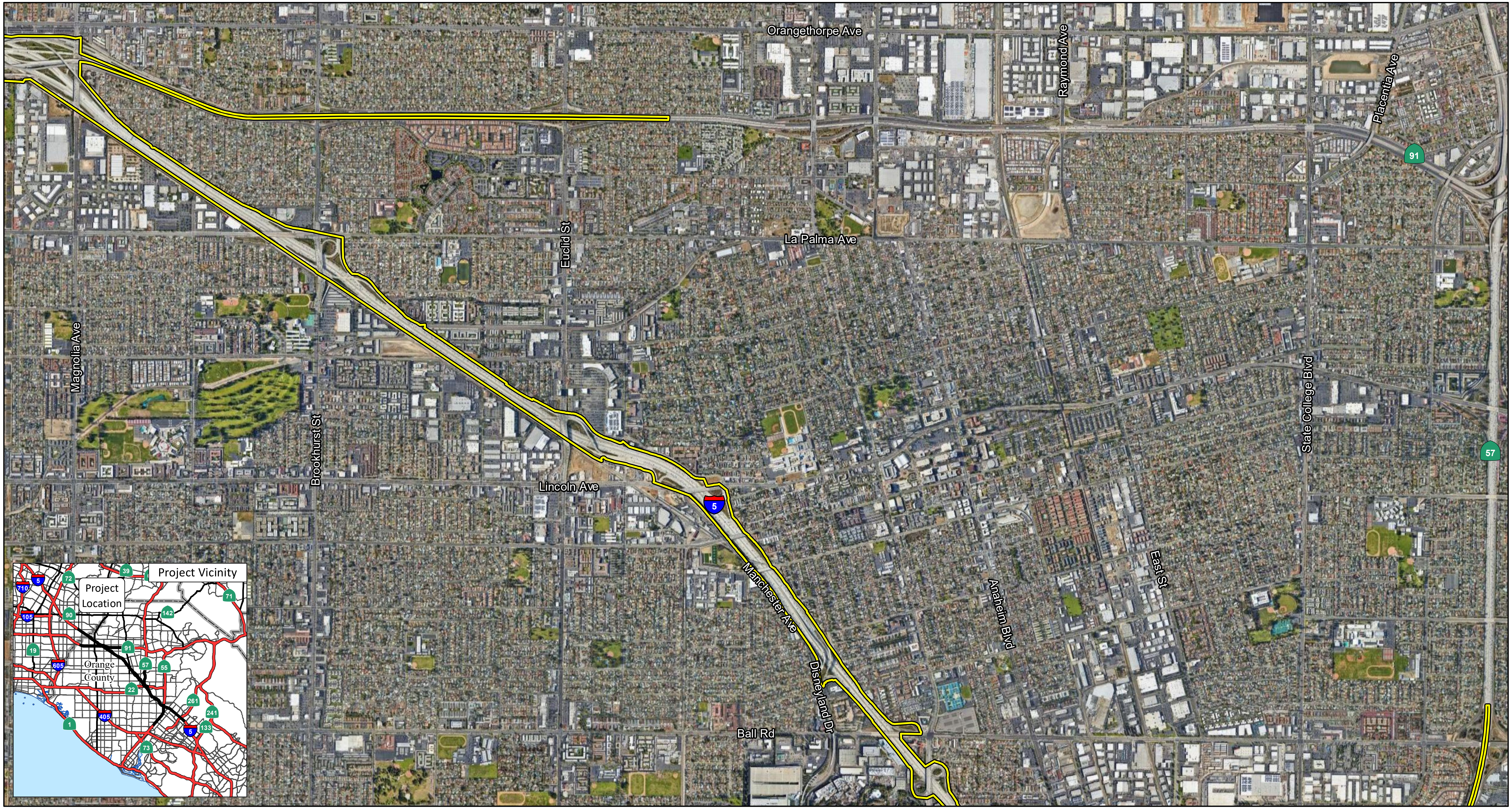

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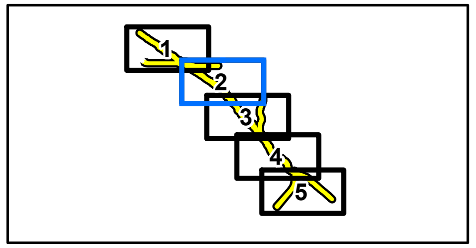

FIGURE 1-1
Sheet 2 of 5

I-5 Managed Lanes Project
(Red Hill Avenue to Orange County/Los Angeles County Line)

Project Location and Vicinity

EA No. 0Q950

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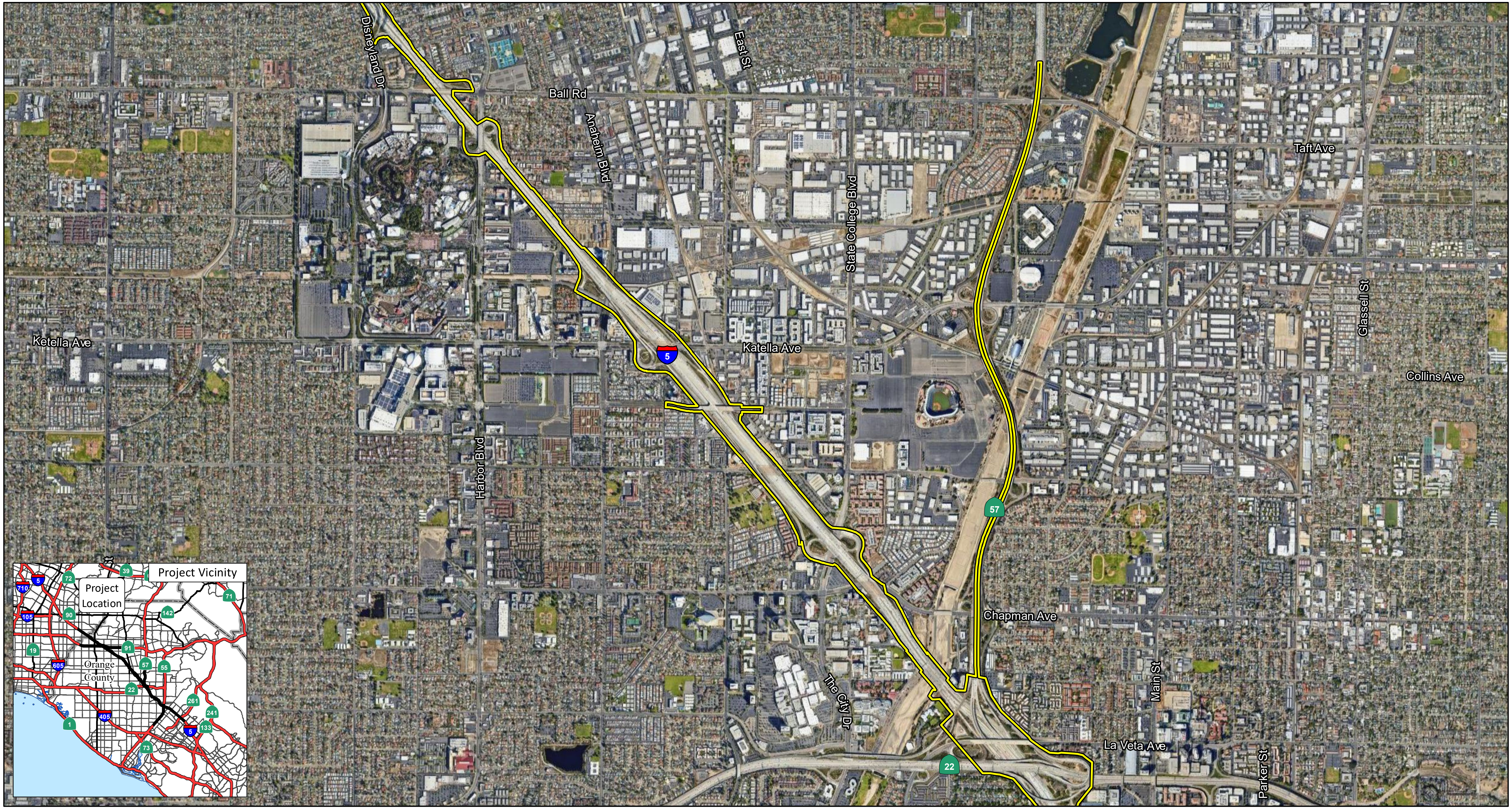

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Project Location

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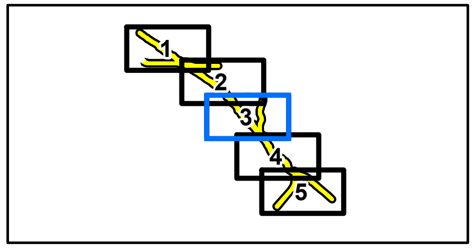


FIGURE 1-1

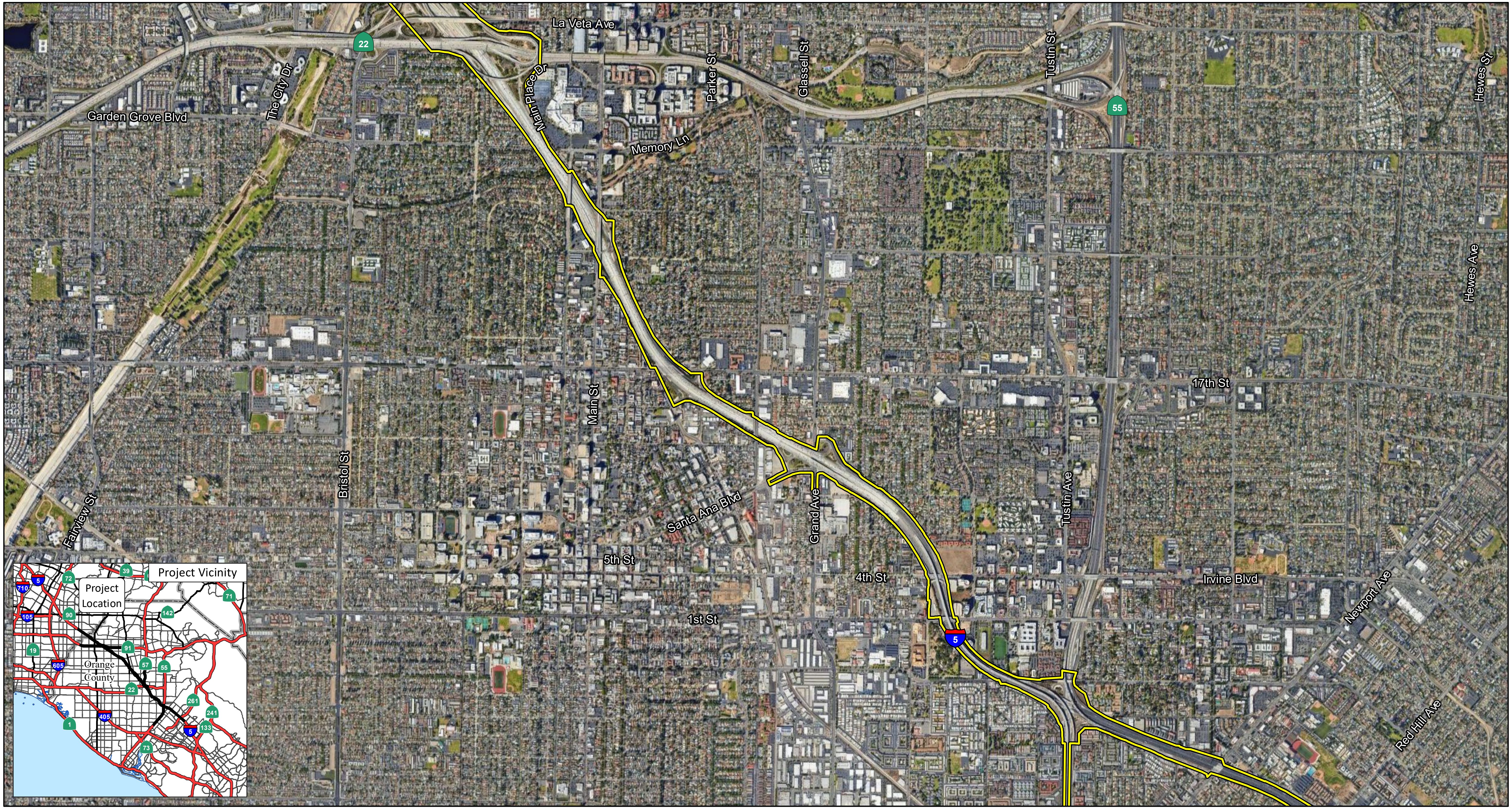
Sheet 3 of 5

I-5 Managed Lanes Project

(Red Hill Avenue to Orange County/Los Angeles County Line)

Project Location and Vicinity

EA No. 0Q950



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Project Location

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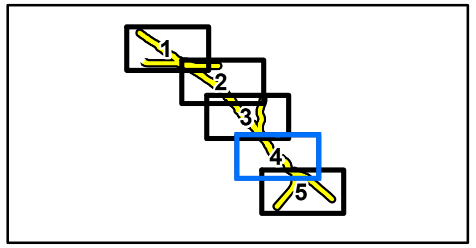

FIGURE 1-1

Sheet 4 of 5

I-5 Managed Lanes Project

(Red Hill Avenue to Orange County/Los Angeles County Line)

Project Location and Vicinity

EA No. 0Q950

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LEGEND

Project Location

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0 1000 2000

FEET

SOURCE: Google (2022)

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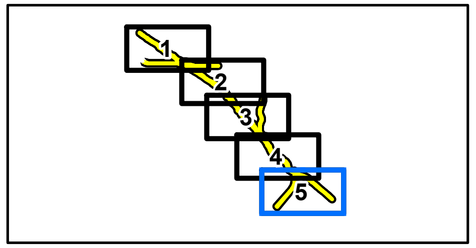


FIGURE 1-1

Sheet 5 of 5

I-5 Managed Lanes Project

(Red Hill Avenue to Orange County/Los Angeles County Line)

Project Location and Vicinity

EA No. 0Q950

Table 1.12: Summary of Existing Traffic Conditions

Scenario/ Analysis Year	Location	AADT		% Truck	VMT (mi/day)	Average Speed During Peak Travel (mph)	Average Speed During Off-Peak Travel (mph)
		Total	Truck				
Existing/Baseline Year 2022	Northbound I-5 Mainline	173,358	14,447	7.0% - 9.5%	2,123,880	42	59
	Northbound I-5 HOV	22,923	0	0%	450,953	52	60
Existing/Baseline Year 2022	Southbound I-5 Mainline	170,445	14,204	7.0% - 9.5%	2,063,228	42	59
	Southbound I-5 HOV	22,662	0	0%	384,967	52	60

Source: Jacobs (2023), AADT shown is the peak rate throughout the Project Study Area, truck percentages from Caltrans census traffic data for 2019.
I-5 = Interstate 5
mph = miles per hour
VMT = vehicle miles traveled

1.4.6 Alternative 1 – No Build Alternative

The No Build Alternative consists of those transportation projects that are already planned for construction by or before 2035. Consequently, the No Build Alternative represents future travel conditions in the Project Study Area without any of the build alternatives and is the baseline against which each of the build alternatives will be assessed to meet National Environmental Policy Act (NEPA) requirements. Table 1.13 shows the I-5 traffic conditions for the 2035 and 2055 No Build conditions. See Appendix B for the full traffic data tables.

Table 1.13: No Build I-5 Traffic Conditions

Scenario/ Analysis Year	Location	AADT		% Truck	VMT (mi/day)	Average Speed During Peak Travel (mph)	Average Speed During Off-Peak Travel (mph)
		Total	Truck				
No Build 2035	Northbound I-5 Mainline	177,419	14,785	7.0% - 9.5%	2,173,356	41	59
	Northbound I-5 HOV	26,673	0	0%	526,377	54	60
	Southbound I-5 Mainline	174,810	14,568	7.0% - 9.5%	2,126,776	41	59
	Southbound I-5 HOV	26,251	0	0%	447,917	54	60
No Build 2055	Northbound I-5 Mainline	183,667	15,306	7.0% - 9.5%	2,249,480	40	59
	Northbound I-5 HOV	32,440	0	0%	642,400	50	60
	Southbound I-5 Mainline	181,522	15,127	7.0% - 9.5%	2,224,545	38	59
	Southbound I-5 HOV	31,773	0	0%	544,779	49	60

Source: Jacobs (2023), AADT shown is the peak rate throughout the Project Study Area, truck percentages from Caltrans census traffic data for 2019, assumed to apply to 2035 and 2055.

AADT = annual average daily traffic
HOV = high-occupancy vehicle
I = Interstate
mi = miles/miles
mph = miles per hour
VMT = vehicle miles traveled

1.4.7 Alternatives 2, 3, and 4 – Build Alternatives

Table 1.14 shows the I-5 traffic conditions for the 2035 and 2055 build alternatives. See Appendix B for the full traffic data tables.

Table 1.14: I-5 Traffic Conditions for the Build Alternatives

Scenario/ Analysis Year	Location	AADT		% Truck	VMT (mi)	Average Speed During Peak Travel (mph)	Average Speed During Off-Peak Travel (mph)
		Total	Truck				
Alternative 2 2035	Northbound I-5 Mainline	181,919	15,160	7.0% - 9.5%	2,226,468	40	59
	Northbound I-5 HOV	15,980	0	0%	267,755	59	60
	Southbound I-5 Mainline	177,384	14,782	7.0% - 9.5%	2,177,990	40	59
	Southbound I-5 HOV	15,520	0	0%	198,492	59	60
Alternative 3 2035	Northbound I-5 Mainline	181,493	15,124	7.0% - 9.5%	2,219,082	41	59
	Northbound I-5 HOV	18,425	0	0%	342,148	58	60
	Southbound I-5 Mainline	178,082	14,840	7.0% - 9.5%	2,166,467	41	59
	Southbound I-5 HOV	18,196	0	0%	279,946	57	60
Alternative 4 2035	Northbound I-5 Mainline	181,472	15,123	7.0% - 9.5%	2,217,174	41	59
	Northbound I-5 HOV	22,027	0	0%	436,325	58	60
	Southbound I-5 Mainline	177,840	14,820	7.0% - 9.5%	2,162,982	41	59
	Southbound I-5 HOV	19,096	0	0%	335,220	58	60
Alternative 2 2055	Northbound I-5 Mainline	188,394	15,700	7.0% - 9.5%	2,310,549	39	59
	Northbound I-5 HOV	17,082	0	0%	311,604	58	60
	Southbound I-5 Mainline	185,675	15,473	7.0% - 9.5%	2,281,966	37	59
	Southbound I-5 HOV	16,773	0	0%	239,241	58	60
Alternative 3 2055	Northbound I-5 Mainline	188,109	15,676	7.0% - 9.5%	2,306,115	39	59
	Northbound I-5 HOV	22,355	0	0%	410,127	57	60
	Southbound I-5 Mainline	187,218	15,602	7.0% - 9.5%	2,287,109	37	59
	Southbound I-5 HOV	22,003	0	0%	336,083	55	60

Table 1.14: I-5 Traffic Conditions for the Build Alternatives

Scenario/ Analysis Year	Location	AADT		% Truck	VMT (mi)	Average Speed During Peak Travel (mph)	Average Speed During Off-Peak Travel (mph)
		Total	Truck				
Alternative 4 2055	Northbound I-5 Mainline	187,831	15,653	7.0% - 9.5%	2,297,071	39	59
	Northbound I-5 HOV	25,590	0	0%	518,658	56	60
	Southbound I-5 Mainline	187,047	15,587	7.0% - 9.5%	2,282,754	38	59
	Southbound I-5 HOV	23,051	0	0%	398,739	55	60

Source: Jacobs (2023), AADT shown is the peak rate throughout the Project Study Area, truck percentage from Caltrans census traffic data for 2019, assumed to apply to 2035 and 2055.
AADT = annual average daily traffic
HOV = high-occupancy vehicle
I = Interstate
mi = mile/miles
mph = miles per hour
VMT = vehicle miles traveled

1.4.8 Comparison of Existing/Baseline and Build Alternative Conditions

The California Environmental Quality Act (CEQA) requires that the build alternatives of the proposed Project be compared to existing/baseline conditions. Under the Opening Year (2035) and Future Year (2055) conditions for Alternative 1 (No Build Alternative), traffic operations within the Study Area are projected to worsen slightly for both the weekday a.m. and p.m. peak hours. With the addition of the ML improvements under the build alternatives for both the Opening Year (2035) and Future Year (2055) scenarios, traffic operations within the Study Area are projected to improve at many segments for both the weekday a.m. and p.m. peak-hour conditions.

Table 1.15 summarizes design features and operational impacts on traffic conditions within the Project limits.

Table 1.15: Summary of Long-Term Operational Impacts on Traffic Conditions of Existing, No Build, and Build Alternatives.

Scenario/Analysis Year	Location	Design Features and Operational Impacts on Traffic Conditions
Baseline (existing) 2022	Mainline	N/A
No Build Alternative 2035	Mainline	N/A
Alternative 2 2035	Mainline and HOV Lanes	Modify the minimum HOV-lane occupancy requirement from two-plus (2+) to three-plus (3+) passengers within the current HOV system in each direction. Traffic operations within the Study Area are projected to improve at many segments for both the weekday a.m. and p.m. peak-hour conditions.
Alternative 3 2035	Mainline and HOV Lanes	Convert the existing HOV lane(s) to Express Lane(s) in each direction. Traffic operations within the Study Area are projected to improve at many segments for both the weekday a.m. and p.m. peak-hour conditions.
Alternative 4 2035	Mainline and HOV Lanes	Convert the existing HOV lane(s) to Express Lane(s) in each direction and construct an additional Express Lane in each direction between SR-57 and SR-91. Traffic operations within the Study Area are projected to improve at many segments for both the weekday a.m. and p.m. peak-hour conditions.
No Build Alternative 2055	Mainline	N/A
Alternative 2 2055	Mainline and HOV Lanes	Modify the minimum HOV-lane occupancy requirement from two-plus (2+) to three-plus (3+) passengers within the current HOV system in each direction. Traffic operations within the Study Area are projected to improve at many segments for both the weekday a.m. and p.m. peak-hour conditions.
Alternative 3 2055	Mainline and HOV Lanes	Convert the existing HOV lane(s) to Express Lane(s) in each direction. Traffic operations within the Study Area are projected to improve at many segments for both the weekday a.m. and p.m. peak-hour conditions.
Alternative 4 2055	Mainline and HOV Lanes	Convert the existing HOV lane(s) to Express Lane(s) in each direction and construct an additional Express Lane in each direction between SR-57 and SR-91. Traffic operations within the Study Area are projected to improve at many segments for both the weekday a.m. and p.m. peak-hour conditions.

Source: Jacobs (2023).
HOV = high-occupancy vehicle
N/A = not applicable
LOS = level of service
SR = State Route

1.5 Construction Activities and Schedule

Construction for Alternative 2 consists of restriping and signage updates along the existing HOV lanes plus two park-and-ride lots. Construction for Alternative 3 would include the same activities as Alternative 2 but would also include construction related to ramp improvements and improvements related to a retaining wall and a soundwall. The construction schedule for Alternative 4 has been provided below as a conservative assumption of construction duration. Construction for Alternative 4 is planned to be conducted in three main phases—two for the mainline widening and one for the tolling infrastructure—and is anticipated to start in May 2026. It is estimated to last approximately 3 years; thus, no construction activities would last more than 5 years at any individual site. Emissions from construction-related activities are thus considered temporary as defined in 40 Code of Federal Regulations [CFR] 93.123(c)(5) and are not required to be included in particulate matter hot-spot analyses to meet conformity requirements. Table 1.16 presents the anticipated project milestone dates.

Table 1.16: Proposed Project Milestones and Dates

Project Phase	Begin Date	Completion Date
Preliminary Engineering/Environmental	12/21	12/23
Engineering	12/23	8/25
Right-of-Way	8/25	4/26
Alternative 4 Construction	5/26	5/29

2. REGULATORY SETTING

Many statutes, regulations, plans, and policies have been adopted at the federal, State, and local levels to address air quality issues related to transportation and other sources. The proposed project is subject to air quality regulations at each of these levels. This section introduces the pollutants governed by these regulations and describes the regulations and policies that are relevant to the proposed project.

2.1 Pollutant-Specific Overview

Air pollutants are governed by multiple federal and State standards to regulate and mitigate health impacts. At the federal level, there are six criteria pollutants for which National Ambient Air Quality Standards (NAAQS) have been established: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter, which is broken down for regulatory purposes into particles of 10 micrometers or smaller (PM_{10}) and particles of 2.5 micrometers and smaller ($PM_{2.5}$), and sulfur dioxide (SO_2). The United States Environmental Protection Agency (USEPA) has also identified nine priority mobile source air toxics: 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (DPM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter (FHWA 2016). In California, sulfates, visibility-reducing particles, hydrogen sulfide, and vinyl chloride are also regulated.

2.1.1 Criteria Pollutants

The Federal Clean Air Act (FCAA) requires the USEPA to set NAAQS for six criteria air contaminants: O_3, particulate matter, CO, NO_2, lead, and SO_2. It also permits states to adopt additional or more protective air quality standards if needed. California has set standards for certain pollutants. Table 2.1 documents the current air quality standards while Table 2.2 summarizes the sources and health effects of the six criteria pollutants and pollutants regulated in the State.

2.1.1.1 Mobile Source Air Toxics

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments (CAAA) of 1990, whereby Congress mandated that the USEPA regulate 188 air toxics, also known as hazardous air pollutants. The USEPA has assessed this expansive list in its rule on the Control of Hazardous Air Pollutants from Mobile Sources (*Federal Register*, Vol. 72, No. 37, page 8430, February 26, 2007) and identified a group of 93 compounds emitted from mobile sources that are part of USEPA's Integrated Risk Information System (USEPA 2018a).

In addition, the USEPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and nonhazard contributors from the 2011 National Air Toxics Assessment (USEPA 2023). These are 1,3-butadiene, acetaldehyde, acrolein, benzene, DPM, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While the FHWA considers these the priority mobile-source air toxics, the list is subject to change and may be adjusted in consideration of future USEPA rules.

Table 2.1: State and Federal Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[1]		National Standards[2]		
		Concentration[3]	Method[4]	Primary[3,5]	Secondary[3,6]	Method[7]
O_3[8]	1-Hour	0.09 ppm (180 µg/m³)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8-Hour	0.070 ppm (137 µg/m³)		0.070 ppm (137 µg/m³)		
Respirable Particulate Matter (PM_{10})[9]	24-Hour	50 µg/m³	Gravimetric or Beta Attenuation	150 µg/m³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m³		—		
Fine Particulate Matter ($PM_{2.5}$)[9]	24-Hour	—	—	35 µg/m³	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m³	Gravimetric or Beta Attenuation	12.0 µg/m³	15 µg/m³	
CO	1-Hour	20 ppm (23 mg/m³)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m³)	—	Non-Dispersive Infrared Photometry (NDIR)
	8-Hour	9.0 ppm (10 mg/m³)		9 ppm (10 mg/m³)	—	
	8-Hour (Lake Tahoe)	6 ppm (7 mg/m³)		—	—	
NO_2[10]	1-Hour	0.18 ppm (339 µg/m³)	Gas Phase Chemiluminescence	100 ppb (188 µg/m³)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 µg/m³)		0.053 ppm (100 µg/m³)	Same as Primary Standard	
SO_2[11]	1-Hour	0.25 ppm (655 µg/m³)	Ultraviolet Fluorescence	75 ppb (196 µg/m³)	—	Ultraviolet Fluorescence; Spectrophotometry (Pararosaniline Method)
	3-Hour	—		—	0.5 ppm (1,300 µg/m³)	
	24-Hour	0.04 ppm (105 µg/m³)		0.14 ppm (for certain areas)[11]	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)[11]	—	
Lead[12,13]	30-Day Average	1.5 µg/m³	Atomic Absorption	—	—	High-Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 µg/m³ (for certain areas)[13]	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 µg/m³		
Visibility-Reducing Particles[14]	8-Hour	See footnote 14	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24-Hour	25 µg/m³	Ion Chromatography			
Hydrogen Sulfide	1-Hour	0.03 ppm (42 µg/m³)	Ultraviolet Fluorescence			
Vinyl Chloride[12]	24-Hour	0.01 ppm (26 µg/m³)	Gas Chromatography			

Source: California Air Resources Board (CARB). 2016. *Ambient Air Quality Standards*. May 4. Website: www.arb.ca.gov/sites/default/files/2020-07/aaqs2.pdf (accessed February 2023).
Footnotes are provided on the following page.

[1] California standards for O_3, CO (except 8-hour Lake Tahoe), SO_2 (1- and 24-hour), NO_2, and PM (PM_{10}, $PM_{2.5}$, and visibility-reducing particles) are values that are not to be exceeded. All others are not to be equaled or exceeded. California AAQS are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

[2] National standards (other than for O_3 and PM and those based on the annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth-highest 8-hour concentration measured at each site in a year, averaged over 3 years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m^3 is equal to or less than 1. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard. Contact the EPA for further clarification and current national policies.

[3] Concentration expressed first in the units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[4] Any equivalent measurement method that can be shown to the satisfaction of the CARB to give equivalent results at or near the level of the air quality standard may be used.

[5] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

[6] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

[7] The reference method as described by the EPA. An “equivalent method” of measurement may be used but must have a “consistent relationship to the reference method” and must be approved by the EPA.

[8] On October 1, 2015, the national 8-hour O_3 primary and secondary standards were lowered from 0.075 to 0.070 ppm.

[9] On December 14, 2012, the national annual $PM_{2.5}$ primary standard was lowered from 15 µg/m^3 to 12.0 µg/m^3. The existing national 24-hour $PM_{2.5}$ standards (primary and secondary) were retained at 35 µg/m^3, as was the annual secondary standard of 15 µg/m^3. The existing 24-hour PM_{10} standards (primary and secondary) of 150 µg/m^3 also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.

[10] To attain the 1-hour standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards, the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

[11] On June 2, 2010, a new 1-hour SO_2 standard was established, and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until 1 year after an area is designated for the 2010 standard, except that in areas designated as Nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard, the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

[12] CARB has identified lead and vinyl chloride as “toxic air contaminants” with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

[13] The national standard for lead was revised on October 15, 2008, to a rolling 3-month average. The 1978 lead standard (1.5 µg/m^3 as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except that in areas designated as Nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standards are approved.

[14] In 1989, CARB converted both the general statewide 10 mi visibility standard and the Lake Tahoe 30 mi visibility standard to instrumental equivalents, which are “extinction of 0.23 per kilometer” and “extinction of 0.07 per kilometer” for the statewide and Lake Tahoe Air Basin standards, respectively.

°C = degrees Celsius
µg/m^3 = micrograms per cubic meter
AAQS = ambient air quality standards
CARB = California Air Resources Board
CO = carbon monoxide
EPA = United States Environmental Protection Agency
mg/m^3 = milligrams per cubic meter
mi = mile/miles
NO_2 = nitrogen dioxide
O_3 = ozone
PM = particulate matter
$PM_{2.5}$ = particulate matter less than 2.5 microns in size
PM_{10} = particulate matter less than 10 microns in size
ppb = parts per billion
ppm = parts per million
SO_2 = sulfur dioxide

Table 2.2: State and Federal Criteria Air Pollutant Effects and Sources

Pollutant	Principal Health and Atmospheric Effects	Typical Sources
Ozone (O_3)	High concentrations irritate lungs. Long-term exposure may cause lung tissue damage and cancer. Long-term exposure damages plant materials and reduces crop productivity. Precursor organic compounds include many known toxic air contaminants. Biogenic VOC may also contribute.	Low-altitude O_3 is almost entirely formed from reactive organic gases/volatile organic compounds (ROG or VOC) and nitrogen oxides (NO_X) in the presence of sunlight and heat. Common precursor emitters include motor vehicles and other internal combustion engines, solvent evaporation, boilers, furnaces, and industrial processes.
Respirable Particulate Matter (PM_{10})	Irritates eyes and respiratory tract. Decreases lung capacity. Associated with increased cancer and mortality. Contributes to haze and reduced visibility. Includes some toxic air contaminants. Many toxic and other aerosol and solid compounds are part of PM_{10}.	Dust- and fume-producing industrial and agricultural operations; combustion smoke and vehicle exhaust; atmospheric chemical reactions; construction and other dust-producing activities; unpaved road dust and re-entrained paved road dust; natural sources.
Fine Particulate Matter ($PM_{2.5}$)	Increases respiratory disease, lung damage, cancer, and premature death. Reduces visibility and produces surface soiling. Most diesel exhaust particulate matter—a toxic air contaminant—is in the $PM_{2.5}$ size range. Many toxic and other aerosol and solid compounds are part of $PM_{2.5}$.	Combustion, including motor vehicles, other mobile sources, and industrial activities, as well as residential and agricultural burning. Also formed through atmospheric chemical and photochemical reactions involving other pollutants, including NO_X, sulfur oxides (SO_X), ammonia, and ROG.
Carbon Monoxide (CO)	CO interferes with the transfer of oxygen to the blood and deprives sensitive tissues of oxygen. CO also is a minor precursor for photochemical O_3. Colorless and odorless.	Combustion sources, especially gasoline-powered engines and motor vehicles. CO is the traditional signature pollutant for on-road mobile sources at the local and neighborhood levels.
Nitrogen Dioxide (NO_2)	Irritating to eyes and respiratory tract. Colors atmosphere reddish-brown. Contributes to acid rain and nitrate contamination of stormwater. Part of the "NO_x" group of O_3 precursors.	Motor vehicles and other mobile or portable engines, especially diesel; refineries; industrial operations.
Sulfur Dioxide (SO_2)	Irritates respiratory tract; injures lung tissue. Can yellow plant leaves. Destructive to marble, iron, steel. Contributes to acid rain. Limits visibility.	Fuel combustion (especially coal and high-sulfur oil), chemical plants, sulfur recovery plants, and metal processing; some natural sources like active volcanoes. Limited contribution possible from heavy-duty diesel vehicles if ultra-low sulfur fuel not used.
Lead (Pb)	Disturbs gastrointestinal system. Causes anemia, kidney disease, and neuromuscular and neurological dysfunction. Also a toxic air contaminant and water pollutant.	Lead-based industrial processes like battery production and smelters. Lead paint and leaded gasoline. Aerially deposited lead from older gasoline use may exist in soils along major roads.
Visibility-Reducing Particles (VRP)	Reduces visibility. Produces haze. NOTE: not directly related to the Regional Haze Program under the Federal Clean Air Act, which is oriented primarily toward visibility issues in National Parks and other	See particulate matter above. May be related more to aerosols than to solid particles.

Table 2.2: State and Federal Criteria Air Pollutant Effects and Sources

Pollutant	Principal Health and Atmospheric Effects	Typical Sources
	"Class I" areas. However, some issues and measurement methods are similar.	
Sulfate	Premature mortality and respiratory effects. Contributes to acid rain. Some toxic air contaminants attach to sulfate aerosol particles.	Industrial processes, refineries, and oil fields; mines; and natural sources like volcanic areas, salt-covered dry lakes, and large sulfide rock areas.
Hydrogen Sulfide (H_2S)	Colorless, flammable, poisonous. Respiratory irritant. Neurological damage and premature death. Headache, nausea. Strong odor.	Industrial processes such as: refineries and oil fields, asphalt plants, livestock operations, sewage treatment plants, and mines. Some natural sources like volcanic areas and hot springs.
Vinyl Chloride	Neurological effects, liver damage, and cancer. Also considered a toxic air contaminant.	Industrial processes.

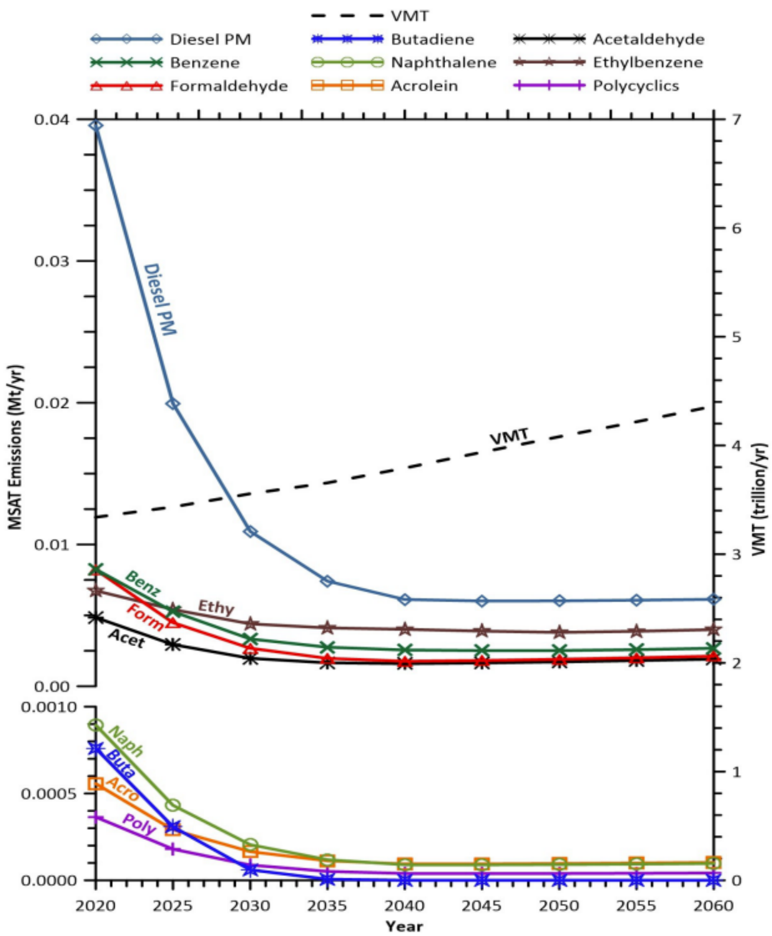
Source: *Standard Environmental Reference* (Caltrans n.d.) (accessed February 2023).
Caltrans = California Department of Transportation

The USEPA rule discussed above requires controls that will dramatically decrease Mobile Source Air Toxics (MSAT) emissions through cleaner fuels and cleaner engines. According to an FHWA analysis using the USEPA's MOVES3 model, even if vehicle activity (VMT) increases by 31 percent from 2020 to 2060 as forecast, a combined reduction of 76 percent in the total annual emission rate for the priority MSATs is projected for the same time period, as shown in Figure 2-1, Projected National MSAT Trends, 2020–2060.

2.1.1.2 Asbestos

Asbestos is a term used for several types of naturally occurring fibrous minerals that are a human health hazard when airborne. The most common type of asbestos is chrysotile, but other types, such as tremolite and actinolite, are also found in California. Asbestos is classified as a known human carcinogen by State, federal, and international agencies and was identified as a toxic air contaminant (TAC) by the California Air Resources Board (CARB) in 1986. All types of asbestos are hazardous and may cause lung disease and cancer.

Asbestos can be released from serpentine and ultramafic rocks when the rock is broken or crushed. At the point of release, the asbestos fibers may become airborne, causing air quality and human health hazards. These rocks have been commonly used for unpaved gravel roads, landscaping, fill projects, and other improvement projects in some localities. Asbestos may be released to the atmosphere due to vehicular traffic on unpaved roads, during grading for development projects, and at quarry operations. All of these activities may have the effect of releasing potentially harmful asbestos into the air. Natural weathering and erosion processes can act on asbestos-bearing rock and make it easier for asbestos fibers to become airborne if such rock is disturbed.



Source: Federal Highway Administration. 2023.
www.fhwa.dot.gov/ENVIRonment/air_quality/air_toxics/policy_and_guidance/msat/
fhwa_nepa_msat_memorandum_2023.pdf (accessed February 2023)

Figure 2-1: Projected National MSAT Trends, 2020–2060

Serpentine may contain chrysotile asbestos, especially near fault zones. Ultramafic rock, a rock closely related to serpentinite, may also contain asbestos minerals. Asbestos can also be associated with other rock types in California, though much less frequently than serpentinite and/or ultramafic rock. Serpentinite and/or ultramafic rocks are known to be present in 44 of California's 58 counties. These rocks are particularly abundant in counties of the Sierra Nevada foothills, the Klamath Mountains, and the Coast Ranges. The California Department of Conservation, Division of Mines and Geology, has developed a map showing the general location of ultramafic rock in the State (2022).

2.2 Regulations

2.2.1.1 Federal and California Clean Air Act

The FCAA, as amended, is the primary federal law that governs air quality while the California Clean Air Act (CCAA) is its companion State law. These laws and related regulations by the USEPA and the CARB set standards for the concentration of pollutants in the air. At the federal level, these standards are the NAAQS. NAAQS and State of California Ambient Air Quality Standards (CAAQS) have been established for six transportation-related criteria pollutants that have been linked to potential health concerns: CO, lead, NO_2, O_3, particulate matter ($PM_{2.5}$ and PM_{10}), and SO_2. In addition, national and State standards exist for lead, and State standards exist for visibility reducing particles, sulfates, hydrogen sulfide (H_2S), and vinyl chloride. The NAAQS and CAAQS are set at levels that protect public health within a margin of safety and are subject to periodic review and revision. Both State and federal regulatory schemes also cover TACs; some criteria pollutants are also air toxics or may include certain air toxics in their general definitions.

2.2.1.2 Transportation Conformity

The conformity requirement is based on FCAA Section 176(c), which prohibits the United States Department of Transportation (USDOT) and other federal agencies from funding, authorizing, or approving plans, programs, or projects that do not conform to a State Implementation Plan (SIP) for attaining the NAAQS. “Transportation Conformity” applies to highway and transit projects and takes place on two levels: the regional (or planning and programming) level and the project level. The proposed project must conform at both levels to be approved.

Conformity requirements apply only in nonattainment and “maintenance” (former nonattainment) areas for the NAAQS, and only for the specific NAAQS that are or were violated. The USEPA regulations at 40 CFR 93 govern the conformity process. Conformity requirements do not apply in unclassifiable/attainment areas for NAAQS and do not apply at all for State standards regardless of the status of the area.

Regional conformity is concerned with how well the regional transportation system supports plans for attaining the NAAQS for CO, O_3, $PM_{2.5}$, PM_{10}, and in some areas (although not in California), SO_2. California has regions designated as “attainment,” “nonattainment,” or “maintenance” for all of these transportation-related “criteria pollutants” except SO_2, and also has a region designated for lead; however, lead is not currently required by the FCAA to be covered in transportation conformity analysis. Regional conformity is based on emission analysis of RTPs and FTIPs that include all transportation projects planned for a region over a period of at least 20 years (for the RTP) and 4 years (for the FTIP). Both RTP and FTIP conformity uses travel demand and emission models to determine whether or not the implementation of those projects would conform to emission budgets or other tests at various analysis years showing that the requirements of the FCAA and the SIP are met. If the conformity analysis is successful, the metropolitan planning organization (MPO), the FHWA, and Federal Transit Administration (FTA) make the determinations that the RTP and FTIP conform with the SIP for achieving the goals of the FCAA. Otherwise, the projects in the RTP and/or FTIP must be modified until conformity is attained. If the design concept, scope, and “open-to-traffic” schedule of a proposed transportation project are the same as described in the RTP and the Transportation Improvement Program (TIP), then the proposed project meets regional conformity requirements for purposes of project-level analysis.

Project-level conformity is achieved by demonstrating that the proposed project comes from a conforming RTP and TIP and the proposed project has a design concept and scope that has not changed significantly from those in the RTP and TIP. If the design concept and scope have changed substantially from that used in the RTP conformity analysis, RTP and TIP amendments may be needed. Project-level conformity also needs to demonstrate that project analyses have used the latest planning assumptions and USEPA-approved emissions models and that the proposed project complies with any control measures in the SIP in particulate matter areas. Furthermore, additional analyses (known as hot-spot analyses) may be required for projects in CO and particulate matter nonattainment or maintenance areas to examine localized air quality impacts.

2.2.1.3 National Environmental Policy Act

NEPA requires that policies and regulations administered by the federal government be consistent with its environmental protection goals. NEPA also requires that federal agencies use an interdisciplinary approach to planning and decision-making for any actions that could affect the environment. It requires environmental review of federal actions, including the creation of environmental documents that describe the environmental effects of a proposed project and its alternatives (including a section on air quality impacts).

2.2.1.4 California Environmental Quality Act

CEQA is a statute that requires State and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. CEQA documents address CCAA requirements for transportation projects. While State standards are often more strict than federal standards, the State has no conformity process.

2.2.1.5 Local

The USEPA has delegated responsibility to air districts to establish local rules to protect air quality. Caltrans Standard Specification 14-9.02 (Caltrans 2022) requires compliance with all applicable air quality laws and regulations, including local and air district ordinances and rules.

SCAQMD and SCAG are responsible for formulating and implementing the Air Quality Management Plan (AQMP) for the South Coast Air Basin (Basin). The main purpose of an AQMP is to bring the area into compliance with federal and State air quality standards. Every 3 years, SCAQMD prepares a new AQMP, updating the previous plan and its 20-year horizon.

The latest plan is the 2022 AQMP (SCAQMD 2022), adopted December 2, 2022. On October 1, 2015, the USEPA strengthened the NAAQS for ground-level O_3, lowering the primary and secondary O_3 standard levels to 70 parts per billion (ppb). The Basin is classified as an "extreme" nonattainment area, and the Coachella Valley is classified as a "severe-15" nonattainment area for the 2015 O_3 NAAQS. The 2022 AQMP was developed to address the requirements for meeting this standard.

The 2022 AQMP builds upon measures already in place from previous AQMPs. It also includes a variety of additional strategies, such as regulation, accelerated deployment of available cleaner technologies (e.g., zero emissions technologies, when cost-effective and feasible, and low-nitrogen oxides [NO_X] technologies in other applications), BMPs, co-benefits from existing programs (e.g., climate and energy efficiency), incentives, and other FCAA measures to achieve the 2015 8-hour O_3 standard.

SCAG is responsible under the FCAA for determining the conformity of projects, plans, and programs with the SCAQMD AQMP. As indicated in the SCAQMD *CEQA Air Quality Handbook* (1993, currently being revised), there are two main indicators of consistency:

- Whether the proposed project would result in an increase in the frequency or severity of existing air quality violations or cause or contribute to new violations, or delay timely attainment of air quality standards or the interim emission reductions specified in the AQMP; and
- Whether the proposed project would exceed the AQMP's assumptions for 2020 or increments based on the year of project buildout and phase.

2.3 Climate Change - Greenhouse Gas Emissions

Climate change refers to long-term changes in temperature, precipitation, wind patterns, and other elements of the Earth's climate system. The Intergovernmental Panel on Climate Change, established by the United Nations and the World Meteorological Organization in 1988, is devoted to greenhouse gas (GHG) emissions reduction and climate change research and policy. Climate change in the past has generally occurred gradually over millennia, or more suddenly in response to cataclysmic natural disruptions. The research of the Intergovernmental Panel on Climate Change and other scientists over recent decades, however, has unequivocally attributed an accelerated rate of climatological changes over the past 150 years to GHG emissions generated from the production and use of fossil fuels.

Human activities generate GHGs consisting primarily of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), tetrafluoromethane, hexafluoroethane, sulfur hexafluoride (SF_6), and various hydrofluorocarbons. CO_2 is the most abundant GHG; while it is a naturally occurring and necessary component of Earth's atmosphere, fossil-fuel combustion is the main source of additional, human-generated CO_2 that is the main driver of climate change. In the United States and in California, transportation is the largest source of GHG emissions (mostly CO_2).

The impacts of climate change are already being observed in the form of sea level rise, drought, extended and severe fire seasons, and historic flooding from changing storm patterns. The most important strategy to address climate change is to reduce GHG emissions. Additional strategies are necessary to mitigate and adapt to these impacts. In the context of climate change, "mitigation" involves actions to reduce GHG emissions to lessen adverse impacts that are likely to occur. "Adaptation" is planning for and responding to impacts to reduce vulnerability to harm, such as by adjusting transportation design standards to withstand more intense storms, heat, and higher sea levels. This analysis includes a discussion of both in the context of this transportation project.

2.3.1 Regulatory Setting

This section outlines federal and State efforts to comprehensively reduce GHG emissions from transportation sources.

2.3.1.1 Federal

To date, no national standards have been established for nationwide mobile-source GHG reduction targets, nor have any regulations or legislation been enacted specifically to address climate change and GHG emissions reduction at the project level.

NEPA (42 United States Code [USC] Part 4332) requires federal agencies to assess the environmental effects of their proposed actions prior to making a decision on the action or project.

The FHWA recognizes the threats that extreme weather, sea level change, and other changes in environmental conditions pose to valuable transportation infrastructure and those who depend on it. The FHWA therefore supports a sustainability approach that assesses vulnerability to climate risks and incorporates resilience into planning, asset management, project development and design, and operations and maintenance practices (FHWA 2019). This approach encourages planning for sustainable highways by addressing climate risks while balancing environmental, economic, and social values—"the triple bottom line of sustainability" (FHWA n.d.). Program and project elements that foster sustainability and resilience also support economic vitality and global efficiency, increase safety and mobility, enhance the environment, promote energy conservation, and improve the quality of life.

The federal government has taken steps to improve fuel economy and energy efficiency to address climate change and its associated effects. The most important of these was the Energy Policy and Conservation Act of 1975 (42 USC §6201) as amended by the Energy Independence and Security Act of 2007; and Corporate Average Fuel Economy (CAFE) Standards. This act established fuel economy standards for on-road motor vehicles sold in the United States. The USDOT's National Highway Traffic and Safety Administration sets and enforces the CAFE standards based on each manufacturer's average fuel economy for the portion of its vehicles produced for sale in the United States. The USEPA calculates average fuel economy levels for manufacturers, and also sets related GHG emissions standards under the FCAA. Raising CAFE standards leads automakers to create a more fuel-efficient fleet, which improves our nation's energy security, saves consumers money at the pump, and reduces GHG emissions (USDOT 2014).

The USEPA published a final rulemaking on December 30, 2021, that raised federal GHG emissions standards for passenger cars and light trucks for model years 2023 through 2026, increasing in stringency each year. The updated GHG emissions standards will avoid more than 3 billion tons of GHG emissions through 2050. In April 2022, the National Highway Traffic Safety Administration (NHTSA) announced corresponding new fuel economy standards for model years 2024 through 2026, which will reduce fuel use by more than 200 billion gallons through 2050 compared to the old standards and reduce fuel costs for drivers (USEPA 2022a; NHTSA 2022).

2.3.1.2 State

California has been innovative and proactive in addressing GHG emissions and climate change by passing multiple Senate Bills (SBs), Assembly Bills (ABs), and Executive Orders (EOs), including, but not limited to, the following.

EO S-3-05

The goal of EO S-3-05 (June 1, 2005) is to reduce California's GHG emissions to (1) year 2000 levels by 2010, (2) 1990 levels by 2020, and (3) 80 percent below 1990 levels by 2050. This goal was further reinforced with the passage of AB 32 in 2006 and SB 32 in 2016.

AB 32

The Global Warming Solutions Act of 2006 (Chapter 488, 2006, Núñez and Pavley), AB 32, codified the 2020 GHG emissions reduction goals outlined in EO S-3-05 while further mandating that the CARB create a scoping plan and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." The Legislature also intended that the statewide GHG emissions limit continue in existence and be used to maintain and continue reductions in emissions of GHGs beyond 2020 (Health and Safety Code §38551(b)). The law requires CARB to adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective GHG reductions.

Senate Bill 375

SB 375, Chapter 728, 2008, Sustainable Communities and Climate Protection, requires CARB to set regional emissions reduction targets for passenger vehicles. The MPO for each region must then develop a "Sustainable Communities Strategy" that integrates transportation, land-use, and housing policies to plan how it will achieve the emissions target for its region.

EO B-30-15

EO B-30-15 (April 2015) establishes an interim statewide GHG emission reduction target of 40 percent below 1990 levels by 2030 to ensure California meets its target of reducing GHG emissions to 80 percent below 1990 levels by 2050. It further orders all State agencies with jurisdiction over sources of GHG emissions to implement measures, pursuant to statutory authority, to achieve reductions of GHG emissions to meet the 2030 and 2050 GHG emissions reduction targets. It also directs CARB to update the Climate Change Scoping Plan to express the 2030 target in terms of million metric tons of carbon dioxide equivalent ($MMTCO_2e$). (GHGs differ in how much heat each traps in the atmosphere [also referred to as global warming potential, or GWP]. CO_2 is the most important GHG, so amounts of other gases are expressed relative to CO_2, using a metric called "carbon dioxide equivalent," or CO_2e. The global warming potential of CO_2 is assigned a value of 1, and the GWP of other gases is assessed as multiples of CO_2.)

Finally, EO B-30-15 requires the Natural Resources Agency to update the State's climate adaptation strategy, Safeguarding California, every 3 years and to ensure that its provisions are fully implemented.

Senate Bill 32

SB 32 (Chapter 249, 2016) codifies the GHG reduction targets established in EO B-30-15 to achieve a mid-range goal of 40 percent below 1990 levels by 2030.

Senate Bill 1386

SB 1386 (Chapter 545, 2016) declares "it to be the policy of the state that the protection and management of natural and working lands … is an important strategy in meeting the state's greenhouse gas reduction goals, and would require all state agencies, departments, boards, and commissions to consider this policy when revising, adopting, or establishing policies, regulations, expenditures, or grant criteria relating to the protection and management of natural and working lands."

Senate Bill 743

SB 743 (Chapter 386, September 2013) changed the metric of consideration for transportation impacts pursuant to CEQA from a focus on automobile delay to alternative methods focused on VMT to promote the State's goals of reducing GHG emissions and traffic-related air pollution and promoting multimodal transportation while balancing the needs of congestion management and safety.

Senate Bill 150

SB 150 (Chapter 150, 2017), Regional Transportation Plans, requires CARB to prepare a report that assesses progress made by each MPO in meeting its established regional GHG emission reduction targets.

Executive Order B-55-18

EO B-55-18 (September 2018) sets a new statewide goal to achieve and maintain carbon neutrality no later than 2045. This goal is in addition to existing statewide targets of reducing GHG emissions.

Executive Order N-19-19

EO N-19-19 (September 2019) advances California's climate goals in part by directing the California State Transportation Agency to leverage annual transportation spending to reverse the trend of increased fuel consumption and reduce GHG emissions from the transportation sector. It orders a focus on transportation investments near housing, managing congestion, and encouraging alternatives to driving. This EO also directs CARB to encourage automakers to produce more clean vehicles, formulate ways to help Californians purchase them, and propose strategies to increase demand for zero-emission vehicles.

AB 1279

AB 1279 (Chapter 337, 2022), the California Climate Crisis Act, mandates carbon neutrality by 2045 and establishes an emissions reduction target of 85 percent below 1990 level as part of that goal. This bill solidifies a goal included in EO B-55-18. It requires CARB to work with relevant State agencies to ensure that updates to the scoping plan identify and recommend measures to achieve these policy goals and to identify and implement a variety of policies and strategies that enable CO_2 removal solutions and carbon capture, utilization, and storage technologies in California.

3. AFFECTED ENVIRONMENT

The topography of a region can substantially affect air flow and resulting pollutant concentrations. California is divided into 15 air basins with similar topography and meteorology to better manage air quality throughout the State. Each air basin has a local air district that is responsible for identifying and implementing air quality strategies to comply with ambient air quality standards.

The proposed Project's Study Area is located entirely within the South Coast Air Basin. The South Coast Air Basin includes the western portions of Riverside and San Bernardino counties, as well as Los Angeles County and Orange County. Air quality regulation in the Basin is administered by SCAQMD. The current population of Orange County is 3.2 million. Orange County's population grew by 5 percent from 2010 but has leveled off in recent years. Orange County's economy is largely driven by healthcare, manufacturing, and tourism/retail (SCAG 2020d).

3.1 Climate, Meteorology, and Topography

Meteorology (weather) and terrain can influence air quality. Certain weather parameters are highly correlated to air quality, including temperature, the amount of sunlight, and the type of winds at the surface and above the surface. Winds can transport O_3 and O_3 precursors from one region to another, contributing to air quality problems downwind of source regions. Furthermore, mountains can act as barriers that prevent O_3 from dispersing.

SCAQMD operates several air quality monitoring stations in the Basin. Figure 3-1, Map of the Air Quality Monitoring Stations Located near the Study Area, shows that the Anaheim Air Quality Monitoring Station is the closest to the Study Area and is representative of meteorological conditions near the proposed Project. The climate of the proposed project area is generally Mediterranean in character, with cool winters (average 70° Fahrenheit [°F] in January) and warm, dry summers (average 92°F in August) (U.S. Climate Data n.d.). Temperature inversions are common, affecting localized pollutant concentrations in the winter and enhancing O_3 formation in the summer. Mountains averaging 10,000 feet in elevation tend to trap pollutants in the region by limiting air flow. Annual average rainfall is 13.99 inches (at the San Juan Capistrano Station), mainly falling during the winter months. Figure 3-2, Predominant Wind Patterns at Mission Viejo, shows a wind rose illustrating the predominant wind patterns in Mission Viejo, near the proposed Project.

3.2 Existing Air Quality

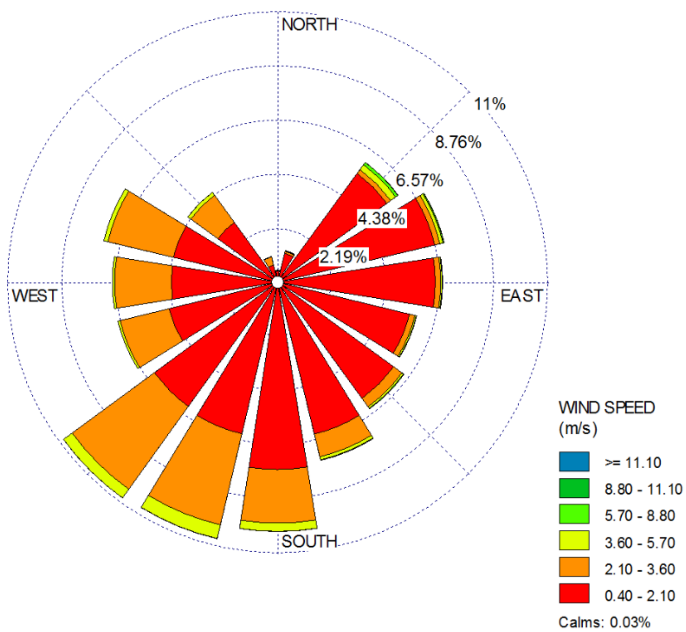
This section summarizes existing air quality conditions in the Study Area. It includes attainment statuses for criteria pollutants, describes local ambient concentrations of criteria pollutants for the past five years, and discusses MSAT and GHG emissions.

3.2.1 Criteria Pollutants and Attainment Status

Air quality monitoring stations are located throughout the nation and are maintained by local air districts and State air quality regulating agencies. The USEPA uses data collected at permanent monitoring stations to identify regions as "attainment," "nonattainment," or "maintenance," depending on whether the regions meet the requirements stated in the primary NAAQS.

Source: CARB iADAM (CARB n.d.-b) (accessed February 2023)

Figure 3-1: Map of the Air Quality Monitoring Stations near the Study Area



Source: Data for AERMOD (SCAQMD n.d.). (accessed February 2023)

Figure 3-2: Predominant Wind Patterns at Mission Viejo

Nonattainment areas are imposed with additional restrictions as required by the USEPA. In addition, different classifications of nonattainment (e.g., marginal, moderate, serious, severe, and extreme) are used to classify each air basin in the State on a pollutant-by-pollutant basis. The classifications are used as a foundation to create air quality management strategies to improve air quality and comply with the NAAQS. Table 3.1 lists the State and federal attainment statuses of the Basin for all regulated pollutants.

Table 3.1: State and Federal Attainment Status of the South Coast Air Basin

Pollutant	State Attainment Status	Federal Attainment Status
Ozone (O_3)	Nonattainment (1-hour and 8-hour)	Extreme Nonattainment (8-hour)
Respirable Particulate Matter (PM_{10})	Nonattainment	Attainment/Maintenance
Fine Particulate Matter ($PM_{2.5}$)	Nonattainment	Serious Nonattainment
Carbon Monoxide (CO)	Attainment	Attainment/Maintenance
Nitrogen Dioxide (NO_2)	Attainment	Attainment/Maintenance
Sulfur Dioxide (SO_2)	Attainment/Unclassified	Attainment/Unclassified
Lead (Pb)	Attainment (only Los Angeles County is in nonattainment)	Attainment (only Los Angeles County is in nonattainment)
Visibility-Reducing Particles	Attainment/Unclassified	N/A
Sulfates	Attainment/Unclassified	N/A
Hydrogen Sulfide	Attainment/Unclassified	N/A
Vinyl Chloride	Attainment/Unclassified	N/A

Source: Air Quality Standards and Area Designations. (CARB n.d.-a) (accessed February 2023).
CARB = California Air Resources Board
N/A = not applicable

The SCAQMD Anaheim Air Quality Monitoring Station, located at 1630 West Pampas Lane, monitors four criteria pollutants (O_3, CO, PM_{10}, and $PM_{2.5}$). The nearest station that monitors NO_2 is the La Habra station, at 621 West Lambert Road. The air quality at these stations is representative of the air quality in the Study Area as they are in the same geographic area. Table 3.2 lists air quality trends identified for data collected between 2017 and 2021. The data shows that CO and NO_2 are consistently below thresholds, while O_3, PM_{10}, and $PM_{2.5}$ occasionally exceed thresholds.

Table 3.2: Air Quality Concentrations for the Past Five Years in the Project Vicinity

Pollutant			Standard	2017	2018	2019	2020	2021
Ozone (from the Anaheim Station)								
Max 1-hour concentration				0.090	0.112	0.096	0.142	0.089
	No. days exceeded:	State	0.09 ppm	0	1	1	6	0
Max 8-hour concentration				0.076	0.071	0.082	0.097	0.068
	No. days exceeded:	State	0.070 ppm	4	1	1	15	0
		Federal	0.070 ppm	4	1	1	15	0
Carbon Monoxide (from the Anaheim Station)								
Max 1-hour concentration				2.5	2.3	2.4	2.3	2.1
	No. days exceeded:	State	20 ppm	0	0	0	0	0
		Federal	35 ppm	0	0	0	0	0
Max 8-hour concentration				2.1	1.9	1.3	1.7	1.5
	No. days exceeded:	State	9.0 ppm	0	0	0	0	0
		Federal	9 ppm	0	0	0	0	0
PM_{10} (from the Anaheim Station)								
Max 24-hour concentration				95.7	94.6	127.6	74.8	63.6
	No. days exceeded:	State	50 $\mu g/m^3$	5	2	4	5	1
		Federal	150 $\mu g/m^3$	0	0	0	0	0
Max annual concentration				26.9	27.7	24.4	26.1	23.2
	Exceeded for the year:	State	20 $\mu g/m^3$	Yes	Yes	Yes	Yes	Yes
$PM_{2.5}$ (from the Anaheim Station)								
Max 24-hour concentration				53.9	63.1	36.1	60.2	54.4
	No. days exceeded:	Federal	35 $\mu g/m^3$	8	7	4	12	10
Max annual concentration				11.4	11.4	9.4	12.4	11.6
	Exceeded for the year:	State	12 $\mu g/m^3$	No	No	No	Yes	No
		Federal	12.0 $\mu g/m^3$	No	No	No	Yes	No
Nitrogen Dioxide (from the La Habra Station)								
Max 1-hour concentration				76.2	67.1	59.4	57.2	63.8
	No. days exceeded:	State	180 ppb	0	0	0	0	0
		Federal	100 ppb	0	0	0	0	0
Max annual concentration				14	13	12	12	12
	Exceeded for the year:	State	30 ppb	No	No	No	No	No
		Federal	53 ppb	No	No	No	No	No

Source: USEPA, (2022). (accessed February 2023).
$\mu g/m^3$ = micrograms per cubic meter
avg. = average
max = maximum
PM_{10} = particulate matter less than 10 microns in diameter
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
ppb = parts per billion
ppm = parts per million
USEPA = United States Environmental Protection Agency

Table 3.3 shows the status of USEPA-approved SIPs relevant to the proposed Project.

Table 3.3: Status of SIPs Relevant to the Project Area

Name/Description	Status
2021 South Coast $PM_{2.5}$ Redesignation Request and Maintenance Plan	Under development by CARB
2021 South Coast PM_{10} Maintenance Plan	Submitted to USEPA on July 22, 2021
2020 South Coast $PM_{2.5}$ SIP Revision	Under development by CARB
2019 South Coast 8-Hour Ozone SIP Update	Under development by CARB
2018 South Coast SIP Revisions and Updates	Submitted to USEPA on December 20, 2018

Source: CARB, www.arb.ca.gov/our-work/programs/california-state-implementation-plans/statewide-efforts (accessed February 2023).
CARB = California Air Resources Board
PM_{10} = particulate matter less than 10 microns in diameter
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
SIP = State Implementation Plan
USEPA = United States Environmental Protection Agency

3.2.2 Mobile Source Air Toxics

In addition to the criteria air pollutants for which there are NAAQS, the USEPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, nonroad mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories and refineries).

Controlling air toxics emissions became a national priority with the passage of the CAAA of 1990, whereby Congress mandated the USEPA regulate 188 air toxics, also known as hazardous air pollutants. The USEPA has assessed this expansive list in its latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Volume 73, No. 201, page 61,358; October 16, 2008) and identified a group of 93 compounds emitted from mobile sources that are listed in its Integrated Risk Information System.

In addition, the USEPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from its 2011 National Air Toxics Assessment. These are acrolein, benzene, 1,3-butadiene, acetaldehyde, DPM, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While the FHWA considers these the priority MSATs, the list is subject to change and may be adjusted in consideration of future USEPA rules. Table 3.4 lists the ambient concentrations of the MSATs in the Study Area. The Los Angeles-North Main Street Station is the closest MSAT monitoring station to the Study Area.

3.3 Greenhouse Gases and Climate Change Setting

CO_2, as part of the carbon cycle, is an important compound for plant and animal life, but it also accounted for 84 percent of California’s total GHG emissions in 2015. Transportation, primarily on-road travel, is the single largest source of CO_2 emissions in the State.

Table 3.4: Mobile Source Air Toxics Measured Concentrations in the Study Area

MSAT	Unit	Measured Maximums				
		2017	2018	2019	2020	2021
Acrolein	ppb	1.0	0.5	1.8	0.15	0.15
Benzene	ppb	1.0	1.4	0.58	0.41	0.94
1,3-Butadiene	ppb	0.19	0.20	0.11	0.09	0.16
Acetaldehyde	ppb	2.6	3.3	2.6	1.8	3.8
Ethylbenzene	ppb	0.4	0.5	0.3	0.1	0.4
Formaldehyde	ppb	7.3	7.4	7.3	3.9	7.1

Source: Annual Toxics Summaries (CARB n.d.-c). (accessed February 2023).
Notes: Monitoring data is from the Los Angeles-North Main Street Station.
The diesel particulate matter, naphthalene, and polycyclic organic matter MSATs are not monitored.
CARB = California Air Resources Board
MSATs = Mobile Source Air Toxics
ppb = parts per billion

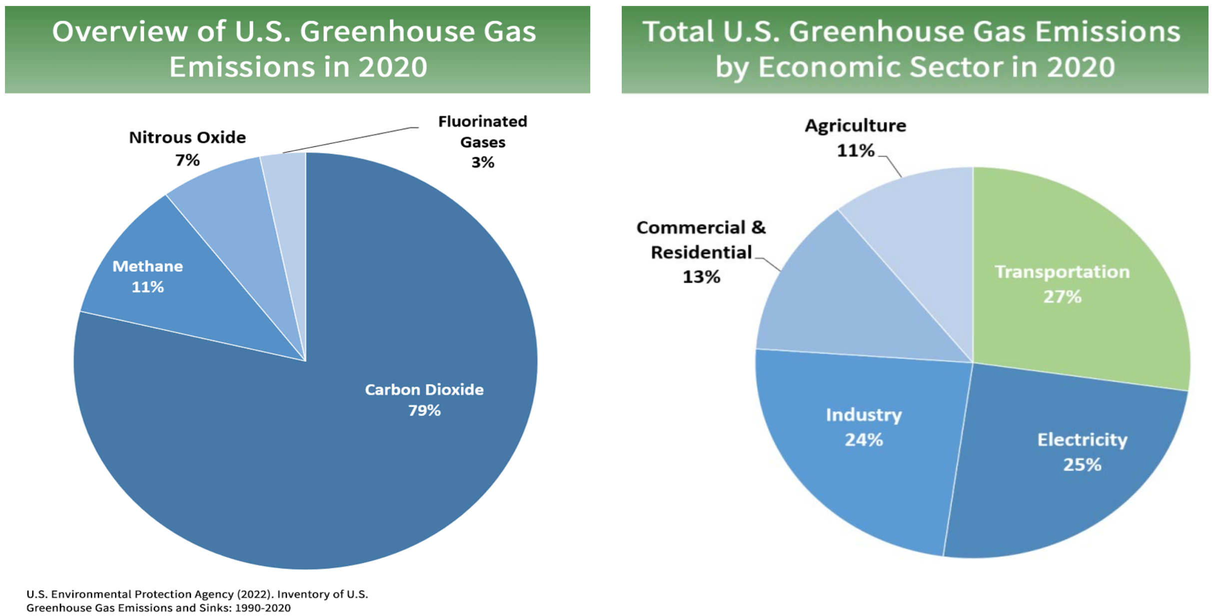
The proposed Project is located in the cities of Irvine, Tustin, Santa Ana, Orange, Anaheim, Fullerton, Buena Park, La Mirada, and Santa Fe Springs. With the exception of La Mirada and Santa Fe Springs (which are located in Los Angeles County) the Study Area cities are located in Orange County. The proposed Project is currently included in the future commitments section of the 2020–2045 RTP/SCS. However, the proposed Project is not captured in future regional models and efforts to incorporate the build alternatives into such models are being taken. Once updated later in 2023 the 2020–2045 RTP and the FTIP will capture the build alternatives in regional models.

3.3.1 GHG Inventories

A GHG emissions inventory estimates the amount of GHGs discharged into the atmosphere by specific sources over a period of time. Tracking annual GHG emissions allows countries, states, and smaller jurisdictions to understand how emissions are changing and what actions may be needed to attain emission reduction goals. The USEPA is responsible for documenting GHG emissions nationwide, and CARB does so for the State, as required by Health and Safety Code §39607.4. Cities and other local jurisdictions may also conduct local GHG inventories to inform their GHG reduction or climate action plans.

3.3.1.1 National Greenhouse Gas Inventory

The annual GHG inventory submitted by the USEPA to the United Nations provides a comprehensive accounting of all human-produced sources of GHGs in the United States. The 1990–2020 inventory found that overall GHG emissions were 5,222 million metric tons (MMT) in 2020, down 11 percent from 2019 levels and 21 percent from 1990 levels. Of the 2020 GHG emissions, 79 percent were CO_2), 11 percent were CH_4, and 7 percent were N_2O; the balance consisted of fluorinated gases. As shown on Figure 3-3, the transportation sector accounted for 27 percent of United States GHG emissions in 2020 and 36 percent of all CO_2 emissions from fossil fuel combustion. Transportation CO_2 emissions for 2020 decreased 13 percent from 2019 to 2020 but were 7 percent higher than transportation CO_2 emissions in 1990 (USEPA 2022a)



Source: USEPA 2022a (accessed February 2023)

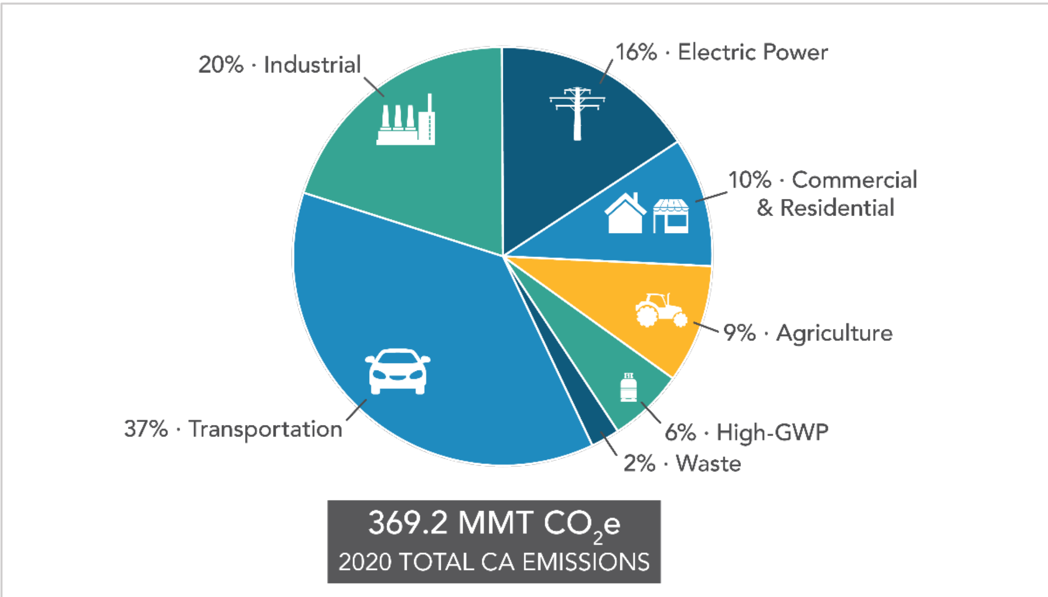
Figure 3-3: United States 2020 Greenhouse Gas Emissions

3.3.1.2 State Greenhouse Gas Inventory

CARB collects GHG emissions data for the transportation, electricity, commercial/residential, industrial, agricultural, and waste management sectors each year. It then summarizes and highlights major annual changes and trends to demonstrate the State's progress in meeting its GHG reduction goals. The 2022 edition of the GHG emissions inventory reported emissions trends from 2000 to 2020. Total California GHG emissions in 2020 were 369.2 $MMTCO_2e$, a reduction of 35.3 $MMTCO_2e$ from 2019 and 61.8 $MMTCO_2e$ below the 2020 statewide limit of 431 $MMTCO_2e$. Much of the decrease from 2019 to 2020, however, is likely due to the effects of the COVID-19 pandemic on the transportation sector, during which VMT declined under stay-at-home orders and reductions in goods movement. Nevertheless, transportation remained the largest source of GHG emissions, accounting for 37 percent of statewide emissions (Figure 3-4). (Including upstream emissions from oil extraction, petroleum refining, and oil pipelines in California, transportation was responsible for about 47 percent of statewide emissions in 2020; however, those emissions are accounted for in the industrial sector.) California's gross domestic product (GDP) and GHG intensity (GHG emissions per unit of GDP) both declined from 2019 to 2020 (Figure 3-5). It is expected that total GHG emissions will increase as the economy recovers over the next few years (CARB 2022a).

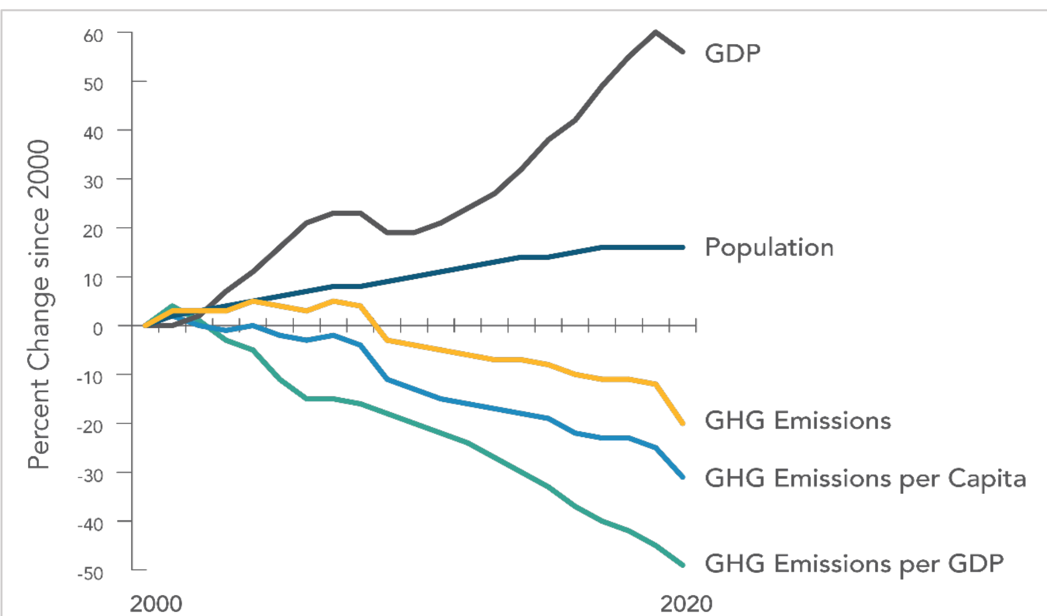
AB 32 required CARB to develop a Scoping Plan that describes the approach California will take to achieve the goal of reducing GHG emissions to 1990 levels by 2020, and to update it every 5 years. CARB adopted the first scoping plan in 2008. The second updated plan, California's 2017 Climate Change Scoping Plan, adopted on December 14, 2017, reflects the 2030 target established in EO

B-30-15 and SB 32. The draft 2022 Scoping Plan Update additionally lays out a path to achieving carbon neutrality by 2045 (CARB 2022b).



Source: CARB 2022a

Figure 3-4: California 2020 Greenhouse Gas Emissions by Scoping Plan Category



Source: CARB 2022a

Figure 3-5: Change in California GDP, Population, and GHG Emissions since 2000

3.3.1.3 Regional Plans

CARB sets regional GHG reduction targets for California's 18 MPOs to achieve through planning future projects that will cumulatively achieve those goals, and reporting how they will be met in the RTP/SCS. Targets are set at a percent reduction of passenger vehicle GHG emissions per person from 2005 levels. The proposed Project is listed in the 2023 FTIP under ID No. ORA210604 (SCAG 2021a). The proposed Project is currently included in the future commitments section of the 2020–2045 RTP/SCS. However, the proposed Project is not captured in future regional models and efforts to incorporate the build alternatives into such models are being taken. Once updated later in 2023 the 2020–2045 RTP/SCS and the FTIP will capture the build alternatives in regional models. SCAG approved the 2020–2045 RTP/SCS on September 3, 2020 and the 2023 FTIP on October 6, 2022.FHWA approved Amendment No. 2 to the 2020–2045 RTP/SCS on December 16, 2022 and Amendment No. 23-01 to the 2023 FTIP and determined that it conforms to the SIP on January 27, 2023.

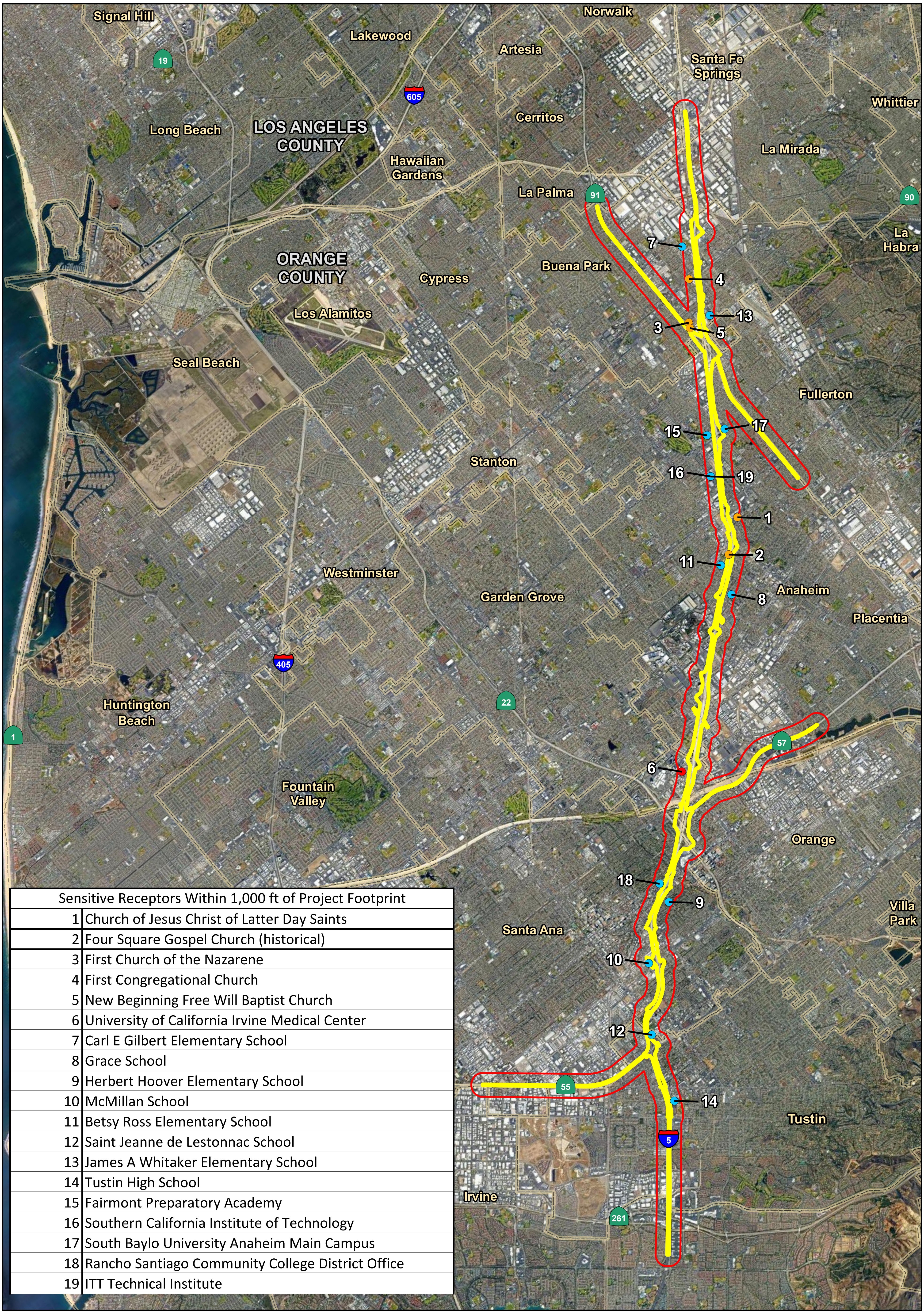
3.4 Sensitive Receptors

Sensitive populations are more susceptible to the effects of air pollution than the general population. Sensitive populations (sensitive receptors) near localized sources of toxics and CO are of particular concern. Land uses considered to be sensitive receptors include residences, schools, playgrounds, childcare centers, athletic facilities, long-term healthcare facilities, rehabilitation centers, convalescent centers, and retirement homes. Sensitive land uses located within the Study Area include single-family residences, apartments, and senior housing. While research shows that the zone of greatest concern near roadways is within 500 feet (150 meters) of the roadway, given the length of the Project footprint and to be conservative, nonresidential sensitive receptors within 1,000 feet of the roadway are documented in Table 3.5. Figure 3-6, Sensitive Receptor Locations, shows that residences are along the majority of the Project footprint. The figure also shows the locations of the nonresidential sensitive receptors relative to the Project footprint and Study Area.

Table 3.5: List of Sensitive Receptors and Distance from Project Limits

ID	Sensitive Receptors	Type	Distance to Project Limits (feet)
1	Church of Jesus Christ of Latter-Day Saints	Church	697
2	Four Square Gospel Church (historical)	Church	50
3	First Church of the Nazarene	Church	369
4	First Congregational Church	Church	684
5	New Beginning Free Will Baptist Church	Church	164
6	University of California, Irvine Medical Center	Hospital	623
7	Carl E. Gilbert Elementary School	School	982
8	Grace School	School	667
9	Herbert Hoover Elementary School	School	672
10	McMillan School	School	314
11	Betsy Ross Elementary School	School	487
12	Saint Jeanne de Lestonnac School	School	210
13	James A. Whitaker Elementary School	School	611
14	Tustin High School	School	429
15	Fairmont Preparatory Academy	School	575
16	Southern California Institute of Technology	School	649
17	South Baylo University Anaheim Main Campus	School	317
18	Rancho Santiago Community College District Office	School	388
19	ITT Technical Institute	School	636

Source: Compiled by LSA Associates, Inc. (2023).



Sensitive Receptors Within 1,000 ft of Project Footprint	
1	Church of Jesus Christ of Latter Day Saints
2	Four Square Gospel Church (historical)
3	First Church of the Nazarene
4	First Congregational Church
5	New Beginning Free Will Baptist Church
6	University of California Irvine Medical Center
7	Carl E Gilbert Elementary School
8	Grace School
9	Herbert Hoover Elementary School
10	McMillan School
11	Betsy Ross Elementary School
12	Saint Jeanne de Lestonnac School
13	James A Whitaker Elementary School
14	Tustin High School
15	Fairmont Preparatory Academy
16	Southern California Institute of Technology
17	South Baylo University Anaheim Main Campus
18	Rancho Santiago Community College District Office
19	ITT Technical Institute

LEGEND

Project Footprint
1,000 ft Study Area
City Boundary

Sensitive Receptors
Church
Hospital
School

0 0.8 1.6
Miles

SOURCE: Google (2022)

FIGURE 3-6

I-5 Managed Lanes Project
(Red Hill Avenue to Orange County/Los Angeles County Line)

Sensitive Receptor Locations

EA No. 0Q950

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3.5 Conformity Status

The Transportation Conformity Rule is based on FCAA Section 176(c), which prohibits USDOT and other federal agencies from funding, authorizing, or approving plans, programs, or projects that do not conform to the SIP for attaining the NAAQS. Conformity applies to highway and transit projects and takes place on two levels: the regional (or planning and programming) level and the project level. The build alternatives of the proposed Project must conform at both levels to be approved.

Conformity requirements apply only in nonattainment and maintenance (former nonattainment) areas for the NAAQS, and only for the specific NAAQS that are or were violated. USEPA regulations at 40 CFR 93 govern the conformity process. Conformity requirements do not apply in unclassifiable/attainment areas for the NAAQS and do not apply at all for State standards, regardless of the status of the area.

3.5.1 Regional Conformity

Regional conformity is concerned with how well the regional transportation system supports plans for attaining the NAAQS for CO, NO_2, O_3, PM_{10}, and $PM_{2.5}$, and, in some areas (although not in California), SO_2. California has nonattainment or maintenance areas for all of these transportation-related "criteria pollutants" except SO_2 and also has a nonattainment area for lead; however, the FCAA does not currently require lead to be covered in transportation conformity analysis.

As part of the Clean Air Rules of 2004, the USEPA published a final rule in the *Federal Register* on July 1, 2004, to amend the Transportation Conformity Rule to include criteria and procedures for the new 8-hour O_3 and $PM_{2.5}$ NAAQS. The final rule addressed a March 2, 1999, court decision by incorporating USEPA and USDOT guidance. On July 20, 2004, the USEPA published a technical correction notice to correct two minor errors in the July 1, 2004, notice. To remain consistent with the stricter federal standards, CARB approved a new 8-hour O_3 standard (0.07 parts per million [ppm], not to be exceeded) on April 28, 2005. Additionally, CARB retained the current 1-hour-average standard for O_3 (0.09 ppm) and the current monitoring method for O_3, which uses the ultraviolet photometry method.

Table 2 of 40 CFR 93.126 lists the types of projects that are exempt. None of the build alternatives of the proposed Project are one of the exempt projects listed in this table; therefore, they are not exempt from all emissions analyses. Projects that are included in Table 3 of 40 CFR 93.127 are exempt from regional conformity.

The proposed Project is in a nonattainment area for the federal O_3 and $PM_{2.5}$ standards; therefore, it is subject to a regional conformity determination.

The proposed Project is currently included in the future commitments section of the Connect SoCal 2020–2045 RTP/SCS and in the 2023 FTIP under ID No. ORA210604 (SCAG 2021a). SCAG approved the 2020–2045 RTP/SCS on September 3, 2020 and the 2023 FTIP on October 6, 2022. FHWA approved Amendment No. 2 to the 2020–2045 RTP/SCS on December 16, 2022 and Amendment No. 23-01 to the 2023 FTIP and determined that it conforms to the SIP on January 27, 2023. Table 3.6 lists the status of plans related to regional conformity.

Table 3.6: Status of Plans Related to Regional Conformity

MPO	Plan/TIP	Date of Adoption by MPO	Date of Approval by FHWA	Last Amendment	Date of Approval by FHWA of Last Amendment
SCAG	Connect SoCal 2020 Regional Transportation Plan/Sustainable Communities Strategy	September 3, 2020	June 5, 2020	Amendment No. 2	December 16, 2022
SCAG	2023 Federal Transportation Improvement Program	October 6, 2022	December 16, 2022	Amendment No. 23-01	January 27, 2023

Sources: SCAG (2020a, 2021a).
FHWA = Federal Highway Administration
MPO = metropolitan planning organization
N/A = not applicable
SCAG = Southern California Association of Governments
TIP = Transportation Improvement Program

3.5.2 Project-Level Conformity

The proposed Project is located in an attainment/maintenance area for federal CO standards, a nonattainment area for federal $PM_{2.5}$, and an attainment/maintenance area for federal PM_{10} standards; thus, a Project-level hot-spot analysis is required under 40 CFR 93.109 for all three pollutants. See Appendix B for the Interagency Consultation (IAC) documentation showing particulate matter determinations.

All build alternatives of the proposed Project are designated as a Transportation Control Measure (TCM) in the SIP, they comply with all $PM_{2.5}$ and PM_{10} measures in the plan and implement measures relied upon in the RTP/TIP regional conformity analysis in a timely matter. None of the build alternatives of the proposed Project cause or contribute to any new localized CO, $PM_{2.5}$, and/or PM_{10} violations, or delay timely attainment of any NAAQS or any required interim emission reductions or other milestones during the timeframe of the transportation plan (or regional emissions analysis).

3.5.3 Interagency Consultation

A Particulate Matter Hot-Spot Interagency Review Form was submitted to the SCAG Transportation Conformity Working Group (TCWG) for the I-5 Managed Lanes Project (Red Hill Ave to Orange / Los Angeles County Line) (ORA210604) for IAC on January 24, 2023. Membership of the TCWG includes federal (USEPA, FHWA, and FTA), State (CARB and Caltrans), regional (air quality management districts and SCAG), and sub-regional (county transportation commissions) agencies and other stakeholders. Pursuant to the transportation conformity rules and regulations, all nonexempt projects must go through review by the TCWG.

On January 24, 2023, the TCWG confirmed that all build alternatives of the proposed I-5 Managed Lanes Project (Red Hill Ave to Orange / Los Angeles County Line) (ORA210604) are not a Project of Air Quality Concern (POAQC). The proposed Project was approved and concurred upon by IAC at the TCWG meeting as a project not having adverse impacts on air quality, and the proposed Project meets the requirements of the FCAA and 40 CFR 93.116. A copy of the TCWG finding is included in Appendix B.

3.6 NEPA Analysis/Requirements

NEPA applies to all projects that receive federal funding or involve a federal action. NEPA requires that all reasonable alternatives for the proposed Project be rigorously explored and objectively evaluated. As described above, all build alternatives of the proposed Project are listed in a conforming FTIP. Construction will last no more than 3 years and would not substantially affect traffic due to detours, road closures, or temporary terminations. Thus, impacts of the resulting traffic flow changes do not need to be analyzed. For NEPA analyses, emissions from the future year build scenario are compared with future no Build Scenario for each alternative.

3.7 CEQA Analysis/Requirements

CEQA applies to most California transportation projects (certain projects are statutorily exempt). CEQA requires that a range of reasonable alternatives to the project that would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project be explored. This air quality study addresses pollutants for which California has established air quality standards (O_3, PM_{10}, $PM_{2.5}$, CO, NO_2, SO_2, lead, visibility-reducing particles, sulfates, H_2S, and vinyl chloride), as well as GHGs, MSATs, and asbestos. Similar to NEPA, the analysis/documentation requirements for CEQA vary by pollutant, ranging from a narrative describing that the pollutant is typically not a transportation issue to an emissions analysis. Since construction would not last more than 3 years or substantially affect traffic due to detours, road closures, or temporary terminations for any of the build alternatives, impacts of the resulting traffic flow changes do not need to be analyzed. For CEQA analyses, emissions from the future year and emissions from each build alternative are compared to emissions from the Baseline (existing conditions). The difference between future No Build and build alternative conditions may help inform significance determinations, which will be made by the Project Development Team.

4. ENVIRONMENTAL CONSEQUENCES

This section describes the methods, impact criteria, and results of air quality analyses of the proposed Project. Analyses in this report were conducted using methodology and assumptions that are consistent with the requirements of NEPA, CEQA, the CAAA, and the CCAA. The analyses also use guidelines and procedures provided in applicable air quality analysis protocols, such as the Transportation Project-Level Carbon Monoxide Protocol (CO Protocol) (Garza et al. 1997), *Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in PM_{10} and $PM_{2.5}$ Nonattainment and Maintenance Areas* (USEPA 2015a), and the FHWA *Updated Interim Guidance on Air Toxics Analysis in NEPA Documents* (FHWA 2016).

4.1 Impact Criteria

Project-related emissions would have an adverse environmental impact if they result in pollutant emissions levels that either create or worsen a violation of an ambient air quality standard (identified in Table 2.1) or contribute to an existing air quality violation.

4.2 Short-Term Effects (Construction Emissions)

During construction, short-term degradation of air quality may occur due to the release of particulate emissions generated by excavation, grading, hauling, and other activities related to construction. Emissions from construction equipment also are anticipated and would include CO, NO_X, volatile organic compounds (VOCs), directly emitted particulate matter ($PM_{2.5}$ and PM_{10}), and TACs (e.g., DPM).

4.2.1 Construction Equipment, Traffic Congestion, and Fugitive Dust

Site preparation and roadway construction would involve clearing, cut-and-fill activities, grading, and paving roadway surfaces. During construction, short-term degradation of air quality is expected from the release of particulate emissions (airborne dust) generated by excavation, grading, hauling, and other activities related to construction. Emissions from construction equipment powered by gasoline and diesel engines are also anticipated and would include CO, NO_x, VOCs, directly emitted PM_{10} and $PM_{2.5}$, and TACs such as DPM. Construction activities are expected to increase traffic congestion in the area, resulting in increases in emissions from traffic during the delays. These emissions would be temporary and limited to the immediate area surrounding the construction site.

Under the transportation conformity regulations (40 CFR 93.123(c)(5)), construction-related activities that cause temporary increases in emissions are not required in a hot-spot analysis. These temporary increases in emissions are those that occur only during the construction phase and last 5 years or less at any individual site. They typically fall into two main categories:

- **Fugitive Dust:** A major emission from construction due to ground disturbance. All air districts and the California Health and Safety Code (Sections 41700–41701) prohibit "visible emissions" exceeding 3 minutes in 1 hour; this applies not only to dust, but also to engine exhaust.[1] In general, this is interpreted as visible emissions crossing the right-of-way line.

Sources of fugitive dust include disturbed soils at the construction site and trucks carrying uncovered loads of soils. Unless properly controlled, vehicles leaving the site may deposit mud on local streets, which could be an additional source of airborne dust after it dries. PM_{10} emissions may vary from day to day, depending on the nature and magnitude of construction activity and local weather conditions. PM_{10} emissions depend on soil moisture, silt content of soil, wind speed, and the amount of equipment operating. Larger dust particles would settle near the source, while fine particles would be dispersed over greater distances from the construction site.

- **Construction Equipment Emissions:** DPM is a California-identified TAC, and localized issues may exist if diesel-powered construction equipment is operated near sensitive receptors.

  The construction emissions were estimated for the build alternatives using the Caltrans California Construction Emissions Tools 2020 (CAL-CET2020), Version 1.0, which is consistent with the guidance provided by Caltrans for evaluating construction impacts from roadway projects. This evaluation includes the two proposed park-and-ride facilities that would be constructed within the existing freeway right-of-way. There are no changes planned to the existing park and ride facilities. Tables 4.1, 4.2, and 4.3 present the maximum amount of construction-related emissions during a peak construction day (model data are provided in Appendix C) for each build alternative.

Table 4.1: Construction Emissions for Alternative 2

Construction Phases (lbs/day)	VOC	CO	NO_x	Total PM_{10}	Total $PM_{2.5}$
Land Clearing/Grubbing	0.3	1.9	2.1	165.2	16.7
Roadway Excavation and Removal	0.7	4.5	4.8	43.6	4.7
Structural Excavation and Removal	0.1	0.3	0.7	201.7	20.2
Base/Subbase/Imported Borrow	1.0	7.0	6.7	83.0	8.8
Structure Concrete	0.3	0.7	1.3	0.1	0.1
Paving	7,351.5	1.8	4.8	0.4	0.4
Drainage/Environment/Landscaping	0.9	2.4	5.7	0.5	0.5
Traffic Signalization/Signage/Striping/Painting	0.6	1.7	4.1	0.3	0.3
Other Operation	0.0	0.0	0.0	0.0	0.0
Maximum (lbs/day)	**7,351.5**	**7.0**	**6.7**	**201.7**	**20.2**
Total (tons/construction project)	**77.3**	**0.3**	**0.5**	**3.7**	**0.4**

Source: Compiled by LSA using CAL-CET2020 v1.0 (February 2023).
CAL-CET2020 = Caltrans California Construction Emissions Tools 2020
CO = carbon monoxide
lbs/day = pounds per day
NO_X = nitrogen oxides
PM_{10} = particulate matter less than 10 microns in diameter
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
VOC = volitile organic compound

[1] California Health and Safety Code (Sections 41700–41701) Website: california.public.law/codes/ca_health_and_safety_code_section_41701 (accessed March 2023).

Table 4.2: Construction Emissions for Alternative 3

Construction Phases (lbs/day)	VOC	CO	NO_x	Total PM_{10}	Total $PM_{2.5}$
Land Clearing/Grubbing	6.7	37.8	40.1	40.8	6.7
Roadway Excavation and Removal	16.9	108.7	113.7	21.0	9.9
Structural Excavation and Removal	4.9	13.1	27.1	55.0	7.0
Base/Subbase/Imported Borrow	24.9	175.1	168.9	32.7	15.3
Structure Concrete	7.3	19.5	34.1	2.2	2.2
Paving	1,809.8	39.1	104.8	8.2	8.0
Drainage/Environment/Landscaping	7.7	19.5	47.2	3.8	3.7
Traffic Signalization/Signage/Striping/Painting	8.0	21.9	54.3	3.9	3.8
Other Operation	0.0	0.0	0.0	0.0	0.0
Maximum (lbs/day)	**1,809.8**	**175.1**	**168.9**	**55.0**	**15.3**
Total (tons/construction project)	**81.9**	**22.9**	**30.5**	**6.0**	**2.7**

Source: Compiled by LSA using CAL-CET2020 v1.0 (February 2023).
CAL-CET2020 = Caltrans California Construction Emissions Tools 2020
CO = carbon monoxide
lbs/day = pounds per day
NO_x = nitrogen oxides
PM_{10} = particulate matter less than 10 microns in diameter
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
VOC = volatile organic compound

Table 4.3: Construction Emissions for Alternative 4

Construction Phases (lbs/day)	VOC	CO	NO_x	Total PM_{10}	Total $PM_{2.5}$
Land Clearing/Grubbing	7.5	42.2	44.7	41.2	7.1
Roadway Excavation and Removal	18.8	121.3	126.9	22.1	10.9
Structural Excavation and Removal	5.4	14.7	30.3	55.2	7.2
Base/Subbase/Imported Borrow	27.8	195.5	188.6	34.3	16.8
Structure Concrete	8.1	21.8	38.1	2.5	2.4
Paving	1811.5	43.6	117.0	9.1	9.0
Drainage/Environment/Landscaping	8.6	21.7	52.7	4.3	4.2
Traffic Signalization/Signage/Striping/Painting	8.9	24.4	60.6	4.3	4.2
Other Operation	0.0	0.0	0.0	0.0	0.0
Maximum (lbs/day)	**1,811.5**	**195.5**	**188.6**	**55.2**	**16.8**
Total (tons/construction project)	**82.50**	**25.6**	**34.1**	**6.3**	**2.9**

Source: Compiled by LSA using CAL-CET2020 v1.0 (February 2023).
CAL-CET2020 = Caltrans California Construction Emissions Tools 2020
CO = carbon monoxide
lbs/day = pounds per day
NO_x = nitrogen oxides
PM_{10} = particulate matter less than 10 microns in diameter
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
VOC = volatile organic compound

The PM_{10} and $PM_{2.5}$ emissions assume a 50 percent control of fugitive dust as a result of watering and associated dust-control measures. The emissions presented below are based on the best information available at the time of calculations and specify the following build schedules for the build alternatives:

- **Alternative 2:** Anticipated to take approximately 11 months beginning in 2026.
- **Alternative 3:** Anticipated to take approximately 36 months beginning in 2026.
- **Alternative 4:** Anticipated to take approximately 36 months beginning in 2026.

Additionally, SCAQMD has established rules for reducing fugitive dust emissions. With the implementation of standard construction measures (providing 50 percent effectiveness) such as frequent watering (e.g., a minimum of twice per day), as well as Minimization Measure AQ-1 (see Chapter 5, Minimization Measures, below), fugitive dust and exhaust emissions from construction activities associated with the build alternatives would not result in any adverse short term air quality impacts.

Construction activities for the build alternatives would not last for more than 3 years at any one site, so construction-related emissions do not need to be included in any hot-spot analysis (40 CFR 93.123(c)(5)).

Implementation of the following measure will reduce air quality impacts resulting from construction activities. Please note that although this measure is anticipated to reduce construction-related emissions, the reductions cannot be quantified at this time.

- The construction contractor must comply with the Caltrans' Standard Specifications in Section 14-9 (2022).
  - Section 14-9-02 specifically requires compliance by the contractor with all applicable laws and regulations related to air quality, including air pollution control district and air quality management district regulations.

4.2.2 Asbestos

The Project limits are in Orange County, extending into Los Angeles County. This area is not generally known to contain serpentine or ultramafic rock, according to the California Department of Conservation, Division of Mines and Geology (2022). Naturally occurring asbestos (NOA) in bedrock is typically associated with serpentine and peridotite deposits. Note that during demolition activities, the likelihood of encountering structural asbestos is low due to the nature of the demolished materials. The material would consist of concrete and metal piping. Therefore, the potential for NOA to be present within the proposed Project limits is considered to be low. Furthermore, prior to the commencement of construction, qualified geologists would further examine the soils and makeup of the existing structure. Should the Project geologist encounter asbestos during the analysis, proper steps shall be executed to handle the materials. Therefore, the impact from NOA during Project construction would be minimal to none. In the unlikely event that NOA, serpentine, or ultramafic rock is discovered, SCAQMD will be notified per Section 93105, Title 17, of the CCR.

4.2.3 Lead

Lead is normally not an air quality issue for transportation projects unless the project involves disturbance of soils containing high levels of aerially deposited lead, painting, or modification of structures with lead-based coatings. The current right-of-way within the Project limits was constructed prior to the prohibition of vehicular leaded fuels; thus, soils adjacent to paved areas within the right-of-way may contain aerially deposited lead from vehicle exhaust. Additionally, yellow pavement traffic markings (thermoplastic and paint) on I-5 and the arterials crossing I-5 potentially contain hazardous levels of lead chromate, and paint on the existing bridge structures constructed before 1979 that cross the Project segment of I-5 may be lead-based paint.

4.3 Long-Term Effects (Operational Emissions)

The primary purpose of the Project is to improve the overall movement of people and goods along the section of I-5 from Red Hill Avenue to the Orange/Los Angeles County line. Therefore, the potential impact of the proposed Project on regional vehicle emissions was calculated using traffic data for the Project region and emission rates from the Caltrans Emissions Factors Model (CT-EMFAC2017) version 1.0.3.0, which uses emission factors developed by CARB in its Emission Factor Model, Version 2017 (EMFAC2017). The emission factor data for scenario years 2022, 2035, and 2050 (CT-EMFAC2017 does not extend past 2050) were utilized with the corresponding traffic data for the 2022 No Build Condition (Existing Condition), 2035 Opening Year, and 2055 Future Year scenarios.

The changes to the traffic on I-5 ramps and connectors will be very minor and the addition of the park-and-ride facilities would only result in fewer vehicles on I-5. Thus, these were not included in the emissions analysis.

CARB has prepared off-model adjustment factors for both EMFAC2014 and EMFAC2017 to account for the impact of regulations implemented since the release of the models. These adjustments are provided in the form of multipliers applied to emissions outputs from EMFAC to account for the impact of these rules and actions. The adjustment factors for construction would apply to the worker vehicles, which represent a small portion of the overall construction emissions. Given that the adjustment factors are included in the Caltrans California Construction Emissions Tools, the adjustment is not needed for the construction air quality emissions. Therefore, no changes were made to the maximum daily construction emissions. However, these adjustments were made to the operational emissions calculations.

Table 4.4 shows the vehicle emissions from traffic on I-5 for the 2022 No Build (existing) condition, 2035 Opening Year without and with build alternatives, and 2055 Future Year without and with build alternatives scenarios. This shows that in all cases, the emissions from a build alternative are less than both the existing scenario and the corresponding No Build Alternative.

4.3.1 CO Analysis

Areas of vehicle congestion have the potential to create pockets of CO called hot spots. These pockets have the potential to exceed the State 1-hour standard of 20 ppm or the 8-hour standard of 9 ppm. At the time the SCAQMD 1993 *CEQA Air Quality Handbook* was published, the Basin was designated nonattainment under the CAAQS and the NAAQS for CO. With the turnover of older vehicles, introduction of cleaner fuels, and implementation of control technology on industrial facilities, CO concentrations in the Basin and in the State have steadily declined. In 2007, the SCAQMD was designated in attainment for CO under both the CAAQS and NAAQS.

The CO Protocol was developed for project-level conformity (hot-spot) analysis and was approved for use by the USEPA in 1997. It provides qualitative and quantitative screening procedures, as well as quantitative (modeling) analysis methods to assess project-level CO impacts. The qualitative screening step is designed to avoid the use of detailed modeling for projects that clearly cannot cause a violation, or worsen an existing violation, of the CO standards. Although the CO Protocol was designed to address federal standards, it has been recommended for use by several air pollution control districts in their CEQA analysis guidance documents and should also be valid for California standards because the key criterion (8-hour concentration) is similar: 9 ppm for the federal standard and 9.0 ppm for the State standard.

Table 4.4: Summary of Comparative Emissions Analysis

Condition	CO (lbs/day)	ROG (lbs/day)	NO_x (lbs/day)	PM_{10} (lbs/day)	$PM_{2.5}$ (lbs/day)
Opening Year 2035					
Existing (2022)	8,493	277	1,793	1,228	346
No Build Alternative	5,734	167	943	1,245	332
Change from Existing	*-2,758*	*-111*	*-849*	*17*	*-14*
Alternative 2	5,348	157	896	1,150	307
Change from Existing	*-3,145*	*-120*	*-896*	*-78*	*-39*
Change from No Build	*-387*	*-9*	*-47*	*-95*	*-25*
Alternative 3	5,433	157	892	1,182	315
Change from Existing	*-3,059*	*-121*	*-900*	*-46*	*-31*
Change from No Build	*-301*	*-10*	*-51*	*-63*	*-17*
Alternative 4	5,562	159	905	1,216	324
Change from Existing	*-2,931*	*-118*	*-887*	*-12*	*-22*
Change from No Build	*-173*	*-8*	*-38*	*-29*	*-8*
Future Year 2055					
Existing (2022)	8,493	277	1,793	1,228	346
No Build Alternative	5,747	168	936	1,296	338
Change from Existing	*-2,746*	*-109*	*-857*	*68*	*-9*
Alternative 2	5,218	155	855	1,178	307
Change from Existing	*-3,274*	*-122*	*-937*	*-51*	*-39*
Change from No Build	*-528*	*-13*	*-80*	*-118*	*-31*
Alternative 3	5,412	159	881	1,223	318
Change from Existing	*-3,081*	*-119*	*-912*	*-6*	*-28*
Change from No Build	*-335*	*-9*	*-55*	*-74*	*-19*
Alternative 4	5,516	159	881	1,259	328
Change from Existing	*-2,976*	*-118*	*-911*	*-30*	*-19*
Change from No Build	*-230*	*-9*	*-54*	*-38*	*-10*

Source: Compiled by LSA (February 2023) using CT-EMFAC2017 (see Appendix E).
CO = carbon monoxide
CT-EMFAC2017 = Caltrans Emissions Factor Model
lbs/day = pounds per day
NO_X = nitrogen oxides
PM_{10} = particulate matter less than 10 microns in diameter
$PM_{2.5}$ = particulate matter less than 2.5 microns in diameter
ROG = reactive organic gases

The methodology required for a CO local analysis is summarized in the CO Protocol, Section 3 (Determination of Project Requirements) and Section 4 (Local Analysis). In Section 3, the CO

Protocol provides two conformity requirement decision flowcharts designed to assist project sponsors in evaluating the requirements that apply to specific projects. The flowchart in Figure 1 (provided in Appendix F of this report) of the CO Protocol applies to new projects and was used in this local analysis conformity decision. The following provides a step-by-step explanation of the flowchart. Each level cited is followed by a response, which in turn determines the next applicable level of the flowchart for the project (Garza et al. 1997).

The flowchart begins with Section 3.1.1:

3.1.1. Is this project exempt from all emissions analyses?

No.

Table 1 of the CO Protocol is Table 2 of 40 CFR 93.126. Section 3.1.1 inquires whether the project is exempt. Such projects appear in Table 1 of the CO Protocol. None of the build alternatives are exempt projects listed in Table 1 of the CO Protocol; therefore, the build alternatives are not exempt from all emission analyses.

3.1.2. Is the project exempt from regional emissions analyses?

No.

Table 2 of the CO Protocol is Table 3 of 40 CFR 93.127. The question attempts to determine whether the build alternatives are listed in Table 2. Projects that are included in Table 2 of the CO Protocol are exempt from regional conformity. Because Alternative 4 would expand and add traffic lanes to an existing highway, it is not exempt from regional emission analysis.

3.1.3. Is the project locally defined as regionally significant?

Yes.

As noted above, Alternative 4 will add traffic lanes to an existing highway. Therefore, Alternative 4 is regionally significant.

3.1.4. Is the project in a federal attainment area?

Yes.

The build alternatives are within an attainment/maintenance area for the federal CO standard; therefore, the build alternatives are subject to a regional conformity determination.

3.1.5. Are there a currently conforming Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP)?

Yes.

Refer to Appendix A.

3.1.6. Is the project included in the regional emissions analysis supporting the currently conforming RTP and TIP?

Yes.

The proposed Project is currently included in the future commitments section of the Connect SoCal 2020–2045 RTP/SCS and in the 2023 FTIP under ID No. ORA210604 (SCAG 2021a). However, the proposed Project is not captured in future regional models and efforts to incorporate the build alternatives into such models are being taken. Once updated later in 2023 the 2020–2045 RTP and the FTIP will capture the build alternatives in regional models. SCAG approved the 2023 FTIP on October 6, 2022, and the FHWA both approved the 2023 FTIP and determined that it conforms to the SIP on January 27, 2023.

3.1.7. Has the project design concept and/or scope changed significantly from that in the regional analysis?

No.

As discussed in Section 3.1.6, regional conformity for all the build alternatives has been demonstrated for the FTIP. The build alternatives are all consistent with the proposed Project Description in the 2023 FTIP under ID No. ORA210604.

3.1.9. Examine local impacts.

Section 3.1.9 of the flowchart directs the Project evaluation to Section 4 (Local Analysis) of the CO Protocol. This concludes the evaluation procedure in Figure 1 (see Appendix F).

Section 4 contains Figure 3 (Local CO Analysis [Appendix F of this report]). This flowchart is used to determine the type of CO analysis required for the build alternatives. Below is a step-by-step explanation of the flowchart. Each level cited is followed by a response, which in turn determines the next applicable level of the flowchart for the build alternatives. The flowchart begins at Level 1:

Level 1. Is the project in a CO nonattainment area?

No.

The Study Area is in an area that has demonstrated attainment with the federal CO standard.

Level 1 (cont.). Was the area redesignated as "attainment" after the 1990 Clean Air Act?

Yes.

Level 1 (cont.). Has "continued attainment" been verified with the local Air District, if appropriate?

Yes.

The USEPA designated the Basin as attainment/maintenance on June 11, 2007. (Proceed to Level 7.)

Level 7. Does the project worsen air quality?

No.

Because none of the build alternatives would meet any of the criteria discussed below, they would not potentially worsen air quality.

The project significantly increases the percentage of vehicles operating in cold start mode. Increasing the number of vehicles operating in cold start mode by as little as 2% should be considered potentially significant.

The percentage of vehicles operating in cold-start mode is the same or lower for the area under study compared to those used for the area in the attainment plan because the attainment plan analysis assumed a mix of cold- and warm-starts and it is assumed that all vehicles on I-5 are in a fully warmed-up mode. Therefore, this criterion is not met.

The project significantly increases traffic volumes. Increases in traffic volumes in excess of 5% should be considered potentially significant. Increasing the traffic volume by less than 5% may still be potentially significant if there is also a reduction in average speeds.

The build alternatives would convert existing HOV lanes to ELs between Red Hill Avenue and the Orange/Los Angeles County line. Table 4.5 lists the annual average daily traffic (AADT) volumes along I-5 for the 2022 No Build (existing) condition, 2035 Opening Year without and with build alternatives, and 2055 Future Year without and with build alternatives. The total and truck AADT for all of the build alternatives would decrease compared to the No Build Alternative. This table shows that the number of diesel vehicles along the proposed I-5 lanes would not significantly increase as a result of any of the build alternatives.

The project worsens traffic flow. For uninterrupted roadway segments, a reduction in average speeds (within a range of 3 to 50 mph) should be regarded as worsening traffic flow. For intersection segments, a reduction in average speed or an increase in average delay should be considered as worsening traffic flow.

As shown in Table 4.5, the projected average speeds of vehicles during peak hours would increase for all build alternatives compared to the No Build Alternative. The average speeds of vehicles during off-peak hours would not change. Therefore, this criterion is not met.

This concludes the Caltrans CO flowchart evaluation procedure listed in Figure 3 (Local CO Analysis [Appendix F of this report]). Using the levels and criteria in Figure 3 of the CO Protocol, the build alternatives would be considered satisfactory, and no further analysis is needed.

Table 4.5: Summary of ADT and Average Speeds

Condition	AADT		Average Speed During Peak Travel (mph)	Average Speed During Off-Peak Travel (mph)
	Total	Truck		
Opening Year 2035				
No Build Alternative	405,153	28,361	48	60
Build Alternative 2	390,803	27,356	50	60
Change from No Build	*-14,350*	*-1,005*	*2*	*0*
Build Alternative 3	396,196	27,734	49	60
Change from No Build	*-8,957*	*-627*	*2*	*0*
Build Alternative 4	400,435	28,030	49	60
Change from No Build	*-4,718*	*-330*	*2*	*0*
Future Year 2055				
No Build Alternative	429,402	30,058	44	60
Build Alternative 2	407,924	28,555	48	59
Change from No Build	*-21,478*	*-1,503*	*4*	*0*
Build Alternative 3	419,685	29,378	47	59
Change from No Build	*-9,717*	*-680*	*3*	*0*
Build Alternative 4	423,519	29,646	47	59
Change from No Build	*-5,883*	*-412*	*3*	*0*

Source: Jacobs (2023).
Note: Truck percentages vary from 7.0 to 9.5 from Caltrans census traffic data for 2019.
AADT = annual average daily traffic

4.3.2 Particulate Matter Analysis

4.3.2.1 Emissions Analysis

Based on the *I-5 Managed Lanes Project (Red Hill Ave to Orange/Los Angeles County Line) Traffic Study* (2023), and as shown in Table 4.5, with the improvement of the MLs, all of the build alternatives would result in reduced PM_{10} and $PM_{2.5}$ emissions compared to the No Build Alternative under both the Opening Year (2035) and Future Year (2055) scenarios. Based on the TCWG findings in January 2023, none of the build alternatives would result in particulate matter emissions or hot spots as described below.

4.3.2.2 Hot-Spot Analysis

In November 2015, the USEPA released an updated version of Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas (Guidance) (USEPA 2015b) for quantifying the local air quality impacts of transportation projects and comparing them to the particulate matter NAAQS (75 Federal Register 79370). The USEPA originally released the quantitative Guidance in December 2010 and released a revised version in November 2013 to reflect the approval of EMFAC2011 and USEPA's 2012 particulate matter NAAQS final rule. The November 2015 version reflects MOVES2014 and its subsequent minor revisions, such as MOVES2014a, to revise design value calculations to be more consistent with other USEPA programs and to reflect Guidance implementation and experience in the field. Note that EMFAC, not MOVES, should be used for project hot-spot analysis in California. The Guidance requires a hot-spot analysis to be completed for a POAQC. The final rule in 40 CFR 93.123(b)(1) defines a POAQC as:

(i) New or expanded highway projects that have a significant number of or significant increase in diesel vehicles;

(ii) Projects affecting intersections that are at Level-of-Service (LOS) D, E, or F with a significant number of diesel vehicles, or those that would change to LOS D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project;

(iii) New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location;

(iv) Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location; and

(v) Projects in or affecting locations, areas, or categories of sites which are identified in the $PM_{2.5}$ and PM_{10} applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.

The build alternatives do not qualify as a POAQC for the following reasons:

(i) The build alternatives would convert existing HOV lanes to ELs between Red Hill Avenue and the Orange/Los Angeles County line. Table 4.5 lists the annual average daily traffic (AADT) volumes along I-5 for the 2022 No Build (existing) condition, 2035 Opening Year without and with build alternatives, and 2055 Future Year without and with build alternatives. The total and truck AADT for all of the build alternatives would decrease compared to the No Build Alternative. This table shows that the number of diesel vehicles along the proposed I-5 lanes would not significantly increase as a result of any of the build alternatives.

(ii) The build alternatives do not construct or alter any intersections.

(iii) The build alternatives do not include the construction of a new bus or rail terminal.

(iv) The build alternatives do not expand an existing bus or rail terminal.

(v) The build alternatives would not be located within or affect locations, areas, or categories of sites that are identified in the PM_{10} or $PM_{2.5}$ applicable implementation plan or implementation plan submission, as appropriate, as sites of violation or possible violation.

Therefore, the build alternatives meet the FCAA requirements and 40 CFR 93.116 without any explicit hot-spot analysis. None of the build alternatives would create a new, or worsen an existing, PM_{10} or $PM_{2.5}$ violation.

The USEPA guidance for particulate matter hot-spot analysis and interagency consultation was used to determine whether any of the build alternatives would be a POAQC. On January 24, 2023, the TCWG determined that none of the build alternatives are a POAQC. Pursuant to the transportation conformity rules and regulations, all nonexempt projects must go through review by the TCWG. The build alternatives were approved and concurred upon by IAC at the TCWG meeting as a project not having adverse impacts on air quality, and the build alternatives meet the requirements of the FCAA and 40 CFR 93.116. A copy of the TCWG finding is included in Appendix B.

Therefore, the proposed Project meets the FCAA requirements and 40 CFR 93.116 without any explicit hot-spot analysis. All build alternatives of the proposed Project are listed in the 2023 FTIP under ID No. ORA210604 (SCAG 2021a). SCAG approved the 2023 FTIP on October 6, 2022, and the FHWA both approved the 2023 FTIP and determined that it conforms to the SIP on December 16, 2022. Thus, the proposed Project was included in the regional emissions analysis that was used to meet regional conformity and would not delay timely attainment of the PM_{10} or $PM_{2.5}$ NAAQS for the Basin. On December 16, 2022, the FHWA published its determination that the Connect SoCal 2020–2045 RTP/SCS conforms to the SIP in accordance with 40 CFR 93. Construction and long-term operation of the build alternatives would therefore be considered consistent with the purpose of the SIP, and the build alternatives would conform to the requirements of the FCAA.

4.3.3 NO_2 Analysis

The USEPA modified the NO_2 NAAQS to include a 1-hour standard of 100 ppb in 2010. Currently, there is no federal project-level NO_2 analysis requirement. However, NO_2 is among the near-road pollutants of concern. The proposed Project is located in an attainment/maintenance area for federal NO_2, thus the proposed Project must be included in a conforming RTP and TIP. The proposed Project is listed in the 2023 FTIP under ID No. ORA210604 (SCAG 2021a). SCAG approved the 2023 FTIP on October 6, 2022, and the FHWA both approved the 2023 FTIP and determined that it conforms to the SIP on December 16, 2022. Within the Study Area, it is unlikely that NO_2 standards would be approached or exceeded based on the relatively low ambient concentrations of NO_2 in the Basin and on the long-term trend toward reduction of NO_X emissions. Additionally, as shown in Table 4.4 all the build alternatives would result in lower NO_X emissions than the No Build Alternative. Because of these factors, a specific analysis of NO_2 was not conducted for any of the build alternatives.

4.3.4 Mobile Source Air Toxics Analysis

The FHWA released updated guidance in October 2016 (FHWA 2016) for determining when and how to address MSAT impacts in the NEPA process for transportation projects. The FHWA identified three levels of analysis:

- No analysis for exempt projects or projects with no potential for meaningful MSAT effects
- Qualitative analysis for projects with low potential MSAT effects
- Quantitative analysis to differentiate alternatives for projects with higher potential MSAT effects

Projects with no impacts generally include those that (a) qualify as a categorical exclusion under 23 CFR 771.117, (b) qualify as exempt under the FCAA conformity rule under 40 CFR 93.126, and (c) are not exempt, but have no meaningful impacts on traffic volumes or vehicle mix.

Projects that have low potential MSAT effects are those that serve to improve highway, transit, or freight operations or movement without adding substantial new capacity or creating a facility that is likely to substantially increase emissions. The large majority of projects fall into this category.

Projects with high potential MSAT effects include those that:

- Create or significantly alter a major intermodal freight facility that has the potential to concentrate high levels of DPM in a single location; or
- Create new or add significant capacity to urban highways such as interstates, urban arterials, or urban collector-distributor routes with traffic volumes where the AADT is projected to be in the range of 140,000 to 150,000, or greater, by the design year; and
- Are proposed to be located in proximity to populated areas or, in rural areas, in proximity to concentrations of vulnerable populations (i.e., schools, nursing homes, or hospitals).

Based on the CARB Land Use Handbook (Cal/EPA and CARB 2005), it is generally recommended in California that projects perform an emissions analysis to address CEQA requirements if any of the following criteria are met:

- The project changes capacity or realigns a freeway, or an urban road with AADT of 100,000 or more, and there are sensitive land uses within 500 feet of the roadway.
- The project changes capacity or realigns a rural road (nonfreeway) with AADT of 50,000 or more and there are sensitive land uses within 500 feet of the roadway.

In addition, explicit notice of the project may be required to any schools and school districts that are within 0.25 mile of the project boundaries (California Public Resource Code Section 21151.4).

FHWA guidance defines MSATs as in the 2007 USEPA regulations; however, in addition, USEPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and noncancer hazard contributors from the 2011 National Air Toxic Assessment (USEPA 2018b). These are 1,3-butadiene, acetaldehyde, acrolein, benzene, DPM, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority MSATs, the list is subject to change and may be adjusted in consideration of future USEPA rules. For CEQA analyses, DPM should be highlighted because CARB considers it to be the most important TAC.

The traffic data, along with the CT-EMFAC2017 emission rates, were used to calculate the acrolein, benzene, 1,3-butadiene, acetaldehyde, DPM, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter emissions for the existing condition (2022), Opening Year (2035), and Future Year (2055). The modeling results are summarized in Table 4.6 and are provided in Appendix E.

Table 4.6: Opening Year (2035) and Future Year (2055) MSAT Emissions

Alternative	MSAT Exhaust (lbs/day)								
	Acrolein	Benzene	1,3-butadiene	Acetaldehyde	DPM	Ethylbenzene	Formaldehyde	Naphthalene	Polycyclic Organic Matter
Opening Year (2035)									
Existing (2022)	0.41	8.68	1.87	4.50	16.23	3.54	11.95	0.29	0.37
No Build (2035)	0.27	5.35	1.19	2.26	7.29	2.26	6.34	0.21	0.19
Change From Existing	*-0.15*	*-3.32*	*-0.68*	*-2.24*	*-8.94*	*-1.29*	*-5.61*	*-0.08*	*-0.18*
Alternative 2 (2035)	0.25	5.06	1.13	2.15	6.73	2.13	6.01	0.19	0.18
Change From Existing	*-0.16*	*-3.62*	*-0.74*	*-2.35*	*-9.50*	*-1.41*	*-5.94*	*-0.09*	*-0.19*
Change from No Build	*-0.01*	*-0.29*	*-0.07*	*-0.11*	*-0.56*	*-0.13*	*-0.33*	*-0.01*	*-0.01*
Alternative 3 (2035)	0.25	5.04	1.13	2.10	6.92	2.13	5.92	0.19	0.18
Change From Existing	*-0.16*	*-3.64*	*-0.74*	*-2.40*	*-9.31*	*-1.42*	*-6.03*	*-0.09*	*-0.19*
Change from No Build	*-0.02*	*-0.31*	*-0.07*	*-0.16*	*-0.37*	*-0.13*	*-0.42*	*-0.01*	*-0.01*
Alternative 4 (2035)	0.25	5.12	1.14	2.12	7.13	2.16	5.99	0.20	0.18
Change From Existing	*-0.16*	*-3.56*	*-0.73*	*-2.37*	*-9.11*	*-1.38*	*-5.95*	*-0.09*	*-0.19*
Change from No Build	*-0.01*	*-0.24*	*-0.05*	*-0.13*	*-0.16*	*-0.10*	*-0.35*	*-0.01*	*-0.01*
Future Year (2055)									
Existing (2022)	0.41	8.68	1.87	4.50	16.23	3.54	11.95	0.29	0.37
No Build (2055)	0.26	5.39	1.20	2.55	7.42	2.26	6.88	0.22	0.18
Change from Existing	*-0.15*	*-3.28*	*-0.67*	*-1.95*	*-8.82*	*-1.28*	*-5.07*	*-0.06*	*-0.19*
Alternative 2 (2055)	0.24	4.97	1.11	2.37	6.86	2.08	6.38	0.21	0.17
Change From Existing	*-0.17*	*-3.70*	*-0.76*	*-2.13*	*-9.37*	*-1.46*	*-5.57*	*-0.08*	*-0.20*
Change from No Build	*-0.02*	*-0.42*	*-0.09*	*-0.18*	*-0.55*	*-0.18*	*-0.50*	*-0.02*	*-0.01*
Alternative 3 (2055)	0.25	5.10	1.13	2.40	7.04	2.14	6.48	0.21	0.17
Change From Existing	*-0.16*	*-3.58*	*-0.74*	*-2.10*	*-9.19*	*-1.41*	*-5.46*	*-0.08*	*-0.20*
Change from No Build	*-0.01*	*-0.30*	*-0.07*	*-0.15*	*-0.37*	*-0.12*	*-0.39*	*-0.01*	*-0.01*
Alternative 4 (2055)	0.25	5.12	1.14	2.38	7.28	2.15	6.45	0.21	0.17
Change From Existing	*-0.16*	*-3.56*	*-0.73*	*-2.12*	*-8.95*	*-1.39*	*-5.49*	*-0.07*	*-0.20*
Change from No Build	*-0.01*	*-0.27*	*-0.06*	*-0.17*	*-0.14*	*-0.11*	*-0.42*	*-0.01*	*-0.01*

Source: Compiled by LSA Associates, Inc. using CT-EMFAC2017 (December 2022).
DPM = diesel particulate matter
EMFAC = Emission Factor Model
lbs/day = pounds per day
MSAT = mobile source air toxic

As Table 4.6 shows for the MSAT emissions in 2035 and 2055, the emissions for all build alternatives are lower than the existing condition and the No Build Alternative emissions.

4.3.5 Greenhouse Gas Analysis

4.3.5.1 Construction Emissions

Construction GHG emissions would result from material processing and transportation, on-site construction equipment, and traffic delays due to construction. These emissions will be produced at different levels throughout the construction phase; their frequency and occurrence can be reduced through innovations in plans and specifications and by implementing better traffic management during construction phases.

Use of long-life pavement, improved TMPs, and changes in materials can also help offset GHG emissions produced during construction by allowing longer intervals between maintenance and rehabilitation activities.

As with the criteria pollutant analysis described in Section 4.2.1, the construction emissions were estimated for the build alternatives using CAL-CET2020, Version 1.0. The CAL-CET2020 results were used to quantify GHG emissions generated by construction of the build alternatives and are presented in Tables 4.7 through 4.9.

Table 4.7: Alternative 2 Construction Greenhouse Gas Emissions

Construction Phase	CO_2 (tons/phase)	CH_4 (tons/phase)	N_2O (tons/phase)	CO_2e (MT/phase)
Land Clearing/Grubbing	2	0.00	0.00	2
Roadway Excavation and Removal	18	0.00	0.00	17
Structural Excavation and Removal	1	0.00	0.00	1
Base/Subbase/Imported Borrow	13	0.00	0.00	12
Structure Concrete	3	0.00	0.00	3
Paving	6	0.00	0.00	6
Drainage/Environment/Landscaping	26	0.00	0.00	24
Traffic Signalization/Signage/Striping/ Painting	12	0.00	0.00	11
Other Operation	0	0.00	0.00	0
Total (tons/construction project)	**82**	**0.00**	**0.00**	**75**

Source: Compiled by LSA using the CAL-CET2020 (February 2023).
Total CO_2e emission is the sum of CO_2 emissions × GWP of 1, CH_4 emissions × GWP of 25, and N_2O emissions × GWP of 298 (i.e., CO_2e = {CO_2} + {CH_4 × 25} + {N_2O × 298}). 1 MT = 1.1 ton.

CAL-CET2020 = Caltrans California Construction Emissions Tools 2020
CH_4 = methane
CO_2 = carbon dioxide
CO_2e = carbon dioxide equivalent
GWP = global warming potential
MT/phase = metric tons per phase
N_2O = nitrous oxide
tons/phase = tons per phase

Table 4.8: Alternative 3 Construction Greenhouse Gas Emissions

Construction Phase	CO_2 (tons/phase)	CH_4 (tons/phase)	N_2O (tons/phase)	CO_2e (MT/phase)
Land Clearing/Grubbing	187	0.01	0.01	172
Roadway Excavation and Removal	1,538	0.05	0.05	1,412
Structural Excavation and Removal	96	0.00	0.01	89
Base/Subbase/Imported Borrow	1,410	0.05	0.04	1,293
Structure Concrete	363	0.01	0.01	332
Paving	553	0.02	0.01	506
Drainage/Environment/Landscaping	419	0.02	0.01	384
Traffic Signalization/Signage/Striping/ Painting	478	0.02	0.02	439
Other Operation	0	0.00	0.00	0
Total (tons/construction project)	**5,043**	**0.18**	**0.14**	**4,625**

Source: Compiled by LSA using the CAL-CET2020 (February 2023).
Total CO_2e emission is the sum of CO_2 emissions × GWP of 1, CH_4 emissions × GWP of 25, and N_2O emissions × GWP of 298 (i.e., CO_2e = {CO_2} + {CH_4 × 25} + {N_2O × 298}). 1 MT = 1.1 ton.

CAL-CET2020 = Caltrans California Construction Emissions Tools 2020
CH_4 = methane
CO_2 = carbon dioxide
CO_2e = carbon dioxide equivalent
GWP = global warming potential
MT/phase = metric tons per phase
N_2O = nitrous oxide
tons/phase = tons per phase

Table 4.9: Alternative 4 Construction Greenhouse Gas Emissions

Construction Phase	CO_2 (tons/phase)	CH_4 (tons/phase)	N_2O (tons/phase)	CO_2e (MT/phase)
Land Clearing/Grubbing	209	0.01	0.01	172
Roadway Excavation and Removal	1,717	0.06	0.05	1,412
Structural Excavation and Removal	107	0.00	0.01	89
Base/Subbase/Imported Borrow	1,574	0.06	0.04	1,293
Structure Concrete	405	0.02	0.01	332
Paving	617	0.02	0.01	506
Drainage/Environment/Landscaping	468	0.02	0.01	384
Traffic Signalization/Signage/Striping/ Painting	533	0.02	0.02	439
Other Operation	0	0.00	0.00	0
Total (tons/construction project)	**5,629**	**0.20**	**0.15**	**5,164**

Source: Compiled by LSA using the CAL-CET2020 (February 2023).
Total CO_2e emission is the sum of CO_2 emissions × GWP of 1, CH_4 emissions × GWP of 25, and N_2O emissions × GWP of 298 (i.e., CO_2e = {CO_2} + {CH_4 × 25} + {N_2O × 298}). 1 MT = 1.1 ton.

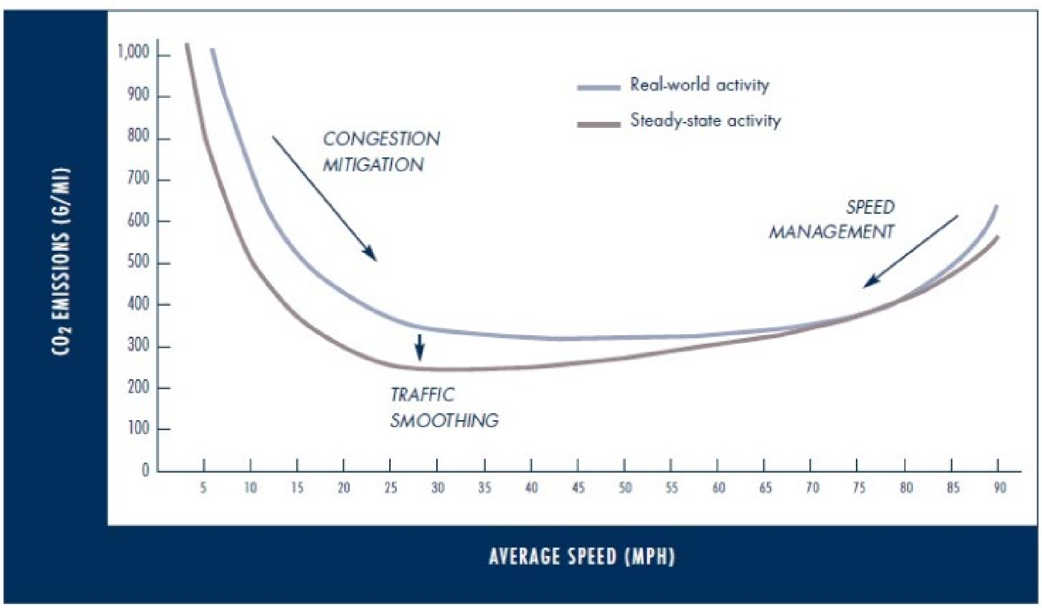
CAL-CET2020 = Caltrans California Construction Emissions Tools 2020
CH_4 = methane
CO_2 = carbon dioxide
CO_2e = carbon dioxide equivalent
GWP = global warming potential
MT/phase = metric tons per phase
N_2O = nitrous oxide
tons/phase = tons per phase

4.3.5.2 Operational Greenhouse Gas Emissions

CO_2 from fossil fuel combustion is the largest component of United States GHG emissions, and transportation is the largest contributor of CO_2. The largest emitters of transportation CO_2 emissions in 2020 were passenger cars (38.5 percent), freight trucks (26.3 percent), and light-duty trucks (18.9 percent). The remainder came from other modes of transportation, including aircraft, ships, boats, and trains, as well as pipelines and lubricants (USEPA 2022a). Because CO_2 emissions represent the greatest percentage of GHG emissions, CO_2 has been selected as a proxy for the following analysis of potential climate change impacts.

The highest levels of CO_2 from mobile sources such as automobiles occur at stop-and-go speeds (0–25 miles per hour [mph]) and speeds over 55 mph; the most severe emissions occur from 0 to 25 mph (see Figure 4-1). To the extent that a project enhances operational efficiency and improves travel times in high-congestion travel corridors, GHG emissions, particularly CO_2, may be reduced, provided that improved travel times do not induce additional VMT.

Four primary strategies can reduce GHG emissions from transportation sources: (1) improving the transportation system and operational efficiencies, (2) reducing travel activity (e.g., VMT), (3) transitioning to lower-GHG-emitting fuels, and (4) improving vehicle technologies and efficiency. To be most effective, all four strategies should be pursued concurrently.



Source: Barth and Boriboonsomsin (2010)

Figure 4-1: Possible Use of Traffic Operation Strategies in Reducing On-Road CO_2 Emissions

The regional VMT for Existing (2022) conditions, the No Build Alternative, and the build alternatives included in the *I-5 Managed Lanes Project (Red Hill Ave to Orange / Los Angeles*

County Line) Traffic Study (Jacobs 2023), along with the CT-EMFAC2017 emission rates, were used to calculate and compare the CO_2 emissions for the 2022, 2035, and 2055 regional conditions.

CARB developed the EMFAC model to facilitate preparation of statewide and regional mobile-source emissions inventories. The model generates emissions rates that can be multiplied by vehicle activity data from all motor vehicles, from passenger cars to heavy-duty trucks, operating on highways, freeways, and local roads in California. EMFAC has a rigorous scientific foundation, has been approved by the USEPA, and has been vetted through multiple stakeholder reviews. Caltrans developed CT-EMFAC to apply project-specific factors to CARB's model.

EMFAC's GHG emission rates are based on tailpipe emissions test data, and the model does not account for factors such as the rate of acceleration and vehicle aerodynamics, which influence the amount of emissions generated by a vehicle. GHG emissions quantified using CT-EMFAC are therefore estimates and may not reflect actual on-road emissions. The model does not, however, account for induced travel. Modeling GHG estimates with EMFAC or CT-EMFAC nevertheless remains the most precise means of estimating future GHG emissions. While CT-EMFAC is currently the best available tool for calculating GHG emissions from mobile sources, it is important to note that the GHG results are only useful for a comparison of alternatives.

Based on the *I-5 Managed Lanes Project (Red Hill Ave to Orange / Los Angeles County Line) Traffic Study* (Jacobs 2023), and as shown in Table 4.10, with the improvement of MLs, all of the build alternatives would result in reduced GHG emissions under both the Opening Year (2035) and Future Year (2055) scenarios.

Table 4.10: Modeled Annual GHG Emissions and Vehicle Miles Traveled by Alternative

Alternative	Annual VMT[1]	Amortized Construction CO_2e Emissions (MT/yr)	CO_2 Emissions (MT/yr)	N_2O Emissions (MT/yr)	CH_4 Emissions (MT/yr)	CO_2e Emissions (MT/yr)
Opening Year 2035						
Existing (2022)	1,742,990,490	--	592,273	18	23	599,708
No Build	1,830,225,725	--	466,205	15	20	472,403
Change from Existing	*87,235,235*	--	*-126,069*	*-3.11*	*-3.89*	*-127,306*
Alternative 2	1,690,134,558	2.5	434,229	14	18	440,011
Change from Existing	*-52,855,932*	--	*-158,045*	*-4.01*	*-5.22*	*-159,698*
Change from No Build	*-140,091,167*	--	*-31,976*	*-0.90*	*-1.33*	*-32,392*
Alternative 3	1,737,652,373	154	441,697	14	19	447,725
Change from Existing	*-5,338,117*	--	*-150,577*	*-4*	*-5*	*-151,983*
Change from No Build	*-92,573,352*	--	*-24,508*	*-1*	*-1*	*-24,677*
Alternative 4	1,787,640,305	172	452,410	14	19	458,598
Change from Existing	*44,649,815*	--	*-139,864*	*-4*	*-4*	*-141,110*
Change from No Build	*-42,585,420*	--	*-13,795*	*-1*	*-1*	*-13,805*
Future Year 2055						
Existing (2022)	1,742,990,490	--	592,273	18	23	599,708

Table 4.10: Modeled Annual GHG Emissions and Vehicle Miles Traveled by Alternative

Alternative	Annual VMT[1]	Amortized Construction CO_2e Emissions (MT/yr)	CO_2 Emissions (MT/yr)	N_2O Emissions (MT/yr)	CH_4 Emissions (MT/yr)	CO_2e Emissions (MT/yr)
No Build	1,964,437,696	--	474,417	17	22	481,299
Change from Existing	*221,447,206*	--	*-117,856*	*-1.17*	*-1.76*	*-118,409*
Alternative 2	1,784,746,094	2.5	434,178	15	20	440,458
Change from Existing	*41,755,604*	--	*-158,095*	*-2.65*	*-3.66*	*-159,251*
Change from No Build	*-179,691,601*	--	*-40,239*	*-1.48*	*-1.91*	*-40,842*
Alternative 3	1,852,783,427	154	448,608	16	20	455,254
Change from Existing	*109,792,937*	--	*-143,665*	*-2*	*-3*	*-144,455*
Change from No Build	*-111,654,269*	--	*-25,809*	*-1*	*-1*	*-26,046*
Alternative 4	1,907,536,046	172	458,021	16	21	464,818
Change from Existing	*164,545,556*	--	*-134,252*	*-2*	*-3*	*-134,890*
Change from No Build	*-56,901,650*	--	*-16,396*	*-1*	*-1*	*-16,481*

Source: Compiled by LSA using CT-EMFAC2017 (2023).
[1] Annual VMT values derived from daily VMT values multiplied by 347, per CARB methodology (CARB 2008).
[2] Total CO_2e emission is the sum of CO_2 emissions × GWP of 1, CH_4 emissions × GWP of 25, and N_2O emissions × GWP of 298 (i.e., CO_2e = {CO_2} + {CH_4 × 25} + {N_2O × 298}).

CARB = California Air Resources Board
CH_4 = methane
CO_2 = carbon dioxide
CO_2e = carbon dioxide equivalent
GWP = global warming potential
MT/yr = metric tons per year
N_2O = nitrous oxide
VMT = vehicle miles traveled

The results of the modeling were used to calculate the CO_2 emissions listed in Table 4.10, which shows that the No Build Alternative and all three build alternatives would result in a net decrease in CO_2 emissions in 2035 and 2055 compared to the existing (2022) condition. The build alternatives in both the opening and horizon years would result in a decrease in CO_2 emissions in the region when compared to the No Build Alternative in each year.

Table 4.10 presents the annual GHG emissions and VMT for each alternative scenario. Construction GHG emissions would be temporary and unavoidable. While construction GHG emissions would be unavoidable, SCAQMD staff recommends that construction emissions be amortized over a 30-year project lifetime so that GHG reduction measures will address construction GHG emissions as part of the operational GHG reduction strategies.

The build alternatives Opening Year (2035) and Future Year (2055) would all show decreases in long-term regional vehicle GHG emissions compared to their respective No Build Alternative.

SCAG's Connect SoCal 2020–2045 RTP/SCS complies with the emissions reduction targets established by CARB and meets the requirements of SB 375, as codified in Government Code Section 65080(b) et seq., by achieving per-capita GHG emission reductions relative to 2005 of 8 percent by 2020 and 18 percent by 2035, which meets or exceeds the targets set by CARB.

As required by SB 375, the SCS outlines growth strategies that better integrate land use and transportation planning and help reduce the State's GHG emissions from cars and light trucks. The build alternatives are currently included in the future commitments section of the Connect SoCal 2020 RTP/SCS. However, the proposed Project is not captured in future regional models and efforts to incorporate the build alternatives into such models are being taken. Once updated later in 2023 the 2020–2045 RTP/SCS and the FTIP will capture the build alternatives in regional models. The build alternatives would assist the region with its overall goals to reduce vehicle-related GHGs by relieving congestion and improving traffic flow, thereby reducing emissions. This is consistent with the RTP/SCS-identified strategies to manage congestion by maximizing the current system and ensuring it operates with maximum efficiency and effectiveness.

4.4 Cumulative/Regional/Indirect Effects

O_3, secondary PM_{10}, and secondary $PM_{2.5}$ are normally regional issues because they form from photochemical and chemical reactions over time in the atmosphere. For these pollutants, localized impact analysis is not meaningful. However, emissions analyses may be required to make some comparison with baseline and No Build conditions. Formation of O_3 and secondary particulate matter is a function of VOC and NO_X emissions. As described above, based on the *I-5 Managed Lanes Project (Red Hill Ave to Orange / Los Angeles County Line) Traffic Study* (2022), and as shown in Tables 4.4 and 4.10, with the improvement of MLs, the build alternatives would result in reduced criteria pollutant and GHG emissions under both the Opening Year (2035) and Future Year (2055) scenarios.

5. MINIMIZATION MEASURES

CEQA requires that feasible measures that can eliminate or substantially reduce project impacts be addressed. The FHWA requires a project to incorporate measures to mitigate adverse impacts caused by the action and requires the project applicant to be responsible for the implementation of the measures (23 CFR 771).

5.1 Short-Term (Construction)

The following standard minimization measure will be implemented during construction activities.

AQ-1 The Contractor shall comply with the California Department of Transportation (Caltrans) Standard Specifications in Section 14-9 (2022) for reducing impacts from construction activities. Section 14-9.02 specifically requires compliance by the contractor with all applicable air-pollution-control rules, regulations, ordinances related to air quality, including air quality management district rules and regulations.

5.2 Long-Term (Operational)

No avoidance, minimization, and/or mitigation measures are required, as the build alternatives would not produce substantial operational air quality impacts.

Caltrans is firmly committed to implementing measures to help reduce GHG emissions. These measures are outlined in the following section.

5.3 Greenhouse Gas Reduction Strategies

5.3.1 Statewide Efforts

In response to AB 32, California is implementing measures to achieve emission reductions of GHGs that cause climate change. Climate change programs in California are effectively reducing GHG emissions from all sectors of the economy. These programs include regulations, market programs, and incentives that will transform transportation, industry, fuels, and other sectors to take California into a sustainable, low-carbon, and cleaner future while maintaining a robust economy (CARB n.d.-e).

Major sectors of the California economy, including transportation, will need to reduce emissions to meet the 2030 and 2050 GHG emissions targets. The Governor’s Office of Planning and Research (OPR) identified five sustainability pillars in a 2015 report: (1) increasing the share of renewable energy in the State’s energy mix to at least 50 percent by 2030; (2) reducing petroleum use by up to 50 percent by 2030; (3) increasing the energy efficiency of existing buildings by 50 percent by 2030; (4) reducing emissions of short-lived climate pollutants; and (5) stewarding natural resources, including forests, working lands, and wetlands, to ensure that they store carbon, are resilient, and enhance other environmental benefits (OPR 2015). OPR later added strategies related to achieving statewide carbon neutrality by 2045 in accordance with EO B-55-18 and AB 1279 (OPR 2022).

The transportation sector is integral to the people and economy of California. To achieve GHG emissions reduction goals, it is vital that the State build on past successes in reducing criteria and toxic air pollutants from transportation and goods movement. GHG emission reductions will come from cleaner vehicle technologies, lower-carbon fuels, and reduction of VMT. Reducing today's petroleum use in cars and trucks is a key State goal for reducing GHG emissions by 2030 (Cal/EPA 2015).

In addition, SB 1386 (Wolk 2016) established as State policy the protection and management of natural and working lands and requires State agencies to consider that policy in their own decision-making. Trees and vegetation on forests, rangelands, farms, and wetlands remove carbon dioxide from the atmosphere through biological processes and sequester the carbon in above- and below-ground matter.

Subsequently, Governor Gavin Newsom issued EO N-82-20 to combat the crises in climate change and biodiversity. It instructs State agencies to use existing authorities and resources to identify and implement near- and long-term actions to accelerate natural removal of carbon and build climate resilience in our forests, wetlands, urban greenspaces, agricultural soils, and land conservation activities in ways that serve all communities and, in particular, low-income, disadvantaged, and vulnerable communities. To support this order, the California Natural Resources Agency released its Natural and Working Lands Climate Smart Strategy Draft for public comment in October 2021.

5.3.2 Caltrans Activities

Caltrans continues to be involved on the Governor's Climate Action Team as CARB works to implement EOs S-3-05 and S-01-07 and help achieve the targets set forth in AB 32. EO B-30-15, issued in April 2015, and SB 32 (2016), set an interim target to cut GHG emissions to 40 percent below 1990 levels by 2030. The following major initiatives are underway at Caltrans to help meet these targets.

5.3.3 Climate Action Plan for Transportation Infrastructure

The California Action Plan for Transportation Infrastructure (CAPTI) builds on EOs signed by Governor Newsom in 2019 and 2020 targeted at reducing GHG emissions in transportation, which account for more than 40 percent of all polluting emissions, to reach the State's climate goals. Under CAPTI, where feasible and within existing funding program structures, the State will invest discretionary transportation funds in sustainable infrastructure projects that align with its climate, health, and social equity goals (California State Transportation Agency 2021).

5.3.4 California Transportation Plan

The California Transportation Plan (CTP) is a statewide, long-range transportation plan to meet our future mobility needs and reduce GHG emissions. It serves as an umbrella document for all the other statewide transportation planning documents. The CTP 2050 presents a vision of a safe, resilient, and universally accessible transportation system that supports vibrant communities, advances racial and economic justice, and improves public and environmental health. The plan's climate goal is to achieve statewide GHG emissions reduction targets and increase resilience to climate change. It demonstrates how GHG emissions from the transportation sector can be reduced through advancements in clean fuel technologies; continued shifts toward active travel, transit, and shared mobility; more efficient land use and development practices; and continued shifts to telework (Caltrans 2021a).

5.3.5 Caltrans Strategic Plan

The Caltrans 2020–2024 Strategic Plan includes goals of stewardship, climate action, and equity. Climate action strategies include developing and implementing a Caltrans Climate Action Plan; a robust program of climate action education, training, and outreach; partnership and collaboration; a VMT monitoring and reduction program; and engaging with the most vulnerable communities in developing and implementing Caltrans climate action activities (Caltrans 2021b).

5.3.6 Caltrans Policy Directives and Other Initiatives

Caltrans Director's Policy 30 (DP-30) Climate Change (June 22, 2012) established a Department policy to ensure coordinated efforts to incorporate climate change into Departmental decisions and activities. The Caltrans *Greenhouse Gas Emissions and Mitigation Report* (Caltrans 2020) provides a comprehensive overview of Caltrans' emissions. The report documents and evaluates current Caltrans procedures and activities that track and reduce GHG emissions and identifies additional opportunities for further reducing GHG emissions from Department-controlled emission sources, in support of Departmental and State goals.

5.3.7 Project-Level GHG Reduction Strategies

The following measure will also be implemented in the Project to reduce GHG emissions and potential climate change impacts from the Project:

The Contractor will comply with the California Department of Transportation (Caltrans) Standard Specifications in Section 14-9 (2022) for reducing impacts from construction activities. Section 14-9.02 specifically requires compliance by the contractor with all applicable air-pollution-control rules, regulations, ordinances related to air quality, including air quality management district rules and regulations.

5.3.8 Adaptation

Reducing GHG emissions is only one part of an approach to addressing climate change. Caltrans must plan for the effects of climate change on the State's transportation infrastructure and strengthen or protect the facilities from damage. Climate change is expected to produce increased variability in precipitation, rising temperatures, rising sea levels, and variability in storm surges and their intensity, as well as in the frequency and intensity of wildfires. Flooding and erosion can damage or wash out roads; longer periods of intense heat can buckle pavement and railroad tracks; and storm surges combined with a rising sea level can inundate highways. Wildfire can directly burn facilities and indirectly cause damage when rain falls on denuded slopes that landslide after a fire. Effects will vary by location and may, in the most extreme cases, require that a facility be relocated or redesigned. Accordingly, Caltrans must consider these types of climate stressors in how highways are planned, designed, built, operated, and maintained.

5.3.8.1 Federal Efforts

Under NEPA Assignment, Caltrans is obligated to comply with all applicable federal environmental laws and FHWA NEPA regulations, policies, and guidance.

The Fourth National Climate Assessment, published in 2018, presents the foundational science and the "human welfare, societal, and environmental elements of climate change and variability for 10 regions and 18 national topics, with particular attention paid to observed and projected risks, impacts, consideration of risk reduction, and implications under different mitigation pathways."

The USDOT Policy Statement on Climate Adaptation in June 2011 committed USDOT to "integrate consideration of climate change impacts and adaptation into the planning, operations, policies, and programs of DOT in order to ensure that taxpayer resources are invested wisely, and that transportation infrastructure, services and operations remain effective in current and future climate conditions" (USDOT 2011). The USDOT Climate Action Plan of August 2021 followed up with a statement of policy to "accelerate reductions in greenhouse gas emissions from the transportation sector and make our transportation infrastructure more climate change resilient now and in the future," following this set of guiding principles (USDOT 2021):

- Use best-available science
- Prioritize the most vulnerable
- Preserve ecosystems
- Build community relationships
- Engage globally

USDOT developed its climate action plan pursuant to federal EO 14008, Tackling the Climate Crisis at Home and Abroad (January 27, 2021). EO 14008 recognized the threats of climate change to national security and ordered federal government agencies to prioritize actions on climate adaptation and resilience in their programs and investments (White House 2021).

FHWA Order 5520 (Transportation System Preparedness and Resilience to Climate Change and Extreme Weather Events, December 15, 2014) established FHWA policy to strive to identify the risks of climate change and extreme weather events to current and planned transportation systems. The FHWA has developed guidance and tools for transportation planning that foster resilience to climate effects and sustainability at the federal, State, and local levels (FHWA 2019).

5.3.8.2 State Efforts

Climate change adaptation for transportation infrastructure involves long-term planning and risk management to address vulnerabilities in the transportation system. A number of State policies and tools have been developed to guide adaptation efforts.

California's *Fourth Climate Change Assessment* (Fourth Assessment) (2018) is the State's effort to "translate the state of climate science into useful information for action." It provides information that will help decision-makers across sectors and at State, regional, and local scales protect and build the resilience of the State's people, infrastructure, natural systems, working lands, and waters. The State's approach recognizes that the consequences of climate change occur at the intersections of people, nature, and infrastructure. The Fourth Assessment reports that if no measures are taken to reduce GHG emissions by 2021 or sooner, the State is projected to experience a 2.7 to 8.8°F increase in average annual maximum daily temperatures, with impacts on agriculture, energy demand, natural systems, and public health; a two-thirds decline in water supply from snowpack and water shortages that will impact agricultural production; a 77 percent increase in average area burned by wildfire, with consequences for forest health and communities; and large-scale erosion of up to 67 percent of Southern California beaches and inundation of billions of dollars' worth of residential and commercial buildings due to sea level rise (State of California 2018).

Sea level rise is a particular concern for transportation infrastructure in the Coastal Zone. Major urban airports will be at risk of flooding from sea level rise combined with storm surge as early as 2040; San Francisco International Airport is already at risk. The miles of coastal highways vulnerable to flooding in a 100-year storm event will triple to 370 by 2100, and 3,750 miles will be exposed to temporary flooding. The Fourth Assessment's findings highlight the need for proactive action to address these current and future impacts of climate change.

In 2008, then-Governor Arnold Schwarzenegger recognized the need when he issued EO S-13-08, focused on sea level rise. Technical reports on the latest sea level rise science were first published in 2010 and updated in 2013 and 2017. The 2017 projections of sea level rise and new understanding of processes and potential impacts in California were incorporated into the State of California Sea-Level Rise Guidance Update in 2018. This EO also gave rise to the California Climate Adaptation Strategy (2009), updated in 2014 as *Safeguarding California: Reducing Climate Risk* (Safeguarding California Plan), which addressed the full range of climate change impacts and recommended adaptation strategies. The Safeguarding California Plan was updated in 2018 and again in 2021 as the California Climate Adaptation Strategy, incorporating key elements of the latest sector-specific plans such as the Natural and Working Lands Climate Smart Strategy, Wildfire and Forest Resilience Action Plan, Water Resilience Portfolio, and CAPTI (described above). Priorities in the 2021 California Climate Adaptation Strategy include acting in partnership with California Native American tribes, strengthening protections for climate-vulnerable communities that lack capacity and resources, nature-based climate solutions, use of best available climate science, and partnering and collaboration to best leverage resources (California Natural Resources Agency 2021).

EO B-30-15, signed in April 2015, requires State agencies to factor climate change into all planning and investment decisions. This EO recognizes that effects of climate change in addition to sea level rise also threaten California's infrastructure. At the direction of EO B-30-15, the OPR published *Planning and Investing for a Resilient California: A Guidebook for State Agencies* in 2017 to encourage a uniform and systematic approach.

AB 2800 (Quirk 2016) created the multidisciplinary Climate-Safe Infrastructure Working Group to help actors throughout the State address the findings of California's Fourth Assessment. It released its report, *Paying it Forward: The Path Toward Climate-Safe Infrastructure in California,* in 2018. The report provides guidance to agencies on how to address the challenges of assessing risk in the face of inherent uncertainties still posed by the best available science on climate change. It also examines how State agencies can use infrastructure planning, design, and implementation processes to address the observed and anticipated climate change impacts (CARB n.d.-d).

5.3.8.3 Caltrans Adaptation Efforts

Caltrans Vulnerability Assessments

Caltrans is conducting climate change vulnerability assessments to identify segments of the State Highway System vulnerable to climate change effects of precipitation, temperature, wildfire, storm surge, and sea level rise.

The climate change data in the assessments were developed in coordination with climate change scientists and experts at federal, State, and regional organizations at the forefront of climate science. The findings of the vulnerability assessments guide analysis of at-risk assets and development of Adaptation Priority Reports as a method to make capital programming decisions to address identified risks.

5.3.8.4 Project Adaptation Analysis

The project adaptation analysis demonstrates how the project will be adapted or resilient to climate change effects. EO B-30-15 requires that all projects consider future climate conditions in the planning and design decisions. According to the 2020 Caltrans Adaption Priorities Report – District 12, several bridges and culverts have been identified as potentially vulnerable to enhanced riverine flooding associated with climate change. Some I-5 roadway segments have been identified as potentially exposed to pavement degrading temperature changes associated with climate change. Table 5.1 lists the affected features.

Sea Level Rise

The proposed Project is outside the coastal zone and not in an area subject to sea level rise. Accordingly, direct impacts to transportation facilities due to projected sea level rise are not expected (see Figure 5-1).

Floodplains

The proposed Project is not located in a floodplain or adjacent to any streams or water bodies that could be affected by climate change so as to present a hazard to the facility or be affected by the facility.

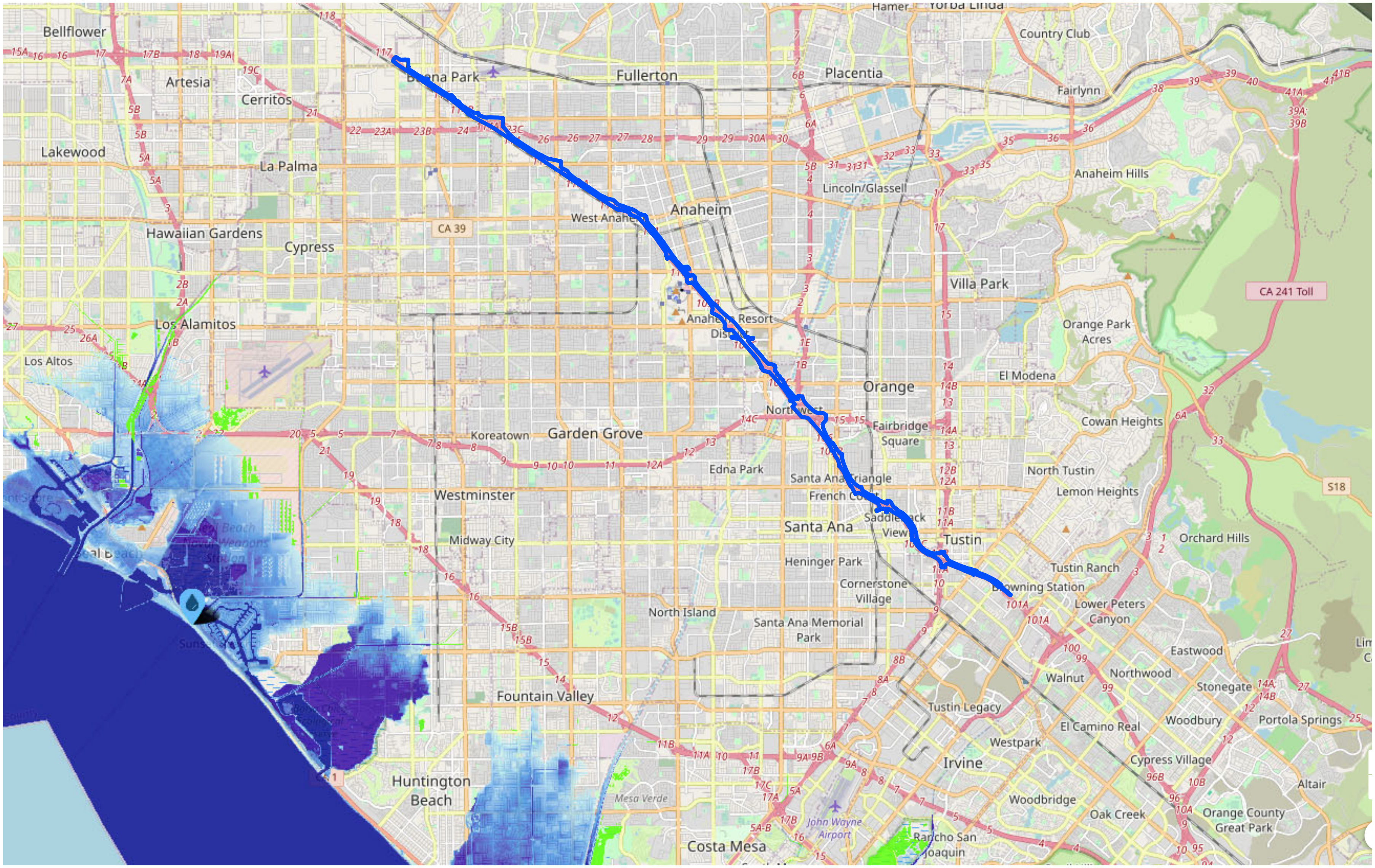
Wildfire

The proposed Project does not traverse any Fire Hazard Severity Zones, as designated by the California Department of Forestry and Fire Protection (CalFire n.d.).

Table 5.1: Caltrans Adaptation Priority List

Priority	Bridge Number	County	Route	Feature Crossed	Postmile	Cross-Hazard Prioritization Score
3	55 1046L	ORA	Interstate 5 SB	Santiago Creek	33.39	21.29
3	55 0811	ORA	Interstate 5	Santa Ana River	34.47	21.34
5	55 1073L	ORA	Interstate 5 SB	Fullerton Creek	42.98	5.16
Culverts Vulnerable to Climate Change						
1	55 0910	ORA	Interstate 5	Carbon Creek	40.2	39.18
Roadway Segments Vulnerable to Climate Change						
Priority	**Route**	**Carriageway**	**From County & Postmile / To County & Postmile**			**Average Cross-Hazard Prioritization Score**
1	5	P	ORA 5 34.008 / ORA 5 34.998			39.86
1	5	P	ORA 5 37.643 / ORA 5 39.183			39.86
1	5	P	ORA 5 42.93 / ORA 5 43.437			39.86
1	5	P	ORA 5 R27.253 / ORA 5 33.849			39.86
1	5	S	ORA 5 27.46 / ORA 5 33.869			39.85
1	5	S	ORA 5 34.036 / ORA 5 35.028			39.85
1	5	S	ORA 5 37.671 / ORA 5 39.045			39.85
1	5	S	ORA 5 42.8 / ORA 5 43.424			39.85
2	5	S	ORA 5 35.028 / ORA 5 35.217			38.18
2	5	S	ORA 5 35.76 / ORA 5 37.671			38.18
2	5	S	ORA 5 39.045 / ORA 5 40.95			38.18
2	5	P	ORA 5 34.998 / ORA 5 35.217			38.08
2	5	P	ORA 5 35.951 / ORA 5 37.643			38.08
2	5	P	ORA 5 39.183 / ORA 5 40.833			38.08
3	5	P	ORA 5 33.849 / ORA 5 34.008			32.63
3	5	P	ORA 5 35.217 / ORA 5 35.951			32.63
3	5	P	ORA 5 40.833 / ORA 5 42.93			32.63
3	5	P	ORA 5 43.437 / LA 5 0			32.63
3	5	S	ORA 5 33.869 / ORA 5 34.036			32.62
3	5	S	ORA 5 35.217 / ORA 5 35.76			32.62
3	5	S	ORA 5 40.95 / ORA 5 42.8			32.62
3	5	S	ORA 5 43.424 / ORA 5 44.376			32.62

Source: Caltrans Adaptation Priorities Report
ORA = Orange County



LEGEND

Project Area

Water Depth (Maximum 10 ft Sea-level Rise)

Low-lying Areas

FIGURE 5-1

NO SCALE

SOURCE: coast.noaa.gov

I-5 Managed Lanes Project
(Red Hill Avenue to Orange County/Los Angeles County Line)
Sea Level Rise Risk

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6. CONCLUSIONS

As described above, the purpose of this Project is to improve the overall movement of people and goods along this section of I-5 from Red Hill Avenue to the Orange/Los Angeles County line. The Project improvements include implementing MLs improvements in each direction between Red Hill Avenue and the Orange/Los Angeles County line.

As shown in Section 4, Environmental Consequences, neither the short-term construction impacts nor the long-term operational impacts would result in any adverse impact with implementation of the minimization measures for construction provided in Section 5.1. With implementation of these minimization measures and features, and implementation of the final design, as included in the conforming 2023 FTIP, no adverse impacts would occur and no additional avoidance, minimization, or mitigation measures are required.

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Appendices to be provided upon request.